Mortality risk assessment in type 2 cardiorenal syndrome: comparative study

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Funding Acknowledgement: Type of funding source: None

Background: Type 2 cardiorenal syndrome is a serious, life threatening clinical condition, associated with adverse clinical outcomes. Although several prognostic biomarkers have been reported, early and accurate prognosis still remains a challenge.
Aims: This study was aimed to identify the best prognostic renal markers, to develop and validate an individualized predictive formula for the mortality risk in type 2 cardiorenal patients.
Methods: A total of 170 hospitalized patients (between 2014 and 2018) were included in this study. Renal function and glomerular filtration rate (GFR) was assessed using the most popular formulas for GFR estimation: the Cockcroft-Gault (CG), the four-variable Simplified Modification of Diet in Renal Disease (sMDRD), CKD-Epidemiology Collaboration (CKD-EPI) based on serum cystatin-C, creatinine and their combination, and the simple cystatin-C formula. All data were used to screen the predictors via univariate and multivariate analyses. A model was developed based on these predictors and validated by internal validation. The model validation comprised discriminative ability determined by the area under the curve (AUC) of receiver operating characteristic (ROC) curve and the predictive accuracy by calibration plots.
Results: During a mean follow-up of 6 months, 29 (16.2%) deaths were recorded. In an adjusted model, renal biomarkers and estimated glomerular filtration rate showed different prognostic value according to the area under the curve. Area under the ROC curve was 0.58 (95% CI:0.47–0.69, P=0.05) for serum creatinine, 0.67 (95% CI: 0.56–0.79, $P<0.05$) for serum cystatin-C; 0.76±0.05 (95% CI: 0.67–0.82, $P<0.01$) for CKD-EPI formula based on serum cystatin-C; 0.73±0.06 (95% CI: 0.65–0.79, $P<0.01$) for simple formula based on serum cystatin-C; 0.72±0.05 (95% CI: 0.64–0.79, $P<0.01$) for CKD-EPI formula based on serum cystatin-C and serum creatinine; 0.617±0.06 (95% CI: 0.53–0.69, $P<0.01$) for CKD-EPI formula based on serum creatinine; 0.615±0.06 (95% CI: 0.53–0.69, $P<0.01$) for sMDRD formula and 0.58±0.07 (95% CI: 0.53–0.69, $P<0.01$) for CG formula. Multivariate logistic regression revealed that cardiovascular disease length, psycho-emotional stress, NYHA class, hemoglobin, serum cystatin-C and GFR using the simple cystatin-C formula were independently associated with mortality in type 2 cardorenal syndrome. A model developed based on the seven variables had a specificity of 79.31%, and sensitivity 78.72% ($P<0.01$), while AUC was 0.792 ($P<0.01$), in internal validation.
Conclusion: GFR is an independent predictor for short term mortality of type 2 cardiorenal syndrome. Cystatin-C based formulas seems to offer improved prognostication in this population, while CG formula and serum creatinine fail to predict short term mortality The proposed model could predict the individualized mortality risk with good accuracy, high discrimination, and potential clinical applicability in cardiorenal patients.