Empower Your Diabetes Management With Tech Transcript

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Introduction and Rich Yangu2019s background

To another episode of Reversing Tour Type 2 Diabetes Summit 2.0 and your co-host Dr. Will Hsu. Today I have the pleasure of inviting one of the veterans in the diabetes space, Mr. Rich Yang, who has really had an illustrious career in the medical technology area.

I know that on this show you've been listened to, you've been listening to a lot of folks in clinical medicine, But I think you, the listeners, want to take control of your diabetes.

You want to know what's coming. You want to know what's at the cutting edge of technology. So today we have a treat by the invited rich to come and join us.

Rich, welcome to the show. Thanks, Will. Happy to be here. Really thoughtful introduction in thoughtful kind words. So appreciate it. You know, when I think about like when I take a look at the landscape of diabetes today, I think of like, you know, I want to ask somebody about what's hot and what's good in the diabetes space.

From a technology standpoint, I cannot think of a better person than to come to you Rich. Tell us a little bit about your history, your journey, and what are you doing these days?

Sure. You know, I'll just keep it very simple and very quick, so emerging. I've been in MedTech for 25 years. I learned a lot about the diabetes space, actually from you as my mentor for many years when you were at Joslin Diabetes.

And so the first part of my career was in product marketing. One of the early product managers for the CGM category and was at Medtronic for almost eight years and really learn the ropes on the ins and outs of medical devices, medtech insulin pump therapy in the great products that Medtronic continues to get out in the market.

I had a great chance to spend a nearly a decade at Dexcom and and again, a great technology we had a chance to take from the early years when I joined and spent about a decade and left in 2017.

I had a chance to join from there and open my career or expand my horizon a little bit and get some exposure over at Foxconn and for a couple of years in.

And that said, that's the manufacturer for the iPhone. They are there a bigger view of tech, health, tech and consumer tech combined so and we spun out a venture fund from that experience.

And bilinguals are only non-revenue generating investment so invested in two rounds of buy only in the early years. And three years ago, one of the co-founders, Jared, had asked me, Jared Penny, one of our co-founders, our current president and chief technology officer.

He asked me to come in and join him on this journey as CEO and couldn't be more humbled to be here working on this platform with intradermal continuous sensing.

Well, that was it. And such an impressive background here that you brought in a lot of words we want to clarify then CGM stating for continuous glucose monitoring.

Now a CGM used to be such a new idea, but now it's such a hustle technology as well, you know?

How CGM evolved over 25 years

Yeah, yeah, yeah. You may be wondering. Yeah. Rich, you may be wondering. A lot of the listeners to this show

wanted to reverse their diabetes and yet in the process they still need to know where their blood glucose is.

They want to know what trend of their glucose improvement is, right? Is it getting better, is not getting better. And so data becomes such an important decision makers.

Right. And also a feedback loop to your behavior change. So tell us broadly, Rich, about this this glucose monitoring field. You've been in this for 25 years now.

Certainly we've witnessed some of the biggest dramatic changes over the years. And so take us through a little bit of that journey. What was it like and where are we now?

Yes. Wow. If we go back to 1999 for the very first CGM, it was wired. So you were tethered to a piece of hardware with the sensor connected to it, and it was blinded mode diagnostic only.

And so we had a chance to travel the world and teach endocrinologists and collaborate with endocrinologists and how we can use this information to drive better outcomes in modifying therapeutics and regimens and the world class, insulins and medications that have been available.

And so it was real extraordinary experience to then go to Dexcom and see the amazing work done by the JD. RF in really driving the outcomes needed to get continuous glucose monitoring reimbursed.

As you know, it's a very expensive proposition to run large outcome studies with this technology. And because of all of that work, companies like Dexcom, Medtronic, Abbott now have reimbursed platforms and glucose sensing and continuous glucose monitoring.

But a real leapfrog came when the technologies became mature enough to get to factory type of no calibration platform. And what does that mean? Help our listeners to understand the factory calibration?

What does it mean? Why is it important. In a Fingerstick is really have been the gold standard for a very long time decades and so fingerstick with glucose meters were still required to make sure that the continuous glucose monitoring systems were still reliable and accurate.

And so in the early years of CGM, finger sticks were needed to calibrate and it was several finger sticks a day. Then it got cut down to, you know, one or two finger sticks a week.

And now you have sensors that lasts 10 to 14 days and no calibration at all. So anything we could do to remove the the need of fingerstick, you know, is a huge barrier for for those that are not so comfortable with doing it so frequently.

And so the ease of use for the technology today, the accuracy in the performance, it's really quite astonishing to see how far this has come over the last 20 years.

So certainly has brought benefits that many people living with diabetes now. But I remember when I was in practice prescribing continuous glucose monitoring of monitors for patients with non insulin was such a challenge, right?

So most of the people that are listening to our show today actually do not have type one diabetes. They have type 2 diabetes. No. And so the cause has been a problem.

You know, although many people want to have the benefit of having a meter that continuously tracks the glucose without having to reach for the stick and trigger finger.

Right. So so what do you think what do you think the industry's goal, Rich there's been so many also other interim technology they have, they're promising to be very helpful from light skin using light spectrum to you can imagine, I mean, even a contact lenses that they're supposed to be able to monitor, to monitor blood glucose, but they haven't really become sort of the mainstream at all.

What are the challenges in measuring glucose? Let's kind of take a little bit deeper, dive into the technology aspect. Yeah, and actually the Type 2 diabetes are non intensively managed, not on insulin.

This is a frontier that is very important to companies that are working on technologies for continuous sensing. You know, the pathway to noninvasive sensing has been really difficult and challenging.

We haven't seen one get through the FDA in in 20 years where we've seen a lot of press releases and a lot of research and science around it, but still not quite there in terms of a viable product to expand the use of continuous sensing into people that are not on insulin.

And the the current devices that are approved today for people using insulin are also wonderful devices, very accurate. And and, you know, one of the biggest barriers is really the ease of use.

Right. Could could it be less complex? Could it be easier to prescribe?

Challenges of glucose sensing and noninvasive monitoring

Could it be, you know, easy enough to put on like a band aid from home in not have hours of training behind it? And there's multiple assets to this from the user experience with the device itself, the the perceived anxiety around trying something new will it hurts.

Is there a needle attached to it? What does the data mean to how people look at information around health care? If you're not on insulin? And especially around metabolic health?

So what does the information mean to those that are not on insulin? In other words, you know, what does it mean if I'm very high for extended periods of time, what can I do about it? Right.

So there's really two, two really main questions that need to be addressed coming from industry in terms of innovation, which is, you know, am I okay and what do I do?

Simple as that. So there could be a solution that lets you know in real time, Are you okay? Good. That's a check in because, you know, especially with type 2 diabetes, a lot of the time people don't feel sick.

So why take medications or a daily pill if I'm if I'm not feeling symptoms and not sick. Very similar to I'm not going to be taking an aspirin if I don't have an headache.

Right. So adherence becomes very difficult if you're not having relevant information for you to consume and digest and understand. And what other better pathway than have a continuous sensor that's giving you real time feedback.

So I think where where the technology is going and I think where it should really go is to really address the three fundamental tenets of sustainable behavior change in cognitive restructuring.

And so, you know, I think this is behavioral science principles that have been around for a very long time. So it's nothing new here to your audience.

But three things really need to happen to support cognitive restructuring real time feedback. That's an obvious one, passively so passive, real time feedback when teachable moments arise.

So if I can get this real time metabolic health feedback immediately after I drink a glass of orange juice, I can see what that does. Sorry, my my office light is dimming.

I've got this motion sensor here, so yeah, but if I can get that real time passive feedback after a glass of orange juice, I can then understand my relationship to foods like orange juice right now.

And then, you know, if I can understand my relationship with activity like exercise and if I can understand my relationship with the medications I'm taking in, I can do that in a convenient way, cost effective with passive real time feedback.

That is the innovation that would inspire opportunities for people to reverse diabetes. Right? The cause and effect relation is everything. You know, we reach.

I think what you said is really so timely, right? So our society right now, it's in the age of information overload. We're getting so much information, but even glucose information as well.

If you get a reading that spits out to you, you know, that gets captured every 5 minutes or so, I mean, that that's a that's a lot of data. How do you digest that?

And and I think the challenge for a lot of our our listeners living as people with type with type two diabetes is the fact that what do you do about it but what are what are the actionable information they can use?

And that's truly challenging. So so now we've outlined the questions. We will outline the problems, what are the solutions? Where is the industry going right now?

There are two dominant brands and there are some other emerging companies, but very much still the same technology, right? You have continuous glucose monitor.

The size is getting smaller. It's still involved in the insertion into the tissue. Right. Is still you still feel a little bit of that, that invasiveness right into the skin.

And then there is also that this kind of the profile of of the CGM that sometimes you can you can pop into a wall and knock it off. Right. I mean, it's helped a lot of people, but the where are we going as industry?

I know that you one of the the most innovative companies in this space. Tell us a little bit a little bit about bio Lincoln and what you guys are doing right now.

Sure. Thank you. So Mylink was founded almost 12 years ago by two PhD students out of UC San Diego, Joshua Winn Miller and Jared Tangney, and as co-founders, they really went about an orthogonal way to look at sensing and because they didn't have any historical context coming out of their school programs, I think they they went excuse me, they went after Moonshot, meaning, you know, they looked at how to take a different approach using Silicon Microneedles.

And this is really looking at a scale opportunity, the likes of which the world has not seen before for by wearables.

MyLynku2019s microneedle sensing approach

So how do you etch microneedles out of a Silicon start material and have independent standalone electrodes across an array of these micro sensors that are so small that it sits right on top of the capillary bed?

So, you know, they have known that the most metabolically active tissue in the body is the upper strata of the particular dermis. The papillary dermis is where the microneedles reside.

And that's part of the skin. Yes. And if you if you can have micro sensors that can be put on without any pain, it doesn't go deep enough to cause any bleeding.

It doesn't hit any capillary tissue or bed. But we're sitting on top of the capillary bed. There's really good perfusion and there's no lag time for glucose.

And glucose information is really easily accessed with electrochemical cells and sensors in this space. That was their dream hands circle in to show how they're so rich.

And I need to interrupt you for a second there because our listeners are just like their eyes glued to the to the monitor right now. So when you say microneedles, I mean, how micro are they?

I mean, how severe when you talk about needles. Yeah, really, really, really small. So let's use a human, but let's use a strand of human hair as an example.

So each one of the microneedles that are, that were developed under this under blink are about 200 times smaller than a human hair film. Yeah, 200 times smaller.

And there is an array of these micro sensors that are on a two millimeter by two millimeter dye, and that is what is at the base of the sensor. And when on the skin, you really don't feel anything.

And so it doesn't go deep enough to draw any blood. It doesn't go deep enough to hit any nerve endings. They don't feel any pain is probably the closest you can get to a noninvasive experience, but really still powered by electrochemistry.

And by the way, I must have a disclaimer here. Bionic is still not yet approved or cleared by the FDA. So this is still an investigational device. It's come a long way over the last 12 years.

And, you know, I've been an investor here for a number of years. But three years ago, coming in as an operator alongside of Jerod Tangney, who is now our president and CTO, the the opportunity to access this compartment of the skin is really where the big win. It's now the sensors that people are willing to use are the ones that will really drive the large majority of the volume when looking outside of, let's say, insulin using people with diabetes.

And I would argue the value propositions that come from having an array of sensors for the redundancy to make sure that what we're sensing is accurate and reliable continuously has a substantial value to people on insulin as well.

In addition to not having any potential scarring from, you know, having filaments on the skin, whether it be you no longer, you know, infusion sets for insulin delivery or longer wearing glucose sensors.

These micro sensors really don't go deep enough to cause any scar tissue. So insulin absorption has been very important for people with insulin. But for people that don't take insulin, it's really that that noninvasive experience.

You know. Very little training, easy to deploy, can't feel it. Well, this is such a promising future. I think a lot of our listeners, although not many people that take insulin in this crowd, but people want the information and not only for medication adjustment, but really for lifestyle change as well.

Right. They're looking at what they eat, how is it impacting on their blood glucose and whether how their activities is is really helping them? And so the idea of now is invasiveness.

It's very appealing because because you're not using that to adjust your medication. So your your tradeoff, right. Your willingness to trade for a needle insertion now changes, right?

You want something that's easy and that's and that's helpful. So a lot of people have it. So I'm sorry to interrupt you. I was going to say technically still considered minimally invasive.

Yeah. Even though the experience is really not, but technically considered minimally invasive. When you think about the depth of that insertion that's so small than the thickness of a hair, I think that's going to be a really different experience.

Right? Right. No introducer needle is required to place it into subcutaneous fat, Right. One of the are the other tier of of a microarray. Well well we know.

Well thank you for disclosing that this is not yet commercial. But I think the purpose of this conversation is to let our

listeners know what's coming.

Right. So, yeah. I feel in terms of what's coming, you know, we're now in this world of, you know, there's just metal information everywhere. And so a lot of wearables out there.

And I mean, the progress that Apple Watch has made is extraordinary with all of the information now on your wrist. So but there are so many different devices that need to be integrated and synched on the back end.

So, you know, one of the promising opportunities is to combine all this information into one single wearable. So because a company like Breitling didn't have any legacy hardware or manufacturing to begin with, there is really no limits to how we architected the technology stack.

So knowing that context is important, we were able to design a wearable with continuous glucose, with redundancy built in, but also with activity built into the chip in addition to sleep and temperature.

Toward integrated metabolic health wearables

So understanding context around your metabolic health provides the the deeper insights to inspire and inform inso the economies of scale are here to do it, the off the shelf technologies are here to do it, and we just combined it all on a single device.

And that makes it easy for anyone to just have this information available without having to orchestrate a synchronization of five different, different, you know, device.

Cells or wear five separate devices, right. Then ten different apps to combine everything and then try to translate all the information from that. So it's one of those things that have been that has opened my eyes.

This is the first time in 25 years, 20 of those years and sensing where I can actually see context around my metabolic health and for example, one of my glucose levels are high posts and an unhealthy meal and I walk around for 15, 20 minutes.

I can see the direct correlation of that walk and seeing my glucose levels drop all under one visualization without having the time sync things off of my other devices.

And that's been really extraordinary for for us to see, especially those of us that have been in the space for so long. So, you know, we're really missing color, right?

Yeah. For sure. Without having that additional context. Know even in the days of episodic glucose monitoring when you have to prick your finger and there are offerings out there that look for more than glucose.

In fact, you can also check ketones. And that was really helpful for people with type type one diabetes where ketone and glucose levels were both helpful and yet they used two different strips but it's still the same meter.

Okay. So is it in store for the future for technology that looks at microneedles and other sensors? Can you speak to that? I think industry as a whole, everybody's pursuing additional analytes.

I mean, the most stable form of continuous monitoring has been glucose because of the characterization and availability of glucose oxidase. The foundational enzyme used to sense glucose.

And so enzymes are very finicky. And so it's been very hard for industry to come up with new sensors that are enzyme based. There are so many natural enzymes or a limited number of natural enzymes to use to sense things like lactate, for example, with lactate oxidase glucose, clearly glucose oxidase have been been around for decades and decades, very well characterized and performs very well.

But it's every time you try to sense a new analyte, it's a whole new chemistry. It's a huge undertaking to stabilize it

for in-vivo sensing and to have it dry storage and shelf life and for it to perform with or without calibrations.

And it's an entirely different chemistry in so the value of other analytes is is huge. Now combining multiple analytes under a single device, that's even a greater orthogonal challenge that hasn't really been solved, although very, you know, being in the spotlight in terms of funding in academic research.

But no company really has yet taken advantage of the new economies of scale, the technologies that are out there to sense other markers and outside of enzyme based electrochemistry.

So I think, you know, we're in the first real decade in human history where we can now synthesize biology. You know, biology has been an observational science for human history up until this decade.

And so there are a lot of new, exciting opportunities to synthesize biology and to leverage these technologies and put them on and sensors to tend to measure other biomarkers that traditionally have not been possible.

There's been a lot of academic research around this for for many, many years. And now is the point in time where the platforms that can leverage these technology, these and deliver them into sensing in vivo continuously, this is all at the forefront of what's to come in the next decade ahead.

So I mean, getting to a continuous metabolic health panel on one array of sensors as an example, it would be extraordinary. I mean, for both people that don't use insulin and for people on insulin, I mean, activity is a huge part of driving glucose levels down in understanding when that happens accurately, combined with other measures like lactate, like ketones and glucose, all combined in one that, you know, those opportunities now are now in front of us.

The next. Well, Rich, this has been such a helpful conversation. I think the intent for this interview with it is really to instill hope in people who are listening to us right now.

They're they're living with diabetes that they're trying to they get to the cutting edge of reversing type 2 diabetes. And but just to know that there are folks working on new generation technology.

And what we heard from Rich is that it's not only integration of all the the technology, the platforms, the ability to sense multiple analytes and also the desire to integrate all these functions from sleep to activity is to dual position to to you name it, whatever that's possible right now.

And there are great technologies such as Apple and others, that platform that's already there for integration, back end integration.

Personal motivation and the future of diabetes innovation

This is truly a great time for a next generation of technology, a new paradigm of care to emerge Rich lastly, I always wanted to end we with a little bit of a personal note, right? So I came out of medicine into into my current company to help drive the category defining science and products and services so that we have a new path to disease reversal.

What really drove you Rich as a person, right to to come in to work at a company like this, to drive forefront of technology to the next stage? What tell us a little bit about the human side of you.

Well, what what makes you take what's driving you from day to day? Yeah, thank you. It's very personal as well for me. And it really relates to impact growing up.

They've had very close best friends and personal friends and family all in this fight against diabetes. And it is probably the most dynamic chronic disease where there are so many facets to this that not any one thing can really provide the kind of support and relief for the day to day management of diabetes.

It's just such a huge global pandemic. It's probably the first real disruptive pandemic that continues to grow around the world. And so the commitment has been a lifelong passion for not only me, but everybody here.

The many former colleagues I worked alongside at Medtronic in Diabetes still continue to fight in this space, but bringing innovation to the masses has been it's difficult.

And I think any time you work on something that's worthwhile, the large majority of the time it will be orthogonal ideas and concepts that nobody's ever done before.

It takes not only tremendous patience and I'd say perseverance, but a certain type of person and a team that could withstand the nuances of taking innovation to market.

It is not the fast journey, especially in diabetes, the amount of investment time, resources in invention to bring something orthogonal to market. As you know, in diabetes specifically, you know, 99.9% of the companies that are pursuing continuous sensing have not made it to the finish line in the last ten years.

Know regardless of how much money has been thrown at it, it's an incredibly difficult problem to solve. So win we never lose sight of bringing innovation to the masses.

So global health equity is something that we continue to chase after we're not done until everybody that can benefit from a sensor has access to it. And so we still have a long way to go.

So 20 years in sensing hasn't been nearly enough. And so I think for for you, for introducing me and teaching me about the diabetes world and the impact we can make many others that have mentored myself and in the many peers that I've worked alongside, this is a horrible, horrible disease.

And I think we're finally in this generation where we can beat it. And so a lot of new technologies on the horizon and we won't stop until we get this in the hands of everybody that needs it.

I love it. 38 million lives battling against diabetes on an everyday basis. I think we together, people coming from all walks of life, even from technology side, offering hope and new solutions.

People for people living with type 2 diabetes. Rich, I want to thank you for the time you spent with us. Thanks, Will. Always a privilege and thank you for your time and have a great holiday weekend ahead.