Validation of a prognostic model for adverse events in advanced chronic kidney disease in the Chinese population

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Background and Aims: Currently, the Grams model has been developed to estimate risks of adverse events among advanced chronic kidney disease (CKD) patients in western populations. Its utility is noteworthy as it predicts multiple adverse events within a single model while taking competing risks into account. While no external validation has been conducted among Asian, especially Chinese population, restricting further practical application and clinical benefits evaluation. Hence, we aimed to validate the performance of Grams model for estimating risks of major adverse events among Chinese CKD population.

Method: The Grams model was validated in the Chinese Cohort Study of Chronic Kidney Disease (C-STRIDE) study, a multicenter prospective cohort study which involved 39 renal departments of 39 hospitals from 28 cities of 22 provinces in China. Participants with estimated glomerular filtration rate (eGFR) < 30 ml/min/1.73 m² during baseline and follow-up were enrolled. The same predictors as those selected in the Gram model were considered, including age, sex, race, history of cardiovascular disease (CVD), smoking status, systolic blood pressure, diabetes mellitus, eGFR, and urine albumin-to-creatinine ratio (uACR). The outcomes included kidney replacement therapy (KRT), CVD and death within 2- and 4-year follow-up periods. The discrimination and calibration of the model were evaluated using the concordance index (C Index), the ratio of observed and expected outcomes (O/E ratio), and the calibration curve. The clinical utility of the model was assessed through decision curve analysis. Intercept recalibration was used to update the model.

Results: Among 1333 included participants (54 (IQR, 43-64) years, 699 (52.4%) male), 386 (29.0%) developed KRT, 118 (8.9%) developed CVD, 88 (6.6%) died during the follow-up period. The Grams model showed a moderate to good discrimination for three outcomes, with the C index ranging from 0.656 to 0.720. According to the O/E ratios and calibration curves, the calibration for KRT was relatively accurate, but the model overestimated the predicted probability of CVD and death. Intercept recalibration led to closer alignment of observed and predicted risks. Decision curve analyses revealed the superior net benefit of the Grams model in guiding KRT preparation.

Conclusion: In summary, the Grams model exhibited moderate discrimination for predicting outcomes, with relatively accurate calibration for KRT but an overestimation of predicted probabilities for CVD and death, intercept recalibration improved the calibration of the model. Despite its limitations, the model offered a superior net benefit in guiding KRT preparation, suggesting its potential use in clinical decision-making process. Further investigations are warranted to improve the performance of the Grams model in Chinese population.