

Modified zwolle score with delta-creatinine: enhancing the safety of early discharge after STEMI

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Introduction: The Zwolle score (ZS) is recommended to identify low-risk patients eligible for early discharge after acute ST-segment elevation myocardial infarction (STEMI), but as only one-third of STEMI have a low ZS, the discharge is often postponed. Creatinine variation (Δ -Cr) also provide prognostic information after STEMI.

Purpose: The authors intend to study the “modified Zwolle Score” (MZS) model, which encompasses Δ -Cr as a variable that may enhance the discriminative power of the standard ZS. The outcome is 30-day mortality, time range that starts right after the ACS.

Methods: This is a retrospective study with data from a national multicentre registry. We have included 3.296 patients with STEMI. Zwolle score was calculated for each patient. It is defined as shown in figure 1.

Δ -Cr was defined as maximum serum creatinine minus admission serum creatinine. A Δ -Cr \geq 0.3 was assigned 2 points in the Modified Zwolle Score, after interpretation of odds ratio via multivariate analysis.

For prediction quality assessment, we have performed ROC curve analysis with both scoring systems versus 30-day mortality. Regarding survival analysis, we have performed Kaplan-Meier curves with Log-rank analysis. We have also registered complications during hospital stay.

Results: The sample mean age is 63 \pm 14, and it is composed by 76.8% of males. The majority of patients presented Killip Class I (87.3%). The STEMI was anterior in 49.7% of patients and inferior in 49.8% of patients.

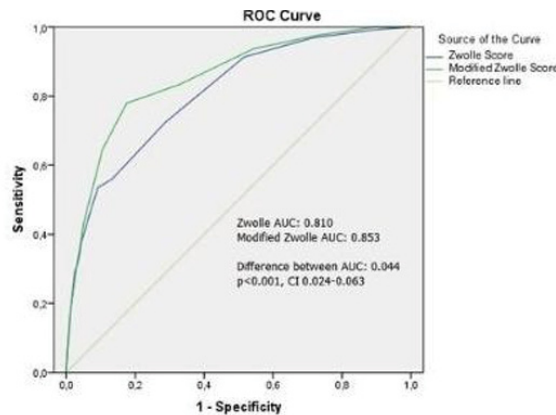
The mean admission time was 5 days. Intrahospital mortality was 3% and 30-day mortality was 4%.

The mean ZS was 3.1 \pm 2.8 points, the mean MZS was 3 \pm 2.1 points and the mean Δ -Cr was 0.2 \pm 0.6mg/dL.

The ROC curve analysis between ZS and early mortality revealed a c-statistic of 0.810 (CI 0.796–0.823), whereas the ROC curve between MZS and early mortality revealed a c-statistic of 0.853 (95% CI: 0.841–0.865). The ROC curves comparison showed superiority of the MZS c-statistic, with a difference between AUC of 0.043 (p<0.001, 95% CI: 0.024–0.063). Regarding low-risk patients, 30-day mortality was 3.3% using ZS (0–2 points) and 2.4% using modified ZS (0–2 points). Fifty patients (1.5%) died between 3rd and 10th day after ACS: original ZS low-risk criteria registered 0.09% and modified ZS low-risk criteria 0.06% fatalities. Kappa coefficient for intergroup concordance was good (0.73).

Conclusion: We conclude that by adding Δ -Cr to the standard ZS, a renal function parameter that was lacking in the ZS, its predicting capacity regarding early mortality in patients admitted with STEMI was increased. Comparing both scores, low-risk patients defined by MZS registered less complications, 3–10 day mortality and 30-day mortality than low-risk patients defined by the original ZS. This fact may lead to better distinction of patients who will benefit from early discharge.

Zwolle Risk Score for STEMI	
Killip class	Points
1	0
2	4
3-4	9
TIMI flow post	
3	0
2	1
0-1	2
Age	
< 60	0
\geq 60	2
3-vessel disease	
No	0
Yes	1
Anterior infarction	
No	0
Yes	1
Ischemia time (> 4 hours)	
No	0
Yes	1
TOTAL SCORE	16



Zwolle Score, ROC curves and survival

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