**Remission of Diabetes Transcript**

**January 2022**

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

0:00 **Chair:** Prynhawn da good afternoon and welcome to our live webinar for Remission of Diabetes, this is one in our series of diabetes. I'm Dr. Nicola Flower, GP CPD lead for West Wales. So without further ado, I'd like to hand over to our speaker Dr Nerys Frater who is a GP and also has a specialist interest in diabetes, particularly on weight management. Thank you Nerys.

0:03 **Speaker:** Thank you very much for the welcome Nicola and the opportunity to talk about my favourite topic, which is remission of diabetes. So, yes, I'm a GP in Brynteg Surgery in Ammanford, and I've done a postgraduate qualifications in obesity and weight management. And actually I run a clinic for the Aman Gwenda cluster around weight loss, and it's become a clinic that we aim for remission of diabetes. I'm hoping to talk for about 30 - 40 minutes just so that we've got enough time for questions afterwards, and we're looking at the exciting topic a new future for diabetes. This is a massive thing, and there's been so much research in the last 10 years and it's ongoing now, and I'd like to just take you through that and make it relevant to GP’s. Don’t panic about the bariatric surgery, I'm certainly not going to be discussing surgical techniques, and it's just to put it all into context. And of course, it's important for us to share what's going on here in Wales as well.

1:46 **Speaker:** So as I've said, exciting field, so we've always thought of diabetes as a chronic relapsing illness, and I've never been a fan of seeing patients with diabetes because it can be quite depressing when you see one after another getting worse. So the last five years have seen a huge surge in research around cures for diabetes. And certainly more realistic is the word remission, and I'm sure you'll find patients asking more especially since COVID, I've found that the people seem to be taking more ownership of their own health.

2:29 **Speaker:** What is diabetes remission? We must start here, and there's a lot of definitions about the place. But over the summer 2021, there seemed to be some consensus, basically for research and for us to know when to Readcode. The Readcode there’s for vision at the bottom and the definition is a HBA1c of less than 48 mmols persisting for at least three months. And in the absence of usual glucose lowering pharmacotherapy. So they need to be off all their blood sugar medications and we will talk at the end I think about the practicalities of that. And you will see definitions in six months or sometimes with metformin but this is what we're going to go with for now, and it's important you do Readcode this specific one because this is in remission so you can't remove the Readcode of diabetes, and we'll go into why that is at the end.

3:34 **Speaker:** So there are three ways we can achieve remission. Medication, bariatric surgery or lifestyle changes. So pretty obvious.

3:47 **Speaker:** If we first start off with medication. So this is our standard care. I think we already know that remission is quite hard to achieve with medication. And there's this interesting study looking at over 120000 patients, and they found the incidence of remission was low. So 2.8 per 1000 person years at one year post diagnosis and then a really, really microscopic chance at seven years. And that's why I became disheartened with caring for patients with diabetes because we just kept seeing them getting worse adding medication eventually on insulin. But saying that it can be done, especially for those on the lower HBA1cs the medication can have quite dramatic effects in some people.

4:35 **Speaker:** And I do need to mention this just to put everything into context, the cost of diabetes, and I'm not talking financial costs. I'm talking about the complications for the patient. So the microvascular complications there in pink, diabetes is a leading cause of end-stage renal failure. 1 in 3 people develops chronic kidney disease, it’s the leading cause of blindness. 80 percent will have evidence of Retinopathy at 15 years post diagnosis. Neuropathy we see a lot of and 60-70 percent of patients with diabetes have evidence of Neuropathy. We know the macrovascular complications 80 percent of patients will develop cardiovascular complications, accounting for 65 percent of deaths. And that is a disaster, isn't it? And we all see it all the time. And what's particularly important for us to know about diabetes is that medication, although we’re lower HBA1c doesn't seem to have much evidence for actually lowering the rate of microvascular complications. There is a link in Type one diabetes but Type two there doesn't seem to be unless we're talking about lifestyle changes.

5:56 **Speaker:** So Bariatric Surgery. We know there's a close link between being overweight and developing Type two diabetes and I think this graph shows beautifully the role of ethnicity, but also the amount that your risk will increase with specific weights. So if you increase your weight by 20 kilos, you increase the risk of developing diabetes by 17000 percent. And of course, it works in reverse. So if you lose weight, you improve your metabolic profile and I think all of us know that.

6:34 **Speaker:** Now bariatric surgery, I feel as GP's we’re so far removed from it that we don't consider it. We often feel it's too extreme and often the patients feel that as well. But actually, from the financial point of view it is cost effective. And actually in Wales, this is an old map showing the prevalence in the year 2014 2015. It's much worse now, but we have a higher prevalence than the average in the UK. We spend a lot of money on managing complications and it’s us GP's doing all the work 85 percent we care for in the community and just to frighten you a bit if current trends continue by 2034, we can expect one in 10 people to have a diagnosis of diabetes. So if we like it or not, we're going to be seen more.

7:33 **Speaker:** The NICE guidelines for bariatric surgery. If you have Type two diabetes, you need a BMI of more than 35, and that's it’s really and so from our point of view at least we cannot refer as GP's directly to the tertiary centres for bariatric surgery. They have to go through the tier 3 obesity service, which is the hospital dietetic team usually, and they have to have shown evidence of interacting with them for two years before they can be considered. And then there are there are other criteria as well.

8:13 **Speaker:** And just briefly, again, I'm not really interested in the process behind these, but there are two types of bariatric surgery the restrictive procedures we actually make the stomach smaller, either with the gastric band or actually slicing the part off, or there are malabsorptive procedures and that's where the surgeon will replumb the small intestine and the stomach. And actually, even though to me that feels like a huge procedure, they're only in hospital for about three days and back on their feet very quickly afterwards.

8:56 **Speaker:** Now when it comes to remission of diabetes, so improving metabolic health, the malabsorptive procedures, as you may imagine, are more effective and the more complicated. The most effective it becomes for diabetes.

9:18 **Speaker:** And again, as you would guess, restrictive procedures, so the ones where you make the stomach smaller, they lower the HBA1c as individuals lose weight. But what's interesting is that the malabsorptive procedures were achieving normal glycaemia within days. So before weight loss occurred and this was rather unexpected and has led to a lot of research around it. How could the blood sugars normalise within days when the weight was more or less the same? And it's because, a lot of it is unknown, but there are hormonal changes. Now right on the left there, the raised GLP1, we're familiar with GLP1s and the management of diabetes so the incretin in hormones. And they're linked to release of insulin. So if you've replumbed the bowel, the stomach is sliced and it's less, the food enters the duodenum much quicker than it would have otherwise and causing a surge in insulin very quickly afterwards. So the blood sugars would come down. The PYY is a satiety hormone, so you’d feel quite full, you’ll feel fuller quicker. There's increased bile acids and that's associated with increased energy expenditure. Increased bile acids is also linked to changes in the gut microbiome. And I'm not sure if you're aware of the research on gut microbiome but it is truly fascinating. And this idea that scientists can look at your stool sample under the microscope and be able to estimate your weight because there are links between the diversity so the amount of different species you have in your bowel and your weight. It's not to do with one bug in particular, it's to do with the diversity in your bowel. So there are changes that happen again within days to weeks. And another important one, of course, is the ghrelin, the hunger hormone. And that hormone is often increased with traditional calorie restriction diet, which ends up in you eating more eventually. So all of those changes are found to be important post malabsorptive procedures.

11:51 **Speaker:** And that's led to people actually not referring to them as bariatric surgery anymore, but metabolic surgery. So the Roux-en-Y procedure seems to have the best reputation for remission of diabetes. The positive predictors rather obvious, really young age, low BMI, lower preoperative HBA1c and on the least amount of medications to control diabetes. And you can expect 80 percent of patients to achieve remission or improvement. And in stark contrast to the numbers we were seeing in the first few slides with standard care. And actually that's massive isn’t it and it's massive for the patient and it's massive for care in general and even 14 years afterwards 83 percent of patients with diabetes were off their medication. And what's important is they were metabolically better. So their cholesterol profile was better, hypertension better, osteoarthritis had improved and obstructive sleep apnea. And of course, it's the whole picture that we need to tackle, not just the diabetes.

13:05 **Speaker:** And again another study this is a big study following people up to 20 years. Yes some people do regain their weight, but from a diabetes point of view, actually it's the incidence is much much less than the average population. So studies seem to conclude that it certainly is worth the consideration.

13:29 **Speaker:** We worry about the downside, we are going to see more and more patients coming through now. And of course, there are early and late complications, which I've put the most common there. But just for us to be aware they do discharge roughly two years after surgery back to us, to the GP, and we will be expected to monitor them annually, especially the ones that have had the malabsorptive procedures. They need to be on long term multi-vitamins and a whole host of blood tests which I've listed there. So just for your reference, as we were on the topic.

14:11 **Speaker:** So what I wanted really was to just increase awareness that bariatric surgery may be an option for more people than we realise, and maybe we need to refer some of these patients sooner and have an open mind about it. Another interesting thing that came out of bariatric surgery for these very low-calorie diet, they found that if they put a patient on one of these shake diets really low-calorie food supplements that they had less complications of surgery. And that was because when you really deprive somebody of calories, obviously they're burning off fat. But the fat that they will use is that visceral fat, the fact in the liver in particular. So by decreasing the fat in the liver, they would shrink the liver's size and there would be less complications. So that started to become standard care. But an unintended consequence or a surprise for everybody was that actually they noticed an immediate improvement in blood sugars even before weight loss and even before the surgery itself.

15:32 **Speaker:** And there was born the DiRECT trial, and this is the famous landmark trial by now. And there's a lot of interest in it. And it's Professor Roy Taylor and his team at Newcastle University that have really brought this home. And they have this hypothesis that actually diabetes is a condition of excess liver fat. So it's such a complicated illness has quite a simple root cause. So it’s specifically caused by ectopic fat within the liver and the pancreas. So if you remove those diabetes goes away, and that was their hypothesis. So around 2010, between 2010 and 2015, and a lot of studies have come from this. There's a lot of information on the DiRECT study website if you wanted to learn more about the twin cycle hypothesis. But basically, this is two cycles of ectopic fat, so fat that should not be in the liver or in any organ in fact. And that drives the process of insulin resistance and I’ll go into insulin resistance later on. And also it drives fat in the pancreas. And of course, neither of these organs are designed to have fat in them. It stops the organ from functioning properly. And once you start looking at your patients, you'll find lots of patients with these isolated, raised ALT, which can be a sign of fatty liver, or we see it all the time on ultrasound scans as well. So these patients have the first steps of developing diabetes. So the obvious idea is get rid of the fat from the liver and see what happens. And in fact, they found in their studies that they can normalise liver fat within seven days and pancreatic fat a bit longer, but within eight weeks.

17:38 **Speaker:** But then, of course putting people on a shake diet is a bit of a nightmare, it's very restrictive, not many people can do it. So what they wanted to do was to test does it work in real life patients in primary care? And that's what the diabetes and remission clinical trial is all about. So 2017 this was published 306 individuals aged between 20 and 65 with a diagnosis of Type two diabetes diagnosed less than six years. And important that they weren’t on insulin. So it's a case control study, and they have three phases. So the first three months is a liquid diet. Total diet restriction heavily supervised by dietitians and yeh very low calorie. Then they go through a food reintroduction phase for the next few months and then a maintenance phase where they again see dietitians but less frequent. And the primary outcome is weight loss of more than 15 kilograms. Because that's what they stipulate is how many kilograms you need to lose to reverse your diabetes. And of course, the aim was remission.

18:57 **Speaker:** So the initial results were 24 percent achieved weight loss of 15kg or more and 48 percent achieved remission, it was only one adverse event thought to be due to the diet and that was biliary colic, and only 8 percent were lost to follow up, which to me actually is brilliant to think is such a restricted diet. But obviously this was a research project, so they were highly motivated and actually they had ways of getting them back in for the evaluation. And still, two years later, a third had remission of diabetes. Again, that's brilliant because what I'm finding with my own clinic and others is that it's not hard to achieve remission. What's hard is keeping the weight off or keeping the blood sugars low.

20:04 **Speaker:** And it's created a lot of interest, and we have our own project in Wales I don’t know if you're aware of this. The All Wales Diabetes Remission project started just as COVID lockdowns were starting and there were a few pilot health boards delivered by the health board dietetic teams and to have support for 12 months. So they selected 100 patients. And these patients obviously were motivated without other health problems so there’s very specific limited selection criteria. I was hoping to share the results with you today, and unfortunately, I'm still waiting. And there are plans to roll it out to the health board. And of course, what we've got to remember, I think, is a lot of people will find that hard and maybe be unable to sustain it. But even if you have very few numbers, the cascade effect of that is quite massive on our health board and within our services if we think about preventing complications.

21:20 **Speaker:** So this where my special interest comes in and that is around the field of therapeutic carbohydrate restriction. So this is again the more low level way of doing it. You've started bariatric surgery, then you've got the intense shake diets and then we've got therapeutic carbohydrate restriction. So we'll see what you make of this.

21:48 **Speaker:** So just to clarify, carbohydrates come in many forms. They are chains of glucose. We learnt in medical school that patients with diabetes should follow a low glycaemic index diet. That's exactly what this is. But carbohydrates can be divided into two groups. You've got the simple carbohydrates and the complex. The simple. So bread, pasta, rice, potatoes, cereals, the nation's favourite foods that are fast release of energy blood sugars will spike very quickly after these and often lacking in vitamins. And it's those big five, as I call them, those are the ones that we need to target. It isn’t uncommon for patients to be eating half a loaf of bread a day, especially those with diabetes. That's why they might be struggling to control their blood sugars. You've then got the complex carbohydrates. So this is nature's food. Fruit and vegetables take a bit of time to break down in your system and there is a slower release of energy.

22:58 **Speaker:** And I like this graph, so the three macronutrients and the blood sugar response. You can see that the carbohydrates cause a huge surge in blood sugar very quickly and then it's gone, protein does a little bit and you can see fat there has no effect on blood sugar at all.

23:22 **Speaker:** Just to go back to medical school only for a second, blood sugar, blood glucose to get into the cell we need insulin. If you're not eating much carbohydrate, then you do not need much insulin in your blood. If like the average Westerner, your diet consists of 60 percent carbohydrates and particularly simple ones the bread, pasta, rice, potato, you have a lot of insulin in your blood.

23:55 **Speaker:** And insulin doesn't just help push the glucose into the cell. It actually is a fat storage hormone. It puts you into a state of fat, to store fat. It tells your body to store the excess glucose as fat stops you from burning the fat, and it makes you feel hungry. And as long as you've got insulin in your blood you are storing that glucose and I’m labouring that point, because we've got a lot of patients that snack all the time, they've got constant insulin in their blood, and they're unable to burn the stored fat that they have and they’re feeling hungry all the time. I mean, we can all relate to that I think.

24:41 **Speaker:** So if we look at this health and disease curve this is a journey to Type two diabetes, we all know it doesn't start overnight, but the first stage is actually high blood insulin hyperinsulinemia.

25:00 **Speaker:** And the poor little cell, if it's got insulin nagging all the time to push glucose into it, it will end up upregulating and saying we've had enough and this is the state of insulin resistance. So the cell is full of glucose it’s saying, no, I don't want anymore. But the glucose is still in the blood. The pancreas is still detecting a higher level because we're still eating a lot of carbohydrates and the effect is to produce more insulin.

25:54 **Speaker:** And the cell upregulates again, and you end up with this vicious cycle of high insulin driving insulin resistance driving high insulin, you go round and round and can go round and round there for decades before you develop Type two diabetes. And then, of course eventually you tip over, you cannot produce enough insulin to cope with the glucose and you tip into prediabetes and then Type two diabetes. And again, 50 percent of the beta cells of the pancreas are not functioning by the time you get to Type two diabetes, that is massive. We look at a HBA1c of 48 and think oh they’ve well controlled diabetes, but actually half the pancreas isn’t working and we previously thought that these beta cells had died. I now refer to them as sleeping. So once we can lift a bit of the fat around those beta cells and give them a bit of a break, they do start working again. But of course the patients that achieve the best response with regards to remission are those that have been diabetic for the least amount of time. And that's where Roy Taylor and the DiRECT study were targeting patients that were within six years of a diagnosis.

26:53 **Speaker:** And then I'm afraid we all know this, but once the diagnosis is there, you're on a steady decline until enough of your pancreas isn't working and then you actually need to inject insulin on top. Which of course, drives the insulin resistance and the whole problem is made worse.

27:16 **Speaker:** So the way that we look at it when we're decreasing carbohydrates is we just lower the insulin level, and the way we would do that is avoid sugar, avoid the simple carbohydrates, lower blood glucose lower the insulin. And we go back down that curve towards health and it really is that simple.

27:44 **Speaker:** And it's really exciting I feel to know that actually all of these conditions are driven by the same thing insulin resistance. It's crazy that we treat each one individually. We medicate high blood pressure, we medicate gout, dyslipidaemia when actually, if we were able to lower the insulin, you find that all of these improve. And that's what I find in my clinic we've had two babies from patients that were amenorrhea from their polycystic ovaries their blood pressure lowers, their cholesterol profile normalises, as well as improvements in their diabetes. So it's well worth thinking about the root cause of all of these conditions it’s the same. And of course, this is the bulk of our work.

28:34 **Speaker:** There are things we can do here, and I like to share these slides. So these are done by David Unwin who is a GP in North of England, who has a passion for the low carb diet. And I like showing these to patients so you can google them. You would just literally write David Unwin infographic and they all come up and there’s a few, I’ll share a few with you. And this is powerful. So a bowl of basmati rice you can see at the top there is the equivalent of eating 10 teaspoons of sugar and patients can see that and they are obviously shocked with that. So he's calculated the glycaemic index and compared it then to sucrose. So yeah and that's the effect it would have on their blood sugar. Potato, nine teaspoons. It's interesting if you put a bit of fat on it, it goes down to seven and a half teaspoons of sugar. And spaghetti, so those are the big ones that we need to target, the top four there. Sweetcorn is surprisingly high, same as eating four teaspoons of sugar. Banana also we've got to remember that fruit are nature's sugar and so be mindful of the banana. And I find patients with diabetes love banana.

30:00 **Speaker:** This is interesting. We advise patients to eat brown bread because there's more fibre in it. But actually from a blood sugar point of view, there isn't that much to gain. 3.3 teaspoons compared to 3.7. And I don't know of many that eat wholegrain barley bread. And people don't like me, they don't love me for recommending cutting down bread. But in all honesty, I find so many eat it for breakfast, lunch and dinner and just cutting that down has a huge impact on the person's blood sugars.

30:40 **Speaker:** Types of fruits. So yeah, the bananas and grapes is what I would tell patients just be mindful. However, I'd rather them eat a banana to be honest than pasta rice has less of an effect, and it's about choosing, isn't it? It's just about awareness I feel it's up to the patients what they do with the information.

30:59 **Speaker:** And this question always comes up. So how many carbohydrates. Patients want to count all the time because we're used to counting calories. So the average Westerner would eat between 200 and 300 grams of carbs a day, I can tell you now that patients with Type two diabetes are often in excess of that from my experience. Low carb is less than 100 grams we will again find lots of different definitions, and I stick with this one. Very low carb is 50 grams a day. And then the ketogenic range is less than 20 grams. So that's a much more restrictive diet and it depends on the patient. What do they want to do? You can get into remission with 100 grams a day. Of course you can, takes longer than it would with a ketogenic range. But actually, I'd rather it take longer and it become a lifestyle change, and it is entirely possible. In fact I always start with asking patients what do you eat for breakfast, only got 10 minutes with patients, you know, a normal surgery. I only target breakfast. What do you eat? You find that they eat cereal, toast and juice usually. And I just recommend can you switch that to eggs. Eggs and bacon omelette will keep you full. And actually, that can be enough to lower the HBA1c a good 20 sometimes depending on how high it is, the higher the HBA1c the bigger the drops is what I found.

32:35 **Speaker:** And of course, if you look at ketogenic foods on the internet or low carbohydrate foods everybody has a bit of a panic about the double cream and the cheese because we do increase the fat. Of course, when you lower the carbohydrates, you do need to increase the fat. And I often challenge patients to think about what their grandparents were eating. When there was less diabetes and obesity around in that age, and they were cooking with lard and butter and then drinking full fat cream.

33:12 **Speaker:** But of course it is a worry, and I was worried when I started my clinic in 2018. Goodness me, what am I going to do to the cholesterol? So I monitored patients cholesterol throughout, and actually a few things have come out of late. And that is we all know we shouldn't be looking at the total cholesterol but it's still widely done. It is actually more protective from a cardiovascular point of view to have a high HDL than a low LDL, ok, and the metabolic syndrome is all about low HDL and high triglycerides, so we need to reverse we need to flip that back. And what’s fascinating of course statins don't do that. They don't lower triglycerides as a rule. But hypertriglyceridemia is actually caused by high carbohydrate consumption, not high fat. And I see the triglycerides plummeting within weeks of lowering the patient's carbohydrate consumption, and the HDL improves as well.

34:17 **Speaker:** Sorry this is old data, but I just wanted to show you that this was the first two groups in 2018, 2019 that I did, and this is comparing the beginning and 16 weeks later so four months later. And what's interesting is all of the ones with low HDL have normalised more or less. The only ones with a drop in HDL were the ones that were high to start with. We don't often see HDL 2.4 in Ammanford. And the triglycerides plummet as I said, sometimes you can have a raise in triglycerides quite soon after starting low carb. And that's because the triglycerides are the vehicles that carry the fat out of the liver. So if you’re losing weight you will carry the fat out of the liver into the blood,

so you might see a transient rise and then it lowers again. Again I've got another two years worth of data showing the same, so I'm confident in what I'm saying because the patients have demonstrated that themselves.

35:26 **Speaker:** So just in case you have patients who've announced to you, I'm going low carb doc, I'm going to do it anyway. I just wanted to tell you there are a few things you need to remember hypoglycaemia being the main one I lose sleep about. If a patient goes low carb, you can expect them to lower their blood sugars rapidly. We've seen it with the bariatric surgery can be within days. And I would suggest that you stop gliclazide. And insulin again, you need to be very careful I’m giving written information, make sure they're aware of hypos and through my clinic I can monitor them and I know we don't quite have that luxury in general day to day general practise. But it's important that they know the risks of hypoglycaemia. It becomes a very real risk. Ketoacidosis, people worry about the ketogenic diet and ketoacidosis. The reality is it's a physiological ketosis. We all go into a physiological ketosis, I wouldn’t say all but we should go into it overnight. So it's a normal process. Dapagliflozin and his friends, the SGLT2 inhibitors can affect that though. I have seen it where they develop ketoacidosis with a normal blood sugar. So you've got to warn patients of the symptoms. And in fact I just remove, I just take it out. I stop SGLT2s as soon as they announce that they're going to lower their carbohydrates because they don't need it and they genuinely don't need it. Their HBA1cs I find they're off gliclazide and SGLT2 inhibitors within two weeks quite often.

37:22 **Speaker:** So back to diabetes remission then, a lot is unknown a lot of research is going on. We've already mentioned about the Readcoding properly. And that's because a lot is unknown. It's uncertain whether complications do decrease once the blood sugars are normalised. My feeling is, of course, I would expect them to be honest with you, but we haven't got that evidence as of yet. So if you keep that Readcode it still triggers annual review, such as the retinopathy screening. And you could use that as a trigger they should still have annual HBA1c, this is remission this is not a cure. And there is much debate about whether metformin should be stopped or not. I have a conversation with patients, we know that metformin can be used to prevent diabetes and to prevent a relapse. And I essentially ask the patients what they want to do, if they hate it and they have side effects, then it's easy decision but actually if they are tolerating it fine, then maybe a low dose would help them because the aim at the end of the day is they have less complications, isn't it? And if metformin helps them achieve that, then so be it.

38:52 **Speaker:** And the other important thing that I want to mention is this legacy effect that's been shown in studies over time, that even if you only lowered their blood sugars for six months, it will have an impact decades down the line. So lowering HBA1c by 1 percent at diagnosis will give a risk reduction in all-cause mortality of 19 percent when they're aged between 60 to 70 years. And of course, the earlier you do it, the more successful you're likely to be. But the bigger the effect on long term health of that patient. So yes, I would encourage you to give it a go and there's a few stats there about the effect of lowering HBA1c 11 mmols. And it has a huge effect, and it's extremely rewarding to see patients actually improve their diabetes and they feel really empowered as well.

39:53 **Speaker:** So that's it from me, and I'm happy to take any questions if you wish. Or if you wanted email me if you’re interested in finding out more about the clinic.

40:10 **Chair:** Lovely thank you very much Nerys. I've got one question from Louisa Godwin. Do you like the liraglutide and semaglutide for weight management reducing risk of diabetes?

40:26 **Speaker:** Yes that’s interesting, it’s not available to us as of yet, I don't believe, but we are considering and I'm in discussions with Ann my diabetes specialist nurse who does this with me.

And I think that if we have patients that are starting to struggle with lifestyle changes, then yeah absolutely. I would give it a go. And I think, you know, I would rather change things with lifestyle changes. But if people are struggling, I think it is a brilliant option. But we haven't yet needed to try. So I haven't got that much experience.

41:03 **Chair:** OK, any more questions anybody? We’ve got a couple of thanks for your presentation. Very helpful talk. But as such unless I've missed one I don't think we have any more questions. Thank you very much Nerys for a fantastic talk. I'm certainly going to look at my diet again. I think I've started to be eating rice and a little bit of bread thinking that's not too bad. But as you say, all together, when you add them all up together then that's not a good thing. So thank you very much. Fabulous talk and look forward to speaking to you again sometime soon. Thank you.

41:39 **Speaker:** Thank you all.