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Personalized Care for AKI – The Role of Digital Decision Support Tools and Augmented Human Intelligence to Improve Outcomes in AKI

Announcer:

Welcome to *KDIGO: Conversations in Nephrology*. This episode titled, "Personalized Care for AKI: The Role of Digital Decision Support Tools and Augmented Human Intelligence to Improve Outcomes in AKI," is provided by KDIGO and supported by Baxter Healthcare.

Here's your host, Dr. Kathleen Liu.

Dr. Liu:

Hello and welcome to KDIGO Conversations in Nephrology. I'm Dr. Kathleen Liu, Professor of Medicine and Anesthesia in the Divisions of Nephrology and Critical Care Medicine at the University of California, San Francisco. Joining me to discuss Personalized Care for AKI – The Role of Digital Decision Support Tools and Augmented Human Intelligence to Improve Outcomes in AKI – is Dr. Kianoush Kashani. Dr. Kashani is a nephrologist and intensivist at the Mayo Clinic, where he is also Professor of Medicine, Assistant Professor of Medical Education, Chair of Nephrology ICU Committee and Digital Health Committees in the Division of Nephrology. His clinical and research interests include acute kidney injury and critical care nephrology, along with digital health. Dr. Kashani, welcome to the program.

Dr. Kashani:

Thank you very much, Professor Liu. It is a great delight and honor to be here.

Dr. Liu:

Great. So, diving right in, Dr. Kashani, we've all heard about digital health and decision support tools, but can you tell us what these terms mean?

Dr. Kashani:

Of course. So, as you are very well aware recently has been huge hype about the implementation of higher level of electronic health records in clinical care, and clinical decision support is one of the aspects of that. Clinical decision support basically means that there are, under the hood tools like the artificial intelligence or machine learning, that classify data in a way that we can make decisions easier or more accurate or more timely. They classify data for data that is currently really huge to smaller package or classes that we can use in order to make timely decisions. Clinical decision support is only one aspect of a larger group of tools that we may have available soon in our disposal under umbrella of digital health. And digital health clinical decision support is obviously one of them, but there are other aspects. We have a lot of centers now using telehealth, in order to provide help for outreach hospitals, outreach clinics, or even homes – patients. We have remote patient monitoring care in our institution that we follow patients after acute kidney injury. There are other tools that now are available, including mobile devices that can help us to assess our weights, our vital signs, and amount of calorie or medication that we take. We have sensors that we can gather data about how patients are doing overall from heart rate and oxygenation all the way to proteinuria. We potentially may have these therapeutics in order to, for example, adjust diuretic dose on a patient that just was discharged from the hospital with heart failure. So there are multiple aspects that can be used – not only inpatient, but also in outpatient clinics, and also in patients' homes and communities.

Dr. Liu:

Great. Can you share with us why you think personalized care for AKI is important?

Dr. Kashani:

Of course. So, as you know acute kidney injury is really heterogeneous. There is no patient that is singular to other patients. They all have different backgrounds as far as comorbid conditions and the severity of those comorbid conditions. They come in with different exposures to procedures or surgeries or sepsis or medications that can lead to different levels of acute kidney injury or different etiologies of acute kidney injury. Indeed, the severity of exposure and the background that they may have defines how outcome of these patients would shape. Patients who have a chronic kidney disease, for example they can get acute kidney injury very easily with smaller exposures. However, young individuals with no past medical history – you really need to have very severe injury, and in order to manage these patients, it is really important to understand the background of each patient with acute kidney injury, in order to individualize care. In addition, timing of development of acute kidney injury is very different. Sometimes it happens very early in hospitalization, or patients arrive with acute kidney injury. Sometimes it happens late. And knowing the timing, using predictive models or digital health, can help us in order to identify patients that may benefit from early establishment of preventive measures or preventive measures for acute kidney injury complications, as a matter of fact.

Dr. Liu:

Thank you. For those just tuning in, you're listening to the KDIGO podcast on Personalized Care for AKI – The Role of Digital Decision Support Tools and Augmented Human Intelligence to Improve Outcomes in AKI. I'm Dr. Kathleen Liu, and I'm speaking with Dr. Kianoush Kashani. Kianoush, can you describe how and where digital health can help clinicians?

Dr. Kashani:

For acute kidney injury, for example, which is a topic of our conversation we need to consider any syndrome, including acute kidney injury, as a continuum of events. There are ways that we can risk stratify patients, recognize the disease of interest, or tailor our responses to guide recovery of the disease. Not only in the hospital, in acute care setting, but also before that, in a community setting and also after acute care settings. For example, there are a lot of studies being done in order to develop and validate predictive models for acute kidney injury.

That is only one aspect of care. There are ways that we can identify patients with acute kidney injury. There are newer models with different techniques, including reinforcement learning, in order to prescribe the option that is associated with the best potential outcomes, and also kind of help patients recover. This requires thinking about acute kidney injury as a process, that goes through steps of being exposed to the risk, and also develop acute kidney injury and changing function, then injury is developed, then kidney completely fails, and some patients die, some patients recover, and each of these steps could potentially use some of the digital health tools of course. This is only one aspect of digital health overall. Where we are looking to impact of these devices on patient care, but a similar conversation could happen in changing health – at a healthcare system or population. We can try to screen patients using these tools at the community level, try to identify high risk patients, try even to identify patients who have acute kidney injury with adequate sensors, and try to avoid this development and help guide this recovery not only in the hospital but also in their homes. For example, we have a program we call remote patient monitoring. We give a patient the scale, a tablet, a blood pressure monitor, oxygen monitor. These are patients with acute kidney injury. And patients submit their data twice a day, that way, we see that they are gaining weight we can, we have a protocol that nurses ask patients to start taking a little more diuretics, and then if they lose weight too fast, they recommend to lower the diuretic dose. And these could be automatically done. In addition, they have protocols to escalate care to urgent care, emergency department, or nephrologists. So this way we have been able to keep patients out of hospital, rather than getting them readmitted to the hospital and get exposed to additional potentially injurious interventions.

Dr. Liu:

Thank you. That sounds like a great program. More specifically, how do you think digital health can help clinicians provide dialysis to their critically ill patients?

Dr. Kashani:

Of course. Dialysis is a very complex process. We identify patients that are at risk of complications, if don't get dialyzed. We prescribe dialysis, we monitor the outcome of dialysis, and we try to encourage recovery from dialysis – or liberation from dialysis. Each of these steps could use digital health. An example of this is the large volume of studies that are focused on prediction of intradialytic hypotension, which we all know is one of the factors that potentially delays recovery of acute kidney injury. If we know that a patient has a chance of hypotension about 30 minutes from now, we can change auto filtration rate, we can change vasopressure support if they are in ICU setting. We can implement preventive measures to avoid that. Not only that, digital health is able to provide options for clinicians automatically or semiautomatically, to adjust auto filtration rate to avoid that.

And this is also, kind of, growing literature that is trying to automate auto filtration rate in order to avoid hypotension that is predicted by the machine. And in clinical trial we recently did we noticed that there is a significant amount of more fluid removal with significant less episodes of hypotension as a result. In addition to that, just imagine that you have a patient with acute kidney injury. You know that

patient is going to have hyperkalemia, acidosis, volume overload within 24 hours. You have predictive models to do that. Then, decisions on initiation of dialysis would be different. Or earlier, or more appropriate. And the same for withholding dialysis. If you know your patient is going to recover from acute kidney injury within the next 48 hours, you may want to start diuretic challenge or stop dialysis a little earlier. So there are a lot of things that we can do with dialysis, and these are just examples that I mentioned. Again, we can risk stratify, recognize a problem; we can tailor responses and we can guide recovery of acute kidney injury throughout the dialysis process.

Dr. Liu:

Before we come to the end of our conversation, Dr. Kashani, are there any final takeaways you'd like to leave with our listeners?

Dr. Kashani:

Of course. I think that this is a very important part of our life that is going to be available in more and more institutions. A friend of mine was saying that while computers are not going to replace us, clinicians with digital health knowledge will replace clinicians without digital health knowledge. This is so important to think about how we can train the next generation of clinicians – who not only are able to use digital health in order to advance care for our patients, but also some of them who are capable enough to actually develop and validate and implement those. The other factor is that decision development on a topic is extremely important, and it's something that we cannot do it alone. It takes a village in order to do that. Collaboration with other investigators, clinicians collaboration with IT, data scientists, all the institutions that have capacity to develop sensors or validate sensors is necessary in order to get there. Research on the topic is extremely important. We obviously feel that these devices can improve care, but unless we have more solid evidence, it would be difficult to make a final judgment on that.

Dr. Liu:

That's a great way to round out our discussion today. I want to thank my guest, Dr. Kianoush Kashani, for joining me. Dr. Kashani, it was great having you on the podcast.

Dr. Kashani:

It was a great pleasure. Thank you very much.

Dr. Liu:

I'm Dr. Kathleen Liu. To access this and other episodes in our series, visit kdigo.org/podcasts. Thanks for listening.