A rising tide of type 2 diabetes in younger people: what can primary care do?

An increasing incidence of early onset type 2 diabetes in New Zealand is putting more people at risk of early mortality and complications such as cardiovascular disease at an age when other people in the community are at their prime. General practitioners, nurses, pharmacists and other primary health care professionals should consider how they can use their role to identify people at high risk and support them to create a different future.

KEY PRACTICE POINTS:

- The incidence of type 2 diabetes in younger adults and adolescents in New Zealand is increasing; people of Māori, Pacific and South-Asian ethnicities are particularly at risk
- People with early onset type 2 diabetes have increased morbidity and mortality compared to those with a later onset or to those of similar age with type 1 diabetes
- Preventing, or delaying, onset of type 2 diabetes is paramount to reducing the burden of diabetes complications; this may be possible with careful management
- Test HbA_{1c} levels in patients at high risk, regardless of their age, so that patients can be supported to make lifestyle changes before they develop diabetes
- The management of type 2 diabetes in younger people is essentially the same as for older people but treatments need to be more assertive, e.g. pharmacological treatment escalated sooner
- A high degree of patient engagement is crucial to maximise the benefits of lifestyle changes and ensure patients take their medicines as prescribed

This article focuses on the prevalence and management of diabetes in younger people. For information on type 2 diabetes in general, see: "Managing patients with type 2 diabetes: from lifestyle to insulin" **www.bpac.org.nz/bpj/2015/december/diabetes.aspx**

Early onset type 2 diabetes: increasingly common and associated with higher risks

New Zealand has a diabetes problem, fuelled in part by one of the highest rates of obesity in the world.[1] Approximately 6% of the total population has diabetes. The prevalence of diabetes is highest in older age groups, reaching approximately 15–20% in people aged over 65 years; however, prevalence is increasing in younger people in New Zealand.[2] Data from the Ministry of Health's Virtual Diabetes Register show the prevalence of diabetes in people aged 30–39 years has almost doubled over the last 12 years (Figure 1). Increases in diagnoses in children aged under 15 years have also been observed, although absolute numbers are still small.[3]

People of Māori, Pacific and South-Asian ethnicity, and people who are socioeconomically disadvantaged, bear a disproportionate burden of obesity and type 2 diabetes. The prevalence of diabetes is two to three and a half times higher in adults aged 25–39 years of Māori and Pacific ethnicity compared to those of European ethnicity (Figure 2). N.B. Increasing rates of type 2 diabetes may partially reflect greater awareness and testing over recent years.

Many young people are at high risk of developing type 2 diabetes

People with HbA_{1c} levels of 41–49 mmol/mol are classified as having "pre-diabetes", which is associated with an increased risk of cardiovascular disease and progression to type 2 diabetes. Data from the most recent national nutrition survey identified that 16% of the population aged under 45 years had pre-diabetes.[4] It is estimated that in the Auckland region, over 40% of people of Māori, Pacific or Indian ethnicity aged 35–39 years have pre-diabetes.[2]

The same factors which increase risk of type 2 diabetes in older adults influence risk in younger people, however, people who develop type 2 diabetes earlier tend to have a greater severity or number of risk factors. For example, the more members of a person's extended family affected by type 2 diabetes, the higher their risk and the earlier the age of onset.[5] Excess body weight is particularly prevalent in people who develop type 2 diabetes earlier in life: among people aged under 40 years with type 2 diabetes registered at the Auckland Diabetes Centre in 2015, the median BMI was 38 kg/m^2.[6] However, weight alone is not an absolute predictor of risk (see: "Is early onset type 2 diabetes in lean people different?").

Early onset results in worse health outcomes

Younger people diagnosed with type 2 diabetes, e.g. before the age of 40 years, have a higher risk of early mortality, cardiovascular disease, chronic kidney disease and retinopathy than older adults diagnosed with type 2 diabetes or people with type 1 diabetes at a similar age.[7–9] This is largely because people diagnosed younger have diabetes for longer and are therefore exposed to more risk, but also because glycaemic control tends to be worse and younger people are more likely to have sporadic contact with healthcare services.[6, 7]

Negative outcomes for people diagnosed with type 2 diabetes earlier in life include:

Increased mortality: People diagnosed under the age of 40 years have a rate of mortality three to six times higher than those without diabetes. In contrast, people diagnosed over the age of 50 have at most a two-fold increase in mortality.[9]

Increased rates of cardiovascular disease: Data from Australia show that a ten year earlier onset of type 2 diabetes is associated with 1.6 times the risk of dying from cardiovascular disease.[10]

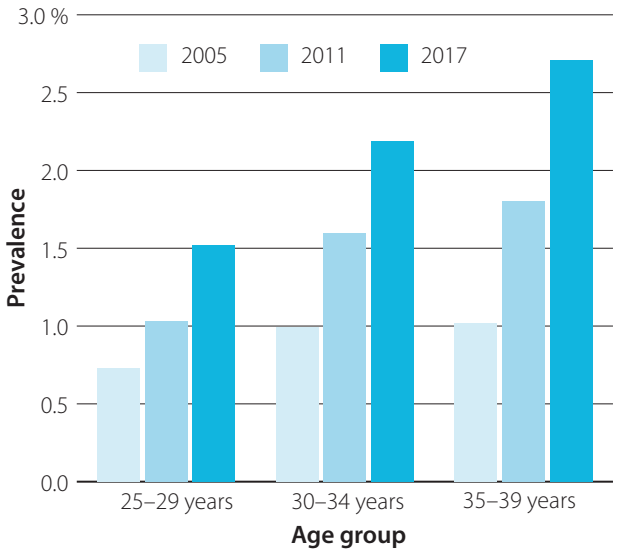


Figure 1: Changes in the prevalence of diabetes from 2005-2017 in adults aged 25-39 years in New Zealand. Source: Virtual Diabetes Register and Statistics New Zealand

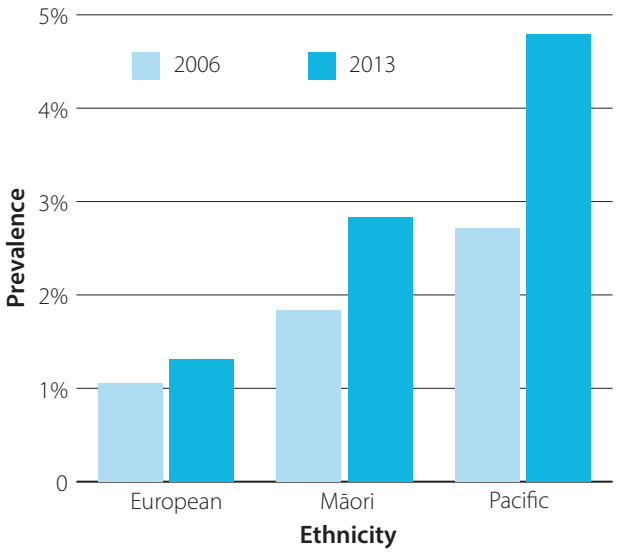


Figure 2: The prevalence of diabetes in adults aged 25–39 years by ethnicity, calculated from entries in the Virtual Diabetes Register compared to the population of the same age and ethnicity at the 2006 and 2013 censuses. Source: Virtual Diabetes Register and Statistics New Zealand

High rates of complications: In 2,000 children and young adults diagnosed with diabetes in the United States, the prevalence of kidney disease was 20% in those with type 2 diabetes compared to 6% in those with type 1 diabetes, and the rates of retinopathy and peripheral neuropathy were doubled.[8]

Test people at high risk

HbA_{1c} should be tested in people at high risk of type 2 diabetes of any age. The benefit of this approach is to identify patients early, to reduce their risk of developing type 2 diabetes, and their risk of renal and cardiovascular complications. Diagnoses of type 2 diabetes are being made in young adults in New Zealand who already have very high HbA_{1c} levels and albuminuria.[6] Cardiovascular risk begins to increase at an HbA_{1c} level of approximately 40 mmol/mol.[12, 13] As type 2 diabetes is not necessarily associated with any symptoms, patients may not even recognise that they are at risk.

Identifying people at elevated risk

Ministry of Health guidelines recommend HbA_{1c} testing in people with **any** of the following risk factors:[2]

- A BMI of ≥ 27 kg/m^2 for people of Māori, Pacific or South Asian ethnicities, or ≥ 30 kg/m^2 for people of other ethnicities*
- A first-degree relative who developed type 2 diabetes at an early age, e.g. < 40 years
- Long-term use of oral corticosteroids
- Females with a past personal history of gestational diabetes
- Females with polycystic ovary syndrome
- Severe mental illness, particularly those on long-term antipsychotic treatment
- Known ischaemic heart, cerebrovascular or peripheral vascular disease

* A lower BMI threshold is recommended for people of Māori, Pacific or South Asian ethnicities due to the higher risk people of these ethnicities have of developing type 2 diabetes.[2] South Asian ethnicities include Indian, Fijian Indian, Sri Lankan, Afghani, Bangladeshi, Nepalese, Pakistani and Tibetan.

A specific opportunity to incorporate HbA_{1c} testing into routine practice is the cardiovascular risk assessment; the age at which to start assessments is now recommended as:[14]

- Age 45 years for males and 55 years for females with no known risk factors
- Age 30 years for males and 40 years for females of Māori, Pacific or South-Asian ethnicity
- Age 35 years for males and 45 years for females with known cardiovascular risk factors or at high risk of developing diabetes†

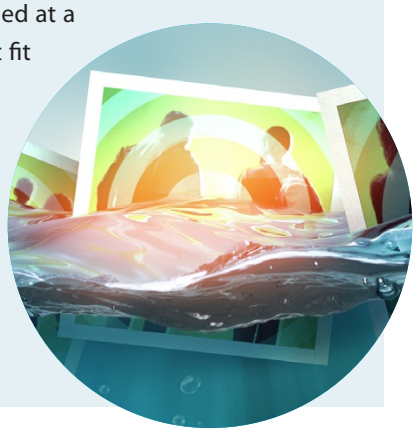
† Further information on family and personal risk factors is available at: **www.health.govt.nz/publication/cardiovascular-disease-risk-assessment-and-management-primary-care**

Consider the possibility of type 1 diabetes or a monogenic form of diabetes in younger adults with elevated HbA_{1c} without obesity, family history or other typical features such as hypertension, dyslipidaemia or non-alcoholic fatty liver disease (see: "Excluding other forms of diabetes in people with early onset changes in glycaemia").

Is early onset type 2 diabetes in lean people different?

Most people diagnosed with type 2 diabetes under the age of 40 years in New Zealand are overweight or obese.[5, 6] However, this is not always the case. People of South or East Asian ethnicity, in particular, develop type 2 diabetes at lower BMI levels than people of European ethnicity, likely due to differences in the accumulation of visceral fat.[11]

There is debate regarding the development of type 2 diabetes in people who are not overweight or obese, and whether this is in some way a distinct form of the condition. Despite a range of theories and research into possible causes of type 2 diabetes in people with a BMI ≤ 25 kg/m^2 there is insufficient evidence for clinicians in primary care to approach management differently. People can still be counselled to follow healthy eating and activity advice, even if weight loss is not an aim. Clinicians should also consider the possibility of an alternative type of diabetes in those identified at a younger age who do not fit the typical presentation of type 2 diabetes (see: "Excluding other forms of diabetes in people with early onset changes in glycaemia").

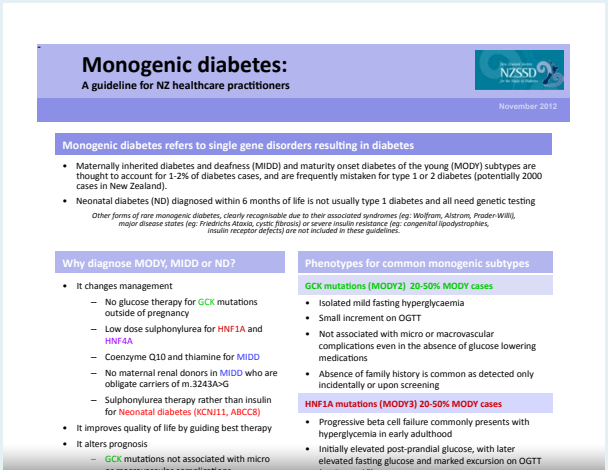


Excluding other forms of diabetes in people with early onset changes in glycaemia

Type 1 diabetes can develop in adults: Type 1 diabetes is caused by autoimmune destruction of pancreatic beta cells. Its incidence peaks in children aged 10–19 years, but over half of cases are diagnosed in people aged over 20 years.[15, 16] Typically, people with type 1 diabetes have symptoms such as a frequent need to urinate, excessive thirst or unexplained weight loss, with an onset over weeks to months, and may have a personal or family history of autoimmune conditions. Test results suggestive of type 1 diabetes (found in 80–90% of people at diagnosis) include ketonuria or ketonaemia, reduced or undetectable C-peptide and positive tests for auto-antibodies (anti-GAD, anti-IA2 or anti-insulin antibodies).[17] Type 1 diabetes is typically slower in onset in adults than in children, and it may be difficult to distinguish from type 2 diabetes, particularly in the early months and years.[18]

Monogenic diabetes and type 2 diabetes share similar symptoms and signs: Monogenic diabetes is caused by mutations in a single gene. The clinical features and management differs depending on which gene is affected: the most common forms of monogenic diabetes are due to mutations in the *GCK*, *HNF1A* or *HNF4A* genes. Monogenic diabetes may make up 2% of all diabetes diagnoses, and it can often be misdiagnosed as type 2 diabetes.[17] Discuss a patient with suspected monogenic diabetes with an endocrinologist as definitive diagnosis requires genetic testing.

An algorithm to help clinicians diagnose monogenic diabetes has been developed by the New Zealand Society for the Study of Diabetes: **www.nzssd.org.nz/education/2013%20Monogenic_diabetes_card_with_forms_18%20Dec%20copy.pdf**


Monogenic diabetes:
A guideline for NZ healthcare practitioners
NZSSD
November 2012
Monogenic diabetes refers to single gene disorders resulting in diabetes
• Maternally inherited diabetes and deafness (MIDD) and maturity onset diabetes of the young (MODY) subtypes are thought to account for 1-2% of diabetes cases, and are frequently mistaken for type 1 or 2 diabetes (potentially 2000 cases in New Zealand).
• Neonatal diabetes (ND) diagnosed within 6 months of life is not usually type 1 diabetes and all need genetic testing
Other forms of rare monogenic diabetes, clearly recognisable due to their associated syndromes (eg: Wolfram, Alstrom, Prader-Willi), major disease states (eg: Friedrichs Ataxia, cystic fibrosis) or severe insulin resistance (eg: congenital lipodystrophies, insulin receptor defects) are not included in these guidelines.
Why diagnose MODY, MIDD or ND?
• It changes management
– No glucose therapy for GCK mutations outside of pregnancy
– Low dose sulphonylurea for HNF1A and HNF4A
– Coenzyme Q10 and thiamine for MIDD
– No maternal renal donors in MIDD who are obligate carriers of m.3243A>G
– Sulphonylurea therapy rather than insulin for Neonatal diabetes (KCNJ11, ABCC8)
• It improves quality of life by guiding best therapy
• It alters prognosis
– GCK mutations not associated with micro
Phenotypes for common monogenic subtypes
GCK mutations (MODY2) 20-50% MODY cases
• Isolated mild fasting hyperglycaemia
• Small increment on OGTT
• Not associated with micro or macrovascular complications even in the absence of glucose lowering medications
• Absence of family history is common as detected only incidentally or upon screening
HNF1A mutations (MODY3) 20-50% MODY cases
• Progressive beta cell failure commonly presents with hyperglycemia in early adulthood
• Initially elevated post-prandial glucose, with later elevated fasting glucose and marked excursion on OGTT

Lifestyle change is a cornerstone of managing and reducing the risk of type 2 diabetes

One of the most important points to convey to people who have type 2 diabetes or pre-diabetes is that the course is modifiable. Changes to their lifestyle may be difficult at first, but they can substantially improve their future health. The patient will have to take the lead role in making those changes, but with support from their primary care team. Setting small, incremental goals can be helpful if patients are feeling overwhelmed by the extent of changes recommended (see: "Engaging people to make changes").[19]

Weight loss has the potential to induce remission of type 2 diabetes in people who are overweight or obese, i.e. to achieve an HbA_{1c} < 50 mmol/mol without the use of medicines,[20] and should be regarded as a core focus of treatment.

Lifestyle change in people with pre-diabetes reduces their chance of developing diabetes by approximately 50–60% over three years and 27% over 15 years.[12, 21] This includes aiming for a 7% weight loss, 2.5 hours per week of moderate intensity physical activity and following healthy diet recommendations.

Referral for bariatric surgery may be appropriate for some people who are obese to assist with weight loss (see: "Bariatric surgery to treat or prevent type 2 diabetes").

Dietary advice

Dietary advice for people with type 2 diabetes or pre-diabetes is the same as advice for a healthy, balanced diet that is applicable to the rest of the population; emphasise to patients that an appropriate diet is more than just avoiding sugar.[18] Various dietary approaches such as the Mediterranean diet, Dietary Approaches to Stop Hypertension (DASH) and the 5+2 diet (intermittent fasting) have been studied in clinical trials, however, no one diet has been found to be superior for people with type 2 diabetes.[18, 19] Likewise, there is no ideal percentage of energy intake from carbohydrates, protein or fat for all people with type 2 diabetes.[18] The most successful diet is one that the person is able to maintain long-term and incorporate into their lifestyle and budget.

When discussing dietary options with patients, consider:[19]

- Their knowledge about nutrition and whether they require more information and support about any particular aspects
- What has or has not worked for them previously
- Whether the changes being discussed are realistic, sustainable in the long-term and affordable

- How to incorporate foods or food-related events important to their culture, religion or lifestyle

Referral to a dietitian can provide additional assistance for people regarding their dietary choices, such as education on the macronutrient content of foods, interpreting product labels, and help with meal planning and selecting healthy options at the supermarket. A dietitian can also assist if someone wishes to pursue more intensive dietary changes such as a very low calorie diet and the temporary use of meal replacement formulas. Some PHOs or DHBs offer a Diabetes Education and Self Management for Ongoing and Newly diagnosed Diabetes (DESMOND) course that people with type 2 diabetes or caregivers can attend; other similar courses are available in some areas.

Free copies of handouts for patients including healthy eating and activity advice are available from: **www.healthed.govt.nz/resource/healthy-eating-active-living**

Tools such as the Diabetes New Zealand "Take Control" app can provide people with information and recipe ideas on their phone: **www.diabetes.org.nz/take-control-toolkit/**

Further information on specific dietary approaches such as the Mediterranean, DASH or low calorie diet is available from the Ministry of Health: **www.health.govt.nz/publication/clinical-guidelines-weight-management-new-zealand-adults**

Bariatric surgery to treat or prevent type 2 diabetes

Consider referral for bariatric surgery for patients who have a BMI between 35–55 kg/m^2.[19] A team within each DHB determines who is likely to gain the most benefit from surgery, taking into consideration factors such as the person's social support and other health concerns that may affect suitability for surgery, e.g. smoking status and substance misuse.[19]

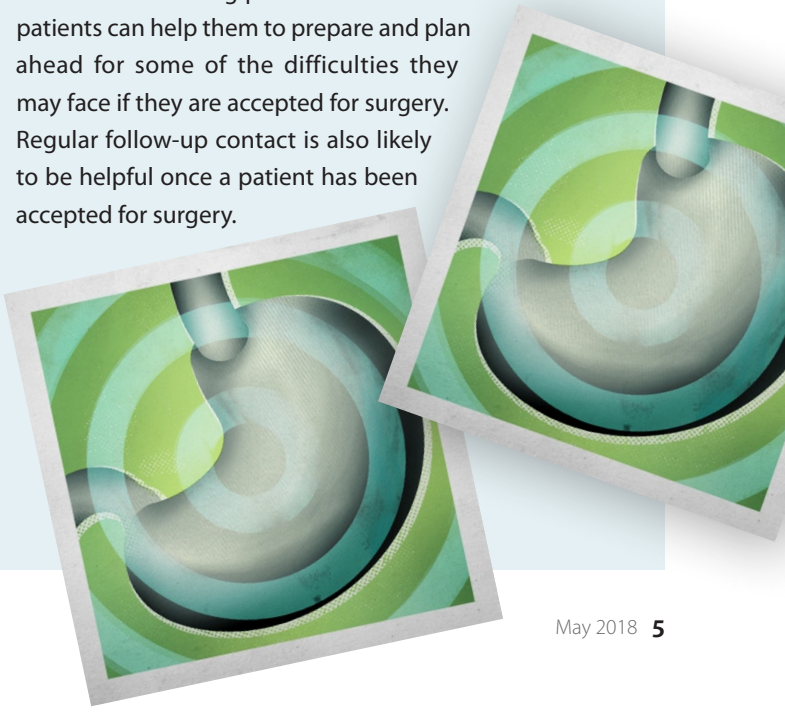
Bariatric surgery can induce remission of type 2 diabetes

In people who have type 2 diabetes, bariatric surgery can induce remission, as well as reduce the risk of diabetes complications, cardiovascular disease and some cancers.[19] Rates of remission vary but on average across various studies 64% of people who underwent bariatric surgery had remission of type 2 diabetes, compared to approximately 16% managed with lifestyle and pharmacological treatment.[22] People who are older, with a longer duration of diabetes and who require more intensive pharmacological treatment to manage HbA_{1c} levels are less likely to achieve remission following surgery,[23] therefore bariatric surgery in younger people may be more beneficial.

Surgery in people at high risk of type 2 diabetes can reduce their likelihood of developing it. A study in France found that 1.4% of people at high risk of type 2 diabetes who had bariatric surgery initiated diabetes medicines over the next six years, compared to 12% of those who did not have surgery.[24]

Māori and Pacific peoples may require more support to ensure they get the surgery they need

People accepted for bariatric surgery will need to commit to both pre-surgical and follow-up assessments. In New Zealand, more publicly funded bariatric surgeries are conducted for European people (3 per 1000 morbidly obese people) than for Māori (1.4 per 1000) or Pacific peoples (0.7 per 1000).[25] The lower rates of surgery for people of Māori and Pacific ethnicity are likely due to higher rates of withdrawing after being accepted for surgery.[26] Males also have higher rates of withdrawal than females.[26] Impediments such as being able to balance the pre- and post-operative demands of surgery with work commitments, or not being able to achieve sufficient pre-operative weight loss, may make undergoing surgery more difficult for some of the people who stand to benefit the most. Discussing potential barriers with patients can help them to prepare and plan ahead for some of the difficulties they may face if they are accepted for surgery. Regular follow-up contact is also likely to be helpful once a patient has been accepted for surgery.



Activity advice

Key aspects:

- Aim for at least 30 minutes of moderate intensity exercise, such as a brisk walk, on most days. This should be increased to 60 minutes per day where possible.
- Include activities which can strengthen muscles on at least two days per week
- Break up sitting time or prolonged periods of inactivity by standing up, stretching and walking around for a few minutes
- Think creatively about exercise – choose activities that are enjoyable, sustainable and affordable

A Green Prescription can help people who may require extra motivation. A local Green Prescription provider can offer support via telephone, face to face or group sessions. The Green Prescription Active Families programme can assist if families have school-aged children that could benefit from support.

For further information on how to refer patients for a Green Prescription, see: **www.health.govt.nz/system/files/documents/pages/greenprescriptionprocess-forprimaryhealthcare.pdf**

Pharmacological management of people with early-onset type 2 diabetes

The approach to pharmacological management of patients with early onset type 2 diabetes is essentially the same as for older patients with type 2 diabetes, i.e. metformin first-line, followed by other oral hypoglycaemic medicines and insulin, as appropriate. However, faster escalation of treatments may be required and lower targets for glycaemic control are justified.[27] Patients with early onset type 2 diabetes can have a more rapid increase in HbA_{1c} levels, despite treatment, and are likely to require more frequent dose increases, use of multiple oral medicines or earlier addition of insulin than older patients with type 2 diabetes.[5] Effective communication and engagement with patients in regards to the importance of adhering to their prescribed medicines is of particular importance in this age group.

Despite being young, patients may already have complications and should have their retinal, foot, renal and cardiovascular health fully assessed and managed at diagnosis. Also consider associated co-morbidities, such as sleep apnoea or non-alcoholic fatty liver disease.

For further information on prescribing glucose-lowering medicines for patients with type 2 diabetes, see: **www.bpac.org.nz/bpj/2015/december/diabetes.aspx**

Metformin for patients with "pre-diabetes"

Metformin can be prescribed (unapproved indication) to reduce the risk of developing type 2 diabetes in patients at high risk (e.g. HbA_{1c} of 46–49 mmol/mol), but should be considered an adjunct treatment in addition to changes in diet and activity levels.[12] Metformin reduces the risk of developing type 2 diabetes by approximately one-third after three years, and approximately 20% after ten years, compared to a placebo medicine in patients at high risk.[28]

Managing cardiovascular and renal risk

Cardiovascular and renal diseases are the main causes of early mortality in people with type 2 diabetes, and preventing the onset or progression of these conditions in young people should be a focus of management.[18] Lifestyle changes can improve markers of cardiovascular risk, such as blood pressure and lipid levels, however, pharmacological treatment should be initiated if lifestyle changes result in insufficient improvements, or if the patient's risk is high.

For further information on managing cardiovascular and renal risk in patients with type 2 diabetes, see: **www.health.govt.nz/publication/cardiovascular-disease-risk-assessment-and-management-primary-care**

An online calculator for determining the risk of cardiovascular and renal disease in patients with type 2 diabetes is available at: **www.nzssd.org.nz/cvd_renal/**

When to seek further advice

Consider discussing patients with a diabetes specialist if appropriate management and adherence to treatment is ineffective in controlling progression of disease, e.g. HbA_{1c} > 75 mmol/mol, declining renal function, significant albuminuria or other uncontrolled diabetes or cardiovascular complications.

Engaging people to make changes

Identify what motivates people

People can have very different reactions to a diagnosis of type 2 diabetes, or being told they are at high risk. For some, it may be the first time they have had, or faced the prospect of, a serious medical condition and the potential consequences may be sufficient to motivate them to make changes. Others may be ambivalent, for example, a person who has a number of family members with type 2 diabetes may believe that getting diabetes themselves is inevitable, and there is not much that can be done. Motivational strategies should be individualised, but a key message for all people is that it is never too late to "step back from the edge" and their course of type 2 diabetes is not pre-determined.

Table 1: Using language which can help avoid blame when discussing diabetes. Adapted from the American Association of Diabetes Educators and American Diabetes Association.[29]

Language/tone of conversation which may have negative connotations	Suggestions for replacement concepts and phrases	Things to consider
Compliance/adherence e.g. "You must take metformin twice a day"	Concepts such as engagement, participation, involvement. Explain the benefits of medicine use and encourage patients to following dosing instructions, e.g.: "Taking metformin twice a day will make it easier for you to reduce your HbA_{1c} level than taking it less often"	Focus on using factual statements to emphasise how the person's health could improve by following the advice.
Regimen/rules e.g. "You need to do 30 minutes of moderate intensity exercise per day"	Plan/choices e.g. "You're doing around 15 minutes per day of walking. This is great – do you think you could now do a bit more? Are there other types of exercise you would like to try? What are some of the things that might stop you from doing more?"	Encourage people to identify changes they want to make and help them to achieve those goals, rather than dictating what those changes should be and judging their progress based on what you think they should achieve.
Control: e.g. glucose control, good/bad control e.g. "Your diabetes is not well-controlled"	Instead of referring to "good/bad control" explain what HbA_{1c} level is being aimed for and the effects of the current approach to treatment: e.g. "Your HbA_{1c} level is 70 mmol/mol. That is an improvement, but how about we make another goal to try to get it even lower." "We started metformin last time, but it is not bringing down your HbA_{1c} levels enough. We might need to increase the dose."	Control may be impossible to achieve given the body's systems for regulating glucose levels are failing. Try to focus on the underlying physiology and what a patient is doing well.
Can't/shouldn't/don't e.g. "Don't have fizzy drinks"	"Have you tried..." "Would you consider...." "I've found what has worked for other people is..." e.g. encourage alternatives, such as "try water with a slice of lemon"	This type of statement (can't/shouldn't/don't) can make people feel they are being given orders
Lacking motivation or unwilling to engage e.g. "So you are not willing to start insulin?"	Focus on perceived barriers and why a patient doesn't want to proceed with a plan of action. This may lead to potential solutions. E.g. "From what you are saying, your main concerns around starting insulin are weight gain and the potential embarrassment of injecting yourself at work?"	Most people want to live a healthy life. The challenge with managing diabetes and weight is that people can feel there are barriers stopping them from changing, or may not appreciate the benefits of doing things differently. People may feel it is not worth the effort or is unachievable.

A strategy that may resonate particularly for younger people is to ask them to think of their future plans and wishes; for example, having children and watching them grow up or plans for their career. Focusing on a positive message that those plans are still possible, may help patients to be motivated to make changes, by taking the emphasis away from the shock of a diagnosis and possible future complications, and changing it to what they can do keep those plans on track.

Avoiding stigma and blame

Discussing lifestyle changes can be challenging, as the advice required often carries an unspoken implication that the person has brought the disease on themselves. Even if the intention is good and the language appropriate, what people may believe they are being told is "you're fat and lazy".

The playing field is not level: The risk of type 2 diabetes and obesity is influenced by factors which are out of a person's control, such as genetics, exposures in utero or early childhood, or factors in the environment.[5] Conveying this may help alleviate some of the stigma and embarrassment associated with obesity and type 2 diabetes, and help people to change the focus from feeling personally responsible for their condition to what they can do to manage the risk that they have been born with or acquired.

Consider how weighing someone makes them feel: Some people may find being weighed during an appointment embarrassing or humiliating, and put them off returning for follow-up visits. Consider whether measuring their weight and tracking changes will hinder more than help. In some cases, e.g. if someone is visibly obese, measuring their weight will not alter management. However, other people may find that tracking their weight is a useful measure of progress and it provides positive reinforcement when they are meeting their goals.

Subtleties in language may imply blame: Consider nuances in language that can carry negative connotations. Advice on language which can help avoid blame when discussing type 2 diabetes is provided in Table 1.

A burden shared is a burden lightened: Helping people understand that others have difficulties making lifestyle changes can prevent them from feeling like their difficulties are a personal failing, and enable them to open up and share what they are finding challenging about making changes. Inclusive phrases which share your own or other people's experiences can help, e.g. "Sometimes I don't feel like exercising, but I just get started anyway and find I'm okay once I start", or "other people I see with diabetes tell me what helps is…". Involving others in the family can help people share the challenges of lifestyle change and provide them with additional support at home.

Options for follow-up support

Regular follow-up is essential for maintaining engagement with lifestyle changes, discussing progress and finding solutions to barriers that people may encounter. Develop an agreed plan that can be used to track progress. A useful strategy is to encourage patients to make one change at a time to transition to a healthier lifestyle with subsequent goals added at follow-up appointments, and helping people to focus on the changes that will bring the greatest benefit, such as weight loss or smoking cessation.

A team-based approach can make regular follow-up simpler for patients and clinicians

Regular follow-up can produce extra demands on clinicians' and patients' time, as well as present an extra cost to patients. Options which can help maintain contact with a lower cost to the patient include arranging follow-up appointments with a practice nurse, providing advice in a telephone conversation or via text message. These strategies have all been used with some success in clinical trials of diabetes or weight loss management.[30, 31]

Encourage people to make use of community groups or peer support

Engaging with a community organisation such as Diabetes New Zealand or a Māori health provider can help patients connect with others with type 2 diabetes and facilitate peer support. Group-based and peer support sessions allow patients to share management strategies, and if health providers are involved, they can discuss barriers with multiple people at once. Practices could consider running their own support groups or holding joint sessions with other practices. Find out about support groups in your area, e.g. run by community or church groups or other organisations.

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N.B. Expert reviewers are not responsible for the final content of the article.

This article is available online at:
www.bpac.org.nz/2018/diabetes.aspx

Patient information about type 2 diabetes:

- Information and support on living with type 2 diabetes:
  - **www.diabetes.org.nz/**
- Handouts on weight loss diets and physical activity:
  - **www.health.govt.nz/system/files/documents/topic_sheets/popular-weight-loss-diet-review.pdf**
  - **www.health.govt.nz/system/files/documents/topic_sheets/spotting-good-and-poor-weight-loss-diets.pdf**
  - **www.healthnavigator.org.nz/healthy-living/physical-activity/**
- Patient information sheets on the use of metformin:
  - NZF: **www.mymedicines.nz/home/sheet/Metformin?format=pdfA4&inline=true**
  - SafeRx: **www.saferx.co.nz/Patient_info_metformin.pdf**
- Information on bariatric surgery:
  - **www.healthnavigator.org.nz/health-a-z/w/weight-loss-surgery/**

References:

1. Ng M, Fleming T, Robinson M, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet 2014;384:766–81. doi:10.1016/S0140-6736(14)60460-8
2. Ministry of Health NZ. Living well with diabetes. Ministry of Health NZ 2015. Available from: www.health.govt.nz/publication/living-well-diabetes (Accessed Jan, 2018).
3. Sjardin N, Reed P, Albert B, et al. Increasing incidence of type 2 diabetes in New Zealand children <15 years of age in a regional-based diabetes service, Auckland, New Zealand. J Paediatr Child Health 2018; [Epub ahead of print]. doi:10.1111/jpc.13924
4. Coppell KJ, Mann JI, Williams SM, et al. Prevalence of diagnosed and undiagnosed diabetes and prediabetes in New Zealand: findings from the 2008/09 Adult Nutrition Survey. N Z Med J 2013;126:23–42.
5. Lascar N, Brown J, Pattison H, et al. Type 2 diabetes in adolescents and young adults. Lancet Diabetes Endocrinol 2018;6:69–80. doi:10.1016/S2213-8587(17)30186-9
6. Beig J, Khanolkar M, Cundy T. Type 2 diabetes in young adults in Central Auckland: demography and complications. Intern Med J 2018;48:67–73. doi:10.1111/imj.13623
7. Huo X, Gao L, Guo L, et al. Risk of non-fatal cardiovascular diseases in early-onset versus late-onset type 2 diabetes in China: a cross-sectional study. Lancet Diabetes Endocrinol 2016;4:115–24. doi:10.1016/S2213-8587(15)00508-2
8. Dabelea D, Stafford JM, Mayer-Davis EJ, et al. Association of type 1 diabetes vs type 2 diabetes diagnosed during childhood and adolescence with complications during teenage years and young adulthood. JAMA 2017;317:825–35. doi:10.1001/jama.2017.0686
9. Al-Saeed AH, Constantino MI, Molyneaux L, et al. An inverse relationship between age of type 2 diabetes onset and complication risk and mortality: the impact of youth-onset type 2 diabetes. Diabetes Care 2016;39:823–9. doi:10.2337/dc15-0991
10. Huo L, Magliano DJ, Rancière F, et al. Impact of age at diagnosis and duration of type 2 diabetes on mortality in Australia 1997-2011. Diabetologia 2018;61:1055–63. doi:10.1007/s00125-018-4544-z
11. Sattar N, Gill JMR. Type 2 diabetes in migrant south Asians: mechanisms, mitigation, and management. Lancet Diabetes Endocrinol 2015;3:1004–16. doi:10.1016/S2213-8587(15)00326-5
12. Ministry of Health NZ. Pre-diabetes: risk factor management. Ministry of Health NZ 2016. Available from: www.health.govt.nz/our-work/diseases-and-conditions/diabetes/about-diabetes/pre-diabetes-and-self-management-long-term-conditions (Accessed Feb, 2018).
13. Huang Y, Cai X, Mai W, et al. Association between prediabetes and risk of cardiovascular disease and all cause mortality: systematic review and meta-analysis. BMJ 2016;355:i5953.
14. Ministry of Health NZ. Cardiovascular disease risk assessment and management for primary care. Ministry of Health NZ 2018. Available from: www.health.govt.nz/publication/cardiovascular-disease-risk-assessment-and-management-primary-care (Accessed Feb, 2018).
15. Thomas NJ, Jones SE, Weedon MN, et al. Frequency and phenotype of type 1 diabetes in the first six decades of life: a cross-sectional, genetically stratified survival analysis from UK Biobank. Lancet Diabetes Endocrinol 2018;6:122–9. doi:10.1016/S2213-8587(17)30362-5
16. Rogers MAM, Kim C, Banerjee T, et al. Fluctuations in the incidence of type 1 diabetes in the United States from 2001 to 2015: a longitudinal study. BMC Med 2017;15:199. doi:10.1186/s12916-017-0958-6
17. McDonald TJ, Ellard S. Maturity onset diabetes of the young: identification and diagnosis. Ann Clin Biochem 2013;50:403–15. doi:10.1177/0004563213483458
18. American Diabetes Association. Standards of medical care in diabetes - 2018. 2018. Available from: http://care.diabetesjournals.org/content/41/Supplement_1 (Accessed Jan, 2018).
19. Ministry of Health NZ. Clinical guidelines for weight management in New Zealand adults. Ministry of Health NZ 2017. Available from: www.health.govt.nz/publication/clinical-guidelines-weight-management-new-zealand-adults (Accessed Feb, 2018).
20. Lean ME, Leslie WS, Barnes AC, et al. Primary care-led weight management for remission of type 2 diabetes (DiRECT): an open-label, cluster-randomised trial. Lancet 2018;391:541–51. doi:10.1016/S0140-6736(17)33102-1
21. Diabetes Prevention Program Research Group. Long-term effects of lifestyle intervention or metformin on diabetes development and microvascular complications over 15-year follow-up: the Diabetes Prevention Program Outcomes Study. Lancet Diabetes Endocrinol 2015;3:866–75. doi:10.1016/S2213-8587(15)00291-0
22. Ribaric G, Buchwald JN, McGlennon TW. Diabetes and weight in comparative studies of bariatric surgery vs conventional medical therapy: a systematic review and meta-analysis. Obes Surg 2014;24:437–55. doi:10.1007/s11695-013-1160-3
23. Wood GC, Mirshahi T, Still CD, et al. Association of DiaRem score with cure of type 2 diabetes following bariatric surgery. JAMA Surg 2016;151:779–81. doi:10.1001/jamasurg.2016.0251
24. Thereaux J, Lesuffleur T, Czernichow S, et al. Association between bariatric surgery and rates of continuation, discontinuation, or initiation of antidiabetes treatment 6 years later. JAMA Surg 2018; [Epub ahead of print]. doi:10.1001/jamasurg.2017.6163
25. Rahiri J-L, Lauti M, Harwood M, et al. Ethnic disparities in rates of publicly funded bariatric surgery in New Zealand (2009-2014). ANZ J Surg 2017; [Epub ahead of print]. doi:10.1111/ans.14220
26. Taylor T, Wang Y, Rogerson W, et al. Attrition after acceptance onto a publicly funded bariatric surgery programme. Unpublished data .
27. Inzucchi SE, Bergenstal RM, Buse JB, et al. Management of hyperglycaemia in type 2 diabetes, 2015: a patient-centred approach. Update to a position statement of the American Diabetes Association and the European Association for the Study of Diabetes. Diabetologia 2015;58:429–42. doi:10.1007/s00125-014-3460-0
28. Diabetes Prevention Program Research Group, Knowler WC, Fowler SE, et al. 10-year follow-up of diabetes incidence and weight loss in the Diabetes Prevention Program Outcomes Study. Lancet 2009;374:1677–86. doi:10.1016/S0140-6736(09)61457-4
29. Dickinson JK, Guzman SJ, Maryniuk MD, et al. The use of language in diabetes care and education. Diabetes Care 2017;40:1790–9. doi:10.2337/dci17-0041
30. Schippers M, Adam PCG, Smolenski DJ, et al. A meta-analysis of overall effects of weight loss interventions delivered via mobile phones and effect size differences according to delivery mode, personal contact, and intervention intensity and duration. Obes Rev 2017;18:450–9. doi:10.1111/obr.12492
31. Daly B, Tian CJL, Scragg RKR. Effect of nurse-led randomised control trials on cardiovascular risk factors and HbA1c in diabetes patients: A meta-analysis. Diabetes Res Clin Pract 2017;131:187–99. doi:10.1016/j.diabres.2017.07.019