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Assessment of Hospital Performance Using Quality of Care Indicators in Patients with Acute Coronary Syndrome

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Abstract

BACKGROUND: Global researchers have found a wide practice gap between the optimal care and actual care of patients with acute coronary syndrome (ACS).

AIM: The main objective of the present study was to evaluate the quality of care provided to patients with ACS and compare our results to that of other similar studies and international standards.

METHODS: A descriptive study was conducted using review of medical records and medical charts of new patients admitted and treated as ACS at the Department of Critical Care Medicine, Cairo University, from January 1, 2015, to December 31, 2020. For the purpose of the analysis, a set of highly predictive quality indicators was used.

RESULTS: 967 patients were divided into two groups: 621 patients with acute ST-segment elevation myocardial infarction (STEMI) (mean age: 58.49 ± 11.45 years, 81.8% of males) and 34.9% presented to hospital in <4 h of symptom onset. Primary percutaneous coronary interventions (PCIs) were applied on 71.3% of cases (N = 443) and the mean "door-to-balloon" time was 78.8 min. In the first 24 h, acetylsalicylic acid (ASA), β-blockers, and angiotensin-converting enzyme inhibitors (ACE-I) or AR-blockers were administered in 100%, 65.9%, and 73.4% of the total eligible cases, respectively. At discharge, ASA, β-blockers, ACE-I/ARBs, and statins were prescribed in 90.8%, 78.3%, 82.8%, and 90.8%, respectively. 346 patients were with UA/NSTEMI (mean age 63±25.7 years, 69.4% male), while 21.7% of patients were presented to hospital after less than 4 hours of symptoms onset. Early PCIs were applied on 28.1% of cases (N = 97). In the first 24 h, ASA, β-blockers, and ACE-I or AR-blockers were administered in 100%, 78.3%, and 78.6% of the total eligible cases, respectively. At discharge, ASA, β-blockers, ACE-I/ARBs, and statins were prescribed in 93.4%, 83.2%, 81.2%, and 92.8%, respectively. In this study, a relation between different quality indicators with inhospital major adverse cardiac event and outcome was observed.

CONCLUSION: There is still substantial work that lies ahead on the way to improve the uptake to evidence-based processes of care. We found some disparities between guidelines and clinical practice for ACS patients and a significant association between process indicators and inhospital outcomes. Our findings are potentially helpful for assessing and improving the quality of care for ACS patients in Egypt.

Introduction

Acute coronary syndrome (ACS) with or without ST-segment elevation myocardial infarction or non-STEMI (STEMI or NSTEMI) is a common cardiac emergency, with the potential for substantial morbidity and mortality. The management of acute myocardial infarction has improved dramatically over the past three decades and continues to evolve [1].

Acute myocardial infarction is an event of myocardial necrosis caused by an unstable ischemic syndrome. In practice, the disorder is diagnosed and assessed on the basis of clinical evaluation, electrocardiogram (ECG), biochemical testing, invasive and noninvasive imaging, and pathological evaluation [2].

Although there are well-developed guidelines in management of ACS [3], several articles have found large practice gap, and disparity between the optimum standards and the actual care that patients receive in hospital when experiencing ACS [4]. To reduce this gap, many researchers are using quality care indicators for patients with ACS to measure adherence to guidelines in routine clinical care [5] and to save many lives. There is strong evidence that hospitals with better performance on these quality-of-care indicators have lower mortality rates [6].

The aim of our study

To evaluate the quality of care provided to patients with ACS at the Department of Critical Care Medicine, Cairo University, and to compare our results to that of other similar studies and international standards.

Methods

Study design

A single-center descriptive (retrospective and prospective) study was conducted retrospectively by

the collected data (from January 1, 2015, to August 31st of 2019) using the department's electronic database (Medica Plus 4) and prospectively (from September 1, 2019, to December 31, 2020), using medical charts of all the patients admitted and managed with ACS at the Department of Critical Care Medicine, Cairo University; the patients included were divided into two groups: 621 cases STEMI and 346 cases unstable angina (UA)/NSTEMI; the two patient groups were considered separately in the analysis. We included all adult patients with age older than 18 years admitted with ACS, and we excluded patients with age younger than 18 years and, patients who refused to be included in study, and those with cardiac arrest prior to or within 15 min of arrival from the study.

Ethical aspects

The Ethics Committee of the "Faculty of Medicine, Cairo University," approved the protocol of the study by considering the nature of the present study; this was based on reviewing medical records of the discharged patients.

Data review

1. Clinical data: It includes demographic data, risk factors, timing of presenting symptoms (pain to door in hours, door to ECG, and door to needle in min in STEMI patients only), investigations (laboratory or radiological), and risk stratifications (KILLIP class, APACHI II score, and TIMI score)
2. Performance measurements: It includes administration of medications at admission and discharge (ASA, P2Y12RI, BB, ACEi/ARB, and statins), coronary interventions data (type of percutaneous coronary interventions [PCI] and door-to-balloon in min in STEMI patients only), and discharge instructions (smoking cessation, nutrition, psychological counseling, physical activity, and cardiac rehabilitation center referral).

The specific contraindications for the use of β-Blockers are: AV-block greater than 1st degree, cardiogenic shock and chronic obstructive pulmonary disease or asthma, while for ACE Inhibitors: intolerance, impaired renal function, hyperkalemia or cardiogenic shock.

This study depends on the basis of recommendations contained in the acute STEMI guidelines and core performance measures as defined by ACC/AHA [7] and Canadian Cardiovascular Outcomes Research Team/Canadian Cardiovascular Society (CCORT/CCS) for Clinical Performance Measure of adults with STEMI [8] [9] [10].

3. Outcome measurements include: 1 - length of hospital stay (LOS); 2 - in-hospital major adverse cardiovascular events (MACE) such as re-admission, re-infarction, cardiogenic shock, heart failure, cerebrovascular stroke, tachy or brady arrhythmia, local or systemic bleeding; 3 - in-hospital mortality.

Statistical analysis

The data collected were verified, coded, entered, and analyzed using IBM Statistical Package for the Social Sciences (SPSS) Statistics 22, and for each indicator, frequencies or medians were calculated as appropriate. Continuous variables were presented as the median value of the indicator for all patients who were eligible for a given measure. The summary statistics were presented as proportions; the means (with standard deviations [SD] or medians) were calculated using references from APACHE II score and TIMI-STEMI score on admission. To estimate the significance between two proportions, we used the following equation: Significance Equation ($P1 - P2$) = $\sqrt{P1\ Q1/n1 + P2\ Q2/n2}$

Where $P1$ is proportion (in percent), $Q1$ is (100-P1), and n1 is number of study population (frequency) in our study results, and similarly, $P2$, $Q2$, and $n2$ are those in recommended benchmark studies.

For qualitative data, bivariate associations were examined using Chi-square tests of independence, as appropriate. For quantitative data, t-test to compare 2 groups and ANOVA for comparison of more than 2 groups were used. All p-values with $p < 0.05$ considered statistically significant.

Results

Our study included a total of 967 patients diagnosed with ACS divided into two groups:

STEMI Group

We included two groups: 1 - (retrospective group) 520 of 621 patients admitted from 1st January, 2015 to 31st august 2019, and their data retrieved from Department's electronic patient information database Medicaplus4; 2 - (prospective group) 101 of 621 patients admitted from 1st September 2019 to 31st December 2020 and their data retrieved from patient's files.

UA/NSTEMI Group

We included two groups: 1 - (retrospective group) 299 of 346 patients admitted from 1st January,

2015 to 31st august 2019, and their data retrieved from Department's electronic patient information database Medicaplus4; 2 - (prospective group) 47 of 346 patients admitted from 1st September 2019 to 31st December 2020 and their data retrieved from patient's files.

The endpoint of interest of this study chosen were 1ry

The end point of interest of all quality of care indicators in this study were 1ry: major adverse cardiac events (MACE)

MACE 2ry: inhospital outcome as survival and mortality emphasis on all quality indicators as a predictor of outcome in our critical care department in management of patients diagnosed by ACS.

STEMI group

Patient characteristics

Regarding age, the age ranged between 21 and 87 years; there was a significant difference between older who developed MACE compared to those who did not experience MACE ($p \leq$ **0.008**). However, regarding gender, 508 (81.8%) were male and 113 (18.2%) were female, respectively; there was no significant difference between males and females as regards MACE (p ≤ 0.113). Regarding risk factors of total STEMI patients, 58.3% (n = 362) were observed to be current smoker, 47.8% were known hypertensive, 42.5% were diabetic, 22.1% (n = 137) were known to had history of dyslipidemia, and prior to admission 22.3% (n = 139) had a history of diagnosed IHD; all risk factors had no significant difference with MACE in STEMI patients (p ≤ 0.690, 0.382, 0.101, 0.257, and 0.843, respectively). Chest pain to door in less hours had significant difference with MACE and outcome (P≤0.033) although door to ECG and needle in less minutes had no significant difference with MACE (p≤0.142 & 0.271 respectively), we found that Patients with higher points in KILLIP class, APACHE II and TIMI score had significant difference with MACE (p≤0.0001) (Table 1 and Figures 1, 2).

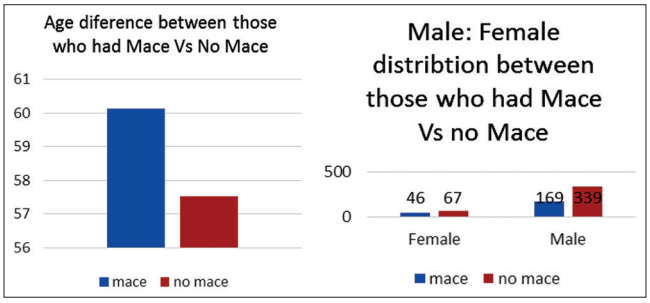

Figure 1: Age and gender difference of the ST segment elevation myocardial infarction patients with major adverse cardiac event

Regarding age, Non-survivors were significantly older compared to survivors (p≤0.003), but regarding gender No significant difference between males and females as regard outcome (P value ≤0.303), regarding risk factors of total STEMI patients, hypertension and diabetes mellitus had significant difference with survival (P≤0.026 & 0.030 respectively), while smoking, dyslipidemia and past history of IHD had no significant difference with survival (P≤0.269 & 0.333& 0.912 respectively),we found also that in patients with door to ECG and needle in less minutes from time of admission had significant difference with survival (p≤0.029 & 0.035 respectively), see (Table 2 and Figures 3, 4).

Table 1: Comparison between the occurrences of major adverse cardiac event in baseline characteristics including age, gender, risk factors, timing of presenting chest pain at admission, time of door to electrocardiogram and needle, lipid profile, echo and risk stratifications in all ST segment elevation myocardial infarction populations

Baseline characteristics STEMI	Total (n = 621), n (%)	MACE		p
		MACE (n = 215), n (%)	No MACE (n = 406), n (%)	
Age, mean ± SD	58.49 ± 11.45	60.13 ± 11.54	57.51 ± 11.32	0.008
Gender				
Female	113 (18.2)	46 (21.4)	67 (16.5)	0.113
Male	508 (81.8)	169 (78.6)	339 (83.5)	
Smoking	362 (58.3)	123 (57.2)	239 (58.9)	0.690
Hypertension	297 (47.8)	108 (50.2)	189 (46.6)	0.382
Diabetes mellitus	264 (42.5)	101 (47.0)	163 (40.1)	0.101
Dyslipidemia	137 (22.1)	53 (24.7)	84 (20.7)	0.257
History of IHD	139 (22.3)	48 (22.3)	91 (22.4)	0.843
Pain to door (h)				
< 4	217 (34.9)	80 (37.2)	137 (58.9)	0.033
4–8	254 (40.9)	72 (33.5)	182 (46.6)	
8–12	63 (10.1)	25 (11.6)	38 (40.1)	
>12	87 (14.1)	38 (17.7)	49 (20.7)	
Door to ECG in min mean ± SD	5.34 ± 3.1	5.08 ± 3.1	5.47 ± 3.1	0.142
Door to needle in min, mean ± SD	6 ± 3.6	6.23 ± 3.8	5.883 ± 3.6	0.271
Lipid profile at 1st 24 h	511 (70.8)	168 (78.1)	343 (84.5)	0.049
Echo LVEF %, mean ± SD		45.66 ± 12.73	52.69 ± 11.08	0.0001
KILLIP class				
1	461 (74.2)	72 (33.5)	389 (95.8)	0.0001
2	26 (4.2)	15 (7.0)	11 (2.7)	
3	13 (2.1)	12 (5.6)	1 (0.2)	
4	121 (19.5)	116 (54.0)	5 (1.2)	
APACHE II score, mean ± SD		11.82 ± 6.72	5.09 ± 2.46	0.0001
TIMI score, mean ± SD		6.47 ± 3.44	2.23 ± 1.80	0.0001

SD: Standard deviation, MACE: Major adverse cardiac event, STEMI: ST segment elevation myocardial infarction, ECG: Electrocardiogram, LVEF: Left ventricle ejection fraction %, IHD: Ischemic heart disease, KILLIP: Classfication according to the severity of their post-MI heart failure, APACHE: Acute Physiology and Chronic Health Evaluation II, TIMI: Thrombolysis in Myocardial Infarction.

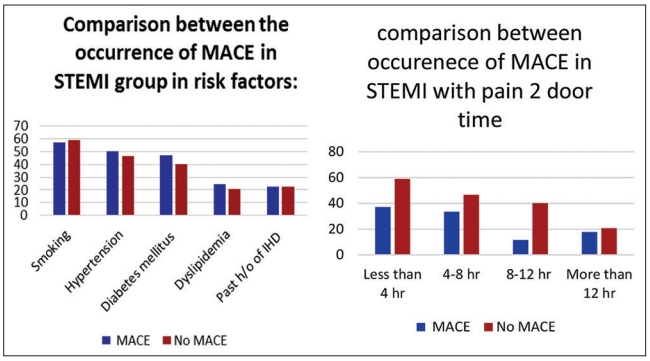

Figure 2: Summary of risk factors and pain 2 door time distribution in ST segment elevation myocardial infarction group with major adverse cardiac event

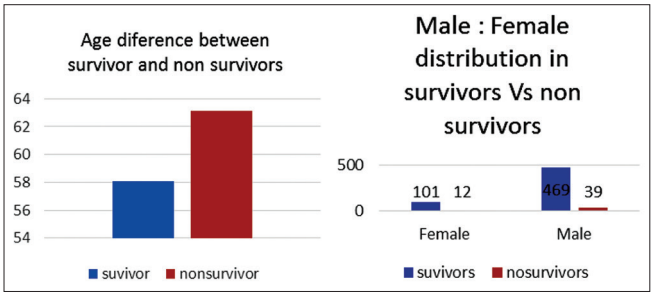

Figure 3: Age and gender difference of the ST segment elevation myocardial infarction patients with outcome

Treatment, procedures, and timing during hospitalization and discharge

Inhospital medical treatment within the first 24 h and at discharge:

1. ASA started within 6 h of medical contact and prescribed at hospital discharge:

   In the first 6 h, ASA was prescribed in 100% (N = 621) of eligible cases, 91.0% of discharged cases (N = 564) had ASA prescribed in their discharge prescription, the remaining 24 cases (2.5%) not prescribed on discharge, and 56 cases (5.8%) died during inhospital course.

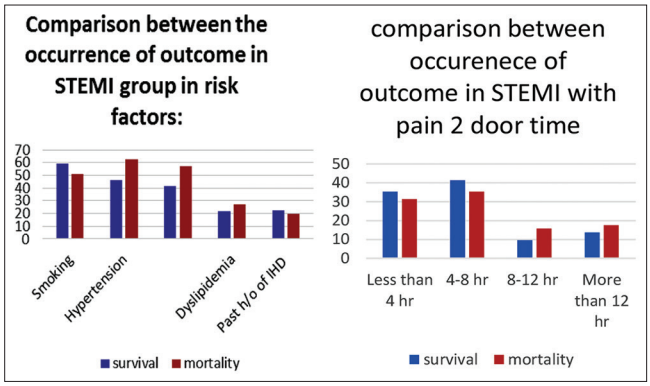

Figure 4: Summary of risk factors and pain 2 door time distribution in ST segment elevation myocardial infarction group with outcome

2. P2Y12R started within 6 h of medical contact and prescribed at hospital discharge:

   In the first 6 h, P2Y12R was prescribed in 100% (N = 621) of eligible cases, 88.9% of discharged cases (N = 552) had P2Y12R prescribed in their discharge prescription, the remaining 21 cases (3.4%) not prescribed on discharge, and 48 cases (7.4%) died during inhospital course.

3. Beta-blocker started within 24 h of admission and prescribed at hospital discharge:

   In the first 24 h, β-blockers were prescribed in 65.9% of cases (N = 409), while contraindications for it were registered in 133 patients (21.4%) at admission. The study showed that 12.7% (N = 79) of the total eligible cases did not have β-blockers prescribed within 24 h of admission, while on discharge, β-blockers were prescribed in 78.3% of cases (N = 486); of the remaining, 49 cases died during inhospital course,

Table 2: Comparison between the occurrences of outcome in baseline characteristics including age, gender, risk factors, timing of presenting chest pain at admission, time of door to electrocardiogram and needle, lipid profile, echo and risk stratifications in all ST segment elevation myocardial infarction populations

Baseline characteristics STEMI	Total (n = 621), n (%)	Outcome		p
		Survival (n = 570), n (%)	Mortality (n = 51), n (%)	
Age, mean ± SD	58.49 ± 11.45	58.07 ± 11.42	63.12 ± 10.92	0.003
Gender				
Female	113 (18.2)	101 (17.7)	12 (23.5)	0.303
Male	508 (81.8)	469 (82.3)	39 (76.5)	
Smoking	362 (58.3)	336 (58.9)	26 (51.0)	0.269
Hypertension	297 (47.8)	265 (46.5)	32 (62.7)	0.026
Diabetes mellitus	264 (42.5)	235 (41.2)	29 (56.9)	0.030
Dyslipidemia	137 (22.1)	123 (21.6)	14 (27.5)	0.333
History of IHD	139 (22.3)	129 (22.6)	10 (19.6)	0.912
Pain to door (h)				
< 4		201 (35.3)	16 (31.4)	0.012
4–8		236 (41.4)	18 (35.3)	
8–12		55 (9.6)	8 (15.7)	
> 12		78 (13.7)	9 (17.6)	
Door to ECG in min, mean ± SD	5.34 ± 3.1	5.42 ± 3.11	4.41 ± 3.08	0.029
Door to needle in min, mean ± SD	6 ± 3.6	5.97 ± 3.6	6.37 ± 3.9	0.035
lipid profile at 1st 24 h	511 (70.8)	486 (85.3)	25 (49.0)	0.0001
Echo LVEF %, mean ± SD		51.07 ± 11.73	37.76 ± 11.67	0.0001
KILLIP CLASS				
1		459 (80.5)	2 (3.9)	0.0001
2		26 (4.6)	0	
3		13 (2.3)	0	
4		72 (12.6)	49 (96.1)	
APACHE II score, mean ± SD		6.42 ± 4.12	18.80 ± 5.80	0.0001
TIMI score, mean ± SD		3.2 ± 2.78	2.22 ± 1.64	0.0001

SD: Standard deviation, STEMI: ST segment elevation myocardial infarction, ECG: Electrocardiogram, LVEF: Left ventricle ejection fraction %, IHD: Ischemic heart disease, KILLIP: Classfication according to the severity of their post-MI heart failure, APACHE: Acute Physiology and Chronic Health Evaluation II, TIMI: Thrombolysis in Myocardial Infarction.

and 15 cases had registered contraindications at discharge. The study showed that 11.4% (N = 71) of the total eligible cases did not have β-blockers prescribed at discharge.

4. Angiotensin-converting enzyme inhibitors (ACE-I)/ARB started within 24 h of admission and prescribed at hospital discharge:

In the first 24 h, ACE-I/ARBs were prescribed in 73.4% of cases (N = 456), while contraindications for it were registered in 119 patients. The study showed that 7.4% (N = 46) of the total eligible cases did not have ACE-I/ARBs prescribed within 24 h of admission, while on discharge, ACE-I/ARBs were prescribed in 82.8% of cases (N = 14); of the remaining, 51 died during inhospital course, and 8 cases had registered contraindications at discharge. The study showed that 7.7% (N = 48) of the total eligible cases did not have ACE-I/ARBs prescribed at discharge.

Table 3: Comparison between the occurrences of major adverse cardiac event with medications taken at admission and discharge

STEMI Medications	Total (n = 621), n (%)	MACE		p
		MACE (n = 215), n (%)	No MACE (n = 406), n (%)	
ASA at admission	621 (100)	215 (100)	406 (100)	
ASA at discharge				
No	6 (1.0)	0	6 (1.5)	0.0001
Yes	564 (90.8)	166 (77.2)	398 (95.0)	
Died	51 (8.2)	49 (22.8)	2 (0.5)	
P2Y12R at admission	621 (100)	215 (100)	406 (100)	
P2Y12R at discharge				
No	21 (3.4)	4 (1.9)	17 (4.2)	0.0001
Yes	552 (88.9)	165 (76.7)	387 (95.3)	
Died	48 (7.7)	46 (21.4)	2 (0.5)	
BB at admission				
No	79 (12.7)	23 (10.7)	56 (13.8)	0.0001
Yes	409 (65.9)	64 (29.8)	345 (85.0)	
Contraindicated	133 (21.4)	128 (59.5)	5 (1.2)	
BB at discharge				
No	71 (11.4)	22 (10.2)	49 (12.1)	0.0001
Yes	486 (78.3)	134 (62.3)	352 (86.7)	
Contraindicated	15 (2.4)	12 (5.6)	3 (0.7)	
Died	49 (7.9)	47 (21.9)	2 (0.3)	
ACE-I/ARB at admission				
No	46 (7.4)	11 (5.1)	35 (8.6)	0.0001
Yes	456 (73.4)	93 (43.3)	363 (89.4)	
Contraindicated	119 (19.2)	111 (51.6)	8 (2.0)	
ACE-I/ARB at discharge				
No	48 (7.7)	11 (5.1)	37 (9.1)	0.0001
Yes	514 (82.8)	151 (70.2)	363 (89.4)	
Contraindicated	8 (1.3)	4 (1.9)	4 (1.0)	
Died	51 (8.2)	49 (22.8)	2 (0.5)	
Statin at admission				
No	4 (0.6)	3 (1.4)	1 (0.2)	0.089
Yes	617 (99.4)	212 (98.6)	405 (99.8)	
Statin at discharge				
No	6 (1.0)	0	6 (1.5)	0.0001
Yes	564 (90.8)	166 (77.2)	398 (98.0)	
Contraindicated	51 (8.2)	49 (22.8)	2 (0.5)	

MACE: Major adverse cardiac event, STEMI: ST segment elevation myocardial infarction, ACE-I: Angiotensin converting enzyme inhibitor, ARB : Angiotensin receptor blocker, BB : Beta blocker, ASA : Acetyl salcylic acid (ASPIRIN).

5. Statins started within 24 h of admission and prescribed at hospital discharge:

In the first 24 h, statins were prescribed in 99.4% of cases (N = 617). The study showed that 0.6% (N = 4) of the total eligible cases did not have statins prescribed, while on discharge, statins were prescribed in 90.8% of cases (N = 564); of the remaining, 51 died during inhospital course. The study showed that 1.0% (N = 6) of the total eligible cases did not have statins prescribed at discharge (Tables 3 and 4).

The "door-to-balloon" time of this population ranged between 20 and 109 min. In patients with less time of door to balloons in min had significant difference with MACE and survival (P≤ 0.036 & 0.017 respectively), regarding type of PCI which done to STEMI patients, 71.3% (n=443) underwent 1RY PCI who showed significant difference with MACE and survival (p≤0.038 & 0.005respectively), Written and verbal smoking cessation instructions were given to 336(54.2%) of total patients but were deficient in 47 (7.6%) of eligible patients. Nutrition, psychological, and physical activity counseling were given to 571, 574, and 572 of patients, respectively, on discharge prescriptions. Referral to cardiac rehabilitation center was done in only 40 (6.4%) eligible patients. All instructions on discharge prescriptions had a significant difference with MACE and survival (p ≤ 0.0001) (Tables 5, 6 and Figure 5).

Our study showed that ASA prescriptions at admission and discharge , statins at discharge & median time from door 2 balloon inflations in primary PCI were adherent to international benchmarks (Table 7).

Inhospital complications

The complications during hospital treatment, depicts 34.6 (n=215) of STEMI PATIENTS developed one or more in hospital complications during their stay as RE-infarction was noted in 22 patients, RE-admission in 20 patients, cardiogenic shock in 117 patients, heart failure in 109 patients, TIA/strokes in only 2 patients, tachyarrhythmia were noticed in 87 patients which

Table 4: Comparison between the occurrences of outcome with medications taken at admission and discharge

STEMI Medications	Total (n = 621), n (%)	Outcome		p
		Survival (n = 570), n (%)	Mortality (n = 51), n (%)	
ASA at admission	621 (100)	570 (100)	51 (100)	
ASA at discharge				
No	6 (1.0)	6 (1.1)	0	0.0001
Yes	564 (90.8)	564 (98.9)	0	
Died	51 (8.2)	0	51 (100)	
P2Y12R at admission	621 (100)	570 (100)	51 (100)	
P2Y12R at discharge				
No	21 (3.4)	18 (3.2)	3 (5.1)	0.0001
Yes	552 (88.9)	552 (96.8)	0	
Died	48 (7.7)	0	48 (94.9)	
BB at admission				
No	79 (12.7)	76 (13.3)	3 (5.9)	0.0001
Yes	409 (65.9)	409 (71.9)	0	
Contraindicated	133 (21.4)	85 (14.9)	48 (94.1)	
BB at discharge				
No	71 (11.4)	71 (12.5)	0	0.0001
Yes	486 (78.3)	486 (85.3)	0	
Contraindicated	15 (2.4)	13 (2.2)	2 (3.9)	
Died	49 (7.9)	0	49 (96.1)	
ACE-I/ARB at admission				
No	46 (7.4)	45 (7.9)	1 (2.0)	0.0001
Yes	456 (73.4)	454 (79.6)	2 (3.9)	
Contraindicated	119 (19.2)	71 (12.5)	48 (94.1)	
ACE-I/ARB at discharge				
No	48 (7.7)	48 (8.4)	0	0.0001
Yes	514 (82.8)	514 (90.2)	0	
Contraindicated	8 (1.3)	8 (1.4)	0	
Died	51 (8.2)	0	51 (100)	
Statin at admission				
No	4 (0.6)	1 (0.2)	3 (5.9)	0.0001
Yes	617 (99.4)	569 (99.8)	48 (94.1)	
Statin at discharge				
No	6 (1.0)	6 (1.1)	0	0.0001
Yes	564 (90.8)	564 (98.9)	0	
Contraindicated	51 (8.2)	0	51 (100)	

STEMI: ST segment elevation myocardial infarction, ACE-I: Angiotensin converting enzyme inhibitor, ARB : Angiotensin receptor blocker, BB : Beta blocker, ASA : Acetyl salcylic acid (ASPIRIN).

Table 5: Comparison between the occurrences of major adverse cardiac event in ST segment elevation myocardial infarction group in "door 2 balloon time" in min and 1RY percutaneous coronary intervention and discharge instructions

STEMI	Total (n = 621)	MACE		p
		MACE (n = 215)	No MACE (n = 406)	
Door to balloon in min, mean ± SD		82.87	76.64	0.036
1RY PCI	443 (71.3)	161 (74.9)	282 (69.5)	0.038
Smoking cessation	336 (54.2)	99 (46.0)	237 (58.5)	0.0001
Nutrition counseling	571 (91.9)	168 (78.1)	403 (99.3)	0.0001
Psychological counseling	574 (92.4)	170 (79.1)	404 (99.5)	0.0001
Physical activity counseling	572 (92.1)	168 (78.1)	404 (99.5)	0.0001
Cardiac rehabilitation center referral	40 (6.4)	10 (4.7)	30 (7.4)	0.0001

MACE: Major adverse cardiac event, STEMI: ST segment elevation myocardial infarction, SD: Standard deviation, PCI: Percutaneous coronary intervention.

need anti-arrhythmic treatment in 87 patients and 74 cases received dc-shock, Brady arrhythmia were noticed in 28 patients who need temporary pacemaker insertion in 27 patients and local/systemic bleeding in 23 patients only. Inhospital complications (MACE) such as readmission, reinfarction, cardiovascular system (CVS), and bradyarrhythmia had no significant difference with survival (p ≤ 0.174, 0.491, 0.672, and 0.231, respectively), while cardiogenic shock, heart failure, tachyarrhythmia, and bleeding had a significant difference with survival (p ≤ 0.0001, 0.0001, 0.0001, and 0.016, respectively) (Table 8 and Figure 6).

Table 6: Comparison between the occurrences of outcome in ST segment elevation myocardial infarction group in "door 2 balloon time" in min and 1RY percutaneous coronary intervention and discharge instructions

STEMI	Total (n = 621)	Outcome		p
		Survival (n = 570)	Mortality (n = 51)	
Door to balloon in min, mean ± SD		77.63 ± 33.24	91.86 ± 40.01	0.017
1RY PCI	443 (71.3)	409 (71.7)	34 (66.7)	0.005
Smoking cessation	336 (54.2)	336 (59.1)	0	0.0001
Nutrition counseling	571 (91.9)	567 (99.5)	4 (7.8)	0.0001
Psychological counseling	574 (92.4)	570 (100)	4 (7.8)	0.0001
Physical activity counseling	572 (92.1)	568 (99.6)	4 (7.8)	0.0001
Cardiac rehabilitation center referral	40 (6.4)	40 (7.0)	0	0.0001

STEMI: ST segment elevation myocardial infarction, SD: Standard deviation, PCI: Percutaneous coronary intervention.

Length of stay

The median length of stay (LOS) was 5 days (mean ± SD, 6.45 ± 4.7) for the STEMI group patients; longer time of LOS in STEMI patients had a significant difference with MACE (p ≤ 0.0001), but shorter time of LOS did not have significant difference with outcome (p ≤ 0.0768).

Table 7: Summary of compliance to different process indicators in ST segment elevation myocardial infarction group

STEMI Process of care indicators	Our results	Recommended results[9]
ASA prescribed within 6 h from admission (%)	100	≥90
ASA prescribed at hospital discharge (%)	90.8	≥90
BB prescribed within 24 h admission (%)	65.9	≥85
BB prescribed at hospital discharge (%)	78.3	≥85
ACE-I/ARB prescribed within 24 h admission (%)	73.4	≥90
ACE-I/ARB prescribed at hospital discharge (%)	82.8	≥85
Lipid profile sample within 24 h admission (%)	82.3	≥85
Statins prescribed at hospital discharge (%)	90.8	≥70
Median time from door to balloon inflations in primary PCI (min)	80	<90
Inhospital LV function assessment by echocardiography (%)	82.6	100
Smoking cessation advice, counseling or therapy during hospital discharge (%)	54	100

PCI: Percutaneous coronary intervention, STEMI: ST segment elevation myocardial infarction, ACE-I: Angiotensin converting enzyme inhibitor, ARB : Angiotensin receptor blocker, BB : Beta blocker, ASA : Acetyl salcylic acid (ASPIRIN).

Inhospital mortality

91.8% (n=570) of STEMI patients discharged alive from our unit but 8.2 (n=51) died, our study showed that length of stay at our icu unit and in –hospital mortality were adherent to international benchmarks, (Table 9).

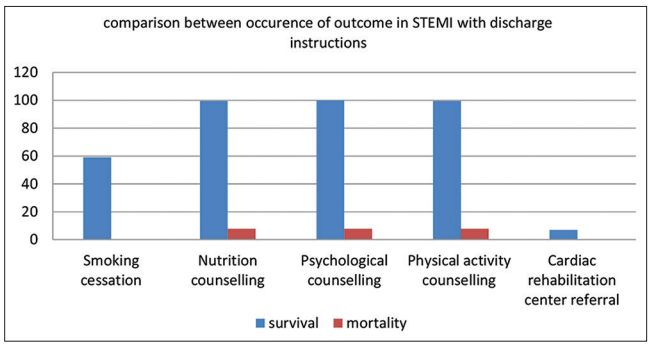

Figure 5: Summary of discharge instructions in ST segment elevation myocardial infarction group with major adverse cardiac event and outcome

B-UA/NSTEMI group

Patient characteristics

Regarding age, the age ranged between 25 and 91 years; there was no significant difference regarding age between older who developed MACE compared to those who did not experience MACE (p ≤ 0.745). Non-survivors were not significantly older compared to survivors (p≤0.875), But regarding gender, 240 (69.3%) were male & 106 (30.7%) were female respectively, No significant difference between males and females as regard MACE and outcome (P value ≤ 0.921 & 0.647 respectively).

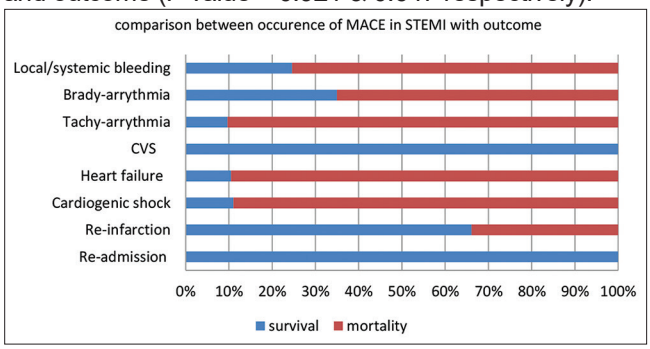

Figure 6: Summary of inhospital complications major adverse cardiac event in ST segment elevation myocardial infarction group with outcome group with outcome

Regarding risk factors ,41.0% (n=142) were current smoker, 62.1% were known hypertensive,

Table 8: Comparison between the occurrences of outcome in ST segment elevation myocardial infarction group with inhospital complications

STEMI Inhospital complications	Total (n = 621), n (%)	Outcome		p
		Survival (n = 570), n (%)	Mortality (n = 51), n (%)	
Readmission	20 (3.2)	20 (3.5)	0	0.174
Reinfarction	23 (3.7)	22 (3.9)	1 (2.0)	0.491
Cardiogenic shock	117 (18.8)	68 (11.9)	49 (96.1)	0.0001
Heart failure	109 (17.6)	62 (10.9)	47 (92.9)	0.0001
CVS	2 (0.3)	2 (0.4)	0	0.672
Tachyarrhythmia	86 (13.8)	47 (8.2)	39 (76.5)	0.0001
Brady-arrhythmia	28 (4.5)	24 (4.2)	4 (7.8)	0.231
Local/systemic bleeding	23 (3.7)	18 (3.2)	5 (9.8)	0.016

CVS: Cardiovascular system, STEMI: ST segment elevation myocardial infarction.

Table 9: Summary of compliance to different outcome indicators in ST segment elevation myocardial infarction group

STEMI Outcome indicators	Our results	Recommended results[4]
Length of hospital stay (days)	5	≤8
Inhospital complications (MACE) (%)	34.6	<10
Inhospital mortality (%)	8.2	<10

STEMI: ST segment elevation myocardial infarction, MACE: Major adverse cardiac event.

46.8% were diabetic, 48.6% (n=168) were known to be dyslipidemic , 45.6% (n=157) had past history of IHD, we found that smoking and past h/o of IHD had no significant difference with mace (P≤0.825 & 0.229 respectively)but hypertension, diabetes and dyslipidemia had significant difference with MACE (p≤ 0.048 & 0.019 & 0.0001 respectively) also only dyslipidemia had significant difference with survival (p≤0.016) while all risk factors except dyslipidemia had no significant difference with survival (p≤0.962 & 0.407& 0.156 & 0.399 respectively).

Chest pain to door in fewer hours had no significant difference with MACE (P≤0.953), while chest pain to door in less hours had significant difference with outcome (p≤0.0001.

Patients with higher points at KILIP class ,GRACE score ,APACHI II score and TIMI score had significant difference with MACE (p≤ 0.0001), also all risk stratifications scores had significant difference with survival (p≤ 0.0001 & 0.007& 0.002 & 0.0001 respectively), (Tables 10 and 11 and Figures 7 and 8).

Treatment, procedures, and timing during hospitalization and discharge

In hospital medical treatment within the first 24 h and at discharge:

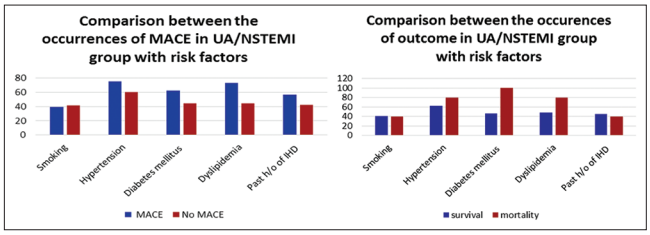

Figure 7: Summary of risk factors distribution in unstable angina/ non-ST segment elevation myocardial infarction group with outcome group with major adverse cardiac event and outcome

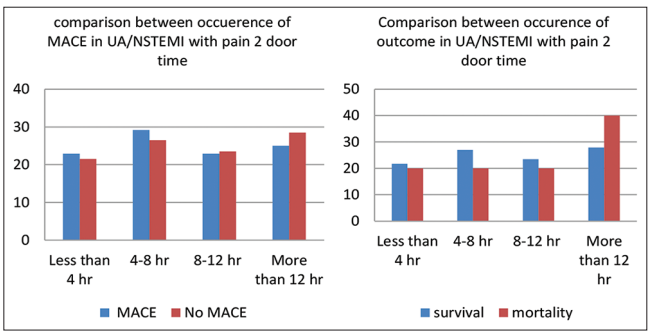

Figure 8: Summary of pain 2 door time distribution in unstable angina/ non-ST segment elevation myocardial infarction group with outcome group with major adverse cardiac event and outcome

Table 10: Comparison between the occurrences of major adverse cardiac event in baseline characteristics including age, gender, risk factors, timing of presenting chest pain at admission, time of door to electrocardiogram and needle, lipid profile, echo and risk stratifications in all unstable angina/ non-ST segment elevation myocardial populations

Baseline characteristics UA/NSTEMI	Total (n = 346)	MACE		p
		MACE (n = 48)	No MACE (n = 298)	
Age, mean ± SD	63 ± 25.7	64.13 ± 9.79	62.82 ± 27.42	0.745
Gender				
Female	106 (30.6)	15 (31.3)	91 (30.5)	0.921
Male	240 (69.4)	33 (68.6)	207 (69.5)	
Smoking	142 (41.0)	19 (39.6)	123 (41.3)	0.825
Hypertension	215 (62.1)	36 (75.0)	179 (60.1)	0.048
Diabetes mellitus	162 (46.8)	30 (62.5)	132 (44.3)	0.019
Dyslipidemia	168 (48.6)	35 (72.9)	133 (44.6)	0.0001
History of IHD	157 (45.6)	27 (56.3)	130 (42.6)	0.229
Pain to door (h)				
< 4	75 (21.7)	11 (22.9)	64 (21.5)	0.953
4–8	93 (26.9)	14 (29.2)	79 (26.5)	
8–12	81 (23.4)	11 (22.9)	70 (23.5)	
> 12	97 (28.0)	12 (25.0)	85 (28.5)	
Lipid profile at 1st 24 h	245 (70.8)	36 (75.0)	209 (70.1)	0.491
Echo LVEF %, mean ± SD	57.2 ± 12.3	49.03 ± 13.6	58.61 ± 11.0	0.0001
KILLIP class				
1	299 (86.4)	10 (20.8)	289 (97.0)	0.0001
2	6 (1.7)	5 (10.4)	1 (0.3)	
3	29 (8.4)	21 (43.8)	8 (2.7)	
4	12 (3.5)	12 (25.0)	0	
Grace score in percent %, mean ± SD	3.6 ± 9.11	22.92 ± 5.73	5.20 ± 2.71	0.0001
APACHE II score, mean ± SD	8.3 ± 7.2	13.21 ± 13.4	5.09 ± 2.46	0.0001
TIMI score, mean ± SD	2.9 ± 1.7	4.25 ± 1.48	2.72 ± 1.67	0.0001

UA: Unstable angina, STEMI: ST segment elevation myocardial infarction, MACE: Major adverse cardiac event, NSTEMI: Non-STEMI, SD: Standard deviation, LVEF: Left ventricle ejection fraction %, IHD: Ischemic heart disease, KILLIP: Classfication according to the severity of their post-MI heart failure, APACHE: Acute Physiology and Chronic Health Evaluation II, TIMI: Thrombolysis in Myocardial Infarction.

1. ASA started within 6 h of medical contact and prescribed at hospital discharge:

Table 11: Comparison between the occurrences of outcome in baseline characteristics including age, gender, risk factors, timing of presenting chest pain at admission, time of door to electrocardiogram and needle, lipid profile, echo and risk stratifications in all unstable angina/non-ST segment elevation myocardial populations

Baseline characteristics UA/NSTEMI	Total (n = 346)	Outcome		p
		Survival (n = 341)	Mortality (n = 5)	
Age, mean ± SD	63 ± 25.7	62.98 ± 25.86	64.80 ± 12.43	0.875
Gender				
Female	106 (30.6)	104 (30.5)	2 (40.0)	0.647
Male	240 (69.4)	237 (69.5)	3 (60.0)	
Smoking	142 (41.0)	140 (41.1)	2 (40.0)	0.962
Hypertension	215 (62.1)	211 (61.9)	4 (80.0)	0.407
Diabetes mellitus	162 (46.8)	157 (46.0)	5 (100)	0.016
Dyslipidemia	168 (48.6)	164 (48.1)	4 (80.0)	0.156
History of IHD	157 (45.6)	155 (45.5)	2 (40.0)	0.399
Pain to door (h)				
< 4	75 (21.7)	74 (21.7)	1 (20.0)	0.0001
4–8	93 (26.9)	92 (27.0)	1 (20.0)	
8–12	81 (23.4)	80 (23.5)	1 (20.0)	
> 12	97 (28.0)	95 (27.9)	2 (40.0)	
lipid profile at 1st 24 h	245 (70.8)	245 (71.8)	0	0.0001
Echo LVEF %, mean ± SD	57.2 ± 12.3	57.20 ± 12.38	57.0 ± 11.96	0.202
KILLIP class				
1	299 (86.4)	299 (87.6)	0	0.0001
2	6 (1.7)	6 (1.8)	0	
3	29 (8.4)	29 (8.5)	0	
4	12 (3.5)	7 (2.1)	5 (100)	
Grace score in percent%, mean ± SD	33.6 ± 9.11	7.86 ± 14.87	61.54 ± 23.27	0.007
Apache II score mean ± SD	8.3 ± 7.2	6.09 ± 3.89	21.20 ± 4.97	0.002
TIMI score, mean ± SD	2.9 ± 1.7	2.9 ± 1.71	5.40 ± 0.54	0.0001

UA: Unstable angina, STEMI: ST segment elevation myocardial infarction, NSTEMI: Non-STEMI, SD: Standard deviation, LVEF: Left ventricle ejection fraction %, IHD: Ischemic heart disease, KILLIP: Classfication according to the severity of their post-MI heart failure, APACHE: Acute Physiology and Chronic Health Evaluation II, TIMI: Thrombolysis in Myocardial Infarction.

ASA was prescribed in 100% (N=346) of eligible cases ON ADMISSION , 93.4 % (N=323) had ASA prescribed in their discharge prescription BUT

ONLY 18 cases (5.2%) not prescribed on discharge and 5 cases (1.4%) died .

2. P2Y12R started within 6 h of medical contact and prescribed at hospital discharge:

In the first 6 h, P2Y12R was prescribed in 85.2% (N = 295) of eligible cases, 81.0% of discharged cases (N = 280) had P2Y12R prescribed in their discharge prescription, the remaining 61 cases (17.6%) not prescribed on discharge, and 5 cases (1.4%) died during inhospital course.

Table 12: Comparison between the occurrences of major adverse cardiac event with medications taken at admission and discharge in unstable angina/non-ST segment elevation myocardial infarction group

UA/NSTEMI Medications	Total (n = 346), n (%)	MACE		p
		MACE (n = 48), n (%)	No MACE (n = 298), n (%)	
ASA at admission	346 (100)	48 (100)	298 (100)	
ASA at discharge				
No	18 (5.2)	0	18 (6.0)	0.0001
Yes	323 (93.4)	43 (89.6)	280 (94.0)	
Died	5 (1.4)	5 (10.4)	0	
P2Y12R at admission	295 (85.3)	47 (97.9)	248 (83.2)	0.008
P2Y12R at discharge				
No	61 (17.6)	1 (2.1)	60 (20.1)	0.0001
Yes	280 (80.9)	42 (87.5)	238 (79.9)	
Died	5 (1.4)	5 (1.4)	0	
BB at admission				
No	33 (9.5)	0	33 (11.1)	0.0001
Yes	271 (78.3)	16 (33.3)	255 (85.6)	
Contraindicated	42 (12.2)	32 (66.7)	10 (3.4)	
BB at discharge				
No	32 (9.2)	0	32 (10.7)	0.10
Yes	288 (83.2)	31 (64.6)	257 (86.3)	
Contraindicated	21 (6.1)	12 (25.0)	9 (3.0)	
Died	5 (1.4)	5 (10.4)	0	
ACE-I/ARB at admission				
No	49 (14.2)	0	49 (16.4)	0.0001
Yes	272 (78.6)	29 (60.4)	243 (81.6)	
Contraindicated	25 (7.2)	19 (39.6)	6 (2.0)	
ACE-I/ARB at discharge				
No	50 (14.5)	0	50 (16.8)	0.0001
Yes	281 (81.2)	38 (79.2)	243 (81.5)	
Contraindicated	10 (2.9)	5 (10.4)	5 (1.7)	
Died	5 (1.4)	5 (10.4)	0	
Statin at admission				
No	10 (2.9)	0	10 (3.4)	0.198
Yes	336 (97.1)	48 (100)	288 (96.6)	
Statin at discharge				
No	20 (5.8)	0	20 (6.7)	0.0001
Yes	321 (92.8)	43 (89.6)	278 (93.3)	
Contraindicated	5 (1.4)	5 (10.4)	0	

UA: Unstable angina, MACE: Major adverse cardiac event, STEMI: ST segment elevation myocardial infarction, NSTEMI: Non-STEMI, ACE-I: Angiotensin converting enzyme inhibitor, ARB : Angiotensin receptor blocker, BB : Beta blocker, ASA : Acetyl salcylic acid (ASPIRIN).

3. Beta-blocker started within 24 h of admission and prescribed at hospital discharge:

In the first 24 h, β-blockers were prescribed in 78.4% of cases (N = 271), while contraindications for it were registered in 42 patients (12.1%) at admission. The study showed that 9.5% (N = 33) of the total eligible cases did not have β-blockers prescribed within 24 h of admission, while on discharge, β-blockers were prescribed in 83.2% of cases (N = 288); of the remaining, 5 cases died during inhospital course, and 21 cases had registered contraindications at discharge. The study showed that 9.2% (N = 32) of the total eligible cases did not have β-blockers prescribed at discharge.

4. ACE-I/ARB started within 24 h of admission and prescribed at hospital discharge:

In the first 24 h, ACE-I/ARBs were prescribed in 78.6% of cases (N = 272), while contraindications for it were registered in 25 patients. The study showed that 14.2% (N = 49) of the total eligible cases did not have ACE-I/ARBs prescribed within 24 h of admission, while on discharge, ACE-I/ARBs were prescribed in 81.2% of cases (N = 281); of the remaining, 5 died during inhospital course, and 10 cases had registered contraindications at discharge. The study showed that 14.5% (N=50) of the total eligible cases did not have ACE-I/ARBs prescribed at discharge.

5. Statins started within 24 h of admission and prescribed at hospital discharge:

In the first 24 h, statins were prescribed in 97.1% of cases (N = 336). The study showed that 2.9% (N = 10) of the total eligible cases did not have statins prescribed, while on discharge, statins were prescribed in 92.8% of cases (N = 321); of the remaining, 5 died during inhospital course. The study showed that 5.8% (N =20) of the total eligible cases did not have statins prescribed at discharge (Tables 12 and 13).

Immediate PCI had a significant difference in UA/NSTEMI patients with MACE ($p \leq 0.006$), but had no significant difference with survival ($p \leq 0.650$) (Tables 12 and 14).

Written and verbal smoking cessation were given to 139 (40.2%) of total patients, but were deficient in 4 (1.2%) eligible patients. Nutrition, psychological, and physical activity counseling

Table 13: Comparison between the occurrences of outcome with medications taken at admission and discharge in unstable angina/non-ST segment elevation myocardial infarction group

UA/NSTEMI Medications	Total (n = 346)	Outcome		p
		Survival (n = 341)	Mortality (n = 5)	
ASA at admission	346 (100)	341 (100)	5 (100)	
ASA at discharge				
No	18 (5.2)	18 (5.3)	0	0.0001
Yes	323 (93.4)	323 (94.7)	0	
Died	5 (1.4)	0	5 (100)	
P2Y12R at admission	295 (85.3)	290 (85.0)	5 (100)	0.0001
P2Y12R at discharge				
No	61 (17.6)	61 (17.9)	0	0.0001
Yes	280 (80.9)	280 (82.1)	0	
Died	5 (1.4)	0	5 (100)	
BB at admission				
No	33 (9.5)	33 (9.7)	0	0.0001
Yes	271 (78.3)	271 (79.5)	0	
Contraindicated	42 (12.2)	37 (10.8)	5 (100)	
BB at discharge				
No	32 (9.2)	32 (9.3)	0	0.0001
Yes	288 (83.2)	288 (84.5)	0	
Contraindicated	21 (6.1)	21 (6.2)	0	
Died	5 (1.4)	0	5 (100.0)	
ACE-I/ARB at admission				
No	49 (14.2)	49 (14.4)	0	0.0001
Yes	272 (78.6)	272 (79.8)	0	
Contraindicated	25 (7.2)	20 (5.8)	5 (100)	
ACE-I/ARB at discharge				
No	50 (14.5)	50 (14.7)	0	0.0001
Yes	281 (81.2)	281 (82.4)	0	
Contraindicated	10 (2.9)	10 (2.9)	0	
Died	5 (1.4)	0	5 (100)	
Statin at admission				
No	10 (2.9)	10 (2.9)	0	0.698
Yes	336 (97.1)	331 (97.1)	5 (100)	
Statin at discharge				
No	20 (5.8)	20 (5.8)	0	0.0001
Yes	321 (92.8)	321 (94.2)	0	
Contraindicated	5 (1.4)	0	5 (100)	

UA: Unstable angina, STEMI: ST segment elevation myocardial infarction, NSTEMI: Non-STEMI, ACE-I: Angiotensin converting enzyme inhibitor, ARB : Angiotensin receptor blocker, BB : Beta blocker, ASA : Acetyl salcylic acid (ASPIRIN).

Table 14: Comparison between the occurrences of major adverse cardiac event and outcome in unstable angina/non-ST segment elevation myocardial infarction group in type of percutaneous coronary intervention done

UA/NSTEMI Type of PCI	Total (n = 346), n (%)	MACE		p	Outcome		p
		MACE (n = 48), n (%)	No MACE (n = 298), n (%)		Survival (n = 341), n (%)	Mortality (n = 5), n (%)	
Immediate PCI	14 (4.0)	6 (12.5)	8 (2.7)	0.006	14 (4.1)	0	0.650
Early PCI	97 (28.1)	17 (35.4)	80 (26.8)		94 (27.6)	3 (60.0)	
Selective PCI	81 (23.4)	9 (18.8)	72 (24.2)		80 (23.5)	1 (20.0)	
Pre discharge PCI	69 (19.9)	11 (22.9)	58 (19.5)		68 (19.9)	1 (20.0)	
Post discharge PCI	46 (13.3)	3 (6.4)	43 (14.4)		46 (13.5)	0	
Conservative (no intervention)	39 (11.3)	2 (4.2)	37 (12.4)		39 (11.4)	0	

STEMI: ST segment elevation myocardial infarction, NSTEMI: Non-STEMI, MACE: Major adverse cardiac event, UA: Unstable angina, PCI: Percutaneous coronary intervention.

were given to 342 (98.8%) of patients on discharge prescriptions. Referral to cardiac rehabilitation center was done in only 4 (1.2%) eligible patients. All instructions on discharge prescriptions had a significant difference with MACE and survivals (p ≤ 0.0001) (Tables 15 and 16).

Table 15: Comparison between the occurrences of major adverse cardiac event in unstable angina/non-ST segment elevation myocardial infarction group on discharge instructions

UA/NSTEMI Discharge instructions	Total (n = 346), n (%)	MACE		p
		MACE (n = 48), n (%)	No MACE (n = 298), n (%)	
Smoking cessation	139 (40.2)	17 (35.4)	122 (40.9)	0.0001
Nutrition counseling	342 (98.8)	44 (91.7)	298 (100)	0.0001
Psychological counseling	342 (98.8)	44 (91.7)	298 (100)	0.0001
Physical activity counseling	342 (98.8)	44 (91.7)	298 (100)	0.0001
Cardiac rehabilitation center referral	4 (1.2)	1 (2.1)	3 (1.0)	0.0001

STEMI: ST segment elevation myocardial infarction, NSTEMI: Non-STEMI, MACE: Major adverse cardiac event, UA: Unstable angina.

Our study showed that ASA prescriptions at admission and discharge and statins at discharge were adherent to international benchmarks (Table 17).

Table 16: Comparison between the occurrences of outcome in unstable angina/non-ST segment elevation myocardial infarction group on discharge instructions

UA/NSTEMI Discharge instructions	Total (n = 346), n (%)	Outcome		p
		Survival (n = 341), n (%)	Mortality (n = 5), n (%)	
Smoking cessation	139 (40.2)	139 (40.8)	0	0.0001
Nutrition counseling	342 (98.8)	341 (100)	1 (20.0)	0.0001
Psychological counseling	342 (98.8)	341 (100)	1 (20.0)	0.0001
Physical activity counseling	342 (98.8)	341 (100)	1 (20.0)	0.0001
Cardiac rehabilitation center referral	4 (1.2)	4 (1.2)	0	0.0001

STEMI: ST segment elevation myocardial infarction, NSTEMI: Non-STEMI, UA: Unstable angina.

Inhospital complications

The complications during hospital treatment, depicts 13.9% (n=48) of UA/NSTEMI PATIENTS developed one or more in hospital complications MACE during their stay AS RE-infarction was noted in 1 patient, RE-admission in 2 patients, cardiogenic shock in 1 patient, heart failure in 39 patients, TIA/strokes in only 3 patients, tachyarrhythmia were noticed in 14 patients WHO need anti-arrhythmic treatment in all 14 patients and received 13 cases only dc-shock, bradyarrythmia were noticed in 1 patient who need temporary pacemaker insertion , local/systemic bleeding in 4 patients only.

Table 17: Summary of compliance to different process indicators in unstable angina/non-ST segment elevation myocardial infarction group

UA/NSTEMI Process of care indicators	Our results (%)	Recommended results[10] (%)
ASA prescribed within 6 h from admission	100	≥90
ASA prescribed at hospital discharge	93.4	≥90
BB prescribed within 24 h admission	78.3	≥85
BB prescribed at hospital discharge	83.2	≥85
ACE-I/ARB prescribed within 24 h admission	78.6	≥90
ACE-I/ARB prescribed at hospital discharge	81.2	≥85
Lipid profile sample within 24 h admission	70.8	≥85
Statins prescribed at hospital discharge	92.8	≥70
Inhospital LV function assessment by echocardiography	74.9	100
Smoking cessation advice, counseling or therapy during hospital discharge	40.2	100

UA: Unstable angina, STEMI: ST segment elevation myocardial infarction, NSTEMI: Non-STEMI, ACE-I: Angiotensin converting enzyme inhibitor, ARB : Angiotensin receptor blocker, BB : Beta blocker, ASA : Acetyl salcylic acid (ASPIRIN).

All inhospital complications such as readmission, reinfarction, CVS, and local/systemic bleeding had no significant difference with survival (p ≤ 0.864, and 0.903, and 0.833, and 0.808, respectively), while cardiogenic shock, heart failure, tachyarrhythmia, and bradyarrhythmia had significant difference with survival (p ≤ 0.0001) (Table 18 and Figure 9).

Table 18: Comparison between the occurrences of outcome in unstable angina/non-ST segment elevation myocardial infarction group with inhospital complications

UA/NSTEMI Inhospital complications	Total (n = 346), n (%)	Outcome		p
		Survival (n = 341), n (%)	Mortality (n = 5), n (%)	
Readmission	2 (0.6)	2 (0.6)	0	0.864
Reinfarction	1 (0.3)	1 (0.3)	0	0.903
Cardiogenic shock	13 (3.8)	7 (2.1)	5 (100)	0.0001
Heart failure	13 (3.8)	34 (10.0)	5 (100)	0.0001
CVA	3 (3.9)	3 (0.9)	0	0.833
Tachyarrhythmia	14 (4.0)	10 (2.9)	4 (80.0)	0.0001
Brady-arrhythmia	1 (0.3)	0	1 (20.0)	0.0001
Local/systemic bleeding	4 (1.2)	4 (1.2)	0	0.808

CVS: Cardiovascular system, UA: Unstable angina, STEMI: ST segment elevation myocardial infarction, NSTEMI: Non-STEMI.

Length of stay

The median LOS was 4 days (mean ± SD, 6 ± 5.4) for the UA/NSTEMI group patients; shorter LOS in UA/NSTEMI patients had a significant difference with MACE and survival (p ≤ 0.01 and 0.0001).

Inhospital mortality

98.6% (n = 294) discharged alive from our unit admitted by UN/NSTEMI, but 1.4% (n = 5) died.

Our study showed that LOS and inhospital mortality were adherent to international benchmarks (Table 19).

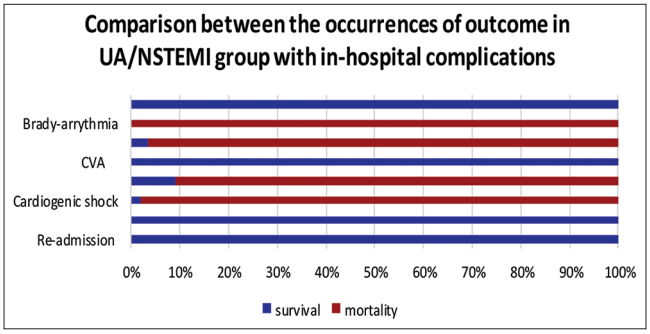

Figure 9: Summary of inhospital complications major adverse cardiac event in unstable angina/non-ST segment elevation myocardial infarction group with outcome

Discussion

The present study was intended to be a first large analytical step in measuring the quality of hospital care indicators that reflect the adherence to current evidence-based processes of care. The application of predefined quality indicators as recommended by different researches and groups has provided valuable insight into their feasibility, ease of use, and availability of required data.

Table 19: Summary of compliance to different outcome indicators in unstable angina/non-ST segment elevation myocardial infarction group

UA/NSTEMI Outcome indicators	Our results	*Recommended results [10]*
Length of hospital stay (days)	4	*≤8*
Inhospital complications (MACE) (%)	13.9	*<10*
Inhospital mortality (%)	1.4	*<10*

UA: Unstable angina, STEMI: ST segment elevation myocardial infarction, NSTEMI: Non-STEMI, MACE: Major adverse cardiac event.

The results of our study showed that quality of hospital care is extremely variable and is often inadequate; results indicate that patients may not receive the recommended care in many cases and that there is wide room for improvement similar to the figures reported by Jha AK *et a*l.'s [11] study.

Regarding age and gender, the majority of population (N = 967) in our study ranged between age group of 21-91 years, which common in ihd patients. The ratio of female: male (1:4.49) in our STEMI study population was similar to figures reported by Mohamed [12] (3.55:1) and Ibrahim [13] (3.2:1) in their research conducted locally, though it was different from similar international studies done by Ganova-Iolovska *et al*. [14] (1:1.98) in Bulgaria and Wang Wang *et al*. [15] (1:1.94) and Flotta *et al*. [16] (1:1:11) in Italy.

Regarding the medical histories, our figures were concordant with those reported by Mohamed [12] who observed smoking, hypertension, and diabetes mellitus in 56.5%, 39.7%, and 38.9% of study population, respectively. Patient characteristics of STEMI study group did not much influence the in hospital MACE on the contrary of UA/NSTEMI study group. .

Regarding prehospital delay, only in the STEMI study group, we found that the majority of our patients (28%) presented to our unit very late more than 12 h from the onset of chest pain, and it is obvious that "pain to door" time for acute STEMI patients was longer compared to a number of international multicenter trials. Although many people do know that chest pain is presenting symptom of MI, they are uninformed about associated symptoms such as pain in the arm, pain of the lower jaw, shortness of breath, and nausea and are unaware of the fact that it is necessary to seek medical assistance within the first 20–30 min. The latter was confirmed by one of the results of an interview study by Ganova-Iolovska *et al*. [14], showing that 60% of the patients self-evaluated their hospital admittance as being within an optimal time interval.

Even also we could not establish a significant relation between pre-hospital time delay in patients with history of IHD, backs the assumption that patient prefer to wait until off the symptoms at home or go to their special treating physician in his or her consultation hours, which may be delayed up to several hours or days. Higher rate of diabetes in such group, and risk of silent MI, could also support the theory, which needs further study.

Regarding coronary intervention in Cairo, reperfusion facilities are limited to few hospitals, among which only hand counted number of medical facilities have 24 h inhospital cardiac catheterization team for coronary intervention (PCI) services. This could be one of the reasons for hospital admission delay so longer "door to balloon time" in our center but was lower than the figures reported by flotta *et al*. [16] who reported median "door to balloon" time of 205 minutes at italy. Despite that, it is longer in comparison to internationally advised time frame of 90 min.

The door to balloon time of our STEMI study group lay between 20 and 109 minutes (mean±SD 78.80±34.04), similar to previous two primary PCI registries done at our center by Mohamed [12] and Ibrahim [13] depicted mean "door to needle" time of 71.3±27.6 minutes & 81.9±2 minutes, respectively. also it is important to note that patients with long time of door to balloon in minutes had significant difference with MACE and mortality (P≤ 0.036 & 0.017 respectively)

So we should improve this time by overcoming the obstacles that may be associated with funding, and time associated with clearance of paper works for government subsidies & insurance claims.

Regarding in hospital medical treatment, the compliance rates in our study were much less than the target level for β-blocker and ACE-I/ARBs BUT administration rates for ASA during the first 24hours were similar to the figures reported by Jencks *et al.* [17] from the USA.

Some measures almost approached optimal adherence while rates regarding lipid profile sample obtained within first 24 hours of admission (82.3%), β-blockers within first 24 hours (65.9%), also in hospital assessment of LV function by echocardiography (82.6%) and referral for cardiac rehabilitation were noticeably intangible. for all other measures a wide variation in uptake was registered in our study similar to the variability has also been already reported by Jha et al. [18] in American hospitals.

Regarding outcome indicators,the length of hospital stay of patients with acute STEMI in our center 5 (mean 6.45 ± 4.7) days was shorter and better than data from Western and Central Europe 8 (mean 8.5 ± 3.3) days in report from Milka *et al.* [14] at Bulgaria.

The rate of complications during hospital treatment (MACE) in our study (65.6%) was found to be higher than the study done by Hassan [19] at our center in 2013 which showed an overall MACE of 44%, also our results were higher in comparison to data from other countries, especially from US and Europe. Arrhythmias were similar to the figures reported by Ganova-Iolovska *et al*. [14] from Bulgaria, but significantly higher for cardiogenic shock and heart failure.

Inhospital mortality rates can be regarded as a measure of association of hospital adherence to guidelines and patient outcomes; in our study, the overall mortality rate was 8.2%. The mortality rate at our center is similar to the figures (7.5%) of the GRACE trial, as well as data of other surveys [19]. Our results were lower to that reported by Tewfik [20] (16.8% in STEMI group) in his ACS registry study conducted at our center in 2014.

Conclusion

Significant conclusions from our study

- Most our quality care indicators esp. prescription of acetylsalicylic acid (ASA)at admission and discharge ,statins at discharge, ACEi/ARBS at discharge, median time of primary PCI of STEMI patients (door to balloon) in minutes , LIPID profile sample taken at the 1st 24 hr. from admission, met or were close enough to internationally recommended benchmark.
- Prescription of β-blockers at admission and discharge, ACEi/ARBS at admission, assessment of LV ejection fraction % by echocardiography, and smoking cessation advice showed very low adherence
- A lot of quality of care indicators had a significant role in reducing the length of hospital stay (LOS), inhospital complications (MACE), and inhospital outcome (mortality).

The wide variation and in some instances the very low adherence to quality indicators in our study suggests that there is still substantial work that lies ahead on the way to improve hospital performance. Furthermore, efforts should focus more on domains of health care than on specific conditions and particularly on improvement in preventive care.

Study limitation

Some potential limitations of our study need to be acknowledged

1. Since this study was first of its type in the country, comparison and bench marking in similar socioeconomic system and performance changes over time could not be assessed
2. Data abstraction was sharply critical in many cases, since it was not possible to retrieve the necessary data from medical records or in some instances data were not available at all. Thus, it is arguable that availability and quality of data may have contributed to lower estimates of the adherence rates
3. Admission preference in center for acute STEMI patients, who are within window period for reperfusion therapy, could have influenced the results of outcome indicators
4. Because of incomplete follow-up mechanisms, we found it difficult to obtain validated data after discharge for all study population.

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