



## Innovations in Diabetes Management

### Guest: Patrick Welch, PharmD, BCACP

Dr. Patrick Welch is an advanced clinical pharmacist that practices in family medicine with Intermountain Health in Utah. He graduated from the University of Utah college of Pharmacy before completing a two-year residency. His current practice includes chronic disease state management which is heavily focused on diabetes management including CGM and insulin pumps. He enjoys giving patients the tools they need to successfully achieve their health goals.

### Host: Candace Pierce DNP, MSN, RN, CNE

Dr. Pierce is a nurse leader committed to ensuring nurses are well prepared and offered abundant opportunities and resources to enhance their skills acquisition and confidence at the bedside. With 15 years in nursing, she has worked at the bedside, in management, and in nursing education. She has demonstrated expertise and scholarship in innovation and design thinking in healthcare and education, and collaborative efforts within and outside of healthcare. Scholarship endeavors include funded grants, publications, and presentations. As a leader, Dr. Pierce strives to empower others to create and deploy ideas and embrace their professional roles as leaders, change agents, and problem solvers. In her position as the Sr. Course Development Manager for Elite, she works as a project engineer with subject matter experts to develop evidence-based best practices in continuing education for nurses and other healthcare professionals.

### Episode 1: Innovations in Diabetes Management

#### Transcript

Candace Pierce: This is Dr. Candice Pierce with Elite Learning by Colibri Healthcare, and you are listening to our Elite Learning podcast where we share the most up-to-date education for healthcare professionals. In this series, we will be discussing some innovations in diabetes mellitus management, and for this episode, we're going to really focus on some of the latest interventions in diabetes management. Now in recent years, we've witnessed a remarkable surge in technology really aimed at revolutionizing how individuals with diabetes monitor their blood sugar levels and even administer insulin. From wearable devices to continuous glucose monitoring systems and advanced insulin pumps, there are some really cutting edge solutions that are improving quality of life and empowering better self care. Today we're joined by Dr. Patrick Welch, an advanced clinical pharmacist, where his current practice includes chronic disease management, but you're heavily focused on diabetes management. Is that correct?

WELCH: Yeah, that's right. So I'm in family practice, but most of my patients have diabetes, as there's a large need for access to diabetes care, and so that's where most of my time is spent.

PIERCE: Wow, great. Thank you so much for taking time to join us for this discussion.

WELCH: Yeah, you're welcome. Thanks for having me on. I'm excited to talk through the technologies and advancements that we have.

PIERCE: Absolutely. How did you get started in this area of medicine?

WELCH: Yeah, good question. Through pharmacy school, putting a pharmacist in clinics was starting to become more and more common. And where most of those pharmacists got in is through diabetes management. And so in school, that's kind of where it started, where I started learning more and more about diabetes and had opportunities to volunteer at different clinics, where a lot of that focus was on diabetes management. And then through residency and jumping into my practice, again, that need was just huge. And so that's where I jumped in through my residency. We didn't have a whole lot of access to endocrinology support for patients. And so, everything was kind of dumped on the pharmacy team. And it's where I learned most about continuous glucose monitors and really insulin pumps and diving into that and making sure patients have access to the technologies that are available.

PIERCE: Absolutely, that's really good. I know they just started putting them in a lot of different units in the hospitals as well. So really, I see the pharmacy profession as really being able to specialize more in different areas.

WELCH: Yeah, absolutely. And, as a pharmacist, we're always known as probably the most accessible healthcare provider, right? You think your local retail pharmacy, there's always a pharmacist there. And, the hope is as people gain that trust in their pharmacist, and as these technologies get more and more simple, there's a lot more access of these technologies at the pharmacy as well. And so I think patients are going to be relying on pharmacists and our nurse colleagues, even support staff like MAs to really help understand a little bit more about how this technology can help in their healthcare journey.

PIERCE: It's really great to see how healthcare providers are becoming more accessible to patients, especially when it comes to chronic disease management.

WELCH: Yeah, absolutely.

PIERCE: So to get us back on track, can you kind of give us an overview of the latest wearable devices and continuous glucose monitoring systems available for diabetes management?

WELCH: Yeah, there's a lot more that have come out. As I started into this journey, there were just a few that were available and they've gotten better and better through the years. So I'll start just kind of how these technologies work and what they are. There's three main pieces when we talk about. A continuous glucose monitor: There's a sensor that's implanted or somewhere underneath the skin that's gathering that glucose data. There's also a transmitter. That transmitter is what gets information from the sensor and then transmits it out to the third piece, which is a monitor or now more often a smartphone app where the user can actually see those readings. So those are the three main components of these devices. Now, the ones that are available on the market, there's a few different

ones. There's some, what we call real-time continuous glucose monitors, where they're constantly giving that, that transmitter is constantly transmitting that data to the receiver or that smartphone app. There's some intermittent scanned continuous glucose monitors where that requires the user to their monitor over the sensor to gather that data and see those readings. There's also an implantable one that's a little more long-term that requires a physician go in and implant a little sensor underneath the skin and then that transmitter is removable and sits on top of the skin. So there's different ones that are now available. I think the good thing with it is, again, there's more and more competition in this field, which is leading to more innovation, improvements as these companies are going against each other. And so, there's a lot more access, even over the last couple of years, of patients really being able to get to these devices as those companies have been improving not only the functions of these devices, but as well as access and cost a little bit as well. So now, the main ones that are on the market, we're getting some pretty good access to them as well. So Dexcom, Libre, Medtronic has a standalone CGM, and then Eversense are the four main ones that are available on the market. In the primary care setting and those that are in primary care, most I would assume are familiar with Freestyle Libre devices and the Dexcom devices as those are out now. And In essence, they're all similar as far as how they're working, how they're getting the information and what they're reporting that to. There's a few nuances between the different devices that might fit one patient better than the other, depending on patient specifics. But yeah, there's a good amount now on the market, and they're becoming more and more accessible. And as we go through our discussion today, I hope that those in primary care are going to understand the benefits of using these in their patients, as well as just the improved access and ease of getting these set up.

PIERCE: Right. So you talked a little bit about the different pieces and components that make up the wearable devices. So what about some of the technologies inside of them? What are their key advantages?

WELCH: Yeah, if we look at advantages and why we're using this versus standard of care, or what we considered standard of care in the past with just a glucometer, a finger poke, these are giving us that real-time data of what's going on. It's helping not only the patient understand what's impacting their glucose, but from a clinician standpoint, it's a whole lot better seeing a data point every minute or every five minutes compared to that glucose log that they'll bring in with two or three finger pokes throughout the day, and we're guessing what's going on between those. So one of the biggest advantages as we look at that from kind of where diabetes care has evolved is I can have a patient that comes in that has a fasting glucose log that looks very well controlled. We've got maybe 100, 110 on their blood glucose readings, and maybe they've got some postprandial readings that are good, but that's all the data I have. If I compare that to a CGM and the data I get from that, maybe that fasting glucose is very well controlled, but there are data points of overnight, maybe they're having undetected hypoglycemic events that were going undetected. And so that can help us improve that patient's safety. Or maybe they're getting some additional spikes in between those either pre-meal readings they're getting or post-prandial readings that they were just unable to see. And so that allows us as clinicians to really focus on medications, more targeted education with these patients, as well as the patients are going to start learning what's impacting that glucose, what's causing those sugars to go high or go low and help them start to make a few little changes in their day-to-day routine that's going to help improve that. So from a technology standpoint and the advantages of it, it gives us that safety net of those lows, those undetected lows, as well as just giving us data, giving us that knowledge we need and the patient needs to make better decisions and improve what we're doing and the goals of therapy and the therapeutic plan that we have for those patients.

PIERCE: So a question for you is accuracy of these particular devices. You know, I've seen where maybe they're reading low on the continuous glucose monitoring device that they're using, but so they'll do, you know, a finger stick. Let's just go ahead and check and make sure is it actually reading correctly or high, is it reading correctly. What is the accuracy rate of these?

WELCH: Yeah, I love this question, because this is something I deal with on a daily basis in clinic where I get patients that are obviously concerned, right? They do that, what you just explained, their CGM is different than their finger stick and they're wondering, can I really trust this? Is this even a beneficial device for me? So I'll start with how these devices are approved through the FDA and what that looks like. There are a couple of different parameters that are looked at. So, there's one that's called the MARD or the Mean Absolute Relative Difference. And that's just looking at the difference between actual glucose levels or blood sugar levels and the CGM values. The lower the number, the more accurate the CGM readings are. Most on the market have kind of set a precedence of 10 % or lower. If that MARD is 10 % or lower, it's likely fairly accurate. Now, understanding that, there's still going to be some variability between actual glucose and these readings. The other thing to look at is what's often referred to as a 20 over 20% or 15 over 15% rule. And that's if the glucose is at 100 or below, that reading on the CGM has to be within 20 points of the actual glucose reading. If their glucose is above 100, then the CGM reading needs to be within 20% of that. So I'll often explain this to my patients where, you know, if your sugar is low, that CGM is probably going to be pretty accurate, right? Even if your glucose reading from a finger stick says 60 and the CGM says 55, that's not a difference to me, right? That's accurate. The higher the sugar, if our sugars are uncontrolled and sitting at 300, then we have a 20 % variance on either side of that 300. And so there's a lot more possibility that your finger stick might show 260, and your actual CGM reading is showing 300 or so, but that's that 20% fluctuation that's allowed. Now it's also important to point out that our glucometers aren't a hundred percent accurate as well, right? There's a lot of variations or variabilities from device to device with the glucometers. And so there's can be a, "hey, is my CGM accurate? Is my, is my glucometer more accurate?" What I look at when I have patients come in, we'll check the A1C and I'll pull their 90-day history from the CGMs and I'll look at the average glucose, the expected A1C from these monitors and compare that to the A1C that I get, and there's a few outliers, but almost always our CGMs are showing within 0.1 or 0.2 % of the actual A1C that I get. And so, I like to explain the trends that we see with these devices are fantastic. The ability for the patients to again, see that trend of, hey, that blood sugar's spiking. What did I do that caused that? That's really what I want these patients to focus on as they wear these. And obviously there will be some outliers that for whatever reason, they just have less than accurate numbers with these CGMs, but for the general population, I'm pretty confident in the CGM readings. And I like to help our patients understand, all right, let's look at the trends. If alarm goes off, let me think, am I symptomatic because it's a low alert? And if I'm not, then let me check with a finger stick. But other than that, these devices have evolved so much that I don't have many concerns at all with the accuracy of them.

PIERCE: That's really good to know. That's really good. From a patient's perspective, using these particular devices, can you share some examples of how it's really enhanced the quality of life for patients?

WELCH: Yeah, I have a lot, especially my more elderly patients that I think are a little bit hesitant to try any new technology or just scared, right? They're like, I have a smartphone, but I don't even know how to answer it. How am I going to use one of these? So from a quality of life for patients, that's usually a hurdle to get over. And I would say if I have a hundred patients, this is just my anecdotal evidence from practice, but if I have a hundred patients, I probably have two that stop CGM therapy, and the rest continue it because they love it. So it gives them that advantage. In fact, I had a patient just last week

where he came in just on some basal insulin therapy, uncontrolled, gave him two weeks on a CGM. He came back in and his first comment to me when I walked in the room was, why did I not start this earlier? This has been fantastic. And it's just awesome to see you give them that data, and they are going to make a whole lot of more improvement than if we're just giving them one finger stick a day on long-acting insulin, right. And so that patient specifically, we were able to look through the data, gave us the ability to have more discussion on what lifestyle is like, what diet has been doing to those sugars, as well as open the door for more education on medication and further discussing a plan for either adding a GLP-1 or some mealtime Insulin, which is what we did in that case. So that's a good experience of these patients. Although a lot are hesitant to start on them, they end up loving them. A couple of other really good things I've seen is adding to that safety net. I've had multiple patients or specifically multiple caregivers for patients that are concerned all night long of lows that have been happening. They've had, you know, horror stories of lows and they've just had bad experiences. And so, they're concerned. They wake up multiple times to check on the patient as the caregiver and giving these, it's really allowed them to sleep throughout the night. They are confident in, hey, I'm not going to need to wake up and check unless I hear that alarm go off. And that's, I think, been a very big benefit that I've seen in a lot of patients' and family members' lives. And there's, as we talk about quality of life, there's lots of studies that show an improvement in that quality of life. In fact, there's one, it was from 2017, I believe, it was posted in JAMA, but it was, I mean, that's a while back when we were talking about technology. And so, this was some of the earlier CGMs that were less user-friendly and a lot more cumbersome to put on required finger stakes. But even though studies showed improvement in treatment satisfaction, less hypoglycemic fears. And so, from then it's only improved as far as ease of use. And I've seen that patient satisfaction really go up and just been life-changing for a lot of patients by just giving them the data, so they are more aware of what's going on.

PIERCE: So, kind of going back to the word hesitancy, because to a lot of patients, this is newer. Electronics are newer for them. They're trying to understand how to use them. This is how I've always done it. This is what I know. This is what's been around the longest. So, if you're a healthcare professional and you are in that place where you have a patient that is just very hesitant, what is your advice as far as how do you help them become more comfortable with technology become more comfortable with their abilities and even the safety of these particular devices.

WELCH: Yeah, that's one of the biggest things I use are just the demo devices. I think giving, as I talk with patients about this or the possibility of getting on, whether it's an insulin pump or a continuous glucose monitor, as I talk about it, I think I can sense that hesitation because they're unfamiliar with the devices. And so, leveraging the demo devices that we have or reach out to your local reps from whatever company and get those demo devices, because that's been very beneficial, where all the time patients are telling me, that's it, that's all, I was expecting something very large or a large needle. And so, I'll show them those demo devices first. And that kind of helps them understand, okay, this is something that's a little bit easier. The other hesitation with the technology piece is, as I tell them, hey, this is going to report to your smartphone, or we can hook it up to your phone. That's where especially the elderly population get very more shy of smartphones. Hold on, I can't do that. And so I'll show them the monitors and the monitors. I like to tell them it's very similar to their glucometer, right? They've been going years with finger pokes, and they can manage that glucometer. The reader is even easier. All they have to do is push the button to wake it up and there's glucose numbers are going to be right there. And so, I'll show them those devices, walk through some of that and those that are more hesitant instead of pulling the trigger and saying, I'm going to send in this prescription, we'll leverage samples that are available to clinics, we'll all throw on a sample from one of the CGMs, let them wear that for a couple of weeks. And again, that's where I found that once we have a conversation and show

them these devices, they've become a lot more open to wearing them because they start seeing that benefit even within a day or two of putting it on.

PIERCE: So, when they're using these devices, is it recommended that they have a separate smartphone or is it okay to put it on their cell phone that they use every day?

WELCH: Yeah, great question. So, with the receiver versus or the monitor versus a smartphone, the smartphone or having it hooked up to a smartphone gives us some advantages where one, we can share that data remotely with our clinic. Every CGM company has their own platform, their own cloud where they're collecting that data. As a healthcare provider, you can log in and see that data. So that gives us an advantage where remotely we can see that. So, if I have a patient that calls me and says, hey, I'm having low blood sugar. I can quickly pull that up, see what's going on, and make some adjustments. The other benefit with using that smartphone app is they can allow family members to get those readings as well, which allows those family members to be alerted for low blood sugars or high blood sugars. And again, that peace of mind for caregivers or family members, especially for elderly patients, they can constantly track that. So, I don't ever recommend getting a new phone for it. But most of the time we can hook it up to the current smartphone that they have. And if that's not an option or my patients that don't have smartphones or say they never carry it with them, then oftentimes we'll just go to the monitor and let them use the monitor. We can't get the remote data from that, but every time they come into the clinic, plug in that and you get the full set of data or they can upload it at home by plugging it into the computer as well. So some advantages to using a smartphone, but for the most part, most patients' phones now are compatible with these devices and they can just use the current phones that they have.

PIERCE: Privacy. Yeah, a lot of people are like, whoa, wait a second, this is saving my data. What do they have for privacy?

WELCH: Yeah, good question. These devices and the two most common ones that I use in practice are Freestyle and Dexcom. There are those patient agreements that they go through as they set up the app. There's also on the back end on our side, these companies do take that protected health information seriously. And so there are safety nets that they have. There's a provider login that allows the provider to manage those that have access to that. There's codes we have to share with the patients so they can put that code in and then they click, yes, I do want to share this with my healthcare provider. So, there are some protections to protect that data, but that's still a real concern for a lot of patients. I get a lot that are concerned with that data sharing, that privacy. And if they're concerned, a lot of those, again, I just have them, give them the reader, let them use the reader. That's not uploading anywhere. They come into the clinic, we just pull the data from that to see what's going on. And that's a way around that. I've got a couple other patients that will come in, they use their smartphone, they don't share anything until they're there in front of me, they'll click share, we can grab the data and then they unshare so that they're not freely sharing that data again. And so, there's a few ways around it, but that is a hesitation. And in those instances, I think using the monitor is a good way to address some of those concerns that patients might have.

PIERCE: So, we talked quite a bit about the continuous glucose monitoring, but there's also technologies that help with the insulin delivery and really optimizing the dosage that patients get. Can you kind of walk us through the advancements in insulin pump technology?

WELCH: Yeah, this is where I'm really excited, especially in the area of primary care. I think historically we've always thought, hey, it's an insulin pump. Yeah, you might be a good candidate, but I can't do

that here in primary care. We have to send you off to endocrine. Endocrine is very busy. I think there's a lot of shortage of endocrinologists throughout the country, which means patients are having more barriers to access these insulin pumps. And so, over the next several years, I see this expanding a lot in primary care, where hopefully our clinicians are going to be more comfortable and confident in managing these, because it's not that difficult. It's just a piece of technology like these continuous glucose monitors of, once you see it, once you learn a little bit about it, I think you're going to be pretty confident in using it. These pumps, as we tie them with the CGMs, it allows us to have a closed-loop system where the continuous glucose monitor is feeding data right to the pump, and that pump is making decisions based on readings that it gets from that continuous glucose monitor. So, we're past the point of just standalone insulin pumps where the patients are having to put in all sorts of data throughout the day, whether they're carbs, or glucose information, and these pumps are kind of doing that on their own. So, it's been a game changer. It's helped a lot of patients improve A1C as well as again, the safety benefit of it, of a reduction in hypoglycemia. I had a patient not too long ago had type one diabetes over the age of 65 had had diabetes for 30 plus years. His spouse had told me every night I wake up, check on those sugars. They're always low, goes through two to three glucagon pens a week because of these lows that he was having had never been on an insulin pump. Again, that technology fair, we talked through it, got them on an insulin pump, not having those throughout the night. Again, they're able to sleep, doing so much better, not having to use that glucagon almost ever now. And so it, again, as we talk about technologies and how it improves the quality of life, it can be such a game changer. And so, allowing access to that in the primary care setting is huge. And in my practice, I don't have all the resources that our diabetes clinics might have or endocrinology clinics. And so, I leverage the educators of the insulin pump companies to come in and help teach my patients the technology and get them set up and running on these pumps. And that's, I think, an easy way in the primary care setting for our clinicians to not spend any more time with these patients, but still give them the ability to have access to those insulin pumps.

PIERCE: So, what about the accuracy versus malfunctioning of these pumps?

WELCH: Yeah, malfunctioning is probably the biggest concern when it comes to those pumps, right? There's a lot that goes on. Is the infusion set up correctly? Did I put the insulin in the reservoir correctly? Is there something on my pump that I touched that paused the setting or anything like that? So, part of my process in setting these up is, again, most of the time we leverage those educators, but we'll go through, all right, this is what we do if your readings go up. Let's check a couple things. Let's check your site. Let's make sure there's insulin in the pump. Let's make sure your pump battery is not dead. Let's make sure that pump is on. I'll also give them the pump company information, because these pump companies have 24-hour support lines where they can call them. But we'll go through, alright, you've got a long-acting insulin prescription. Make sure you've got a basal insulin in the fridge. That way, if your pump fails, you've got some insulin. You can go back to injections and making sure we that conversation with these patients has been huge because I do get patients that go into the emergency department for an issue, hyperglycemia and providers in inpatient in the hospital, I don't think have a lot of confidence or knowledge on these pumps and so most of the time I see them just telling them to take their pump off, and saying go back to injections but that's all the information they get from that provider is just go back to injections they get no more instructions and so making sure we write down for the patients, this is what you do if these pumps fail. And again, I don't have a whole lot of issues with pump failure or patients being unable to manage a pump issue because we've gone through that education, they're comfortable on these pumps. And again, they're getting very, very easy to use and troubleshoot if issues come up with that. So, it's definitely a little bit of a learning curve, but from a primary care standpoint and improving access to these, I don't see any reason we shouldn't be having these discussions with patients in the primary care setting.

PIERCE: Absolutely. And I do see where there is a gap of education of healthcare providers from the clinic setting to the hospital setting, just working as a nurse at the bedside and being told, we're not going to mess with their insulin pumps. We don't know anything about those. We go right back to using sliding scale insulin and finger sticks to check the blood sugar. So instead of being able to leverage the things that they already have in place, and be able to send them home understanding what to do when they get home. We can't tell you what to do when you get home now because we've had you on finger sticks and sliding scale and now, I don't know how to get you back to where you were in your normal day-to-day routine. So, we definitely need more education and guidance in between our primary care versus our emergency care versus our long-term the hospital care, not necessarily long-term facilities. I'm not sure I can't speak on how those work, but definite gaps there in education for us.

WELCH: Yeah, absolutely. And one thing I've found is, is I've worked with patients on insulin pumps is these patients almost always know this pump better than I do, right? They're living with it 24-7. And so, when they come in, I'll ask them, Hey, what's going well? What are you seeing? What issues do you have? And most of the time I'm learning something new about that pump every time because I'm not the one spending every single second with it. And the same thing on the inpatient side, if we can, I think, as a clinician or an aid or a nurse on the inpatient side, if we just say, all right, what are you doing at home? Maybe, you know, the hospital protocol still has, you've got to come off your pump. We've got to do Q4 finger sticks. But still, if we can just get a sense of what the patients are doing because they live with diabetes every day and they know how to manage that. I think that goes a long way in having those conversations with the patient and understanding and giving them the credit of you probably know more about what's going on with your diabetes than I do as the provider.

PIERCE: Absolutely, and it's going to start with educating of those clinicians that are inpatient and then working through policies and procedures of hospitals that allow those at the bedside to be able to, you know, utilize the tools that this patient who comes in, who has had diabetes for, you know, a really long time, they know what to do. Let's leverage that so that we can make sure they get the best care.

WELCH: Yeah, absolutely. And I think we will see more and more protocols and health systems change where more and more patients are able to use, whether it be the CGM or their insulin pump while inpatient because they're becoming more and more accessible and more widely available.

PIERCE: Absolutely. Well, Patrick, we are at the end of our time for episode one, but we're going to be continuing this discussion in episode two, where we're really going to kind of focus on the future of these innovations and maybe some emerging trends and the potential for further integration of artificial intelligence and personalized medicine. So, and if time allows, hopefully, we can get into the challenges and considerations surrounding accessibility, affordability, and that right widespread adoption of these really great cutting-edge solutions. So, we hope you'll join us for episode two.

## Episode 2: Innovations in Diabetes Management

### Transcript

Candace Pierce: Welcome back to our series on innovations in diabetes management. In the previous episode, Dr. Candace Pierce, an advanced clinical pharmacist gave us tremendous insight into the



latest wearable devices, continuous glucose monitoring systems, and insulin pump technologies that are really just transforming the way individuals with diabetes can monitor their blood sugar levels and administer their insulin. Patrick is still here with me to continue this discussion. Thank you for sticking around, Patrick.

WELCH: Yeah, thank you. I'm still excited to talk more about this because there's a lot to cover.

PIERCE: Yes, there absolutely is. So, for this episode, our plan is to discuss where we're headed as far as cutting-edge solutions and some emerging trends, and the potential to use artificial intelligence in personalized medicine. So, I want to get started with how technology is evolving. So, what exciting developments or trends do you foresee in the field of diabetes management in the coming years?

WELCH: Yeah, as we talk about artificial intelligence and how that's going to play into this, there's already use of that right now with our closed loop systems with the CGM and insulin pump. And so, in the future, I think those are just going to improve what we call algorithms in the pumps or how those pumps are adjusting insulin on their own, continue to improve and get better where they're able to learn more and more of patient habits, that individual patient and really make those adjustments. As we think of it again, diabetes, we know there are all sorts of things that impact glucose, right? Whether it's food, diet, activity, stress, environment, or outside things that impact it, these artificial intelligence systems are constantly running. And so, they can, every minute or few minutes, they can make those adjustments where the patients don't have to constantly be thinking, okay, I just did this or what's going on? They can be more hands-off and let that artificial intelligence, let those algorithms in the pumps start managing that on a more micro level and really allow those patients just to continue throughout their day without having to focus on and worry about those glucose controls and diabetes. And so, over the next several years, even in the last couple of years, we've seen a lot of advancements in those algorithms. There are a couple of new pumps out on the market that have been leveraging more and more of that AI and algorithms and updating that to really give improved glucose control with less and less patient interaction with the pump. And so that's been exciting over the last couple of years. And I, that's what I foresee is continuing to evolve. It's just that improvements in these systems were more hands-off for the patient and better glucose control from the system itself.

PIERCE: Okay, when you hear the term artificial intelligence, you still get a lot of hesitancy just with that term alone. So now we're looking at insulin pumps or continuous glucose monitoring plus artificial intelligence. Where do you see that hesitancy affecting that?

WELCH: Yeah, that's great. From a patient standpoint, hesitancy from a provider standpoint, I have that hesitancy too. One of the newer pumps that's out is from Beta Bionic. And with insulin pumps, it's been very much, hey, let me put in the initial settings. If we're on a closed-loop system, it'll start making some changes, but let me put in those initial settings as a clinician. I feel very comfortable in putting in initial pump settings, and telling the pump how to start delivering that insulin. With this newer system that's out, we put in the weight, the patient's weight, and we let the AI take over and dose insulin from there. So, there's a lot of hesitancy on my part of I don't have as much control from that, as well as patients, especially our patients with type 1 diabetes that have been taught their whole life that they have to manage this every single day, all day long. And now we're saying, hey, put this pump on, don't worry about it. You tell the pump when you're eating and that's all you have to do. So having confidence in technology is good, but I still have some of that hesitancy of, hey, it's more hands-off for me and for the patient. Again, clinical trials with these devices are showing fantastic results. And so, it's just, I think a little bit of a learning curve is the more and more we use it, the more we're going to be very confident in these. It's just like CGMs that came out on the market. When I first started in

my practice where I'm at right now, I remember having a conversation with one of our providers there who said, hey, I don't like to use CGMs. And I said, well, I like to use them on everybody. If everybody with diabetes had access to these, I'd use them on every single one. And slowly that practice, those providers have caught on and love these using CGMs. And I think that's where we'll get with these advancements with AI with the algorithms is the more and more that they're used and we get more real-world data, we're going to be more and more confident and comfortable in using them and trusting the technology that's out there.

PIERCE: Where are we with this particular technology? Is this out for the mainstream? Are we still in the testing phase? Where are we with this?

WELCH: Yeah. Good question. So mainstream, we have access to it. Testing, these insulin pump companies do a fantastic job at continuing to try and push their technology. And so, there's continual testing going on. The good thing with most of the new pumps now is that previously used to be a hardware update where you, if there was a new update for an insulin pump, whether it's an algorithm or some other technology, you have to get a whole new pump. Now it's just a software update where it's just pushing the pump and those algorithms are updated. But some of the pumps out there now, every five minutes, they're adjusting insulin. They're adjusting the basal rate, that background rate where it'll drop it if the sugars are going low, it'll stop it, it'll increase it. And they're also now adding auto-corrections. And so, if the pump senses, hey, I think you just ate because that sugar is rising, but you didn't put anything in, you didn't put in a bolus dose, those systems will now kick in and give some auto-corrections. And that's been very, very helpful because we all have patients that are less than compliant with mealtime insulin and giving those doses when they're eating. These pumps have done a fantastic job at recognizing those patients who aren't eating and giving that extra bolus dose to help bring it down. So that technology is there and again, a lot of this technology within the last one to two years is newer as these companies continue to push that technology, get more and more data, more and more trials where they're improving this over and over. And even as we talk about what's out right now with this technology, every few months, there's probably going to be software updates where it's improving either the algorithm or additional settings we can use. And so, yeah, that technology is here, but again, I only see it getting better and better and easier to use.

PIERCE: So are these types of pumps that are using AI, are they still connected to your smartphones?

WELCH: Yeah, so they are. There are the closed loop systems where we can put just the CGM and connect it right to the pump. There are other pumps like our tubeless Omnipod pump where we do connect it to the smartphone. That smartphone is connected to both the pod or the pump itself and the CGM. There are other ones like Tandem is a standalone one where we can have just the CGM connected to the pump. Beta Bionics, same idea, you can have it connected just to the pump. Medtronic, you can have their Guardian CGM connected just to the pump. They all also have the ability to connect it to the phone, which again, when we talk about data sharing and remote management, is helpful because as clinicians, we can see all the pump data from that. And some of those systems allow the patients to bolus right from their phone. So, I've got patients, younger patients that love technology, they're always on their phone. They love that because they don't have to mess with their pump. Everything's there. They can bolus right from their phone. And that makes it very helpful. Again, for elderly patients who are more hesitant towards technology, we can just use the pump and the CGM and put those together and let that run and do its thing.

PIERCE: So, I like to think that I am technologically literate for the most part, but when my phone sometimes updates, I'm like, what is this? What is happening here? So, you're talking about these

pumps that are updating algorithms, updating system settings that they can do. So how do you stay, especially with those who are not necessarily technologically literate?

WELCH: Yeah, great question. I like to think I'm technologically savvy as well until I talk to my kids, and I realize I'm not. But yeah, so these, when there's an update like that, especially if it's changing a lot of things, there's going to be videos that are out, depending on the pump company, they'll have videos, and most of the time they'll send an email or a notification to the patient and say, there's an update. Most times, they watch a video on those updates, so they know what's going to be changed. Other times, if it's a very big change, for example, we had tandem that went from just a basal IQ where they were suspending insulin if it went low, it was just adjusting the background rate. And they went to what they call a control IQ that allows for auto-corrections. For that update, we had to send a prescription to tandem and say, yes, this patient can have the software update. And so that gives us the ability to touch base with the patient. If they need education on it, we can bring them in, and go through that education. But also, again, there are videos and online learning portions that the patient does for those updates. And so, I think that's been very helpful because the patients, again, most of my patients on pumps, they love them and they take the initiative to say, hey, I already watched this or I heard this is coming out, what do you know about this? I'm like, that's a great question, I don't know, let's look into it, let's see what's coming down the pipeline. And so, even though there are updates like that, most patients are very well aware of what's going on in those updates and how that might impact their therapy going forward.

PIERCE: So, with these types of innovations that we're talking about, do they have a place in preventative care, you know, early intervention for those at risk for developing diabetes?

WELCH: Yeah, I think they do. Specifically, the CGMs, the continuous glucose monitors. Again, it's opening the curtain, if you will, of allowing people to see what's going on behind the scenes. Because right now, they might come in, A1C is at 6.0%, right? We throw them in that pre-diabetes standpoint or threshold, but they don't know really what that means they don't know what the 6% A1C is or what's impacting that on a day-to-day lot basis because we tell them that's over a three-month period. And so, giving them access to open the curtain, see what's going on behind the scenes, day in and day out, is really going to give them the knowledge to make decisions of, hey, this is going to improve my health, or I just ate this, sugar's going up, maybe I should go for a walk instead of sitting down at my desk and working. And so having access to those CGMs in the early stage, I think is going to be huge. I'm very excited because there are things coming out that I think are going to improve access for this patient population. They might not have diabetes, but either in the pre-diabetes range or at risk of developing diabetes. And we know there's an over-the-counter product that will be coming out shortly in the summer, a continuous glucose monitor that again is going to allow better access to these devices so that patients can see what lifestyle is doing and what lifestyle changes can do and how that can impact their long-term health.

PIERCE: That's really good. I'm really excited about that. I did not know that.

WELCH: Yeah, yeah, it's great. So, who knows when it will be available, but Dexcom does have an FDA-approved over-the-counter continuous glucose monitor that hopefully will be out soon. And again, just allow us more access for those patients in that population.

PIERCE: Well, kind of touching on access, you know, accessibility and affordability. So I kind of have a two-fold question for you and I'm going to ask them together just so you can see where we're going with it. But, you know, this is some remarkable technology. This is really great. But there's going to be

concerns about accessibility and affordability. And then looking at that, what are the challenges that need to be addressed so that we can have widespread adoption and equitable access to these types of innovations in healthcare?

WELCH: Yeah, great question. Cause again, there's always been a concern with access and cost specifically for these devices. We talk about how great they are, but the end of the day, if our patients cannot afford them, they're not getting them. They're not using them. So, access-wise over the last few years, and probably because of the pandemic, Medicare has changed their criteria on coverage of these, which has given us a lot more access for our Medicare recipients. Now, all these Medicare recipients, they just have to be on a daily insulin. It doesn't specify which type or how often. They just have to have one insulin injection per day and they will be considered covered for a CGM. So that's improved. And anytime Medicare makes a change, our commercial insurances typically follow shortly after that. So, it's becoming more and more accessible. Again, the tricky part though is that just because it's covered doesn't mean it's affordable for these patients. Right? We're still sitting at least over a hundred dollars a month without insurance for these devices. And so even if they have a co-insurance of 50%, they're still \$50 plus. And, I've had a lot of patients express concerns on affording that. One thing that I've done is I'll leverage samples in my clinic to help. There are some patient assistance options available for some of these companies where I encourage the patients to reach out to the company and see what's available if there are some patient assistance options. But other things, my patients, again, they love them, but the hard part is the cost to them. And so, I'll have patients that will let them wear a sensor for 10 days or two weeks, give them a month off, throw another one on. And so that cost is not as frequent. But again, as there are more and more technological advances with the CGM specifically, I'm hoping that price is going to continue to come down where more and more patients can access it. And that's where these over-the-counter options, I'm hopeful, will have good price targets because that should be improving that access to it. But I definitely think we need to help push that need for these devices for those who might not even be on insulin. Again, we talk about the long-term health of people understanding what their glucose is like, and that long-term health is extremely beneficial if they know what's going on now. And so, pushing insurers to cover for these devices, even if they're not on insulin or maybe even in that pre-diabetes range would be great. So, let's with CGMs, and insulin pumps. Again, insulin pumps are fairly expensive devices. There are not only the upfront costs, but monthly costs with your insulin, your reservoirs, and your sites, there are ongoing costs with that. And so again, as that technology improves, as it moves more towards software updates where maybe we can hold onto the hardware longer, hopefully, that'll help improve some access. But insulin pumps have been a struggle in my practice to get access and affordable access where come, October, November, and December when most of my patients have met, they're out of pocket or they're deductibles. That's where we're doing a lot of new insulin pumps because they're not paying for them in that area. But again, with the newest pump out on the market, the Beta Bionics, I'm hoping more competition is going to drive down those prices as more and more are out. But that's still, in my practice, the biggest hard thing I'm seeing is just that access to insulin pumps and costs with those.

PIERCE: Absolutely. And it's such an interesting thought because as a society, our healthcare has been about taking care of the issue when it arises, not necessarily preventing the issue. And so, I would love to see us start looking at ways that we can start helping people who are pre-diabetes not actually become a patient with diabetes.

WELCH: Yep. And that's one of the things I see again is just the lack of understanding from the patients on what's increasing the risk of developing diabetes, right? I get patients all the time that come in and say, hey, I made a great change, doc. I cut out my cereal in the morning and now I'm eating oatmeal.

Great, let's put on this monitor. And then they come back, and they say, my oatmeal is causing my sugar to go up. I never knew, I thought that was healthy. Thought oatmeal was, you know, healthy.

PIERCE: Well, how much sugar were you mixing into your oatmeal so that you could get it down?

WELCH: So yeah, having access, early access to these devices would be huge in a lot of patients' lives just to give them the knowledge that they need to understand what's going on.

PIERCE: Absolutely. I would love to see just a larger push for preventative care, especially in this area, diet, nutrition, and lifestyle changes. I do think that's missing in our healthcare system. So from a healthcare provider's perspective, what steps can be taken to really just integrate these technologies into clinical practice and really optimize their use for improving patient outcomes?

WELCH: Yeah, I'd say don't hesitate to reach out to the companies. I know, I think most of us try away from reps, but get those demo devices. Have those demo devices on hand in clinics so you can show patients what they look like. If you can, get some samples. But the biggest thing is to have your support staff work on getting access or getting a healthcare provider account for whatever CGM you're using, whatever pumps you're using so that you can see that data remotely. This will again allow you to have all the data at your fingertips when you walk into the patient's room, you already have everything. You can hopefully very efficiently go through questions you might have of certain areas you're seeing of concern and make changes right there pretty quickly. It also opens the door, I think, for some additional telehealth-type visits and telehealth medicine for these patients because you can just schedule a video visit, they don't have to come to the office anymore. And it allows you to have more frequent touches with these patients where you're educating them, giving them that education, making therapeutic changes if you need to. And so, to make it seamless, I leverage my support staff, have them kind of manage the online cloud where they're getting all that data, hooking patients up to that cloud so we can see that. Then as the clinician, I can quickly pull it up, get the full picture of, glucose, and go from there and help focus my education on the patient or again, make some medication changes and better improve that. And so, when you talk about seamlessly, if we can get every patient hooked up remotely to share that data, that makes it so much easier in practice and saves a lot of time.

PIERCE: Absolutely. So where do you see these innovations that are evolving, continuously evolving in this field of medicine? But you know, there's a potential that they're all going to converge as far as telemedicine, remote patient monitoring. I know you're saying you can, you know, have access to some of this information. So how do you see this converging in our healthcare system?

WELCH: Yeah, I think since the pandemic, I've had a lot of patients that love video visits and they've been a lot more willing to make a visit if it's a video visit versus coming into the office. And so, as we go forward and again, as this technology advances, a lot of it is focused on data capture and just getting data, whether it's from insulin pumps and we can see what their insulin usage is throughout the day or the CGMs and what their glucose values are throughout the day. It just comes down to data capture. And so having access to that, to that data is huge. And when we talk about AI, I think there's going to be a lot more of, all right, this is AI saying, here's the report. This is where trends are different, maybe consider X, Y, or Z with it. And so, it's going to allow, again, a little more efficient, I think, delivery of the data to the clinician. So, the clinician can more quickly make those decisions and help come up with a better therapeutic plan for those patients. As they converge with telehealth medicine, it opens the door from a billing standpoint where you can bill to interpret the results you're getting from the continuous glucose monitor. And if you do that once a month over a video visit that lasts five or ten

minutes, I think that increases the capture rate as well for clinicians to be able to build and continue to help these patients as they're also making sure they're able to get paid for the services that they're providing.

PIERCE: Absolutely. So, using these technologies that are already out there and seeing, you know, kind of what's coming out and where this is headed, what challenges do you see inpatient care coming with those?

WELCH: Yeah. Yeah. I think challenges one, again, just the comfort level from a patient standpoint and provider standpoint. And so, a way to get over that, I think, is just having those conversations, saying, all right, this is what's out there. Let's look. What's your interest level like looking at an insulin pump? And so that's still a hurdle of that comfort level. Cost, I think, is always going to be a concern. I think in our healthcare world, that's the main thing, right? We talked about medications with patients and cost is almost always one of the first questions that we get, same with these technologies. And so, as we continue to show the benefit of these, I'm hoping that drives down more and more that cost whereas a healthcare system, we're really able to see the benefit this has on individual patient lives where we can hopefully improve that access. So, I think just comfort level from patient and clinician standpoint and costs are still kind of those hurdles going forward that need to continually be addressed. But from a healthcare provider standpoint, I would encourage you not to shy away from going online to these companies, and looking up what they have. There are great tutorials online so you can get familiar with it. Have one of those educators come in and show you what devices they have, just so that you can, as a clinician, make sure your patient has access or knowledge of technologies that are out there that are really going to have an impact in there.

PIERCE: So, as we bring this series to an end, what do you want to leave our listeners with regarding diabetes management? What do you want them to walk away remembering?

WELCH: Yeah, that's a great question. I think the biggest thing is, again, understanding that our patients that are living with diabetes, it's a big stress for them, right? We know it's something they're thinking about day in and day out and giving them access to these technologies can help take a little bit off their plate of that stress they have, the concern they have with diabetes or that constant thinking, if I do this, is it going to impact my sugar? If I do this, what's going to happen? Giving them access to these technologies, I've seen in practice where it improves their quality of life. It reduces their stress. It improves their sleep because they don't have to worry about lows overnight. And so just giving our patients access to help kind of ease their diabetes management journey where they can make better-informed decisions, it's huge. I had a patient just yesterday, in the clinic, very frustrated with his current diabetes management, not feeling like he was making progress. And he said to me, hey, look, I know you help patients with diabetes all day long, but it's different. I have diabetes, I'm trying to make adjustments on a daily basis, but you don't. And I said that's very true. I don't know what it's like day in and day out, right, always have those stressors. But as we give you this technology, I tell my patients a lot, don't worry about checking yours just because you have that data on your phone every five minutes. Don't worry about checking it every five minutes. Let's kind of lessen that anxiety that might come along with it. Let's look at it before you eat, before you go to bed, or if the alarm goes off. Let's just look at it then. And then again, when you come in, we can sit down and look at the full data and make some changes based on what we're seeing. But let's just gather the data, let's give you some tools where you feel a little more comfortable and confident in what's going on that allows you to hopefully take a step back and say, okay, I don't have to focus on this every single minute of the day. I don't have to be anxious about it. I don't have to worry about it. And so that would be my biggest thing

I just to leave is give you your patients access to this technology because it can be very life-changing for them and just improve their day-to-day quality of life as they go on their diabetes journey.

PIERCE: Absolutely. And just a super random question for you. But we're talking about all of these technological advances, and you know, it's kind of like my car. The more things that they put in my car that are electronic that do all these things, the more opportunity there is for something to break and to be expensive to fix. With these pumps and these monitors, the more that we put into it technologically, there's more that can break. What are your thoughts on that?

WELCH: Yeah, that's a great question. That is very true, right? Like there are now thousands of computers in a car that one breaks and it's more and more expensive. Yeah, these devices, again, I think part of the technology advances is more and more we're seeing that they're more reliable, right? It's longer, they're lasting longer. We're not having as many issues as they come out. One thing I will credit towards the companies that make these is, if there's an issue, I have my patients call that company. They'll help troubleshoot it or they'll just send them new sensors without charging. So, they back their products, which is great. Our insulin pumps, most have a four-year warranty on those pumps where they'll cover, assuming the patient doesn't go out and smash it with a hammer or something, but they'll cover issues that come up or things that break. Just recently a patient had to get a brand-new pump after only about six months on it just because it was no longer functioning, and it was under warranty. So, the company backed it and gave them that. So, no cost to the patients on that. Where that's really good. These companies, I think, have a lot of confidence in their ability to make quality products that they are backing it and making sure patients don't have to spend extra money on those repairs or if something goes wrong, they'll help with that. So that's good. And again, the more these technologies advance, the less and less issues I've been seeing.

PIERCE: Good to know. That's really good. Thank you so much. Well, looking ahead, it's really clear that technology is going to continue to play a pivotal role in revolutionizing chronic disease management. And hopefully, as it evolves, it will continue to develop with the goal of really empowering individuals to take control of their health. And, you know, we also see the potential for convergence with other areas of healthcare technology, like telemedicine and remote patient monitoring which holds even greater promise toward personalized comprehensive care. Thank you so much, Patrick, for sharing your expertise and your insight with us.

WELCH: Yeah, thank you.

PIERCE: Well, to our listeners, I encourage you to explore many of the courses that we have available on [Elitelearning.com](https://www.elitelearning.com) to help you grow in your careers and earn CEs.