Prediabetes

Proactive intervention to prevent or delay onset of type 2 diabetes

KIRSTINE BELL BNutr&Diet, GradCert Diab Edu, PhD

The early detection of prediabetes is a crucial step for initiating proactive intervention and support strategies to prevent or delay the onset of type 2 diabetes and associated comorbidities, such as cardiovascular disease. This article provides a summary of the major recommendations from the recent position statement on screening and management of prediabetes in adults in primary care.

Type 2 diabetes is recognised as a major health problem in Australia and yet about 60% of cases are preventable through lifestyle interventions.[1] Recently, the major diabetes professional societies – Australian Diabetes Society, Australian Diabetes Educators Association, Dietitians Association of Australia, Exercise and Sports Science Australia and Pharmaceutical Society of Australia – reviewed the pertinent evidence and developed consensus-based clinical recommendations on the management of prediabetes.[2] It is their position that the early detection of prediabetes represents a crucial step for initiating proactive intervention and support strategies to prevent or delay the onset of type 2 diabetes and associated comorbidities, including cardiovascular disease (CVD). This article discusses the major points of this position statement and provides a summary of the recommendations (Box).[2]

Key points

- **Early detection of prediabetes represents a crucial step for initiating proactive intervention and support strategies to prevent or delay the onset of type 2 diabetes and associated comorbidities, including cardiovascular disease.**
- **A range of strategies are effective for prediabetes, therefore management plans should be individualised. However, it is imperative that advice (e.g. regarding healthy eating or exercise approaches) is consistent between members of the multidisciplinary team so as not to confuse the individual.**
- **Lifestyle interventions are recommended for all individuals with prediabetes with the aim to reverse prediabetes, or at least delay the onset of type 2 diabetes, and reduce associated risk factors through weight reduction, healthy eating, regular physical activity, stress reduction, improved sleep and smoking cessation.**
- **Lifestyle interventions can be provided by referring individuals to allied healthcare professionals or by public, private or community organisations (via face-to-face meetings, telephone, webinars or community programs) with expertise in the management of prediabetes.**

ENDOCRINOLOGY TODAY 2020; 9(4): 25-28

Dr Bell is a NHMRC Research Fellow at The University of Sydney, Sydney, NSW.

Defining prediabetes

Prediabetes is a metabolic condition characterised by elevated blood glucose levels, but not to the diagnostic threshold for type 2 diabetes (Flowchart).[2] It may include impaired fasting glucose (IFG), impaired glucose tolerance (IGT) and/or elevated glycated haemoglobin (HbA_{1c}). Prediabetes affects nearly one in six Australian adults (more than 2 million individuals) over the age of 25 years.[3] Without intervention, about one in three people with prediabetes will develop type 2 diabetes within 10 years.[2] Furthermore, people with prediabetes are at greater risk of developing CVD than those without prediabetes.[2]

Summary of recommendations on the management of prediabetes[2]

- Individuals with clinical risk factors for prediabetes are recommended to receive formal screening using the Australian Type 2 Diabetes Risk Assessment (AUSDRISK) screening tool. For those at high risk of type 2 diabetes, pathology screening is recommended to identify prediabetes or type 2 diabetes (using fasting blood glucose measurement, HbA_{1c} test or the two-hour oral glucose tolerance test).
- An oral glucose tolerance test is recommended before referring individuals to a structured, intensive lifestyle program, as the clearest evidence for benefit of these programs is in those with impaired glucose tolerance.
- The management of prediabetes should be multifaceted, including lifestyle interventions, diet, physical activity, psychological support and, if appropriate, pharmacotherapy.
- Education on prevention of type 2 diabetes and healthy lifestyle advice is best provided at first identification of prediabetes, and as frequently as needed or desired to support behavioural or pharmacological interventions.
- Care needs to be person-centred, treating the individual as an active decision-maker in their healthcare team.
- A collaborative, multidisciplinary healthcare team (e.g. GP, credentialled diabetes educator, accredited practising dietitian, accredited exercise physiologist and/or physiotherapist) needs to be involved in the management of individuals with prediabetes.
- Advice should be tailored to the individual's needs and preferences and the advice should be consistent among healthcare professionals.
- Lifestyle strategies should include weight reduction, healthy eating, regular physical activity and reducing sedentary behaviour as appropriate. Weight loss of 5 to 10% has been shown to halve the risk of progression to type 2 diabetes.
- No medications are TGA-indicated for prediabetes. Glucose-lowering agents, such as metformin, are generally not as effective as a structured, intensive lifestyle intervention; however, these may be worthwhile in younger individuals who do not respond to lifestyle interventions alone.
- There is no indication for self-monitoring of capillary blood glucose levels by individuals with prediabetes.
- The frequency of ongoing monitoring needs to be individualised. Annual retesting of HbA_{1c} for the detection of type 2 diabetes is supported by Medicare. Other health outcomes, such as weight, lipid and blood pressure management, can be reassessed more regularly to assess the efficacy of interventions and any disease progression.

Screening and detection of prediabetes

AUSDRISK screening tool

Prediabetes can be identified through the screening pathway for type 2 diabetes. The Australian Type 2 Diabetes Risk Assessment (AUSDRISK) screening tool is a short questionnaire designed to estimate the risk of progression to type 2 diabetes over five years in individuals based on clinical risk factors, including age, gender, ethnicity, family history of diabetes, previous history of high blood glucose levels or blood pressure, waist measurement and lifestyle factors.[4] Individuals who are at intermediate risk (score of 6 to 11) or high risk (score of 12 or above) should undergo biochemical testing to identify prediabetes or type 2 diabetes (see Flowchart).[2]

Pathology screening

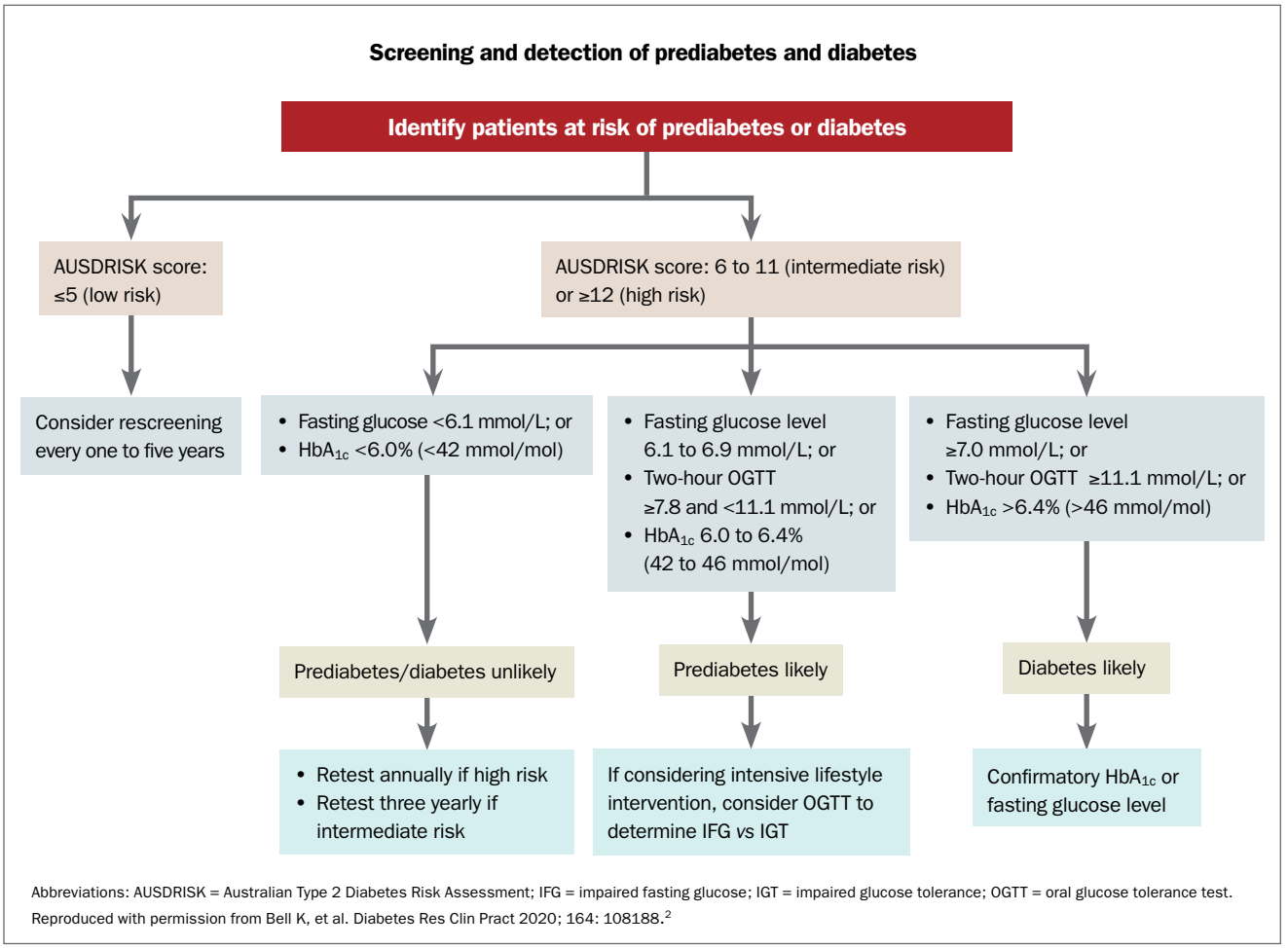
Prediabetes and type 2 diabetes can be identified by:

- two-hour oral glucose tolerance test (OGTT)
- measurement of fasting blood glucose levels
- HbA_{1c}.

Each of these tests has its benefits and limitations and therefore the most appropriate test should be tailored to the individual and planned intervention. An OGTT is the most burdensome for patients but is the only test that can distinguish between IFG and IGT. As the strongest evidence of benefit for intensive, structured lifestyle programs is for people with IGT, it may be important to identify IGT using an OGTT before referral to such a program. A fasting glucose measurement only involves a single timepoint so may be more convenient for patients, but can only identify IFG, not IGT, so may misclassify some patients as not having prediabetes. In practice, an HbA_{1c} test may be most practical as it is a single timepoint test that does not require fasting. However, the HbA_{1c} test cannot distinguish between IFG and IGT, only an overall elevated glycaemia. HbA_{1c} test can be unreliable in people who have conditions in which red cell turnover or haemoglobin binding of glucose is abnormal (e.g. haemoglobinopathies, anaemia, iron deficiency, and significant renal impairment).

Management of prediabetes

The management of prediabetes should be individualised and multifaceted, and involve a multidisciplinary team of healthcare professionals. There is strong evidence to support intensive and structured lifestyle programs (i.e. preset curriculum and schedule of visits) for individuals with IGT, but less certain for those with IFG.[2] Regardless, lifestyle interventions are recommended for all individuals with prediabetes.[5-7] The goal of a management plan is to reverse prediabetes, or at least delay onset of type 2 diabetes, and reduce associated risk factors through weight reduction, healthy eating, regular physical activity, stress reduction/improved sleep and smoking cessation, as



Abbreviations: AUSDRISK = Australian Type 2 Diabetes Risk Assessment; IFG = impaired fasting glucose; IGT = impaired glucose tolerance; OGTT = oral glucose tolerance test.
Reproduced with permission from Bell K, et al. Diabetes Res Clin Pract 2020; 164: 108188.[2]

appropriate. Lifestyle interventions in individuals with overweight or obesity that result in a weight loss of 5 to 7% reduce the risk of developing type 2 diabetes by 57%, with a further reduction in those that sustained a weight loss of 5% after three years.[8,9] Patient-centred care and shared decision-making are important for ensuring the management plan is tailored to the individuals' goals, preferences and readiness to make behaviour modifications to encourage long-term adoption of lifestyle changes.[5]

Healthy eating

Dietary advice for individuals with prediabetes should be consistent with the Australian Dietary Guidelines,[10] which provide evidence-based nutrition advice, but are flexible enough to encompass a range of healthy eating approaches. Long-term weight loss/weight maintenance is more likely to be achieved with realistic and sustainable dietary approaches and a focus on macronutrient quality. Meta-analysis of various dietary approaches suggests value in a range of evidence-based diets including Mediterranean, lower carbohydrate, lower glycaemic index and higher protein diets.[11] An accredited practising dietitian can provide individualised dietary advice and support.

Physical activity

Regular physical activity and exercise should be part of the therapeutic strategy in people with prediabetes, given the improvements in glucose control, cardiovascular risk factors, mood and sleep.[12-15] Ideally, 150 to 300 minutes of moderate to vigorous intensity aerobic and resistance exercise should be undertaken each week, with no more than two consecutive days without exercising.[13,16,17] Further benefit may be obtained with additional exercise or exercise completed at higher intensities. In addition, strong evidence supports reducing overall sedentary time and interrupting prolonged sitting.[18-20] Individuals with prediabetes should be referred (where feasible) to an accredited exercise physiologist or physiotherapist to design an individualised exercise prescription.

Pharmacotherapy

No medications have a TGA indication for the prevention of type 2 diabetes. Oral glucose-lowering agents, such as metformin, are generally not as effective as an intensive lifestyle intervention. Therefore, if oral antihyperglycaemic agents are used, it is recommended that they are prescribed in conjunction with intensive lifestyle modification. Pharmacotherapy is likely to be most beneficial in

younger adults, as the long-term benefits of a delay in onset of type 2 diabetes would be the greatest in this group.[21]

Psychosocial care

Individuals with prediabetes are at a higher risk of depression and anxiety.[22] Psychological distress may reduce the capacity for people with type 1 or 2 diabetes to engage in daily health behaviours, including healthy eating and physical activity.[22] Ongoing psychological care may be considered through regular, supportive interactions with the GP and multidisciplinary team, plus referral of the patient to a counsellor, psychologist or psychiatrist as appropriate.

Creating a holistic prediabetes management plan

The management plan for people with prediabetes should be multifaceted and individualised and include healthy eating and physical activity. As there are several different lifestyle approaches that have been proven to be effective in people with prediabetes, management should be patient-centred and advice (e.g. on healthy eating, exercise strategies or clinical targets) should be consistent between healthcare professionals.

The frequency of ongoing monitoring needs to be individualised. There is no indication for self-monitoring of capillary blood glucose levels by individuals with prediabetes but annual retesting of HbA_{1c} to screen for type 2 diabetes is recommended and supported by Medicare. Other health outcomes, such as weight, lipid and blood pressure management, should be assessed by the multidisciplinary team in conjunction with the individual to assess the efficacy of interventions and disease progression. Ongoing support from the GP and other healthcare professionals, and regular interactions, are encouraged to build on strong, supportive, lasting professional relationships with patients, as well as providing education and advice. Education on prevention of type 2 diabetes and healthy lifestyle advice is best provided at first identification of prediabetes, and as frequently as needed or desired to support behavioural or pharmacological interventions.

Lifestyle programs may be provided by referring the individual to allied healthcare professionals, such as accredited practising dietitians or accredited exercise physiologists. Programs can also be provided by public, private or community organisations with expertise in the management of prediabetes (via face-to-face meetings, telephone, webinars or community programs). For example, the NSW Government telephone-based Get Healthy: type 2 diabetes prevention program (see: www.gethealthynsw.com.au/program/type-2-diabetes-prevention-program/) or Diabetes Australia state and territory-run programs (see: www.diabetesaustralia.com.au/prevention for further details). A Medicare chronic disease plan management is not available to people with prediabetes alone. **ET**

References

1. Lindström J, Ilanne-Parikka P, Peltonen M, et al. Sustained reduction in the incidence of type 2 diabetes by lifestyle intervention: follow-up of the Finnish Diabetes Prevention Study. Lancet 2006; 368: 1673-1679.
2. Bell K, Shaw JE, Maple-Brown L, et al. A position statement on screening and management of prediabetes in adults in primary care in Australia. Diabetes Res Clin Pract 2020; 164: 108188.
3. Shaw J, Tanamas S. Diabetes: the silent pandemic and its impact on Australia. Melbourne: Baker IDI Heart and Diabetes Institute; 2012.
4. Australian Government Department of Health. The Australian Type 2 Diabetes Risk Assessment Tool (AUSDRISK). Canberra: Commonwealth of Australia; 2020. Available online at: www.health.gov.au/resources/apps-and-tools/the-australian-type-2-diabetes-risk-assessment-tool-ausdrisk (accessed September 2020).
5. Glechner A, Keuchel L, Affengruber L, et al. Effects of lifestyle changes on adults with prediabetes: A systematic review and meta-analysis. Prim Care Diabetes 2018; 12: 393-408.
6. Evert AB, Dennison M, Gardner CD, et al. Nutrition therapy for adults with diabetes or prediabetes: a consensus report. Diabetes Care 2019; 42: 731-754.
7. Hemmingsen B, Gimenez-Perez G, Mauricio D, et al. Diet, physical activity or both for prevention or delay of type 2 diabetes mellitus and its associated complications in people at increased risk of developing type 2 diabetes mellitus. Cochrane Database Syst Rev 2017; 12: CD003054.
8. Paulweber B, Valensi P, Lindström J, European evidence-based guideline for the prevention of type 2 diabetes. Horm Metab Res 2010; 42 Suppl 1: S3-36.
9. Penn L, White M, Lindström J, et al. Importance of weight loss maintenance and risk prediction in the prevention of type 2 diabetes: analysis of European Diabetes Prevention Study RCT. PLoS One 2013; 8: e57143.
10. National Health and Medical Research Council (NHMRC). Australian Dietary Guidelines. Canberra: NHMRC; 2013.
11. Ajala O, English P, Pinkney J. Systematic review and meta-analysis of different dietary approaches to the management of type 2 diabetes. Am J Clin Nutr 2013; 97: 505-516.
12. Christ-Roberts CY, Pratipanawatr T, Pratipanawatr W, et al. Exercise training increases glycogen synthase activity and GLUT4 expression but not insulin signaling in overweight nondiabetic and type 2 diabetic subjects. Metabolism 2004; 53: 1233-1242.
13. Hordern MD, Dunstan DW, Prins JB, et al. Exercise prescription for patients with type 2 diabetes and pre-diabetes: a position statement from Exercise and Sport Science Australia. J Sci Med Sport 2012; 15: 25-31.
14. Eriksson KF, Lindgärde F. Prevention of type 2 (non-insulin-dependent) diabetes mellitus by diet and physical exercise. The 6-year Malmö feasibility study. Diabetologia 1991; 34: 891-898.
15. Shiroma EJ, Cook NR, Manson JE, et al. Strength training and the risk of type 2 diabetes and cardiovascular disease. Med Sci Sports Exerc 2017; 49: 40-46.
16. Montesi L, Moscatiello S, Malavolti M, Marzocchi R, Marchesini G. Physical activity for the prevention and treatment of metabolic disorders. Intern Emerg Med 2013; 8: 655-666.
17. Bassuk SS, Manson JE. Epidemiological evidence for the role of physical activity in reducing risk of type 2 diabetes and cardiovascular disease. J Appl Physiol 2005; 99: 1193-1204.
18. Dempsey PC, Owen N, Yates TE, Kingwell BA, Dunstan DW. Sitting less and moving more: improved glycaemic control for type 2 diabetes prevention and management. Current Diabetes Reports 2016; 16.
19. Saunders TJ, Atkinson HF, Burr J, et al. The acute metabolic and vascular impact of interrupting prolonged sitting: a systematic review and meta-analysis. Sports Med 2018; 48: 2347-2366.
20. Dunstan DW, Kingwell BA, Larsen R, et al. Breaking up prolonged sitting reduces postprandial glucose and insulin responses. Diabetes Care 2012; 35: 976-983.
21. Gillies CL, Abrams KR, Lambert PC, et al. Pharmacological and lifestyle interventions to prevent or delay type 2 diabetes in people with impaired glucose tolerance: systematic review and meta-analysis. Br Med J 2007; 334: 299.
22. Hendrieckx C, Halliday JA, Beeney LJ, Speight J. Diabetes and emotional health: a handbook for health professionals supporting adults with type 1 or type 2 diabetes. Canberra: National Diabetes Services Scheme; 2016.

COMPETING INTERESTS: Dr Bell has received personal fees from Glucolife PTE Ltd.