Quality control project in ST elevation myocardial infarction

STEMI registration in Belgium

Focus on hospital length of stay in STEMI population

Background

Despite the good results of reperfusion therapies for ST-segment elevation myocardial infarction (STEMI), the mortality and morbidity across different patient categories varies substantially and will affect hospital length of stay. Previous studies have shown that early discharge (48h post primary PCI) can be carried out safely in a subset of patients with a low estimated mortality risk of <1% at one month. Identification of a low-risk subset of patients may be an attractive way to reduce hospitalization and costs. In our Belgian STEMI database this low risk group represent one third of the STEMI population and can be identified by a previous validated TIMI risk score (score <3).
In addition, some recent studies in patients with cardiac failure have suggested that variation in discharge policy or readmission more closely reflect variation in the underlying hospitalization policy than differences in the quality of care during hospitalization. Data on the variation of hospital length of stay in STEMI population are not known.
Therefore, we aimed to evaluate the variation of hospital length of stay in an unselected Belgian STEMI population and to assess predictors of this variation.

Methods:

We collected data on hospital duration in 34 hospitals that enrolled >20 STEMI patients between period of 2010 and 2011. The present study focused only on STEMI patients without CPR on admission and who were discharged at home (alive). Collection of data was carried out by electronic web-based registry that is governed by an independent software company specialised in electronic data capture solutions (Lambda-plus- website: http://www.lambdaplus.com).
A number of baseline characteristics for each patient was included which allowed to stratify the patients according to a previous validated TIMI risk score: age, gender, collapse with cardiopulmonary resuscitation (CPR), history of coronary artery disease (CAD) or peripheral artery disease (PAD), location of infarction, total ischemic time. age, hemodynamic status on admission, history of atherovascular disease, history of

hypertension or diabetes. Following types of reperfusion strategy were defined: thrombolysis (TL), percutaneous coronary intervention (PCI) or no reperfusion. In addition, for TL and for no-reperfusion patients subsequent invasive evaluation (either in the acute phase or more electively during hospitalisation) was recorded.

Hospital length of stay was defined as time from admission for STEMI to discharge at home.

Statistical Analysis

Absolute numbers and percentages are shown for categorical variables, and medians with interquartile range (IQR) for continuous variables unless otherwise mentioned. For descriptive purposes, binary variables are compared between subgroups by χ^2 test and by ANOVA for continuous variables. Predictors of prolonged (>7 days) hospital length of stay are analyzed by multiple logistic regression and reported as odds ratio (OR) and 95% confidence interval (95%CI). A significance level of 0.05 is assumed for the statistical tests. All P-values are results of two-tailed tests.

Results

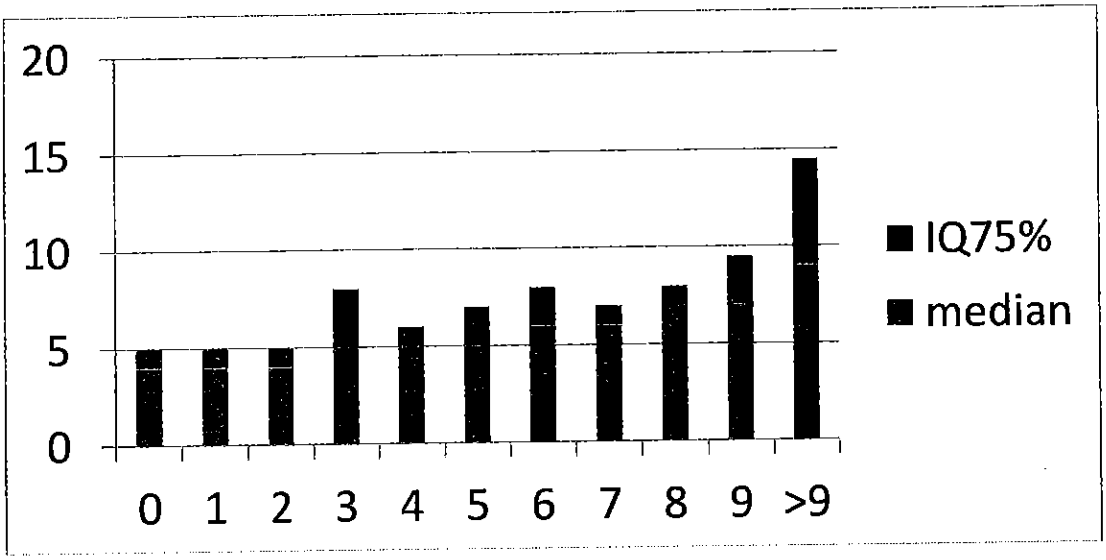
Patients and demographic characteristics

The total study population consisted of 2154 STEMI patients (24% females) with an average age of 62+/- 13. The majority (77%) was admitted in a PCI centre. Of those that were admitted in a non-PCI center, the majority (80%) were referred for primary PCI.
In the total study population, 2,5% received thrombolysis and 4.5% received no reperfusion therapy mainly because of too late presentation. The average TIMI risk score was 3.6 +/- 2.4 and 849 (39%) patients had TIMI risk score <3.

Hospital length of stay and determinants

The hospital length of stay ranged from 1 to 126 days with an average of 6.7 days and median of 5 days (75% IQR 4-6 day). A total of 410 patients (19%) stayed more than 7 days in the hospital. Only 34% of the patient at low risk (TIMI risk score<3) left the hospital within 3 days after admission. There was a trend to shorter hospital stays in 2011 as compared to 2010: average of 6.5 vs 6.1 (p=0.1).
Figure 1 depicts the relationship between TIMI risk score and hospital length of stay (days) and provides also the interquartile range (IQR75%) within each TIMI risk score. Duration of hospital length of stay prolonged with increasing TIMI risk score with following regression analysis: LOS = 3,672 +, 737 x TIMI risk score; R = 0.25 p<0.001. This indicates that TIMI risk score is responsible for only 25% of variation in hospital length of stay.

Figure 1:



The individual determinants for prolonged hospital stay (>7 days) are depicted in table 1. The most important baseline factors for prolonged hospital stay are high age, female gender, Killip class>1, hart rate>100 on admission, history of peripheral artery disease, anterior infarction and long ischemic time delay. Admission in PCI centre or modalities for reperfusion therapy did not significantly affect hospital length of stay.

Table 1. Predictors of prolonged hospital stay (>7 days)

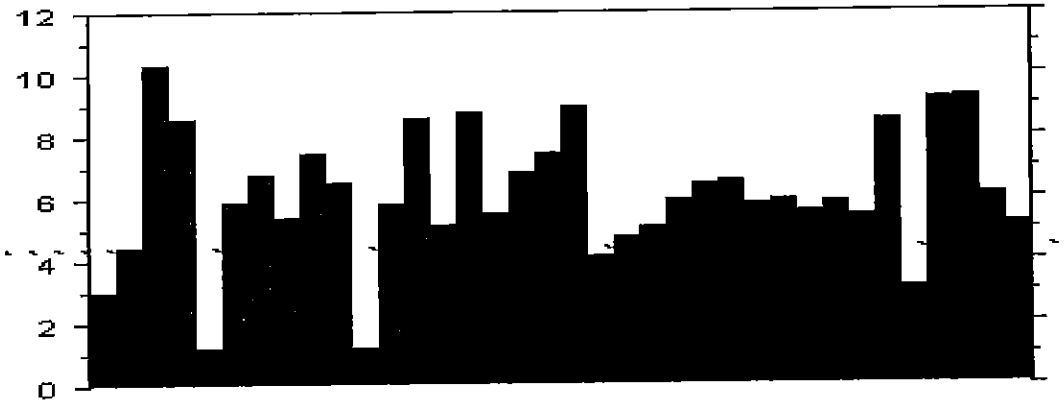
	OR (95% CI)
age	1.04 (1.03-1.05)
Female gender	1.57 (1.18-2.1)
Killip Class>1	2.5 (1.8-3.4)
PAD	1.87 (1.28-2.7)
HR ≥100bpm	1.8 (1.3-2.6)
Anterior infarction	1.5 (1.16-1.9)
Ischemic time ≥4h	1.3 (1.02-1.67)

Predictors of in-hospital mortality are analyzed by multiple logistic regression. Values are expressed as odds ratio (OR) with 95% confidence interval (95% CI)., PAD: peripheral artery disease, , HR: heart rate, bpm: beats per minute

Inter-hospital variation of length of stay.

Figure 2 gives the average length of stay for the individual hospitals.

Figure 2



To compare differences in discharge policy among hospitals, hospitals were subdivided into three groups (thirdtiles) according to their average length of hospital stay for the low risk STEMI patients (TIMI risk score<3).
Hospital group A includes 10 hospitals with an average hospital length of stay of 3.1±2.1
Hospital group B includes 12 hospitals with an average hospital length of stay of 4.9±2.2
Hospital group C includes 12 hospitals with a average hospital length of stay of 5.9±4.9
There were no significant differences with regard to hospital characteristics (university, PCI facilities, STEMI volume) among the three groups.
However, for the whole STEMI population, hospital length of stay was significantly shorter in group A (4.9 vs 6.1 and 7.7 days) despite a higher overall TIMI risk score and more female patients (both independent predictors for prolonged hospital stay).
In addition, safety of early discharge (group A) was demonstrated by 0% mortality rate between discharge and at 1 month after index event.

Table 2 compares the patient and hospital characteristics of those three groups.

	Group A	Group B	Group C	P value
Number of hospitals	10	12	12	
Hospital entity With PCI facility University High volume(>50/y)	 50% 20% 44%	 67% 8% 50%	 67% 33% 42%	 0.66 0.3 0.9
Number ofpatients	629	680	818	
Patient characteristics TIMI risk score Female gender age	 3.9±2.7 26% 62±14	 3.4±2.3 21% 61±13	 3.6±2.3 24% 63±13	 0.0005 0.049 0.2
Hospital length of stay All TIMI score<3	 4.9±5.7 3.1±2.1.	 6.1±6.5 4.9±2.2	 7.7±8.3 5.9±4.9	 <0.0001 <0.0001
Mortality at 1 month	0 %	0.4%	0.3%	0.5

Conclusion

The present study describes hospital length of stay in 34 Belgian hospitals from period 2010 and 2011 in a total of 2154 STEMI patients. The main findings are

1. Consistent with the results of previous studies, hospital length of stay is significantly related to baseline risk profile of the patient (cf TIMI risk score), but this accounts only for 25% of the observed variability in hospital duration.
2. Large inter hospital variations in length of stay were observed that could not be explained by medical factors or by logistics factors (hospital facilities) and seems to be related more to general discharge policies (possibly driven by the fear to discharge STEMI patients too early).
3. Early discharge (within 3 day after admission) can be carried out safely for patients with a low estimated risk profile (TIMI risk score <3). However, only one third of the low risk patients were discharged early in our registry. A more systematic early discharge policy in those low risk STEMI patients may positively affect the patient satisfaction and will reduce substantially the hospital cost.

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