

Estimating renal function for patients in wheelchairs

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After listening to the podcast and reading the article about drug dosing in chronic kidney disease,¹ I am still perplexed about the best way to estimate renal function (for drug-dosing purposes) for patients in wheelchairs. I have asked many colleagues without success.

I do many group home visits where the majority of patients are in wheelchairs and fed by PEG (percutaneous endoscopic gastrostomy), hence my question.

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Darren Roberts, one of the authors of the article, comments:



The clinical issue raised here relates to disuse atrophy of the muscles which results in decreased creatinine production. It is therefore anticipated that a patient in a wheelchair with significant chronic kidney disease may have a serum creatinine concentration that is in the reference range. This means that routine laboratory reporting of the estimated glomerular filtration rate (eGFR) will incorrectly indicate that the patient has a 'normal' GFR.

Although there are limited data regarding this patient group, published studies have confirmed this hypothesis, and the limitations of simple approaches based on the serum creatinine concentration and either eGFR or estimated creatinine clearance (eCrCl). Both the eGFR^{1,2,3} and eCrCl^{1,3,4,5} commonly overestimated CrCl as measured on a 24-hour urine collection^{1,2,4,5} or measured GFR (mGFR).^{3,4} The actual CrCl measured on a 24-hour urine collection was approximately

70–80% lower than estimates using eGFR or eCrCl in two studies,^{1,5} and even lower in patients who were quadriplegic.⁵ In another study, the 24-hour urinary CrCl was on average 17 mL/minute higher than the corresponding mGFR.³

A few studies indicate that of the approaches which use a single blood sample, cystatin C-based methods are superior to creatinine-based methods.^{4,6} However, these are not widely available.

Taken together, eGFR and eCrCl are more likely to be inaccurate in patients in wheelchairs, but interpatient variability precludes an adjustment factor being applied universally. Until more information is available, including data confirming the accuracy of cystatin C-based approaches, a CrCl based on 24-hour urine collection may be the simplest option, particularly in those with an indwelling urinary catheter. However, since this may also overestimate the actual GFR, then an mGFR should be considered if clinically indicated. Therapeutic drug monitoring should also be used when appropriate.

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