



**Article:**

Ridwan B Ibrahim, Poyyapakkam Srivaths, Estella Tam, and Sridevi Devaraj.  
*Utility of Cystatin C-based Equation for the Estimation of Glomerular Filtration Rate in a Pediatric Population.*

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**Guest:** Dr. Sridevi Devaraj from Texas Children’s Hospital and Pavilion for Women and Baylor College of Medicine in Houston, Texas.

Randye Kaye:

Hello and welcome to this edition of *JALM* Talk from *The Journal of Applied Laboratory Medicine*, a publication of the Association for Diagnostics & Laboratory Medicine. I’m your host, Randye Kaye. In pediatric medicine, the estimated glomerular filtration rate, or eGFR, is essential for assessing kidney function and for detecting and monitoring chronic kidney disease. Several eGFR equations are recommended that are tailored for children, addressing the complexities of growth and development that impact renal function. However, ongoing efforts are focused on developing more precise eGFR equations to improve diagnostic accuracy, guide clinical decision-making, and enhance overall management of kidney health in pediatric populations.

The July 2024 issue of *JALM* features a focused report describing the evaluation of the chronic kidney disease in children under 25, CKiD U25, equations, one with creatinine and another with cystatin C relative to older but still commonly used pediatric eGFR equations. The study compared the performance of these equations relative to directly measured GFR in a cohort of 57 children and young adults, ages six months to 22 years.

Today, we’re joined by the corresponding author of this article, Dr. Sridevi Devaraj. Dr. Devaraj is the Medical Director for Clinical Chemistry, Mass Spectrometry, and Point of Care Technology at Texas Children’s Hospital and Pavilion for Women, and she is a Professor of Pathology and Immunology, and the Director of the Clinical Chemistry Fellowship at Baylor College of Medicine. Welcome, Dr. Devaraj.

Over the past couple of years, we’ve heard a lot about the recommendations for the race-free CKD-EPI 2021 estimated glomerular filtration rate equations, which are intended for adults. But which eGFR equation or equations are currently used for children and what are their limitations?

Sridevi Devaraj:

You know, eGFR calculations is something that is a problem for many institutions because there are so many equations that are available. For pediatrics, one of the most common ones that is used is the Bedside Schwartz equation. But in

recent years, there have been other equations that have been proposed to be slightly better than the Bedside Schwartz equation and one is the creatinine cystatin C-based CKiD equation and, more recently, they have an equation that could go up to 25 years, so pediatrics and some of the adults, and since pediatrics are transitioning now to better care as adults in the renal population, it's important to note that this equation may be gaining further ground and that is the CKiD U25 equation.

Now, you asked about limitations of these equations that are currently being used. So, the first one, let me talk about the Schwartz equation. So, you have a creatinine-based Schwartz equation which can be used, but the problem is that, in the equation, you use the height and not always is the most recent height documented in the electronic medical record. So, that is a problem. With regards to the CKD-EPI formula that you were talking and that you asked about, it is age dependent. So, if you're switching for example from the CKiD to the CKD-EPI, you can have problems with a false increase in renal function. Now, that are cystatin C-based equations that are better, but the problem is that not every lab offers cystatin C measurement, just like all labs pretty much offer creatinine measurements, but not all labs have instruments that can measure cystatin C. And also, they're really useful. The cystatin C measurements are useful because they can be used in special cases where patients have reduced muscle mass, which affects the creatinine measurements, but the problem again is that not all labs have standardized cystatin measurements. So, if you have an assay on an instrument that is also standardized to the international standard, I'm talking about for cystatin C, that's the best.

Randye Kaye: All right. Thank you. Well, you've already spelled out a few of the advantages and disadvantages but let's dive a little deeper. Your study evaluated the performance of the CKiD U25 equations relative to other commonly used pediatric equations. And then, you specifically compare these equations to the measured GFR, which is considered as the gold standard. Would you like to add anything to summarize your key findings?

Sridevi Devaraj: Yes. So, this is a follow-up study to a study that we had published earlier, I think about a couple of years back, where we looked at more than 170 patients, that pediatric patients. So, this one, the addition of this study to that is that we evaluated the performance of the CKiD U25 cystatin C equation in the pediatric patient. So, amongst all of those equations that we have talked about in our study in this paper, we showed that the CKiD U25 cystatin C compared to the measured GFR, which is the gold standard so far, we showed that it had the best correlation, or the best

performance. We also looked to see if there were any, you know, across all of the groups that was summoned. We were not able to say that it is better in a particular group like non-Hispanic Whites versus Hispanic Whites versus non-Hispanic Blacks versus Asian. These were the four ethnic race groups that we studied and, amongst all of the other equations, the Bedside Schwartz was really good with cystatin C, but the best one was the CKiD U25.

**Randye Kaye:** Okay. So, the CKiD U25 cystatin C equation had the best overall performance compared to mGFR which you've just said. So, how do you think that adopting this particular equation will impact the overall care and management of pediatric patients who have kidney disease?

**Sridevi Devaraj:** Yeah, that's a very good equation. As you are aware that the kidney disease is actually a continuum, which means that if you are able to pick it up at early stages, then it is better in terms of prevention and in terms of treatment strategies, right? So, while we showed that both the CKiD U25 cystatin C and the Schwartz cystatin C with a better estimation, the CKiD U25 cystatin C is really good in terms of its performance, and it correlated really well to the measured GFR and, for pediatrics, getting to measure the GFR is a Herculean task. And so, you know, such equations will provide probably not only a good indication of those patients that can be picked up earlier, pediatric patients with kidney disease, I think that picking them up earlier will also result in better management. What we as laboratorians need to do, however, is to make sure that we have cystatin C that is standardized to the international standard.

**Randye Kaye:** All right. Thank you. So, there are challenges. Finally, you know, what other challenges do you foresee in implementing the CKiD U25 cystatin C equation in pediatrics clinical practice and what can people do to address the challenges?

**Sridevi Devaraj:** I think this is obviously a small study that we've done, and I do think that we need to look at it in much larger populations to confirm our findings. The only thing is that for labs that are adopting this equation, one is I told you that we have to standardize the cystatin C. It has to be available 24/7. The third thing is that the equation is for the U25. Is eGFR is equal to  $K$ , which is a constant factor  $\times 1$  divided by cystatin C, and the  $K$  is different for males versus females, and it's different across three different age groups. So, that means that you need a good LIS, or Lab Information System, and people that know how to calculate these appropriately because we do not want manual calculations. We want calculations that are automatic once your cystatin C is measured.

Randye Kaye: All right. Thank you. Well, thank you so much for joining us today.

Sridevi Devaraj: Thank you.

Randye Kaye: That was Dr. Sridevi Devaraj from Texas Children's Hospital describing the *JALM* article, "Utility of Cystatin C-Based Equation for the Estimation of Glomerular Filtration Rate in a Pediatric Population." Thanks for tuning in to this episode of *JALM* Talk. See you next time and don't forget to submit something for us to talk about.