Investigating for diabetes in rural and remote Indigenous communities

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Case scenarios are used in this section to educate doctors on the best approach to the diagnosis and management of patients with different endocrine problems. The appropriate selection of tests and correct interpretation of test results are discussed.

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You are on an outreach visit to a remote Aboriginal community in the Northern Territory. A 35-year-old man comes in for an adult health check up. His last visit for this purpose was three years ago. He smokes six to 10 cigarettes a day and his blood pressure is 120/80 mmHg. He has a body mass index (BMI) of 24 kg/m^2 and a waist circumference of 92 cm. He has not fasted.

From a population screening point of view, what further investigations does this patient require?

Answer: Measurement of lipid levels, estimated glomerular filtration rate, urine albumin/creatinine ratio, random blood glucose level (BGL) with or without glycosylated haemoglobin (HbA_{1c}), and a recent full blood count are indicated. This is with the intent of screening for diabetes and renal disease and assessing his absolute five-year cardiac risk.

Aboriginal people are at higher risk of cardiovascular disease and type 2 diabetes mellitus, particularly at a young age, compared with the mainstream population of European origin.[1] This difference in epidemiology is reflected in the latest Royal Australian College of General Practitioners (RACGP) diabetes guidelines, which suggest that Aboriginal and Torres Strait Islander people should be screened every three years for diabetes from the age of 18 years, rather than from 40 years.[2]

Absolute cardiac risk assessments are recommended by the national guidelines for Aboriginal and Torres Strait Islander people from the age of 35 years.[3] This recommended age threshold for risk factor screening is even lower in the Northern Territory's principal guidelines for remote communities – the Central Australian Rural Practitioners Association (CARPA) standard treatment manual. These local guidelines recommend a one to two yearly BGL measurement commencing from the age of 15 years in patients of low individual risk of cardiovascular disease.[4]

Some also recommend testing for diabetes in Indigenous children in remote settings from age 10 years onwards if they are overweight or obese, have a positive family history of diabetes, have signs of insulin resistance, dyslipidaemia, are receiving psychotropic therapy or were exposed to maternal diabetes *in utero*.[5]

How is the actual method of screening for diabetes different in remote Indigenous communities to mainstream populations?

Answer: The Australian type 2 diabetes risk assessment tool (AUSDRISK) is not recommended in remote Indigenous communities, regardless of individual risk. This is because these populations have a greater than 5% prevalence of diabetes. The AUSDRISK has been shown to underestimate the five-year risk of diabetes in Aboriginal and Torres Strait Islander people.[2]

No single blood test detects all cases of diabetes. In asymptomatic individuals, a screening test should be followed by a diagnostic test on a separate day.

A fasting BGL has traditionally been the recommended first-line blood test for diabetes. However this test is often impractical in small remote communities (e.g. outstations) as outreach teams will not physically arrive in these communities until late in the day. Fasting two-hour oral glucose tolerance test (OGTT) has the same logistical issues. This leaves measurement of random BGLs, two-hour nonfasting OGTT and measurement of HbA_{1c} as the main methods of screening and subsequent diagnostic testing in the very remote settings.

Random BGL testing is commonly used as initial screening for diabetes, but is not recommended in the latest RACGP guidelines for subsequent diagnostic testing in the asymptomatic individual.[2]

The two-hour nonfasting OGTT involves a standard glucose intake followed by a BGL measurement two hours later. Before widespread use of measurements of HbA_{1c}, this was the main test used by remote community healthcare providers to delineate the diagnosis of patients with abnormal blood glucose readings who were not diagnostic of diabetes.[4]

HbA_{1c} measurement is useful as a screening test for diabetes. It can also be repeated to diagnose both diabetes and prediabetes. The threshold for a diagnosis of diabetes is 6.5% (48 mmol/mol) or more and the CARPA manual uses a threshold of 5.7% (39 mmol/mol) or more for diagnosing prediabetes.[4] In November 2014, the cost of this test became Medicare rebatable when performed for the diagnosis of diabetes in asymptomatic patients at high risk.

HbA_{1c} levels may be affected by conditions that affect the level, longevity or structure of haemoglobin. Levels may be falsely low in pregnant women and those with haemolytic anaemias or haemoglobinopathies, whereas levels may be falsely high in those with iron deficiency anaemia, with alcoholism or who have had a splenectomy. Therefore noting a recent haemoglobin level and any large discrepancies between simultaneous glucose testing and HbA_{1c} is useful when using this test. HbA_{1c} is not validated as a diagnostic test in children (under 18 years), therefore testing methods involving a BGL can only be used in this age group.[2]

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Does a capillary BGL have any value in screening for diabetes?

Answer: Capillary BGL is an attractive and widely used option for remote rural healthcare providers because turnaround times for laboratory testing can be slow and communicating results in areas with poor telecommunications challenging. Despite being considered too inaccurate as a screening test in the national guidelines, this method has been validated as a screening test in remote Indigenous populations of the Kimberley region of Western Australia. The Kimberley Aboriginal Medical Services Council's clinical guidelines for diabetes use 5.5 mmol/L as the threshold for proceeding to laboratory screening testing and 12.2 mmol/L is the threshold for proceeding to laboratory diagnostic testing.[7] The CARPA recommend stratifying patients with a capillary BGL of 5 mmol/L or more to laboratory testing.[4-6]

This patient had a random capillary BGL of 11 mmol/L, which led to measurement of a random venous BGL and HbA_{1c} being taken. The results showed a venous BGL of 11.2 mmol/L and HbA_{1c} of 7.1%. Haemoglobin level was 130 mg/L with normal mean corpuscular volume. A repeat HbA_{1c} measurement, taken one month later, was 7.2% and urine analysis was negative for ketones. Total cholesterol level was 4.7 mmol/L, triglyceride level 4.3 mmol/L, low-density lipoprotein level 1.8 mmol/L and high-density lipoprotein level 0.9 mmol/L. Estimated glomerular filtration rate was above 90 mL/min/1.73 m^2 and urine albumin to creatinine ratio was 1 mg/mmol.

How do you interpret these test results and the patient's physical findings?

Answer: The patient meets criteria for diagnosis of diabetes mellitus. The absence of symptoms and normal urine analysis support type 2 diabetes. There is no microalbuminuria. Total cholesterol and high-density lipoprotein levels are sufficiently unaffected by fasting status so they can be used in a cardiac risk calculator; however, in patients with a high HbA_{1c} repeating the lipid levels after BGLs are as optimised as possible is important because of the effects of hyperglycaemia on lipids profiles. The elevated triglyceride level might reflect a non-fasting sample.

The waist circumference and BMI are normal for a Caucasian man but perhaps high for this patient. There is evidence that a lower BMI and waist threshold may be needed for Aboriginal and Torres Strait Islander people.[8] A BMI of 22 kg/m^2 for overweight adults has been proposed as a more accurate representation of risk in remote populations.[9]

According to the absolute cardiovascular disease risk calculator, the patient has a five-year cardiovascular risk of 1%. However, according to the risk calculator of the local guidelines (CARPA), 5% is added to this calculation, making the risk 6%.[3,4] The target population of the local guidelines better matches our patient's epidemiology, so the latter is adopted. In either case the patient is below the threshold, so statin therapy is not recommended.

Why might the local guidelines for this patient (in this case the CARPA guidelines) be different from the national guidelines for cardiac risk assessment?

Answer: The absolute cardiovascular disease risk calculator used in the national guidelines is based on data from the Framingham Heart study, which is derived from mostly middle class Americans of mostly European origin. The one study that attempted to validate its use in remote Northern Territory Aboriginal populations found that the calculator grossly underestimated risk.[10] A similar problem has been noted in Maori people, Pacific Islanders and people of the Indian subcontinent.[11]

In New Zealand, adding 5% to the results obtained by the same risk calculator improved the underestimation of risk of the calculator in the combined Indian, Maori and Pacific Islander population.[11]

Both national and the local CARPA guidelines recommend statins in addition to lifestyle advice in Aboriginal patients with 10% or more five-year risk of a cardiovascular event.[3,4]

What challenges do you face with managing this patient?

Answer: Management of this patient will be challenging, as there may be language, cultural, reading and health literacy barriers. These may be partly offset by interpreters, Aboriginal healthcare practitioners, strategies to retain healthcare staff and correct medium of information.

Lack of affordable reasonable quality vegetables and fruit in the patient's community may be partly offset by promotion of appropriate bush tucker, and local fresh produce initiatives. Lack of exercise facilities may be partly offset by increased incidental exercise found in daily activities such as bush tucker hunting and participation in local sports.

Metformin is the first-line drug therapy. Use of insulin can be challenging, given the potential lack of refrigeration and difficulties in safe needle disposal in overcrowded housing. Issues of reduced access to specialised services can be partly offset by the use of retinal cameras, telemedicine and in the case of feet problems digital photography.

Conclusion

Investigations and management of diabetes in a remote setting requires a different approach to the mainstream population. Guidelines are important but should only be followed if they make sense of the local epidemiology, local resources and the patient in front of you. They are just what they say they are…a guide. **ET**

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