The Diabetes Rollercoaster

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Dr Emma Wilmot
Hello. Welcome to the diabetes rollercoaster module. You may be wondering what that's all about but if you hold onto your seats, you'll find out soon. My name is Emma Wilmot and I'm the chair of the Diabetes Technology Network and a consultant diabetologist in Derby.

Nick Rycroft
I'm Nick Rycroft, a type 1 diabetic and co-founder of the Derby type 1 diabetes group.

Dr Emma Wilmot
So, I'm going to hand over to Nick who's going to give us his perception on the diabetes rollercoaster.

Nick Rycroft
Anyone with type 1 diabetes will recognise many of the graphs shown here. This is what we talk about when we talk about the rollercoaster and most of us have been there done it and got the t-shirt several times. But with the introduction of the Libre data, you can start to understand and maybe find a way of actually making changes to your regime which will allow you, in effect, to control this.

So, let's have a look at some of the reasons why it might happen. Here we have a list of the sort of things that could influence and create that rollercoaster or fuel it. Let's take a look at a couple of them with regard to what might actually happen. Snacks when we don't bolus is a most obvious one, but we sit there in an evening and sometimes you might eat a few biscuits and we forget to bolus for those and suddenly we find our blood glucose is going skyrocketing. And what happens is, we then panic, we probably end up doing something to correct it and we might end up with a problem later.

In addition, let's look at alcohol. We all like a bit of alcohol now and again but the impact of that overnight can be, for some people, quite serious and often creates the opportunity for a hypo. And we all know what happens when we have a hypo at night, is we tend not to be patient. We want to raid the fridge and get all the snacks that we can and what happens is we're back on the rollercoaster again. So, if you thought this was a list which was a lot of things to consider then looking at the next slide you can see that there is a lot for us to work through.

42 factors have been identified effectively making impact on your blood glucose. So, if you want to get the roller coaster under some form of control, we need to understand what are the things that we can influence.

So, let's look at the high rapidly rising glucose. The sort of thing that could cause that, common causes, would be a missed bolus where we've snacked, we've forgotten to take some insulin for it or we snack and we take the insulin afterwards when we suddenly realise. But the first time that we do it, it's most likely because we're running around sorting the kids out wondering what we're going to do for tomorrow and we just simply forget and what happens is we end up with a high which rapidly overwhelms us in an evening.

If we go out, for instance, on an evening out and with a meal and it might be to a takeaway that's not one that you know or a meal that you've got no idea what the carbs are, then you going to have to guess and again this will impact potentially on you getting on to that rollercoaster. And then what will happen is, if you're not careful, you go back as we said into a hypo situation later where you would over correct. And obviously, just to make note, that if you are on insulin pump one of the reasons that this might happen in terms of the high could be a set failure.

So, just to look at those things that might influence or might be common causes for a rapidly falling glucose. Remembering that a corrective dose given when you're panicking with a high could be the first thing that's going to force you down quickly into a low and on the basis of that, corrected doses need to be considered on the basis of how long they take to act. Patience is a really important part of anything that you do with regard to getting off the rollercoaster.

And stacking of insulin. We all know that when we have insulin in our body, that if we have another meal and we have it rapidly after the first, that there's insulin on board in our system. And if we're not careful, then we can effectively stack that insulin and we find the effects coming through as a rapid drop in blood glucose later. So, at this point I'm now going to hand over to Emma to go through a bit more detail.

Dr Emma Wilmot

Thank you, Nick. So, here is an example of some Freestyle Libre data that has been downloaded in clinic. And there is certainly a bit of a rollercoaster going on here. So, let's look at it in a bit more detail. So, you can see that on the first night, there's a large drop in the glucose from above 20 down into the hypoglycaemic range quite quickly and this is quite often the pattern that you see when a correction dose is too much. Like Nick said, the fridge is then emptied, the glucose rises quickly, and this person's glucose runs high throughout the day. There is then another correction dose given later, and the glucose comes plummeting down resulting in a hypoglycaemia again. And this rollercoaster effect can make people feel really lousy and also contributes to higher HbA1c overall.

So, the question we all need the answer to is how do we get off the rollercoaster.

Number one, prevent the hypos. And the Freestyle Libre is a really good device for allowing you to do that. By scanning frequently, you can see when hypos are coming and take action to prevent them.

Then we need to think about how we prevent those highs. So, try not over treat hypoglycaemia is one option but also ensuring that when you consume carbohydrates you always cover it with a bolus insulin and try to give that bolus 15 minutes before you eat, if possible. I realise that that is a really challenging thing to do. And try to be as accurate as you can when you are carb counting and deciding what bolus to take.

So, here's an example of hypo over-treatment. On the left-hand side, you can see that this person has become hypoglycaemic and they have continued to scan during that hypo. The disadvantage of relying on the Libre when you are hypoglycaemic is that there is a 5 to 10-minute lag. So, it will continue to show that your hypo even though your glucose might actually have gone back into the normal range. If you continue to treat your hypo during the time it's showing you are hypo, you have a massive rebound high as shown here.

Ideally you want to have the scenario as shown on the right-hand side where you become hypoglycaemic, you rely on your blood glucose, and you give your 15 to 20 gram treatment and your glucose comes back into the target range.

So, when it comes to preventing hypos, scanning regularly is absolutely key. If your glucose starts to drop, stop and think why. What insulin have you got on board, what activity have you done and more importantly, what are you going to have to do to prevent becoming hypoglycaemic.

If you would like some more information on hypoglycaemia, I would highly recommend Pratik Choudhary's module on hypoglycaemia.

Another common cause of hypos is the over correction of high glucose levels as Nick Rycroft mentioned earlier. Remember that your quick acting insulin should take 3 to 4 hours to bring your glucose back to target. If your glucose is dropping more quickly than this, then that would suggest that your correction dose isn't quite right. And you can see in the example here that the glucose starts off high and then very quickly falls very quickly into the hypoglycaemic range. If this is happening to you, your insulin settings need adjusted and if you're not confident doing that by yourself, then reach out to your local diabetes team who will support you with this.

The next step in preventing high glucose levels is to get accurate on your carbohydrate counting. Now this can be easier said than done. If you haven't already, I would highly recommend attendance at a structured education programme. Dafne structured education being the gold standard. There are other opportunities to improve your carbohydrate counting. There are apps and there are websites available that will support you such as Carbs and Cals, MyFitnessPal. And if you haven't recently, then certainly arrange to see your local type 1 diabetes specialist dietitian. If you're still struggling with it then it's unfortunately a matter of going back to the basics getting the scales out and really getting your carbohydrate grams measured down to the nearest gram and trying to be as accurate as you possibly can to try and troubleshoot.

If, despite all of this, you're still struggling with quite erratic glucose levels then think about why that might be. Have a look at your injection sites and see whether there's any build up of fat under the skin. Now this can happen very gradually over a long time, and it can be quite difficult to pick up so it's worth asking your diabetes team to have a look at your injection sites. If you've got a build up of fat underneath the skin related to injecting in the same area, then the insulin will sit there, and it can cause very erratic glucose levels. So, it's always worth going back and having a look and make sure you continue to rotate your injection or your cannula sites too to avoid these building up.

Libre data can really help you if you have lots of variability in your glucose levels. Here on the left, we have an example of where the variability is low. You'll see that the dark blue band is quite a narrow band, and the glucose levels are generally staying within quite a tight range. Compare that to the one on the right where the blue band is very wide. This suggests that glucose levels are varying from low to high quite a lot between days. You can have a look at this on daily patterns in the Librelink app and that will help you work out whether you've got high variability or low variability. Make a plan to try to address the variability and review your data regularly to see whether you're getting on top of it. There's a lot more information available on glycaemic variability in Iain Cranston's module which is available online.

In conclusion, I would like to really thank Nick Rycroft for coming along today and sharing his insights with us.

Nick Rycroft

Thank you, Emma. I think what we would say is that type 1 diabetes is really challenging. On a day-to-day basis we all have difficulties trying to keep ourselves off the rollercoaster but it doesn't go to all according to plan, but we have now more data through Libre which can actually be used to help us understand what's going on.

Dr Emma Wilmot

I think everyone has those large swings in their glucose but it's important to stop and think why they're happening and try and prevent them happening in the future. You have a lot of Libre data there and use it. Try to sit down, reflect on what's happening and reach out to your local diabetes team who can support you with interpreting the data and helping improve things. Good luck in your journey.