



Basal insulin with an insulin pen

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Hello my name is Emma Wilmot and I'm presenting this model on basal insulin and it's designed for people who use the insulin pen therapy.

I'm chair of the Diabetes Technology Network and I'm also a consultant diabetologist in Derby. My disclosures are here.

The objectives for this module are to understand what the common basal insulins are and to understand the desired effect on glucose levels but ultimately, we want you to feel more confident at looking at the freestyle Libre traces and adjusting your insulin doses to match what you see.

The aim of the basal insulin is to provide 24-hour coverage and keep the glucose level steady when you're not eating. Here you can see the basal insulin in green. The basal insulin should make up 50% of your total Daily Dose and the other 50% is made up with your bolus insulin depicted here in red.

Some of the common basal insulins include Detemir or Levemir which are usually taken twice a day or there are some insulins which are given once a day such as Glargine otherwise known as Lantus or Abasaglar. There also more modern insulins such as Glargine U300 otherwise known as Toujeo or Degludec otherwise known as Tresiba.

How do we start to assess whether the basal insulin dose is correct? Ultimately, the best place to start is to look at your glucose trace overnight. If the dose is correct, then the glucose should stay flat and stable overnight. Ideally you want this to happen on most nights but in reality, this is very difficult to achieve.

If your basal insulin dose is too low, then you will see a gradual rise in the glucose levels overnight. If you see a recurrent rise in the glucose overnight on most days, then the chances are you need to increase your basal dose to counteract this. If on the other hand your basal dose is too high, you will see a steady fall in the glucose overnight. If this happens night after night, this would suggest your basal dose is too high and you need to lower your basal insulin dose.

If you notice that your glucose levels take off during the night and you wake up with a high glucose, you may have something called the dawn phenomenon. The glucose starts to rise before you get up in the morning. This can be quite tricky to manage as we know that if you increase your basal overnight it will increase the risk of hypoglycaemia during the night and that's the last thing that we want. So, if this is something that you are struggling with, talk to your diabetes team. There may be other options available for you such as insulin pump therapy for example.



What about if you wake up in the morning with high glucose levels? Don't always presume that this is a problem with your basal insulin. Look back if your glucose is steady overnight and a flat trace, then the chances are that it's the evening before that is the problem. Think about whether you have covered all your snacks with insulin and why you are going to bed with a high glucose and try to tackle glucose control in the evening leading up to going to bed and hopefully then going to bed with a glucose that is in target will allow you to wake up with a glucose that is in target.

The reality is that in type 1 diabetes anything is possible and within a given week you may see every single one of these traces which makes it really challenging to get it right. However, the Freestyle Libre gives you the ability to gain a better understanding of all the factors that contribute to your glucose traces.

Here we have an ideal scenario, a nice flat stable glucose that is in target overnight. But do not feel dismayed if this is not the case for you as this is the Holy Grail of type 1 diabetes therapy and it's not possible for most people on most nights.

What you want is a basal insulin dose that will keep your glucose cruising at your desired altitude. However, there are many many factors that cause turbulence in the amount of insulin that your body needs to keep the glucose levels stable. Some things reduce the amount of insulin you need such as exercise, standing, alcohol, being more relaxed, and some things increase the dose of insulin you need such as stress, illness, sitting around more, pre-menstruation. However, using the Libre, you'll be able to visualise the impact of these factors on your glucose and gain further insight into how you might need to adjust your insulin doses to counteract these.

So here is an example of somebody's freestyle Libre data. This is their ambulatory glucose profile, and it is essentially a summary of where all their glucose levels lie over the last fortnight. The dark blue line shows the median value across that period. The dark blue shaded area is where 50% of the values lie. So, what are we going to do with the basal insulin in this example? We can see that the glucose here seems to be quite flat and stable overnight but we're waking up with a high glucose in the morning. So how are we going to tackle that? I think it's wise to look at the detail underlying this. So, we'll move on to look at the daily traces. And typical for anyone with type 1 diabetes, there is not much of a pattern here. There is a range of different glucose responses overnight.

So how do we decide what to do with the basal insulin? As a user of the freestyle Libre, you have a unique understanding of what happened during that period of time and how it has impacted on your glucose data. And for the person here, alcohol is one of the contributing factors to a fall in the glucose levels on some nights but that brings us back. How do we decide what we do with the insulin here? So, what I tend to do is scan through the data and try and find a night where the glucose is in the target range and see what happened. And we can identify on the last day there that when the glucose was in target, it actually stayed there perfectly well. So, from the data here I don't think we need a change in the basal insulin, but this just gives you some insight into just how tricky getting to grips with the data can be.



Here is another example of an ambulatory glucose profile. The most striking thing about this one is that you will see that the dark blue median line is in the hypoglycaemic range overnight and that's a concern. And again, when you look at this on the daily traces, it becomes very apparent that this person is experiencing quite a lot of hypoglycaemia and this is related to the basal insulin being too high as you can see the glucose falling during the night.

So, a word of warning is if you have unexplained hypoglycaemia overnight, presume that your basal dose is too high and reduce it the next night. Another word of warning if the Libre shows that you're hypoglycaemic, please please check with a blood glucose as we know that the Libre isn't always as accurate in the hypoglycaemic range and there's also a lag time so blood glucose in this instance is more accurate.

If you're interested in learning more about hypoglycaemia, I would recommend Dr Pratik Choudhary's hypoglycaemia module to you.

In conclusion, the Freestyle Libre allows us to see glucose trends overnight providing unique insight that we didn't have before. The aim of your basal insulin is to keep your glucose steady overnight and in range. However, there are multiple factors that will affect your ability to do that but hopefully through using this device you will gain new insights into why you see the fluctuations that you do.

Thank you very much.

