

Weight loss for the prevention and treatment of type 2 diabetes

Obesity is contributing to the increasing rate of type 2 diabetes in New Zealand, most notably in people aged under 40 years. The outcomes for these people are worse than for adults diagnosed later in life as end-organ damage, e.g. diabetic kidney disease, retinopathy and neuropathy, develop over time and the lifetime risk of cardiovascular disease (CVD) and early mortality is higher at a younger age. Weight loss achieved through lifestyle interventions, pharmacological treatments or surgery can be successful in preventing or delaying the onset of diabetes, inducing diabetes remission and improving cardiovascular outcomes in people who have, or are at high risk for type 2 diabetes.

Lifestyle change can prevent type 2 diabetes in people who are overweight or obese

In people who are at high risk for type 2 diabetes, a healthy diet, physical activity and weight management can prevent or delay the onset of diabetes.¹ Changes in dietary composition and increased physical activity are thought to be the two most significant modifiable factors that contribute to a lower incidence of diabetes.² Patients can be encouraged to consume low calorie, low glycaemic index (GI) foods, increase vegetable intake and minimise the consumption of dietary fat, energy-dense foods, sugar and alcohol to form a nutritionally balanced dietary regimen. A healthy diet should be undertaken in combination with physical activity (ideally 150 minutes per week) to maximise the benefits.

There is a large evidence base for the benefits that lifestyle changes have on the risk of developing type 2 diabetes including:

- In a 7.4-year follow-up of The Finnish National Diabetes Prevention Program, 10,149 participants at high risk for type 2 diabetes (average BMI > 30 kg/m²) engaged in a one-year primary care-led lifestyle counselling intervention (i.e. on weight reduction, healthy diet and physical activity). Of the 2,730 participants who completed the intervention, those who achieved weight loss between 2.5% – 4.9%, and ≥ 5%, had a reduced incidence of type 2 diabetes of 37% and 29%, respectively, compared with people who did not lose weight.³
- In a German study, 2,227 participants who were obese (BMI 30 – 40 kg/m²) completed a 12-month lifestyle intervention delivered in a primary care setting which consisted of physical activity (41 exercise sessions with

progressive intensity), dietary modifications (reduction in the intake of dietary fat and energy-dense foods with a focus on consuming low GI foods) and behavioural changes (using cognitive-behavioural strategies to set action-based goals, identify potential barriers and enable self-monitoring).⁴ Body weight significantly reduced by 6% and approximately 38% of the participants who had initially elevated HbA_{1c} levels achieved normal levels by the end of the trial.⁴ During a six-year follow up, participants who had normalised HbA_{1c} levels from the intervention had significantly lower risk of type 2 diabetes than those whose HbA_{1c} levels did not normalise during the initial study.⁴

- In an observational follow-up of the Chinese Da Qing Diabetes Prevention study, 577 people (average BMI 25.7 kg/m²) with impaired glucose tolerance were each assigned to a control group (no intervention) or an intervention group of diet, exercise, or diet and exercise for six years, and followed for up to 30 years to assess the effect of the intervention.² Interventions aimed to increase vegetable intake, lower alcohol and sugar intake and increase the amount of exercise undertaken during spare time; people who were overweight or obese were encouraged to reduce calorie intake.² During the 30 year follow-up, those assigned to diet and exercise achieved a delay in diabetes onset of approximately four years and subsequently had a lower incidence of serious diabetes complications and diabetes-related mortality compared with those who had no intervention.²

Remission of type 2 diabetes with weight loss

A substantial proportion of people with type 2 diabetes who are overweight can achieve a non-diabetic state if they are able to lose enough body weight. In a European population-based study, weight loss of ≥ 10% in the first year following a diagnosis of type 2 diabetes was associated with twice the likelihood of remission at five years.⁵ Remission becomes much less likely as the duration of diabetes increases, but it is never too late to try.⁶ Low-energy, low GI and modified macronutrient dietary approaches, e.g. low carbohydrate, low fat and high protein diets, have been effective in achieving weight loss and type 2 diabetes remission, however, there is no conclusive evidence that one approach is more effective than another.⁷

There has been increased focus in recent years on the benefits of low/very low carbohydrate diets for type 2 diabetes. The effectiveness and safety of this type of diet in people with type 2 diabetes was recently assessed in a systematic review and meta-analysis of 23 trials (1,357 participants).⁸ Participants were assigned to low (< 130 g/day or < 26% of a 2000 kcal/day) or very low (< 10% of calories from carbohydrates)

carbohydrate diet intervention groups for at least 12 weeks.⁸ The group following the low carbohydrate diet (LCD) achieved a 32% increase in diabetes remission at six months compared with people following low-fat control diets.⁸ Very low carbohydrate diets were less effective than LCDs at inducing diabetes remission, likely due to lower adherence.⁸ Remission rates were lower in people using insulin likely due to people having had diabetes for longer and/or higher HbA_{1c} levels.⁸

Remission was also demonstrated in the DiRECT trial which involved 306 participants with type 2 diabetes in the United Kingdom. The intervention involved replacing half of the groups' meals with a nutritionally balanced liquid diet (825 – 853 kcal/day) for three to five months:⁹

- At 12 months, the mean weight of the intervention group had fallen by 10% and 46% of individuals had achieved diabetes remission
- At 24 months, the mean weight loss of the intervention group was 7.6% and 36% had diabetes remission
- Post-hoc analysis concluded 24% of participants maintained ≥ 10 kg weight loss and 64% of those sustained remission

The balance of evidence suggests that the magnitude of weight loss is the key factor in achieving diabetes remission and it does not matter how this is achieved, as long as it is sustainable.^{9, 10} If appropriate, pharmacological and surgical treatments may be considered to achieve weight loss if lifestyle interventions alone are not adequate.

Type 2 diabetes remission and relapse following bariatric surgery

In people who have type 2 diabetes and are obese, bariatric surgery can induce remission, as well as reduce the risk of diabetes complications, cardiovascular disease and some cancers.¹¹ A New Zealand study following 224 people with type 2 diabetes who underwent bariatric surgery found a remission* rate of 80%.¹² The relapse rate at five years was 34% and 47% at ten years.¹² Relapse rates were higher in those who had a longer duration of diabetes, were taking insulin at referral and who had less reduction in BMI following surgery.¹²

* Defined as HbA_{1c} < 50 mmol/mol in the absence of insulin or other diabetes medicines

The Ministry of Health's criteria for consideration of publicly funded bariatric surgery are:¹¹

- A BMI 35 – 55 kg/m², but body weight less than 160 kg, and co-morbidities, e.g. diabetes, sleep apnoea, hypertension, hypercholesterolaemia, infertility or arthritis

- Stable living arrangements and strong social supports
- No substance addiction, including nicotine; smoking cessation is required at least six weeks prior to surgery
- A willingness to accept life-long monitoring

Referrals for surgery are reviewed within each DHB by a team who apply a national scoring system to determine who will receive the greatest benefit.³ Bariatric surgery can also be accessed privately; acceptance criteria is likely to vary between clinics.

Weight loss may improve cardiovascular outcomes in people with diabetes

If people with diabetes do not achieve remission after losing weight, it is likely that they will still benefit from the improved cardiovascular outcomes associated with weight loss. A healthy diet, exercise and weight control in people at high risk of type 2 diabetes enables improved management of cardiovascular risk factors.^{3,13}

Benefits on cardiovascular health from weight loss achieved through lifestyle interventions have been demonstrated in the:

- Chinese Da Qing Diabetes Prevention study, where after ten years of follow-up participants experienced:^{3,14}
 - Fewer CVD events and deaths
 - Lower incidence of microvascular complications
- Look AHEAD trial post-hoc analysis, where there was an association between the extent of weight loss and the incidence of CVD. In participants with $\geq 10\%$ weight loss, there was a:¹⁴
 - 21% reduction in the risk of CVD
 - 24% reduction in the first occurrence of myocardial infarction or stroke, hospitalisation for angina, congestive heart failure or death

The impact of exercise on type 2 diabetes and cardiovascular health

To maximise the benefit to cardiovascular health, weight loss should be coupled with exercise. Regular exercise is a critical component in the management of type 2 diabetes. Exercise improves glycaemic control and weight loss, and contributes to reductions in cardiovascular risk factors through enhancing cardiometabolic health and fitness.¹⁵ Exercise has also been shown to reduce CVD mortality, coronary heart disease, diabetes, myocardial infarction and stroke.^{16,17} Walking is a cost-effective and accessible exercise for most people. A systematic review and meta-analysis including 20 randomised controlled trials and 866 participants with type 2 diabetes concluded that walking alone (i.e. in the absence of dietary interventions or in combination with other exercises) was effective in reducing

HbA_{1c} on average by 5.5 mmol/mol.¹⁵ Only interventions lasting eight weeks or more were included in the study, and people in supervised programmes achieved better results than those who were unsupervised.¹⁵

Before recommending an exercise regimen, consider the patient's medical history.¹⁵ Concomitant medications such as beta-blockers can lower the exercise intensity threshold, and some anti-diabetic medicines can cause hypoglycaemia which could be exacerbated by exertion.¹⁵ If a patient has peripheral neuropathy and accompanying foot problems, suggest non-weight bearing exercises (see below).¹⁵

To maximise patient engagement and adherence, recommend that they initiate exercises that are less intensive which can then be escalated as tolerance of the regimen improves.¹⁵

Besides providing general advice on engaging in at least 30 minutes of physical activity per day, other useful recommendations can be made on how to achieve this; consider suggesting:¹⁵

- Alternative ways to walk, such as brisk walking (e.g. 15 minutes fast walking instead of 30 minutes slow walking for those short on time), interval walking (e.g. alternating 1 – 3 minutes fast walking with 1 – 3 minutes slow walking), Nordic walking (using poles to intensify walking by including upper body exercise), joining a walking group, walking on a treadmill
- Increasing energy expenditure by walking on sand or through water, uphill or downhill
- Walking around the room during television ad breaks or for three minutes every 30 minutes, to interrupt sedentary behaviour
- Using a step-counter as motivation to reach at least 10,000 steps per day
- If the patient has co-morbidities that prevent walking, try alternative activities, e.g. arm and leg exercises while seated, stationary exercise biking, leisure cycling or water-based activities

Maintaining and sustaining lifestyle change

Lack of adherence to lifestyle changes is a common issue and patients may need support with strategies to maintain motivation. A multi-targeted approach encompassing physiological, psychological and external factors is best.¹⁸ Motivational interviewing may be a useful tool as well as constructive feedback sessions to reinforce accountability.¹⁸

For example, a strategy to improve long-term adherence to lifestyle changes is to assess patient's emotional needs that are currently managed by unhealthy behaviours, i.e. stress eating or low-mood overindulgence.¹⁹ Suggest alternative coping

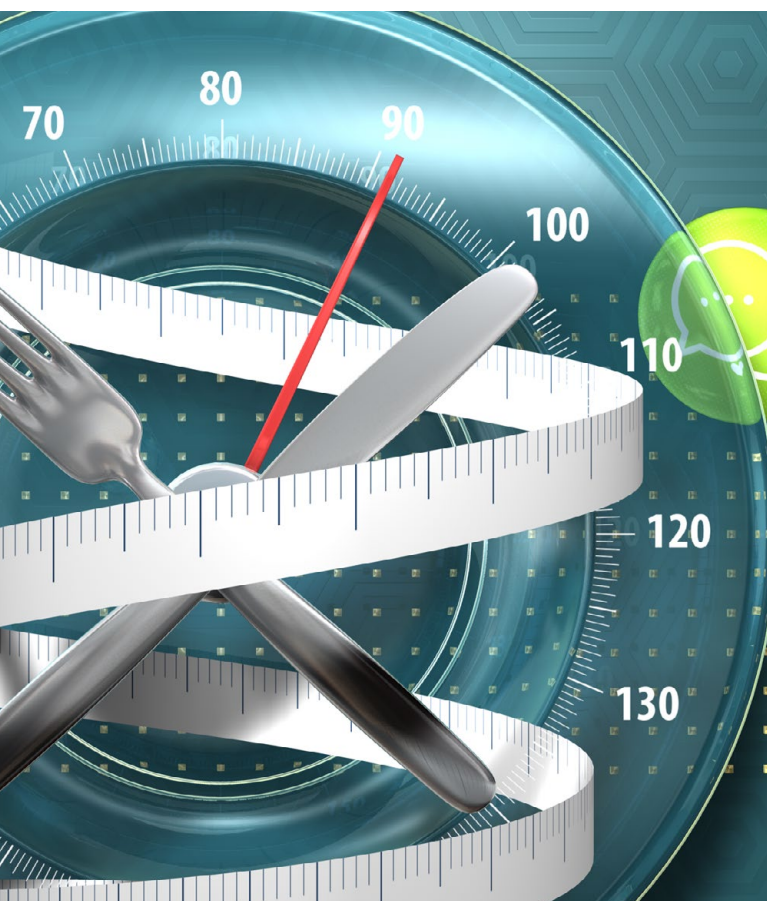
mechanisms, e.g. relaxation or mindfulness techniques when feeling stressed, or counselling if suppressed mood remains problematic.¹⁹

Other strategies that may be useful in sustaining lifestyle changes include:^{15, 18, 19}

- Celebrating achievements of any size without fixating on weight loss
- Engaging in exercises that are enjoyable
- Focusing on healthy eating habits that are less restrictive
- Group based physical activity with friends for socialisation, pleasure and accountability
- Encouraging a positive attitude that is flexible and self-forgiving
- Set achievable goals that are self-guided and non-restrictive; some may find setting long-term goals more helpful (and achievable) than short-term goals
- Setting up prompts, e.g. having sneakers by the door, or having healthy pre-prepared meals in the fridge

👁 Further information on motivation interviewing is available from: [bpac.org.nz/2019/motivational.aspx](https://www.bpac.org.nz/2019/motivational.aspx)

👁 Further information on weight loss is available from: [bpac.org.nz/2019/weight-loss.aspx](https://www.bpac.org.nz/2019/weight-loss.aspx)



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