Optimizing chest pain knowledge reduce number of requested cardiac work (ECG &CARDIC ENZYMES),that can decrease medical costs, time staying in ER department & workload of nurses

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Abstract:
Although large numbers of requested ECG &cardiac enzymes in ER department for every chest pain , only small numbers of them have significant findings such as myocardial infarction or acute coronary syndrome. That has a negative impact towards medical costs, time staying of patients in ER department and workload to nurses .The lack following guidelines by ER physicians and lack of continues medical education to ER staffs are considered the main reasons for this problem. The aim of this study was to reduce the negative consequences as mentioned previously. Through arranging regular educational sessions using posters in ER department as well as using the screen saver of a computer at the office of physicians to show the recent guidelines and approach with chest pain management by using a simple prediction rule. Also, we involved that predication rule in an initial triage sheet of patient.

. The study was set in ER department within an urban private hospital. Participants included ER staffs including registered nurses and ER physicians.

METHODS: (The Plan Do Study Act) method of quality improvement was used for this project. Baseline assessment included review of **Marburg Heart Score (MHS)** before the intervention. Documentation numbers of ECG in ER, numbers of cardiac enzymes, numbers of significant findings of ECG and cardiac enzymes related to acute coronary syndrome were requested before and after following the Marburg Heart Score (MHS).

INTERVENTION: Survey of staff was conducted to evaluate knowledge of Marburg Heart Score (MHS) and also to determine current healthcare providers' practice as related to identification and treatment of cardiac causes of chest pain.

RESULTS: Two months following education on the use of Marburg Heart Score (MHS) and implementation the knowledge in care of chest pain reveled significant reduction in numbers of cardiac works 44% by the first month then reach to 25% by the end of the second month .

CONCLUSIONS: Identification and implementation of Marburg Heart Score (MHS) accurately during evaluation of chest pain have a remarkable impact in selection of cardiac cause of chest pain. Therefore, the time of staying in ER, work load of nurses and medical cost significantly changed. It was learned from project that we can save the time and improve the quality of caring patients if follow the guidelines and make it easily accessible for our staff.

Keywords: cardiac work (ECG, cardiac enzymes), ER Department, Marburg Heart Score (MHS), chest pain, cardiac cause of chest pain, coronary heart disease (CHD)

INTRODUCTION:

Chest pain remains a challenge in emergency department. Although the underlying etiology in the majority of patients is non-cardiac for example, musculoskeletal, psychological or esophageal. Cardiac cause accounts for 8.0–14.6% of chest pain cases in this setting. (1-3). ER physicians must have enough knowledge to select serious cardiac causes of chest pain. Thus, protecting patients from unnecessary investigations,time staying and workload towards nurses. Based on history taken from patient and physical examination, the physician determines the probability of chest pain of cardiac origin and decides whether additional tests or treatment are needed. A simple prediction rule assisting physicians to identify patients with a low probability of cardiac diseases as the underlying cause of chest pain was developed.(4) The Marburg Heart Score (MHS) is based on five findings of the medical history and physical examination; all five items contribute equally to one score

Score item	Assigned points
Sex/age (female ≥65, male ≥55)	1
Known clinical cardiovascular disease	1
Patient assumes cardiac origin of pain	1
Pain worse with exercise	1
Pain not reproducible by palpation	1

Score interpretation (1):

score	Coronary artery disease risk	Recommendation
0-2	3%	Outpatient evaluation
≤3	23%	Urgent evaluation

Although this scoring system was innovated for assisting General practitioners in ruling out coronary heart disease (CHD) in patients presenting with chest pain, we found it has a good impact if using in medical triage of ER department.

Available knowledge:

Only a few clinical prediction rules for CHD have been externally validated in general practice (1, 4, and 5)

Rationale:

Chest pain raises concerns about the occurrence of a serious condition such as coronary heart disease (CHD)(6). Predictive scores for CHD in emergency settings have been developed (7,8).

Such a score might help physicians, reassure patients (9), and spare time and resources from being spent on further investigations.

. **Specific Aims**

The specific aim of a project was to reduce the workload of nurses, cost of doing cardiac works and time staying in the hospital through following guidelines in management of chest pain.

Context:

The staffs, who involved in this study, were ER physicians especially those in medical triage, ER nurses and financial department. The department was ER department in a private hospital and our target patents were complaining of chest pain.

Assessment of problem and analysis of its causes:

We used plan, do, and study and act approach. We divided the team into groups responsible for collecting the data for every patient has chest pain, others for numbers of requested cardiac works and others for follow up the patients have positive results. . It was remarkable that most of the patients have chest pain transferred directly from triage to inside ER department in order to make cardiac works (ECG, cardiac enzymes). Thus, they were stay in ER department until finish all of cardiac investigations. According to our study those patients were in ER waiting the results for almost 45 min, they were lying in bed to make ECG for almost 5min and the cost of cardiac works **160** US dollars per patient. Numbers of patients were in our study **600** for one month. So**, 96000** US dollars for cardiac works, **450** hours as staying in ER department and **50** hours as lying in bed to making ECG.

Intervention:

After implication of The Marburg Heart Score (MHS) there was significant reduction in numbers of requesting cardiac works. We found in same number of patients only **250** of them had cardiac chest pain. Therefore, the cost(**40000 US dollar**),time staying of patents were

decreased remarkably(**187.5 hours**) and the time of doing ECG reduced to be almost **20** hours. The posters in rest room of staff, screen saver of ER computer and regular educational sessions were the methods used to make that scoring system familiar to physicians. Besides that, we involved the scoring system in initial triage sheet of patient.

Strategy for change

The timeline of study was implication of the scoring system after collection of data directly then continues reevaluation the results in our regular meetings by the end of every week. Feedback was taken from staff especially nurses. They were satisfied after implication of that scoring system through reducing the workload. Besides that , we discussed using of that strategy with cardiology department.

Measurement

The analytical method was plan, do, and study and act approach.

A comparative study was conducted. Over a period of 8 weeks. Patients were eligible if they had pain localized in the anterior chest. Patients were excluded if the cause of chest pain not related to heart such as trauma, musculoskeletal, psychological or esophageal. The approach to ongoing assessment were collecting the data from ER department of any patient had chest pain cardiac origin, any positive data of cardiac works and follow up the patient with cardiology department after admission for those patients. Besides that, we collected the data from finical department and reception for patients who had cardiac works done to them. During the time of collecting data, study physicians gathered standardized data on the medical history and clinical examination including the variables contributing to the MHS. Then after that we collected the feedback from nurses, Triage physicians, cardiology department and reception. Data were collected between December 2021 and January 2022.

Analyses were conducted using a constant comparative approach. To ensure that the analyses were systematic and valid, several common qualitative techniques were employed including consistent use of the score in triage of ER, continues education to ER team and using posters. Those qualitative approaches used after doing fishbone analysis to the problem. Thus, we found lack of knowledge of that scoring system and lack of continues education.

Ethics statements

Patient consent for publication

Not required.

Ethics approval

The project was initiated after institutional ethics Committee approval.

Results

Over the course of this study, 600 patients encounter that met criteria took place. Evaluation was tracked, and the percentage of patients who had cardiac origin chest pain, cost of cardiac works and time of staying in ER were documented. Key improvement areas and specific interventions are included continues education, using posters, using scoring system as screening saver of ER computer , involving this scoring system in a triage sheet ,individual reports of personal performance, personal coaching of noncompliant staff and rewards for compliance . Key interventions that were tested and implemented included revision of the scoring system with ER physicians, re-education and re-emphasis the importance of using scoring system in triage sheet.

Effects of changes

The impact of this study was positive for us because we met our goals. Besides that, around 40% was reduction in requesting cardiac works and time staying in ER. The benefits of this study were significant by reducing the cost and time. The problem we faced when we collect the data because many patients had chest pain non cardiac origin In addition to that , some patients supposing their chest pain has a cardiac origin even it is not related to heart; therefore they were looking for further investigations. If we had begun this project, we would have involved the families through educational sessions about not all chest pain are cardiac in nature. . Also, there were cases had atypical presentation of cardiac chest pain, which was a negative point. Therefore, any case was suspected to be heart in origin the cardiologist was consulted for further follow up.

Discussion

Summary

In our study of 600 patients we found that all of chest pain was dealt as cardiac origin before implication of scoring system. Thus, the cost of cardiac works, time of staying in ER and workload to nurses were high. However, after finding out and implementation of the main key improvement areas results changed significantly although there were some atypical patients. To our knowledge, this study is the first study concerning about cost and workload although this study was done in relevant to using this score to reduce morbidity and mortality in primary health care. (3)

Interpretation

After QI interventions, the percentage of cardiac works, time staying and workload reduced significantly by 40%.We learned that following the guidelines in clinical practice have good impacts in quality improvement in medical care. Using of posters in restroom

and screen saver of computer have continues educational effect passively. Our data are in agreement with a pervious study (3) we found our results were near in term of using Marburg Heart Score in triage although our study was general to include the cost and time of staying.

Conclusions:

We have found that average of waiting the results of cardiac works in ER almost 45 min and workload towards nurse increase by doing ECG and cardiac works for any patient had chest pain. Furthermore, the cost of cardiac works 160 US dollars per patient. Thus, we can reduce that if we follow the MHS scoring system in triage. To our knowledge this is the first study shows the relationship between using scoring system in selecting cardiac chest pain cases and cost of investigations, time staying in ER and workload of nurses. While these ER triage physicians -oriented interventions have been shown to significantly reduce in requesting cardiac works by ER triage, our finding suggest that the hospital cost and workload will be declined significantly. The sustainability of quality improvement initiatives related to this issue may ultimately depend on physicians' ability to follow up the scoring systems and medical guidelines with regular reassessment.

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