Consistent Methods for Fat Free Mass, Creatinine Production Rate, Creatinine Clearance and Glomerular Filtration Rate for Description of Renal Function from Neonates to Adults

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Abstract

Aim: Renal function is an important covariate to describe variability in clearance of renally eliminated drugs. Estimating glomerular filtration rate (GFR) should account for differences in size, age and body composition consistently when using GFR to determine drug dosage. We aimed to develop a continuous model for renal function from prematurity to adulthood based on models for fat free mass (FFM), creatinine production rate (CPR) and GFR. **Methods:** A model for fractional FFM in premature neonates to adults was developed using pooled data from 4462 subjects and 2847 FFM observations. Data from 108 subjects with measurements of serum creatinine and GFR were used to construct a model for CPR by assuming that CL_{cr} is equal to GFR. A previously published model for human GFR was updated using the model for fractional FFM and accounting for the effects of maturation and birth. Together these models were used to predict renal function. **Results:** Girls have a FFM larger than that predicted from adult women based on height, weight and sex. Boys have a FFM lower than adult men predicted FFM until around the onset of puberty, when it approaches adult values. CPR can be predicted using FFM, post menstrual age and sex and avoids discontinuous predictions between neonates, children and adults. The updated model for GFR maturation was used to describe expected normal GFR. Renal function calculated from the ratio of individual CL_{cr} to normal GFR. **Conclusion:** Continuous models for FFM, CPR and GFR predict renal function independent of age and size.

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