2 - Mastering Control-IQ – The Spider-Man of AID Systems

John Pemberton (00:09.966)

Welcome to the Glucose Nevel Ice podcast where science meets real life experience to empower diabetes management. I'm John Pemberton. I've lived with type 1 diabetes since 2008 and have spent nearly 20 years mastering both the science and art of managing it. Through personal experimentation, published research and my work as a diabetes specialist dietician, I've gained deep insights into what truly makes a difference. When my son Jude tested positive for type 1 diabetes antibodies,

I realised that all the knowledge in my head was wasted if I couldn't communicate it in a way that was clear, actionable and easy to come back to. So I built the Glucose Nebuliser Education Programme, a free online resource designed to teach people diabetes management exactly the way I'd want people to understand it if they were looking after my son. After battling a functional motor disorder for many years and recently experiencing a major depressive episode, I was eventually pulled out of that hole by my friends, family and professionals who helped me get back to being me.

That experience taught me the power of giving and this podcast is my way of giving back. My co-host Louise is a highly experienced diabetes nurse with over 20 years in the field. She brings a wealth of knowledge and her superpower is making complex diabetes science accessible and practical for everyday life. She is the best diabetes nurse I have ever worked with and there have been some good ones. Most importantly, she keeps me in check and keeps the podcast on point. So if you're living with diabetes or supporting someone who is,

We want to make things easier, clearer, and importantly, more enjoyable. We hope you enjoy the content. If you do, please share it with those who may like it too. As a disclaimer, the information shared on the Glucose Nebulize podcast is for informational and educational purposes only. While we discuss strategies and insights for diabetes management, this podcast is not a substitute for professional medical advice. Always consult your healthcare team before making any changes to your diabetes plan.

That done with, let's get into the content.

John Pemberton (02:13.774)

Glucose Nevelized episode two, and this is all about the tandem T-Slim with control IQ. Essentially, with great power comes great responsibility. So just a bit of a recap from the last session, Louise and I went through what AID therapy is, the four systems available, and maybe some decision-making criteria. And then what we said we'd focus on the next few episodes is each of those systems, a little bit more of a deep dive into how they work, and most importantly, how to get the most out of them, either as a person with diabetes

or as a healthcare professional who's supporting people who are using this system. So you've got any reflections from the last episode? Anything you want us to think about? No. Okay, that's fine. So I guess we'll sort of kick off with really the tagline for that, the tagline for the control IQ, which is with great power comes great responsibility. And we talked a lot about in the last episode of the beauty of the T-SIM and the control IQ is that the user sets the basal rates.

which then determines where the algorithm starts from. And then the correction factor, which is the insulin sensitivity factor, is the thing that drives how aggressive or how weak the system is at tackling high glucose levels. So it puts the power in the hands of the user or the healthcare team who are supporting the user, which in theory is fantastic if the people who are doing those are skilled, can keep up with things, and can manage it effectively. So...

we're going to discuss some of the functionality. We're going to discuss how you can optimize some of that and then also think about who may be most suited to this. So we talked about in the last thing, what are the components that this are? So obviously you've got the tandem pump to start with, which is obviously the pump with the cannula. And then you've got a sensor. So at the moment, you can use the decks from G6, G7, and I think in the States, freestyle Libra 2 and in some...

I think in the UK soon enough, the Freestyle Libra 2. And as we discussed in the previous session, all of those sensors are ICGM approved, which means that they're the highest accuracy standards. The only difference being is that the Freestyle Libra 2, cannot calibrate. So if that's the calibration of nudging the glucose back into where the fingerprinting device is saying occasionally is something that's of benefit to you, that's obviously where you may think of the Dextrom G6, G7.

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But if you prefer a sense that lasts longer, 14, 15 days, and you don't regularly check your finger brick at all, it doesn't matter. Maybe you prefer the freestyle Libra too. Just from our personal practice, we've been using Dexcom because we find that sometimes the parents and the children like to calibrate, but they certainly don't all do that. Maybe sort of 30 % of our cohort do that. Do think that's fair? Yeah, I think there's a certain...

type of person or family that will calibrate. Like me. Yeah, absolutely. Or if you've got particularly young children or people that might have used a pump previously in open loop therapy without a sensor and those sorts of things. So whereby obviously a lot of our families are going on to AID systems fairly soon after diagnosis, but it's important that we not forget those families that have battled.

previously on MDI, a pumping open loop and then seeing the event of the centres coming in as well. So we'll just give an overview of how the algorithm works. Apologies if we get any of this wrong, but this is the best we can do. So essentially the algorithm takes into account quite a few factors, the glucose level, where it's trending, how much insulin is on board, and then what it looks like is 30 minutes into the future.

And if the 30 minutes into the future predicts it's still going to be between 6.3 and 8.9, it just continues at the current basal rate that it's currently running at. However, if it predicts it's going to be above 8.9, then it will start to increase the basal rate based on the correction factor using that as the main driver. If it's predicted to go above 10, it will put an auto correction in of 60 % of what it believes is required, but it can only do that once every hour. So that's maybe not as aggressive as some of the other.

systems, however it does, give those extra correction doses as required every hour if the glucose level is predicted to be above 10. On the flip side, if you're predicted to be below 6.3 but not quite hypoglycemic in the next half an hour, it will reduce the basal rate. But if you're predicted to be below 3.9, it will then suspend the basal rate when you're predicted again half an hour into the future. So essentially, as all these systems do, if you're going to go up

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it puts more insulin in. If you're going to go down, it reduces or stops the insulin. But there are the specifics on how the algorithm works. So I guess in simple terms, what we can think about is there's two measures that it can put into place to reduce higher glucose levels. So it can increase the basal rate based on that current sensitivity. But if that's insufficient, or maybe there's been a misblowless for food, it will add a correction in.

And then on the converse side, it's obviously looking at where it is in the future and then we can suspend that insulin going on in the background as well. And that will all be done without necessarily knowing that that's sort of happening in the background if the pump wasn't looked at, I guess. And it does have two other modes. It has exercise mode and sleep mode. So when you put the exercise mode on, essentially it just puts the target a little bit higher.

about where it decides to put those increased basals and increased correction doses. So it doesn't allow them to happen as soon as I think it's something like it only then predicts if you're going to be above 8.9. 8.9. Yeah, 8.9 and it'll put a bit more in. So it just gives you a bit more protection. One thing to say is it doesn't stop the auto corrections though. So those still can happen. So what a lot of people do for activity is just do a tiny manual bolus of 0.05.

And then that stops the automatic correction, both that goes in as just a pro tip for you. Sleep mode, do you want to go through that? So suppose there's quite a lot of confusion sometimes

about sleep mode in terms of thinking about when it should be initiated to come on. So you can set sleep mode on to come on over.

different days. So if you go to bed, for instance, much later at the weekend, Friday and Saturday, then you might programme sleep mode to come on at say 10 o'clock. It's important to enable it to come on at least, do we say, about two, three hours after that last evening meal or last sort of meal time bolus, because when we're in sleep mode, it won't give automatic corrections. So that's just something to bear in mind. So if you have

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a person that's going to eat particularly late at night, it's probably worth delaying that sleep mode a little bit. But then it does the, it targets a slightly lower glucose sensitivity range. So 6.1 to 6.6 overnight. So you might think, cause it's not going to give automatic corrections. I won't get as good control, but actually it targets that glucose level to be a little bit lower overnight by using the

programmed insulin sensitivity for that time of day. So that's, I would say that's like a massive advantage of this pump in terms of what we can see overnight happening without the user really needing to do anything. So yeah, there's a standard mode we described is the exercise mode where the increase in insulin won't happen as often. And actually if you're predicted to be below 4.4, it will suspend the insulin. So again,

offers more protection from that perspective. So that's the nuts and bolts of sort of how the algorithm works. And again, going over the pros of this system, as I've described, not only can you have this one profile where you set the basal rates and correction factors, you can set up multiple profiles. So for example, if you're someone who does a lot of activity on a Saturday, you can set a profile that has basal rates that are 50 % lower than your other setting and correction factors which are 50 % less aggressive, the same with carb ratios.

So again, you can just flip to that profile on the Saturday morning and you don't have to worry about setting exercise modes and worry about reducing boluses. So you can do all of that. And again, this is fantastic for the engaged user and the healthcare professional team that are really on top of those things. On the flip side, if you're not a user that wants that level of interaction and a healthcare team that are like, wow, know, kind of this person's come back.

with three different profiles and we need to up the incident on all of them where do I begin it becomes more challenging to get on top of those things so again with you know with every pro there's a con from from that perspective yeah but I would probably say that is one of the most unique and positive things about this system the fact that you it's not learning every day like

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the other systems. So it is that you can literally flip into a different profile at the weekend and not worry that that's then going to impact how your glucose control is going to be on a Monday morning. Obviously providing you flip back to your school profile or whatever. But it does, like John says, rely on keeping those sort of profiles up to date. And I guess that is about being able to look at your downloads from a healthcare professional point of view and knowing that they've got those different profiles.

and what, you know, which one needs changing and those sorts of things, which can be a little bit more labor intensive, I guess. Yeah. And I think as we mentioned on the previous podcast is one of probably the cons of this system is it has an active insulin time of five hours, which means if you've given your bolus probably a bit late or underestimated your carbohydrate, because it doesn't differentiate between insulin for food and correction insulin, it thinks that all that insulin that you've given is going to bring, is basically correction insulin, when actually a lot of it is to do with the food that's in your stomach.

So people can stay sometimes to get a bit frustrated with the pedestrian nature of how aggressive it is or lack of aggressiveness for the after meal highs. People get around that by doing fake carbs, making the correction factor stronger. It's just something to be aware of. It's like anything. If you understand the challenges, you've always got a solution to manage it. So it's just to be mindful of that really. Absolutely. Absolutely.

So our top things really for optimizing control are first of all, get your first profile bang on by making sure you get your basal rates and your correction factors working well as is required. And then really from that point, if you need another profile, definitely do one. But the real big learning that we got was we were probably messing around with the basal rates too much and not focusing on the correction factor. When the research came out to say the correction factor is the thing that you need to optimize.

we noticed I think a significant improvement in terms of timing ranges because the whole team were kind of on board with making the correction factors more aggressive, which in reality on old style pump therapy, that was the last thing that got adjusted. Now it needs to be the first thing that's adjusted. So it's a bit of a mindset shift. Yeah, definitely, definitely overlooked. think people traditionally when we were adjusting, were much more confident in adjusting bais or out, which actually is going to make...

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little different really or less different to that incident sensitivity. And I guess the other thing you think about handling high fat and high protein meals, the good thing about this pump is it does still offer an extended bolus function. So we know and we'll link into the show notes that high fat

and high protein meals will cause the delayed food into leaving the stomach and also causing some resistance. So you often see a real glucose spike later on. So we often teach to

increase the carbs that you're eating by 25 to 50 percent but do an extended bolus over two hours. So in this case if someone was eating 100 grams you would dial in 125 or 150, split it half up front half over the next two hours and that along with the algorithm can really ensure those delayed highs are kept on top of. So again that is an advantage of this system it does offer the extended bolus function as only do it over the two hours currently that's the max but it is the only one I suppose that you can do it like that. Yeah.

I mean, obviously, exercise conditions, you want to make sure you get the exercise mode on 90 minutes before you start, ideally. But the benefit of being able to have separate profiles does make this quite unique for people who certainly do very, very different days on the weekend compared to the weekday. So if you're a weekend warrior on the exercise front, this may offer some advantages for you, certainly.

So I guess, yeah, those are the key things. We'll obviously cover more in the top 10 tips that will be helpful for people who have choosing a control IQ or have already chosen one. But I guess our sort of takeaways would be with great power comes great responsibility. Those people who want control and flexibility have to kind of do the work to make sure that the settings get optimized for them. So it's kind of a choice around that, would you say? Yeah, absolutely. The other couple of settings in terms of the weight and the total daily dose, how much

Do they play into the algorithm or are going to talk about that? No, I don't think that's a really good question. So I think like most clinics and most people, the kind of the total at the beginning, get your total daily dose and you're waiting. And we were doing that as you need to do at the beginning to give the algorithm some parameters. But we went to a specialist T-SIM session and the head guy from T-SIM was basically saying after the first kind of week, it makes no difference. So it's probably good to keep it updated.

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But the reality is it's going to make very, very little difference because it's the basal rates and the user set correction factors that drive everything. It's just really safety settings as I understand it from the initial as it gets going. Initiation. So that's it for this podcast. The next one is going to be looking at the deep dive on the Medtronic 780G, the hope, looking at its strengths, its weaknesses and why people have chosen it, how to get the most out of it. And so we hope you'll join us then.

Peace.