**Insulin Resistance and Prediabetes Transcript**

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**Dr Nerys Frater, GP in Hywel Dda UHB**

0.01 **Chair:** Hello there, everybody. Welcome and thank you so much for joining us. Today we are going to have our second webinar in our Diabetes Series. Hopefully by late spring next year, we'll have covered everything we really need to know about diabetes. We're starting at the beginning. We've had a session on diabetes, and I'm really pleased to welcome Dr Nerys Frater to present today on insulin resistance and prediabetes. Nerys is a GP in Hywel Dda University Health Board. She has got a particular interest in obesity and naturally that leads on to insulin resistance and type 2 diabetes.

I shall introduce Nerys now. Thank you so much for doing this.

0.52 **Speaker:** Well, thank you very much for the invite. As David said, I'm a GP I Ammanford in Hywel Dda and my interest started off with obesity and weight management and it's quickly flipped across to pre-diabetes and insulin resistance, such is the link between them.

1.13 **Speaker:** So I'm going to cover these topics today.

* Why we need to think about prediabetes. And I want us to kind of demonstrate all the changes that happen before we even know about prediabetes.
* So mainly, we're going to be talking about hyperinsulinaemia and insulin resistance. It's not something I learnt about in medical school at all, but I do find it fascinating, so I'm going to share some of that.
* We're going to be talking about the NICE guidelines in preventing diabetes, which would include medical management.
* And then at the end, Public Health Wales have asked me to put a slide up about the all-Wales Diabetes Prevention Pathway.

So I'll probably whittle through that in about 30 40 minutes. So there's enough time for questions afterwards. And if you want to stop me in the middle as well, I'm happy either way.

2.05 **Speaker:** So we always have to start with the depressing stuff first. We all know, the challenge we're facing. We're seeing diabetes, prediabetes and obesity every single day. So 10% of the annual budget of the NHS actually goes on diabetes, and it's the complications of diabetes that cost the money. And that's what we spend most of our time managing as well. And 80% of the spending is on managing complications. And it's, of course, it’s us that do it. It's the GPs who look after 85% of people with type 2 diabetes, which is quite different to the way it was 20/30 years ago when it used to be a hospital consultant looking after them. We are worse off in Wales than the average in the UK, and you can see it is linked to poverty deprivation. The most recent map I could find with Welsh data is 2015. So we can only assume that things are worse by now.

3.12 **Speaker:** And of course, we know the obesity is fuelling a rise in type 2 diabetes. We know they're closely linked, and you'll hear lots of people call it the **‘diabesity epidemic’**. So in 12 or so years from now, they think that 1 in 3 people will be obese, so not overweight, but obese. 1 in 10 will develop type 2 diabetes. And that's quite scary as a GP, isn't it? It's not something I can say I'm particularly looking forward to, but that's the way things are going, and I guess that's why there's a lot of money now being invested in prevention.

3.52 **Speaker:** So we're going to be covering all of these definitions; these definitions of come and gone with time. I'm going to use the umbrella term of prediabetes to cover all of them. And it's these three stats at the bottom here what we're especially worried about. So 70% of people with prediabetes will eventually develop diabetes. 5-10% of them will become a diabetic annually. 50% of cases of type 2 diabetes can be prevented or delayed. And I guess that's the idea behind Public Health Wales' new strategy, which we'll discuss at the end.

4.42 **Speaker:** And this is the crux of it, isn't it? Prevention is better than cure. We know this but we're too busy firefighting what's already in front of us that we can't really do preventative medicine. But of course, that's where the money should, should be funnelled towards and because it's so expensive to treat complications and it's so difficult to treat diabetes. That's why I have an interest in lifestyle medicine. It's much easier than will the medication, etc.

5.16 **Speaker:** So and I wanted to and to show you kind of the changes that happened before type 2 diabetes manifests. And just to recap here that high glucose is a symptom of both type 1 and type 2. But the actual process is very different. So with type 2 diabetes, it's actually a problem of too much insulin or hyperinsulinaemia and which is the direct opposite of type 1 diabetes. And there's a lot of experts that think that actually we should probably be measuring the insulin level rather than the end, which is the high glucose. If we were able to measure insulin, then we would pick up many more cases way earlier, decades before diabetes, rather than right at the end when the pancreas is struggling.

6.05 **Speaker:** So I'm going to be coming back to this all the time. This is the health and disease curve, so and we've got health on the left and then the arrow going upwards to type 2 diabetes and there are specific points along the way which I'm going to be talking about. And this pathway happens over decades. It's not something that's there for a few months before diabetes. It is decades before. So the definition of type 2 diabetes is a HbA1c of more than 48 mmol/mol. We all know that. But what I didn't realise was actually that at that point, 50 % of the beta cells are functioning. So 50% are not functioning. So half the pancreas is not functioning, which is a massive thing. And imagine if we had half the lungs not working or half the heart not working. It is a disaster. And how many times have I seen HbA1c of 48 in my inbox and thought, ‘Oh good, that's a well-controlled diabetic. Nothing to worry about that. I don't need to do start any medication or anything’.

But actually, I look at it very differently now, and the HbA1c of 42 to 47 is prediabetes, as I'm sure you're all aware, and this has been taken from a study showing the beta cell function. So we're normal up here, we're low down here and you can see the actual point of diabetes is very low. This particular paper said that up to 70% of the beta cells weren't functioning at the point of diagnosis and then prediabetes then is here at 50%. So you can see that with type 2 diabetes, we’ve actually missed a lot of the story by the time of diagnosis.

8.01 **Speaker:** So what we're missing is what's underneath or behind or the left of this line. So to the left of that vertical line is the kind of the iceberg underneath the sea. We're aware of that pre-diabetes and type 2 diabetes, we're good at picking those up. It's just the hyperinsulinaemia and insulin resistance.

So and if we go right back to the beginning, then so this state of high insulin in the blood. We are now decades before diabetes, the way things are going at the minute this is probably where our teenagers and children are at. And there are lots of different causes of high insulin or hyperinsulinaemia. I've picked out the main ones here. Of course, food is there. And we all blame our diets for the development of diabetes. But it's much more complicated than that. Chronic stress is there, lack of sleep, sedentary lifestyle. And then, of course, you've got genetics and epigenetics. And that's interesting because the heritability of type 2 diabetes is thought to be between 20% and 80%, which is a huge variable there. Lifetime risk of developing diabetes 40% if one parent affected. And then it's 70% if both. And I see this a lot with patients, you know, they've kind of accepted that while their parents are diabetic, so therefore it will happen to them. And there is a genetic link. There's also lots of genetic variants which increase fat storage. And so this thrifty genotype is, I don’t know if you've heard of that, but there's lots of theories, which of course, in the past it was favourable to put on fat when food was scarce. And of course, our environment has changed a huge amount now. Which is what I've said in the last point. Genes have changed very little, but the environment has changed greatly. And that brings us on to the whole world of epigenetics, which I don't claim to be any sort of an expert on. But it's this idea that although you may be predisposed to a condition, for example, breast cancer and or diabetes or obesity, it doesn't mean it has to happen. Your environment, your lifestyle can switch on and off these genes, and the way I like to think about it is that your genes load the gun, but your environment pulls the trigger.

10.48 **Speaker:** If we go on to these lifestyle measures because we now know that they are linked to genetics, so you are not always going to have what you're destined to have. And if we talk about foods that raise blood glucose. So if we go back to medical school, I'm sure we will remember that for us to use glucose we need insulin, and this comes from the pancreas. It pushes the glucose into the cell.

And if we look at the three types of macronutrients and their effect on blood sugar. You can see here the blood sugar on the left and carbohydrates are, of course, chains of glucose, so they will cause a surge of glucose in your blood. Protein does a little bit, and it takes a bit longer and that through more complicated mechanisms in the liver. And then fat. You can see at the bottom there, has no effect at all on blood sugar.

But before we demonise all carbohydrates and they are of course, divided into 2 different groups. So we have the complex carbohydrates, and those are the foods that are seen in nature - fruit and vegetables essentially. They are chains of glucose, but because they're complex, it takes a while for you to digest and release that glucose, so you don't get such a surge of insulin in the blood. However, the simple carbohydrates then on the left are broken down to glucose very quickly. So within an hour of eating these you can see a surge in your blood glucose and a surge then an insulin level to bring it down. Those are pasta, rice, potato breads and cereals. Everybody's favourite foods.

And of course, what we're used to now is a diet very high in carbohydrates. So they say a modern man in the UK is eating at least 60% carbohydrates and it's not really the broccoli and the green beans. It is more the bread and pasta, rice, etc. That's the type of food we're eating.

13.04 **Speaker:** And if we're eating 60% of a diet of carbohydrates, we produce a lot of insulin. So you can see in the right there a lot more insulin in that person's body than there is on the left, which is somebody that was following a diet high in fat. And that's what they thought we used to eat in the UK hundreds of years ago. So only 5% of our diet was actually carbohydrates. And of course, it was a complex type.

So we've mentioned that insulin is there to push the glucose into the cell. But it is also a fat storage hormone because usually the reason is high glucose in the blood as you've just had a meal. So it's part of the digestion. To put it away, storing excess glucose as fat. It blocks the body from burning stored fat. And of course, as the glucose comes down sometimes rapidly, it makes you feel hungry as well. So this is even before you become overweight. So as I said, it could be in the teenagers, people in their 20s, 30s. They have this state of high insulin.

14.13 **Speaker:** This is a good one, chronic stress, very relevant for us. And you know what? You can't underestimate the effect of stress. I actually do a weight loss clinic for the Amman Gwendraeth cluster, and I do group sessions with patients with diabetes, prediabetes and those without. And I do a whole hour on stress, and I can see patients at the beginning. They roll their eyes. They don't want to talk about this. They don't think it's relevant. And then at the end, they all seem to have this epiphany about how goodness me that this stress is underlying it all. And it's very relevant for us as well in our jobs.

So there are hormonal changes that happen. We release adrenaline, the fight or flight response which leads to insulin resistance. Interestingly, in my clinic, I give people blood sugar monitors so they can see the effects different foods have on their blood sugars. And I noticed this one guy that was doing really well, and his sugars were brilliant. They were between five and seven and everything was going well. But every Saturday morning, his blood sugar would go up to 14/15 despite him up in kind of a breakfast with a low glycaemic index, something like eggs. And we finally worked it out. What was happening was that every Saturday morning his grandchildren were coming to visit, and they were just massively pushing his blood glucose. And that really showed me how stress really does affect your blood sugars. So acute stress like that, would lead to adrenaline release. If that's happening all the time, so if these grandchildren were coming every day, it does cause inflammation and it leads to insulin resistance. (We will come on to that) But essentially, that's the state when your body starts ignoring the insulin.

The other big stress hormone is Cortisol, and it increases insulin resistance as well. But also it increases appetite. You know, when you're stressed, if you've had a long day in work, you've just done an on-call. Of course, you can grab a takeaway and it's because it makes you feel better. You haven't got time to cook you hungry. And specifically, stress makes us crave sugary, salty foods, preferably in combination. And we get more reward. So it rewards our pleasure area in the brain more than it would have on a different day.

17.02 **Speaker:** So lack of sleep, this is another depressing slide, sorry. But sleep is really important. We're told we're in the middle of a sleep epidemic. Apparently, we are on average sleeping 2 hours less per night than our grandparents were doing. And there's all sorts of reasons for that. One is this homeworking. People aren't switching off when they go home. We've all got laptops, mobile phones. We can all be contacted all the time. So there's less of a difference between work and home. The phone is getting the blame for a lot of things because of the blue light. Looking at your phone in the evening actually can inhibit sleep as can a laptop, as can the television - but less so because it's a bit further away. It's also linked with alcohol and caffeine intake as well. But there's hormonal changes, so ghrelin and leptin levels are measured to be different. The less you sleep, the more you eat. And again, I've seen it time and time again with blood sugar monitors. People's blood sugars are up the day after a bad night's sleep. And then at the bottom there, a few worrying studies. So one study sleep-deprived a group of young, healthy males. So they were having five hours of sleep a night, and after six nights, their blood sugars were in the pre-diabetes range. And even worse is that one night of poor sleep makes you less insulin sensitive the next day. So you can imagine what years or decades can do.

18.50 **Speaker:** And then the sedentary lifestyle, again, we all know about this. A sedentary lifestyle is linked to insulin resistance, and that graph on the left there shows that they forced healthy young individuals again, to lie in bed for five days. So they were on full bed rest. And you can see the difference in their insulin levels. The insulin was higher which ultimately leads to insulin resistance. So on the flip side, we also know that regular physical activity decreases your risk of developing diabetes by 40%. So there's massive benefits, and I'm sure you're all aware of the government guidelines with the amount of exercise - 150 minutes and all that. I met with a lot of resistance when I try to encourage my patients, they don't like it. There's always a reason why you can't exercise. And I would just say, well, something is better than nothing. And actually pottering around all the time, moving all the time is shown to be very beneficial to your blood sugar and your risk of diabetes. So keep moving if you can do an exercise that gets you breathless, brilliant. But equally as important is to build muscle. And I will tell my patients that to think of it as an extra cupboard to store their glucose even. The bigger your muscle, the bigger the cupboard. So if you did exercise, the good news is that the effects on your blood sugars can last up to 48 to 72 hours afterwards, which is brilliant.

20.46 **Speaker:** So here we are. We're right at the beginning. All of these things combine together and they're all closely linked. You can't just treat one and not the other. You have to think about all of them when you're making a lifestyle change. But here we are. We have hyperinsulinemia. So back to the cell them. The poor little cell is having a lot of insulin nagging it to get all the glucose inside it, to hide it away. And the cell actually says, ‘I don't want anymore. I'm full of glucose here.’ It will say no, and it'll upregulate the receptors. And of course, that causes the pancreas to panic a bit to produce even more insulin. And again, the cell will say, ‘I haven't got any more room’ and it'll upregulate, and you get into this vicious cycle which would lead ultimately to insulin resistance.

21.50 **Speaker:** So you've got high insulin. The higher the insulin, the more your body starts ignoring it. You develop insulin resistance, which causes your pancreas to produce even more insulin and you go round and round and round for years and years with this cycle. Both problems gradually getting worse. So you are going all the way up the straight line there until you get to the point of prediabetes.

22.20 **Speaker:** I like this study. So it was a prospective cohort study of six and a half thousand civil servants. And they followed them for 13-14 years. And they found that 500 of them developed type 2 diabetes and then they looked backwards, then at the trajectories and the results. And I think these results are quite interesting because with the green line there, the non-diabetic and then the blue line are the patients that later develop type 2 diabetes. You can see there along the bottom of the graph it's going backwards in time. And you can see 13 years before diabetes, these guys (the blue line) are much less sensitive to insulin already. So you can only imagine if you pull that line further backwards, we all go in many, many years back in the past when this started. So if they are less insulin sensitive it means, then more insulin resistant.

And you can see the response to glucose. So already 13 years ago, they're not quite as efficient at managing an oral glucose tolerance test. And then six years before, things go really wrong and you can see this, they don't respond quite as quickly and as efficiently as those with the green line. And you can see them in the 2 years before it really kind of goes out of control.

24.04 **Speaker:** And if you look at the Beta cell function. Again 13 years before it is working, the beta cells are working harder because you've got this higher glucose level. So you need to produce more insulin until four years before the full pancreas starts can even harder. So it's trying to manage this raise in glucose until three years before it burns out and you can see then the function rapidly deteriorates until time zero, which is when a type 2 diabetes develops.

24.38 **Speaker:** And you can see all four graphs together here. The last one on the bottom right corner there is the fasting glucose and it's the 2 years before that it goes haywire.

24.47 **Speaker:** And then it continues to do so, I'm afraid. The Beta cells continued to deteriorate and until you get to the point with type 2 diabetes where it's not working at all and you are needing to actually give the patient insulin.

25.09 **Speaker:** And of course, the answer is quite simple. We just need to go back to the beginning and lower that insulin level. But I think this brings it back for me anyway. This idea of treating the root cause. Insulin resistance is the root cause of so many conditions and these are the big ones that we see. In fact, this is most of our work in general practise, I would argue. And so type 2 diabetes, ischemic heart disease, stroke, polycystic ovaries, gout, hypertension, fatty liver, dyslipidaemia. And actually, we can treat all of them if we just went for the insulin resistance. So that is what I see with my clinic is they don't lose weight. They come out of their diet. They improve their diabetes. Their off their gout medication. The blood pressure lowers. And it's a much more satisfying way of treating the problem, treating the root cause rather than medicating with different medications for each of these. You could end up referring this patient to four or five different specialities, and they're all treating the same thing essentially.

26.30 **Speaker:** Essentially what we're talking about is the metabolic syndrome. There's lots of different definitions for it. I’ve picked this one. And you essentially need central obesity and 2 others. So note that there is the triglycerides and the HDL, that's an interesting, rather than the total cholesterol, which is often what we've traditionally taken an interest in. The blood pressure on the bottom there is a sign of diabetes or treated diabetes. So that's the metabolic syndrome, which is essentially insulin resistance.

27.14 **Speaker:** So people with the metabolic syndrome are fivefold greater risk of developing type 2 diabetes. Of course they are. We've just seen why and the more components of the metabolic syndrome, the higher the cardiovascular mortality.

27.31 **Speaker:** So as I've said already, we are we are best treating a lifestyle condition with lifestyle medicine, to be honest, and that of course will have an effect on the epigenetics.

So prevention is better than cure and if you need any of the more convincing, I've just got a few facts here. So if we wait for a diagnosis of type 2 diabetes, worryingly, at the time of diagnosis, around 50% are thought to already have a complication. And I guess for those without the median time to incidence of a complication ranging from three to five years, which actually doesn't seem very long, does it? Except for the fact that we actually know that this has been brewing for decades. So if you think about it that way, then it has it has been a long time coming. Even more worrying is that medication does not decrease the Continuum Beta cell death. So the diabetes is marching on. And we can give medication but actually all it does is hide away the glucose, either by making us urinate the glucose out or metformin is increasing our sensitivity to insulin. But actually the Beta cells are still on their downward spiral. And then we also know that unlike type one diabetes, tight glycaemic control with medication does not lower macrovascular complications with type 2. However, metformin does seem to have more evidence to support it and that it can do that.

29.22 **Speaker:** So we're on to guidelines. I think a lot of this is common sense. We know who's at risk. So these are the NICE guidelines now on preventing type 2 diabetes. They were published in 2012 and updated in 2017. We know the more you weigh, the higher the risk. The BMI actually is not useful, but it's the waist circumference. It's that abdominal fat; the visceral fat. That's what we want to know about. You are at increased risk if you if you measure more than 80cms for women and 94cms for men. Men are at a slightly increased risk. And certain ethnicities are as well. And when we're thinking about who is at risk and thinking about risk scoring, high risk is over 40 years old in the white population but over 25 years in those ethnicities. So that's something to keep in mind. We've already discussed family history and interestingly, hypertension is down as increasing your risk. I think that's all part of the metabolic syndrome.

Now, the advice from the NICE guidelines is to use a validated tool to work out who is at risk. I think we do this intuitively as GPs and but there is a risk tool if you want it, and the one they recommend is Diabetes UK. You can download it and attach it to Vision. Beware it underrates your score if you've had gestational diabetes and it's deemed as not suitable during pregnancy. So you answer a certain number of questions, and it gives you points which essentially can tell you your risk of type 2 diabetes. Worryingly for me, though, is if you have a score of zero, you have still got a 1 in 200 chance of having diabetes, which worries me a bit.

31.37 **Speaker:** Then with that risk score, it guides you then as to how frequently to monitor. So if you've got a low score, you can still offer brief intervention advice on diet and lifestyle and then retest in five years. If they are higher risk, then just offer a HbA1c straightaway. If it's less than 42, that's normal and you reassess the risk every three years. If it's more than 42, then you would offer advice regarding diet and lifestyle and monitor once every year, and they recommend the weight and HbA1c to be monitored.

And, of course, the diet and lifestyle advice you're going to be given is lose weight by whichever means possible because the link is so strong, and you can see the graph they show in the different ethnicities and how they tip into diabetes at much lower weight or waist circumference than the white population will.

So, yes, weight loss by whichever method possible. The best diet is the one a patient can stick to and aim for 5% weight loss because that's the kind of level that makes a difference metabolically.

33.06 **Speaker:** So we're on to the medications to prevent diabetes. Again, this is from the same NICE guidelines. NICE advises using clinical judgement, which is brilliant. But actually, they do suggest the best candidates are ones where lifestyle changes have failed (or arguably the ones that really aren't interested) or a deteriorating HbA1c showing progression to diabetes. So if you are checking annually and it's getting worse and worse every year, then it might be a good idea and a BMI over 35 because we know it's a much higher risk, the higher your weight. Then we've got Orlistat and ‘Metamorfin’, as my patients call it. Orlistat then - BMI more than 28. You would advise them to follow a low fat diet, as you would and the non-diabetic patient. The advice has always been to review at 12 weeks, and if they haven't lost 5% of their original body weight, then stop it. But actually, they tell us now to be more lenient. It may take more time for patients with diabetes to lose weight. So it's more open-ended, I think, the Orlistat. It will be interesting to see what people think of Orlistat with weight loss. I haven't seen much improvement at my end, but you know, some doctors do like it.

And then Metformin. So the studies have shown it does decrease progression to diabetes. However, we need to counsel patients. It is going to be lifelong. It is not as effective as lifestyle changes, and it does need monitoring. And of course, it has side effects as well. As we know, with the gastro-intestinal side effects being the biggest. NICE advises U&E twice a year. So the advice, of course, is to start at a low dose. The studies have been done with a standard release preparation, so they suggest starting that first. Increase gradually as tolerated, with monitoring the HbA1c annually.

35.13 **Speaker:** So I think for us, it's really hard to get a conversation started. We haven't got time. And it is often an awkward conversation. But since I do a weight loss clinic, I am much more likely to raise the topic and actually am shocked with how many people do want to talk about it, actually. And there is some expectation, I guess, that the doctor will raise it. And these quotes are taken from a book on motivational interviewing for health care practitioners. And it is essentially asking permission; just asking them:

* How important do you think lifestyle changes are?
* Would it be helpful?
* Would you like me to talk about?
* Do you know?

Using that kind of language, you know, pretty quickly who isn't interested. And we probably remember the minority, but they are the minority. And if people don't want to and that's fine, I wouldn't waste my time particularly. And I would really push for the ones that do want to discuss it and are worried about developing diabetes.

36.27 **Speaker:** And I think a lot of our job is to signpost. We can't give all of this lifestyle advice in one go, you know, we just we just can't the way things are at the minute in particular. But there are actually lots of organisations available. I think [www.diabetes.co.uk](http://www.diabetes.co.uk) has a brilliant website. Yes, patients do need to pay, I think, to go on to the proper one if they wanted to do a low carb diet, for example. But in my mind, this is money well spent. And there's lots of apps for NHS weight loss. Foodwise is there. I think in all of Wales, via the local dietetic service.

With stress then the meditation app seems to be working. ‘Calm’ and ‘Headspace’ are the best and probably the most widely known. I have to recommend Dr Chatterjee’s books. I'm a big fan of his and ‘The Stress Solution’ in particular has been helpful to many patients and to us doctors here. And then yoga - you can do it on YouTube. You don't have to pay for expensive lessons.

With sleep, I've actually devised a sleep handout and am happy to share that if anybody wanted it. Interesting cognitive behavioural therapy for insomnia. And we could talk about that if somebody wanted to know at the end.

And there are absolutely loads of things for exercise: Couch to 5K exercise referral scheme, Chamnge4Life, Walk4Life and of course, the Park runs. Lots of different stuff you can refer people to.

38.04 **Speaker:** Which brings us to our last topic - the All Wales Diabetes Prevention Pathway. So the Welsh Government and PHW have teamed together to try and prevent diabetes. So it builds on the pilot approaches in the Afan Valley and North Ceredigion clusters. I am not sure if you are aware of that? They recruited health care assistants to offer brief intervention for patients, and they monitored their HbA1c and found that there was less progressing into type 2 diabetes. And the aim is to have a measurable reduction in HbA1c. So that's something that's going to be rolled out in March. There's talks ongoing over the country at both the national and local level. So that's something we may well see quite soon. And it's part of the Healthy Weight Healthy Wales strategy.

And that's it for me. I think that we are. And so, yeah, I'm happy to take any questions or comments or feedback.

39.15 **Chair:** Thank you so much, Nerys. If you do have any questions, please post them in the chat box. I guess the other thing I was thinking of was ‘What can we do as GPs when results come in?’

I did come across somebody who did a really good audit, actually. And of course, we all have to do some kind of quality improvement thing for revalidation. And actually, it audited how the practise managed HbA1c results coming in over a previous six months and then the next six months and the number of results that come in all the time, of course, as well. It's very difficult when you've got a hundred results, but the sorts of work were just automatically sending (via a little protocol on the computer system) a booking for an appointment with the health care system for the lifestyle advice and repeat test. And so I don't know if that's something perhaps we could do is just look at how we manage results coming in at a pre-diabetic stage and say we can improve on that?

40.40 **Speaker** So what I did was just devise an A4 piece of paper just telling people - You are at high risk of diabetes. These are the things you could do to help improve, and I would signpost them to all of these things. And so all we do now is once we get the HbA1c and a new prediabetes, we can just right click on the on the blood results. And I just say, send prediabetes, letter and at least we've done something. And we have also told the patients, you need to organise your blood test every year because you are at high risk. I haven't actually audited, if it makes a difference, it probably should but I haven’t found time yet.

41.29 **Chair** Are there any tricks of the trade in trying to convince people to change lifestyle? I don't know if there's an answer to this, but.

41.44 **Speaker**: Well, there are so many ways of doing it, aren't they? And it's as keeping the weight off is that is the tricky thing. So there's plenty of ways to lose weight but is keeping it off because your body has so many ways of sabotaging your attempts. And what it comes down to is you have to think of it as a lifestyle change that you gradually eat. I think the main advice is that you eat real food, i.e. not these processed meals with all the kind of pro-inflammatory chemicals in them. If you if you were to cook from scratch, I think that's a huge, huge thing.

But there's all sorts of reasons why our patients don't, isn't there? And money is a big one, they will argue. And it's just doing a little bit on everything. So making sure you're sleeping while making sure that your stress levels are as low as possible and that you are not snacking all the time as well is the other one?

42.40 **Speaker**: You know what's a massive learning curve for me? This will make me sound like a real geek, but I don't care. For Christmas. I had the Libra Monitor, you know, the continuous glucose model. You can buy them for £50 off Amazon. So anyway, I had one for Christmas and it is an eye opener. I'm not I'm not a diabetic, but to see my blood sugars and the way they were going up. I put it on Christmas Day and actually you can really see the effects of potatoes and you learn all sorts of stuff like for example, if I ate a plate of potatoes, yes, my blood sugars will go up. But if I ate exactly the same meal in an evening, it goes up even higher. So you learn these little things - you deal with glucose less well in the evening than then at lunchtime, for example. Fascinating.

43.42 **Chair:** It is, isn’t it? And again, the bits about when we've gained weight it's hard. You can lose weight, but it's very easy to put it back on again, and I had somebody who had read something clever, tell me recently that it's almost like the fat cells have a memory, and once they've reached a certain size, they want to get back to it. Is it something you've come across?

44.10 **Speaker**: Oh yes, I could do a whole talk on that as well. Your body doesn't want you losing weight, end of, and it will try to get you back to what your set point is.

44.28 **Chair:** Well, I think I think the take home message for us is really do what we can at a young age, isn't it? We have to. We're at the mercy of higher authorities like Public Health Wales, Welsh Government, the UK really, you know, and in fact, you could say it is a global epidemic, isn't it? So, you know, that perhaps they have to do their bit in education maybe. But we can do our bit and maybe keep our spirits high when we try and encourage people to bring up the subject as well. You know - ask the question. That's what got me thinking about advertising because you said the number of people who actually engage if you're if you ask the question was quite high, wasn't it?

45.18 **Speaker**: That's what started me off, to be honest with you. And also, I didn't feel I had anywhere to signpost patients, which was another reason I set up my clinic was at least you can refer them onwards, isn't it, just easier to bring the conversation up? But actually, you know, every health board does have their own weight management service.

45.43 **Chair:** Well, it doesn't look as that always got any questions.

I think keep a positive attitude with patients and say and encourage the lifestyle changes. I think with a lot of this, we depend on our practice nurses and healthcare assistants as well. OK, I think we can draw to a close. Thanks, everyone. Thanks so much, Nerys that was so helpful.