



Diabetes Management in General Practice

Guidelines for Type 2 Diabetes



DIABETES

2010/11

An electronic version of these guidelines is available at www.racgp.org.au

Any changes after the printing of this edition and before the next will be available on this website.

This booklet is intended to provide information about the management of type 2 diabetes in Australian general practice. However, type 1 diabetes is mentioned in several sections. General practitioners seeking information about the management of type 1 diabetes should consult other sources. This booklet is not intended to replace professional judgement, experience and appropriate referral. While every care has been taken to ensure accuracy, reference to product information is recommended before prescribing. Diabetes Australia and the RACGP assume no responsibility for personal or other injury, loss or damage that may result from the information in this publication.

DIABETES MANAGEMENT

in

GENERAL PRACTICE

Sixteenth edition 2010/11



 **alphapharm**

supporting the education programs
of Diabetes Australia

EDITORIAL PANEL

Gratitude is expressed to everybody who has contributed to these guidelines: The Health Care and Education Committee of Diabetes Australia, The Australian Diabetes Educators Association, Australian Diabetes Society, Dietitians Association of Australia, The Drug and Therapeutics Information Service, many general practitioners, endocrinologists, dietitians, diabetes educators and podiatrists.

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Appreciation is expressed to Dr Chris Holmwood who prepared the original guidelines and to Professor Stephen Colagiuri who reviewed the guidelines.

The Editors have considered and included relevant information within guidelines and evidence recognised by the medical profession, including the NHMRC and the Australian Diabetes Society. This document is designed for first line primary care. More complex care is best addressed by a team.

ISBN: 978 1875690 190

July 2010

This publication was reviewed by Diabetes Australia's Health Care and Education Committee and RACGP's National Standing Committee for Quality Care in 2010 and is endorsed for publication until 2011.

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Diabetes Australia Publication NP 1055

Printed by Pinnacle Print Management, Gorokan NSW

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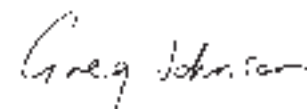
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Foreword

General practitioners continue to provide most of the medical care to people with type 2 diabetes. The complexity of care for this common disease requires systematic care from the practice team and the timely referral to community and hospital based specialists.

The current guide, in its sixteenth edition, has an important role in providing a readable summary of current guidelines and recommendations from various sources on the management of type 2 diabetes in adults in the general practice setting.

Importantly, this edition again includes specific issues relating to treating diabetes in the Aboriginal and Torres Strait Islander population which reflects the burden of this disease within this group. Also included is a routine care checklist for practice nurses for use under the clinical oversight of the general practitioner.



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What's new?

HbA1c and diagnosis: The American Diabetes Association now recommends HbA1c as well as venous plasma glucose levels to diagnose type 2 diabetes with diagnostic values being $\geq 6.5\%$. This policy may be adopted in Australia in 2010/11.

HbA1c values: In the past, HbA1c methods have been calibrated to produce values equivalent to those obtained in the Diabetes Control and Complications Trial (DCCT). Internationally there is a move towards a different standard based on the chemistry of HbA1c. Use of this new standard would result in reported values for HbA1c being considerably lower (by approximately 2%, ie: as 6% instead of 8%). It is expected that if this change in standards is adopted in Australia both the DCCT and the new values will be reported.

What's changed?

NHMRC Guidelines: Several changes appear in this 16th edition of Diabetes Management in General Practice to ensure consistency with the latest edition of the NHMRC Evidence Based Guidelines for Blood Glucose Control in Type 2 Diabetes.

Section 4, page 22: Targets for glycaemic control in type 2 diabetes.

Section 5, page 32: The information relating to Medicare has been updated.

Section 6, page 39: Algorithm for use of oral hypoglycaemic medications in type 2 diabetes.

Section 6.2, page 42: Step guide to insulin treatment in type 2 diabetes. Basal and premixed insulin schedules are described.

What's controversial?

Aspirin: Discussion continues about the role of aspirin in reducing cardiovascular events in those with type 2 diabetes but without evidence of clinical cardiovascular disease. An international prospective randomised controlled trial is underway.

Until the results of this trial have been published it is suggested that doctors consider prophylactic aspirin (75–325 mg) daily unless there are contraindications (refer pages 16, 54–55) and Goals for Management (tear out card and the outside back cover).

Introduction

This booklet is a guide to type 2 diabetes in adults.

Type 2 diabetes is a chronic condition which can result in disability and early death. Management of the person with diabetes requires the skills of several professionals (general practitioner, specialist physician, diabetes educator, podiatrist, dietitian, ophthalmologist or optometrist, exercise professional and dentist) and the active participation of the patient.

The aim of this booklet is to provide guidelines for management of type 2 diabetes. We hope that general practitioners will consult these guidelines in order to ensure a high standard of care for their patients.

- **The underlying aim is improvement in the duration and quality of life of patients.**
- **Encourage patients to participate and take an active role in the management of their diabetes.**
- **Ensure that all other preventive health care activities are included, while maintaining good diabetes health care.**

Any guideline should be flexible: management takes into consideration the patient's age, educational level, cultural background, the current scientific knowledge, the availability of resources and the range of particular preferences of the patient and professionals involved.

The overall goals in degree of control and lifestyle modification must be realistic. The general practitioner can have an important positive effect on patient lifestyle. Education of a partner or other responsible carers is an important factor in maintaining positive lifestyle changes in a patient. Similarly the general practitioner can ensure that management is individualised to the person's cultural, educational and financial status.

The general practitioner is a key member of the therapeutic team. In many instances the general practitioner may be the principal medical professional. In other instances there may be a 'shared-care' arrangement between specialist and general practitioner, while in others, management of diabetes by the specialist may be preferable. In all situations the paramount consideration is the patient's well being.

Specific issues relating to the treatment of diabetes in the Aboriginal and Torres Strait Islander population will be highlighted in boxes throughout the guidelines. A conservative approach has been taken on the statements included to ensure that practitioners can have confidence they are based on solid evidence.

For the team approach to be successful there should be good communication between members based on trust and respect. For example, the patient will often relate best to the general practitioner. The other team members should be able to support that relationship and channel their input to management accordingly.

The role of the general practitioner ideally involves initial diagnosis, treatment, coordination of consultant and allied professional care and continuing management (including education and counselling of the patient and carers).

- The importance of the patient-doctor partnership in the management of diabetes cannot be overstated. The patient and the general practitioner need to have an agreed understanding of the patient's diabetes and associated problems and agree on the management strategies being adopted.
- In order to provide optimum care, the general practitioner must have adequate records and systems in place which will assist in the recall of patients for further investigations or continuing management. Adequate records are also necessary in order to monitor outcomes – both for the individual and within the wider community. A diabetes register at every practice is encouraged.
- Ensure that all other preventive health care activities are included, while maintaining good diabetes health care.

Carers need to become involved in education and management decisions. This is particularly so in young people with diabetes, disabled patients and where major dietary changes are required. Every carer needs to be well informed on recognition and treatment of hypoglycaemia, if the patient is treated with insulin, sulphonylureas or repaglinide.

1 Diagnosis

People in high risk groups need to be screened for undiagnosed type 2 diabetes. See following page for high risk categories.

A three-step screening and diagnosis procedure is recommended for detecting undiagnosed type 2 diabetes:

1. Initial risk assessment using a risk assessment tool or risk factors
2. Measurement of fasting plasma glucose
3. Sometimes an OGTT (see below).

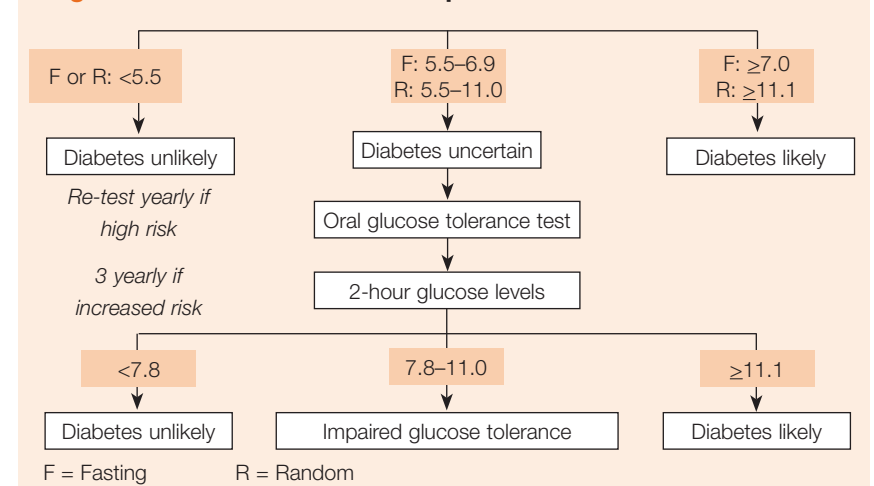
Diagnosis must be confirmed on a subsequent day unless unequivocal hyperglycaemia with acute metabolic decompensation or obvious symptoms are present.

The OGTT is unnecessary to diagnose diabetes in people with an unequivocally elevated fasting or random plasma glucose. An OGTT needs to be performed in a person with an equivocal result. (See Fig. 1).

The test is carried out after an overnight fast, following three days of adequate carbohydrate intake (greater than 150 g per day). A 75 g load of oral glucose is given and the diagnosis of diabetes can be made if venous plasma glucose level fasting is ≥ 7.0 mmol/L or 2-hour post glucose load is ≥ 11.1 mmol/L.

Capillary blood glucose measurement using a desktop meter may be used for testing for undiagnosed diabetes as long as it is confirmed by venous plasma measurement. Urine testing is not sufficiently sensitive or specific as a screening test for undiagnosed diabetes.

Fig. 1: Glucose levels – venous plasma: mmol/L



1.1 Who needs to be tested for undiagnosed diabetes?

Asymptomatic people at high risk of undiagnosed diabetes should be identified and screened by measurement of plasma glucose. This needs to be performed in a laboratory (rather than with a blood glucose meter) and preferably on a fasting sample. However a random sample may be used.

People at high risk for undiagnosed type 2 diabetes are:

- People with impaired glucose tolerance, impaired fasting glucose (see below).
- Aboriginal and Torres Strait Islanders aged 35 and over.
- Certain high risk non-English speaking people aged 35 and over (specifically Pacific Islanders, people from the Indian subcontinent, people of Chinese origin).
- People aged 40 and over who have one or more of the following risk factors:
 - Obesity (BMI ≥ 30 kg/m²)
 - Hypertension
- All people with clinical cardiovascular disease (myocardial infarction, angina, stroke or peripheral vascular disease).
- Women with polycystic ovarian syndrome who are obese.
- People on antipsychotic drugs.

The following groups are also at high risk but further studies are required to evaluate net clinical or economic benefit:

- Women with a history of gestational diabetes.
- People aged 55 and over.
- People aged 45 and over, with a first degree relative with type 2 diabetes.

Certain medications (especially glucocorticoids and atypical antipsychotics) can affect glucose metabolism and increase the risk of diabetes.

The AUSDRISK tool (www.health.gov.au) is recommended for use every 3 years in all adults over the age of 40 as a screening tool to identify those at increased risk of having undiagnosed type 2 diabetes or of developing the disease in the next 5 years. To help prevent diabetes, some Divisions of General Practice offer programs to patients with high scores.

Impaired fasting glucose and impaired glucose tolerance

At-risk patients include those who:

- are over 40 years
- are overweight (particularly those with central adiposity), or
- have high blood pressure, known cardiovascular disease, a family history of diabetes or past history of gestational diabetes.

Type 2 diabetes or impaired glucose tolerance (IGT) cannot be excluded in a patient with a random glucose of >5.5 mmol/L and <11.1 mmol/L. In such patients an oral glucose tolerance test (OGTT) should be performed to establish a diagnosis.

Diagnosis

Fasting plasma glucose level ≥ 6.1 mmol/L but <7.0 mmol/L (impaired fasting glucose [IFG]), or 2-hour glucose level following a 75 g glucose load ≥ 7.8 mmol/L but <11.1 mmol/L (impaired glucose tolerance [IGT]). Over 16% of the Australian population over the age of 25 years have either IGT or IFG.

Significance of IFG and IGT

Although originally considered to be 'pre-diabetes', indicating risk of future diabetes, there is now evidence of a continuum of cardiovascular risk associated with dysglycaemia and early insulin resistance through IFG/IGT to the diabetic state. A close association between impaired glucose control not reaching the threshold for diagnosis of diabetes and the development of cardiovascular disease (CVD) has been described. CVD risk is distributed across a continuum of post-challenge glucose levels, making it likely that any degree of post-challenge hyperglycaemia is associated with the development of premature CVD.

Management of IFG and IGT

Patients with IFG/IGT must be counselled that they are at increased risk of CVD, and strict control of all cardiovascular risk factors (blood pressure, lipids, smoking) should be a priority. Dietary and exercise advice should be given and aspirin therapy should be considered.

Patients should be counselled about the increased risk of progression to diabetes, and advised of the results of recent diabetes prevention studies that have shown that lifestyle change (diet together with at least 150 minutes of exercise per week to achieve a weight loss of 7%) can delay or prevent progression to type 2 diabetes.

Increased physical activity is particularly important in maintaining weight loss. Regular physical activity, including resistance activities, also improves insulin sensitivity; reduces plasma levels of insulin in people with hyperinsulinaemia; improves dyslipidaemia and lowers blood pressure. Moreover, physical activity increases metabolically active muscle tissue, improves general cardiovascular health and also reduces the risk of type 2 diabetes.

Whilst use of metformin and glitazones have been trialled as pharmacological approaches to diabetes prevention in this group with some success, lifestyle modification is more effective.

Periodic testing for undiagnosed diabetes is recommended in high risk individuals. All high risk people with a negative screening test are at risk of cardiovascular

disease and the future development of type 2 diabetes, and need to be given appropriate advice on SNAP risk factor reduction (Smoking, Nutrition, Alcohol and Physical activity).

Pregnant women need to be screened for gestational diabetes (*see section 10.2 on page 70*).

Routine testing of low risk asymptomatic people is not recommended.

The Aboriginal and Torres Strait Islander population has a higher risk of developing diabetes and is 10.5 to 13 times more likely to die from diabetes, compared with non-Indigenous Australians.

The *prevalence* of undiagnosed diabetes in the Aboriginal and Torres Strait Islander population exceeds 5% in all those over 35 years of age. In some regions the prevalence approaches 5% at a much younger age (as young as 18 years). The prevalence of diabetes risk factors including impaired glucose tolerance (IGT) exceeds 5% in this population aged under 35 years of age.

The *incidence* of diabetes in the Aboriginal and Torres Strait Islander population is 10 times higher than the general population and reaches 2% per year in some regions (eg: Central Australia).

1.2 What type of diabetes?

Differentiation is based on age, rate of clinical onset, body weight, family history and urinary ketones.

Once a diagnosis is made it is important to determine the type of diabetes. Usually there is clear clinical evidence and differentiation is easy.

Type 1	Type 2
– Young (generally) – Rapid onset	– Middle-aged (generally) – Slow onset
– Ketosis prone – Insulin deficient	– Not prone to ketosis – Insulin resistant
– Recent weight loss	– Overweight – Strong family history

At present there are no practical or specific markers for either group. While type 1 diabetes occurs in the young it is by no means confined to that group. Similarly while many people with type 2 diabetes are overweight, some are normal weight. In fact, most overweight people do not develop diabetes.

Remember that someone treated with insulin does not necessarily have type 1 diabetes. In fact, if insulin is started several years after diagnosis, it is likely that the person has type 2 diabetes.

Type 1 diabetes

This type of diabetes was previously known as Insulin Dependent Diabetes Mellitus (IDDM) or Juvenile Onset Diabetes. All patients should be suspected as type 1 until you can convince yourself otherwise. A simple urine dipstick can be used. If ketones are present, type 1 diabetes is highly likely. All children who are symptomatic should have a urine test or finger prick. If positive for glucose, urgent referral to hospital is needed (formal pathology is not required).

Late-onset Autoimmune Diabetes in Adults

There is a form of late onset diabetes that is autoimmune and requires treatment with insulin within a relatively short period after diagnosis (often in the next 2 years). This is known as Late-onset Autoimmune Diabetes in Adults (LADA). These people tend to be young (30–40 years), lean and have a personal and/or family history of other autoimmune diseases (eg: hypo or hyperthyroidism). Testing for glutamic acid decarboxylase (GAD) antibodies can confirm the diagnosis and can prompt counselling the person about the likely time course of diabetes progression and the possibility of other autoimmune disease.

Type 2 diabetes

This type of diabetes was previously known as Non-Insulin Dependent Diabetes Mellitus (NIDDM) or Maturity Onset Diabetes. However, type 2 diabetes can occur in children and adolescents if they are overweight or obese, have a family history of type 2 diabetes and/or come from a high risk group.

Gestational diabetes

This type of diabetes occurs during pregnancy and is discussed on page 70.

Medication induced diabetes

Some medications, for example prednisolone and olanzapine, can produce hyperglycaemia which can be associated with abnormal OGTT and the diagnosis of diabetes. This may require hypoglycaemic medication. Such patients require the usual diabetes assessment and management. When the medication is ceased, the requirement for hypoglycaemic treatment may change, but patients should still be considered to have diabetes and require ongoing cardiovascular monitoring. They are also at risk of developing frank diabetes again.

Other forms of diabetes

These are uncommon but include cystic fibrosis, other causes of pancreatic injury and endocrinopathies.

2 Assessment

2.1 Initial assessment

Assessment includes appraisal of cardiovascular risks and end-organ damage.

A detailed assessment needs to be made at first diagnosis.

History:

Specific symptoms:

Glycosuria

- Polyuria
- Polydipsia
- Polyphagia
- Weight loss
- Nocturia

Hyperglycaemia

- Malaise/fatigue
- Altered vision

Risk factors for complications including:

- Personal or family history of cardiovascular disease
- Smoking
- Hypertension
- Dyslipidaemia

Lifestyle issues:

- Smoking
- Nutrition
- Alcohol
- Physical activity
- Occupation

Predisposition to diabetes:

- Age
- Family history
- Cultural group
- Overweight
- Physical inactivity
- Hypertension
- Obstetric history of large babies or gestational diabetes
- Medication causing hyperglycaemia
- Personal or family history of haemochromatosis
- Autoimmune disease (personal and/or family history of other autoimmune diseases (eg: hypo or hyperthyroidism))

General symptom review including:

- Cardiovascular symptoms
- Neurological symptoms
- Bladder and sexual function
- Foot and toe problems
- Recurrent infections (especially urinary and skin)

Examination

Weight/waist:

- Body Mass Index (BMI) = weight (kg) divided by height² (m²)
- Waist circumference (*see page 23*)

Cardiovascular system:

- Blood pressure, ideally lying and standing
- Peripheral, neck and abdominal vessels

Eyes:

- Visual acuity (with correction)
- Cataracts
- Retinopathy (examine with pupil dilation)

Feet:

- Sensation and circulation
- Skin condition
- Pressure areas
- Interdigital problems
- Abnormal bone architecture

Peripheral nerves:

- Tendon reflexes
- Sensation: touch (eg: with 10 g monofilament) vibration (eg: with 128 hz tuning fork)

Urinalysis:

- Albumin
- Ketones
- Nitrites and/or leucocytes

Investigations

Baseline:

- Renal function: plasma creatinine (eGFR), micro-albuminuria
- Lipids: LDL-C, HDL-C, total cholesterol, triglyceride
- Glycaemia: glycated haemoglobin (HbA1c)

Other:

- Consider:
- ECG, if >50 years old and at least one other vascular risk factor
 - Microurine if high risk group (woman, neuropathy, vaginal pessary)
 - Thyroid function tests if there is a family history or clinical suspicion

2.2 Plan of continuing care

- Relieve acute symptoms.
- Optimise control of glycaemia and other risk factors for complications.
- Treat existing complications.
- Maintain other preventive activities.

Priorities of management

Patient and carer counselling includes identifying and addressing concerns which may be causing distress and adversely affecting management.

If the patient is symptomatic then treatment of hyperglycaemia needs to be prompt but if the patient is asymptomatic initial treatment can be more relaxed. The long term medical goal is the prevention of complications.

Control of blood pressure and dyslipidaemia are important as well as glycaemic control in preventing complications.

The overall aim of management is to improve quality of life and prevent premature death:

Short term:

- Relief of symptoms and acute complications

Long term:

- Achievement of appropriate glycaemia
- Reduction of concurrent risk factors
- Identification and treatment of chronic complications
- Maintain other preventive activities (eg: immunisation)

- **All patients should be advised of the risks of smoking and offered assistance with smoking cessation.**
- **Consider low dose aspirin for cardiovascular protection for all people with diabetes.**

2.3 Referral

- **Patients with type 1 diabetes need specialist assessment.**
- **All people with type 2 diabetes need to see an ophthalmologist or optometrist initially and then at least every two years.**

Diabetes educator:

Initially and then as patient becomes more familiar with management, as considered necessary by patient, doctor or diabetes educator.

Dietitian:

Ideally initially, then as considered necessary by patient, doctor or dietitian.

Endocrinologist:

- Children, adolescents and adults with type 1 diabetes if the general practitioner is not confident with management.
- Pregnant women with established diabetes and women with gestational diabetes (*see page 70 for screening recommendations*).
- People with diabetes and uncontrolled hyperglycaemia or with significant complications.

Ophthalmologist or optometrist:

- Fundal examination (dilated pupils).
- The presence of cataracts needs to be checked.
- Assessment:
 - prepubertal children: referral at puberty
 - adults: referral at time of initial diagnosis
 - thereafter at least every two years.

Podiatrist:

Ideally initially, and then regularly if there is/are peripheral vascular disease, neuropathy, skin and/or nail problems and if there is difficulty in cutting toenails. Consider referral to a high risk foot clinic if ulceration or intractable foot pain is present.

While Indigenous Australians are at high risk of many diseases and premature death, they are less likely to receive many aspects of preventive care. Identification of patients of Aboriginal and Torres Strait Islander background is critical for appropriately targeting interventions. GPs are encouraged to routinely ask all patients if they have Aboriginal and Torres Strait Islander background so that they may target this risk group effectively.

3 The team approach

- **Consider referral to a diabetes educator or dietitian for consolidation of education.**
- **A podiatrist's help needs to be sought if neuropathy, peripheral vascular disease, foot abnormality or calluses are present.**
- **Rebates for attendance at private dentists and exercise professionals are available for patients under the Enhanced Primary Care Program, as part of a Team Care Arrangement.**
- **Medicare subsidies are available for group education sessions involving diabetes educators, dietitians and exercise physiologists.**

In the team management of diabetes the **patient** is the central member.

For patients to be actively involved in their care they must understand the condition, its effect on health and the practicalities of management. Good communication between team members is important so that advice is consistent and not confusing for the patient.

3.1 Members of the team

The following professionals are important in the team approach to diabetes:

Diabetes educator

The diabetes educator can often spend more time than the general practitioner has available, consolidating the patient's knowledge and skills regarding eating plan, physical activity, self-monitoring, medication usage, foot care etc. The Australian Diabetes Educators Association (ADEA) has established a credentialling program. Qualified professionals are "ADEA Credentialed Diabetes Educators". If available, the services of a diabetes educator are useful in the early stages and a continuing liaison can be established.

Dietitian

The role of the dietitian in the management of diabetes is paramount. Lifestyle changes alone (healthy food and regular exercise with ensuing weight loss) are sufficient for glycaemic control in the majority of patients with newly diagnosed type 2 diabetes. Recommendations should be individualised to maximise cooperation. Early referral to a dietitian is desirable to ensure detailed education on this most important aspect of management. If the general practitioner and practice nurse understand the principles of dietary advice, the dietary recommendations can be reinforced within the general practice.

Endocrinologist/diabetologist/paediatrician

The advice of a specialist physician may be valuable for people with complicated problems related to diabetes – especially children, adolescents and adults with type 1 diabetes or diabetes in pregnancy. A shared care approach by general practitioner and specialist will provide the best combination of specialised expertise and continuity of care. In many cases the specialist will be part of an organised, multi-disciplinary diabetes care team which can provide a comprehensive diabetes education program.

Exercise professional

When initiating a physical activity program in a patient who has been relatively inactive, the help of a physiotherapist with a special interest in exercise routines or an exercise physiologist may be of benefit. Rebates for attendance at exercise physiologists are available for patients under the Enhanced Primary Care Program, as part of a Team Care Arrangement (*see pages 33 to 35*).

General practitioner

The general practitioner has the central role in coordinating management of the person with diabetes and in education, counselling and softening the "technology/person interface" often felt by people with a chronic condition. The general practitioner is the point of first contact and usually assumes responsibility for overall management.

Practice nurse

In many practices, the practice nurse is invaluable in establishing, managing and implementing systems for diabetes care.

Ophthalmologist/optometrist

All people with diabetes need to be assessed regularly by an ophthalmologist or optometrist. Early detection of retinopathy, before visual loss occurs, markedly improves prognosis for sight. Any deterioration in vision requires immediate referral back to the ophthalmologist.

Oral health professional

Dental and periodontal problems are common in people with diabetes who need to see a dentist regularly (eg: yearly). Rebates for attendance at private dentists are available for patients under the Enhanced Primary Care Program, as part of a Team Care Arrangement (*see pages 33 to 35*).

Pharmacist

Pharmacists are frequently consulted by members of the community about a wide range of health issues. Pharmacists usually know the health problems and prescribed

medications and can provide useful advice on medication usage and potential problems. A formal Home Medicines Review (HMR) can be arranged by general practitioners (*see page 33*).

Podiatrist

The podiatrist renders expert preventive care. If there is evidence of neuropathy, macro vascular disease, anatomical problems or a previous foot problem, early referral is desirable and regular review is necessary. Foot complications account for over 50% of hospital bed days occupied by patients with diabetes and are the most common cause of non-traumatic amputation.

Aboriginal Health Workers

Where they are available, Aboriginal Health Workers (AHWs) have a key role in providing culturally appropriate and practical support and counselling, thus improving patient understanding and adherence to treatment programs.

3.2 Counselling the person with diabetes

The diagnosis of diabetes can be very stressful for both younger and older patients. Initial denial of the condition (ie: a grief reaction) is normal. But if denial continues, diabetes care can be compromised.

Patients, whose difficulties with accepting the diagnosis compromise their treatment, may benefit from Cognitive Behaviour Therapy or other psychological interventions. General practitioners can engage the help of a psychologist, social worker or counsellor. These practitioners may be accessed as part of a Team Care Arrangement within a General Practice Management Plan or under the Better Access to Psychiatrists, Psychologists and General Practitioners through the Medicare Benefits Scheme Initiative.

The younger patient should become familiar with the condition, insulin and diet and has to cope with feelings of dependence on medication for survival. The older patient faces increasing vulnerability to sickness, disability and loss of function. Fears may include job security, physical disfigurement and loss of ability to contribute to present relationships.

The diagnosis of diabetes may have a profound effect on people engaged in certain occupations, eg: machinery operators, pilots, heavy vehicle drivers, divers, etc. While not always prohibiting many of these occupations, the diagnosis of diabetes may require careful career counselling.

Lifestyles which have been established for many years are not easy to change and health care professionals cannot expect immediate adherence to the plan of management. Assess the SNAP risk factors (Smoking, Nutrition, Alcohol and Physical activity) and establish a long term lifestyle plan.

It is important for the patient to have all the information available so that a common sense of purpose between the health care professionals and the patient can develop. This takes time and some patients may decide to reject advice.

Professionals need to maintain an open approach and emphasise that help is available when required.

Weight reduction is often difficult. A combined program of healthy eating, physical activity and education directed at behavioural changes is often successful. Carer and peer encouragement helps these behavioural changes.

Health care professionals need to be sensitive to patient views concerning diabetes and be ready to counsel. The normal stresses of daily living can affect diabetes control. Seek opportunities to help patients regain control, to improve self esteem and to understand and control their condition.

There is a range of approved educational materials produced by State and Territory Diabetes Organisations which can be recommended to the newly diagnosed person with diabetes.

Education is ongoing and needs to continue for the rest of the person's life. Diabetes knowledge, especially self care skills (blood glucose monitoring, foot care, insulin administration) need to be assessed regularly (eg: as part of the complication screen at the twelve monthly review).

4 Initial management

Targets for glycaemic control in type 2 diabetes

Pre prandial blood glucose (mmol/L)	Post prandial blood glucose (mmol/L)	Comment
4–6.0	4–7.7	Normoglycaemia
6.1–8.0	6.0–10.0	Target values
>8.0	>10.0	High

The aim of treatment of type 2 diabetes is normal blood glucose levels (normoglycaemia). However, especially in the elderly, biochemical ideals should be tempered by common sense and the need to remove symptoms and maintain or improve quality of life. It is important to be clear about the aims of treatment. Over-zealous management can result in severe hypoglycaemia and may be associated with increased mortality. While there has been some discussion raised by recent trials about ideal targets, the targets as listed above are currently accepted.

Patient blood glucose monitoring enables appropriate lifestyle and medication adjustment. Long term glycaemic control is monitored by measuring glycated haemoglobin (measured as HbA1c). The United Kingdom Prospective Diabetes Study (UKPDS) showed reduced incidence and progression of diabetes related complications in subjects with a low HbA1c. The IDF suggests that an HbA1c >7% should prompt more active hypoglycaemic treatment. The general HbA1c target in people with type 2 diabetes is ≤7%. An HbA1c target >7% may be appropriate in people with type 2 diabetes who have a history of severe hypoglycaemia, a limited life expectancy, co-morbidities or who are elderly.

Working toward the target level is important but any significant reduction in HbA1c will improve patient outcomes.

4.1 Nutrition

Nutrition management involves controlling weight and the introduction of a healthy eating plan.

Healthy eating is a critical component in the management of type 1 and type 2 diabetes. In over 50% of people presenting with type 2 diabetes restriction of energy intake, increased activity and weight reduction will initially normalise blood glucose levels. Medication is likely to be needed later.

Maintaining cooperation during weight reduction can be a major problem. A consistent coordinated approach by the general practitioner, dietitian and diabetes educator helps the patient maintain the effort.

There is evidence that Aboriginal and Torres Strait Islander communities in remote regions face significant access barriers to nutritious and affordable food. Nutritious food tends to cost more in rural and remote areas; cost may be an issue in low socio-economic groups. Food choices can be significantly altered when people have access to appropriate foods and education about nutrition.

Nutritional guidelines

While an appreciation of the dietary management of diabetes by the general practitioner or physician is important, detailed instructions need to be given by a dietitian. To find a qualified dietitian in your area, contact the Dietitians Association on 1800 812 942 or refer to your usual dietitian. Constant reinforcement of dietary advice usually results in enhanced cooperation and better control.

Healthy eating, body weight and regular physical activity are important objectives in people with diabetes. The following criteria of 'overweight' apply to those of European descent. Different criteria may apply to other groups:

Body Mass Index

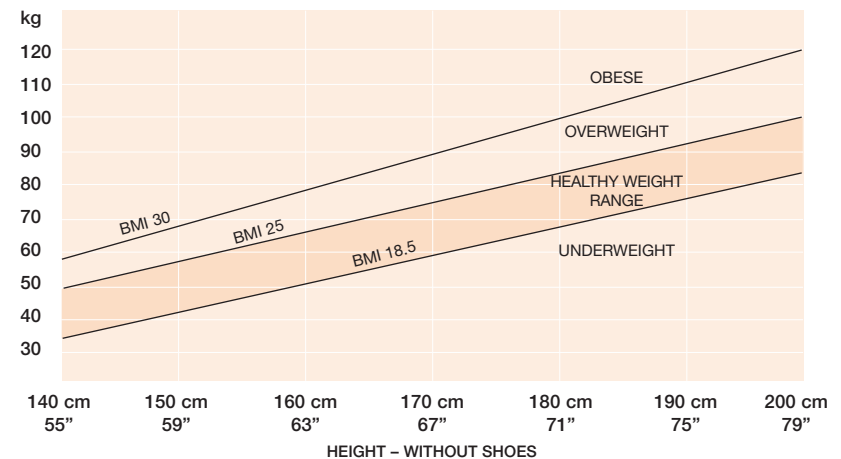
$$\text{BMI (kg/m}^2\text{)} = \frac{\text{Weight (Kilograms)}}{\text{Height squared (Metres}^2\text{)}}$$

The healthy BMI is 18.5 to 24.9, overweight 25 to 29.9, obese ≥30. As a rough guide the patient's healthy weight (kg) is approximately: Height (cm) – 100

Alternatively waist circumference (cm) can be used.

	Healthy	Overweight	Obese
Men	<94	94–101.9	≥102
Women	<80	80–87.9	≥88

Weight for height chart for men and women from 18 years onward



There is some evidence that rates of obesity in the Aboriginal and Torres Strait Islander population are higher than in the general Australian population.

The diet for a person with diabetes is qualitatively no different from the Australian Dietary Guidelines recommended for all people (whether they have diabetes, hypertension, dyslipidaemia or not). The key issue of weight control is learning to eat a range of foods in amounts appropriate for energy requirements.

In people with type 2 diabetes increased activity and elimination of concentrated sources of energy with substitution with high fibre, carbohydrate foods will often bring the condition under control. Unless the patient is very symptomatic, a trial of at least 6 to 8 weeks of lifestyle modification is wise before oral hypoglycaemic agents are considered.

Body weight

Loss of body weight will often result in near normal glycaemic, blood pressure and lipid profiles. Often an ideal body weight is not achievable and setting this as a goal discourages patients to attempt any dietary change. Many studies suggest that a weight loss of 5 to 20% will improve glycaemic control. Therefore it is important to encourage any degree of weight loss. A medium term goal for overweight patients is 5–10% body weight loss.

Sources of hidden energy need to be identified and minimised: for example alcohol, cakes and sweet beverages. A reduction in total energy intake of 2,000 kilojoules (475 calories) per day should result in a weight loss of 0.5 kg a week.

Carbohydrates

Carbohydrate foods which are rich in fibre and have a low energy density are the basis of the eating plan and it is recommended that they contribute up to 50% of the total energy intake. Meals containing carbohydrate are spread evenly through the day. Both the quantity of carbohydrate and the quality of carbohydrate will affect blood glucose levels. The amount of carbohydrate has a larger effect on glycaemia than the quality.

The quality of carbohydrate is reflected by its glycaemic index (GI) which indicates the post prandial glycaemic response to a particular carbohydrate food. This will have a lesser but additional effect on blood glucose levels. The GI classifies carbohydrates as slow acting (low), moderate (medium) and quickly absorbed (high). Some foods have been GI tested in an accredited laboratory and the GI Symbol Program (sponsored by Diabetes Australia, Sydney University and the Juvenile Diabetes Research Foundation) indicates the GI of the food on their labels.

The glycaemic load (GL) refers to both the quantity and the quality of carbohydrate. GL is the GI multiplied by the carbohydrate grams divided by 100. A lower GL (less than 80 GL per day) is desirable for people with diabetes. In practice it is

recommended that people with diabetes have one high fibre, low GI carbohydrate food at each meal. This would include wholegrain breads, rolled oats, low fat, low sugar breakfast cereals, pasta, beans, lentils and temperate fruits. Other carbohydrate foods can be included but in lesser amounts. These include rice, potato and tropical fruit.

Sugar does not need to be eliminated. Including a small amount of sugar as part of a mixed meal or food, eg: breakfast cereal, does not adversely affect the blood glucose level. Allowing small amounts of sugar as part of a high fibre, low fat meal plan increases the choice of foods available and may aid adherence.

Low carbohydrate, high protein diets may predispose the person to hypoglycaemia if they are taking a sulphonylurea, repaglinide or insulin. Those adopting these diets should be made aware of the risk and the appropriate precautions.

Dietary fat

It is recommended that fat contribute to less than 30% of total energy intake. This has a beneficial effect on serum lipids and helps with weight reduction. Saturated fats in the diet will have an adverse effect on general lipid profiles.

The most common sources of oils and fats are:

- Additives in cooking
- Meat
- Dairy products
- Snack and takeaway foods.

Fried foods need to be avoided (even with polyunsaturated or monounsaturated oils).

Monounsaturated fats (Ω -9 fatty acids) as in olive oil or canola have a LDL-C lowering effect. Likewise seed sourced polyunsaturated oils (Ω -6 polyunsaturated) lower LDL-C. Fish oils (Ω -3 polyunsaturated oils) in doses of 5 g/day lower triglyceride levels. They also inhibit platelet aggregation and may protect against thrombosis in diseased blood vessels.

The main thrust of management is to lower total fat intake and to find substitutes for saturated fats.

Low fat milk could be used as a substitute for whole milk and some 'light' margarines have 40% of the fat content of standard margarines. Alternative spreads are reduced fat cottage cheese or ricotta cheese. Some margarines contain plant sterols that reduce cholesterol absorption and cholesterol levels.

There is considerable variation in the fat content of meats, depending on the source and cut. It is best to ask the butcher what is 'lean' and what is not, especially since the 'new cuts' are much lower in fat.

Dietary protein

It is recommended that protein contribute 10–20% of total energy. The average Australian diet achieves this without difficulty. Selection of type of protein depends

on patient preferences taking into consideration the fat content of each source. Vegetable sources of proteins such as beans and pulses are very low in fat.

Additional considerations

Alcohol

As many people with type 2 diabetes are overweight or obese, alcohol should be minimised. Australian guidelines at the time of publication recommend ≤ 2 standard drinks (20 g) per day for men and women. Low alcohol beers are a better choice than ordinary or diet beers.

Although Aboriginal and Torres Strait Islander people are less likely than non-Indigenous people to drink alcohol, those who do are more likely to drink at hazardous levels. Hazardous drinking is more prevalent among Indigenous Australian males and females aged 35–44 years than the general population.

Added salt in cooking and in foods needs to be minimised. Recommend the use of 'low salt' or 'no added salt' products.

Although small amounts of sugar can be included, alternative sweeteners may still have a role in management. Suitable sweeteners include aspartame, sucralose, acesulphame K, alitame, saccharin and cyclamates. It should be noted that all sweeteners are deemed by the Food Standards Australia and New Zealand as suitable and safe for use in pregnancy, although some are known to cross the placenta. If concerned, pregnant women should speak to their health professional.

The inclusion of sugar alcohols, eg: sorbitol, is not recommended as these offer no advantage over sucrose in improving metabolic control, increasing cooperation or in managing weight loss.

4.2 Physical activity

- **Regular physical activity improves metabolic control and reduces other cardiovascular risks.**
- **Patients on insulin, sulphonylureas or repaglinide may need to take special precautions to prevent hypoglycaemia.**
- **Appropriate care of feet during physical activity is important.**

Increasing physical activity improves metabolic control in people with diabetes. Low level aerobic exercise (eg: brisk walking for half an hour per day) and physical resistance training have the following benefits:

- Improved glucose tolerance as insulin sensitivity increases
- Increased energy expenditure resulting in weight loss

- Increased feeling of well being
- Increased work capacity
- Improved blood pressure and lipid profiles.

Aerobic training which 'makes you puff' and brings the heart rate up to 60–70% of maximum ($220 - \text{age [years]}$ beats per minute) for a minimum of 30 minutes 3 or 4 times per week, establishes and maintains fitness and aerobic capacity. Active Australia recommends >150 minutes per week of moderate intensity physical activity (eg: walking).

When prescribing a physical activity program a careful history should be taken. Special attention needs to be paid to exertion-induced symptoms such as chest or abdominal discomfort or syncope. People with type 2 diabetes frequently have silent macrovascular disease. Consider second yearly ECG if a patient is over 50 years old and has at least one vascular risk factor. Screening with a stress ECG is not indicated in asymptomatic individuals, but specific symptoms need to be actively investigated.

Isometric exercises such as heavy weight lifting (high load, low repetition) may increase blood pressure, increasing the risk of vitreous haemorrhage and sudden cardiac events. However, resistance programs using moderate weights and high repetition can be part of an exercise program for those with diabetes and have been shown to improve glycaemic control.

People requiring insulin may need to increase their carbohydrate intake and/or decrease their insulin before exercise. They need to also carry some refined carbohydrate with them. Similarly people with type 2 diabetes taking sulphonylureas or repaglinide may need to take extra food and/or reduce their medication.

People requiring insulin need to be aware of potential delayed effects of physical activity on glucose levels, in particular delayed hypoglycaemia 6–12 hours after cessation of the activity. People with diabetes need to be advised to cease their activity if they develop cardiovascular symptoms or just feel unwell. However, patients with leg or buttock claudication need to be encouraged to continue physical activity with intermittent rests when leg or buttock pain occurs since this will gradually increase their capacity to exercise.

The importance of appropriate foot care and comfortable, well-fitting footwear during physical activity needs to be stressed, especially if there is neuropathy, vascular disease, abnormal foot structure or previous foot ulcer(s).

Lower levels of physical activity have been reported for Aboriginal and Torres Strait Islander people and people living in rural and remote areas. There is poor access to facilities for physical activity in many Aboriginal communities.

5 Health care for diabetes

5.1 Self-monitoring

- **Self-monitoring is essential.**
- **Home blood glucose monitoring is the method of choice in most patients.**
- **The method and frequency of testing need to reflect therapeutic aims.**

Blood glucose monitoring is recommended for all people with type 2 diabetes. A balance should be reached considering the patient's age, need for ideal control and ensuring long term cooperation. Despite some recent controversial studies, the current view is that blood glucose monitoring is recommended.

Initially close supervision is recommended. A suggested initial schedule of testing is 3 to 4 blood glucose tests daily (early morning, plus other tests before ± after meals). Frequent consultation with health care professionals is important.

Self-monitoring needs to be individualised and assist people with diabetes to understand the impact of medication, food and physical activity on blood glucose control. Frequency of self-monitoring can be determined according to the individual's self-management goals.

In elderly patients testing on 1 or 2 days per week, varying the time, may be adequate if diabetes control is good.

Monitoring in type 2 diabetes need not be as intensive as with type 1 diabetes except when the normal pattern is broken (eg: travelling, the festive season, intercurrent illness, changes to medication and diet). The ideal would be blood glucose estimation before ± after meals. A reasonable approach in a patient with stable glycaemic control would include blood glucose estimation at different times of the day on 2–3 days each week.

Values before meals give information about baseline glycaemia which is affected by general factors such as weight, diet, activity and long acting medication. Values after meals give information about peak glycaemia which is affected by the baseline level, the food eaten and short acting medication (eg: repaglinide, acarbose or short acting insulin).

People on either insulin or oral hypoglycaemic agents must be able to identify 'hypos' and understand treatment. Blood glucose monitoring can be of help.

Targets for self-monitored blood glucose levels are 6–8 mmol/L fasting and pre prandial, and 6–10 mmol/L 2 hours post prandial.

Many people learn to adjust their treatment schedule according to blood glucose levels and thus improve glycaemic control. People can measure their blood glucose using

reagent strips that are read in the meter and/or visually (for some strips). Meters today are quick, reliable and simple to use. Use of the meter should be demonstrated. People need to be competent in the technique of blood glucose monitoring before treatment decisions based on the readings are made. All meters need regular quality control checks by the user. All self blood glucose measurement systems have quality control materials.

5.2 Medical monitoring

Regular follow-up visits offer an opportunity for the general practitioner and patient to explore the patient's understanding, fears and concerns about diabetes. Some practices run diabetes clinics, often delivered by practice nurses. The use of practice protocols, checklists and algorithms that have been developed by the doctors and nurses in a practice ensures the practice nurse can undertake a large proportion of the routine care (under the clinical oversight of the doctor).

The following is a guide for the doctor's oversight of patients. A suggested checklist for nurse activity appears at the end of each section. Results of nurse consultation should be incorporated into the clinical record. As this checklist assumes the knowledge and clinical experience of a registered nurse, practices should use it according to the professional and clinical status of their nursing staff.

5.2.1 Quarterly review

- **Discourage smoking**
- **Review symptoms**
- **Check weight, BP**
- **Review self-monitoring**

Once control is achieved the routine visit should review:

History:

Review SNAP profiles (Smoking, Nutrition, Alcohol, Physical activity), patient's record of home testing and quality control results, foot symptoms.

Examination:

Check weight/waist, height (children and adolescents), blood pressure, feet examination if new symptoms or at risk (eg: neuropathy ± peripheral vascular disease).

Investigation:

Measure glycated haemoglobin (HbA1c) at least six monthly.

Watch for intercurrent illnesses such as urinary tract infections, thyrotoxicosis etc which may alter degree of control. Asymptomatic urinary infections are common in patients with diabetes, especially older women.

5.2.1.1 Quarterly nursing review

Ask about: Smoking
Nutrition
Alcohol intake
How much exercise and how often
Any problems with medication

Check: Weight/waist
Height (children and adolescents)
Blood pressure
Feet examination without shoes, if new symptoms or at risk (eg: neuropathy ± peripheral vascular disease)

Review: Goals with patient to identify specific areas of focus for doctor consultation

5.2.2 Annual review

- Review goals of management
- Check for diabetic complications
- Update immunisation schedule
- Consider specialist referral

The yearly review is a time for more detailed assessment, updating the problem priority list and re-establishment of goals, and contractual arrangements for management. Eating plan, lifestyle, home monitoring and treatment need to be reviewed.

There needs to be a full system review checking for vascular, renal, eye, nerve and podiatric problems. As there is an increasing trend towards involving specialist allied health professionals, the yearly visit is a good opportunity to coordinate follow-up.

Full physical assessment:

- Cardiovascular system
- Eyes
- Peripheral nervous system
- Feet

Immunisations:

- Influenza Once per year
- Pneumococcal
Non-Aboriginal and Torres Strait Islanders:
<65 – single dose and revaccinate age 65 or after 10 years whichever later
>65 – single dose and revaccinate 5 years later
Aboriginal and Torres Strait Islanders:
<50 – single dose and revaccinate age 50 or after 10 years whichever later
>50 – single dose and revaccinate 5 years later
- Tetanus Booster at age 50 (unless booster has been given within 10 years)

Investigations: (annually if below target, more frequently if being actively treated)

Lipids – triglyceride; HDL-C, LDL-C and total cholesterol
Renal – microalbuminuria and plasma creatinine

Referral:

Ophthalmologist/optometrist – second yearly with no retinopathy, more frequently if abnormal.

Diabetes educator, dietitian, podiatrist – if patient has or has developed a problem requiring review.

Pharmacist – for a Home Medicines Review if the patient is likely to have problems with medication (eg: taking more than 5 types).

Oral health professional – especially if periodontal disease is present.

5.2.2.1 Annual nursing review

Ask about: Smoking
Nutrition (last contact with dietitian or diabetes educator)
Alcohol intake
How much exercise and how often
Any problems with medication
Any changes in medication (by doctor/pharmacist or patient)
Chest pain
Vision (when last checked)
Any foot discomfort
When was last podiatry check
Immunisations (include Flu and Pneumovax)
Family history and update

Check: Weight/waist
Height (children and adolescents)
Blood pressure
Feet examination: without shoes, pulses, monofilament check
Blood glucose at examination
Urinalysis
Visual acuity

Review: Goals with patient to identify specific areas of focus for doctor consultation
Last care plan to identify timely referrals

Check: Registration with NDSS/membership of State or Territory Diabetes Organisation

Records:

The use of a check list and a separate sheet in the patient's notes (preferably attached to the front of the problem list) can be used to record the frequency and results of these assessments.

Medical software incorporates acceptable forms of diabetes records. These accrue to support the annual cycle of care which can be used for the Medicare items (see page 34).

5.3 Systems for care

Diabetes is a complex disorder and requires a systematic approach to care. There is evidence that this approach in the general practice setting results in better outcomes.

A systematic approach to care is facilitated by the use of:

- 1. Disease register:** This is a list of all patients in the practice with diabetes and basic demographic data. The register can also include clinical information. This allows tracking of patients' clinical status and their need for ongoing care.
- 2. Recall system:** This facilitates timely recall of patients when certain aspects of their care require review eg: recall for annual review, ophthalmologist review, etc.
- 3. Flow charts:** Included in the patients' notes these allow following of clinical parameters and flag when interventions or investigations are necessary.
- 4. Review charts:** Included in the patients' notes, these are checklists for annual and three monthly reviews to facilitate thorough coverage of all issues at these milestone consultations.

The RACGP and General Practice networks have resources to assist practices in establishing such systematic approaches to the care of their patients with diabetes.

5.3.1 How Medicare supports the process

The Australian Government supports high quality care through a series of non-fee-for-service payments to general practitioners and general practices. These include the **Enhanced Primary Care Program** and the **Practice Incentive Program**. The Practice Incentive Program is only available to general practices either accredited or working towards accreditation by the Royal Australian College of General Practitioners.

As a result of these programs, services performed by a number of allied health professionals (including diabetes educators, Aboriginal health workers, dietitians, psychologists, podiatrists, exercise physiologists and dentists) may attract a rebate when a patient sees them within the Enhanced Primary Care Program. There are also Medicare items for group intervention services provided by eligible dietitians, diabetes educators and exercise physiologists within this system.

The **National Integrated Diabetes Program** was established to improve the prevention, early diagnosis and management of people with diabetes. The initiative includes a general practice incentive, a general practice network incentive and a community awareness campaign. The incentive program requires practices to register and create a patient register and recall/reminder system, with additional incentives for completing an annual cycle of care and further incentive for reaching target levels of care for people with diabetes.

Some people with diabetes will require complex medication schedules and a **Home Medicines Review** may be useful (Medicare item 900). This involves a pharmacist assessing people who may have problems with their medications, and recommending changes to improve effectiveness, safety and adherence.

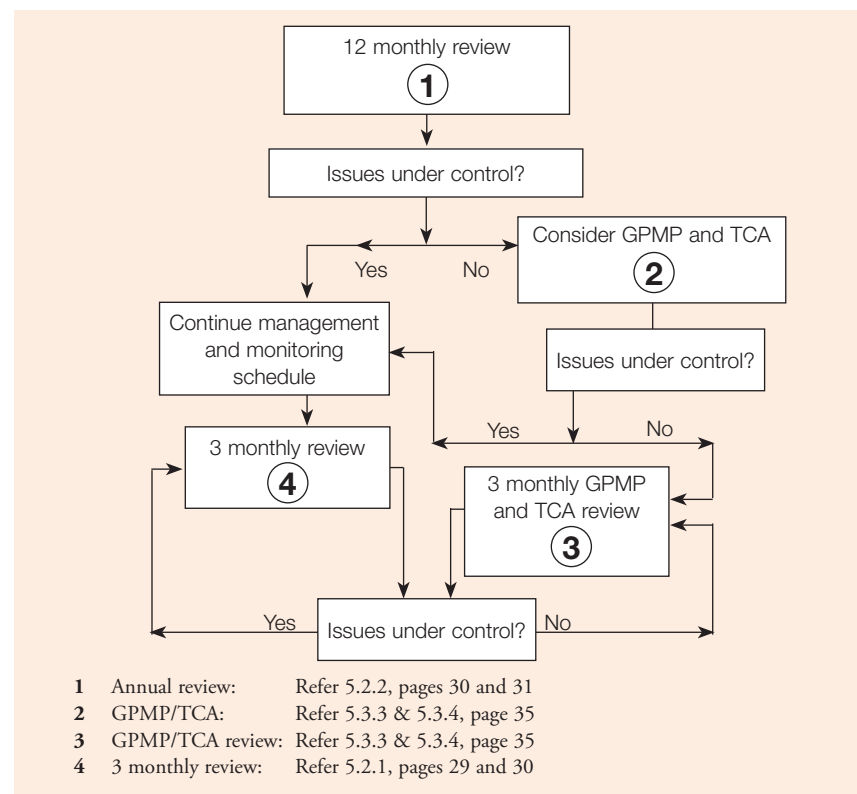
Some patients find diabetes a significant burden. They may benefit from the support of a psychologist, social worker or counsellor. Access to these practitioners is available under the **Better Access to Psychiatrists, Psychologists and General Practitioners** through the **Medicare Benefits Scheme Initiative**.

Practice nurses do not have the ability to charge Medicare rebatable items for care related to diabetes. General practitioners who work in urban areas of workforce need can apply for grants to employ nurses (under the program Strengthening Medicare) as can rural practitioners through the ongoing rural nurse program grants.

From 1 May 2010 the Medicare Benefits Schedule item number 715 provides for a health check for Aboriginal and Torres Strait Islander people who have not had the check in the previous 18 months. There are time based health check items for all Aboriginal people (items 701,703,705,707: see www.health.gov.au/mbsonline)

Preparation of a GP Management Plan (item 721) and coordinating the development of Team Care Arrangements (item 723) are also appropriate supports for comprehensive management of diabetes for Aboriginal and Torres Strait Islander people.

5.3.2 Required annual cycle of care



Item numbers which can be used are:

	In-surgery consultations	Out-of-surgery consultations
Vocationally registered GPs		
Level B	2517	2518
Level C	2521	2522
Level D	2525	2526
Non-vocationally registered GPs		
Standard consultation	2620	2631
Long consultation	2622	2633
Prolonged consultation	2624	2635

In addition, general practitioners working in accredited practices who have applied for PIP (**Practice Incentive Program**) will attract SIP (**Service Incentive Program**) payment for themselves and PIP payments for their practices (see www.medicareaustralia.gov.au).

The SIP cycle requires:

Blood pressure	every 6 months
Ht/wt/waist (BMI)	every 6 months
Feet exam	every 6 months
Glycaemic control (HbA1c)	once per year
Blood lipids	once per year
Microalbuminuria	once per year
Eye exam	at least every 2 years
Smoking	review once per year
Healthy eating plan	review once per year
Physical activity	review once per year
Self care education	review once per year
Medications	review once per year

These are minimum levels of care for all people with diabetes and obviously more care will be required for those with complications and co-risk factors.

5.3.3 General Practice Management Plans (GPMP)

These are documented plans developed by the general practitioner and patient together, that incorporate the patient's needs, goals, how this is to be achieved and reference to any other resources used. Templates for use are available via medical software and General Practice networks.

Item numbers which can be used are:

Initial preparation:	721
Payable 1–2 yearly depending on need for revision	
Review of plan:	732*
Payable every 3–6 months, but not within 3 months of 721	
(* item 732 replaces 725)	
Involvement in GPMP developed by another provider	729
Involvement in a care plan developed by an aged care facility	731

5.3.4 Team Care Arrangements (TCA)

These are an expansion of the GPMP which detail the allied health workers who implement any part of the GPMP.

Item numbers which can be used are:

Initial preparation:	723
Payable 1–2 yearly depending on need for revision	
Review of plan:	732*
Payable every 3–6 months, but not within 3 months of 723	
(* item 732 replaces 727 and is the same item number as the review for 721)	

Access to allied health and dental EPC items requires a GPMP and TCA, or item 731 if in an aged care facility. GPMP and TCA can be developed and claimed simultaneously.

Please note: Under the changes to Medicare Item descriptors from 1 May 2010, there is no change to the items applicable to Diabetes Cycles of Care.

6 Medication

Multiple interventions and medications are needed to control the multiple risk factors associated with type 2 diabetes (hyperglycaemia, hypertension, dyslipidaemia and increased thrombogenesis).

6.1 Oral hypoglycaemic agents

- **Medication will not substitute for healthy eating and activity.**
- **Metformin is the medication of choice in the overweight person with type 2 diabetes.**
- **Hypoglycaemia and weight gain can be problems with sulphonylureas and repaglinide. Acarbose may cause flatulence and diarrhoea. Fluid retention can occur during glitazone therapy and caution is necessary in cardiac failure.**
- **Allergy to a specific medication is a contraindication to its use.**

If a trial of healthy lifestyle for 6 weeks or more is unsuccessful in controlling blood glucose in a person with type 2 diabetes, oral hypoglycaemic agents can be used (*see chart page 40*). If the patient is symptomatic at initial diagnosis or the blood glucose level is very high (>20 mmol/L), medication can be used early to decrease glucose levels and relieve symptoms.

Metformin is the medication of first choice in people with diabetes (*see chart page 40*). Metformin reduces hepatic glucose output and insulin resistance. Metformin has been shown to significantly reduce the risk of diabetes-related morbidity and mortality in overweight patients. Renal impairment is the only absolute contraindication to metformin (ie: a raised serum creatinine which usually reflects significantly impaired renal function). Metformin is contraindicated in people with an eGFR <30 ml/min/1.73 m² and should be used with caution in people with an eGFR of 30–45 ml/min/1.73 m². Metformin should be used with caution in people with hepatic or cardiac disease and those with a heavy alcohol intake.

Sulphonylureas increase insulin secretion and can be used after a trial of healthy lifestyle and metformin.

Acarbose is useful when blood glucose values remain high after meals despite dietary modification. Acarbose inhibits the digestion of carbohydrate and thus slows the rate of glucose delivery into the circulation. Acarbose needs to be taken at the time of starting the meal and introduced gradually to avoid flatulence and abdominal discomfort. If hypoglycaemia occurs (because of concurrent sulphonylurea or insulin treatment) glucose rather than other carbohydrates is required. Care is necessary in those with renal impairment or gastrointestinal disease and liver enzymes need to be monitored.

Repaglinide causes a rapid, transient increase in pancreatic insulin secretion. Repaglinide can be used as mono therapy or with metformin to control post prandial hyperglycaemia. It should not be used in combination with sulphonylureas.

The glitazones (thiazolidinediones) are another class of oral hypoglycaemic agent and include pioglitazone and rosiglitazone. These agents are effective in lowering blood glucose by reducing insulin resistance.

Both glitazones can be used as dual therapy with metformin or sulphonylureas.

Pioglitazone can also be used in triple therapy with metformin and a sulphonylurea or in combination with insulin. Contraindications include moderate to severe cardiac failure.

Rosiglitazone is not indicated in triple therapy with metformin and a sulphonylurea or in combination with insulin. Contraindications include mild, moderate to severe, or any history of cardiac failure.

Rosiglitazone is not recommended in patients with **known** ischaemic heart disease, particularly in those taking nitrates. Refer to Product Information for more details. Care is necessary in those with any degree of cardiac failure or liver dysfunction.

Two classes of medications now target the glucagon-like peptide (GLP-1) actions. GLP-1 enhances insulin secretion and inhibits glucagon secretion in a glucose dependent manner. Both fasting and post prandial glucose are reduced.

The GLP-1 ‘mimetics’ are injected medications which bind to the GLP-1 receptor (exenatide, Byetta).

The GLP-1 ‘enhancers’ (DPP4 inhibitors) are oral medications and slow the breakdown of endogenous GLP-1. One class of agents falls into this category – the dipeptidyl peptidase-4 inhibitors (DPP-4 inhibitors). Sitagliptin, Januvia and vildagliptin, Galvus are both subsidised by the PBS.

Both are similarly effective to the other oral hypoglycaemic agents. The GLP-1 ‘mimetics’ also aid weight loss and the DPP-4 inhibitors are generally weight neutral and improve post prandial control.

With sulphonylureas, special care needs to be taken, especially in the elderly, not to precipitate hypoglycaemia. When used as mono therapy, metformin, acarbose, glitazones, GLP-1 mimetics and DPP-4 inhibitors will not cause hypoglycaemia. All the sulphonylureas can cause hypoglycaemia. People taking sulphonylureas, repaglinide or insulin may need to notify motor vehicle licensing authorities and their insurance company as these medications can affect driving performance (*see page 73*).

Start with a small dose and increase weekly or fortnightly until control occurs. If control is not occurring check the patient’s understanding of management and monitoring skills and if these are satisfactory, look for other exacerbating factors such as occult urinary tract infection or medications which may interfere with control.

If a patient continues to lose weight while on oral hypoglycaemic agents the dose may be reduced and sometimes stopped.

Most people with diabetes will require increasing doses and additional medications as their diabetes progresses. Insulin therapy may also be required.

Socioeconomic disadvantage, increased co-morbidity and higher family burden of chronic disease can create a significant barrier to affordability of medications for the Aboriginal and Torres Strait Islander population. Evidence also suggests that some Aboriginal people are uncomfortable seeking medicines advice, and the consumer medicine information provided is often difficult to understand, culturally inappropriate and unlikely to be utilised. Medication sharing is common in some communities.

The main side effects of metformin are:

- Anorexia, nausea, vomiting
- Diarrhoea, abdominal cramps, flatulence
- Lactic acidosis (if renal, liver or cardiovascular disease exist)

The main side effects of sulphonylureas are:

- Weight gain
- Symptomatic hypoglycaemia
- Anorexia, nausea, diarrhoea, skin rashes
- Occasionally blood dyscrasias

The main side effects of glitazones are:

- Increased subcutaneous fat and/or fluid
- Decreased haemoglobin levels
- Increased risk of peripheral fractures in women
- Possible increased risk of myocardial infarction (rosiglitazone)
- Increased LDL-C (rosiglitazone)

The main side effects of repaglinide are:

- Symptomatic hypoglycaemia
- Nausea, diarrhoea, constipation
- Skin rashes, abnormal LFT
- (Rare) hepatitis and/or jaundice

The main side effects of acarbose are:

- Flatulence and abdominal bloating
- Non response to carbohydrates other than glucose if hypoglycaemic
- (Rare) liver abnormalities

The main side effects of GLP-1 agents are:

Exenatide:

- Nausea and vomiting
- Injection site reactions
- Possible pancreatitis

Sitagliptin:

- Nasopharyngitis
- Headache
- Upper respiratory tract symptoms

Vildagliptin:

- Dizziness
- Tremor
- Headache

Effects of non-diabetes medications

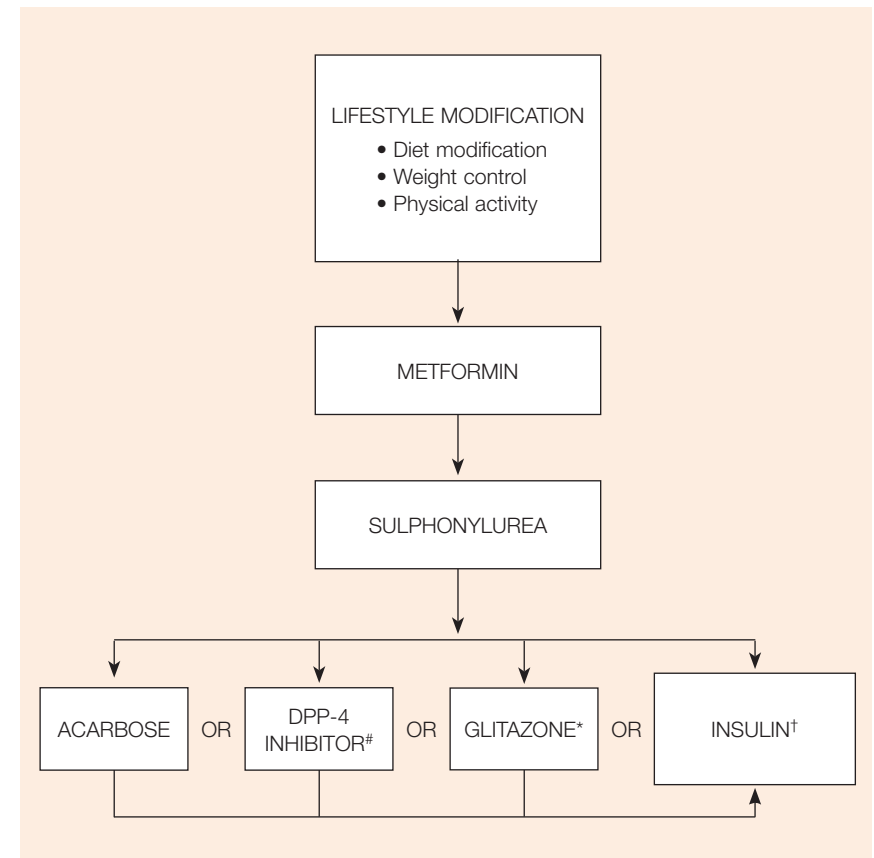
Beware of interaction with other medications which increase or decrease blood glucose action:

Reduce blood glucose	Increase blood glucose
Alcohol	Adrenergic compounds
Beta-blockers	Oestrogens
Sulphonamides	Glucocorticoids
Monoamine oxidase inhibitors	Thiazide diuretics (high dose)
Salicylates – in high doses*	Phenytoin
Gemfibrozil†	

* Low dose aspirin (100–300 mg/d) does not cause problems.

† Increases effect of repaglinide.

Treatment algorithm: PBS approved medications for type 2 diabetes



Notes:

- The algorithm is based on that published by the NHMRC.
- The algorithm includes only therapeutic agents available through the PBS.
- If HbA1c >7% consider intensifying treatment provided hypoglycaemia is not a problem.

Authorised only as dual therapy with metformin or sulphonylurea where combination metformin and sulphonylurea is contraindicated or not tolerated.

* Rosiglitazone is not authorised for triple therapy or for use with insulin (from 1 February 2009) but is approved only as dual therapy with metformin or sulphonylurea where combination metformin and sulphonylurea is contraindicated or not tolerated.

† Insulin is frequently required for glycaemic control in people with type 2 diabetes and can be initiated as basal therapy or as premixed insulins, usually in combination with oral antidiabetic medications.

Oral hypoglycaemic agents available

Chemical name	Brand name	Tablet size	Daily dose range	Approx duration	Frequency (time/day)	Administration (time/day)
Acarbose (a)	Glucobay	50/100 mg	150–600 mg	3 h	3	With meals
Glibenclamide (b)	Daonil Glimel	5 mg 5 mg	2.5–20 mg	18–24 h	1–2	With meals
Gliclazide (b)	Diamicron* Genrx gliclazide Glyade Mellihexal Nidem	80 mg 80 mg 80 mg 80 mg 80 mg	40–320 mg	18–24 h	1–2	With meals
Gliclazide ER†	Diamicron MR Glyade MR Oziclide MR	30/60 mg 30 mg 30 mg	30–120 mg	24 h	1	
Glimepiride (b)	Amaryl Aylyde Diapride Dimirel Glimepiride Sandoz	1/2/3/4 mg	1–4 mg	>24 h	1	With meals
Glipizide (b)	Melizide Minidiab	5 mg	2.5–40 mg	16–24 h	1–2	With meals
Metformin (c,e)	Diabex Diaformin Formet Genrx metformin Glucohexal Glucohexal 1000 Glucomet Glucophage Metforbell Metformin Metformin GA Metformin (Genepharm) Metformin (Generic Health) Metformin (Ranbaxy)	0.5/0.85 g/1.0 g 0.5/0.85 g/1.0 g 0.5/0.85 g/1.0 g 0.5/0.85 g 0.5/0.85 g 1.0 g 0.5/0.85 g 0.5/0.85 g 0.5/0.85 g 0.5/0.85 g 1 g 0.5/0.85 g 0.5/0.85 g 0.5/0.85 g	0.5–3.0 g	12 h	2–3	With/after meals
Metformin ER*	Diabex XR Diaformin XR Metex XR Metformin XR	0.5 g/1.0 g 0.5 g 0.5 g 0.5 g	0.5–2.0 g	24 h	1	With evening meal
Metformin/ glibenclamide (b,c,e)	Glucovance	250/1.25 mg 500/2.5 mg 500/5.0 mg	up to 2000/20 mg	18–24 h	2–3	With meals
Metformin/ rosiglitazone (c,d,e,f)	Avandamet	500/2 mg 500/4 mg 1000/2 mg 1000/4 mg	up to 2000/ 8 mg	12–24 h	2	With meals
Metformin/sitagliptin (c, e, f, h)	Janumet	500/50 mg 850/50 mg 1000/50 mg	up to 2000/100 mg	>24 h	2	With meals
Pioglitazone (d, e, f, i)	Actos	15 mg 30 mg 45 mg	15–45 mg	24 h	1	Without regard to meals
Repaglinide (g)	NovoNorm	0.5/1/2 mg	1.5–16 mg	2–3 h	1–3	With meals
Rosiglitazone (d,e,f)	Avandia	4/8 mg	4–8 mg	24 h	1–2	Without regard to meals
Sitagliptin (f,h)	Januvia	25/50/100 mg	100 mg	>24 h	1	Without regard to meals
Vildagliptin (f,h)	Galvus	50 mg	50–100 mg	>24 h	1–2	With meals
Exenatide (g)	Byetta†	Twice daily non-insulin hypoglycaemic agent. Inject 5mcg bd subcutaneously one hour before two main meals and at least 6 hours apart. After one month increase to 10mcg bd.				

† Possibly to be PBS listed 1 August 2010

* ER = Extended Release

Note: Oral agents need to be used with special care in the elderly.

- (a) Care renal, gastrointestinal disease (d) Thiazolidenedione (g) Private script
 (b) Sulphonylurea (e) Care renal, liver and cardiovascular disease (h) Care renal insufficiency
 (c) Metformin (f) Streamlined authority required

6.2 Insulin treatment

Starting insulin in type 2 diabetes

Insulin may be required if adequate control has not occurred on maximum doses of oral hypoglycaemic agents. However, ensure that exercise and dietary management are satisfactory and exacerbating factors eg: intercurrent infection, problems with medication (*see page 67*) have been excluded.

Insulin may be needed early in the condition when treatment is being started (the so-called ‘primary’ failure of oral hypoglycaemic agents that suggests the patient actually has type 1 diabetes) or when the patient has later become refractory to oral hypoglycaemic agents (so-called ‘secondary’ failure consistent with the usual progression of type 2 diabetes).

If the patient is symptomatic then insulin is required. If there are no symptoms but fasting blood glucose levels are consistently >7.0 mmol/L, the decision is more difficult.

When deciding glycaemic targets and considering insulin treatment, take into account: life expectancy, existing physical and psychosocial problems and potential problems with insulin.

The selection of treatment goals, treatment schedules and monitoring schedules needs to be a decision arrived at after discussion with the patient and may be the stimulus for a General Practice Management Plan (*see page 35*).

Initiation of treatment with insulin is regarded as a major step by most patients. They require encouragement and psychological support.

At this stage the help of a physician with a special interest in diabetes may be useful.

- Insulin is not a substitute for healthy eating, activity and weight control in type 2 diabetes.
- Inappropriate use of insulin produces weight gain and continuing poor control.

Step guide to insulin treatment in type 2 diabetes

Basal insulin

People with type 2 diabetes requiring insulin can often be managed with a single daily dose of intermediate or long acting insulin added to their oral hypoglycaemic schedule. Quick acting insulin is not necessarily needed. A recommended starting schedule is a single dose of basal insulin (eg: 10 units at bedtime or breakfast). The basal insulin can be isophane or glargine. Glargine may cause less hypoglycaemia than isophane.

In the long term metformin can be continued or added to reduce insulin resistance (and dose) and to help reduce weight gain.

Step 1		
Check that diet, activity and oral medication are appropriate and that complicating medical conditions are not present.		
Step 2 – Decide the time and type of insulin		
Morning Blood Glucose	Evening Blood Glucose	Schedule
High	OK	Night-time basal
OK	High	Morning basal
High	High	Twice daily isophane/once daily glargine
Step 3 – Dosage		
Decide the dose: 'start low and go slow' (eg: 10 units basal)		
Single dose: morning or evening		
Less may be required in elderly, active, thin patients and more in the overweight and underactive.		
Step 4 – Adjust doses		
Change doses in increments of 10–20% at intervals of 2–4 days. Mixed insulins may be needed.		

Premixed insulin

Alternatively, premixed insulin (human or analogue) can be used with a single dose before the largest meal (often the evening meal) or twice daily doses (before breakfast and the evening meal). As with basal insulin, the dose should 'start low and go slow' (eg: starting dose 10 units with changes in increments of 10–20% at intervals of 2–4 days).

Choosing the insulin

Short-acting insulin

The speed of onset and length of action is shortest for the insulin analogues, followed by human neutral insulin and then by bovine neutral insulin.

Intermediate insulin

The isophane/NPH preparations can be used in injectors or syringes and do not affect the kinetics of added neutral insulin. The isophane/NPH preparations have replaced the insulin zinc suspension (lente type) preparations.

Long-acting insulin

The bovine isophane preparation is longer acting than the human isophane preparations which may not provide 24-hour cover. The absorption profile of new analogue basal insulin preparations (insulin detemir, insulin glargine) is longer, flatter and more reproducible than previous long-acting preparations. At the time of writing, only insulin glargine (Lantus) was subsidised by the PBS for insulin therapy in type 2 diabetes.

Pre-mixed insulin

Although the fixed proportions of intermediate and quick-acting insulin (eg: 30% neutral, 70% intermediate) may not be ideal for glycaemic control, these preparations are very convenient for patients to use.

Diet, exercise and insulin

The depot of insulin will work whether the person is eating or undertaking physical activity. Both exercise and eating should be regular to increase the predictability in blood glucose levels.

6.3 Insulin delivery

Sites for insulin injections

- **Abdominal wall:** Generally fastest and the most uniform rate of absorption.
- **Legs:** Slowest absorption (unless exercising). Acceptable site.
- **Arms:** Not recommended.

Injections should be subcutaneous.

Syringes

Syringes are the most commonly used device for delivering insulin. Free insulin syringes and subsidised test strips for self-monitoring are available through State and Territory Diabetes Organisations to members and non-members alike. To be eligible, patients must register with the National Diabetes Services Scheme (NDSS) by contacting their State or Territory Diabetes Organisation on 1300 136 588 (*see page 79*).

Patients often reuse syringes but in situations where injections are given by visiting nursing staff, single use only is recommended. In children it may be desirable to reduce the number of uses of a single use syringe to keep the needle sharp.

People can dispose of sharps (blood-letting lancets, syringes etc) in an approved sharps disposal container. Arrangements for the collection of sharps vary in different States and Territories (eg: local council, hospital). People can contact their State or Territory Diabetes Organisation for advice.

Insulin pens

Insulin injectors are like large fountain pens with a cartridge of insulin inserted like an ink cartridge. They make injections much simpler since drawing up is unnecessary. Older people may find the Innolet injector easier to use because it is larger and markings are more visible.

With insulin injectors, multiple daily injection schedules become much easier and people can be more flexible in their self-management.

Insulin pumps

Insulin pumps are used by some people with type 2 diabetes (*refer 6.6 New technology page 47*). The pump is attached to the person's clothing and infuses ultra short acting insulin at variable rates into the subcutaneous tissues through an infusion set. Insulin pumps can be programmed to provide variable basal insulin infusion rates throughout the day and can also provide preprandial doses of bolus insulin.

Follow up

The insulin schedule and dosing should be reviewed at each consultation to review diabetes. The insulin dosage may need to be reduced if the person adopts a healthier lifestyle and/or loses weight.

6.4 Insulins available

Type	Brand Name	Manufacturer	Nature
ULTRA SHORT ACTING (peak at 1hr, last 3.5–4.5 hrs)			
Insulin lispro	Humalog ⁺	Lilly	Analogue
Insulin aspart	NovoRapid ⁺	Novo Nordisk	Analogue
Insulin glulisine	Apidra ⁺	sanofi-aventis	Analogue
SHORT ACTING (peak at 2–5 hrs, last 6–8 hrs)			
Neutral	Actrapid	Novo Nordisk	Human
	Humulin R	Lilly	Human
	Hypurin Neutral	Aspen	Bovine
INTERMEDIATE ACTING (12–24 hrs)			
Isophane	Humulin NPH	Lilly	Human
	Protaphane	Novo Nordisk	Human
	Hypurin Isophane	Aspen	Bovine
LONG ACTING			
Insulin detemir (up to 24 hrs)	Levemir	Novo Nordisk	Analogue
Insulin glargine (24 hrs)	Lantus	sanofi-aventis	Analogue
PRE-MIXED INSULINS			
Lispro 25% Lispro protamine 75%	Humalog Mix 25 ⁺	Lilly	Analogue
Lispro 50% Lispro protamine 50%	Humalog Mix 50 ⁺	Lilly	Analogue
Insulin aspart 30% Insulin aspart protamine 70%	NovoMix 30 ⁺	Novo Nordisk	Analogue
Neutral 30% Isophane 70%	Humulin 30/70	Lilly	Human
	Mixtard 30/70	Novo Nordisk	Human
Neutral 50% Isophane 50%	Mixtard 50/50	Novo Nordisk	Human

The pharmacokinetics of the different insulins are patient dependent. Please review product information for each product before prescribing. An empirical approach to dosage together with a 'go slow' policy will result in the smoothest fine tuning of management. Some of these insulins are available as injection devices, pen injectors, disposable insulin pens, cartridges and vials.

⁺ Very quick acting. Should be given immediately before eating.

6.5 Problems with medication

Insulin and sulphonylureas can cause symptomatic hypoglycaemia and weight gain. Patients and their families need to be aware of the risk and be able to manage hypoglycaemia.

Hypoglycaemia

Hypoglycaemia may arise due to excessive insulin or sulphonylurea dose, deficient carbohydrate intake or unaccustomed exercise. The cause needs to be identified and the episode dealt with by reinforcing education, counselling the patient and perhaps changing treatment.

Those who are taking insulin secretagogues or insulin, striving for ideal control, the elderly, those on beta-blockers and those who live alone or have a high alcohol intake are at special risk.

- **If the patient is conscious, initial treatment should be with oral glucose or sucrose.**
- **If the patient is unconscious give glucagon 1 mg subcutaneously, intramuscularly or intravenously. (Glucagon is available through the PBS as 'Glucagon hypo kit', suggest one at work and one at home).**
- **Carers and work colleagues of the at risk person with diabetes should be familiar with the identification of hypoglycaemia and its treatment including subcutaneous glucagon administration.**
- **If the doctor is available and glucagon fails to restore consciousness, administration of intravenous 50% glucose 20–30 ml should follow the glucagon.**
- **It is important to follow resuscitation with ongoing monitoring and carbohydrate input.**

Poor control

The general practitioner is in a unique situation to be able to identify possible factors which contribute to poor control. The general practitioner can explore the patient's understanding of diet, self-monitoring, treatment, as well as anxieties about the condition. The general practitioner can also appreciate the dynamics within the family and socio-economic stresses experienced by the patient.

Factors worth considering in poor control are:

- Inappropriate food intake
- Inappropriate insulin or oral hypoglycaemic usage
- Irregular metabolic demand, eg: exercise, shift work
- Intercurrent infection (especially urinary tract infection)
- Incorrect administration of medication/insulin
- Psychological stress.

6.6 New technology

Two new technologies which are used in the management of type 1 diabetes are now being used in type 2 diabetes: insulin pumps and continuous glucose monitoring systems (CGMS). Generally, these new technologies are prescribed and monitored by specialist colleagues.

Insulin pumps infuse continuous (basal) subcutaneous insulin and extra boluses as needed (eg: at meals or to correct high blood glucose values). Pumps offer the flexibility of having different basal insulin doses at different times of the day and of being able to quickly change insulin delivery. Note that insulin pump consumables are currently subsidised by the NDSS only for people with type 1 diabetes.

CGMS measure, record and can display blood glucose values derived from measurements in subcutaneous fluid over a 24-hour period. There is a delay between the calibration of glucose concentrations in blood and subcutaneous fluid. The systems are calibrated by blood glucose values measured by the patient and entered into the device.

These two technologies can be combined and give information about blood glucose and the capacity to flexibly deliver insulin. As yet they do not automatically adjust insulin delivery according to the measured glucose values.

6.7 Surgical procedures

Management aims at reasonable glycaemic control before, during and after surgery.

People with diabetes should be seen several weeks before surgery for assessment of diabetic control and anaesthetic suitability.

Minor or 'day only' procedures usually involve fasting from midnight (if held in the morning) or a light breakfast and then fasting (if held in the afternoon). In either case oral hypoglycaemic agents should be withheld.

For colonoscopy preparation, Colonlytely rather than Fleet should be used in patients with renal impairment who may become severely hyperphosphataemic with Fleet.

Appropriate written instructions should be given to the patient beforehand.

Major surgery causes considerable stress to the patient. **Metformin should be ceased before major surgery.** Pre-operative care is the same as for minor surgery, but blood glucose levels should be monitored intra operatively (if a prolonged procedure) and post operatively for several days. Insulin is often required post operatively for people with diabetes.

Patients with diabetes treated with insulin will usually require peri operative insulin and glucose infusions and close blood glucose monitoring.

7 Sick days

- **Look for the underlying cause and treat.**
- **Increase self-monitoring.**
- **Ensure continuity of advice (especially after hours).**
- **Usually an increase in medication is needed.**

In any chronic condition it is inevitable that additional episodes of sickness will occur from other causes. Sick day management needs to be part of normal patient education.

Patients need to have a plan for sick days negotiated in advance. This plan should include:

- When to call the doctor
- How often to measure blood glucose and urinary ketones
- What medicines to take
- How to eat.

It is important that telephone access to a resource person is available. Telephone advice may be sufficient when the patient is knowledgeable about diabetes but if any doubt exists, a formal consultation needs to be arranged. The patient should make contact if they have been unwell for a couple of days and not getting better, if they have moderate (or more) ketones in their urine, if the blood glucose is rising despite taking medication or if they are unsure of what to do for their care.

Intercurrent illnesses, infections (urinary tract infections, boils), trauma, acute myocardial infarction and stroke will worsen control. In addition the use of corticosteroids, beta agonists and diuretics may impair control.

The important aspect is to increase self-monitoring:

- Blood glucose measurement 3–4 times/day
- Checking blood or urine for ketones if blood glucose is over 15 mmol/L (in type 1 diabetes).

Patients should try to maintain their normal meal plans if possible. Fluid intake (eg: water) should be increased to prevent dehydration. Advise about alternative easy-to-digest foods like soups if the patient cannot tolerate a normal diet. Some non-diet soft drinks may provide essential carbohydrate in this situation.

Type 2 diabetes controlled with diet alone

Worsening control may require the addition of sulphonylurea or insulin temporarily. These patients are generally not ketosis prone but increased blood glucose levels will impair the body's immune mechanisms and make recovery slower. In addition they may become dehydrated because of the osmotic diuresis.

Type 2 diabetes on oral hypoglycaemic agents

Worsening control may require the use of insulin temporarily. This may require hospital admission. In patients with nausea, vomiting and/or diarrhoea, consider stopping metformin temporarily as metformin may aggravate these symptoms.

Type 1 diabetes and type 2 diabetes on insulin

Patients should increase their morning intermediate or long acting insulin dose by 10–20% and depending on further blood glucose levels, modify subsequent doses of short acting insulin during the day. Those with type 1 diabetes need to test their urine for ketones if blood glucose is high and they feel unwell.

Patients with gastrointestinal upset who are not eating, but who feel well and continue their usual activities, may need to reduce their insulin (especially quick acting insulin) to avoid hypoglycaemia.

In all cases the underlying cause should be identified and treated and the doses of insulin and oral hypoglycaemic agents should be reviewed.

The Australian Diabetes Educators Association has developed guidelines and patient information on sick day management. Patient information is also available from State and Territory Diabetes Organisations.

8 Hyperglycaemic emergencies

- **Look for an underlying cause – sepsis, myocardial infarct.**
- **Correct extracellular fluid deficit and then slowly correct water depletion and hyperglycaemia.**
- **Monitor plasma glucose, sodium and potassium closely.**
- **Transfer to a specialist unit if possible.**

Hyperglycaemic emergencies have a significant mortality. They are preventable in people known to have diabetes and their occurrence in this group signifies a major breakdown in medical management.

It is essential that sick day protocols are understood by patients and their carers and that a knowledgeable resource person be contactable at all times (eg: the patient's general practitioner or associate, endocrinologist, diabetes resource centre).

Adequate early management of sick patients with either type 1 or type 2 diabetes will prevent hyperglycaemic emergencies. Therefore many cases will be in patients with previously undiagnosed diabetes.

8.1 Diabetic ketoacidosis

An absolute insulin deficiency results in:

- Increasing hepatic glucose production
- Osmotic diuresis and dehydration, potassium and phosphate depletion
- Increasing peripheral lipolysis. The liver, in the absence of insulin, converts fatty acids into ketoacids which cause the acidosis.

Signs of diabetic ketoacidosis include dehydration, hyperventilation, ketotic breath, disturbed conscious state and shock.

Also check for signs of some precipitating factors such as urinary tract infection, myocardial infarction, pneumonia.

Wherever possible the patient should be managed in a specialist endocrine unit. In remote rural practice this may not be possible. In this situation it is advisable to contact the most appropriate diabetes resource person for advice while starting treatment straight away.

The general outline of management is:

Initial investigations

Blood glucose
Arterial blood gases (venous in children)
Electrolytes and renal function
Urine glucose, ketones, microscopy and culture
ECG
Chest X-ray

Frequent observation

Clinical and biochemical status. For example:

½ hourly: BP, pulse, urine output
Hourly: capillary blood glucose
2 hourly: electrolytes especially potassium

Fluids and electrolytes

Most patients have a deficit of several litres (40 to 80 ml/kg). Calculate deficit plus continuing requirements for the next 24 hours and give about ⅓ of this in the first 5–6 hours. Normal (0.9%) saline is suitable.

As long as the plasma potassium is not very high (eg: above 6 mmol/L) start replacement (eg: ½–2 g, 6–26 mmol per hour) and measure levels and adjust the dose at least 2 hourly.

Insulin

An intravenous bolus of 0.15 units/kg neutral insulin.

An infusion of neutral insulin 100 units/litre saline is commenced. Run 100 mls through the line before connecting to the patient to saturate insulin binding to the giving set. If a syringe pump is available add 50 units of neutral insulin to 50 ml of saline and flush the giving set. Commence the infusion at 0.05 to 0.15 units per kg per hour and adjust the dose depending on glycaemia (usual rates are 0.5–6 units per hour for a 70 kg adult).

When blood glucose levels fall below 15 mmol/L set up a 5% dextrose infusion (50–100 ml per hour) and make appropriate adjustments to other i/v fluids.

Diabetic ketoacidosis can be complicated by severe infection, arterial thrombosis, profound shock and lactic acidosis and cerebral oedema. Once treatment is initiated (unless the acidosis is mild and response rapid) transfer the patient to a specialist unit.

8.2 Hyperosmolar non-ketotic coma

In type 2 diabetes insulin deficiency is not absolute. Hyperglycaemia and osmotic diuresis occur but lipolysis and ketosis are not major features. Extreme hyperglycaemia develops because of increased hepatic glucose production and decreased peripheral glucose utilisation and because of the fluid losses caused by the osmotic diuresis. Although there is extracellular fluid and sodium depletion plasma sodium levels may be increased because of the larger depletion in total body water. The depletion of the total body water leads to the hyperosmolality of body fluids reflected by the extreme hyperglycaemia and increased plasma sodium. This hyperosmolar state affects consciousness and may cause coma. Hence the name hyperosmolar non-ketotic coma.

The priority is to correct extracellular fluid volume and then slowly correct the hyperglycaemia (with insulin) and water deficit (with low sodium fluids eg: 5% dextrose or 4% dextrose and $\frac{1}{5}$ normal saline). Rapid correction of the hyperosmolar state is dangerous. Monitor extracellular fluid status and plasma glucose and plasma sodium.

Blood glucose meters will not register very high glucose levels so access to a laboratory is necessary to monitor the correction of hyperglycaemia as well as to monitor sodium and potassium levels.

Signs of hyperosmolar coma include severe dehydration, disturbed consciousness, coma and shock. Also check for signs of some precipitating factors such as urinary tract infection, pneumonia, myocardial infarction or stroke.

Wherever possible the patient should be managed in a specialist endocrine unit. In remote rural practice this may not be possible. In this situation it is advisable to contact the most appropriate diabetes resource person for advice whilst starting treatment straight away.

The general outline of management is:

Initial investigations

Blood glucose
Electrolytes and renal function
Urine glucose, ketones, microscopy and culture
ECG
Chest X-ray

Frequent observation

Clinical and biochemical status. For example:

½ hourly: BP, pulse, urine output

Hourly: capillary blood glucose (when registering on the meter)

2 hourly: electrolytes especially sodium and potassium

Fluids and electrolytes

Most patients have a deficit of many litres (60 to 100 ml/kg). Initially normal (0.9%) saline is suitable to replete the extracellular volume (eg: 3–5 litres over 5–6 hours). Thereafter fluid replacement should be guided by:

- Signs of extracellular volume – to guide administration of normal saline
- Measures of a body osmolality (measured or roughly calculated: $2 \times \text{Na} + \text{G}$) to guide administration of low sodium fluids.

As long as the plasma potassium is not very high (eg: above 5 mmol/L) start replacement (0.5–1 gram, 6–13 mmol/L per hour), measure levels and adjust the dose at least 2 hourly.

Insulin

An intravenous bolus of 0.15 units/kg neutral insulin.

An infusion of neutral insulin 100 units/litre saline is commenced. Run 100 mls through the line before connecting to the patient to saturate insulin binding to the giving set. If a syringe pump is available add 50 units of neutral insulin to 50 ml of saline and flush the giving set. Commence the infusion at 0.05 to 0.15 units per kg per hour and adjust the dose depending on glycaemia (usual rates are 0.5–2 units per hour for a 70 kg adult).

When blood glucose levels fall below 15 mmol/L set up a 5% dextrose infusion (50–100 ml per hour) and make appropriate adjustments to other i/v fluids.

Hyperosmolar coma can be complicated by severe infection, arterial thrombosis, profound shock and lactic acidosis and cerebral oedema. Once treatment is initiated (unless the hyperglycaemia is mild and response rapid) transfer the patient to a specialist unit.

Many hospitals now have an Indigenous Hospital Liaison Officer or equivalent. Contacting that person may assist in accessing acute hospital care for Aboriginal and Torres Strait Islander patients.

9 Factors complicating management

These may occur independently from the diabetes itself eg: intercurrent illness or may result from the diabetic process eg: macrovascular disease or microvascular disease with nephropathy, retinopathy and neuropathy.

Risk factors

Diabetes is an independent risk factor for both macro and microvascular disease. Improved glycaemic control has been shown to reduce long term microvascular complications. Control of hypertension also reduces microvascular complications.

Reduction in macrovascular complications may depend on glycaemic control (shown for metformin) but clearly depends on modification of other risk factors such as smoking, hypertension and dyslipidaemia.

Calculation of absolute risk will identify those people where especially active intervention and risk factor monitoring are indicated (absolute 10 year myocardial infarct risk >15%). The chart available from the National Heart Foundation is a simple assessment tool (www.heartfoundation.org.au).

9.1 Macrovascular disease

- **Arterial disease is a major cause of mortality and morbidity in people with diabetes.**
- **There is a 2–6 fold excess compared with the non-diabetic population.**
- **Risk factor management is essential – especially smoking, blood pressure, lipids and glycaemia.**
- **Unless there are contraindications, prophylactic aspirin (75–325 mg/d) should be considered.**

Diabetes is a major risk factor for the development of atherosclerosis of the major vessels especially coronary and aorto-ilio-femoral systems. These in turn are the major cause of premature death in people with type 2 diabetes. It should be remembered that the incidence of cardiovascular disease is especially increased in women with diabetes.

Management of other risk factors eg: hypertension, dyslipidaemia and smoking will reduce the risk of developing macrovascular disease.

Atypical presentations occur most commonly in the elderly and in women with diabetes, but cardiovascular disease is high in the differential diagnosis in any person with diabetes presenting with a medical problem.

The high prevalence of risk factors for cardiovascular disease and of existing disease makes it likely that preventive strategies such as low dose aspirin (eg: 75–325 mg per day) will be beneficial. Note that low dose aspirin does not interfere with oral hypoglycaemic agents and is not contraindicated in most forms of retinopathy. Other antiplatelet agents may be appropriate for patients who have had vascular events (eg: clopidogrel, dipyridamole).

Smoking

Among the lifestyle related factors, smoking makes the largest contribution to the absolute risk of macrovascular complications for people with diabetes. The added risk from smoking is greater than in people without diabetes.

There is evidence that minimal interventions in the general practice setting can improve cessation rates. The diagnosis of diabetes is often a crisis for people and offers an opportunity to bring about cessation of smoking.

The general practitioner can assist people to quit in the following ways:

- Ask about and document smoking habits
- Assess stage of readiness and nicotine dependence
- Advise to quit and set a date
- Assist with information about the QUIT program, nicotine replacement and other pharmacologic therapy
- Arrange follow up.

The Royal Australian College of General Practitioners' SNAP (Smoking, Nutrition, Alcohol and Physical activity) guide outlines a general practitioner-friendly smoking cessation intervention. The guide is available at www.racgp.org.au. The QUIT website is also useful (*see Internet Resources on inside back cover*).

Smoking is more prevalent among Indigenous Australians than the general population. Indigenous Australian adults over 18 years (in every age group) are twice as likely to be current smokers than non-Indigenous (51% versus 24% respectively).

9.2 Hypertension

- **Blood pressure control reduces macro and microvascular complications.**
- **Non pharmacological measures should be tried first.**
- **Preferred initial pharmacological agents are ACE inhibitors or Angiotensin Receptor Antagonists (ARAs) for most patients.**
- **To achieve BP targets, combination therapy is often required.**

The presence of hypertension in the person with diabetes is an independent contributory risk factor for:

- Macrovascular disease: coronary, cerebral and peripheral
- Retinopathy
- Nephropathy.

Early detection, active treatment and frequent review are essential if morbidity is to be reduced. The general practitioner should aim for lower blood pressure levels in people with diabetes because their blood vessels (both macro and micro) are more susceptible to hypertensive damage (target $\leq 130/80$ mmHg).

- Non-pharmacological treatment, especially maintenance of ideal weight, regular exercise and minimisation of salt and alcohol in the diet, should be emphasised.
- Based on evidence of their effects on renal function, ACE inhibitors and ARAs are preferred drugs for the control of blood pressure in people with diabetes. ACE inhibitors and ARAs have a beneficial effect on renal and cardiovascular function.
- ARAs have a role for people with micro or macro albuminuria.
- Both lying and standing blood pressure must be assessed.
- Checking the blood pressure before the morning dose assesses whether blood pressure control is maintained at trough levels of medication.

Reliable ambulatory blood pressure monitors are available and self-monitoring by patients can provide useful information on blood pressure profiles over the 24-hour period. Such monitoring should be considered in those with suspected 'white coat' hypertension or who are resistant to therapy.

People with diabetes with autonomic neuropathy are particularly prone to orthostatic hypotension. It may be preferable to accept some hypertension rather than have the person suffer (or fall) with postural hypotension.

Getting to target BP ($\leq 130/80$; $<125/75$ if proteinuria >1 g/d present)

Step 1: Healthy eating, physical activity, weight control

Step 2: ACE inhibitor or ARA

Step 3: ACE inhibitor and diuretic

Step 4: Beta-blocker

ACE inhibitors/ARAs

Produce good control with generally no postural symptoms and no alteration in lipid profile or glucose tolerance. ACE inhibitors are one of the first line medications in the treatment of moderate to severe hypertension in patients with diabetes.

ACE inhibitors and ARAs can both reduce renal function in patients with renal arterial stenosis or diffuse renovascular disease and it is wise to check plasma potassium and creatinine approximately one week after starting treatment.

Diuretics

Thiazide diuretics are established agents with a place in early management of mild hypertension. Low doses (eg: hydrochlorothiazide 12.5 mg/d or indapamide 1.25/2.5 mg/d) have few metabolic side effects.

Beta-blockers

May mask symptoms of hypoglycaemia and cause hyperglycaemia. They may also adversely affect the lipid profile, reducing HDL-C and increasing triglycerides. Cardioselective beta-blockers are preferable eg: atenolol, metoprolol.

Calcium antagonists

Have no adverse effects on glucose tolerance or lipid profile.

Diltiazem and verapamil affect cardiac output and the dihydropyridines (eg: nifedipine) reduce peripheral resistance. Side effects include constipation. The vasodilating dihydropyridines can cause troublesome flushing, peripheral oedema, tachycardia and worsening of angina. Long acting or sustained release preparations are preferred.

Prazosin

Can cause orthostatic hypotension but otherwise is a safe vasodilator in people with diabetes. It is not recommended in the elderly or patients with autonomic symptoms or cardiac failure.

Centrally acting agents

Occasionally a centrally acting sympatholytic (eg: alphas-methyl-dopa, clonidine or moxonidine) is useful where beta-blockers cause problems or are contraindicated. However depression, postural hypotension and erectile dysfunction are common side effects.

The Aboriginal and Torres Strait Islander population has a much higher risk of developing cardiovascular (CV) disease and an earlier age of onset than the general Australian population. Ischaemic heart disease (also known as coronary heart disease) is a major contributor to mortality and morbidity in this population. There is also evidence that hypertension is more common, is present from a young age, and often unrecognised in the Aboriginal and Torres Strait Islander population.

9.3 Dyslipidaemia

- Management of dyslipidaemia is important.
- Non pharmacological measures should be tried first.
- Preferred agents are HMG CoA reductase inhibitors, ezetimibe and resins for hypercholesterolaemia and fibrates for hypertriglyceridaemia.

Dyslipidaemia is common in patients with diabetes and is an independent risk factor for the macrovascular complications of diabetes. It is therefore important to identify and treat dyslipidaemia.

Often poor control with persistent hyperglycaemia results in hypertriglyceridaemia. The triglyceride level will often drop to acceptable levels when adequate control of weight, diet and glycaemia is achieved. Cholesterol levels will often fall with weight reduction and metabolic control of diabetes. Fish oils (Ω -3 polyunsaturated oils) in doses of 5 g/day lower triglyceride levels.

The dietary management of hypercholesterolaemia is similar to that of diabetes. The diet should be low in cholesterol, saturated, trans and total fat. However, special emphasis should be put on reducing the intake of total, saturated and trans fats in patients with diabetes and hypercholesterolaemia.

If dietary measures fail after 3–6 months, pharmacological treatment should be instituted. The usual first line medications for isolated hypercholesterolaemia are HMGCoA reductase inhibitors (statins). Adherence is good and statins are extremely effective. Bile acid sequestrant resins (cholestyramine or colestipol) are also reasonable choices for isolated hypercholesterolaemia because of their proven

long term safety. Ezetimibe (10 mg, available on PBS streamlined authority script for eligible patients) is a once daily oral medication that also reduces cholesterol absorption. Combining HMGCoA reductase inhibitors and agents reducing cholesterol absorption can be very effective. As the resins may impair absorption of oral hypoglycaemic agents, care should be exercised to separate the time at which the two classes of medication are taken by at least one and a half hours.

Treatment when both cholesterol and triglycerides are raised should be a statin and/or a fibrate (fenofibrate or gemfibrozil) first depending on the lipid subfractions levels. Combining a fibrate and a statin can cause muscle damage (less so with fenofibrate than gemfibrozil) and should only be considered after specialist consultation. Combining a fibrate with ezetimibe (contraindicated in patients with gall bladder disease) or a resin might be an alternative.

There is some evidence that there is a higher rate of dyslipidaemia in the Aboriginal and Torres Strait Islander population than in the general Australian population. It is important to note that the PBS guidelines include a lowered threshold for prescription of hypolipidaemic medications to Aboriginal people with diabetes. Aboriginality is itself a recognised risk factor for CVD, decreasing the thresholds for initiating medical management of other risk factors, such as hypertension and hyperlipidaemia.

PBS guidelines for prescribing lipid lowering drugs in individuals with diabetes

(Private scripts can be provided for patients who do not meet the PBS criteria)

Patient group	Lipid criteria (fasting plasma levels)
Diabetes in individuals ≥ 60 years old	Treat at any cholesterol level
Diabetes with microalbuminuria	
Diabetes in Aboriginal/Torres Strait Islander individuals	Treat if TC* > 5.5 mmol/L
Diabetes not otherwise included	

*TC = Total cholesterol

Nicotinic acid can be added to either schedule but referral may be indicated if the above therapies are not successful. Nicotinic acid can increase glucose intolerance.

Targets recommended by the National Heart Foundation for people with diabetes (considered at high risk of CVD) are:

National Heart Foundation targets	
Total Cholesterol	<4.0 mmol/L
Triglycerides	<1.5 mmol/L
HDL-C	>1.0 mmol/L
LDL-C	<2.5 mmol/L

More active treatment may be indicated in people with existing coronary heart disease eg: LDL-C <2.0 mmol/L.

9.4 Renal damage

- **Microalbuminuria gives early warning of renal damage – check at annual review.**
- **Monitor plasma creatinine to estimate changes in GFR.**
- **Microalbuminuria is an indicator of high cardiovascular risk. Check other risk factors.**
- **Control of blood glucose and blood pressure reduces renal damage.**
- **Watch for asymptomatic urinary tract infections.**

Proteinuria is the hallmark of diabetic nephropathy. The appearance of proteinuria during the routine review of patients with diabetes is common. The time of onset of proteinuria and the rate of increase is variable. However, once clinical proteinuria occurs (dip stick positive, >500 mg/L) progressive renal damage is likely. The magnitude of proteinuria (ie: all proteins in the urine) is more than albuminuria (ie: the albumin component). Thus 500 mg/L of proteinuria is roughly equivalent to 300 mg/L of albuminuria.

Initially intermittent low grade proteinuria occurs (microalbuminuria, 20–200 µg/min). At this stage control of blood pressure and glycaemia may stabilise renal function.

Monitor serum/plasma creatinine to estimate glomerular filtration rate (GFR) at least every twelve months since other causes of renal impairment are common in diabetes.

Regular checks of creatinine identify changes in renal function and prompt review. The national adoption of eGFR makes GFR calculation simpler but eGFR is not valid at extremes of body habitus or age and should be interpreted accordingly. Laboratories are encouraged to report estimated GFR ml/min/1.73 m² body surface area (BSA) –

the eGFR. Remember that medication doses should be adjusted according to the **total GFR**, not GFR adjusted for BSA.

The rate of decline in renal function is accelerated by hypertension. The effect of glycaemic control on established renal damage is not clear. However, ideal glycaemic control in patients without renal damage and in those with microalbuminuria delays the onset or progression of renal damage.

The significance of proteinuria (macroalbuminuria) is as follows:

- Ten year survival is poor once persistent significant proteinuria is present (ie: 2+ or more).
- Retinopathy will be present. The patient should be reviewed for retinal problems and have treatment initiated (eg: photocoagulation) if necessary.
- Hypertension should be treated actively and BP maintained at lower levels (≤130/80; <125/75 if proteinuria >1 g/d exists) to slow progression of nephropathy.
- Urine should be regularly screened for infection, a common exacerbating factor in diabetic nephropathy.
- Metformin should not be used in patients with diabetic nephropathy if plasma creatinine is increased and/or calculated total GFR is decreased because of the risk of metformin accumulation and lactic acidosis.
- ACE inhibitors have been shown to slow progression of microalbuminuria and ARAs have been shown to slow progression of micro and macro albuminuria to clinical events.
- 24 hour urine protein excretion should be used to monitor progress and not first voided or timed overnight collections which are used to assess microalbuminuria.
- Referral to a nephrologist or physician experienced in treating renal disease should be considered.

	Women	Men
Albumin creatinine ratio (mg/mmol)		
Specimen: first voided morning urine		
Normal	0–3.5	0–2.5
Microalbuminuria	3.6–35	2.6–25
Macroalbuminuria	>35	>25
Urinary albumin excretion (µg/min)		
Specimen: timed overnight urine collection		
Normal	<20	<20
Microalbuminuria	20–200	20–200
Macroalbuminuria	>200	>200

If microalbuminuria is established then the use of an ARA or ACE inhibitor should be considered even in the absence of hypertension.

The STENO-2 study in patients with type 2 diabetes and microalbuminuria showed that more active intervention and improved management of risk factors reduced the incidence of cardiovascular events and renal failure by approximately 50%.

Radiographic contrast media and other nephrotoxic agents may precipitate a sudden deterioration in renal function (*see page 67*). Tetracyclines may also precipitate sudden deterioration.

The Aboriginal and Torres Strait Islander population has a much higher risk of developing chronic renal disease and end-stage renal failure than the general Australian population. In particular, the rising prevalence of diabetes in Aboriginal and Torres Strait Islander people is associated with increased early onset end stage renal disease.

9.5 Eye damage

Regular eye review (at least every two years) to detect and prevent complications.

Patients with diabetes are subject to an increased risk of developing several eye complications. For children with onset of diabetes before puberty, eye screening should commence at puberty or earlier in some circumstances. All other patients should be referred to an ophthalmologist or optometrist at the time of diagnosis. Thereafter, patients should be reviewed at least second yearly and more frequently if problems exist.

Refractive errors occur as the lens shape alters with changes in blood glucose concentrations. Blurred vision due purely to refractive error corrects with the pinhole test. Correction of refractive errors should be postponed until blood glucose levels are stabilised.

Cataracts occur prematurely in people with diabetes. Patients present with blurred vision and glare intolerance and may find night vision a particular problem. Interpretation of colours becomes more difficult. Clinically the light reflex is reduced and the fundus may be difficult to see. Treatment is surgical when reduced acuity is affecting lifestyle.

Retinopathy occurs as a result of microvascular disease of the retina. Loss of acuity not corrected with pinhole testing may be due to retinopathy. Changes seen are:

- Dot and blot haemorrhages
- Soft and hard exudates
- Proliferative blood vessel formation.

Maculopathy is difficult to see ophthalmoscopically but is the most common cause of visual loss in people with diabetes.

Assessment is by direct ophthalmoscopy (with dilated pupils), retinal photography and fluorescein angiography depending on the state of the patient's fundi. General practitioners can monitor patients for diabetic eye disease if they are confident of their technique and examine the eyes through dilated pupils. Initial and then intermittent referral to an ophthalmologist or optometrist is still recommended.

Early diagnosis of retinopathy is essential as early use of laser photocoagulation may delay and prevent visual loss. This early detection can only be achieved by a program of routine screening. Sudden loss of vision may be due to:

- Central retinal artery occlusion
- Retinal detachment
- Vitreous haemorrhage.

Urgent contact with an ophthalmologist is indicated.

The Aboriginal and Torres Strait Islander population has a higher risk of developing cataract than the general Australian population.

9.6 Foot problems

- **Patients need to know and practise routine foot care.**
- **Check six monthly for factors predisposing to problems: reduced circulation or sensation, abnormal foot structure, poor hygiene.**
- **High risk patients should be reviewed by a podiatrist.**

Foot problems result in a large proportion of all amputations and of hospital bed days for diabetes patients. Many problems can be prevented by an organised program of education and supervision.

Prevention is the most important aspect of management of the patient's feet. Early referral to a podiatrist to assess potential abnormal architecture and regular review of neuropathy, vascular disease or deformity are essential.

The foot of a person with diabetes is at risk of damage due to a combination of small and large vessel disease, nerve damage and mechanical instabilities in the foot. Tissue is more susceptible to injury and infection and heals more slowly. A podiatrist may be useful to assess foot architecture at an early stage so that early preventive treatment can be implemented. If vascular disease exists, surgical intervention on the foot can result in poor healing, ulceration and, at worst, gangrene. Such procedures should be carried out by professionals used to working with people with diabetes.

Ulcers

The most common sites of ulceration are on the plantar surfaces under the metatarsal heads. Abnormal shearing forces initially cause a bruise under the epidermis. Infection then intervenes, the overlying skin or callus becomes necrotic, sloughs and reveals the ulcer. Complications include cellulitis, thrombotic arterial occlusion and gangrene that may result in amputation.

If the ulcer is superficial, management needs to aim to keep the ulcer moist and to minimise any pressure that might perpetuate the ulcer. If the ulcer is deep, or if cellulitis is present, hospitalisation and bed rest are necessary. Key points of management include:

- Specialist endocrine and surgical referral if neuropathy and/or vascular compromise are present
- Swabs for culture (including anaerobic) and sensitivity
- X-ray to determine bony involvement
- Amoxicillin/potassium clavulanate or metronidazole plus cephalexin (Therapeutic Guidelines – Antibiotic 2006).
- Urgent drainage of pus
- Post-operative irrigation of wound
- Adequate diabetes control
- Education and reassessment of footwear.

If the ulcer is not infected and is superficial, care can be ambulatory.

- The general practitioner or a podiatrist should remove excess callus from around the ulcer to facilitate drainage
- Patients should be encouraged to keep pressure off the lesion as much as possible to encourage healing
- Orthotic aids may redistribute weight bearing forces away from the ulcer site
- A contact cast and sometimes orthopaedic intervention for disorganised tarsal joints can help to heal indolent diabetic ulcers.

Neuropathic joint damage

The painful, red, hot, swollen foot is not always infected. It is important to differentiate between infection and Charcot's arthropathy as the treatment is very different. Damage can occur as a result of minor trauma. Initial x-ray can be normal but serial x-rays will show fracture, new bone formation and joint disorganisation. The metatarsal joints are most commonly affected but the ankle and the metatarsotarsal joints can also be affected.

An early bone scan will confirm the diagnosis. Differentiation from osteomyelitis or septic arthritis can usually be made by normal white cell count and absence of fever. Treatment is with non-weight bearing crutches, appliances fitted by

a podiatrist to reduce further damage and possibly a below knee cast until inflammation has subsided.

The Ischaemic foot

In people with diabetes the disease is usually bilateral and symmetrical.

Clinically leg ischaemia presents as:

- Claudication
- Rest pain
- Ulceration
- Gangrene.

Patients with claudication should be encouraged to exercise since this may increase the claudication distance.

Surgical treatment is indicated if there is severe claudication, intractable rest pain or ulceration not responding to medical treatment.

Surgical treatment may consist of:

- Sympathectomy: can occasionally help with rest pain but may not improve circulation sufficiently for ulcer healing
- Arterial reconstruction if there is a correctable obstruction
- Major amputation: for rampant infection, extensive tissue destruction or rest pain not responsive to arterial reconstruction.

9.7 Neuropathy

Peripheral neuropathy complicating diabetes most commonly affects the sensory and motor nerves of the lower limbs. Early clinical findings include paraesthesia (sometimes painful), decreased pain and touch sensation and impaired deep tendon reflexes. Reduced proprioception occurs later.

- **Peripheral neuropathy affects sensory, motor and autonomic nerves.**
- **Foot care is especially important in patients with neuropathy.**
- **Check reflexes and sensation at annual review.**

Peripheral nerve function should be checked at least yearly in the person with diabetes.

The major significance of abnormal peripheral nerve function is its contribution to foot problems. Reduced pain sensation delays attention to trouble spots and significant tissue damage occurs before the patient's attention is aroused. In addition, poor proprioception and muscle atrophy results in abnormal stresses on the foot and joints and in increased propensity for soft tissue and joint damage.

Patients should understand the importance of appropriate footwear and foot care, establish a regular self-monitoring schedule (including visual checks) and have an action plan to respond to early problems (eg: skin breakdown).

The pain of peripheral neuropathy can be difficult to manage. Antidepressants, anti-epileptics and non steroidal anti-inflammatory medications may help. Local measures may help: desensitisation with capsaicin cream (Zostrix HP) coverage with Opsite and avoidance of pressure from bedclothes at night.

The appearance of peripheral neuropathy should prompt review and consideration of causes other than diabetes. Discomfort may be an incentive to improve metabolic control. Regular podiatric review needs to be considered. Alcohol consumption needs to be assessed and reduced or stopped if excessive.

Motor neuropathy sometimes occurs with muscle wasting, weakness and abnormalities of gait. This can contribute to foot problems by altering the biomechanics of the ankle and foot.

Autonomic neuropathy may result in:

- Orthostatic hypotension
- Impaired gastric emptying
- Diarrhoea
- Delayed/incomplete bladder emptying
- Erectile dysfunction and retrograde ejaculation in males
- Reduced vaginal lubrication with arousal in women
- Loss of cardiac pain, 'silent' ischaemia or infarction
- Sudden, unexpected cardio-respiratory arrest especially under anaesthetic or treatment with respiratory depressant medications
- Difficulty recognising hypoglycaemia.

Management of people with diabetes with these problems should include a team approach involving relevant specialist medical and allied health professionals.

9.8 Problems with medications

- **Review medication adherence as part of the annual cycle of care.**
- **Polypharmacy is common and drug interactions can be dangerous. Consider a Home Medicines Review.**

Non-adherence

Non-adherence is common and may be a barrier to achieving treatment targets. Consider simplifying treatment schedules and limiting the number of medications and medication taking occasions. The RACGP guide Putting Prevention into Practice also provides some strategies to address patient adherence on pages 24–26. The full reference for the guide is available at <http://www.racgp.org.au/guidelines/greenbook>.

Important drug interactions and side effects

People with diabetes will often be taking many hypoglycaemic medications and will require further prescription and non-prescription agents. Some drug interactions are dangerous and special care is required in older patients and those with autonomic neuropathy. Pharmacists have access to an extensive database, usually detect potential drug interactions and can provide useful advice. A Home Medicines Review may be indicated.

Hypoglycaemia (especially glibenclamide and glimepiride in older patients and those with autonomic neuropathy)

- affecting sulphonylurea pharmacokinetics: sulphonamides, cimetidine, azole antifungal agents, NSAIDs, fluoxetine, fluvoxamine
- causing hypoglycaemia or reducing response: alcohol, beta-blockers, ACE inhibitors, high dose salicylates, perhexiline

Hypotension (especially in older patients and those with autonomic neuropathy)

- anti-depressants, nitrates, phosphodiesterase inhibitors

Renal impairment

- imaging procedures: standard (non-low ionic) radiocontrast agents or causing dehydration
- non-steroidal anti-inflammatory drugs (NSAID), ACE inhibitors, ARAs and diuretics
- colonic preparation: dehydration, Fleet (hyperphosphataemia)

Hyperkalaemia

- ACE inhibitors, ARAs, NSAIDs, potassium sparing diuretics, potassium supplements, non-selective beta-blockers.

Rhabdomyolysis

- statin and/or fibrates, medications affecting statin clearance: diltiazem, clarithromycin, erythromycin, azole anti fungals, fluvoxamine, fluoxetine, grapefruit juice.

Refer also to page 38 for glycaemic effects of non-diabetes medications.

9.9 Complementary medicines

Predictable positive and negative interactions between complementary medicines and prescribed diabetes medications may be variable, as there is little formal assessment of many of these products.

Recognised issues from observations include:

- **Hypoglycaemic effect:** From fenugreek, gymnema, bitter melon, chromium, zinc. Ginseng has at least four in-vivo clinical trials supporting defined hypoglycaemic effects.

- **Hypertension:** Agents such as liquorice may cause raised blood pressure in people with diabetes with cardiac and/or renal dysfunction plus deleterious effects of decreasing serum potassium.
- **Hypotension:** In the presence of renal impairment and hypertensive management, the following commonly used agents appear to have case reports of concern leading to or aggravating hypotension: andrographis, astragalus, bilberry, cat's claw, CoQ 10, dan shen, dang gui, ginkgo.
- **Hyperlipidaemia:** Omega-3 fish oil supplementation may have positive mortality benefits in patients at high risk of cardiac mortality including type 2 diabetes.
- **Hypertriglyceridaemia:** Though some benefit from niacin has been shown, liver enzyme abnormalities and hyperglycaemic effects may occur at effective dose.

The National Prescribing Service (NPS) have compiled a guide to medicines information resources relevant to Australian health professionals. This list is available at www.nps.org.au/medicines_information_guide. Interactions can be checked by searching these resources, however the NPS does not warrant their completeness or accuracy.

10 Diabetes and reproductive health

10.1 Pregnancy

- **Glycaemic control is important before and during pregnancy.**
- **Specialist endocrine and obstetric care is indicated.**

Women with diabetes are more prone to the complications of pregnancy. In addition, pregnancy may accelerate complications of diabetes. There are also increased risks to the well being of the newborn. There is a risk of congenital abnormalities and first trimester spontaneous abortions are increased, probably due to inadequate metabolic control during the first eight to ten weeks of pregnancy. It is therefore important to:

- Ensure reliable contraception before pregnancy
- Ensure good metabolic control before becoming pregnant and throughout all stages of pregnancy.

Once pregnancy is diagnosed in a woman with diabetes, she should be managed, if possible, by an obstetrician together with a physician specialising in diabetes. Many of the complications in the later stage of pregnancy can be minimised by ideal metabolic control, close obstetric monitoring and prompt intervention. Proliferative retinopathy may be worsened in pregnancy and if present, should be treated beforehand. Stable background retinopathy is not a contraindication to pregnancy. Similarly diabetic nephropathy can deteriorate in pregnancy and there is a high incidence of pregnancy induced hypertension and pyelonephritis. In general the presence of complications of diabetes is not an indication for termination of pregnancy. The patient must be counselled with respect to risks, treatment options and prognosis.

A few brief points:

- The time when the patient requests contraception is appropriate for discussion of long term family planning. When pregnancy is planned, discuss the need for metabolic control, the use of folate and iodine supplements and the outlook for the pregnancy.
- In general, oral hypoglycaemic agents are not used during pregnancy because of potential ill effects on the fetus. If a woman on an oral agent is trying to become pregnant she needs to consider changing to insulin.
- Encourage couples to have their children early when the likelihood of complications from diabetes is less.
- When pregnancy is being considered, check the degree of control and for retinopathy or nephropathy. A review by a specialist physician and ophthalmologist is usually helpful.

- The outlook for pregnancies in patients with glycaemic control and managed in tertiary institutions is very good.

Aboriginal and Torres Strait Islander women are at high risk of having or developing diabetes during pregnancy. Ideally they would check that their blood glucose level is normal before stopping contraception and have early screening for gestational diabetes.

10.2 Gestational diabetes

All pregnant women should be screened between 26 and 28 weeks gestation with a non-fasting modified glucose tolerance test. This can be done using a 50 g or 75 g load and plasma glucose taken 1 hour after the load. Women whose levels are >7.8 mmol/L or 8.0 mmol/L respectively should have a formal (fasting) 75 g oral glucose tolerance test.

Pregnancy is diabetogenic in those with a genetic predisposition. Routine screening does not obviate the need for earlier testing if clinically indicated (eg: glycosuria at 12 weeks gestation, family history, previous gestational diabetes, poor obstetric history).

Women whose oral glucose tolerance test confirms gestational diabetes (fasting ≥ 5.5 ; 2 hours ≥ 8.0 mmol/L) or frank diabetes should be managed by an obstetrician and physician specialising in this condition, wherever possible. The follow-up of these women is important. A glucose tolerance test at three months post partum will usually show reversion to a normal state. However, 10% to 50% of women who have had gestational diabetes will have type 2 diabetes within five years and the prevalence steadily increases with time. Women who have had gestational diabetes should be encouraged to exercise regularly, to maintain an optimal weight and to be tested every 1–2 years. If a woman is planning another pregnancy she needs to check for diabetes before stopping contraception and check again at 12 and 26 weeks gestation.

Women who have a history of gestational diabetes should have regular screening:

- All women with previous gestational diabetes to be offered testing for diabetes with a 75 g OGTT 6–8 and 12 weeks after delivery.
- Repeat testing should be performed every 1–2 years among women with normal glucose tolerance and the potential for further pregnancies.
- If no further pregnancy is planned, follow-up testing should be performed every 1–2 years for women with normal glucose tolerance and the potential for further pregnancies and every 3 years if pregnancy is not possible. More frequent re-testing depends on the clinical circumstances (eg: ethnicity, past history of insulin treatment in pregnancy, recurrent episodes of gestational diabetes).

Aboriginal and Torres Strait Islander women are a high risk group and should be tested for gestational diabetes at 12 weeks as well as 26–28 weeks. Those women who develop gestational diabetes should be offered tests for diabetes at 6–8 weeks and at 12 weeks after delivery as well as 1–2 yearly thereafter.

10.3 Contraception

The combined oral contraceptive pill is usually the best option.

In women of reproductive age with type 2 diabetes, it is important to take a menstrual history as some of these women may also have polycystic ovarian syndrome. Treatment with metformin or a glitazone for their diabetes may restore the menstrual cycle and fertility.

Although there are theoretical arguments against the use of the combined oral contraceptive in patients with diabetes (eg: oestrogen may cause hyperglycaemia) overall reliability and safety make it a good choice.

The progesterone-only pill has theoretical advantages, but is less reliable and can be associated with troublesome spotting intermenstrually. The etonogestrel implant provides greater reliability with 3 years of continuous contraception. As with other progesterone only contraceptives, irregular bleeding can occur. Depot medroxyprogesterone acetate may increase weight and glucose levels but is a reliable and safe form of contraception.

An intra-uterine device (IUD) may be considered in women at ‘low risk’ for complications (ie: parous, older women with a stable single partner relationship). The risk of infection is higher in women with diabetes, especially if control is not optimal.

Barrier methods may be effective, but the risk of pregnancy is greater than with the above methods.

Permanent sterilisation is an attractive option if no (or no more) children are wanted. This is especially so in a woman with diabetes given the risks of continuing reversible contraception and the risks of pregnancy itself.

10.4 Hormone replacement therapy

There are no data supporting the use of hormone replacement therapy for primary prevention in postmenopausal women with diabetes.

Hormone replacement therapy (HRT; also known as hormone therapy) should not be recommended to women with diabetes for primary or secondary prevention of

ischaemic heart disease. Cardiovascular event rates may be increased and there is a significantly increased risk of thrombo-embolic events. There are currently no data to support the use of HRT in primary prevention of cardiovascular disease in women with diabetes.

10.5 Sexual problems

Erectile problems occur in up to 50% of men with diabetes.

Inquire at annual review.

Men with diabetes may suffer from erectile dysfunction. This may occur acutely during periods of high blood glucose or chronically.

It is important to inquire about this in the annual screening because the prevalence in men over 40 years old with diabetes may be as high as 50%.

Failure to achieve erection may be due to psychological causes, macrovascular disease or pelvic autonomic neuropathy. An organic cause is more likely when there are other macro or microvascular complications.

It is important to differentiate psychogenic from organic erectile dysfunction. Usually inquiring about spontaneous erections while asleep or in non-sexual situations will help. Psychogenic erectile dysfunction requires counselling and behavioural therapy. Patients with organic erectile dysfunction should be counselled supportively. Phosphodiesterase inhibitors (sildenafil – Viagra; tadalafil – Cialis; vardenafil – Levitra) starting with a low dose are available for men with erectile dysfunction where he and his partner wish to resume sexual activity. Common side effects are generally mild and relate to vasodilation (flushing, nasal stuffiness). If vasodilating nitrates are used, phosphodiesterase inhibitors can cause catastrophic and life threatening hypotension and are contraindicated. Many of the men will have cardiovascular disease (symptomatic or asymptomatic) and the potential cardiovascular risk of resuming sexual activity needs to be discussed.

Other techniques like intrapenile prostaglandin E₁ by injection (Caverject) or vacuum devices may help.

The help of a sympathetic specialist urologist should be sought for those considering penile injection with vasoactive agents (preparations now commercially available) or surgical treatment.

Women with diabetes do not seem to suffer from as much sexual dysfunction as men. Some women with diabetes complain of impairment in vaginal lubrication with arousal, presumably due to pelvic autonomic neuropathy. Explanation and use of lubricants may be useful.

11 Driving

- **Diabetes is identified as one of the medical conditions that may impair driving ability.**
- **Drivers with diabetes must meet certain medical standards.**

Whilst many factors contribute to safety on the road, driver health is an important consideration. Therefore, certain criteria must be met by drivers to ensure that their health status does not increase the risk of a crash in which they or other road users may be killed or injured.

National medical standards for drivers of private and commercial vehicles are contained in the Austroads document Assessing Fitness to Drive 2003 to be found at www.austroads.com.au/aftd/index.html. An interim review of these standards is being undertaken and discusses changes to diabetes monitoring. Until this review has been completed, the 2003 standards remain current. Note that these are national standards. It is therefore important to contact the driving authority in individual States and Territories as variations to the national standards do exist.

Unexpected hypoglycaemia is the main hazard for those on glucose lowering medications. People with type 2 diabetes not on hypoglycaemia inducing medication may have their ability to drive safely impaired by sensory or end organ complications, particularly reduced vision and reduced sensation in the feet.

Assessing Fitness to Drive 2003 provides:

- Medical criteria for driver capability based on available evidence and expert medical opinion
- Legal obligations of medical practitioners and drivers
- General guidelines for managing patients with respect to their fitness to drive
- A medical examination pro-forma to help guide the assessment process
- A reporting template to guide reporting to the Driver Licensing Authority.

After review medical practitioners can advise that a conditional licence is appropriate.

Further details, including clinical examination pro-forma, medical condition notification form, patient questionnaires and rights and responsibilities of medical practitioners can be found at <http://www.austroads.com.au/aftd/index.html>

Medical standards for licensing – diabetes

Private standards: (Drivers of cars, light rigid vehicles or motorcycles unless carrying public passengers or bulk dangerous goods)	Commercial standards: (Drivers of heavy vehicles, public passenger vehicles or bulk dangerous goods vehicles)
Diabetes controlled by diet alone	
A person with diabetes controlled by diet alone may drive without licence restriction and without notification to the Driver Licensing Authority. They should be reviewed by their treating doctor periodically regarding progression of the illness.	A person with diabetes controlled by diet alone may drive without licence restriction and without notification to the Driver Licensing Authority. They should be reviewed by their treating doctor periodically regarding progression of the illness.
Non-insulin requiring type 2 diabetes mellitus	
A person with non-insulin requiring diabetes may drive without licence restriction and without notification to the Driver Licensing Authority, subject to 5 yearly review providing they have no complications as per this publication. <i>The criteria for an unconditional licence are NOT met...</i> <ul style="list-style-type: none"> • if the person has end organ complications which may affect driving, as per this publication, or • if the person has 'defined' hypoglycaemic episodes. A conditional licence may be granted by the Driver Licensing Authority, taking into account the opinion of the treating doctor/general practitioner, and the nature of the driving task, and subject to periodic review... <ul style="list-style-type: none"> • if the end organ effects and/or hypoglycaemic episodes are satisfactorily treated, with reference to the standards in this publication. In the event of a defined hypoglycaemic episode occurring in a previously well controlled person they generally should not drive for six weeks depending on identification of the reason for the episode, and a specialist opinion. In the event of a defined hypoglycaemic episode being associated with a motor vehicle crash, the Driver Licensing Authority must be notified.	<i>The criteria for an unconditional licence are NOT met...</i> <ul style="list-style-type: none"> • if the person has non-insulin requiring diabetes mellitus on oral hypoglycaemic agents. A conditional licence may be granted by the Driver Licensing Authority, taking into account the opinion of a specialist in diabetes or endocrinology, and the nature of the driving task, and subject to at least annual review... <ul style="list-style-type: none"> • if the condition is well controlled and the patient compliant with treatment, and • there is an absence of defined hypoglycaemic episodes as assessed by the specialist, the patient has awareness (sensation) of hypoglycaemia, and the patient is taking agents that provide the minimum risk of hypoglycaemia, and • there is an absence of end organ effects which may affect driving as per this publication.
Insulin requiring diabetes mellitus (types 1 and 2)	
<i>The criteria for an unconditional licence are NOT met...</i> <ul style="list-style-type: none"> • if the person has insulin requiring diabetes mellitus. A conditional licence may be granted by the Driver Licensing Authority, taking into account the opinion of the treating doctor/general practitioner, and the nature of the driving task, and subject to at least two yearly review... <ul style="list-style-type: none"> • if the condition is well controlled, and • there is an absence of defined hypoglycaemic episodes and there is awareness of hypoglycaemia sufficient to stop driving a vehicle, and • there is an absence of end organ effects which may affect driving, as per this publication. In the event of a defined hypoglycaemic episode occurring in a previously well controlled person they generally should not drive for six weeks depending on identification of the reason for the episode, and a specialist opinion. In the event of a defined hypoglycaemic episode being associated with a motor vehicle crash, the Driver Licensing Authority must be notified.	<i>The criteria for an unconditional licence are NOT met...</i> <ul style="list-style-type: none"> • if the person has insulin requiring diabetes mellitus. A conditional licence may be granted by the Driver Licensing Authority, taking into account the opinion of a specialist in diabetes or endocrinology, and the nature of the driving task, and subject to at least annual review... <ul style="list-style-type: none"> • if the condition is well controlled and the patient compliant with treatment, and • there is an absence of defined hypoglycaemic episodes as assessed by the specialist, the patient has awareness (sensation) of hypoglycaemia, and the patient is taking agents that provide the minimum risk of hypoglycaemia, and • there is an absence of end organ effects which may affect driving as per this publication. In the event of a defined hypoglycaemic episode occurring in a previously well controlled person they should not drive for a period determined by a specialist. In the event of a defined hypoglycaemic episode being associated with a motor vehicle crash, the Driver Licensing Authority must be notified.

Ref: 'New medical standards for drivers' pp 732–736, Australian Family Physician Vol. 32, No. 9 September 2003.

Note: These are national standards. It is important to contact the driving authority in individual States and Territories as variations do exist.

12 Travel

- **Forward planning is the key to safe and enjoyable travel.**
- **Special insurance may be necessary.**
- **Australian air security guidelines apply.**
- **Patients should have a covering letter from their doctor and extra supplies of food, medication and monitoring equipment.**

People with diabetes can travel with safety provided a few extra precautions are taken and the travel is planned. They should arrange a medical consultation at least 6 weeks before the proposed travel to allow time to assess control and alter management as required. Use this visit to check routine immunisation status and other medication conditions.

Australian air authorities stipulate the following security guidelines. If not using an Australian carrier, it is advisable for the patient to check with the chosen airline for applicable security guidelines.

- All diabetes supplies including testing equipment, insulin and glucagon delivery devices (syringes, pen needles and insulin pump consumables) carried on board must be in the hand luggage of the person who has diabetes and whose name appears on the airline ticket. It is advisable to pack extra insulin in checked-in luggage.
- The traveller's name should appear on the insulin and/or glucagon prescription labels.
- It is advisable to carry legible prescriptions for all medications. The prescriptions must include the traveller's name, name and type of medication and contact details of attending medical practitioner.
- The National Diabetes Services Scheme (NDSS) card is accepted as primary proof that a person with insulin treated diabetes needs to carry with them their diabetes equipment such as insulin pen, pump, syringes, needles and glucagon kit. Supplementary photographic proof of identity such as a driver's licence may also be requested.
- It is advisable to carry a letter from the attending medical practitioner which outlines medical diagnoses, prescribed medications, if insulin is used and if so, the delivery device/s. The letter must stress the importance of the patient having to carry medications with them and include frequency of dosage. For those using an insulin pump, the letter must stress the need for the pump to be worn at all times.

- Australian airline regulations limit the amount of liquids (including aerosols and gels) carried by international travellers in their carry-on baggage. Each container must not exceed 100 ml and must fit into a transparent resealable plastic bag no larger than one litre (approx 20 cm x 20 cm, purchased from the local supermarket). While people with diabetes who need to carry supplies of insulin are exempt, they will be required to present the insulin at the security point and carry proof of their condition and their need for insulin.
- People wearing electronic devices to monitor blood glucose levels or infuse insulin should check with the airline as to whether these devices can be operated in flight.

Rights of people with diabetes during security check

People with diabetes who use an insulin pump are not required to remove their pump at the security point. If this is requested by security staff, the person with diabetes has the right to request access to a private consultation room which security staff are required to provide. People with diabetes are also entitled to make this request if discussion about their condition is required.

Those people not using insulin generally have few problems during travel. The stress of travel may increase blood glucose levels slightly. The decreased activity experienced in a long plane trip, together with the amount of food given en route often results in increased blood glucose levels. These return to normal once a more usual lifestyle has been resumed at the destination.

For more information about travel and diabetes, go to <http://travelsecure.infrastructure.gov.au> and scroll down to 'special needs'.

13 Diabetes Australia

Diabetes Australia is a national body, representing a Federation of consumer, health professional and research organisations. It is the national peak body for diabetes in Australia providing a single powerful voice for people living with diabetes, their families and carers.

In 2007 Diabetes Australia developed a new strategic focus around five key national priorities to turn diabetes around. These priorities span the full spectrum of the disease: awareness, prevention, detection, management and cure. In collaboration with State and Territory Diabetes Organisations, diabetes health professionals and educators, researchers and health care providers, Diabetes Australia works to minimise the impact of diabetes on the Australian community.

Diabetes Australia represents the interests of people with diabetes and those at risk of developing diabetes. It is a significant financial contributor to research into better treatments for diabetes and the search for a cure, raising around \$3 million for research every year. Diabetes Australia is the Australian member of the International Diabetes Federation (IDF) and participates in leading medical symposiums and conferences worldwide.

State and Territory Diabetes Organisations – how your patients will benefit from membership

With more than 180,000 members, membership of State and Territory Diabetes Organisations offers exclusive benefits to people with diabetes and health professionals including product discounts and other special services for a nominal annual subscription fee. Call 1300 136 588 for details.

Educational resources from Diabetes Australia

Membership of State and Territory Diabetes Organisations offers a wide range of educational resources including information sheets in different languages, available for free download from www.diabetesaustralia.com.au with links to State and Territory Diabetes Organisations.

Working with general practice

The 'Diabetes Management Journal' is published quarterly by Diabetes Australia as a direct line of communication between Diabetes Australia, general practitioners and health professionals in the field of diabetes management. This ensures that messages on the optimum care for people with diabetes and the latest developments in diabetes management are delivered to front line health care providers. The 'Diabetes Management Journal' is available through professional membership of State and Territory Diabetes Organisations (call 1300 136 588).



Diabetes Australia
National Office
GPO Box 3156
Canberra ACT 2601
Ph: 02 6232 3800 Fax: 02 6230 1535
Email: admin@diabetesaustralia.com.au

14 National Diabetes Services Scheme (NDSS)

What is the NDSS?

The NDSS is an Australian Government Scheme, administered by Diabetes Australia. The purpose of the Scheme is to deliver diabetes-related subsidised products and information and support services to people diagnosed with diabetes. Products available on the NDSS are blood glucose testing strips and urine testing strips and free pen-needles and syringes. Insulin pump consumables are available on the NDSS to registrants who meet additional criteria.

The NDSS offers community tailored information programs, focused on improving quality of diabetes care and self-management.

NDSS registrants should contact their local NDSS Agent on 1300 136 588 to find out what free services they are entitled to as registrants of the NDSS.

The role of the general practitioner

Diabetes Australia understands the importance of the initial information provided by medical practitioners in ensuring that the newly diagnosed are referred to the NDSS.

As the first point of contact at diagnosis, general practitioners are in a unique position to improve a patient's capacity to manage their diabetes through registration with the NDSS. Refer to the lift-out card for information to correctly refer patients. Diabetes Australia and the Australian Government would like to see every person diagnosed with diabetes able to receive the very real benefits offered by the NDSS.

NDSS products and services

Diabetes related products and services available on the NDSS include:

- Subsidised blood glucose testing strips and urine testing strips costing the patient less in co-payment than those available with a prescription
- Free syringes and pen-needles for insulin-requiring registrants
- Subsidised insulin pump consumables for eligible registrants
- A range of information and education services.

A Registrant Information Pack is provided at the time of registration on the NDSS. From time to time, Diabetes Australia may also send information to assist registrants in managing their diabetes and tell them about the NDSS. There are no charges for these services and personal details remain confidential.

Who is eligible to register

All Australians who have diabetes (including gestational diabetes) and a Medicare card are able to benefit from the NDSS, as are some visitors to Australia who have diabetes and are from a country with a reciprocal health agreement. Eligible persons can only be registered by a doctor or diabetes educator.

Over 900,000 people are registered on the NDSS, with new registrants joining at a rate of approximately 7,000 per month. It has been estimated that there may be 50,000 people with diagnosed diabetes currently not registered with the NDSS and at least another 500,000 with undiagnosed diabetes.

Registration forms are available from www.ndss.com.au or by calling 1300 136 588. Registration is free, easy and only has to be done once.

Access to the NDSS

Once registered with the NDSS, people with diabetes can access the wide range of products through one of the 3,000 NDSS pharmacies/outlets throughout Australia. Products can also be mailed out by ordering over the phone, by fax or via the internet (selected states only).

For more information on the NDSS, including where NDSS products can be purchased, go to www.ndss.com.au.

There is a difference

Registering with the NDSS does not automatically entitle your patients to membership with State and Territory Diabetes Organisations. Membership is separate and there is an annual subscription. For details phone your nearest State or Territory Diabetes Organisation on 1300 136 588 or go to www.diabetesaustralia.com.au for a link to your State or Territory.



The National Diabetes Services Scheme (NDSS) is an initiative of the Australian Government administered by Diabetes Australia.

15 Royal Australian College of General Practitioners

RACGP was established in 1958 to maintain high standards of learning and conduct in General Practice. The College is the respected and national leader in setting and maintaining standards for quality practice, education and research for Australian general practice.

RACGP advocates and promotes high quality diabetes management and care through:

- Regular articles in Australian Family Physician. AFP is the most widely read peer reviewed general practice journal in Australia. You can access recent editions of AFP at <http://www.racgp.org.au/afp>
- Advocacy on key issues related to diabetes management.
- Partnership with Diabetes Australia in the production of this handbook, Diabetes Management in General Practice which is updated annually.
- Access to an extensive library collection, with many items available electronically.
- The College's flagship products – Guideline for Preventive Activities in General Practice (the Red Book), Putting Prevention into Practice (the Green Book) and the RACGP SNAP Guide. You can access the latest edition of these resources at <http://www.racgp.org.au/guidelines>

RACGP
1 Palmerston Crescent
Sth Melbourne VIC 3205
03 8699 0414



Further resources (all accessed June 2010)

Diabetes: Australian facts 2008

<http://www.aihw.gov.au>

NHMRC

National Evidence Based Guidelines for the Management of Type 2 Diabetes Mellitus
<http://www.nhmrc.gov.au/publications/synopses/di7tod13syn.htm>

National Evidence Based Guidelines on Type 2 Diabetes
<http://www.nhmrc.gov.au/publications/synopses/di16to19syn.htm>

Diabetes Australia

Diabetes Australia
www.diabetesaustralia.com.au

Diabetes Prevention and Management in General Practice: Using the Pen Computer Systems Clinical Audit Tool

www.diabetesvic.org.au/HealthProfessionals/GeneralPracticeProgram/ClinicalAuditTool/tabid/351/Default.aspx

* Available in most divisions, otherwise available through PCS.

Medicines

Australian Medicines Handbook, 2010 edition
www.amh.net.au/index.php

National Prescribing Service — provides information for consumers and health professionals on use of medicines
www.nps.org.au

Consumer

Healthinsite
www.healthinsite.gov.au

healthdirect — 24 hour health advice line
Freecall: 1800 022 222

NSW Multicultural Health Communication Service
www.mhcs.health.nsw.gov.au

Reality Check — type 1 diabetes network
www.realitycheck.org.au/what_is_reality_check

Prevention/early detection

Guidelines for Preventive Activities in General Practice (the red book), 7th edition, 2009
www.racgp.org.au/guidelines/redbook

Putting Prevention into Practice (the green book), 2nd edition, 2006
www.racgp.org.au/guidelines/greenbook

SNAP: A Population Health Guide to Behavioural Risk Factors in General Practice, 2004
www.racgp.org.au/guidelines/snap

Heart Foundation — Managing Lifestyle Risk Factors
www.heartfoundation.org.au/Professional_Information/General_Practice/Pages/Managinglifestylelifestylriskfctrs.aspx

Australian Type 2 Diabetes Risk Assessment Tool
[www.health.gov.au/internet/main/publishing.nsf/Content/C73A9D4A2E9C684ACA2574730002A31B/\\$File/Risk_Assessment_Tool.pdf](http://www.health.gov.au/internet/main/publishing.nsf/Content/C73A9D4A2E9C684ACA2574730002A31B/$File/Risk_Assessment_Tool.pdf)

National Physical Activity Guidelines for Australians
www.health.gov.au/internet/main/publishing.nsf/content/health-pubhlth-strateg-phys-act-guidelines

Alcohol Guidelines
www.nhmrc.gov.au/your_health/healthy/alcohol/index.htm

Dietary Guidelines for all Australians
www.nhmrc.gov.au/publications/synopses/dietsyn.htm
Glycemic Index
www.glycemicindex.com

Smoking Cessation Guidelines for Australian General Practice — including a desktop guide
www.racgp.org.au/guidelines/smokingcessation

Smoking
www.quit.org.au

Aboriginal and Torres Strait Islanders

National Guide to a Preventive Assessment in Aboriginal and Torres Strait Islander Peoples
www.racgp.org.au/aboriginalhealth/nationalguide

Travel and Diabetes

www.diabetesaustralia.com.au/Living-with-Diabetes/Everyday-Life/Travel--Diabetes

Professional

Australian Diabetes Educators Association — Guidelines for Sick day Management for people with Diabetes, 2006
www.adea.com.au/asset/view_document/979316048

Australasian Podiatry Council — find a podiatrist
www.apodc.com.au

Optometrists Association Australia — find an optometrist
www.optometrists.asn.au

Clinical Trials

ACCORD Study Group. Effects of combination lipid therapy in type 2 diabetes mellitus. *Engl J Med* 2010 Apr 29;362(17):1563-74.

ACCORD Study Group. Effects of intensive blood-pressure control in type 2 diabetes mellitus. *N Engl J Med* 2010 Apr 29;362(17):1575-85.

Diabetes Prevention Program Research Group. 10-year follow-up of diabetes incidence and weight loss in the Diabetes Prevention Program Outcomes Study. *Lancet* 2009 Nov 14;374(9702):1677-86.

Diabetes Control and Complications Trial Research Group. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *N Engl J Med* 1993 Sep 30;329(14):977-86.

United Kingdom Prospective Diabetes Study Group (UKPDS). Intensive blood glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in people with diabetes. *Lancet* 1998;352:837-53.

See also Internet Resources on page 85.

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Internet resources

General	www.diabetesaustralia.com.au www.bakeridi.edu.au www.diabetes.org.au	www.heartfoundation.org.au www.idf.org
Government	www.nhmrc.gov.au www.healthinsite.gov.au	www.health.gov.au
Multilingual	www.diabetesaustralia.com.au/resources/multilingual www.mhcs.health.nsw.gov.au	
Consumer support	www.diabetesaustralia.com.au	www.realitycheck.org.au/what_is_reality_check

SPECIAL TOPICS

Prevention/early detection	www.racgp.org.au/guidelines/nationalguide www.racgp.org.au/guidelines/redbook www.racgp.org.au/Content/NavigationMenu/ClinicalResources/RACGP Guidelines/SNAPpopulationhealthguidetobehaviouralriskfactorsingeneral practice/SNAPguide2004.pdf	
Aboriginal people Torres Strait Islanders	www.racgp.org.au/Content/NavigationMenu/ClinicalResources/RACGP Guidelines/NationalguidetoapreventiveassessmentinAboriginal andTorresStraitIslanderpeoples/20050926evidence_base.pdf (go to page 51 within pdf) www.racgp.org.au/guidelines/nationalguide	
Alcohol	www.nhmrc.gov.au/publications/synopses/ds10syn.htm	
Eyecare	www.nhmrc.gov.au/publications/synopses/cp56covr.htm	
Footcare	www.diabetes.usyd.edu.au/foot	
Healthy eating	www.health.gov.au (key in 'dietary guidelines') www.glycemicindex.com	
Professional	www.diabetessociety.com.au www.adea.com.au www.racgp.org.au	
Smoking	www.quit.org.au	
Travel	http://travelsecure.infrastructure.gov.au (scroll down to 'Special Needs')	
UKPDS	www.dtu.ox.ac.uk (downloadable UKPDS risk engine)	

* Above websites accessed 8 June 2010.

* See also Further Resources on page 82.

An electronic version of these guidelines is available on RACGP's website www.racgp.org.au/guidelines. Also available are the significant clinical changes to the last edition in 2009/10. Any changes after the printing of this edition and before the next will be available on this website.

For copies of this booklet, contact your local General Practice network.

- When referring your patients to their State or Territory Diabetes Organisation for educational resources, the phone number is 1300 136 588.
- If unable to obtain a copy of this booklet from your local General Practice network, phone the State and Territory Diabetes Organisations Publications Division on 02 9527 1951 (Fax 02 9527 1952).



Goals for management

Encourage all people with diabetes to reach the following goals for optimum management of their diabetes

BGL	6.1–8 mmol/L (fasting) [†]
HbA1c	≤7 %
LDL-C	<2.5 mmol/L*
Total cholesterol	<4.0 mmol/L*
HDL-C	>1.0 mmol/L*
Triglycerides	<1.5 mmol/L*
Blood pressure	≤130/80 mm Hg [^]
BMI	<25 kg/m ² where appropriate
Urinary albumin excretion	<20 µg/min (timed overnight collection) <20 mg/L (spot collection) <3.5 mg/mmol: women <2.5 mg/mmol: men (albumin creatinine ratio)
Cigarette consumption	zero
Alcohol intake	≤2 standard drinks (20 g) per day for men and women [°]
Physical activity	at least 30 minutes walking (or equivalent) 5 or more days/week (total ≥150 minutes/week)

Doctors should consider:

- Prophylactic aspirin (75–325 mg) daily unless there are contraindications
- Immunisation against influenza and pneumococcal disease

[†] NHMRC National Evidence Based Guideline for Blood Glucose Control in Type 2 Diabetes, 2009

* National Heart Foundation Guidelines

[^] NHMRC Evidence Based Guidelines for the Management of Type 2 Diabetes, 2005

[°] NHMRC Australian Guidelines to Reduce Health Risks from Drinking Alcohol, 2009



supporting the education programs of Diabetes Australia