Initiating insulin for people with **type 2 diabetes**

Due to its progressive nature, many people with type 2 diabetes will eventually require insulin treatment. In most cases, insulin can be initiated in primary care. A team approach with close follow-up is essential to enable patients with type 2 diabetes to optimally self-manage their insulin regimen.

KEY PRACTICE POINTS:

- Consider insulin treatment for any person with type 2 diabetes who has not met their HbA_{1c} target despite optimal lifestyle modification and pharmacological management with non-insulin glucose-lowering medicines
- Insulin initiation is recommended for all patients with significant hyperglycaemia (e.g. HbA_{1c} > 90 mmol/mol) at any stage, including diagnosis
- Patients with type 2 diabetes are typically initiated on basal insulin; isophane insulin is an appropriate choice of basal insulin for most people
- Treatment intensification to a basal-bolus or biphasic insulin regimen should be considered for patients who have not reached their HbA_{1c} target despite taking basal insulin for three months at 0.5 units/kg/day and/or achieving fasting blood glucose levels < 7 mmol/L
- The choice of a basal-bolus or biphasic regimen should be based on patient characteristics and preference, e.g. flexibility of meal times, carbohydrate intake and exercise, blood glucose monitoring and injection frequency, any cognitive or physical limitations on regimen complexity
- Ongoing advice, education and support are essential to ensure patients are confident with their prescribed insulin regimen; consider referral to a diabetes nurse specialist or education programme if available locally

This is a revision of a previously published article. What's new for this update:

- Insulin initiation is recommended for all patients with HbA_{1c} > 80 – 90 mmol/mol at any stage, including diagnosis. This is higher than previously recommended (75 mmol/mol) due to the availability of more options to manage hyperglycaemia.
- Tables added to show the funded short-, intermediate- and long-acting and biphasic insulins available in New Zealand
- Information provided on calculating correction insulin doses
- Up to 30 g (rather than 12 – 15 g) of carbohydrate is now recommended for managing hypoglycaemia

Insulin depletion is probable over time

Type 2 diabetes is a progressive disease characterised by insulin resistance and a decreasing ability of pancreatic β-cells to produce insulin. Both of these factors contribute to hyperglycaemia. Alongside lifestyle modifications, most patients with diabetes begin treatment with metformin (with or without other glucose-lowering medicines). However, due to the progressive nature of type 2 diabetes, treatment with insulin is eventually required in some patients.

Making the decision to initiate insulin

New Zealand guidelines recommend that insulin treatment be considered for any person with type 2 diabetes who has not met their HbA_{1c} target despite optimal lifestyle modification and pharmacological management with non-insulin glucose-lowering medicines.[1] Insulin initiation is recommended for all patients with significant hyperglycaemia (e.g. HbA_{1c} > 80 – 90 mmol/mol)* at any stage, including diagnosis.[1]

* This is higher than previously recommended (75 mmol/mol) due to the availability of more options to manage hyperglycaemia[2]

Reinforce the importance of lifestyle interventions

Emphasise to all patients initiating insulin that this is not a substitute for a healthy lifestyle and that behavioural strategies such as exercise, healthy eating and smoking cessation should still continue. Alcohol consumption should be limited as this increases the risk of hypoglycaemia in patients taking insulin.

It may be possible for some people with type 2 diabetes, following significant weight loss, to stop taking insulin, especially if they have had diabetes for a short period, now have a body mass index (BMI) < 30 kg/m^2 and are close to or at their HbA_{1c} target.

For further information on weight management, see: "Weight loss for the prevention and treatment of type 2 diabetes", Page 16 and **bpac.org.nz/2022/weight-loss.aspx**

When to seek further advice

Advice about an insulin regimen should be sought from a diabetes clinic in cases where:[3]

- The patient is a child or adolescent
- The patient is very lean or has lost weight rapidly – testing for glutamic acid decarboxylase (GAD) autoantibodies indicating type 1 diabetes may be appropriate
- There is repeated hypoglycaemia
- The patient is a vocational driver
- HbA_{1c} levels remain above target following insulin initiation and titration – the HbA_{1c} target should ideally be reached within three to six months of treatment initiation and optimisation[4]

Choosing an insulin regimen

There are three main types of insulin regimens used by people with type 2 diabetes: basal, basal-bolus and biphasic. Selection of a regimen should be guided by the pattern of blood glucose results and individual patient factors (also see: "Treatment intensification: basal-bolus or biphasic?"). Typically, people with type 2 diabetes are initiated on basal insulin.

For a schematic representation comparing the duration of different insulins, see: **www.nzf.org.nz/nzf_3629**

Basal regimens use an intermediate/long-acting insulin (basal insulin) injected once or twice daily. Basal insulin reduces HbA_{1c} by controlling hepatic glucose production. There are two types of basal insulin available fully funded in New Zealand (see: "Funded insulins available in New Zealand" for brand names and product variations):

- Isophane insulin (e.g. Humulin NPH or Protaphane), also known as NPH* insulin, is an intermediate-acting insulin – suitable for most patients
- Insulin glargine (e.g. Lantus), an insulin analogue, is a long-acting insulin – consider switching to this insulin if patients have significant hypoglycaemia with isophane insulin[5]

* Neutral Protamine Hagedorn (NPH)

Basal-bolus regimens use a rapid/short-acting (bolus) insulin injected before or with meals and snacks and an intermediate/long-acting (basal) insulin injected once or twice daily. Rapid/short-acting formulations reduce HbA_{1c} by decreasing post-prandial glucose levels. Basal-bolus insulin regimens are usually administered as a flexible dose (i.e. carbohydrate counting to match insulin requirements to the carbohydrate content of the upcoming meal) but some patients may use a fixed dose, depending on their circumstances, e.g. if they are unable to count carbohydrates.

For information on carbohydrate counting, see: **bpac.org.nz/2019/diabetes-insulin.aspx**

Biphasic regimens use an intermediate-acting insulin mixed with a short-acting insulin, injected twice daily, i.e. before breakfast and dinner. Biphasic regimens are an alternative to basal-bolus regimens for patients who are taking basal insulin and require treatment intensification. A variety of pre-mixed biphasic insulins with differing proportions of intermediate-acting and short-acting insulin are funded (Table 2). A reasonable initial choice is a biphasic insulin containing a rapid-acting insulin analogue, e.g. Humalog Mix25 (biphasic insulin lispro) or Novomix30 (insulin aspart), because of the faster onset of action than those containing human neutral insulin, allowing patients to "inject and eat". Humalog Mix50

Funded insulins available in New Zealand

Tables 1 and 2 show the funded insulin brand names and product variations available in New Zealand. The delivery device depends on the type of insulin used. There is some variability in the pens provided by different manufacturers which may make one preferable to another, e.g. maximum number of doses, whether they deliver insulin in half-unit increments, size of the dial, pressure needed on the injection button to deliver the dose.[11] "Memory pens" that remember the time and size of the last dose are also available.

In order to reduce the risk of prescription errors with insulin ensure:

- To use the full brand name of the insulin when prescribing – take care with products that have similar names, e.g. Humalog, Humalog Mix and Humulin; Novomix and Novorapid
- The patient understands their regimen, i.e. the type(s) of insulin and when to use, and knows to discuss with the prescriber if their prescription is different from usual
- The patient knows to discuss with the pharmacist if the product or packaging looks different from what they usually receive
- Ensure that any changes in insulin regimen are explained to the patient and clearly understood

Table 1: Funded short, intermediate and long-acting insulins as of June, 2022.[12]

Insulin	Manufacturer	Brand	Formulation*	Injection device**	Time course (subcutaneous injection)
Rapid/short-acting insulin					
Insulin aspart	Novo Nordisk	Novorapid	10 mL vial × 1	Prescribe injection syringes with attached needle	Onset: 10 – 20 minutes Peak: 1 hour Duration: 2 – 5 hours
		Novorapid Penfill	3 mL cartridge × 5	Use with Novo Nordisk insulin delivery systems	
		Novorapid FlexPen	3 mL prefilled disposable device × 5		
Insulin glulisine	Sanofi-Aventis	Apidra	10 mL vial × 1	Prescribe injection syringes with attached needle	
			3 mL cartridge × 5	Use with the following reusable injection pens: - AllStar - AllStar Pro - JuniorStar - ClikStar	
		Apidra Solostar	3 mL disposable device × 5		
Insulin lispro	Eli Lilly	Humalog	10 mL vial × 1	Prescribe injection syringes with attached needle	
			3 mL cartridge × 5	Use with HumaPen injection device	

Table continued on next page

Insulin	Manufacturer	Brand	Formulation*	Injection device**	Time course (subcutaneous injection)
Short-acting insulin					
Human neutral insulin	Novo Nordisk	Actrapid	10 mL vial × 1	Prescribe injection syringes with attached needle	Onset: 30 – 60 minutes Peak: 2 – 4 hours Duration: up to 8 hours
			3 mL cartridge × 5	Use with Novo Nordisk insulin delivery systems	
	Eli Lilly	Humulin	10 mL vial × 1	Prescribe injection syringes with attached needle	
		Humulin R	3 mL cartridge × 5	Use with HumaPen injection device	
Intermediate-acting insulin					
Isophane insulin	Eli Lilly	Humulin NPH	10 mL vial × 1	Prescribe injection syringes with attached needle	Onset: 1 – 2 hours Peak: 4 – 12 hours Duration: 8 – 24 hours
			3 mL cartridge × 5	Use with HumaPen injection device	
	Novo Nordisk	Protaphane	10 mL vial × 1	Prescribe injection syringes with attached needle	
		Protaphane Penfill	3 mL cartridge × 5	Use with Novo Nordisk insulin delivery systems	
Long-acting insulin					
Insulin glargine	Sanofi-Aventis	Lantus	10 mL vial × 1	Prescribe injection syringes with attached needle	Onset: 1 – 2 hours No pronounced peak Duration: 24 hours
			3 mL cartridge × 5	Use with the following reusable injection pens: ■ AllStar ■ AllStar Pro ■ JuniorStar ■ ClikStar	
		Lantus SoloStar	3 mL disposable device × 5		

* All funded insulin formulations are at a concentration of 100 units/mL. Three months' supply may be dispensed at one time if endorsed "certified exemption" by the prescriber or pharmacist.

** Injection syringes and pen needles may be prescribed with subsidy if prescribed on the same form as insulin or if the patient has previously had a prescription of insulin and the prescription is endorsed; pharmacists may endorse the prescription if there is a prior record of insulin dispensing[13]

Table 2: Funded biphasic insulins as of June, 2022.[12]

Insulin	Manufacturer	Brand	Mix	Rapid/short-acting insulin component	Intermediate-acting insulin component	Formulation*	Injection devices**
Biphasic insulin lispro	Eli Lilly	Humalog Mix25	25/75	Insulin lispro 25 units/mL	Insulin lispro protamine‡ 75 units/mL	3 mL cartridges × 5	For use with HumaPen injection device
		Humalog Mix50	50/50	Insulin lispro 50 units/mL	Insulin lispro protamine‡ 50 units/mL	3 mL cartridges × 5	
Biphasic isophane insulin	Eli Lilly	Humulin 30/70	30/70	Neutral human insulin 30 units/mL	Isophane insulin 70 units/mL	10 mL vial × 1	Prescribe injection syringes with attached needle
						3 mL cartridge × 5	For use with HumaPen injection device
	Novo Nordisk†	Mixtard 30	30/70	Neutral human insulin 30 units/mL	Isophane insulin 70 units/mL	10 mL vial × 1	Prescribe injection syringes with attached needle
		Penmix 30	30/70	Neutral human insulin 30 units/mL	Isophane insulin 70 units/mL	3 mL cartridge × 5	For use with Novo Nordisk insulin delivery systems
		Penmix 50	50/50	Neutral human insulin 50 units/mL	Isophane insulin 50 units/mL	3 mL cartridge × 5	
Biphasic insulin aspart	Novo Nordisk	Novomix 30	30/70	Insulin aspart 30 units/mL	Insulin aspart protamine‡ 70 units/mL	Prefilled disposable devices × 5 (FlexPen)	

* All funded insulin formulations are at a concentration of 100 international units/mL. Three months' supply may be dispensed at one time if endorsed "certified exemption" by the prescriber or pharmacist.

† Novo Nordisk brands of biphasic insulin isophane with insulin neutral (Mixtard 30, Penmix 30 and Penmix 50) **are being discontinued**. Penmix 40 was discontinued in 2022. Mixtard 30, Penmix 30 and Penmix 50 will continue to be listed on the Pharmaceutical Schedule until stock is exhausted (final shipment due by 30th September, 2024).

** Injection syringes, needles and pen needles are subsidised if prescribed on the same form as insulin or if the patient has previously had a prescription of insulin and the prescription is endorsed; pharmacists may endorse the prescription if there is a prior record of insulin dispensing[13]

‡ Insulin lispro protamine and insulin aspart protamine are intermediate-acting insulins that are only available as part of premixed biphasic preparations in New Zealand

may be helpful if the premixed insulin is administered with a large carbohydrate-based meal, particularly if the patient has postprandial hyperglycaemia with mixes containing 25% or 30% rapid/short-acting insulin.[1]

Patients using insulin should begin self-monitoring of blood glucose

Self-monitoring of blood glucose is recommended to help guide insulin dosing and meal planning. For patients with type 2 diabetes initiating basal insulin, a once daily measurement is usually sufficient, taken either:

- Before breakfast (fasting) if initiating insulin injections in the evening; OR
- Prior to evening dinner if initiating insulin injections in the morning

The aim of treatment is to achieve blood glucose levels between 6 – 8 mmol/L at these times.[3]

For some patients self-monitoring of blood glucose levels may be useful before initiating insulin to determine their daily pattern of glycaemia, e.g. before and after main meals for three days prior to initiation.

Various blood glucose meters are available fully funded

There are three blood glucose testing meters currently fully funded* for people with type 2 diabetes who are taking insulin:[6, 7]

- CareSens N – big screen and large numbers
- CareSens N Pop – small, slim meter; backlit for testing in low light environments
- CareSens N Premier – big screen and large numbers; bluetooth functionality

These meters all use the CareSens N blood glucose test strips. Patients should be encouraged to keep a record of their blood glucose measurements, as well as noting any changes to their normal diet, routine or health. Logbooks are available from diabetes clinics or diabetes medicine manufacturers. All funded blood glucose meters can be read by the SmartLog software supplied by the manufacturer at no cost to the patient. Patients should bring their meter and logbook to their appointments. A variety of smartphone apps are also available to record data.

* The CareSens-Dual meter measures blood glucose and blood ketones (using the CareSens PRO and KetoSens test strips); this meter is not funded for people with type 2 diabetes

N.B. Although mainly used by people with type 1 diabetes, continuous blood glucose monitoring may be useful in some people with type 2 diabetes taking insulin.[8] For further information on continuous blood glucose monitoring, see: **bpac.org.nz/2019/diabetes-insulin.aspx**

Patient information on diabetes smartphone apps is available from: **www.healthnavigator.org.nz/apps/d/diabetes-apps/**

Recommended initial isophane treatment regimen

New Zealand guidelines recommend starting with once daily basal insulin, administered in the evening to help reduce high blood glucose levels in the morning.[1] However, administering the injection in the morning may be appropriate for some patients who have increases in blood glucose levels throughout the day (Table 3).

Table 3. Patient characteristics to guide once daily dosing of basal insulin[9]

Once daily injections at night are suitable for patients:	Once daily injections in the morning are suitable for patients with:
■ With high blood glucose levels in the morning ■ At lower risk of nocturnal hypoglycaemia ■ Who can respond to a nocturnal hypoglycaemic event, e.g. have no mobility issues or can rely on assistance from others	■ Blood glucose levels that increase throughout the day ■ Increased risk of nocturnal hypoglycaemia ■ Increased risk of consequences of a nocturnal hypoglycaemia event, e.g. living alone, frailty, risk of falls

A weight-based approach is recommended to determine the initial basal insulin dose:[1]

- 0.1 units/kg daily if any of:
  - HbA_{1c} < 64 mmol/mol
  - BMI < 18 kg/m^2 (less likely to have type 2 diabetes)
  - Older (e.g. aged > 65 years) or frailty
  - Renal or liver failure
- 0.2 units/kg daily if HbA_{1c} > 64 mmol/mol and BMI > 18 kg/m^2

Patients will need to titrate the insulin dose upwards from this starting point based on their fasting blood glucose levels. Having patients adjust their own doses, rather than waiting for instructions from a clinician, is usually a more successful approach for achieving HbA_{1c} targets.[10]

There are different methods for titration; New Zealand guidelines recommend increasing the dose by 10% or 2 units if patients have three consecutive days of fasting blood glucose levels > 7 mmol/L (i.e. the dose can be increased every three days).[1]

The upwards titration of basal insulin should be stopped if:[1]

- Hypoglycaemia occurs (blood glucose levels < 4 mmol/L); OR
- Fasting blood glucose levels are < 7 mmol/L; OR
- Dose > 0.5 units/kg/day – consider adding a rapid/short-acting insulin (usually one dose with the largest meal)

If fasting blood glucose levels < 6 mmol/L are recorded, insulin doses should be reduced:[3]

- Between 4 – 6 mmol/L: decrease insulin dose by 2 units
- < 4 mmol/L: decrease insulin dose by 4 units

Treatment intensification: basal-bolus or biphasic?

Treatment intensification should be considered for patients who have not reached their HbA_{1c} target after three months' treatment with basal insulin, despite achieving fasting blood glucose levels < 7 mmol/L and/or taking a dose of 0.5 units/kg/day.[1] The choice of intensification to a basal-bolus or biphasic regimen should be based on patient characteristics and preference (Table 4).

Table 4. Factors influencing the choice between a basal-bolus and biphasic regimen[1]

Factor/characteristic	Basal-bolus	Biphasic (i.e. premixed)
Allows flexibility, e.g. for work patterns, exercise	Yes	No
Allows for varied diet and meal times	Yes	No
Likely requires rapid treatment intensification	Yes	No
Level of ability required to manage injections, e.g. cognitive, dexterity	Higher	Lower
Frequency of blood glucose monitoring	More frequent	Less frequent
Frequency of injections	More frequent	Less frequent

A treatment algorithm from the NZSSD type 2 diabetes management guideline (2021) is available from: **t2dm.nzssd.org.nz/Insulin-Algorithm.html**

Initiating a basal-bolus regimen

When adding bolus insulin to a basal regimen, start with a rapid-acting insulin immediately before the largest meal (also known as a "basal plus" regimen):[1]

- Start with 4 units or 10% of the basal dose (maximum starting dose is 10 units)
- Stop sulfonylurea once established on bolus insulin
- Continue lifestyle management and other glucose-lowering medicines
- Monitor blood glucose levels before and two hours after that meal
- Basal insulin dose may need to be reduced to prevent hypoglycaemia, particularly if HbA_{1c} levels < 64 mmol/mol

Increase the dose of rapid-acting insulin by 2 units if blood glucose level increase with the meal is > 3 mmol/L on three occasions. Adherence and injection technique should be checked before increasing doses.

Add bolus insulin at other meals if HbA_{1c} remains above the target or blood glucose levels increase by > 3 mmol/L at other meals. N.B. The doses of bolus insulin are likely to be different at different meals.

Add correction doses of rapid-acting insulin to treat pre-meal hyperglycaemia. The calculation is: 1 unit for every x mmol over 8 mmol/L, based on the total daily dose of basal + bolus insulin (see: Table 5 and Table 6). Initially it may be safer to limit the correction dose to a maximum of 6 – 10 units. Other correction doses may be added, e.g. before bed, but there should be at least three hours before correction doses.[1]

Table 5. Correction insulin dose calculation based on total daily insulin dose[1]

Total daily dose of basal + bolus insulin	Correction dose calculation
≤ 25 units/day	1 unit for every 4 mmol > 8 mmol/L
26 – 40 units/day	1 unit for every 3 mmol > 8 mmol/L
41 – 75 units/day	1 unit for every 2 mmol > 8 mmol/L
≥ 76 units/day	1 unit for every 1 mmol > 8 mmol/L

Managing hypoglycaemia

Symptomatic hypoglycaemia can occur when a person's blood glucose level falls below 4.0 mmol/L.[1] People taking insulin need to be alert for the symptoms of hypoglycaemia and know how to manage the condition. The most common reasons for hypoglycaemia occurring in a person with type 2 diabetes are a lack of food, an increase in physical activity, administration of insulin or less commonly, a sulfonylurea, administering insulin into new sites if previous sites had lipohypertrophy, declining renal function or consumption of alcohol without food.[1]

Symptoms of hypoglycaemia include:[1]

- Hunger
- Blurred vision, headache, light-headedness
- Loss of concentration, confusion, irritability, fatigue
- Sweating, tingling around mouth and lips, trembling, weakness and possible loss of consciousness

A person with diabetes who suspects they are hypoglycaemic should stop what they are doing, sit down and check their blood glucose level. Hypoglycaemia is treated by consuming rapid-acting carbohydrate: 0.3 g/kg of body weight **OR** 30 g total (see below). N.B. weight-based management of hypoglycaemia is more effective.[1]

Examples of 30 g* of rapid-acting carbohydrate include:[1]

- 10 Dextro-Energy or Vita glucose tablets or 6 BD brand glucose tablets
- 30 g of glucose powder
- 6 teaspoons of sugar dissolved in water
- 350 mL of fruit juice or non-diet/zero soft drink
- 18 jellybeans
- 2 tablespoons of honey
- 3 tablespoons of jam
- 2 Hypofit gels

* Previously, a lower dose, e.g. 12 – 15 g was recommended. However, data from a 2018 New Zealand-based study has shown that 30 g glucose is more effective than the lower doses at resolving hypoglycaemia in people with type 2 diabetes.[14]

After ten minutes blood glucose levels should be reassessed and more glucose taken if required. This process should continue until blood glucose levels are above 4.0 mmol/L. A carbohydrate snack such as a slice of toast, two biscuits or crackers with cheese should then be eaten and blood glucose levels rechecked after 30 minutes.[1] Encourage patients to report any episodes of hypoglycaemia to their general practice as a change in insulin dose may be needed. The use of a MedicAlert bracelet is also recommended.

Ensure patients and their family/whānau are aware that if they experience a lowered level of consciousness, unusual behaviour or seizures, immediate medical attention must be sought (i.e. call an ambulance).

Best Practice tip: Patients who believe they may be experiencing nocturnal hypoglycaemia can confirm this by setting an alarm and performing a blood glucose test during the night (e.g. at 3 am) on several occasions.

Example of how to calculate a correction dose of insulin

If a patient is taking 40 units of basal insulin once daily (evening dosing) and 10 units of bolus insulin with meals their total daily dose is 70 units per day, so their starting correction is 1 unit for every 2 mmol > 8 mmol/L.

Table 6. Example correction insulin dose based on blood glucose levels and total daily dose of 70 units insulin daily[1]

Blood glucose level (mmol/L)	Correction dose of insulin (unit)	Total insulin dose (bolus + correction) with meal (unit)
< 10	0	10
10 – 11.9	1	11
12 – 13.9	2	12
14 – 15.9	3	13
16 – 17.9	4	14
18 – 19.9	5	15
≥ 20	6	16

Initiating a biphasic regimen

Emphasise to patients the importance of premixing insulin by gently inverting the device before each use to reduce the risk of hypoglycaemia.

The type of biphasic regimen depends on whether the patient predominantly has one large meal per day or multiple meals per day (Table 7). Adherence and injection technique should be checked before any dose increases.

If after three months of optimised treatment HbA_{1c} levels remain above the target, consider:[1]

- Switching one or both injections to Humalog Mix50 if significant hyperglycaemia after meals
- Adding bolus insulin at other meals if blood glucose levels increase > 3 mmol/L at these times (e.g. lunch, large snacks)
- Switching to a basal-bolus regimen

Education is key for patients initiating insulin

Ongoing advice and education are paramount to ensure patients are confident with their prescribed insulin regimen.

An initial session for patients starting insulin should cover:[1, 3, 4]

- Self-monitoring of blood glucose levels
- How to use their injection device, injection technique and rotation of injection sites

Table 7. Guide for initiating biphasic insulin in people with type 2 diabetes[1]

Predominately one large meal per day	Multiple meals per day
Start **once daily** premixed insulin: ■ Convert the daily dose of basal insulin to premixed insulin ■ Administer before the largest meal ■ Monitor blood glucose levels before and two hours after that meal ■ Increase dose by 10% if blood glucose level increase with that meal is > 3 mmol/L and fasting blood glucose level is > 10 mmol/L	Start **twice daily** premixed insulin: ■ Convert the daily of dose basal insulin to premixed insulin ■ Administer half the dose before breakfast and the other half before dinner; consider a different ratio if there is a large difference in meal sizes or the patient is older, e.g. 2/3 of the total daily insulin dose before the larger meal and 1/3 before the smaller meal; older people should have lower evening doses ■ Monitor blood glucose levels before and two hours after that meal ■ If on three occasions blood glucose levels increase > 3 mmol/L with breakfast and pre-dinner blood glucose levels are > 10 mmol/L, increase the breakfast dose by 10% ■ If on three occasions blood glucose levels increase > 3 mmol/L with dinner and pre-breakfast blood glucose levels are > 10 mmol/L, increase the dinner dose by 10%

- Appropriate storage of insulin and disposal of injection devices and needles
- How to titrate the insulin dose based on self-measurement of blood glucose levels
- What to do during disruptions to their typical daily routine, such as if they are acutely unwell, miss meals or are travelling
- Managing hypoglycaemia (see "Managing hypoglycaemia", Page 44), including how diet and exercise can affect the risk, recognising symptoms, testing blood glucose levels during suspected hypoglycaemia and how to respond if levels are too low
- Driving safely while using insulin and any impact using insulin may have on their fitness to drive (see: **t2dm.nzssd.org.nz/Section-100-Diabetes-and-driving**)
- Use of a Medic Alert bracelet

The initial session will likely require a longer consultation time and/or a team approach with the general practitioner, nurse practitioner or practice nurse; consider referral to a diabetes nurse specialist or education programme covering the above points if offered by the local DHB or PHO.

After the initiation of insulin, make regular contact with the patient, e.g. phone calls from the practice nurse with in-person or virtual consultations, as required, until satisfactory glycaemic control is achieved.

Further resources

Diabetes group education classes are offered by local Diabetes Centres. Diabetes New Zealand provides additional information on subjects such as healthy eating and exercise as well as providing links to support groups and research publications.

Pamphlets for patients can be downloaded or ordered from: **www.diabetes.org.nz/pamphlet-ordering**

The Diabetes New Zealand "Take Control Toolkit" for patients is available at no cost as a smartphone app: **https://www.diabetes.org.nz/take-control-toolkit**

Acknowledgement: This article is a revision of an original article published by bpac[nz] in 2012. The original article was reviewed by **Dr Rick Cutfield**, Physician and Endocrinologist, Mercy Specialist Centre, Waitematā DHB and **Gavin Hendry**, Clinical Nurse Specialist-Diabetes, Southern District Health Board.

N.B. Expert reviewers do not write the articles and are not responsible for the final content. bpac[nz] retains editorial oversight of all content.

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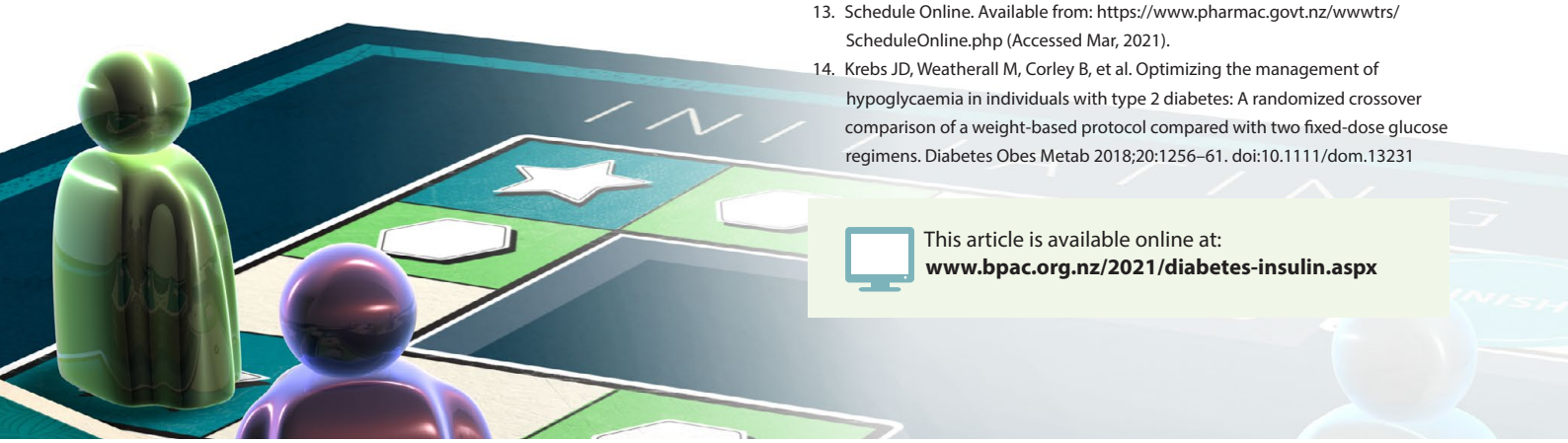

This article is available online at:
www.bpac.org.nz/2021/diabetes-insulin.aspx