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Knowledge, Attitude, Practice & Perceptions for the Management of Factors Cause Delay Door to Balloon Time (Code STEMI) for Primary Percutaneous Coronary Intervention (PPCI) for Acute Myocardial Infarction among Health Staffs in the Emergency Department and Cardiac Centre at KFMC

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Factors of delaying DTBT

Abstract: ***Introduction: Door-to-balloon time is important for a good quality care & reduce mortality among acute myocardial infarction patients. This study established & concentrated on the Knowledge, attitude, practice & perceptions for health care providers. Objective: Assess knowledge, attitude & perceptions for health care staff in the cardiac centre, EMS to manage the factors cause delaying door to balloon time at KFMC. Methods: Were conducted to analyses knowledge & perceptions of health care providers for factors that cause delays in this field. Is a cross-sectional study, study data was collected from period of September to November 2016.This study include all health care providers who work in cardiac center, emergency departments & paramedics. Results: There were total 240 participants, most of the respondents were females 210(87.5%), a majority of nurses 221(92.1%), more participants were fromsome cardiac center, education level of participants more find with bachelor's degree 97(40.4%) & experience of percipients the most was from (5-10) years with percentage of 132(55.0%). Study was included all heath care providers working in KSHC & EMS from (Physicians, Nurses, technicians & paramedics). Conclusions: HCW at KFMC had good knowledge levels and poor/good attitude regarding DTB of STEMI patients. Curricular changes aiming to promote STEMI management in medical patients and correcting the ingrained misconceptions are needed.***

Keywords: DTBT; PPCI; AMI; STEMI; Knowledge; Attitude

1. Introduction

CVDs are the leading cause of deaths in both developed and developing countries. In 2008, 30% (17.5 million people) of global all-cause mortalities were from CVDs.
In KSA, CHD is the major cause of morbidity and mortality and CVDs are estimated to cause 46.0% of all mortalities[(1)].

Acute myocardial infarction (AMI) is a common disease among cardiac patients & one of factors that cause of morbidity and mortality worldwide & lead to deaths pre hospital admission[(2).]

Primary percutaneous coronary intervention (PCI) is the preferred method of treatment for ST-elevation myocardial infarction (STEMI) if it can be performed in a timely manner. The American College of Cardiology/American Heart Association guidelines for the treatment of STEMI state that PCI is the favored approach if an institution can achieve a door-to-balloon time (DBT) of no longer than 90 minutes. This benchmark time is derived from multiple studies that show that shorter DBTs are associated with improved clinical outcomes[(3,4,5,6)].

American heart association define door to balloon time as amount of time between a heart attack patient's arrival at the hospital to the time he/she receives percutaneous coronary intervention (PCI), such as angioplasty [(7).]

Moreover, studies explained the meaning of door to balloon time defined as a time of interval from the patient's arrival at the hospital to inflation of the balloon to restore flow within 90 minutes[(8)].

Reduced door-to-balloon time in primary percutaneous coronary intervention for the treatment of ST-elevation myocardial infarction has been associated with lower cardiac mortality rates.

Door-to-balloon time is an integral & important process metric for measuring cardiovascular quality[(9)].

Knowledge about DTBT and its delay contributing factors is a vital pre-requisite to change the HCP attitudes, behaviors and lifestyle practices. Knowledge improvement to the recognition of DTBT will lead to earlier presentation to medical care that may result in better patients outcomes[10,11,12,13,14,15].

Guideline door-to-balloon-times were more often achieved when trained paramedics independently triaged and transported patients directly to a designated primary PCI center than when patients were referred from emergency departments[16,17].

Prompt reperfusion treatment is essential for patients who have myocardial infarction with ST-segment elevation. Guidelines recommend that the interval between arrival at the hospital and intracoronary balloon inflation (door-to-balloon time) during primary percutaneous coronary intervention should be 90 minutes or less.However, few hospitals meetthis objective. We sought to identify hospital strategies that were significantly associated with a faster door-to-balloon time[18].

Strategies for reducing the door-to-balloon time in acute myocardial infarction[19].

The estimation of the baseline knowledge about DTBT among the HCP has significant public health application as it helps in developing targeted educational programs.

However, there are no published studies to date that comprehensively assess the existing knowledge of HCP among the public in KSA. Hence, this study was designed to determine the level of current DTBT knowledge among HCP, and to identify factors that are associated with delay treatment.

Knowledge, attitude & practice is important for health care providers because they are the key help save a patient's life spicily among patients diagnosed with acute myocardial infraction going for primary PCI procedure. Code STEMI or DTBT had a JCI standard <90 minutes to measure time from patients onset symptoms of AMI since arrive to EMD department till balloon inflation in Cath lab, from measuring time we can know if health care providers if they are more knowledgeable & attitude practice able to improving the success of hospital quality improvement.

King Salman heart center one of important local centers in Riyadh city received a huge number of CAD patients, a large number underwent primary PCI. Another group of patients were transferred from ministry of health hospitals.

KSHC concept followed a protocol and guidance system of code STEMI (KSHC Code STEMI protocol).

Of the services provided at the Cardiac Center is the treatment of acute myocardial infarction by primary percutaneous coronary intervention.

The statistics of 2016 found an increase of the admitted cases with MI compared with those seen in past years[20,21].

In Saudi Arabia AMI is a leading cause of hospital mortality of 20% [22].

This study was performed to assess the level of knowledge towards AMI management. It also explored HCP views on the role DTBT in PPCI and MI outcome.

2. Material & Methods

This study conducted in King Fahad Medical City in cardiac centre. The centre provides Cardiac catheterization services. It is an advanced reference centre for cardiology and cardiovascular surgery in Ministry of Health hospitals in Riyadh, Kingdom of Saudi Arabia. EMS is connected by Code STEMI combination with cardiology team Emergency with Ambulance team, which provides emergency technicians and paramedics. The EMS is able to provide advanced cardiac life support and early STEMI to follow JCI standard of door to balloon time (DTBT) < 90 minutes of recognition by means of 12 lead ECG acquisition and paramedic interpretation.

Cross-section descriptive design was used in this study, questionnaires was distributed to the health care providers in all wards/units at Cardiac Centre, EMS& paramedics in KFMC to assess their knowledge, attitude, practice & perceptions on how to manage the factors that cause delaying door to balloon time at KFMC.

Statistical analysis:
Demographic characteristics of study participants are reported as mean ±SD for continuous variables and counts (percentage) for categorical variables. Factors causing the delay of a door to balloon time for primary percutaneous coronary intervention (PCI) for acute STEMI were determined based on the response rate of participants. For the knowledge scale, we calculated the total score for correct answers. Items were recoded; Correct answers=1, all others = 0. Range: 0-4 (Sum of items). A Higher score indicates higher knowledge about code STEMI. Complete statistics were performed using SPSS 22.0 software (SPSS Inc., Chicago, IL, USA) package.

Ethics:
The study protocol was approved by the Institutional Review Board Committees of King Fahd Medical City. (IRB number 15-340). The participants were voluntary to involve in this study. Anonymity and confidentiality was considered.

Study Design:
Is observational experimental (Prospective study).

3. Results

Baseline demographics:
The study yielded 240 health care providers participants. Most participants (n = 210, 87.5%) were female, and the average age was 34.33 (± 5.52) years. The most participants were nurses (n = 421, 92.1%). CCU was the most unit participated (n = 89, 37.1%), with substantial percentages of these participants experience 5-10 years (n = 132, 55.0%). Most participants of education level was bachelor degree (n = 97, 40.4 %,) [Table 1].

Table 1: Demographic Characteristics of Study Participants

		Mean±SD	N (%)
Age		34.33 ± 5.52	
Gender	Male		30(12.5%)
	Female		210(87.5%)
Occupation	Cardiologist		4(1.7%)
	ER Physician		8(3.3%)
	Nurse		221(92.1%)
	Technician		6(2.5%)
	Paramedic		1(0.4%)
Department	CCU		89(37.1%)
	CVICU		12(5.0%)
	CTW		16(6.7%)
	CIU/CW1		21(8.8%)
	CW2		12(5.0%)
	CSW		20(8.3%)
	ACCL		29(12.1%)
	CCU/Ext		2(0.8%)
	ER		37(15.4%)
	Paramedic		1(0.4%)
	Other		1(0.4%)
Experience	1-5		74(30.8%)
	5-10		132(55.0%)
	>10		34(14.2%)
Education	Dip		20(8.3%)
	BSN		97(40.4%)
	Postgraduate		123(51.2%)

Knowledge information:

This study reported that the most of participants has knowledge about the meaning of Code STEMI (DTBT) (n=220, 91.7%). The participant were knowledgeable most in use of code STEMI activation (n=216, 98.6%) [Table 2].

Table 2: Knowledge of staff about Code STEMI

		N (%)
1- Do you know what does a door to balloon time (Code STEMI) mean?	❑ Yes (if yes, please answer the Q (2–5)	220(91.7%)
	❑ No	20(8.3%)
2-The door to balloon time applies in which type of STEMI?	❑**Primary PCI**	162(73.6%)
	❑Rescue PCI	4(1.8%)
	❑Urgent PCI	54(24.5%)
	❑Staged PCI	
	❑Elective PCI	
3-The code STEMI is started for?	❑**Acute STEM**	216(98.6%)
	❑NSTEM	1(0.5%)
	❑Non-Q wave MI	2(0.9%)
4- The optimal door to balloon time according to JCI standards?	❑**≤ 90 min**	207(94.1%)
	❑91-120 min	13(5.9%)
	❑>120 min	
5- The best outcome of primary PCI in STEMI is chest pain duration?	❑**<12 hrs.**	138(63.3%)
	❑12-24 hrs.	75(34.4%)
	❑>24 hrs.	5(2.3%)
6-There is a Code STEMI System (door to balloon time) in KSHC?	❑ Yes	209(87.1%)
	❑ No	31(12.9%)
7- Do you like to have KSHC code STEMI System and KFMC Directory Systems Unified to facilities activation?	❑ Yes	211(87.9%)
	❑ No	12(5.0%)
	❑ Don't know	17(7.1%)

Factors of delaying:

Most factor that cause delaying DTBT are the measurement of patient data (n=169, 70.4%). Compared to the lower factor was outside factors (n=110, 45.8%) [Table 3].

Table 3: Factors that cause a delay of a door to balloon time

		N (%)
1. Manpower.	Q Yes(if yes, please answer the Q(A).	136(56.7%)
	❑ No	104(43.3%)
A. Factors caused by workforce because of: (Choose more than one).	❑Shortage workforce staff.	72(69.9%)
	❑Shortage of experience &qualified Staff.	28(27.2%)

	❑EMS & KSHC poor communication among the workforce.	25(24.3%)
2. Logistics.	❑ Yes (if yes, please answer the Q(B).	161(67.1%)
	❑ No	79(32.9%)
B. Factors caused by materials because of: (Choose more than one).	❑Shortage CCU beds.	49(62.0%)
	❑ACCL labs availability.	22(27.8%)
	❑ Shortage of ECG equipment.	18(22.8%)
3. Process.	❑ Yes(if yes, please answer the Q(C).	168(70.0%)
	❑ No	72(30.0%)
C. Factors caused by the process because of: (Choose more than one).	❑ No clear process of STEMI clinical pathway.	40(55.6%)
	❑Poor arrangement.	39(54.9%)
	❑ No clear information communication.	32(44.4%)
4. Measures of Data	❑ Yes(if yes, please answer the Q(D).	169(70.4%)
	❑ No	71(29.6%)
D. Factors caused by measures because of: (Choose more than one).	❑A data collection is not clear & not well defines.	53(71.6%)
	❑ No apparent revision by a cardiologist to data collected.	33(44.6%)
	❑ Missing data in cortex & HIM chart.	32(43.8%)
5. Outside factors.	❑ Yes(if yes, please answer the Q(E).	110(45.8%)
	❑ No	130(54.2%)
E. Factors caused by outside factors because of: (Choose more than one).	❑ On call arranging schedule.	43(33.6%)
	❑ Road Traffic.	98(76.6%)
	❑ Transportation.	80(63.5%)

Perceptions of healthcare providers:

Most of the participants perceived high regarding code STEMI (n=196, 82.0%). While the lowest perception of the participants was availability of the facilities to support patients life in the ambulance (n=6, 2.5%) [Table 4].

Table 4: Perception about Code STEMI

		N (%)
1. Is the paramedic the first channel to save a patient's life?	❑ Yes (if yes, please answer the Q(A).	159(66.3%)
	❑ No	70(29.2%)
	❑ Don't know	11(4.6%)
A. The requirements should be available in paramedics is(choose more than one)	❑Aware about ECG(interpretation & connection).	118(74.7%)
	❑Have BLS / ACLS certified.	124(78.5%)
	❑Aware of code STEMI activation.	120(75.9%)
	❑Patient preparation.	78(49.4%)
2. Do you think ambulance should have all facilities to paramedics help save a regular life?	Q Yes(if yes, please answer the Q(B).	6(2.5%)
	❑ No	234(97.5%)
B. What is the equipment's that should be available in the ambulance?(Choose more than one).	❑Cardiac Monitor.	153(65.4%)
	❑Defibrillator monitor.	153(65.7%)
	❑ECG leads.	199(85.0%)
	❑ECG monitors.	143(61.1%)
	❑MONA protocol.	140(60.1%)
3. How pre-hospital 12-lead ECG information transmitted and interpreted?(Check all the apply)	❑ECG read by paramedic and interpretation called by phone.	167(69.6%)
	❑ECG read by a computer algorithm and called by phone.	133(55.4%)
	❑ECG transmitted to hospital by another device (i.e. What's Up,)	144(60.0%)
	❑Doesn't Know	16(6.7%)
	❑ECG read by paramedic and interpretation called by phone.	167(69.6%)
4. Are there distension protocols (i.e. bypass on – PCI centres) for patients that have had a pre-hospital identification of code STEMI (door to balloon time)?	Q Yes	136(56.7%)
	❑ No	20(8.3%)
	❑Doesn't Know	84(35.0%)
5. Is pre- hospital fibrinolysis used in your code STEMI system (door to balloon time)at KFMC?	❑ Yes	85(35.6%)
	❑ No	51(21.3%)
	❑Doesn't Know	103(43.1%)
6. Do you have a single call activation number to activate the code STEMI Team/Cath Lab in your STEMI System?	❑ Yes	196(82.0%)
	❑ No	10(4.2%)
	❑Doesn't Know	33(13.8%)
7. Please categorise data feedback of performance and patient outcomes, including door to balloon times.(Check all that apply)	❑ None	59(24.6%)
	❑ To cardiology / Cath lab	171(71.3%)
	❑ To PCI hospital emergency department	97(40.4%)
	❑ To non-PCI hospital emergency department	54(22.5%)
	❑ To EMS	61(25.4%)
8. How frequently is feedback provided to members of the code STEMI Team?	❑ Within 24 hours	68(28.3%)
	❑ 24 hours to one week	25(10.4%)
	❑ Monthly	89(37.1%)
	❑ Quarterly or less	14(5.8%)
	❑ N/A	42(17.5%)

9. Dose KFMC accepts STEMI transfers regardless of hospital bed availability?	❑ Yes (if yes, please answer Q(C & D)	106(44.2%)
	❑ No	42(17.5%)
	❑Doesn't Know	92(38.3%)
C. Does the patient return to the hospital origin before discharge to home after PCI?	❑ Yes	60(56.6%)
	❑ No	32(30.2%)
	❑Doesn't Know	14(13.2%)
D. The duration of transferred is:	❑Immediately	44(43.1%)
	❑After one day	15(14.7%)
	❑After two days	38(37.3%)
	❑Doesn't Know	5(4.9%)

4. Discussion

This study amid to assess the knowledge of health care providers about DTBT & factors of DTBT delaying. It is an original and unique study because it is a new concept that serves the patient in terms of measuring the level of knowledge for health care providers and the factors causing delay by taking the opinion of health care providers through which we can provide quality health care to patients.

This study were divided to four parts, first part identified demographic data; most of participants in this study were female, nurses & from critical unit. However, this finding is not surprising considering that the KSHC & EMS has a large expatriate workforce which is predominately female. While the second part was assessed the knowledge; the result showed that most of the participants have the knowledge regarding;1) DTBT. 2) The type of PCI need to apply and 3) which code to be activated, furthermore most of participants aware about JCI standard time& time of chest pain duration for apply PPCI. There were no studies examine the knowledge of healthcare provider regarding door to balloon and code STEMI. However there were a limited studies discussed the need of programs to be conducting for staff and community awareness for door to balloon and code STEMI. A study of Al-Mallah et al, 2010 aimed to identify the frequency and predictors of delayed presentation and missed reperfusion in patients with STEMI in the Gulf Register of Acute Coronary Events registry; recommended a community and physical awareness programs to increase the utilization of appropriate lifesaving therapies. Most acute STEMI patients in the Arabian Gulf region did not aware about EMS services, lunching educational public campaigns are top health care system priorities (Alhabib et al, 2016).

The third part of this study was focused on the factors that cause delaying of DTBT, most of participants agreed the factor cause delaying is measures of data because data collection is not clear & not well defines. Non system reasons are the factors of delay (Swaminathan Ret.al,2013; (J Am CollCardiol 2013;61:1688–95) © 2013 by the American College of Cardiology Foundation). In contrast one study prove the cause delay is the system (Terkelsen C et.al,2010) . The chief delay in DTB time in one study was due to a delay in obtaining consent and financial reasons (Victor et al, 2012).

Several factors have contributed to the delays in achieving the goal standard of above 90%; these include late identifications of patients with STEMI, delays in obtaining the ECG, activation of the catheterization laboratory and delay of patients' transportation (Al Bugamia et al, 2016). AttardBiancardi, 2013 stated some factors that can improve locally the mean Door-to-Balloon times for patients with a STEMI include; 1) Direct communication with the cardiologist when a STEMI is diagnosed, thus avoiding intermediators and re-evaluation of the patient. 2) Having well trained and experienced doctors who can diagnose early the patients with STEMI even with subtle ECG changes. 3) Having well trained nursing staff who can triage early the patients with features of myocardial infarction, and performing early Electrocardiograms in patients with atypical chest pains. 4) Having an in-hospital Cath Lab team with cardiologist cover capable in performing Primary PCI especially 'After Hours'. 7) Training to Cath lab teams to maintain response times of 30 minutes or less especially 'After Hours' if an in-hospital team cannot be obtained. Many studies were conducted an audit programs to reduce door to balloon time. Lai et al, 2009 stated that the implementation of an audit program was associated with a significant reduction in door-to-balloon times among patients with acute STEMI. Another study they achieved 90 min DTB time in majority of patients by using effective hospital strategies (Victor et al, 2012). Similar to study of Levis et al 2010, the achievement of door-to-balloon times of ≤90 minutes was for 97% of STEMI patients, this achievement are due to Initiation of a Heart Alert protocol. In contrast of study conducted by Ikemura et al, 2017, they reported half of the present STEMI patients did not achieve DTB time ≤90 min. AttardBiancardi 2013, conducted an audit for 123 patients over a 12 month period to determine the local Door-to-Balloon times in Primary Percutaneous Coronary Intervention for patients with ST-Elevation Myocardial Infarction, they conclude that they did not reached to the standards suggested by the ACC/AHA and ESC of Primary PCI ≤ 90 minutes for STEMI. The delay that occurs for STEMI patients' pre-hospital is quiet too long but door-to-balloon time is well within the guideline-recommended timeframe in Switzerland (Kardiologie & Gefässmedizin, 2011).

The fourth part of this study addressed the perception of health care provider about code STEMI; the result showed that their perceptions are close to the realities of practical life& this parttaken from questionnaire of STEMI systemIn American heart association. http://www.cpr-ecc.org/idc/groups/heart-public/@wcm/@global/documents/downloadable/ucm_300570.pdf.

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6. Conflicts of interest

There is no conflict of interest.

7. Conclusions

In conclusion, this study showed that majority of the healthcare professionals had good knowledge and attitude about DTB and understood the need for thatIt was also found that there is a positive correlation between the training of STEMI programmer and their position by a healthcare professional. The fact that majority of respondents agreed that knowing DTB is necessary and awareness should be taught in detail to health professionals emphasis that they have started to understand the importance of DTB.

The deficits in knowledge and attitude identified in this survey are a significant barrier to the efficient management of patients. The impact on learning and outcomes of these interventions will be the subject of future studies in a countrywide continual quality improvement project.

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