RICHARD BERGENSTAL: I'd like to welcome you to our discussion today on sensor-based glucose monitoring in what we're calling the diabetes intelligence zone. And this is module 3 of a three-part module series. And I'm Dr. Richard Bergenstal, the Executive Director of the International Diabetes Center in Minneapolis, Minnesota.

You may remember that module 1 was about analyzing the ambulatory glucose profile and learning the core CGM metrics. Module 2, we delved into personalizing diabetes management, how to move from the A1C through the glucose management indicator over to the AGP in time in range for personalized management.

And now, in module 3, we're going to talk about how to act on all of that CGM data to optimize care. And I call this a balancing act. We're balancing real time and retrospective use of CGM. We're balancing time in range and time below range. We're balancing that all-important patient experience and clinical outcomes. So let's go and talk about the use of CGM.

First of all, let's get the right patients. Who is it, particularly in the type 2 diabetes world, that we should consider using CGM? I'll just say type 1 diabetes. I would consider it in every patient with type 1 diabetes. Not everyone's going to be able to use it, but it certainly makes sense for every type 1 person with diabetes.

Now type 2, it's newer in its use in type 2. And the American Diabetes Association has this statement, that it can be used in those on insulin as a helpful tool to get their A1C down, or to reduce hypoglycemia, or if they're not meeting targets. So that puts out a little stake there, insulin therapy patients who need further improvement.

There's a blinded CGM. Remember we talked about that, a professional version of CGM. And that can be used in a much broader array, type 1, type 2, to understand someone's glucose patterns and profiles. So think about that in almost any patient with diabetes to get a look at what their profile looks like.

Sometimes those are pretty high-level, general recommendations International Diabetes Center honed them down a little bit. And in our busy primary care practice of several thousand clinicians, they wanted some more guidance. So we said well, start with all the type 2s on multiple daily injections. They really could use a CGM to look at those profiles and learn how to adjust their insulin therapy. Anybody with significant hypoglycemia really would be good.

And remember in module 2, we talked about that mismatch between the A1C and the GMI. If you have some finger stick or CGM data and it's not matching your A1C, keep that CGM going. It's really important to go with that personalized A1C, which I call the GMI. That's the highest benefit.

Next, people on any type of insulin, basal insulin, sulfonylurea, they are at higher risk for hypoglycemia. So you'll want to think about a CGM in them even if it's intermittently. For educational purposes, learning lifestyle modifications, there's nothing better than a CGM profile. If somebody is wildly swinging day to night, throughout the day, if they have a clinical condition like gastroparesis or renal impairment, or they really just can't do finger sticks well because of visual imparity think about CGM.

And then moderate, you might do it intermittently for people who are starting a steroid regimen or want to just keep up on their regimen intermittently. They have an illness that you want to assess their current status. Put a CGM on them. I put in the last benefit category just somebody who wants to do it because they'd rather avoid a finger stick. Well, that's not a bad reason, actually, but probably a lower priority than just all these other medical conditions.

So lots of reasons for CGM, we can categorize the hierarchy a little bit. But now, let's get into using that CGM. You've decided to do it. How are you going to act on the data? And I think it's really important, and often not stressed enough, there's two ways to act on the data. Looking at the real time data, minute by minute, and watching those glucoses come out or stopping and looking back over the patterns, I call that Thinking Fast and Thinking Slow.

Thinking Fast is taking corrective action, because the arrows are showing a rapid increase or decrease. Do something now. Make a correction. Thinking Slow, taking a minute, taking a breath, what does that pattern look like? What do the dailies look like? What does that profile look like? Both are important. If you put these two together, Thinking Fast and Thinking Slow, I think you're going to get the best results.

Now if you think that I thought up those names, well, sorry. We'll give credit to the Nobel Laureate, Daniel Kahneman, who thought up the way our brain thinks fast and slow. But I thought it applied to CGM. So let's just follow that for a minute. Let's talk about acting on the Thinking Fast mode, taking corrective action and making an adjustment based on what you're seeing day to day, minute by minute. I ate this, and look what happened. I walked here, and look what happened. I lifted weights and what happened.

Does this really come up in your practice, particularly if you see people with type 2 diabetes? Don't they always just want another drug, another drug? No, people don't want another drug. They would wish you would focus on this box right here. Did you miss that box on your algorithm, lifestyle adjustments? Could I please do a lifestyle adjustment? Could I do that? Well, you could. But I'd feel much better about it if you did it with CGM.

So let's look at that. I'm going to give you a case, because cases are the only way to learn how to act. Here's an AGP report, type 2 diabetes, not on insulin. A1C 8.2, time and range 55, what's the goal? 70, we've got a ways to go. Every 5% will help. Metformin, SGLT2 inhibitor, well good for you. Good for you. GFR is down, probably some protein. You said I'm going to use a SGLT2. You did the right thing.

But their A1C is still 8.2, so you say, I got another medicine for you. The patient says, please, can I try change in diet? I would say, OK, if you put a CGM on. And you look at the data and you look at your sugars, day by day, and see what foods affect it. And then they say, I'm not sure I understand what you're talking about. Is there a good tool out there? Well, a few months ago there wasn't, but there is now.

So here is a tool that we developed at the International Diabetes Center, glucose monitoring for lifestyle choices. You might also come to know it as the no observe learn tool. But basically what it does is put a one pager in front of the patient to say, when you're using that CGM, here's how we want you to look at it to help guide good lifestyle choices. And I'll just break it down in three quick bullets.

First, when you see all that data coming out, remember you're getting glucoses every one minute or every five minutes. Know what you're aiming for. Know the targets, 70 to 130 before meals and in the morning, under 180 after the meals. I know what I should be as I see all these glucoses rolling out of my sensor onto my phone or onto my reader. Know what your target should be for CGM. We spent all of module 1. I know you know what the targets are, greater than 70% time and range, less than 4%, under 70, less than 1%, under 54.

The patients can get that too. If they see a low, they'll recognize it if you show this tool. So know your targets for mealtime and after meal. Know your CGM targets. Next, observe. Look what's happening. What happens when you follow that plate method? The plate method is a good one, and we describe it here. What happens when you walk? What happens when you actually get a little more sleep? What happens if you work on that stress that's really gotten to you, particularly in this day and age in that we're in?

That's observing. It's really important you just make note of that. And then, once you observe a change, this spaghetti really made my sugar go up. This pizza was a nightmare for the next four hours, not for two hours. It was a long effect. That's important. You've got to learn from that. What can I do? Can I cut it down? Can I change my medications to match it better? Can I try a salad and half of the pizza? So write down what worked for you and what didn't work for you.

So that's our tool, knowing, observing, and learning. And patients have really taken to it. And this patient got the tool. You got to have some real life situations to show four months later, going through the tool, A1C looks better. It's down to 7, this time in range is up, the profile just looks flatter. Look at the outside, light gray cloud. There are some days that weren't so great. They have a couple of days where they were low and a couple of days they were high but much more time in range.

And then we asked, well that's pretty good. I wasn't quite sure you were going to do it. What did you do? Well, I actually took my medicine as I was prescribed. I didn't miss it twice a week. I gave up that sweet tea at lunchtime where I had the biggest rise. I did like that plate method. It was understandable, first diet that I was given that made some sense. And I walked a little more, not perfect, but lifestyle can work. I call that that's Thinking Fast. It's using the glucose data you're seeing, minute by minute, day by day, making adjustments to match that data.

And you also did a good thing, because you match the patient's experience. They feel much better about it than another $80 copay for another medicine you wanted. You feel good about it, because it worked and you met the patient halfway there. So it was a good balancing act there.

Now let's take our balance and shift over to the retrospective. Sometimes you just got to stop and look back, and look at the patterns, and look at the trends, and see what's happening. That's what we call Thinking Slow, retrospective analysis, of two weeks of CGM data. Now we've got a tool for that, too. And I'm not going to go through and read you this tool today. But it's important just to go through a once, so you understand how we're thinking.

This is what we covered a lot of in module number 1. We went through all the terminology, but here it is on a one page in the back of this page. And it's published by Mary Johnson and Tom Martens, Anders Carlson, Amy Creigo, Greg Simonson. It's all published for you to read, but I'm going to walk you through it in a case, much better to do it in a case.

Here's Jean. We're in the Thinking Slow mode here, now, meaning we got a CGM report after two weeks, and we looked at it together. She wasn't changing every day. She just wore it. And maybe she paid attention, maybe she didn't. But now, she's ready to sit down with us and discuss it.

Let's see how we're doing. Do we have enough data? Well, look in the middle. How many days? 14, OK, good. Did we ask the patient what their other clinical factors were? Look down at the red box in the lower left. These are key data. Do they have type 1 or type 2? What's their BMI? What's their A1C? What's their EGFR? Do they have heart disease? Do they have heart failure?

Just put those away, because they're really important in your decision making. Remember in module 2, we talked about the algorithm addressing these. Number three, we hardly ever do this. We hardly ever do it. It's so valuable. Actually talk to the patient. What do you see? Why is it going up in the morning there at 6 AM? When do you wake up? When do you have breakfast? When do you have lunch, dinner, bedtime? Write it down on the paper.

Metformin, sulfonylurea, I see you take those in the morning, and you take the metformin in the evening. Now we've got a picture. Your time in range is 65%. Now, let's look at these patterns. What do we see?

Well, we look for lows first. Where do we see some lows overnight? I'm a little worried that you're getting close. You're not there yet. So not too many lows, only 2%. Highs, a little more of a problem after breakfast and in the evening. It's quite a bit of variability out there in the evening in particular. Look at that wide blue.

If you've got a past AGP, compare it to the past, really helpful to see how you're making progress or not. And then, what this whole module is about, act. You've laid out the story. You built up the case. You talked to the patient. You know their medications. What would you do? What would you do for Jean this case, right now, today with this profile?

There is a few different things we could do, but I'd ask you to go over to that red box and read it one more time. First, you might want to calculate their GMI if it's not on your report. It's 7.2 their A1C was 7.9. Anybody remember module 2? Look at that delta. Look at that mismatch, 0.7%. It's not unusual, but it's important. Jean's more personalized A1C is closer to 7.2 than 7.9, but there she is. You still want to flatten that curve out a little bit if you can.

So we look at this box. And we say, I remember that algorithm. I remember personalizing care based on atherosclerotic heart disease that we should use a GLP-1 if they could tolerate it or an SGLT2. So maybe we should do that. OK, let's do it. Jean, are you game? You have heart disease. You should be on a GLP-1 whether you're A1C was good or bad, whether it was the 7.2 or the 7.9. But I think it'll help your heart, and it will probably improve your profile.

Put this AGP snippet into your electronic medical record. Here she is back for her next visit. This might be a month later, might be two months later, but enough time that she's got this medication going. And she's had two weeks of CGM. And we're doing, again, this is the Thinking Slow. This is the retrospective. We're looking. How does it look?

She's up to 89% time in range. Her A1C was 7.9 at 7.1. She has a medication that's actually addressing her clinical needs. We gave her a once, weekly, GLP-1. They do amazing job overnight. And they flatten some of the postprandials, just what you would expect. What's her GMI? 6.5 versus 7.1, there's still that gap. A given patient tends to have the same gap from their A1C from across time.

That was Gene. Now, let's take another individual. This is a 60-year-old gentleman with type 2 diabetes, no history this time of cardiovascular disease or kidney disease. That's interesting, good. A1C of 7.5, weight, they're on metformin and gilmepiride and glargine. So pretty common to have SU, and metformin, and add a basal insulin. And what do you see? The time tin range is not so great. They've got enough data and all, but the time in range is only 51%. We'd like it to be 70.

Here's what I see when I look at that profile. I call it the classic stair step. You start in the morning pretty decent. And look at that step with breakfast, look at the step with lunch, a smaller step with dinner, but not a recovery. So a stair step up through the day. And the patient is on a large dose, 70 units of basal insulin. You keep increasing the dose to slam it back down by the morning.

Oh they're high every night. I can give her more basal insulin. I can give him more basal insulin. I can give him more baseline. So now we call this over basalinazation. I don't know if it's a word, but it's a concept. What would you do?

Well, they're on insulin already. So I guess I'll just start a little insulin at each meal or maybe just one meal. And you can do it either way. American Diabetes Association says when starting mealtime insulin, you can do one meal where the largest elevation is, or you can do a little bit on all three meals. But that's what was decided here.

You've got to reduce the glargine. If you put insulin in at breakfast, and you put some at lunch, and you put some at supper, you're going to come in the evening much lower. So you need probably half of that. So you could just take the total insulin, split in half even, and give half spread out for each meal and half overnight is one approach. I would stop the SU. That's up to you as a clinical team, but I think it only confuses the issue, doesn't add any help.

So you might say, OK, I'm just about to do that. But I remember what you said about looking at that algorithm again. What did that ADA algorithm say again? Where was insulin on this algorithm? Well it was pretty far down there. This basal insulin, if I go to that algorithm to the next page of the algorithm, and I look at using insulin page, it actually walks me through if I'm on basal insulin and I need to get better control, what do I do next?

And this algorithm, if you blow up that one little panel, basically it says, how about an injectable actually being a GLP-1. Instead of adding multiple doses of mealtime insulin, a GLP-1 might be a good choice. So you could reel the reel back and say, well, wait a minute. I still see a stair step, and I know that's too much basal insulin. But instead of three injections of mealtime insulin, what if I added a GLP-1 on top of that to get the mealtime and keep the night time good? I don't really need the SU if I did that, and I would reduce the basal insulin.

So that's another approach, so either one of those two approaches that you're comfortable with and if they tolerate the GLP-1. So I hope you appreciate that those are some cases of really acting on the data, acting in real time, or acting in retrospective look.

So that really brings us to a conclusion of module 3. And if I was just going to summarize this whole series, I would say with the advent of CGM technology that's come so far now, think about moving from that A1C as your primary management tool, crossing that bridge over to using the AGO then time in range.

First, you've got to know how to analyze the AGP, more green, less red, more in range, less hypo. Treat the hypos first, but follow up for the hyperglycemia, flat, narrow, and in range. Personalize your treatment. It's not only about glucose, blood pressure, cholesterol, smoking are important. Thinking about the right algorithm to treat their heart disease or kidney disease, using the GMI to personalize that A1C, if you still like the A1C, if you really are holding tight, at least get a more accurate reflection of the A1C for that individual with the GMI.

And then fourth, act on that data. It's a balancing act. Some real time, some retrospective look, if you use those together, you're going to get amazing results. Balance the time in range in the time below range. Get those so they're safe and both close to target. And finally, always think about the patient experience. Keep them in the loop, and you'll get much better clinical outcomes. Thank you very much for your attention.