MINISTRY OF HEALTH
MANATŪ HAUORA

Guidance on the Management of Type 2 Diabetes 2011

Diagnosis of type 2 diabetes

Early identification of patients at high risk of diabetes-related complications

Better management of raised blood pressure and microalbuminuria

Improved glycaemic control

Endorsed by:

New Zealand Society for the Study of Diabetes
NZSSD

New Zealand Guidelines Group
Te Rōpū Rarangi Tohutohu
Promoting Effective Health and Disability Services

Statement of intent

While this guidance represents a statement of best practice based on available evidence and advisory group consensus (at the time of publishing), it is not intended to replace the health practitioner's judgment in each individual case.

Care decisions should consider the following:

- the individual's clinical state, age and comorbidities
- personal preferences and preferences of family/whänau
- current best practice based on the latest available research evidence.

Citation

New Zealand Guidelines Group. *Guidance on the Management of type 2 diabetes 2011.* Wellington: New Zealand Guidelines Group; 2011.

Access to the guidance

This resource has been prepared as a standalone, downloadable guidance document on the management of type 2 diabetes. The content is also included in the *New Zealand Primary Care Handbook 2012*. Copies of the Handbook 2012 can be ordered or downloaded at www.nzgg.org.nz.

Other published resources include a primary care practitioner summary resource (Quick Card), an RNZCGP-accredited CME unit and presenter slides for use by educators. These are available free online at www.nzgg.org.nz.

Ministry of Health, PO Box 5013, Wellington 6145, New Zealand

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Contents

About this guidance

This guidance on the management of type 2 diabetes has been developed for use in primary care. It addresses four identified priority areas in the management of type 2 diabetes:

- diagnosis of type 2 diabetes*
- early identification of patients at high risk of diabetes-related complications
- better management of raised blood pressure and microalbuminuria
- improved glycaemic control (including insulin initiation).

* Taken from the New Zealand Society for the Study of Diabetes (NZSSD) *Position statement on the diagnosis of, and screening for, type 2 diabetes* (September, 2011). The position statement is available at www.nzssd.org.nz

Note: The content was adapted from the position statement for inclusion in the *New Zealand Primary Care Handbook 2012* and is included in this guidance document also for ease of reference.

This guidance document and other related resources summarise evidence-based practice in diabetes management in algorithms and other tools designed to support clinical practice. The resources draw in particular on SIGN guideline 116 Management of Diabetes 2010 www.sign.ac.uk, which was assessed as being of appropriate quality and relevance to New Zealand. The specific content has been developed by a Diabetes Advisory Group convened by the New Zealand Guidelines Group (NZGG). Details of the NZGG Diabetes Advisory Group membership are included in Appendix A.

Development of this guidance was initiated and funded by the Ministry of Health, with NZGG contracted to produce this targeted revision of existing guidance for the management of type 2 diabetes with its focus on improving specific patient outcomes.

For further details of the development of the guidance see *Management of Type 2 Diabetes Evidence Summary for Four Priority Areas*.

Screening and diagnosis of type 2 diabetes

This section on diagnosis of diabetes is reproduced from *New Zealand Primary Care Handbook 2012.*

About diagnosis and use of HbA1c

In the absence of symptoms and/or markedly raised blood glucose levels, the diagnosis of diabetes has been based on measures of glycaemia that are associated with an increased risk of its specific microvascular complications (in particular, retinopathy). The precise criteria have always been determined by consensus among experts, based principally on several large observational cohort studies. The criteria have been somewhat modified over time as more high quality data have become available. More recently, several international diabetes organisations including the New Zealand Society for the Study of Diabetes (NZSSD) have issued consensus statements supporting the use of glycated haemoglobin (HbA1c) rather than blood glucose alone for the diagnosis of diabetes (and prediabetes).

NZGG notes that none of the international statements set out a strongly systematic method in the identification and critical appraisal of published research. As at December 2011, neither NZGG nor NZSSD have been funded to undertake a systematic review.

Nonetheless, HbA1c has low biological variability across patients and over time, there is a body of data relating HbA1c to microvascular outcomes, and standardisation in the measurement of HbA1c has improved. HbA1c is also more convenient for patients and practitioners since it avoids the need for fasting measurements and glucose tolerance testing.

This content on screening and diagnosis of diabetes is taken from the NZSSD *Position Statement on the diagnosis of, and screening for, type 2 diabetes* (September, 2011). The position statement is available at www.nzssd.org.nz

The guidance does not apply to pregnant women and gestational diabetes.

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Screening and diagnosis of type 2 diabetes continued...

🔑	An HbA1c is the NZSSD-recommended diagnostic screening test for diagnosing diabetes. It should be measured by an accredited laboratory. Point-of-care assays are not sufficiently accurate for use in diagnosis
🔑	If it is not possible to measure HbA1c or there are concerns about its validity, then a fasting plasma glucose is recommended
🔑	HbA1c can be misleading in some circumstances (eg, falsely low in patients with increased red blood cell turnover or post blood transfusion, falsely high in some haemoglobinopathies, some ethnic differences in rate of Hb glycation)
🔑	An oral glucose tolerance test (OGTT) should be used where there is uncertainty about the validity of HbA1c measures in specific patients (eg, in the presence of haemoglobinopathy or abnormal red cell turnover) or where there are special clinical reasons

Table 1 Who should be screened for type 2 diabetes?

People undergoing cardiovascular risk assessment	Table 2 specifies people requiring risk assessment and the age at which risk assessment should start
Other selected adults over 25 years	NZSSD recommends opportunistic screening for a person: • with ischaemic heart disease (angina or myocardial infarction), cerebrovascular disease or peripheral vascular disease • on long-term steroid or antipsychotic treatment
Obese children and young adults (BMI ≥30 kg/m^2 or BMI ≥27 kg/m^2 for Indo-Asian* peoples)	NZSSD recommends screening if: • there is a family history of early onset type 2 diabetes; or • they are of Māori, Pacific or Indo-Asian* ethnicity

* **Indo-Asian** Indian, including Fijian Indian, Sri Lankan, Afghani, Bangladeshi, Nepalese, Pakistani, Tibetan.

Table 2 The age to start cardiovascular disease risk assessment

Group	Men	Women
Asymptomatic people without known risk factors	Age 45 years	Age 55 years
Māori, Pacific peoples or Indo-Asian* peoples	Age 35 years	Age 45 years
People with other known cardiovascular risk factors or at high risk of developing diabetes **Family history risk factors** • Diabetes in first-degree relative (parent, brother or sister) • Premature coronary heart disease or ischaemic stroke in a first-degree relative (father or brother <55 years, mother or sister <65 years) **Personal history risk factors** • People who smoke (or who have quit only in the last 12 months) • Gestational diabetes, polycystic ovary syndrome • Prior blood pressure (BP) ≥160/95 mm Hg, prior TC:HDL ratio ≥7 • Prediabetes (see section 'Screening and diagnosis of type 2 diabetes' in Chapter 4) • BMI ≥30 or truncal obesity (waist circumference ≥100 cm in men or ≥90 cm in women) • eGFR† <60 ml/min/1.73 m^2	Age 35 years	Age 45 years
People with diabetes	Annually from the time of diagnosis	

* Indo-Asian peoples Indian, including Fijian Indian, Sri Lankan, Afghani, Bangladeshi, Nepalese, Pakistani, Tibetan

† eGFR estimated glomerular filtration rate

Source: Reproduced from *New Zealand Primary Care Handbook 2012*.

Table 3	What to do following a screening test for type 2 diabetes

Result	Action	Why
Symptomatic		
HbA1c ≥50 mmol/mol and, if measured Fasting plasma glucose ≥7.0 mmol/L Or Random plasma glucose ≥11.1 mmol/L	No further tests required	Diabetes is confirmed
Asymptomatic		
HbA1c ≥50 mmol/mol and, if measured Fasting plasma glucose ≥7.0 mmol/L Or Random plasma glucose ≥11.1 mmol/L	Repeat HbA1c or a fasting plasma glucose	Two results above the diagnostic cut-offs, on separate occasions are required for the diagnosis of diabetes*
HbA1c 41–49 mmol/mol and, if measured Fasting plasma glucose 6.1–6.9 mmol/L	Advise on diet and lifestyle modification. If over 35 years, a full cardiovascular risk assessment and appropriate management is indicated Repeat the test after 6–12 months	Results indicate 'prediabetes' or impaired fasting glucose*
HbA1c ≤40 mmol/mol and, if measured Fasting plasma glucose ≤6.0 mmol/L	Retest at the next cardiovascular risk reassessment interval	This result is normal

* When HbA1c and fasting plasma glucose are discordant with regard to diagnosis of diabetes, repeat testing at an interval of 3–6 months is recommended. The test that is above the diagnostic cut point should be repeated – if the second test remains above the diagnostic threshold then diabetes is confirmed. If the second result is discordant with the first, then subsequent repeat testing at intervals of 3–6 months is recommended. Patients with discordant results are likely to have test results near the diagnostic threshold.

Content on glucose testing, drawn from the 2009 edition of the *New Zealand Cardiovascular Guidelines Handbook*, is detailed in Appendix B.

NZSSD position statement advises that where glucose-based testing is used, the diagnostic criteria remain unchanged.

Early identification of patients at high risk of diabetes-related complications

Determining level of risk for macrovascular and microvascular complications is a key component of treatment planning and target setting for each individual with type 2 diabetes.

- The risk of complications varies greatly across the diabetic population.
- The aim is prevention of complications, especially targeting those at high risk.
- Patients with existing complications (eg, foot, eye, kidney or cardiovascular disease) are in a high-risk category and should be managed intensively.

Figure 1 provides information to assist the identification of people with diabetes at high risk of complications. This risk appraisal is of overall risk for microvascular and macrovascular complications.

People identified as being at high risk of complications should receive more intensive intervention and follow-up. Appropriate management of those identified as being at moderate to high risk of diabetes-related complications is outlined in Figure 2. This includes guidance for ongoing clinical review of risk factors and identification of complications. Specific risk factors for foot complications are listed in the following box titled: Identifying high risk feet.

Figure 1 Determining level of risk for diabetes-related complications

Low risk

- HbA1c 50–55 mmol/mol*
- BP <130/80 mm Hg*
- ACR <2.5 mg/mmol in men or <3.5 mg/mmol in women
- eGFR ≥60 ml/min/1.73m²*
- Lipids: triglycerides <1.7 mmol/L, total cholesterol <4.0 mmol/L
- Non-smoker
- Attends at least 6-monthly review of HbA1c and blood pressure; annual review of lipids, ACR, eGFR and foot check. Two-yearly retinal screening

Moderate to high risk

High risk = 3 or more risk factors

Moderate risk = 2 risk factors

- HbA1c >55 mmol/mol.* Risk increases incrementally with increasing HbA1c
- BP ≥130/80 mm Hg*
- ACR ≥2.5 mg/mmol men, or ≥3.5 mg/mmol in women
- eGFR <60 ml/min/1.73m²*
- Lipids: triglycerides ≥1.7 mmol/L, total cholesterol ≥4.0 mmol/L
- Current smoker
- Ethnicity (Māori, Pacific Islander, South Asian)
- Moderate retinopathy (R3), mild maculopathy (M3) – in either eye
- More than one year since diabetes last reviewed or poor adherence or attendance

* Consider patient age. In younger people, tighter control should be considered given their higher lifetime risk of diabetes-related complications. Evidence suggests that a blood pressure target <120 mm Hg may be harmful. Care should be taken to estimate likely treatment response for patients when BP approaches the target of <130 mm Hg.

Increasing risk for diabetes-related complications

Existing complications

These place the person at **high risk** of developing more severe and/or additional complications:

- previous cardiac event or stroke/TIA
- eGFR <45 ml/min/1.73m² and/or ACR >30 mg/mmol
- severe retinopathy (R4), moderate maculopathy (M4) – in either eye
- previous amputation/ulceration
- peripheral arterial disease or previous leg vascular surgery

The aim of this chart is to assist the identification of people with diabetes at moderate to high risk of diabetes-related complications with a view to more intensive intervention and follow-up. The content of the chart is evidence-based. The quantification of risk reflects the consensus of the Diabetes Advisory Group convened by the New Zealand Guidelines Group.

Figure 2 Management of people at moderate to high risk of diabetes-related complications

Urgent and intensive management is indicated to improve modifiable risk factors.

More frequent follow-up is recommended during treatment changes or if the parameter is much higher than target.

Management plan decisions should take into account patient preference, likely patient adherence and resource availability.

Lifestyle advice

- Offer evidence-based dietary advice including *achievable* goals (note 1). Dietitian advice should be sought if available
- Offer evidence-based advice on exercise including *achievable* goals (note 1)
- Offer ABC smoking cessation advice (note 2)

Medication adjustment/ intensification

- Improve glycaemic control* with adjustment of oral medication +/– insulin
  * Refer to figure 4
- Control blood pressure** through medication adjustment
  ** Refer to figure 3
- Improve lipid control with the use of statins (note 3)

Ongoing clinical review

- Monitor blood pressure, HbA1c and eGFR 3 monthly
- Monitor ACR 6 monthly (note 4)
- Review annually: weight, peripheral neurovascular status, cardiovascular status (clinical examination and cardiovascular risk calculation), feet. Review feet 3 monthly if at high risk for foot complications
- Screen retina 2 yearly as a minimum, at least annually if diabetic retinopathy present
- Seek specialist advice for newly-diagnosed complications or treatment resistance

Practice management

- Access long-term conditions funding to develop a wellness plan and promote regular follow-up
- Review nurse responsibilities and role in regular monitoring
- Set up computerised reminders to recall patients if these are not already in place
- Monitor patient risk profiles using a practice diabetes register

Note 1. See *Clinical Guidelines for Weight Management in New Zealand Adults 2009*.

Note 2. See *New Zealand Smoking Cessation Guidelines 2007.*

Note 3. See *New Zealand Primary Care Handbook 2012* at www.nzgg.org.nz.

Note 4. Unless eGFR < 60ml/min/1.73m^2 or frank proteinuria (24 h urine > 1 g per day or urine protein creatinine ratio > 100 mg/mmol).

Identifying high risk feet

Risk factors for diabetic foot disease include:

- peripheral vascular disease (PVD)*
- peripheral neuropathy
- previous amputation
- previous ulceration
- presence of callus
- joint deformity
- visual/mobility problems.

* Risk factors for PVD are smoking, hypertension and hypercholesterolaemia. The cumulative effect of these risk factors for PVD is considered to be at least additive.

Appropriate footwear is recognised in the literature as an important part of management to prevent diabetic foot disease.

Approach to setting treatment targets

The NZGG Diabetes Advisory Group considers that setting treatment targets is an important component of diabetes management for all patients. In this guidance, targets are given for specific parameters on the basis of best available evidence. However, a treatment target for a given patient should be appropriate for that individual.

Treatment targets

Treatment targets to address risk factors:

- should be appropriate for and agreed with the individual patient
- glycaemic control target: HbA1c 50–55 mmol/mol or as individually agreed
- blood pressure target: <130/80 mm Hg. Evidence suggests a BP target <120 mm Hg may be harmful. Care should be taken to estimate likely treatment response for patients when BP approaches the target of <130 mm Hg
- lipids target: triglycerides <1.7 mmol/L; total cholesterol <4.0 mmol/L.

Lipid management including guidance on the use of statins is not included in this guidance document. For information on lipid management see the *New Zealand Primary Care Handbook 2012* at www.nzgg.org.nz or 2009 edition.

Better management of raised blood pressure and microalbuminuria

These points provide evidence-based guidance for practitioners when making treatment decisions for a given individual with type 2 diabetes.

- Target systolic blood pressure <130 mm Hg and target diastolic blood pressure ≤80 mm Hg is recommended.
- Hypertension should be treated aggressively with lifestyle modification including dietary salt restriction and drug therapy.
- Evidence from the Accord Study Group in 2010 indicates a greater frequency of serious adverse effects where the systolic blood pressure target is <120 mm Hg.
- Microalbuminuria is the earliest sign of diabetic kidney disease.
- Younger patients with type 2 diabetes have a higher lifetime risk of renal complications.
- Annual screening for microalbuminuria using albumin:creatinine ratio (ACR) measurement is recommended. More frequent monitoring of renal status is indicated for Māori, Pacific Island and South Asian peoples. Those at moderate to high risk of diabetes-related complications (see Figure 2. Management of people at moderate to high risk of diabetes-related complications) should have their ACR measured 6 monthly.
- Microalbuminuria should be treated promptly if identified.
- Patients with confirmed microalbuminuria should be treated with an ACE inhibitor or angiotensin 2 receptor blocker (ARB) whether or not hypertension is present.

The NZGG Diabetes Advisory Group considered that treating hypertension 'aggressively' should be interpreted as the initiation and intensification of lifestyle and pharmacological therapy, not a recommendation to attempt to lower systolic blood pressure well below 130 mm Hg. Evidence from the ACCORD Study Group in 2010 suggests that systolic BP targets <120 mm Hg are harmful. The Advisory Group highlights that the recommended blood pressure target may not be appropriate for specific patients and should not be pursued in patients with a short life expectancy or who are at significant risk of hypotension.

Restricting dietary salt intake is important in the management of hypertension. A 2004 Cochrane systematic review reported that reducing daily salt intake by 5 g/day (a teaspoon) on average reduces blood pressure by 5/3 mm Hg. New Zealand and Australian 2006 guidance on nutrient reference values gave a suggested dietary target for daily sodium intake of 1600 mg (4 g of salt). Appendix C details the New Zealand Cardioprotective Dietary Pattern containing information on daily servings of salt and serving-size examples.

The NZGG Diabetes Advisory Group accepted the findings of the appraisal completed for the SIGN 2010 guideline that more data are required to determine the effect of *combination* ACE inhibitor and ARB therapy on kidney disease progression. Combination ACE inhibitor and ARB therapy should not be used without recommendation of a diabetes or renal specialist. The Advisory Group considers that use of loop diuretics instead of or in combination with thiazide diuretics is appropriate for patients with significant renal impairment (eGFR <45 ml/min/1.73m^2).

Figure 3 is a summary algorithm outlining appropriate management of raised blood pressure and microalbuminuria for people with type 2 diabetes. Appendix D contains guidance on the recommended method of blood pressure measurement.

Figure 3 Management of raised blood pressure and microalbuminuria in type 2 diabetes

Target BP is <130/80 mm Hg – note 1

Hypertension should be treated aggressivly with lifestyle modification including dietary salt restriction and drug therapy.

Evidence suggests a blood pressure target <120 mm Hg may be harmful. Care should be taken to estimate likely treatment response for patients when BP approaches the target of <130 mm Hg.

Start drug therapy if:

BP >130/80 mm Hg consistently for 3 months despite attempts at lifestyle modification

Maintain lifestyle improvements

Start ACE inhibitor (and titrate dose) or ARB if intolerant – note 2

If above target

Add **one** of: CCB or thiazide type diuretic

If above target

Add **another** of: thiazide type diuretic or CCB

If above target

Add **one** of:
- alpha-blocker
- beta-blocker
- further diuretic therapy (potassium sparing)

If above target

Add **another** of:
- alpha-blocker
- beta-blocker
- further diuretic therapy (potassium sparing)

or refer to a specialist

Approach to management

If hypertensive, intensive monthly follow-up and stepwise protocol adjustments to medication are advised until consistently below target.

BP should be reviewed at least 6 monthly once at target.

Refer to Appendix D for the recommended method of BP measurement.

Renal disease

Microalbuminuria is confirmed if, in the absence of infection or overt proteinuria, two out of three specimens have an elevated ACR.

People with confirmed microalbuminuria should be treated with an ACE inhibitor or an ARB whether or not hypertension is present.

Mäori, Pacific Island and South Asian peoples are at a higher risk of renal complications. More frequent monitoring of renal status is indicated.

Any evidence of renal disease based on decreasing eGFR should be treated with urgency.

Loop diuretics may be used instead of or in combination with thiazide diuretics in patients with significant renal impairment (eGFR <45 ml/min/1.73m^2).*

Note 1. Consider patient age. In younger people tighter control should be considered given their higher lifetime risk of diabetes-related complications.

Note 2. ACE inhibitor or ARB medication are contraindicated in pregnancy.

* Consensus of NZGG Diabetes Advisory Group

ACE Inhibitor: angiotensin converting enzyme inhibitor
ARB: angiotensin 2 receptor blocker
CCB: calcium channel blocker

Source: National Institute of Clinical Excellence (2008). Adapted with permission by the New Zealand Guidelines Group Diabetes Advisory Group from CG 66 *Type 2 diabetes: National clinical guideline for management in primary and secondary care (update)*. London: NICE. Content consistent with SIGN Guideline 116, 2010.

Improved glycaemic control

Good glycaemic control has a clear benefit on microvascular outcomes and if started early enough, on long-term macrovascular outcomes. Treatment targets should be set for an individual in order to balance benefits with harms, in particular hypoglycaemia and weight gain.

- A target of HbA1c 50–55 mmol/mol is recommended *or as individually agreed.* It is important to consider patient age. In younger people, tighter control should be considered given their higher lifetime risk of diabetes-related complications.
- Any reduction in HbA1c is beneficial.

Note: From August 2011 New Zealand laboratories will report HbA1c values in IFCC-aligned format (molar units measured in mmol/mol), not in DCCT-aligned format (measured in percentage). Appendix E provides a conversion table for HbA1c formats.

Setting a target HbA1c for a patient

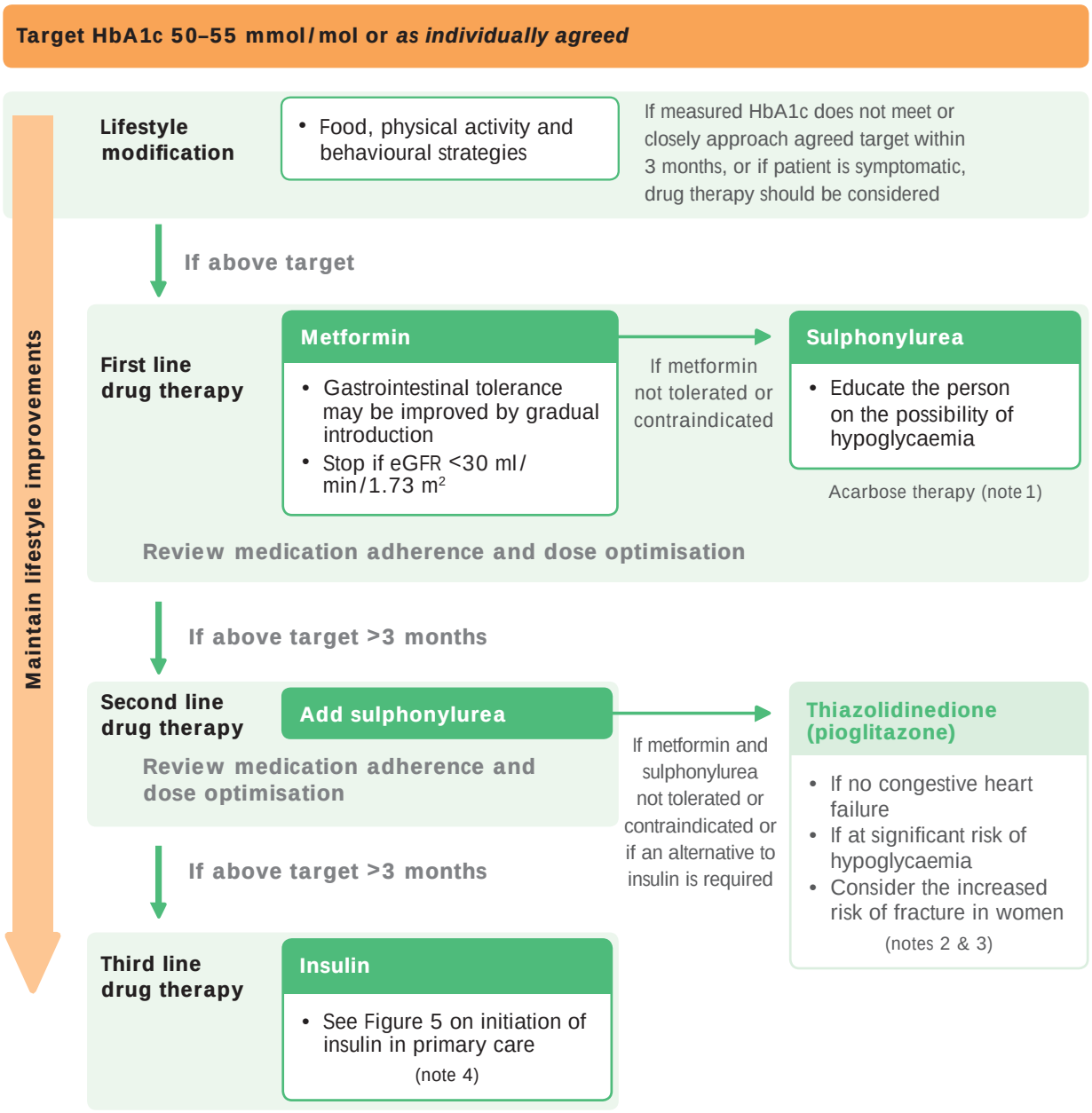
This should take into account for that individual:

- the risk of microvascular and macrovascular complications (see section: Early identification of patients at high risk of diabetes-related complications)
- the risk and consequences of hypoglycaemia and weight gain
- the personal preferences the individual has with respect to managing diabetes and preventing complications.

The NZGG Diabetes Advisory Group highlights that the progressive nature of diabetes means that more intensive treatment may be required as the condition progresses to achieve the target HbA1c. It is important that people with type 2 diabetes are aware that insulin is likely to be required as future treatment and that they are prepared for this eventuality well in advance.

Figure 4 is a summary algorithm outlining appropriate management of glycaemic control for people with type 2 diabetes. The NZGG Diabetes Advisory Group emphasises the value of using proven agents, such as metformin, sulphonylureas and insulin for the management of glycaemic control. For guidance on specific lifestyle modification strategies including diet and physical activity see *Clinical Guidelines for Weight Management in New Zealand Adults*.

Figure 4 Management of glycaemic control



Note 1. Acarbose can also be used as a first line drug therapy, if tolerated.

Note 2. Medsafe is currently monitoring the safety of pioglitazone following reports of increased adverse effects. See www.medsafe.govt.nz for latest updates. Special authority for pioglitazone may be sought if: i) patient has not achieved glycaemic control on maximum dose of metformin or sulphonylurea or where either or both are contraindicated or not tolerated; or ii) patient is on insulin.

Note 3. DPP-IV inhibitor may be an alternative agent if patient is at significant risk of hypoglycaemia or weight gain is a concern. At time of publication (2011), DPP-IV inhibitors are not subsidised.

Note 4. DPP-IV inhibitor and GLP-1 agonist are possible alternatives. GLP-1 agonists may be used if BMI >30 kg/m^2 or there is a desire to lose weight. At time of publication (2011), neither DPP-IV inhibitors nor GLP-1 agonists are subsidised.

Source: Scottish Intercollegiate Guidelines Network (2010). Adapted with permission by the New Zealand Guidelines Group Diabetes Advisory Group from SIGN 116: *Management of diabetes: a national clinical guideline*. Edinburgh: SIGN.

Self-monitoring blood glucose

The body of evidence on self-monitoring blood glucose (SMBG) by people with type 2 diabetes is conflicting and difficult to assess as a whole. Benefits of SMBG include:

- assisting patients and health practitioners in adjustment of insulin and other medication
- encouraging self-empowerment
- promoting better self-management behaviours.

However, self-monitoring may fail to improve diabetes control and has been associated with negative psychological outcomes in some studies.

Table 4 provides guidance on when SMBG is recommended.

Table 4 Recommended use of self-monitoring blood glucose

Medication used as treatment	Is SMBG recommended?
Insulin	Yes
Sulphonylureas	Yes. If the patient is motivated they may benefit from routine SMBG to reduce risk of hypoglycaemia
Metformin and other oral hypoglycaemic agents	In general SMBG is not recommended, but there are specific occasions when SMBG may be considered for those: • at increased risk of hypoglycaemia • experiencing acute illness • undergoing significant changes in pharmacotherapy or fasting eg, during Ramadan • with unstable or poor glycaemic control (HbA1c >64 mmol/mol) • who are pregnant or planning pregnancy

Source: SIGN guideline 116 *Management of Diabetes* (2010)

The NZGG Diabetes Advisory Group considers SMBG is also of value in individuals with newly-diagnosed type 2 diabetes who as part of self-management wish to determine the effect of changes to food or exercise on their blood glucose levels. The Advisory Group also notes that selected individuals may benefit from continuing SMBG monitoring where this is having a positive impact on their management.

Further information on SMBG in relation to insulin therapy is included in the section titled: Insulin initiation.

Insulin initiation

The following recommendations are intended for use by primary care practitioners as a guide. Practitioners should seek specialist advice to support patient management as needed. It is important that the individual is helped to understand their insulin regimen and encouraged to take an active role in management during the initiation of insulin.

When to consider insulin

Consider insulin therapy if the individual with type 2 diabetes has unsatisfactory glycaemic control (measured HbA1c does not meet or closely approach agreed target) or there are signs and symptoms of hyperglycaemia despite:

- management including appropriate food/diet, physical exercise and behavioural strategies (refer to *Clinical Guidelines for Weight Management in New Zealand Adults*)
- review of medication adherence and dose optimisation of oral hypoglycaemic agents (see Figure 4. Management of glycaemic control).

People who have an HbA1c above 65 mmol/mol should be seriously considered for insulin therapy.

Note: Target HbA1c is 50–55 mmol/mol *or as individually agreed*.

It is important to assess the individual's readiness for commencing insulin therapy and address any patient concerns (see Appendix F. Addressing patient concerns about insulin therapy). A patient education checklist for practitioners relating to initiation of insulin therapy is also included in Appendix G.

Assess blood glucose profile

Prior to initiating insulin therapy, it is essential that the patient is regularly self-monitoring their blood glucose levels to assist decision-making about an appropriate insulin regimen.

Blood glucose profile: practice points

- Educate the patient on how to measure blood glucose levels using a meter and how to record results using a log book (see Appendix H for an example) to determine their current blood glucose profile.
- Review recorded blood glucose results with the patient to identify their current blood glucose profile and 'problem' times of the day
- Use their blood glucose profile to help you and the patient decide on an appropriate insulin regimen (see Appendix H, which includes a logbook interpretation as an example).

Insulin therapy

When initiating insulin therapy for a given patient, ensure that the patient understands that the initial insulin dose is a starting point for dose titration. Discuss and agree on the frequency of follow-up.

Isophane insulin

- Once daily isophane (NPH*) insulin at night (or pre breakfast if the patient has daytime hyperglycaemia) should be used when adding insulin to metformin and/or sulphonylurea therapy.
- Twice daily isophane (NPH) insulin may be considered if the person has high blood glucose levels during both the day and night. The NZGG Diabetes Advisory Group also recommends considering twice daily insulin if the person is markedly hyperglycaemic. When prescribing twice daily insulin therapy sulphonylurea therapy should be stopped.

* Neutral protamine Hagedorm

Other regimens

- Basal insulin analogues should be considered if there are concerns regarding hypoglycaemia.
- Premixed insulin can be considered if post prandial levels are elevated and the HbA1c target has not been met.
  - Consider seeking specialist advice if instigating a premixed insulin regimen.
- The option of adding short-acting insulin relates to the intensification of insulin therapy and is not included in this guidance.

Figure 5 is a summary algorithm outlining appropriate initiation of insulin in primary care for people with type 2 diabetes.

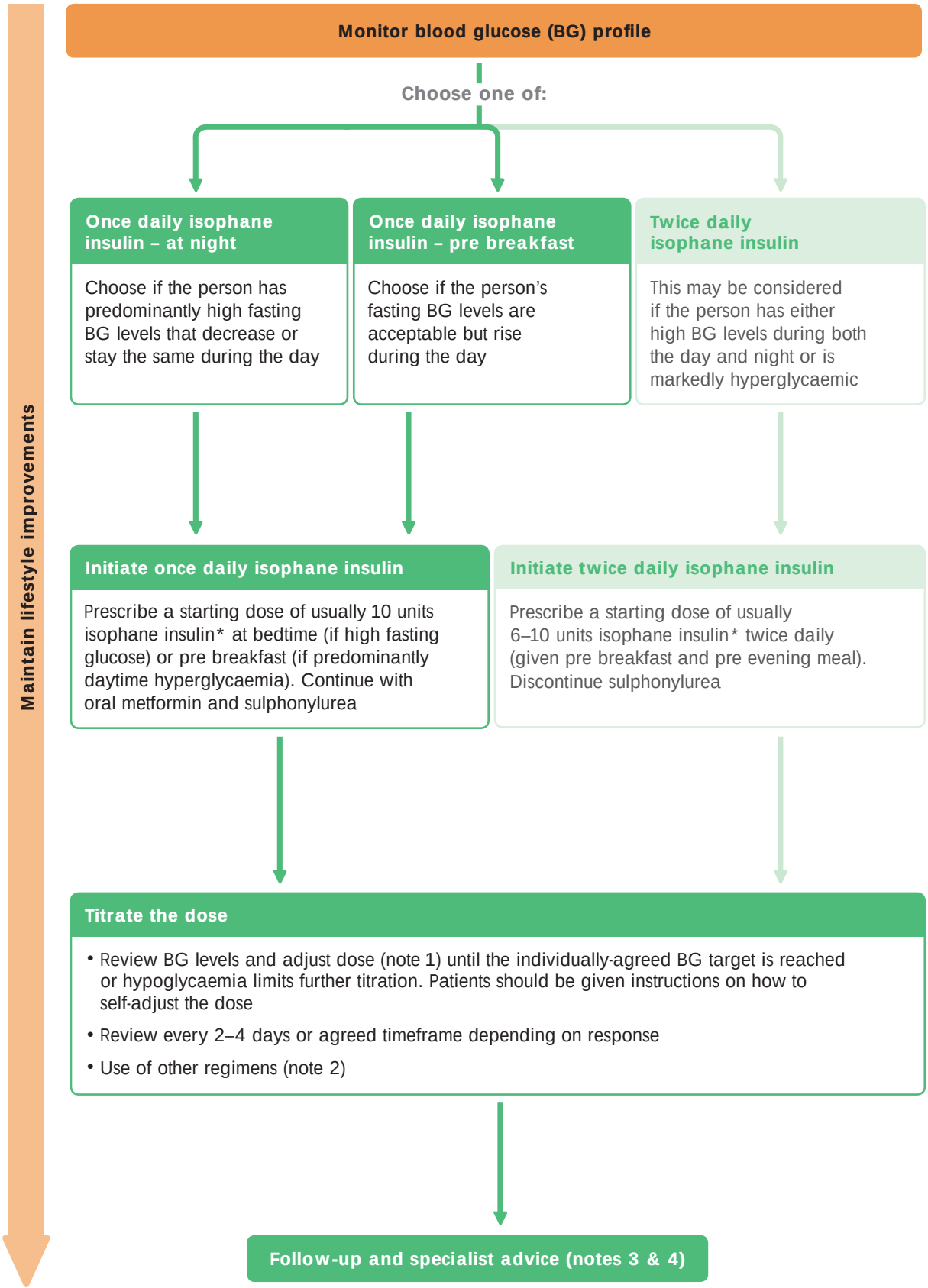
Maintenance self-monitoring blood glucose

Once the patient is established on insulin and blood glucose levels are stable, frequency of blood glucose testing can be reduced but should still be such as to show the blood glucose profile over the course of the day (see Appendix H. Monitoring of blood glucose profile).

- If the patient chooses to test less frequently, ask them to vary testing across different times of the day.
- Patients may choose to test in other patterns eg, 4 times a day on one or two days of the week.

Maintenance SMBG can be combined with checking HbA1c levels (3–6 monthly) to assess glycaemic control and the need for medication changes.

Figure 5 Initiation of insulin in primary care



* Currently funded isophane insulin is Protaphane or Humulin NPH

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Note 1 Guide to dose adjustments for initial titration

Table 1. Once daily isophane insulin – at night

Pre breakfast (fasting) BG	Insulin dose increase
Usually >8 mmol/L and never less than 4 mmol/L	Increase dose by 4–6 units
Usually 6–8 mmol/L and never less than 4 mmol/L	Increase dose by 2–4 units
Once receiving >20 units daily 3 consecutive pre breakfast (fasting) BG results higher than agreed BG target AND BG never less than 4 mmol/L	Insulin dose can be increased by 10–20% of total daily dose

Table 2. Once daily isophane insulin – pre breakfast

Pre evening meal BG	Insulin dose increase
Usually >8 mmol/L and never less than 4 mmol/L	Increase dose by 4–6 units
Usually 7–8 mmol/L and never less than 4 mmol/L	Increase dose by 2–4 units
Once receiving >20 units daily 3 consecutive pre evening meal BG results higher than agreed BG target AND BG never less than 4 mmol/L	Insulin dose can be increased by 10–20% of total daily dose

Table 3. Twice daily isophane insulin

Pre breakfast (fasting) BG	Insulin dose increase
Usually >8 mmol/L and never less than 4 mmol/L	Increase night-time insulin dose by 4–5 units
Usually 6–8 mmol/L and never less than 4 mmol/L	Increase night-time insulin dose by 2–4 units
Pre evening meal BG	**Insulin dose increase**
Usually >8 mmol/L and never less than 4 mmol/L	Increase pre breakfast insulin dose by 4–5 units
Usually 7–8 mmol/L and never less than 4 mmol/L	Increase pre breakfast insulin dose by 2–4 units
Once receiving >20 units daily 3 consecutive BG results (either pre breakfast or pre evening meal) higher than agreed BG target AND BG never less than 4 mmol/L	Appropriate insulin dose can be increased by 10–20% of total daily dose

Note 2 Other regimens

- Basal insulin analogues should be considered if there are concerns regarding hypoglycaemia.
- Premixed insulin can be considered if post prandial levels are elevated and HbA1c target has not been met.
  - Consider seeking specialist advice if instigating a premixed insulin regimen.
- The option of adding short-acting insulin relates to the intensification of insulin therapy and is not covered in this guidance.

Note 3 Follow-up

- Review BG levels every 2–4 days, depending on the individual and response.
- Once BG levels are stable, re-evaluate BG profile regularly (3–6 monthly) and change regimen if required.
- Check for risk of hypoglycaemia.
- Measure HbA1c 3–6 monthly, according to individual need.
- Monitor weight (if gaining weight, review lifestyle advice).

Note 4 Specialist advice

Seek specialist advice when:

- patient is very lean or has experienced rapid weight loss
- HbA1c persistently above individual target despite initiation of insulin, titration, and review of lifestyle modification
- patient has recurrent hypoglycaemia
- patient is an adolescent or child with type 2 diabetes
- patient is a vocational driver.

Appendices

Appendix A

Members of the NZGG Diabetes Advisory Group

Jim Mann (Chair)
Professor of Human Nutrition and Medicine
University of Otago and Southern DHB, Dunedin
Invited by: New Zealand Guidelines Group

Stephen Allen
Mäori health advocate
Invited by: New Zealand Guidelines Group
Until January 2011

Chris Baty
President, Diabetes New Zealand, Wellington
Invited by: New Zealand Guidelines Group

Bryan Betty
General Practitioner, Porirua Union Community and Health
Royal New Zealand College of General Practitioners
Nominated by: Royal New Zealand College of General Practitioners

Tim Cundy
President, New Zealand Society for the Study of Diabetes
Endocrinologist, Auckland District Health Board
Invited by: New Zealand Guidelines Group

Rick Cutfield
Diabetologist
Diabetes Clinic, North Shore Hospital, Takapuna Hospital, Auckland
Invited by: New Zealand Guidelines Group

Sandy Dawson
General Practitioner, Porirua Union Community and Health Services
Invited by: New Zealand Guidelines Group

Paul Drury
Medical Director, New Zealand Society for the Study of Diabetes
Auckland Diabetes Centre
Invited by: New Zealand Guidelines Group

Louise Farmer
Clinical Nurse Manager/Diabetes Nurse Specialist, Diabetes Service,
Hutt Valley District Health Board
Invited by: New Zealand Guidelines Group

Pauline Giles
Clinical Nurse Specialist (Diabetes), MidCentral Health
Nurse Practitioner (Diabetes and related conditions),
Chair of Diabetes Nurse Specialist Section of
New Zealand Nurses Organisation
Invited by: New Zealand Guidelines Group

Greg Hamilton
Team Leader Service Transition, Planning and Funding, Canterbury
District Health Board
Invited by: New Zealand Guidelines Group

Aniva Lawrence
General Practitioner, Paihia Medical Centre, Paihia
Pacific perspective
Invited by: New Zealand Guidelines Group

Rob Leikis
Endocrinologist, Hawkes Bay Hospital
Invited by: New Zealand Guidelines Group

Donna McArley
General Practice Coordinator, Western Bay of Plenty Primary Health
Organisation
Invited by: New Zealand Guidelines Group

Graham McGeoch
General Practitioner, Development Team Member, Canterbury Initiative
Invited by: New Zealand Guidelines Group

Peter Moodie
Medical Director, Pharmac
Invited by: New Zealand Guidelines Group

Lorna Smeath
Whänau Ora Clinical Projects Coordinator, Te Tai Tokerau Primary Health Organisation
Invited by: New Zealand Guidelines Group

Lucia Bercinskas
Ex-officio
Nominated by: Ministry of Health

Brandon Orr-Walker
Ex-officio Diabetes specialist
Nominated by: Ministry of Health

Appendix B

Interpreting fasting plasma glucose results

This appendix is reproduced as it appears in the *New Zealand Primary Care Handbook 2012*.

Table AB.1 What to do following a fasting venous plasma glucose result

Result	Action	Why
7.0 mmol/L or more	Repeat a fasting plasma glucose*	Two results above this level, on separate occasions,* are diagnostic of diabetes and do not require an OGTT†
6.1–6.9 mmol/L Request an OGTT†	Request an OGTT†	A 2-hr post glucose load of ≥11.1 mmol/L is confirmation of diabetes A 2-hr post glucose load of ≥7.8 and <11.1 mmol/L is confirmation of prediabetes
5.5–6.0 mmol/L	Request an OGTT† in high-risk groups‡	The fasting plasma glucose result may be normal but some patients will show diabetes or prediabetes on the OGTT† A 2-hr post glucose load of ≥11.1 mmol/L is confirmation of diabetes A 2-hr post glucose load of ≥7.8 and <11.1 mmol/L is confirmation of prediabetes
5.4 mmol/L or less	Retest at next cardiovascular risk assessment interval	This result is normal

* The diagnosis of diabetes should be confirmed by repeating a fasting plasma glucose on another day unless there is unequivocal hyperglycaemia with acute metabolic decompensation or obvious symptoms of thirst or polyuria.

† OGTT Oral glucose tolerance test.

‡ Non-European ethnicity, first-degree relative with diabetes, past history of gestational diabetes.

Appendix C

The New Zealand Cardioprotective Dietary Pattern

Food	Healthy servings (per day)	Serving size examples	Notes
Vegetables	At least 3–4 servings Include at every meal	½ cup cooked vegetables 1 cup raw green vegetable or salad 1 tomato or carrot	Choose coloured varieties daily, especially the green, orange and red vegetables. Also includes cauliflower, onions, mushrooms, turnips
Fruit	At least 3–4 servings	1 medium apple, pear, orange, small banana ½ cup stewed, frozen, canned fruit (natural or 'lite') 2–3 small apricots or plums 10–15 grapes, cherries, strawberries 1 cup other berries 3 prunes, dates, figs or 1 tbsp raisins, sultanas 6–8 halves of dried apricots 180 ml 100% fruit juice	No more than one serving of fruit juice per day
Breads, cereals, grains	At least 6 servings	1 medium slice of whole grain bread or ½ bread roll 30 g of other breads such as pita, naan, corn tortilla, wraps ½ cup bran cereal or ⅔ cup wheat cereal or ½ cup cooked porridge or ⅓ cup muesli or 3 crispbreads ½ cup cooked pasta or ⅓ cup cooked rice	Choose more or less depending on body weight and level of physical activity. Include at every meal Choose a variety of grain products with at least half as whole grain products
Starchy vegetables		1 small potato ½ kumara ⅓ cup yams ½ cup corn ½ parsnip 1 small round of taro	These replace bread/ grain products. Limit for weight and diabetes control

continued over…

Food	Healthy servings (per day)	Serving size examples	Notes
Low-fat or fat-free milk products	2–3 servings or replace with soy products	1 glass trim or low-fat milk (250 ml) 1 pottle low-fat yoghurt ⅓ cup cottage cheese ½ cup low-fat cottage cheese ¼ cup quark or ricotta 2 tbsp parmesan or 3 tbsp grated cheddar cheese 2 cm cube cheddar cheese 3 cm cube soft cheese	Use 0 to 0.5% fat milk and <1% fat yoghurt Hard cheese and semi-soft cheeses can be included up to 4 times weekly in very small amounts camembert, brie, edam, feta, mozzarella
Fish, seafood	1–2 servings weekly	2 small, 1 large fillet of cooked fish ½ cup tuna or 1 cup mussels ⅓ cup salmon or ½ can sardines	If eating fish, choose some oily fish: tuna, kahawai, trevally, kingfish, warehou, dory, salmon, sardines, eel, squid, mussels or oysters
Peas, beans, soy products (legumes)	4–5 servings weekly	1 cup cooked dried beans, chickpeas, lentils, dahl ½ cup tofu or tempeh 1 glass fortified soy milk (250 ml)	
Skinned chicken or very lean meats	Limit to 1–1½ servings	2 slices trimmed meat/chicken (100–120 g) ½ cup lean mince or casserole (125 g) 1 small lean steak (100 g) 1 small chicken breast (120 g) 2 small drumsticks or 1 leg, skinned	Use alternatives to meat several times a week
Eggs	3 eggs weekly	1 egg	

continued over...

Food	Healthy servings (per day)	Serving size examples	Notes
Liquid oils, unsaturated margarines and spreads or avocado	3 or more servings	1 tsp soft table margarine or oil 2 tsp light margarine (50–60% fat) 2 tsp mayonnaise or vinaigrette (50–60% fat) 3 tbsp reduced-fat mayonnaise or dressing (10% fat or less) 1 tbsp avocado	Choose more or less depending on body weight and level of physical activity. Choose products made from sunflower, soya bean, olive, canola, linseed, safflower or nuts and seeds, other than coconut.
Nuts, seeds	Eat regularly up to 30 g/day	1 dsp nuts or pumpkin seeds 1 dsp peanut butter 1 tbsp sunflower or sesame seeds	For weight control 1 serving of nuts replaces other oils and spreads
Confectionery and added sugar	Up to 1* serving or up to 3 servings	1 tbsp sugar, jam, syrup or honey 2 tbsp all-fruit jam spreads Small pottle reduced-fat ice-cream or frozen yoghurt 2 fruit slice biscuits	Best incorporated as part of the meal or snack only if diabetes is well controlled. Artificial sweeteners may be used for additional sweetness as a replacement for sugar
Minimise added salt	Limit high salt seasonings to 1/day	1 tsp seasoning paste ⅙ stock cube or ⅛ tsp stock powder ⅓ tsp gravy mix or 1 tbsp liquid seasoning	Use minimal salt in cooking Do not add salt to meals
Limit high salt foods	Limit these high salt foods to less than 4 servings/day	30 g lean ham/pastrami 1 tbsp pickles or 1 tsp marmite/vegemite 1 tsp soy sauce 20 to 30 g cheese ½ cup canned/packet soup 50 g canned or smoked salmon/tuna 30 g other smoked fish/sardines	Choose breads and cereals with less than 450 mg/100 g sodium and spreads with less than 400 mg/100 g sodium Choose low or reduced salt/sodium canned foods, soups, sauces seasonings, crispbreads, relishes and meals Check labels of cured, corned, pickled, smoked, marinated and canned foods

continued over…

Food	Healthy servings (per day)	Serving size examples	Notes
Alcoholic drinks	Limit to <3 drinks for men and <2 for women	1 (300 ml) glass ordinary strength beer 1 (60 ml) glass fortified wine (sherry, port) 1 (30 ml) pub measure spirits (whisky, gin) 1 (100 ml) glass of table wine	
Nonalcoholic drinks	6–8 drinks /day	1 glass water (250 ml) 1 cup 'diet' soft drink (180 ml) 1 glass trim or low-fat milk (250 ml) 1 cup tea, coffee or cocoa 1 cup vegetable juices (180 ml)	Drink plenty of water every day Limit the consumption of fruit juice, cordial and fizzy drinks because of their high sugar content

* Up to 1 serving per day for weight control or for people with high triglycerides or diabetes as part of a meal or snack. Up to 3 per day for people in the healthy weight range who are active with normal triglycerides and no diabetes.

Source: *New Zealand Cardiovascular Guidelines Handbook* (2012 Edition), available at www.nzgg.org.nz

Appendix D

Recommended method of blood pressure measurement

1	Use a device with validated accuracy that is properly maintained and calibrated
2	Measure sitting blood pressure (BP) routinely. Measure sitting and standing blood pressure in the elderly or people with diabetes
3	Remove tight clothing, support arm with BP cuff at heart level, and ensure the hand is relaxed
4	Use cuff of appropriate size for arm circumference
5	Inflate the cuff until the radial pulse is no longer palpable
6	Lower mercury slowly, by not greater than 2 mm Hg per second
7	Read BP to the nearest 2 mm Hg
8	Measure diastolic BP as disappearance of sounds (phase 5)
9	Two measurements at a single visit are sufficient for calculating cardiovascular risk
10	At least two measurements should be made at each of three visits to determine BP thresholds if considering treatment – some of these can be recorded at nurse consultations using this measurement technique
11	Possible indications for 'home' or ambulatory BP monitoring include the diagnosis of 'white coat hypertension', suspected hypotension, excessive BP variability and resistance to drug therapy
12	Home-based measurement may be lower than office measurement and therefore treatment decisions should be based predominantly on office measurement

Source: *New Zealand Cardiovascular Guidelines Handbook* (2012 Edition), available at www.nzgg.org.nz

Appendix E

Conversion table for HbA1c formats

Since October 2011 New Zealand laboratories report HbA1c values only in IFCC-aligned format (molar units measured in mmol/mol), not in DCCT-aligned format (measured in percentage).

The conversion formulae are:

IFCC-aligned HbA1c value = (10.93 x DCCT-aligned value) – 23.5 mmol/mol

DCCT-aligned HbA1c value = (0.0915 x IFCC-aligned value) + 2.15 %

Health practitioners are able to calculate HbA1c values at www.diabetes.org.uk/hba1c

Table AE.1 Conversion table for HbA1c formats

IFCC-aligned HbA1c (mmol/mol)	DCCT-aligned HbA1c (%)	IFCC-aligned HbA1c (mmol/mol)	DCCT-aligned HbA1c (%)
20	4.0	38	5.6
21	4.1	39	5.7
22	4.2	40	5.8
23	4.3	41	5.9
25	4.4	42	6.0
26	4.5	43	6.1
27	4.6	44	6.2
28	4.7	45	6.3
29	4.8	46	6.4
30	4.9	48	6.5
31	5.0	49	6.6
32	5.1	50	6.7
33	5.2	51	6.8
34	5.3	52	6.9
36	5.4	53	7.0
37	5.5	54	7.1

continued over...

IFCC-aligned HbA1c (mmol/mol)	DCCT-aligned HbA1c (%)
55	7.2
56	7.3
57	7.4
58	7.5
60	7.6
61	7.7
62	7.8
63	7.9
64	8.0
65	8.1
66	8.2
67	8.3
68	8.4
69	8.5
70	8.6
72	8.7
73	8.8
74	8.9
75	9.0
76	9.1
77	9.2
78	9.3
79	9.4
80	9.5
81	9.6
83	9.7
84	9.8
85	9.9
86	10.0
87	10.1
88	10.2

IFCC-aligned HbA1c (mmol/mol)	DCCT-aligned HbA1c (%)
89	10.3
90	10.4
91	10.5
92	10.6
93	10.7
95	10.8
96	10.9
97	11.0
98	11.1
99	11.2
100	11.3
101	11.4
102	11.5
103	11.6
104	11.7
105	11.8
107	11.9
108	12.0
109	12.1
110	12.2
111	12.3
112	12.4
113	12.5
114	12.6
115	12.7
116	12.8
117	12.9
119	13.0
120	13.1
121	13.2
122	13.3

IFCC-aligned HbA1c (mmol/mol)	DCCT-aligned HbA1c (%)
123	13.4
124	13.5
125	13.6
126	13.7
127	13.8
128	13.9
130	14.0
131	14.1
132	14.2
133	14.3
134	14.4
135	14.5
136	14.6
137	14.7
138	14.8
139	14.9
140	15.0
142	15.1
143	15.2

IFCC-aligned HbA1c (mmol/mol)	DCCT-aligned HbA1c (%)
144	15.3
145	15.4
146	15.5
147	15.6
148	15.7
149	15.8
150	15.9
151	16.0

Source: Adapted from SIGN guideline 116 Management of Diabetes (2010)
www.sign.ac.uk/guidelines/fulltext/116/index.html

IFCC International Federation of Clinical Chemistry and Laboratory Medicine
DCCT Diabetes Control and Complication Trial

A patient info sheet can also be downloaded at
www.nzssd.org.nz/HbA1c/MoH%20Diabetes%20Flyer.pdf

Appendix F

Addressing patient concerns about insulin therapy

This content has been prepared by the NZGG Diabetes Advisory Group to assist primary care practitioners when discussing initiation of insulin therapy with patients. It draws on the experience of the Advisory Group.

Common misconceptions about insulin therapy and discussion points

It is important to enquire about and address an individual's concerns about insulin therapy.

Common misconceptions

- My diabetes has become worse, or is a more serious disease
- Insulin therapy is a sign of my personal failure to manage the condition
- Insulin therapy will adversely impact on my lifestyle and will be inconvenient, resulting in loss of my personal freedom and independence
- Insulin therapy leads to complications
- I will be treated differently by family and friends
- For Mäori and Pacific people with diabetes, particularly older people, a common misconception is that starting insulin therapy means that they will die soon.

Suggested discussion points

- Type 2 diabetes is progressive and medication needs change over time
- Lifestyle management efforts are of value and should be ongoing. (Acknowledge the individual's lifestyle management efforts.)
- Insulin therapy is an additional tool to use alongside lifestyle management efforts
- Present the benefits of insulin: 'can improve health and make them feel better'
- Insulin therapy is the next logical step in treatment if oral therapy is insufficient
- Insulin therapy does not cause diabetes complications (if needed, it reduces the risk)
- Initially, only once or twice daily insulin will be required
- Insulin types and delivery devices have changed and improved in recent years
- Insulin devices allow very discreet use. (Show an insulin pen as an example.)
- Self-monitoring of blood glucose means that insulin therapy is now safer and more easily managed than in the past

continued over...

Addressing patient concerns about insulin therapy continued...

Common misconceptions about insulin therapy and discussion points continued...

Other suggestions

- Include the patient's partner or family/whänau in discussion/education
- Provide information about local patient support groups
- Show the patient a 6 mml insulin needle and let them try it out
- Suggest a trial period of insulin therapy for eg, 8 weeks. 'Try it for 8 weeks and see how you feel about it.'

Appendix G

Patient education checklist: initiation of insulin therapy

This content has been prepared by the NZGG Diabetes Advisory Group to assist primary care practitioners when initiating insulin therapy with a patient. It draws on the experience of the Advisory Group.

Education advice for your patients

- Self-monitoring of blood glucose
  - When to test, how to test, how to record in a log book style
  - Test if they have symptoms of hypoglycaemia
  - Increase frequency of testing if unwell
- Insulin regimen
  - Which insulin preparation
  - What the dose is, and when to administer it
  - How to use the insulin injection device
  - How to titrate the dose (if this is appropriate at this stage)
- How to administer insulin
- How to store the insulin and how to dispose of 'sharps'
- Dietary and lifestyle advice
  - Maintaining a healthy body weight by healthy eating and exercise
  - The risk of hypoglycaemia with excess alcohol consumption
- Managing hypoglycaemia
  - How to recognise the symptoms of hypoglycaemia
  - How to manage and prevent episodes of hypoglycaemia
- Driving: legal and practical issues
  - Ensure the patient understands their responsibility to maintain a reasonable level of glycaemic control while minimising their risk of hypoglycaemic episodes
  - If the patient is a vocational driver please refer for specialist advice
  - Refer to the NZ Transport Agency *Medical aspects of fitness to drive: A guide for medical practitioners* July 2009

continued over…

Patient education checklist: initiation of insulin therapy continued...

Education advice for your patients continued...

- Provide Medic Alert bracelet information
- Provide contact and emergency telephone numbers
- Advise the patient where to get further self-help information (eg, Diabetes New Zealand website www.diabetes.org.nz or local diabetes societies)

Provide your patient with appropriate written pamphlets

Diabetes New Zealand has pamphlets on relevant topics eg, 'Diabetes and Insulin' and 'Diabetes and Healthy Food Choices'. These are available through Diabetes Supplies Ltd www.diabetessupplies.co.nz or 0800 DIABETES

Appendix H

Monitoring blood glucose profile

This content has been prepared by the NZGG Diabetes Advisory Group to assist primary care practitioners when initiating insulin therapy with a patient. It draws on the experience of the Advisory Group.

Monitoring blood glucose profile: use of a logbook

The use of a logbook to record the results of blood glucose testing assists initial and ongoing decision-making about insulin therapy and should be encouraged.

By varying the times of the day that the patient tests blood glucose, and recording these results in a logbook format, the patient's typical blood glucose profile across the course of a day will become apparent.

Patients can test more intensively when initiating insulin therapy and less intensively once insulin therapy is established.

In reviewing the logbook, focus on the trends on days that are representative of 'normal' for that person. Ignore outrider results or 'noise' (birthday parties, 'binges', 'not so good' days, sickness, excess alcohol).

Table AH.1 Example of a completed blood glucose profile logbook

	Before breakfast	After breakfast	Before lunch	After lunch	Before dinner	After dinner	Before bed
Mon	11.9		8.9				
Tues		10.8				7.6	
Wed	14.6				4.9		
Thur		11.9		6.3			
Fri	10.8		9.6		5.2		7.3
Sat							
Sun	13.6			7.2		7.5	

In this example, the person is only testing on average twice a day but is varying the times of the day and recording results in the correct columns. These results can thus be readily scanned to establish the person's usual daily pattern or profile.

The blood glucose levels shown in this example indicate the person would benefit from a once daily isophane insulin delivered in the evening to correct their morning high blood glucose level the next day.

ADDITIONAL RESOURCES

- Summary resource
- CME unit
- Presenter slide set

www.nzgg.org.nz