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https://reachmd.com/programs/cme/patient-portal-technology-safety-clinical-decisions-diabetes/50984/

Released: 08/25/2026
Valid until: 08/25/2027
Time needed to complete: 15 minutes

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Patient Portal: Leveraging Technology to Improve Safety with Clinical Decision-Making for People with Diabetes

Announcer:
Welcome to CME on ReachMD. This activity is the sixth in the series titled, “In the Range: Real Talk on Diabetes Monitoring Best Practices.” This episode, titled “Patient Portal: Leveraging Technology to Improve Safety with Clinical Decision-Making for People with Diabetes,” 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. Dhatariya:
Continuous ketone monitoring has the potential to help us overcome many barriers to diabetic ketoacidosis, also known as DKA, and in particular in preventing DKA. And the recommendations and algorithms from various international experts and diabetes organizations all over the world have recently come out to try and help us use and implement these advances in new diabetes technologies. So I want to dig into some of that as we try and explore some of the better approaches to diabetes management than we have currently. And to help me do that, we have a special guest, Dr. Eden Miller.

This is CME on ReachMD, and I'm Professor Ketan Dhatariya. And joining me today to share these updates in DKA monitoring is one of my co-authors on the international consensus document on continuous ketone monitoring, Dr. Eden Miller. Dr. Miller, thanks very much indeed for being here today.

Dr. Miller:
Oh, thanks so much, and such a pleasure to talk with you. I am sure you're as excited as I am being a part of this international consensus and talking about something that is just almost magical for 2026 and 27.

Dr. Dhatariya:
Absolutely it is. Listen, I want to dig right into this. So let me ask you, tell me, how significant is the burden of DKA? And also where are the gaps in how we monitor ketones at the moment?

Dr. Miller:
Yeah, I think those are great questions to kind of tee off. DKA has been with us for a long time, and I think you would agree with me. It's kind of been in the shadows because we didn't know really what to do with it. We were usually on guard for the severe symptoms when it needed to be sent to the hospital for admission.

But let me tell you a bit. I think the burden is a little bit more than we realize. When we think of ketosis, we usually think of type 1 diabetes, but type 2 diabetes is not immune to it. on the overall burden level about 16% to 17% of those with type 1 diabetes will have at least one episode of DKA in their lifetime. A little over our percentage will do that with type 2 diabetes. But guess what? Ketosis is rising. We don't know exactly why. Whether some say it's viral. Some say it's medication. It's probably a cofactor-type of increase, but that incidence is going up in type 1 from 1% to 4%, and it's more than like four or five times that in type 2 diabetes.

The other thing too is if you had DKA once, you can get it again, and if you get it again, then you can get it a third time.

So the other day, I had a young kiddo who was on his third episode of DKA. It's quite hard. He has type 1. He's got some social determiners of health, but I sat the parents down and I said when we start to see reoccurrnt DKA, we start to see those comorbidities and mortalities increase. And I don't like to use fear ever to try and improve kind of attention, but it's one of those burdens that come with especially type 1 diabetes, and it's so unfortunate because it's so disruptive. It's not like a high sugar or a low sugar, and you can mitigate it pretty quickly or at home; it's one of those things that kind of slowly starts to progress, and oftentimes the symptoms go so unrecognized.

And we also have our colleagues who compartmentalize persons with diabetes based on, "Oh, these people will never get DKA." And that brings up even other groups of individuals with diabetes, such as type 2. We call them ketosis-prone. We know that those individuals can also have lack of insulin. They're kind of variants of type 2 diabetes where they don't make enough insulin for their metabolic needs.

And to go to your second question what are the gaps? Well, sometimes the gaps are because we don't know how to detect something until it's right on top of you, the beast of DKA. And so we kind of forgot it, or rather, we hoped it would never occur. And so I'm going to say this is both on the clinician side as well as the client side or the individual side. Less than 1/2 even test. Many didn't even know what a ketone is, or they don't have the resources, or the type of testing they're using is out of date or expired, or they just don't even have the resources.

I hate to say, if you were to ask the average clinician, what is an abnormal ketone level? What are the colors associated with urine? And then finally, if we go based on the current assessment, how we're monitoring ketones how we're looking at it, we have the urine that the vast majority of people use, but you're detecting acetoacetate, which is a byproduct of beta-hydroxybutyrate, which is the ketone body formed when we burn fat for energy. And so it's kind of like after the fact. It's not even point of care.

We do have capillary blood monitors. Just like glucose monitors, you can get the strips and test, and you can get an actual beta-hydroxybutyrate level with very good accuracy. But we also don't have individuals who know when to do ketone sensing, when to monitor it, and our lack of utilization and guidelines are very, very archaic.

Dr. Dhatariya:
Just remember that the main ketone in the blood is beta-hydroxybutyrate, and as it's resolving, it's converted into acetoacetate, which is what's in the urine. So that's why you were mentioning that, actually, if you measure urine ketones, it's a measure of what happened in the past, not what's happening now, and it's also, of course, an average of what happened since you last emptied your bladder. So there are differences between urine and ketones.

So now we've talked about all of those things. You know, where's the evidence? What evidence is there to say that actually we need this device? Or do people not test regularly? What's your take on that?

Dr. Miller:
Oh, it's abhorrent when you look at the amount of testing. I mean, the percentages are less than 1/3 of people even know what a ketone is, let alone routinely test. Almost 1/2 never test at all.

And they're also not as aware of the symptoms. Okay, so, one of the things I think we see the most is just very simplistic. When you look at rising ketones, there is kind of a lead-up to it, right, where you could have small to moderate ketones and feel absolutely fine, but not until the ketones get to what we call elevated or severe, where they start to affect your body's physiology. Because what you're doing—and just a simple reminder because we want everybody to be on the same page—is when you have a metabolic mismatch of the requirement of the energy that you need, and it's a relative deficiency of insulin, it doesn't have to be somebody who doesn't make insulin at all. It's a relative deficiency. It's kind of like gas mileage, right? And that's the key, is we don't know what everybody's insulin mileage is. And so, for whatever reason, they get a relative deficiency in their insulin, given a state of illness or medications or pregnancy or you name it. And so their body, because diabetes, I always say, is starvation in the land of plenty. On the cellular level, the cell is starving, right? We need energy, but all the energy is built up in the circulation, and so you're starving on a cellular level. But you have so much glucose, you can't get it to where you need because the key of insulin opens the door.

So imagine your body starts to burn fat for this energy, and when it burns fat, it throws off these ketone bodies. And as these ketone bodies build up, they change the pH. When we change the pH, and other counterregulatory hormones kick in because our body is trying to buffer it, then you start to feel symptoms. But even in that symptomatic state of nausea or confusion or that, we still get individuals who don't test, or they miss it, or they say that it is gastroenteritis and they have the flu.

And I did an interesting retrospective analysis looking at Medicare admissions that just got published at the ADA this year of individuals

who were admitted for gastroenteritis and GI issues and fever and all this, and they ended up having DKA. So the need is massive. But I also see that there might be a bit of reticence because of not understanding what continuous ketone monitoring will provide.

Dr. Dhatariya:
So I want to just pick you up on that then. So we think about this new device that's going to come through, and if it's showing a number that people don't know what to do with they're going to call up any healthcare professional that they're most familiar with. So there's an element of safety. There's an element of effectiveness.

Dr. Miller:
Where we're going to be able to monitor ketones, but you're not going to be alerted to them until they're high. So I use the analogy because at the ADA there was this debate, and some of the naysayers were like, "I don't want that much more information." And I said to the group, I said, "Who has an airbag in their car?" You know, everybody raises their hands. And I said, "Whose airbag has gone off?" And, you know, very few people did. And I said if your continuous ketone monitor goes off, you got a problem. You need to address it.

And so remember, this is going to be something that's going to be monitoring in the background, only reporting if there are elevated levels. Nothing small, nothing trace; moderate and above. It's going to be customizable if and when we get this ability. It's going to be something that, as the clinician, we can have those conversations. But don't despair, we in the groups have made educational resources, conversation pieces. Of course, those of us involved in the CKM initiative, we do not want this to be burdensome. We want it to be empowering. We want it to be clear. And I'll tell you, there's amazing step-by-step things that I don't think are going to cause distress, but rather empower the patient to monitor, mitigate, and manage their own disease.

Dr. Dhatariya:
For those just tuning in, you're listening to CME on ReachMD. I'm Professor Ketan Dhatariya, and today I'm speaking with Dr. Eden Miller about updates in DKA monitoring and how we can apply them in practice.

We spoke a bit earlier about the limitations of current strategies for ketone monitoring and the clinical potential of continuous ketone monitoring. Now, let's take a closer look at how this translates into real-world care.

Dr. Miller, you just mentioned that you were part of that international consensus document that I was also part of. You're also part of the ADA Continuous Ketone Management Algorithm. Where are the differences between the two documents?

Dr. Miller:
I love it. I'll be honest with you, a few of us said—and so appreciate working with you on that international paper—but a few of us who got the privilege of kind of being at all the different parties really wanted to try to make them pretty universally translatable.

It doesn't always have to be a high glucose. It can be what we call they call it euglycemic DKA, but I don't know what you feel about it. I call it lower-threshold DKA because euglycemia, yeah, I don't want to imply that the blood sugar is 100, but it's definitely lower than kind of that 300 that you and I in clinical practice learned.

And so there are differences with it. But we have, I would say, a consensus in terms of some of the awareness, the levels, the colors, the discussion, the treatment. There's a lot more agreement with it. But at the same time, we're kind of waiting for that very final piece.

Dr. Dhatariya:
So it sounds as though there's going to be a lot of education. It's going to be necessary for healthcare providers and the people using the device because, as you say, this is brand new. It's good to know that there is consensus on thresholds because that would have been really confusing otherwise.

Dr. Miller:
Even colors. We were like, keep the colors the same.

Dr. Dhatariya:
Absolutely. The thresholds, the colors, the device. When you see it on the devices that you use, you need to know what to do. And I think looking at both of the documents, much of the information and the education around the thresholds and the glucose and so on is really very consistent.

So I know we're coming to the end of the conversation, and I just wanted to ask you what kind of takeaways would you share with the clinicians and the people out there listening to this?

Dr. Miller:
I think the first thing is being ketone aware. Have ketone conversations. Go with us on a journey. I often say it's like we're on *Star Trek*; we're going where no clinicians have gone before. We're kind of in an area. We have a lot more to define. A lot of the resources that you

see are even currently in development, and we worked on them yesterday. And we have the mindset of being implementable in the provider setting, but actionable and understandable in the patient setting, the caregiver setting, the school-based setting. I mean, you name it, we're trying to do those resources. We're trying to make this easier.

The implementation of this has big economic ramifications from the complications, from empowering even people who are in early stages of type 1 to never even go into DKA as they present with diabetes. What a great psychological boost. I mean, yeah, you don't want a chronic disease, but let's not start it with an ICU admission, you know?

Dr. Dhatariya:
Your enthusiasm is just infectious. I think you're absolutely making the right point. I think we have to wait for the device to come out. We're going to learn how to use it, educate all of our colleagues, and then look to the future and see where we can use this in other disease conditions where ketones are definitely beneficial.

Listen, it's been a fantastic way to round off our discussion, and I want to really thank you so much, Dr. Eden Miller, for helping us better understand the updates and the role of continuous ketone monitoring in DKA monitoring, and of course other conditions in the future. Listen, it was fantastic talking to you, and thank you very much indeed.

Dr. Miller:
Thank you so much. So looking forward to it and having future discussions.

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.