

PEDIAPOD MARCH 2021 TRANSCRIPT

Geoff Marsh

Hello and welcome back to PediaPod for March 2021. This month we discuss the impact of integrated clinical decision support systems in the management of pediatric acute kidney injury.

Acute kidney injury causes significant morbidity and mortality in children, including prolonged hospital stays, increased risk of in-hospital death and future risk of hypertension and progression to chronic kidney disease. Whilst it's quite common, it often goes unrecognized, especially outside of the critical care setting.

In this episode, I spoke to Dr. Shina Menon, a pediatric nephrologist at Seattle's Children's Hospital who performed a pilot study which evaluated the utility of an e-alert system to alert care providers that a patient had acute kidney injury in conjunction with a care bundle which offered simple guidelines to help with their management.

Shina is also this month's highlighted early career investigator and she joined me over Zoom to tell me a bit about her career as a nephrologist and how this pilot study played out.

Dr. Shina Menon

I grew up in India and I did my initial medical school training there. After that, I started working as a clinical researcher in pediatric nephrology at the All India Institute of Medical Sciences. That was kind of where I got interested in nephrology per se. Following that research period, I came to the United States to pursue my training. I did residency and fellowship in Detroit. I attended a second fellowship in acute care nephrology in Cincinnati, and I've been working at Seattle Children's Hospital since 2017. My research interest is acute kidney injury and critical care nephrology.

Geoff Marsh

Okay, so that sounds like a good place to start, Shina. Could you give us a description of what acute kidney injury is, what does it look like when it presents itself?

Dr. Shina Menon

So acute kidney injury is when the kidney function drops fairly rapidly over a short period of time. It might not often have any specific symptoms but it can lead to a wide variety of downstream effects. When the kidneys are not working so well, patients may not be able to get rid of all the toxins that the kidneys are supposed to get rid of. They start accumulating these wastes, and they might have complications from that, whether it's urea or potassium, or any of the other electrolytes can be abnormal. It can also result in fluid overload in the body. So the kidneys make urine and they regulate volume in the body so when the kidneys are not working, the body tends to retain fluid and patients may have fluid overload, which can present as fluid in the lungs or in other parts of the body and cause complications. So by itself, acute kidney injury might not cause any direct symptoms, but it does have a lot of downstream effects.

Geoff Marsh

And you mentioned that you've come across this a lot in your work in critical care. Presumably, that's where you find a lot of this, in the pediatric intensive care unit.

Dr. Shina Menon

That's the most common location where we find acute kidney injury, but it does happen outside the ICU as well. My research actually focuses on acute kidney injury outside the ICU. What happens is in the ICU people are more vigilant about acute kidney injury and AKI is more severe so it tends to get recognized more frequently, and it tends to get acted upon. Outside the ICU people are not as careful or they're not thinking about it so much so it often gets overlooked and that was kind of what my research focused on,

Geoff Marsh

So why is it that it can go unnoticed outside of the critical care setting? Is it particularly hard to spot?

Dr. Shina Menon

It is in some ways. So the way we recognize it is based on a blood test using creatinine, which is a common marker of kidney function. Adults have a fairly standard range of creatinine. Their normal levels are well established, but for children that normal creatinine varies as they get older and for acute kidney injury, you need to have a 50% rise in creatinine and so point two to point three could be considered abnormal. So that's a very subtle difference and that might go unnoticed, or it might go from point two to point four and somebody might still think that point four looks fairly normal. They might not recognize that point four is actually double of what that child's creatinine should be.

Geoff Marsh

So it's not just that outside of the ICU creatinine levels aren't being measured, it's that, perhaps even if they are being measured, people aren't aware of those consensus baselines?

Dr. Shina Menon

Definitely one problem is that people aren't recognizing those changes from the baseline, but the other problem is also, as you pointed out, that it is not being measured as often as it should be. Studies have shown that outside the ICU patients might not get more than one creatinine [measurement] during their entire hospital stay. If you have only one creatinine [measurement] then you don't know how different it is from your baseline.

Geoff Marsh

So in broad terms, you're hoping to improve the detection and management of AKI, and as part of that you've been using these clinical decision support systems. Can you tell us what that is, and what sort of precedent that has in this field.

Dr. Shina Menon

Clinical decision support systems are a group of tools. They can include things like electronic alerts. They can include care bundles. There can be automated decision making systems. It kind of started with the NHS. They realized that acute kidney injury was a really big problem which was going undetected. Patients were not being managed appropriately so the NHS led a charge whereby all the hospital systems within the NHS - they have electronic alerts for acute kidney injury. So given that the definition of AKI is so precise - it varies from baseline, so if you have a 50% rise of creatinine from your baseline, that's considered acute kidney injury. So that's a very precise definition which can be programmed into our electronic health record systems and providers can get an automated alert when somebody has acute kidney injury. So even if they don't recognize that the change from, say, point three creatinine to point five creatinine is abnormal, they might get a notification on their computer screen when they open a patient's chart that this patient has acute kidney injury, you need to do something about it. Just recognizing is not enough or just telling a physician that their patient has acute kidney injury is not enough. We probably also need to tell them what to do about those patients. What kind of interventions need to be done.

Geoff Marsh

And so this paper that we're talking about today is you basically testing whether those e-alerts in conjunction with this sort of care bundle actually improved the detection of AKI and the renal outcomes for the children in non-ICU inpatients at your Seattle Children's Hospital.

Dr. Shina Menon

Yes. We had these electronic alerts which were sent out as pages. The physician taking care of a patient would get a page telling them that their patient had acute kidney injury and that they should follow the care bundle. The care bundle was called 'A E I O U'.

Geoff Marsh

That's a catchy initialism!

Dr. Shina Menon

It is! 'A' is for 'assess cause of AKI', 'E' - 'evaluate drug doses', 'I' for 'intake output charting', 'o' is for 'optimize volume status - ensure that your patient is euvolemic or restrict fluids if they are oliguric, and 'U' is for doing a 'urine' dipstick.

Geoff Marsh

Okay, so your primary outcomes were essentially about disease progression and if you made a difference with this setup, and you had a load of secondary outcomes as well. Tell us what you found.

Dr. Shina Menon

We did not see a big difference in our primary outcome measures - both our outcomes, whether it was AKI progression, or improvement in the stage of AKI - they were roughly similar across all three

phases. Where we did see a significant difference was in terms of all the process measures. Documentation of AKI was much improved once we started sending out the alerts. Patients had intake output charting that was ordered, their fluid management was better. If they were receiving nephrotoxic medications, those were stopped at a higher frequency when providers were given an alert about AKI. So all of those interventions that we recommended for AKI, there was an improvement in those. However, we did not see a change in the outcome of AKI, per se.

Geoff Marsh

Does that make you think that these e-alerts and care bundles just aren't effective or do you think that there's another reason for that not reaching statistical significance?

Dr. Shina Menon

We did see a slight trend towards decrease in the stage of AKI after onset of AKI. So it is possible that had we done a larger study or included multiple centers, we might have seen a significantly positive primary outcome. However, recognition of AKI and all these interventions for AKI are still fairly significant because these patients did have a slightly better creatinine at the time of discharge, they had established follow up at a higher rate after discharge, so the patients themselves are more aware of acute kidney injury. Those who've had acute kidney injury are at higher risk of having more episodes, so the fact that this gets documented - that means that next time they come to the hospital, somebody is going to keep that in mind, that this patient has already had one episode of AKI so we just need to be a little bit more careful during this admission. So that was a positive outcome.

Geoff Marsh

What do you take away from these results? There were all those positive secondary outcomes...do you think that this should be rolled out or do you want to do a bigger study? Where are you going now?

Dr. Shina Menon

There were all these positive secondary outcomes and we plan to implement some changes based on what we learned from this study and roll this out at a larger scale in our hospital. I know that a few other nephrologists have started working on something similar and other children's hospitals as well, so I'm hoping this will have more widespread use in the future.

Geoff Marsh

That was Dr. Shina Menon from Seattle Children's Hospital. And that's it for this episode. Please join us again next month. I'm Geoff Marsh and thanks for listening.