Type 2 diabetes remission: Toolkit for General Practice

Supporting practices to help people attain remission of type 2 diabetes if ineligible for the NHS Path to Remission Programme

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About this toolkit

The NHS England Type 2 Diabetes Path to Remission programme has numerous eligibility criteria, including age less than 65 years, BMI of greater than 27 kg/m^2 (ethnicity-adjusted) and duration of type 2 diabetes less than 6 years. Individuals who are not eligible for the programme but for whom such a weight loss intervention is likely to be safe may benefit from practice-based care.

Those with more than 6 years' duration of type 2 diabetes can achieve remission, but it becomes steadily less likely. However, weight loss in type 2 diabetes potentially has many other benefits, including substantially decreasing cardiovascular risk. In the DiRECT study, the programme was delivered by practice nurses or practice dietitians, with minimal doctor input.

This toolkit provides materials to support practice-based care aimed at the attainment of remission through total diet replacement in people who are ineligible for the NHS Path to Remission Programme.

Knowledge summary

Type 2 diabetes is caused by more fat inside the liver and pancreas than an individual can tolerate		This happens when a personal fat threshold for tolerance of fat is exceeded
Removal of this intra-organ fat leads to return of normal metabolic function (remission)	This can only be achieved by weight loss of at least 10–15 kg (or 10% if BMI <27 kg/m^2)	A simple method allows many people to achieve this target (35% at 1 year in the Path to Remission programme)
With total diet replacement, usual food intake is swapped with formulated, low-calorie meals for 12 weeks		In DiRECT, average weight loss was still 6.1 kg after 5 years, with major benefits to health
Remission is recognised by **SNOMED code: 703136005**, allowing for the individual to be declared in remission of type 2 diabetes (for insurance and all other matters) but with continuation of recall for annual checks and ongoing QOF recognition of care. **Do not code as 'diabetes resolved'**		

Exclusions for this intervention

This intervention is not suitable for people with any of the following:

- Active cancer.
- Heart attack or stroke in last 6 months.
- Severe heart failure (defined as New York Heart Association grade 3 or 4).
- Severe renal impairment (most recent eGFR <30 mL/min/1.73 m^2).
- Active liver disease (not including MASLD; MASLD is **not** an exclusion).
- Active substance use disorder.
- Clinically evident eating disorder (including binge eating).
- Porphyria.
- Known proliferative retinopathy that has not been treated.
- Pregnancy or breastfeeding*

*Although weight loss in pregnancy improves outcomes in women who have a pre-pregnancy BMI above the normal range, use of diets less than 1,200 calories per day cannot provide complete nutrition during pregnancy. The approach described in this document is not appropriate during pregnancy or breastfeeding.

Offering potential remission

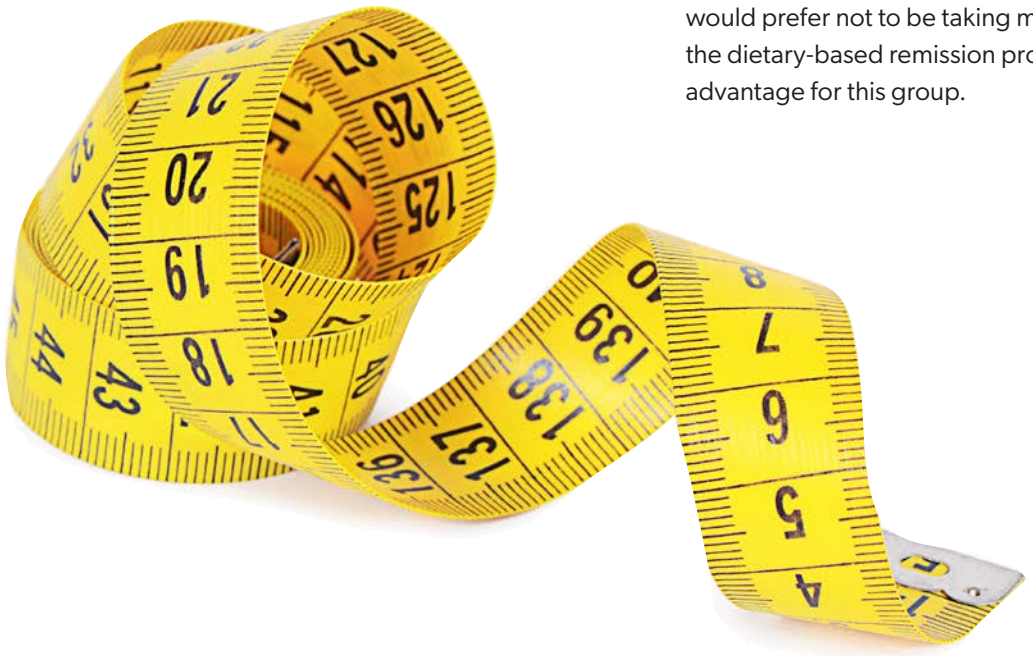
Optimal management of type 2 diabetes may be presented as a choice:

EITHER – medication to decrease glucose levels but with continued risk of complications,
OR – substantial weight loss with likely return to health as long as this is maintained.

Remission is defined as achieving and maintaining (for at least 3 months) glucose levels below the diabetes range (usually measured with HbA_{1c}) without using glucose-lowering medications. The use of medications which can lower glucose levels for another purpose (e.g. reducing cardiovascular risk) does not preclude the attainment of remission.

The weight loss required for this is usually around 10–15 kg. Not all would wish to undertake such a programme, but many people at type 2 diabetes diagnosis liken the news to a hammer blow to self-esteem as well as health – and are willing to consider definitive action. Not everyone is suitable. Also it is not possible to predict who will do well on the programme, not least because this is affected by support from partners or close friends.

Note that most people will not be eligible for 'weight loss medicines', whether used primarily for weight or for glucose-lowering, at time of diagnosis of type 2 diabetes. Further, current evidence suggests that the weight regain post-cessation of these medicines occurs at a rate much greater than typically seen after non-pharmacologically driven intensive weight loss programmes. Many people would prefer not to be taking medicines of any kind, hence the dietary-based remission programme offers a clear advantage for this group.



Points to cover in the explanation of what is involved:

- Type 2 diabetes is a serious condition which poses major risks to future health, wellbeing and happiness.
- This is not your fault – you are just more susceptible than most people to a relatively small amount of fat inside your liver and pancreas.
- Fat inside the liver and pancreas is stopping these organs from properly regulating blood sugar levels, BUT this can improve if the fat is removed.
- A programme of rapid weight loss is considered the easiest way for most people to achieve the substantial weight loss needed to do this.
- And:

> **“Remission causes a huge decrease in risk of heart disease and cancer.”**

> **“People who have done this say it is much easier than they expected, although still challenging.”**

> **“For 8–12 weeks: Low-calorie liquid meals, no snacks or alcohol. Milk for tea/coffee is allowed.”**

> **“You are likely to feel much more energetic and to sleep much better within 2 weeks.”**

> **“No new exercise programme during the weight loss. That would make losing weight more difficult.”**

> **“After weight loss, your smaller body will need only around ¾ of the amount you have usually eaten (smaller food bills).”**

> **“There are three steps: Weight loss; careful return to normal eating; and then avoidance of weight regain.”**

Preparatory steps

> Before any decision about undertaking the programme, advise the individual to discuss with their partner and close family and friends. Support will be very important (use the handout in *Appendix 1*).

All non-insulin glucose-lowering medicines are to be stopped on Day 1 of the diet. This is especially important for SGLT2 inhibitors owing to risk of euglycaemic ketoacidosis, and for sulfonylureas owing to risk of hypoglycaemia.

Note that fasting blood glucose falls rapidly on starting the diet despite withdrawal of medication (see *Appendix 2*).

Insulin dose reduction requires care but can also be carried out simply and safely (see *Appendix 3*).

If on blood pressure-lowering medicines, provided that blood pressure is adequately managed before starting, it is important to stop one medicine on Day 1 of the diet to avoid postural hypotension. This may cause concern for clinicians – until the extent of the decrease in blood pressure brought about by the diet is appreciated (see the typical blood pressure graph in *Appendix 2*). The safety of doing this has been demonstrated in the current NHS Type 2 Diabetes Path to Remission Programme.

In practice it is rare to require restarting of medications that have been withdrawn, but assessment of individual circumstances should be applied as usual.

Ensure that the individual is able to test blood glucose at home and has clear instructions for what to do if they have unacceptable hyperglycaemia, including when to take action (over 20 mmol/L or consistently above 15 mmol/L is reasonable), who to contact and which medicines to restart.

Advise:

- Empty cupboards of biscuits, crisps, sweets, chocolate and other treats.
- Keep a jug of water (+/– lemon or another flavour) in the fridge to drink two glasses if hungry.
- Write a list of tasks/activities for when tempted to snack.
- Writing a list of 'things to do when you are at a loose end and are tempted to eat'. Remember that time is freed up by not cooking/eating as per usual.
- Encourage choice of start date to minimise overlap of the 2–3-month programme with birthdays and other celebrations.
- Agree a weight target: usually 15 kg less than weight at diagnosis. If BMI is <27 kg/m^2, a target of 10% weight loss is more appropriate.

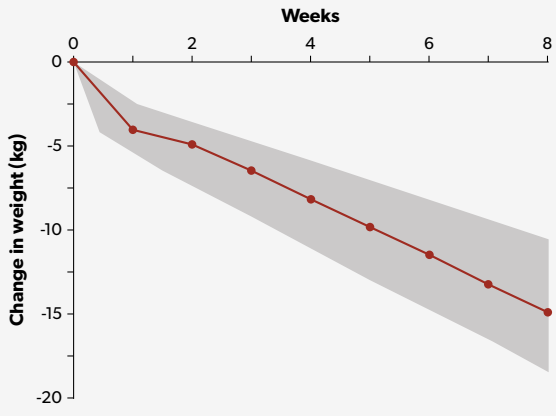
Choice of diet

The use of liquid food replacement (see *Appendix 4*) is most successful and acceptable.

Home-prepared 800 kcal meals require considerably more dedication, effort and time. If an individual wishes to do this, they need to know the expected weight loss trajectory and to have a fall-back plan to switch to food replacement if weight loss is not sufficient.

Feasible weekly weight loss targets during 800 kcal/day

This information can be usefully discussed with the individual. Weight loss in the first week is a guide to how well someone is likely to do overall.



Data from a group of people with type 2 diabetes and average baseline weight 102 kg

Necessary support during the programme

Support during the weight loss phase

- Encouragement: Re-emphasise the benefits and deal empathetically with the very real challenges.
- Managing lack of weight loss: Might there be some food slipping in at difficult times, such as social occasions? Can such occasions be avoided? What are the overall barriers and challenges experienced?
- Constipation is common, and Fybogel or other agents may be required. The likelihood of constipation is decreased by eating non-starchy salad foods daily; this contributes minimally to calorie intake.
- Tiredness is rare, with feelings of increased energy levels being the norm. If tiredness occurs, reassurance than it will improve as weight loss continues can be provided.
- Hunger is notable by being much less troublesome than might be expected on this dietary regimen, but if experienced then advice can be provided. It can be helpful to:
  - immediately commence a task from a prior list of 'things to get done';
  - go for a walk;
  - drink a pint of water;
  - remember that this is a sign that the intervention is all working.
- Telogen effluvium (temporary hair thinning) can occur rarely but entirely recovers.
- Adjustment of blood pressure-lowering medication is not usually needed after the initial withdrawal of one medicine, but if at any stage blood pressure is unsatisfactory, usual management should be applied.
- Review is advised to be weekly during the first 4 weeks and then 2-weekly thereafter. If feasible, the possibility of telephone advice in between visits would be offered.

Support during stepped return to normal eating

Meals are introduced one at a time: stop the evening shake and substitute normal food until they are confident to move forwards (1–2 weeks usually). Then stop the lunchtime shake and substitute normal lunch for a similar period. Then stop the final shake and substitute normal breakfast.

Remind of the previously given advice that "After successful weight loss, your smaller body will require only around ¾ of the amount you have previously been eating."

Definitive advice on portion size is vital – see *Appendix 5*.

Weight regain of around 1 kg is expected during this phase due to water accumulation (storage of glycogen requires water).

Ideally, review every 2 weeks will be continued for this ~4-week period.

Supporting long-term avoidance of weight regain

This is the most difficult phase. Regular supportive review is important to help avoid weight regain. Appointments at 3, 6 and 12 months are appropriate but with the offer of extra help when required. In the DiRECT study, these contacts were exclusively with a Practice Nurse knowledgeable about the clinical process. Many episodes of weight re-gain are related to temporary life stresses, and use of 'rescue packages' of the low-calorie diet for 2–4 weeks can be very effective (see *Appendix 6*).

Even if type 2 diabetes is in remission, annual screening, including retinopathy screening, should be continued. This is a precaution as when non-diabetes-range blood glucose levels are achieved, microvascular disease is thought not to progress. Proliferative retinopathy (uncommon in type 2 diabetes) should be treated before rapid weight loss.

Pre-diabetes versus 'post-diabetes': Note that pre-diabetes is defined as HbA_{1c} 42–47 mmol/mol and is considered a state of high risk for cardiovascular disease. This is distinct, however, from the situation of an HbA_{1c} at the same absolute level achieved after significant weight loss in the context of a previous diabetes state. In the latter situation, lipids are likely to have normalised, with a reduction in the risk of cardiovascular disease accordingly. This 'post-diabetes' state can be expected to last for as long as weight regain is avoided.

The principles of weight stability

- Avoid ready-meals and takeaways – they can result in overeating and early post-meal hunger.
- Avoid biscuits, confectionery and sugar-containing drinks such as fruit juices.
- Only eat at meal times.
- Eat slowly and focus on enjoying the food.
- Never do anything else whilst eating (e.g. watching TV), as this tends to result in too much food slipping down unnoticed.
- Keep a written record of weekly home weighing.
- Ideally, increase daily distance walked by building this into routine activities.
- Enjoy life – join in with celebrations and parties. But remember, 'Party but Payback' – after an overindulgence, a few days of greater food limitation is necessary.
- Weight regain is not a failure. It often reflects a life stress (family illness, work problems, financial worries, etc.), so when the individual is back on an even keel, a pre-planned rescue package for 2–4 weeks is advised (*Appendix 6*).
  - For more than 4 kg weight regain, this involves a return to the low-calorie diet.
  - For 2–4 kg weight regain, it may be sufficient to just substitute one meal per day with a formulated low-calorie product.
- If weight regain is slow and steady, advise an appraisal of food/drinks and quantities consumed (not forgetting alcohol) – then cut down on the least favourite sources of extra calories.

Is it really type 2 diabetes?

The possibility of achieving remission of type 2 diabetes relates specifically to this common form of diabetes. Rare forms of diabetes can sometimes be identified from personal and family history and specific testing. But there is minimal risk associated with low-calorie weight loss for most people (in the pre-insulin era, this was the only way of prolonging life in type 1 diabetes). Note that the glycaemic response to 15 kg weight loss can help elucidate a diagnosis.

A. **Monogenic diabetes.** Onset of diabetes in teens or early adult life, usually in people with a very strong family history of diabetes who do not fit the typical phenotype for type 2 diabetes at this age. Glycaemic control will not change after weight loss, as the specific genetic change cannot be reversed.

B. **Slow-onset type 1 diabetes.** The presence of ketones+++ in the urine associated with hyperglycaemia may be a clue to diagnosis, but note that any recent hypocaloric dieting will bring about slight or modest urinary ketones. Typically individuals present with high blood glucose levels but may appear to respond to weight loss initially. However, despite adequate diet, blood glucose levels rise over the subsequent weeks or months, and insulin therapy is inevitably required.

C. **Pancreatogenic diabetes.** Most commonly caused by chronic pancreatitis and rarely by haemochromatosis. The associated clinical features are likely to make this diagnosis evident.

Other useful points

Most individuals will be able to reduce food intake substantially, with no short- or medium-term risks to health. However, a multivitamin and possibly iron supplementation should be considered if prolonged hypocaloric dieting using ordinary food is undertaken (the liquid formula diets contain all necessary vitamins). The preferred rapid (8–12 weeks) low-calorie diet is highly unlikely to cause any nutritional deficiency unless significant iron deficiency is already present.

If there is no retinopathy, or only early changes (R1/M1 grade), then no additional precaution is required other than annual screening. If moderate or more severe retinopathy is present then arrangements should be made to rescreen within 6 months. This is because sudden normalisation of the typically increased retinal blood flow may disadvantage areas of the retina with marginal circulation, with resulting deterioration in retinopathy.

As with any toolkit of this kind, the information contained here is considered generally applicable to people with type 2 diabetes but should be interpreted within the context of each individual. **It should never override clinical judgement.**

Appendix 1. Handout to aid discussion of the programme with family and friends

(This can be amended for local circumstances)

Why type 2 diabetes is a problem

- Having type 2 diabetes brings with it several major risks.
- It can lead to a heart attack or stroke years earlier than would happen to a similar person without diabetes. It can also lead to problems with eyesight, kidneys, nerve pain and feet. The risk of getting cancer is increased.
- The standard treatment using medicines can decrease these risks but typically cannot get rid of them entirely.

New understanding of type 2 diabetes

Type 2 diabetes used to be regarded as a life-long condition, requiring more and more treatment in the form of tablets or injections as the years went by. Now, though, it is known what causes the condition and how it can be put into remission.

In susceptible people, when there is more fat in the body than can safely be stored, it spills over into the liver and pancreas, stopping these organs from doing their usual job of keeping blood sugar levels steady. But the level of fat that is 'too much' for any one person is very much an individual matter. Everyone has a 'Personal Fat Threshold', above which they may develop type 2 diabetes. This varies from person to person and can be exceeded even if someone is not classed as living with obesity. People with type 2 diabetes and relatively normal weight have built up more fat than they personally can tolerate, resulting in the development of type 2 diabetes. The same applies at much greater weights, such that people may still be classed as living with obesity even after losing enough weight to put their diabetes into remission.

What your clinician is recommending

A new approach has been developed to lose weight and keep it off. This involves a short, intensive weight loss period followed by ongoing support to avoid weight regain. A low-calorie diet will be advised, which provides around 800 calories per day. This is a challenge during the first few days, but after that (to everyone's surprise), hunger fades away. The liquid formula diet is designed to make a person feel satisfied after a meal, and now thousands of people have used this approach. They report that it is not as hard as they thought it would be and that after around 2 weeks they start to feel much better – more energy, sleeping more soundly and able to move around much more easily. It becomes self-motivating because people feel so much better.

The liquid diet is all that is eaten during the rapid weight loss period (although salad and leafy vegetables are also acceptable to eat). Alcoholic drinks contain a lot of calories and should be avoided. It is important that no new exercise programme is started during this initial phase – because this has such a big effect on 'compensatory' eating. For many people this is encouraging advice, having found the usual 'walk more, eat less' advice to make little difference to their weight.

All of this requires a big change in daily living, and support from those closest (e.g. partners, others in the household) is really helpful. Having help from friends, and people at work, is also important in minimising temptations and achieving success. Planning how to occupy time usually spent eating is best done in advance, with family and friends.

Is it worth it?

1. People report feeling '10 years younger'.
2. Avoiding having to take medication and avoiding side effects of these is very appealing.
3. Over 5 years, the risk of serious illness is decreased by **one half** (data from the DiRECT study) and the risk of cancer is also substantially decreased.
4. Putting diabetes into remission makes people feel better in themselves and may also decrease the cost of holiday insurance.
5. The eye, kidney and other complications of diabetes are likely avoided if blood sugar levels are kept under the diabetes range.
6. If one person in a family develops type 2 diabetes, the risk to children is much increased, so the life skills of how to manage food to avoid the onset of this serious condition are precious.

On the other hand:

1. It requires a big change in everyday living for the 8–12 weeks of the rapid weight loss period.
2. There is no guarantee that the diabetes will go into remission – it is achieved by around 2 out of 3 people who lose 10 kg weight and 9 out of 10 people who lose 15 kg in weight. However, **any** degree of weight loss is still likely to reduce the risk of heart disease and stroke considerably.

Are there any side effects?

- The safety of this approach has been well demonstrated in recent years through the tens of thousands of participants on the NHS Path to Remission Programme.
- Serious side effects are extremely unlikely, in contrast to many pharmacological agents.
- However, constipation is common and can be treated as usual. Fybogel (or its key ingredient, psyllium husk) is often used.
- Tiredness is rare but can be experienced. Increased energy levels are far more common, however.

Preparation

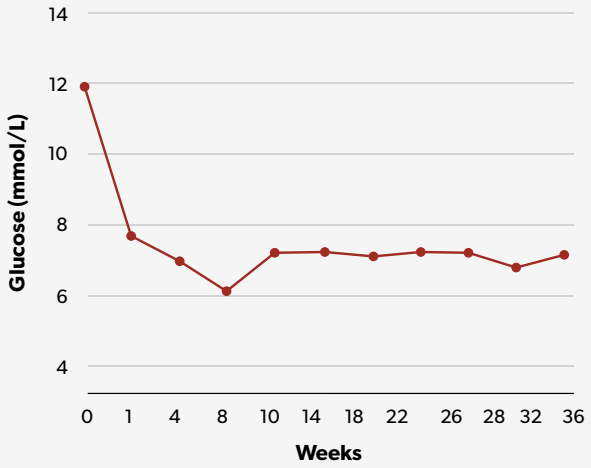
- The decision as to whether or not to commence this programme has to be carefully weighed up. And if so, the timing of when to start needs consideration as well.
- It is best to avoid major family celebrations that might happen in the next 8–12 weeks, or at least plan how to deal with these.
- The critical yes/no decision is the first step in restoring health. Help and support of family and friends is really important to help a person through the inevitable tough periods and on to success. In practice, many people lose weight with a buddy – who also benefits!

Appendix 2. Trends in plasma glucose and blood pressure after starting low-calorie diet despite withdrawal of glucose lowering and blood pressure medications

Data from the Counterbalance study (Stevens et al 2016; doi: 10.2337/dc15-1942). Diet continued for 8 weeks, followed by long term normal eating to minimise weight regain.

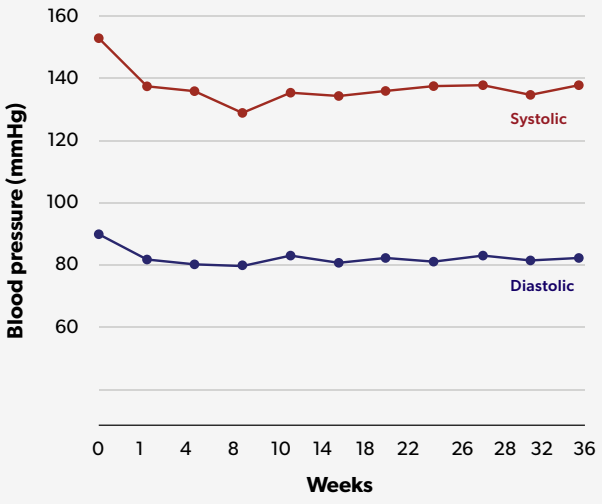
A. Fasting plasma glucose fell rapidly after stopping all oral hypoglycaemic agents (OHAs) on Day 1 of the diet.

A. Plasma glucose after stopping OHAs and starting the 800 kcal/day diet



B. Both systolic and diastolic blood pressure decreased after stopping all antihypertensive agents on Day 1 of the diet. **N.B.** It is now recommended to stop only one antihypertensive agent, as this achieves the purpose of avoiding postural hypotension.

B. Blood pressure after stopping antihypertensives and starting the 800 kcal/day diet



Appendix 3. Safe management of insulin withdrawal in type 2 diabetes during weight loss

Insulin withdrawal can be carried out safely in type 2 diabetes – provided that the individual is able to undertake daily monitoring of fasting blood glucose and can contact an appropriate member of your team by phone as necessary.

- On Day 1 of the diet, insulin dose is decreased by 50%.
  - ➤ Daily fasting blood glucose monitoring should show no increase over the usual average reading.
- On Day 3, if glucose levels are falling, insulin dose is decreased by a further 50%.
- On Day 5, if glucose levels have decreased further, insulin is stopped.
- Daily blood glucose monitoring must be continued for at least a week to demonstrate stability.

So, for example, if daily dose is insulin glargine 80 units:

- On Day 1 of the diet, only 40 units will be given.
  - ➤ This is repeated on Day 2.
- Provided that blood glucose levels are falling, only 20 units will be given on Days 3 and 4.
- No insulin is given from Day 5 onwards, provided that blood glucose levels do not rise.

If a basal–bolus regimen is being used, the short-acting insulin is withdrawn first. So, for a regimen of basal insulin 40 units daily and boluses of 20 units per meal:

- Stop all short-acting insulin on Day 1 but take the basal insulin dose of 40 units.
  - ➤ This is repeated on Day 2.
- On Days 3 and 4, a basal dose of 20 units will be taken instead.

Paradoxically, people requiring very large doses of insulin (more than 100 units daily) yet still with high blood glucose levels usually respond very well. Typically for such individuals, fasting blood glucose returns to normal within a few days on the diet. This is because the very high dose is determined by severe insulin resistance in the liver, and the resistance disappears when liver fat levels are decreased by the hypocaloric diet in the first few days.

Appendix 4. Suitable 'Soups and shakes' and how to use

There are a confusing variety of low-calorie meal replacement products which meet regulatory requirements for total diet replacement. These can come in different forms (e.g. shakes, bars) and flavours.

The important details are that they should provide approximately 200 calories (usually written as the formal scientific term 'kcal') per meal, and that they provide around 55 grams of protein per day.

People with diabetes may be alarmed by the seemingly high sugar content in some products, but they can be reassured that the total intake (on an 800 calorie per day diet) will be less than the amount that the liver normally produces for vital needs of the body, and far less than the liver typically produces in type 2 diabetes.

All necessary vitamins and iron are included. A shaker is needed to make the powder into a drink of suitable consistency.

No commercial products are specifically endorsed, but here are some examples suitable of meal replacement shakes for rapid weight loss:

- Fast 800
- Shake That Weight
- Optifast
- Habitual

The cost is £2–3 per meal, which may not be very different to the usual food bill.

If cost is a major problem, a milk-based diet can be used: 1.6 litres of skimmed milk per day (with artificial flavouring if preferred) plus non-starchy vegetables. A multivitamin tablet is also required. Iron supplementation is needed for pre-menopausal women.

Appendix 5. Definitive advice on portion size during stepped food reintroduction

This must take account of personal preferences and cultural norms. It is useful to ask what the individual might normally eat, then advise on portion size.

Example evening meal

This is usually the first meal to replace a liquid formula meal. If the individual has been taking a portion of salad foods daily, the easiest route to 'normal' eating is to advise adding 3 oz of meat/fish/cheese and two small potatoes to the usual salad.

Otherwise, a large helping of a preferred vegetable, together with the same protein and carbohydrate portion, is suitable.

Example lunch

If lunch is to be portable, possibilities include:

- 3 oz of nuts plus tomatoes and an apple.
- Two oatcakes with 3 oz of cheese plus an apple/orange/banana.

If at home, a homemade soup plus a half-slice of bread may be preferred.

Example breakfast

Boiled egg with one slice of toast + spread.

Note that the precise calorie count is not important. The aim is to smooth the return to eating normal food. Remind of the original advice given: that they need to eat less than they habitually did before. Weekly measurement of body weight is the ultimate arbiter of whether habitual portion size is suitable.

Reminding about the expected 1 kg weight increase on return to normal eating helps to prevent unnecessary concern.

Appendix 6. Rescue plans

The ethos should be that weight regain **is not** a failure. If it occurs, rescue plans for weight gain prevention can be used. Importantly, people should be advised in advance about the need to seek advice if weight regain occurs so that they know specific help is available.

As weight regain tends to happen during sudden life stresses (financial, family illness, relationships, etc.), identifying such underlying factors is important. Action to lose weight again may be better postponed until the acute crisis has subsided, so full discussion is useful in deciding a time plan.

Alternatively, weight regain may be gradual, reflecting recurrence of old eating habits.

Action:

Discuss sources of excess calories (social eating; usual portion sizes; snacks between meal; alcohol).

If:

- **Weight gain of 2–4 kg:** Offer the use of liquid diet products to replace either lunch or evening meal daily for 2–4 weeks.
- **Weight gain of >4 kg:** Offer a return to full liquid formula diet for 2–4 weeks, with fortnightly review and a 2-week food re-introduction (as before).

In all cases, reiterate portion control dietary advice and encourage sustainable daily physical activity.

Appendix 7. Further information

(Click or scan the QR codes to access)

Website with information on the how and why of type 2 diabetes remission

How-to-do-it book:
Life Without Diabetes by Roy Taylor (2nd Edition, 2025), published by Hachette

NHS Type 2 Diabetes Path to Remission programme website

One-year outcomes of the Path to Remission programme

Five-year outcomes of the DiRECT study

Twelve-year cardiovascular and renal benefits of even 1–4 years' remission