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A New Lens on DKA: Leveraging the Latest Tech for Improved Patient Outcomes

Announcer:

Welcome to CME on ReachMD. This activity is the fifth in the series titled, "In the Range: Real Talk on Diabetes Monitoring Best Practices." This episode, titled "A New Lens on DKA: Leveraging the Latest Tech for Improved Patient Outcomes," is provided by Cornerstone Medical Education and AACME and supported by an educational grant from Abbott Diabetes Care. Since the recording of this activity, the 1st dual glucose-ketone sensor has been FDA approved in the US.

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Dr. Goldman:

Despite remarkable advances in diabetes management, diabetic ketoacidosis remains one of the most serious acute complications in diabetes. Although ketone monitoring is a cornerstone of DKA prevention, current approaches are largely intermittent and reactive. Emerging advances in continuous ketone monitoring have the potential to support earlier recognition of metabolic deterioration and reshape how clinicians think about DKA prevention.

This is CME on ReachMD. I'm Dr. Jennifer Goldman. Today I'm joined by Dr. Ketan Dhatariya, an internationally recognized expert in diabetic ketoacidosis and ketone metabolism and lead author of the recently published international consensus on continuous ketone monitoring. Professor Dhatariya, thank you for joining me today.

Dr. Dhatariya:

You're very welcome. Nice to be here.

Dr. Goldman:

Well, before we discuss emerging approaches to ketone monitoring, let's begin with a brief review of diabetic ketoacidosis and why it continues to represent such a significant clinical burden despite remarkable advances in diabetes management.

When many clinicians think about DKA, they think primarily of type 1 diabetes. While that remains true, we now recognize that DKA affects people across the diabetes spectrum. It remains the most common hyperglycemic emergency in people with diabetes and is associated with substantial morbidity, mortality, and healthcare utilization.

Although most cases occur in type 1 diabetes, approximately 1 in 5 DKA hospitalizations now occur in people with type 2 diabetes, where in fact mortality can actually be higher.

Unfortunately, the burden of DKA continues to grow. Long-term, real-world data presented this year showed that both the incidence and recurrence of DKA have increased over the past two decades, with a recent DKA episode emerging as the strongest predictor of another event. These findings reinforce that preventing recurrent DKA remains a major unmet need.

One important reason is that our current approach to ketone monitoring is largely reactive. Fewer than 20% of patients check ketones during sustained hyperglycemia, 38% never test when they are nauseated or vomiting, and 45% never test when they have a fever. So, in other words, many patients aren't monitoring ketones during the situations when they are at highest risk.

So, despite everything we've learned about DKA over the past decade, prevention remains a major challenge. That naturally raises the next question: Who should clinicians be thinking about as being at risk today? Professor Dhatariya, tell us a little more about who's at risk for DKA, including some new data just presented at the ADA.

Dr. Dhatariya:

Yeah, thanks, Jennifer. So, as you rightly said, the people who are most at risk are actually those people who have had a recent episode of DKA. So, if you've had one in the last 30 days, you're more at risk of developing another episode.

It's those people who have suboptimal glycemic control. So that's not just a high HbA1c, but it's those people whose glucose goes up and down for whatever reason. Those people who forget to take their insulin, deliberately omit their insulin. It's those people who have infections, and there's a lot of information to show that those people who develop infections are at highest risk.

Of course, those people using technology. Technology can always go wrong, as we all know. If your pump becomes disconnected, or your pump fails, or you don't renew, you don't fill up your reservoir, whatever, then you can develop DKA. It's those people who sometimes don't use technology for the same reason because their life kicks in and they forget to take their insulin. They use the wrong insulin. Something happens, they don't take it.

It's those people who are on SGLT2 inhibitors, and we know that people with type 2 diabetes can develop this condition called euglycemic DKA, where their glucose can be completely normal. So even below 200 mg/dL, 11 mmol/L, it can be completely normal.

We also know there's a whole group of individuals from certain ethnicities who can develop DKA. So there's this thing called ketosis-prone type 2 diabetes, which is predominantly in Afro-Caribbean origin people and Hispanics. We've known about this for about 20 or 30 years. There are a group of people who present when they become unwell for whatever reason. They just go quickly into ketosis and ketoacidosis, and when they recover, they go back to looking as if they've got type 2 diabetes.

So there are a whole bunch of people who are at increased risk of developing DKA who we really need to try and focus on because, as you said earlier on, they cost all health services an enormous amount of money and resource.

Just saying that people who are, for example, COVID. I mean, of course, that's gone away now. But those people who are at increased risk of infection, increased risk of developing DKA for whatever reason, earlier recognition of ketosis before it develops into ketoacidosis is absolutely key.

Before we get on to some of the newer technologies, in particular the thing that's coming around the corner, the continuous ketone monitoring, can I just ask you, from a practical standpoint, how should clinicians, how should patients be checking for ketones?

Dr. Goldman:

Today, clinicians have two primary options for outpatient ketone assessment: urine ketone testing and blood ketone testing.

So, urine test, that measures acetoacetate. It's inexpensive. It's widely available, but it reflects ketone production over time rather than a patient's current metabolic state.

So, blood testing measures beta-hydroxybutyrate, the predominant ketone body in DKA. So, providing a more accurate and timely assessment of ketosis using blood testing, but that's why blood beta-hydroxybutyrate has become the preferred method in these patients. But it's also important to remember that DKA is not diagnosed by ketones alone; it requires evidence of hyperglycemia, ketosis, and metabolic acidosis. So ketone values always need to be interpreted in the broader clinical context.

While both testing methods really remain essential, they provide only a single point-in-time assessment. So, they rely on patients recognizing symptoms, knowing when to test, having the supplies available, and understanding how to respond.

So, from a patient perspective, ketone testing remains underutilized, with many patients uncertain about when to test and what to do if ketones are elevated. And from the clinical perspective, testing is episodic rather than continuous, so often only occurring after symptoms develop, so limiting our ability to detect evolving metabolic deterioration.

So together, these limitations mean our current approach to DKA prevention remains largely reactive rather than proactive. So, current ketone monitoring remains an important component of diabetes care, but these practical limitations create an opportunity to identify ketosis earlier and potentially intervene before patients progress to DKA.

Dr. Dhatariya:

That's a good point. So, what do you think would be the benefits of continuous ketone monitoring?

Dr. Goldman:

So, having that availability, the way I look at it is we can prevent danger. So, instead of being reactive and allowing people to be so critically ill, we will have the opportunity to prevent that from happening. Very exciting.

For those just joining us, this is CME on ReachMD. I'm Dr. Jennifer Goldman, and today I'm speaking with Professor Ketan Dhatariya about the evolving role of continuous ketone monitoring in diabetes care.

So far, we've discussed the burden of diabetic ketoacidosis, who's at risk, and the limitations of current outpatient ketone monitoring. Now we'll turn our attention to the emerging evidence, recent technological advances, and the potential role of continuous ketone monitoring in DKA prevention.

Interest in ketone monitoring continuously has been driven by a growing body of evidence demonstrating both its feasibility and potential clinical value. One of the earliest proof-of-concept studies showed an excellent correlation between interstitial ketone measurements and venous beta-hydroxybutyrate, with a correlation coefficient of 0.96. Continuous ketone monitoring also identified DKA resolution about 55 minutes earlier than standard of care and was shown to be safe and well tolerated. So, although this is an early feasibility study, it really demonstrates that continuous ketone monitoring can accurately track changes in ketone concentrations and supported continued investigation of this technology.

Additional studies have continued to build on those findings. So, emerging physiologic data suggests that ketone concentrations may really begin rising before marked hyperglycemia develops, raising the possibility that continuous monitoring could identify metabolic deterioration earlier than the current approaches.

Patient surveys have also been encouraging. Most individuals expressed interest in continuous glucose and ketone monitoring while highlighting familiar barriers to current ketone testing, and that includes recognizing the symptoms, knowing when to test, access to supplies, the inconvenience of intermittent testing.

So, with this, Professor Dhatariya, you led the international expert panel that developed the first international consensus on continuous ketone monitoring. What prompted this group to come together? Why did you feel it was important to develop these recommendations before this technology becomes widely available?

Dr. Dhatariya:

But when we had continuous glucose monitoring, say 10 years ago, we had to have a lot of new information. When we first started using it, you just got numbers and you didn't know what to do with them. Now, 10 years down the line, we've got all these amazing metrics we can use, we can infer, we can calculate.

CKM is exactly the same as the beginning of CGM. We have no idea. We don't know what normal is. We don't know what happens in people who are otherwise healthy and living well. When does something physiological become pathological? How long do you have to have high ketones for? All of these questions remain unanswered.

So what we've tried to do is create that big text that toolbox that people can have. The moment they start using it, you know what to do because we won't have the data to know when do you need to intervene. We don't know that yet, so we've had to start somewhere.

Your question is a really good one because we get asked that all the time. Why have you done this? It's because we have to start somewhere, and that's what we've done. We've given the thresholds for what is normal, less than 0.6 mmol/L. When do people need to start thinking about it? So it's elevated, so 0.6 or above to 1.5 mmol/L. When it's high, so 1.5 to 3 mmol/L, where you need to start taking some action, you need to start taking some fluids, some carbohydrates, some insulin, doing what I would call in the UK, sick-day rules. Just doing something. And if it's above 3, which is urgent high, think about if the glucose is high, even if the glucose is low, but if you're feeling unwell, definitely going to seek some medical attention.

Dr. Goldman:

Exactly. So having this consensus before the widespread clinical implementation, kind of it really does speak to how significant this technology may become, and like you just pointed out, just the whole evolution of CGM, of what we were doing and what we know now. So very exciting. And rather than waiting for adoption to occur, these guidelines can provide clinicians with really practical advice, practical guidance, so they are prepared when a dual continuous glucose and ketone monitor technology actually enters the clinical practice. So really monumental information.

But Professor Dhatariya, now that the first dual glucose and ketone-sensing technology has been approved in Europe, how do you see this changing clinical practice? What should healthcare professionals in the United States be watching for as this field continues to evolve?

Dr. Dhatariya:

So I think what we need to get people are going to start using this device all over the world when it becomes available, and we need to be able to—the most important thing is that the entire healthcare team, anybody who has patient contact, needs to understand what the numbers mean because there'll be people—people are not familiar, certainly in the United States where people are not familiar with doing capillary ketone testing on a regular basis. Many parts of the world have those. I'm aware it's not available in the US very commonly.

But the question is, what do the numbers mean? When do I need to ask for help? And if the device changes color and it says seek help, and the arrows are, just like with CGM, going in the direction you don't want them to, they're going to be calling for help. And whoever's at the end of the phone, and it could be any member of the healthcare team that they're most familiar with. It doesn't have to be the doctors; it could be the nurses, the dietitians, anybody who they're in contact with, then then they need to understand what the numbers mean, when they should take some action, and what action they should take.

And that's what we've done within that consensus document is allowed them a single sheet of paper. Oh, what's your glucose? What are your ketones? Okay, you need to do this.

Dr. Goldman:

But I also like the point that you made about having the whole team be involved, so it's an exciting perspective. And as with every major advance in diabetes technology, successful implementation won't depend on technology alone; it depends on how we educate the patients and how the healthcare team works together to integrate it into clinical practice.

Dr. Dhatariya:

It was a team effort. It was a team effort. Thank you.

Dr. Goldman:

As we conclude today's discussion, one message stands out. Despite remarkable advances in diabetes care, DKA remains a significant clinical challenge. Emerging advances in continuous ketone monitoring, together with the first international consensus recommendations, are providing a framework for earlier recognition of metabolic deterioration and may help shape the future for DKA prevention. As the evidence continues to evolve, it's an exciting time for clinicians caring for people with diabetes.

Professor Dhatariya, thank you for joining me today and sharing your expertise on the consensus guideline that you and your whole team put together. It was a pleasure speaking with you.

Dr. Dhatariya:

Thank you, and thank you so much for asking me to be here.

Announcer:

Since the recording of this activity, the 1st dual glucose-ketone sensor has been FDA approved in the US. This activity was provided by Cornerstone Medical Education and AACME. To receive your free CME credit, be sure to complete the post-test and evaluation at CME on ReachMD.com. Thanks for listening.