Updated formula measures kidney function more accurately

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Measuring kidney function in children can be expensive, time-consuming for clinicians, and tedious for children, who may be exposed to radioactivity and subjected to a large number of blood draws. A new calculation eliminates many of these obstacles, relying instead on various blood tests that can be performed in a clinical setting to offer an accurate estimate of a child's kidney function.

This new estimate formula, developed from a study that will appear in the *Journal of the American Society of Nephrology* in March, could prove a valuable tool for adjusting fluids, antibiotics and chemotherapy and more accurately assessing kidney function in children battling chronic kidney disease (CKD). This formula can be used to estimate glomerular filtration rate (GFR) - the rate at which fluid is filtered through the kidneys - quickly and without infusing any synthetic substances. It was developed from a multi-site NIH-funded study for which the University of Rochester serves as the central biochemistry laboratory.

"Most other formulas used to estimate kidney function in children with CKD are singular to their institutions or hospitals. In addition, most clinicians are unaware of what biochemical analyses are being used by their institutions to measure waste products excreted by the kidney, such as creatinine and blood urea nitrogen (BUN), and different analyses would yield different estimate formulas," said George J. Schwartz, M.D., chief of Pediatric Nephrology at the University of Rochester Medical Center's Golisano Children's Hospital at Strong and director of University of Rochester's biochemistry lab. "An accurate estimate is

crucial to properly treat children with acute and chronic kidney problems and the scale of this study makes its findings quite significant."

The study included 349 patients from more than 50 institutions across North America and was based on data collected by the CKiD Study, which was funded by the National Institute of Diabetes and Digestive and Kidney Diseases, part of the National Institutes of Health. Schwartz is a principal investigator in the Chronic Kidney Disease in Children (CKiD) Cohort Study.

The new GFR formula generated by the study is based on height and gender, serum creatinine and BUN, and cystatin C - a ubiquitous protein that is well-correlated with kidney function. These factors can be quickly and easily measured in a clinical setting without the need for radioactivity or urine collection.

"Clinicians can easily specify the gender and height of a child during a regular clinical visit. A basic chemistry panel on a very small sample of blood will determine the level of serum creatinine and BUN, while a slightly more complicated method of collection will yield the cystatin C result. These five variables can effectively assess how well a child's kidney functions," said Schwartz. In addition, the study developed a quick bedside calculation that offers a good approximation of the GFR formula from the child's height in centimeters, serum creatinine level and a constant that relates this estimate to the measured level of GFR.

The new Schwartz formula uses an updated method of measuring creatinine. The enzymatic analysis can measure creatinine much more accurately than the older Jaffe method, which utilized a less specific color change. The Jaffe method was used in an earlier estimated GFR formula that Schwartz developed in the mid-1970s.

The study focused on finding a more precise GFR estimate formula for

children with CKD because chronic kidney disease does not go away and tends to worsen over time, eventually resulting in kidney failure.

"Because children with CKD are more in danger of progressing to kidney failure than children with normal kidney function, we decided it was imperative to find an accurate estimate of GFR for children with CKD before studying other populations," said Schwartz.. "It will also be important to determine if such a formula will apply to children and infants with higher levels of kidney function, so that any harm that might come from antibiotics, chemotherapeutic drugs and dehydration can be minimized in these populations as well."

Source: University of Rochester Medical Center