Predictive model for in-hospital mortality following cardiogenic shock

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Introduction and objectives: Cardiogenic shock is a condition caused by reduced cardiac output and hypotension, resulting in end-organ damage and multiorgan failure. Although prognosis has been improved in recent years, this state is still associated with high morbidity and mortality. The aim of our study was to perform a predictive model for in-hospital mortality that allows stratifying the risk of death in patients with cardiogenic shock.

Methods: This is a retrospective analysis from a prospective registry, that included 135 patients from one Spanish Universitary Hospital between 2011 and 2020. Multivariate analysis was performed among those variables with significant association with short-term outcome of univariate analysis with a p-value <0.2. Those variables which had a p-value >0.1 in the multivariable analysis were excluded of the final model. Our method was assessed using the area under the ROC-curve (AUC). Goodness of fit was tested using Hosmer-Lemeshow statistic test. Finally, we performed a risk score using the pondered weight of the coefficients of a simplified model created after categorizing the continuous quantitative variables included in the final model, giving a maximum of 16 points and creating three categories of risk.

Results: The in-hospital mortality rate was 41.5%, the average of age was 74.2 years, 35.6% were females and acute coronary syndrome (ACS) was the main cause of shock (60.7%). Mitral regurgitation (moderate-severe), age, ACS etiology, NT-proBNP, blood hemoglobin and lactate at admission were included in the final model. Risk-adjustment model had good accuracy in predicting in-hospital mortality (AUC 0.85; 95% CI 0,78–0,90) and the goodness of fit test was p-value>0.10. According to the risk score made with the simplified model, these patients were stratified into three categories: low (scores 0–6), intermediate (scores 7–10), and high (scores 11–16) risk with observed mortality of 12.9%, 49.1% and 87.5% respectively (p<0,001).

Conclusions: Our predictive model using six variables, shows good discernment for in-hospital mortality and the risk score has identified three groups with significant differences in prognosis. This model could help in guiding treatments and clinical decision-making, so it needs external validation and to be compared with other models already published.

ROC curve
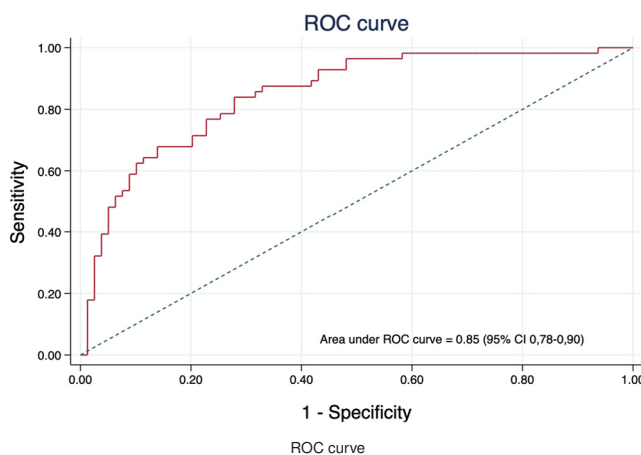
Variables	Points
Age (years)	
<65	0
65-79	1
>80	3
Etiology (Acute coronary syndrome)	
No	0
Yes	2
Mitral regurgitation (moderate-severe)	
No	0
Yes	2
Lactate at admission (mmol/L)	
<2	0
2-5	1
>5	3
Hemoglobin (g/dL)	
<11	0
≥11	1
NT-proBNP (pg/mL)	
<2000	0
2000-4999	2
5000-14999	4
≥15000	5
MAXIMUM SCORE	**16 POINTS**

Risk Score