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## Assessing AKI Risk: Best Practices for Biomarker Testing

### Announcer:

You're listening to *Clinician's Roundtable* on ReachMD, and this episode is sponsored by bioMérieux. Here's your host, Dr. Javed Butler.

### Dr. Butler:

This is *Clinician's Roundtable* on ReachMD, and I'm Dr. Javed Butler. Joining me to discuss how we can use biomarker testing to stratify a patient's risk of acute kidney injury is Dr. Jay Koyner. Not only is he a Professor of Medicine in the Section of Nephrology at the University of Chicago, but he's also the Medical Director of Inpatient Dialysis and the Director of ICU Nephrology at the University of Chicago. Dr. Koyner, welcome to the program.

### Dr. Koyner:

Thanks for having me, Dr. Butler. It's great to be here to be talking about AKI.

### Dr. Butler:

So let's get into some of the background for the topic. Can you tell me a little bit about how prevalent this issue of acute kidney injury is? How do you diagnose it? How does it impact patients? How does it impact the healthcare system as a whole? Just some general idea about the epidemiology of acute kidney injury.

### Dr. Koyner:

Acute kidney injury is a major healthcare problem. We define it by talking about either changes in serum creatinine or changes in urine output. So in patients who are in the hospital, either a rise in serum creatinine or drop in urine output. For the serum creatinine, it's over the course of several days; for the urine output, it's actually defined between 6 and 24 hours. In terms of how prevalent it is, that depends on where you are and what type of doctor that you are. I'm sure that most folks understand that in a place like the ICU, or the intensive care unit, acute kidney injury is a little bit more common than say, a general medicine or a general surgery ward. That said, when you look at the entirety of an inpatient population, we and others have published data that anywhere from 10 to 20 percent of the entire hospital will develop AKI with rates close to 30 to 40 percent, if not higher, in certain intensive care units.

In terms of the overall cost or the magnitude of the problem with regards to AKI, AKI is associated repeatedly with increased morbidity and mortality. And that's true regardless of where you are, although the magnitude of those effects are greater in places like intensive care units. Patients with acute kidney injury are more likely to be in the hospital for longer compared to matched or controlled patients who have the same comorbidities in the absence of AKI. And because of that, their care costs more. There's also excellent data that demonstrates that even after they're discharged from the hospital, folks with acute kidney injury are at greater risk for problems like chronic kidney disease as well as problems like congestive heart failure and that their outpatient costs are greater compared to other patients who don't have AKI. AKI is a staged problem. There are three stages of it, and all of the effects for all the things I just described get magnified as you progress from stage 1 to stage 2 to stage 3, which is the most severe form.

### Dr. Butler:

Can you stratify risk for the patients based on clinical characteristics or biomarkers? Can you sort of predict who's going to get into trouble?

### Dr. Koyner:

So yes, I think that depending on the clinical scenario that you're describing, there are a number of risk scores that are available. The easiest one to point to is there about four or five different commonly used risk scores for something like AKI after cardiac surgery or AKI

upon ICU admission. And you can use those risk scores. Some of them are a little bit cumbersome to calculate. The surgical ones sometimes get calculated before someone goes to the operating room.

There are a plethora of biomarkers out there that also will allow for risk prediction. Some of them include things like urine albumin or proteinuria, which we know serves as a marker for preexisting kidney disease. And so patients who have proteinuria or albuminuria are unfortunately generally at greater risk for developing acute kidney injury. But there are also a wide variety of more novel biomarkers that are out there, things that didn't exist 20 years ago when I was doing nephrology training that allow us to better identify patients who are going to develop AKI.

**Dr. Butler:**

So as a quick follow-up to that, what are some best practices for testing? For instance, how and when should we perform biomarker testing in our patients?

**Dr. Koyner:**

I think that that depends on the biomarker that you're measuring, right? So something like albuminuria, which is a risk factor in the preoperative setting for the development of postoperative AKI, that needs to be sent before someone goes for surgery. Some of the more novel biomarkers out there, whether it be TIMP-2, IFGBP7, proenkephalin, or NGAL, those are generally sent at the time of say, ICU arrival, whether after surgery or if you're arriving in a CCU or a medical intensive care unit or a neurointensive care unit. Those tests themselves have different indications. Some of them predict AKI risk in the setting of someone who doesn't have AKI, and some of them, like TIMP-2 and IGFBP7, have actually been approved for predicting the presence or the future presence of severe AKI.

**Dr. Butler:**

For those just tuning in, you are listening to *Clinician's Roundtable* on ReachMD. I am Dr. Javed Butler, and I'm speaking with Dr. Jay Koyner about biomarker-driven risk stratification in the management of acute kidney injury.

So now let's sort of turn our attention a little bit to the practice settings at large. What do you think are some of the challenges that clinicians might face in trying to incorporate these biomarkers into their workflow?

**Dr. Koyner:**

Who uses the biomarkers very much depends on who you are. And that, from my perspective as a nephrologist, I don't want to be the one telling someone to send a risk biomarker because I generally don't see people until they already have established AKI. And so I think part of the problem is that these are tools that we as nephrologists have worked to develop, but they're not necessarily tools that I'm going to be sending or ordering.

So when we at the University of Chicago have implemented TIMP-2 and IGFBP7, we did it in concert with our intensivists in saying, "Hey, these are patients who are at risk for AKI," whether it is that they have some of the same criteria that we talked about before, early AKI, or they're on pressors or they're on more than minimal vent settings and that they may be at risk and you should think about sending them. And I'll be honest with you, when we had those meetings about bringing in the biomarker, we got a lot of people saying, "Hey, I know how to take care of AKI patients, and I don't need this test." Who uses the test in the end is not the nephrologist, but you need nephrologists involved so that they can help educate and bring the intensivists or the surgeons or the cardiologists to the table to say, "Hey, this is a useful tool." We know that we develop patients who have AKI, and that even though people are trying to provide thoughtful AKI preventative care, it still happens. And I think that that's the role for some of these biomarkers is to bring together that group of people, whether it is surgeons, intensivists, cardiologists, and nephrologists, to say this is a tool that can help you provide better care.

**Dr. Butler:**

You mentioned that at your institution part of the process of implementation was to bring sort of different specialties together. Any other lessons learned through that implementation process that other people who are trying to incorporate biomarkers in their intensive care setting for acute kidney injury might learn from you in order to implement that?

**Dr. Koyner:**

I think that the other piece that becomes important when you're implementing a biomarker is there are a whole bunch of people in the lab who are interested in it, right? You need to engage the laboratory people, and then you also need to engage the administrators. Sometimes it's hard for people to see that there is a benefit to something that's going to cost more and have the implicit trust that it's going to make things better. But adopting a strategy that one size fits all is what got us here in the first place. By which I mean, one size creatinine doesn't fit all. So saying, "Hey, we're going to implement this biomarker, and we're going to use it the same way in the medical intensive care unit as we are in the cardiothoracic ICU" doesn't make sense. I do think that bringing all those parties to the table becomes the most important piece and making sure that they understand whether you're talking about the ICU or the lab or the

administrators, that there are all these pushes and pulls in terms of what we want. Because in the end, if the goal is to have less severe AKI or shorter lengths of stay, that's a win for everyone, right? I've yet to meet an intensivist or an administrator who doesn't want people in the hospital for shorter.

**Dr. Butler:**

Putting all this together, if you're able to do these biomarkers and if you're able to risk stratify the patient, what sort of impact are you looking for in terms of patient management and outcome?

**Dr. Koyner:**

I think that that very much depends on, again, who you are, right? And here I'll speak specifically to nephrologists. There are lots of nephrologists out there that probably don't know what their AKI event rates are, what percentage of their people develop stage 2 or require dialysis, or even things like if you do require dialysis in the hospital, what is your overall mortality rate in the hospital where you provide care? I think that part of the discussion here is about making people aware of that and having them beginning to think about understanding those metrics so that if you do implement a change, great; now you know which needles you're trying to move and how far you need to move them.

But I think that bringing everyone together and making sure that every voice is heard and that the test and the activity has a physician champion who's willing to say, "Hey, I know what we're trying to do here." And the majority of times that may be a nephrologist, but it actually doesn't always have to be. There are lots of capable cardiologists out there who know how to care for patients' kidneys. There are lots of capable intensivists too. I think that I would be remiss if I didn't say nephrology needs to be at the table, but everyone needs to be at the table. And that if it's done right, implementing these biomarkers leads to improved care.

**Dr. Butler:**

Well, given the integral role that renal biomarker testing plays in achieving better patient outcomes, I'd like to thank my guest, Dr. Jay Koyner, for sharing his insights on this important topic in acute kidney injury care. Dr. Koyner, it was great having you on the program.

**Dr. Koyner:**

Thank you. Thanks for having me, Dr. Butler. It's great to be talking about AKI.

**Announcer:**

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