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The CamGFR model for renal function in patients with cancer: Validation and extension for use with data from isotope mass dilution spectrometry creatinine assays

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Abstract

Background

Estimation of renal function using glomerular filtration rate (GFR) is important for the management of patients with cancer and is often performed using serum creatinine measurements. These are increasingly determined using isotope dilution mass spectrometry (IDMS) assays. We present validation of the CamGFR model that we developed originally with non-IDMS data (JCO, 2017) and a validated extension using IDMS creatinine data.

Method

The study was approved by the relevant ethics committees. Data on age, sex, height, weight, serum creatinine, and results for GFR from ^{51}Cr-EDTA excretion measurements were obtained from adult patients with cancer from one Swedish and two UK centres. Data were split 4:1 into development and validation datasets. For IDMS data, we refitted the CamGFR model using interaction terms between all creatinine terms and the creatinine measurement type. We assessed bias, accuracy, and precision for GFR using median residuals, root-mean-squared-error (RMSE), and residual interquartile range (IQR). A comparison of carboplatin dosing accuracy based on an absolute percentage error more than 20% (APE > 20%) was undertaken.

Results

Data from 6200 patients were obtained, 1913 of these contained IDMS creatinine data. The CamGFR model was the most accurate (RMSE 15.1, 95% CI 14.4 to 15.8) and least biased (median residual 0.85, 95% CI 0.01 to 1.64) model for estimating GFR compared with all other published models for IDMS creatinine data. Body surface area (BSA) adjusted CKD-EPI was the second most accurate model (RMSE 17.0, 95% CI 16.2 to 17.8). Importantly, the CamGFR model reduced the fraction of patients with a carboplatin dose APE >20% to 0.150 (95% CI 0.131 to 0.170) from 0.190 (95% CI, 0.168 to 0.213) for the BSA CKD-EPI.

Conclusion

The CamGFR model represents a better standard for estimation of GFR in patients with cancer, in particular when using IDMS creatinine data.

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