National Diabetes Services Scheme

An Australian Government Initiative

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Clinical guiding principles for sick day management of adults with type 1 diabetes or type 2 diabetes

A guide for health professionals

Your trusted partner in diabetes care

ADEA is a National Health Professional Body Agent for the NDSS.

The NDSS is administered by Diabetes Australia

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If you require further information about this resource, please contact ADEA on **02 6287 4822** or email. **admin@adea.com.au**.

Contents

Background and Acknowledgements

In 2006, the ADEA released Guidelines for Sick Day Management for People with Diabetes.

The guidelines were reviewed in 2011 by the Baker IDI,with input from the ADEA Clinical Practice Committee and Australian Diabetes Society (ADS) and updated again in 2016 by the ADEA Clinical Practice Committee and in 2020 by an Expert Advisory Group along with feedback from ADEA members on the previous versions of the guidelines and associated materials and input from people living with diabetes.

In 2024, the guidelines and associated consumer education materials were again reviewed and updated. This version of the guidelines reflects current evidence and expert opinion from a project Expert Advisory Group.

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The NDSS is an initiative of the Australian Government administered by Diabetes Australia. The NDSS aims to enhance the capacity of people with diabetes to understand and self- manage their life with diabetes. Please refer people with diabetes to the NDSS Helpline on **1800 637 700** or **ndss.com.au** for information, self-management support or products.

The ADEA is the leading Australian organisation for health care professionals providing diabetes care and education. The ADEA actively promotes evidence-based best practice diabetes education to ensure optimal health and wellbeing for all people affected by, and at risk of, diabetes.

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Abbreviations

The following abbreviations are used throughout this document:

ADEA	Australian Diabetes Educators Association
ADS	Australian Diabetes Society
CDE	Credentialled Diabetes Educator
CGM	Continuous glucose monitoring
DKA	Diabetic ketoacidosis
HHS	Hyperosmolar hyperglycaemic state
IPT	Insulin pump therapy
MDI	Multiple daily injections
NDSS	National Diabetes Services Scheme
ORS	Oral rehydration solutions
SGLT2	Sodium-glucose transport protein 2
TDD	Total daily dose

Definitions

Sick day is a short-term illness or infection which requires a person with diabetes to make changes to their usual diabetes management to prevent hyperglycaemia, hypoglycaemia and the development of diabetic ketoacidosis (DKA) or hyperglycaemic hyperosmolar state (HHS).

Intercurrent illness in people with diabetes is an illness which is unrelated to diabetes, but which may impact a person's diabetes management.

Hyperglycaemia is a high blood glucose level which may occur for several reasons, including the stress of an illness or infection. While hyperglycaemia is generally defined as a blood glucose level above 10.0 mmol/L, symptoms of hyperglycaemia may not occur until blood glucose levels are even higher. Blood glucose levels above 15.0 mmol/L, particularly in the setting of illness and/or positive ketones, require prompt treatment to reduce the risk of a hyperglycaemic emergency (DKA or HHS).

Ketones are produced by the liver from breakdown of fat when glucose is not readily available, to provide the body with an alternative source of energy. There are three ketones produced in the body: acetoacetate (AcAc), 3-beta- hydroxybutyrate (3βHB) and acetone.

Diabetic ketoacidosis (DKA) is a severe, life-threatening acute complication of diabetes, resulting from absolute or relative insulin deficiency. It occurs mostly in people with type 1 diabetes but can also develop in those with type 2 diabetes who have low insulin secretion or who are taking sodium-glucose transport protein 2 (SGLT2) inhibitors. It is characterised by hyperglycaemia, hyperketonaemia and metabolic acidosis, although euglycaemic DKA can also develop, particularly in those who are taking SGLT2 inhibitors. Diagnostic criteria include a blood glucose level above 11.0 mmol/L or known diabetes, arterial pH below 7.3 and serum bicarbonate below 15.0 mmol/L, and ketonaemia (>3.0 mmol/L) or significant ketonuria.[1]

Euglycaemic DKA is the presence of metabolic acidosis (arterial pH below 7.3 and serum bicarbonate below 15.0 mmol/L) and ketosis (moderate-to-severe ketonuria or ketonemia) without hyperglycaemia).[1]

Hyperglycaemic hyperosmolar state (HHS) is a severe, life-threatening acute complication of diabetes, occurring mostly in people with type 2 diabetes and characterised by severe hyperglycaemia and dehydration. Diagnostic criteria include a plasma glucose level above 30.0 mmol/L, serum osmolality above 320 mmol/kg, and no appreciable metabolic acidosis or ketonaemia.[2]

Hypertonic fluids are fluids with higher concentrations of solutes (such as salts and sugars) compared to plasma and intracellular fluid. They are absorbed from the stomach more slowly than weaker fluids so don't rehydrate as quickly. They also draw water from body tissues into the gut, potentially increasing dehydration. Examples include undiluted fruit juices and sugar-sweetened soft drinks.

Introduction

Managing diabetes during an intercurrent illness is a challenging and crucial aspect of diabetes care.

Sick day management plans are an integral component of diabetes education. The development of a sick day management plan along with education on sick day management should be provided at diagnosis and reviewed or updated at regular intervals. This is one of the most important activities Credentialled Diabetes Educators (CDEs) can undertake.

Sick day management education can empower people with diabetes to:

- recognise the signs and symptoms of illness
- understand the impact illness can have on blood glucose and ketone levels
- understand the self-management interventions that can minimise the effects of illness on glycaemic management
- recognise when medical assistance is required, who to contact and how to contact them, and when to present to emergency.

The purpose of these clinical guiding principles is to:

- Assist health professionals in providing best practice self-management advice and support for adults with type 1 and type 2 diabetes when they experience an intercurrent illness. They may also be suitable for adults with other types of diabetes.
- Reduce the risk of further acute deterioration of glycaemic management in people with diabetes who are unwell, resulting from either insufficient or ineffective sick day management intervention strategies.

The guidelines apply to non-inpatient management of adults with type 1 or type 2 diabetes (including pregnant women with pre-existing type 1 or type 2 diabetes) experiencing periods of minor intercurrent illness which require changes to the person's usual diabetes self-management practices. Non- inpatient settings include home, residential care and correctional facilities. The guidelines do not discuss diabetes management for hospital inpatients or the management of diabetic emergencies that require hospitalisation i.e. DKA, HHS and lactic acidosis.

They also don't discuss the sick day management of children or adolescents, or women with gestational diabetes.

For information on sick day management in children and adolescents, refer to the International Society for Paediatric and Adolescent Diabetes (ISPAD) Clinical Practice Consensus Guidelines 2022: Sick day management in children and adolescents with diabetes[3], available from **https://www.ispad.org/page/ISPADGuidelines**.

Diabetes and intercurrent illness

Acute illness may affect diabetes management in several ways, causing hyperglycaemia, hypoglycaemia or having no significant effect on blood glucose levels. Being unwell can also impact on a person's ability to self-manage their diabetes or require increased support from a carer.

Illness, particularly when severe, can lead to hyperglycaemia due to the activation of counter- regulatory hormones (including cortisol and adrenaline), which increase glucose production by the liver (gluconeogenesis) and reduce glucose uptake by peripheral tissues due to increased insulin resistance.[3] Blood glucose levels and insulin requirements are sometimes increased for a few days before the onset of the illness, during the incubation period, and may persist for a few days after the illness has passed.

Illnesses most likely to increase blood glucose levels include viral illnesses or bacterial infections, particularly if associated with fever.[3] If not managed appropriately, acute illness or infection can quickly lead to hyperglycaemia and in some cases may develop into diabetic ketoacidosis (DKA) and hyperosmolar hyperglycaemic state (HHS).

DKA and HHS are serious acute complications of diabetes that can be life-threatening. Both conditions are characterised by significant hyperglycaemia resulting from relative or absolute insulin deficiency and an increase in counter-regulatory hormones.[1,2]

DKA usually occurs in type 1 diabetes, where hyperglycaemia is accompanied by hyperketonaemia and metabolic acidosis.[1] It can also occur in people with type 2 diabetes with low insulin production and those taking SGLT2 inhibitors.[4,5] HHS is most commonly seen in older adults with type 2 diabetes and usually results in more severe hyperglycaemia, dehydration and plasma hyperosmolality with no appreciable metabolic acidosis and ketonaemia.[2]

Illness associated with vomiting and diarrhoea (e.g. gastroenteritis) may lower blood glucose levels and result in hypoglycaemia rather than hyperglycaemia.[3] Gastrointestinal illness can also increase the risk of euglycaemic DKA. Pregnant women with diabetes are at higher risk of hypoglycaemia and ketosis if emesis occurs.

Diabetic ketoacidosis and hyperosmolar hyperglycaemic state are serious acute complications of diabetes that can be life-threatening.

Key concepts of sick day management plans

A number of key concepts are vital in the development of a sick day management plan for individuals with both type 1 and type 2 diabetes.

- All individuals with diabetes and members of their support team require appropriate, timely and ongoing education from a CDE or other diabetes health professional to correctly and confidently manage their diabetes when unwell.
- Sick day management education and a sick day management plan must be provided soon after initial diagnosis as an integral part of survival skills information, particularly for people with type 1 diabetes, and be regularly reviewed for their understanding of implementing a diabetes sick day management plan. The latter could be done as part of an annual cycle of care and/or complications assessment.
- Sick day management plans should identify and clearly articulate the role of the person with diabetes and of relevant members of their multidisciplinary team. This will potentially include their support person(s), their diabetes care team (including the endocrinologist/diabetologist, credentialled diabetes educator, general practitioner, nurse practitioner and dietitian) and other relevant team members (e.g. indigenous health worker, mental health case worker, residential staff). Ideally, all members of this team should be offered the opportunity of being involved in developing and/or reviewing the sick day management plan. A sick day management plan should be followed at the first signs of the person with diabetes feeling unwell.
- Factors that might dictate the need for a review of the sick day management plan include changes in diabetes treatment, the development of diabetes-related complications or other comorbidities, a recent hospital admission due to illness, transition from paediatric to adult services, changes in employment, geographical relocation, pregnancy or travel.
- Sick day management plans for other medical conditions should be cognisant of diabetes.
- Sick day management concepts and strategies will be different for people with type 1 diabetes and those with type 2 diabetes. They may differ within the population of people with type 2 diabetes depending on their diabetes management (e.g. with insulin, other glucose lowering agents or diet only). They will also vary with different types and severity of intercurrent illness and with the presence or absence of vomiting and/or diarrhoea.
- The sick day plan and sick day education also needs to take into account factors such as type of diabetes and treatment, other medical conditions, life expectancy, remoteness from acute medical services, available support persons and services, previous experiences with acute illness, physical and cognitive capacity and the health literacy and English literacy of the person with diabetes and their carers.
- Individual sick day management plans should be developed for people with diabetes in the supported residential care environment and correctional institutions. Organisations caring for people with diabetes also need to develop clear policies and procedures to support individuals with diabetes during times of illness.[6,7]
- All aspects of education related to sick day management plans and their development must be documented in the person's medical record as well as a copy given to the person with diabetes or their carers for safekeeping and future reference.
- The person with diabetes should see their GP or other relevant health professional for treatment of the underlying illness or infection.
- People with diabetes and their carers should be familiar with the signs and symptoms of illness that warrant immediate emergency care and should act accordingly.
- The person with diabetes (and support team) should remain alert to the signs and symptoms of hypoglycaemia during illness.
- The use of sugar-free medicines is not essential.
- Health professionals must recognise that diabetes-related complications, in particular gastroparesis, can mimic illness by producing symptoms such as nausea, vomiting, anorexia and abdominal pain.
- Following an episode of illness, the health care team should review and evaluate the sick day management plan with the person with diabetes and their carers to determine whether the plan was implemented, whether it was successful and to determine if any changes need to be made to the plan and/or if further education is needed around sick day management. This can be achieved by asking at each review appointment whether the person has been unwell and, if so, whether their sick day plan was used.

Components of a sick day management plan

A sick day management plan should include:

- Guidance on when to commence and cease a sick day management plan.
- Recommended frequency and amount of fluids to reduce the risk of dehydration, and carbohydrate-containing food and fluids to reduce risk of hypoglycaemia and the development of ketones.
- The frequency of blood glucose monitoring and, if appropriate, blood or urine ketone testing.
- When, if using CGM, to confirm readings with or switch to using fingerprick blood glucose monitoring–for example, when following up the treatment of hypoglycaemia and if there is a discrepancy between their sensor glucose and their symptoms or what they expect.
- Advice on the cessation/adjustment and recommencement of diabetes medications.
- Recommended additional medication useful to address clinical symptoms of illness, e.g. antiemetic and antidiarrhoeal agents.
- Clinical criteria to trigger contact with the diabetes care team.
- Name and phone number for contact with the diabetes health care provider/department including for times outside office hours, weekends and public holidays.
- Medical facility to which to present or phone if the sick day management plan is not effective or if the person's condition further deteriorates or their usual health care team is not contactable and when to call for an ambulance (**000**).
- Contents of a sick day management kit which is adaptable to other situations, such as travel.
- Regular checking of a sick day management kit to ensure all items are within their expiry dates.

Key concepts for sick day management – type 1 diabetes

1. A sick day management plan should be tailored to the individual needs of the person with diabetes and be initiated at the first signs of an illness that impacts their metabolic status (i.e. causing hyperglycaemia and/or ketosis) and/or their ability to self-manage their diabetes.

2. People with type 1 diabetes (and/or their carers) should be alert to the signs and symptoms of significant hyperglycaemia and DKA including:
   - nausea, vomiting and/or abdominal pain
   - increased thirst and/or a dry mouth
   - polyuria
   - deep and laboured breathing (Kussmaul breathing)
   - a fruity-smelling breath
   - feeling drowsy, weak or confused.

3. More frequent blood glucose monitoring (using capillary glucose monitoring or continuous glucose monitoring) is needed during episodes of illness:
   - every 2-4 hours if blood glucose levels are elevated (above 13 mmol/L) and ketones are normal (below 0.6 mmol/L on blood test OR negative/trace on urine test)
   - every 1-2 hours when ketones are present
   - every 15 minutes if blood glucose levels are 4.0 mmol/L or below and then hourly for 3-4 hours once levels are back above 4.0 mmol/L.

4. Fingerprick blood glucose monitoring should be used in place of CGM when following up treatment of hypoglycaemia and when sensor readings don't match the person's symptoms. Sensor readings should also be confirmed with fingerprick glucose readings for those using Medtronic Guardian 4 when taking paracetamol (and for those using Dexcom G6 if taking more than 1000mg paracetamol every 6 hours) and for those using the Freestyle Libre 2 when taking more than 500mg/day of vitamin C.

5. Ketone levels should be measured during episodes of illness:
   - when blood glucose levels have been above 13 mmol/L for 6 hours or more (2-4 hours in those on an insulin pump or women who are pregnant)
   - every 2-4 hours while blood glucose levels remain above 13 mmol/L
   - every 1-2 hours once ketones have been detected or the person has symptoms suggestive of DKA
   - every 1-2 hours if the person has persistent vomiting and/or diarrhoea or poor oral intake, regardless of blood glucose levels.

6. Blood ketone levels above 0.6 mmol/L or positive urine ketones (more than trace) indicate the development of ketosis and the need to take appropriate action to prevent DKA.

7. Blood ketone testing is the preferred method of measuring ketosis (see page 22). Urine ketone monitoring may be used where blood ketone testing is not available.

8. People with type 1 diabetes (and/or their carers) should be reminded to never discontinue taking insulin, especially basal insulin. However, adjustments to insulin doses may be required, as follows:
   - those on insulin injections should take supplemental doses (see page 12) of rapid-acting insulin according to the table on page 14
   - those using an insulin pump should adjust their insulin doses/basal rates according to the guidelines on page 15-17 depending on which pump they are using
   - pre-meal short/rapid-acting insulin may need to be reduced if dietary carbohydrate intake is low and blood glucose levels are not elevated.

9. Maintenance of food and fluid intake is important to reduce the risk of dehydration and to prevent hypoglycaemia and the development of ketones.

10. Individuals using an insulin pump should be advised:
    - to change their cannula and entire infusion set if blood glucose levels are elevated and ketones present
    - that they may need to switch back to manual mode if they are using a hybrid closed loop pump and the pump algorithm is unable to manage the change in insulin needs for illness, they may need to adjust how they use their pump, and this will depend on which pump they are using (see pages 15-17 and Appendix 3)
    - that if they have high blood glucose and ketone levels and don't have an intercurrent illness, this may be from an infusion set or pump failure.

11. Although not yet TGA approved, SGLT2 inhibitors are increasingly used by people with T1D and may increase the risk of DKA. These medications should be ceased during illness and not resumed until recovery, following consultation with a healthcare provider.

Supplemental insulin

Supplemental doses of insulin are defined as:

- Doses of rapid or short-acting insulin given in addition to usual insulin dose(s). Usual doses include prescribed correction doses for those managed with flexible insulin therapy using insulin pump therapy (IPT) or multiple daily injections (MDI).
- Insulin to be given immediately (but not closer than two hours to the previous dose of rapid-acting insulin) and not delayed until the time that the next prescribed usual insulin dose is due.

Supplemental insulin doses are calculated as a percentage of the total daily dose, i.e. percentage of the total of rapid/short and intermediate/long/ultralong-acting usually taken in a 24-hour period.

Example of how to calculate extra insulin dose:

Usual daily doses	Morning	Lunch	Dinner	Evening
Rapid/short-acting insulin	6	4	8	
Long-intermediate acting insulin	10			12
Total daily dose (TDD)	40U			

5% of TDD	2U
10% of TDD	4U
20% of TDD	8U

Insulin dose adjustment table

Total Daily Dose (TDD) units	Extra 5% rapid or short-acting insulin	Extra 10% rapid or short-acting insulin	Extra 20% rapid or short-acting insulin
1 to 10	0.0-0.5 units	0.5-1 units	0.5-2 units
11 to 20	0.5-1.0 units	1-2 units	2-4 units
21 to 30	1.0-1.5 units	2-3 units	4-6 units
31 to 40	1.5-2.0 units	3-4 units	6-8 units
41 to 50	2.0-2.5 units	4-5 units	8-10 units
51 to 60	2.5-3.0 units	5-6 units	10-12 units
61 to 70	3.0-3.5 units	6-7 units	12-14 units
71 to 80	3.5-4.0 units	7-8 units	14-16 units
81 to 90	4.0-4.5 units	8-9 units	16-18 units
91 to 100	4.5-5.0 units	9-10 units	18-20 units

Type 1 diabetes: multiple daily injections

Individuals with type 1 diabetes using multiple daily injections (MDI) should be advised to follow their sick day management plan when they experience one or more of the following:

- They feel unwell, even if their blood glucose level is within their target range.
- Their blood glucose level is greater than 13 mmol/L for 2-4 hours or more, even if they feel well.
- They have positive ketones (0.6 mmol/L or higher on blood test OR more than trace on urine test) in their urine or blood.

Sick day plan: basic guidelines

Individuals with type 1 diabetes using MDI who are unwell should be advised to:

- Check blood or CGM glucose and ketone levels at least every 2 hours if ketones are above 0.6 mmol/L and at least every 4 hours if ketones are less than 0.6 mmol/L. Capillary blood glucose monitoring is recommended in addition to CGM.
- Always continue taking their basal insulin.
- Continue to eat and drink if possible.
- Try to have 125-250 mL of fluid per hour to avoid dehydration (for individuals without fluid restrictions).
- Treat episodes of hypoglycaemia with 15g rapid-acting carbohydrate and repeat hypo treatment every 15 minutes until above 4 mmol/L.
- If blood glucose and/or ketones are elevated, use the guidelines below to adjust insulin doses.
- If they have significant vomiting and/or diarrhoea, see separate guidelines on page 18 (***Type 1 diabetes: vomiting and/or diarrhoea***).
- Present to hospital if blood ketones remain above 1.5 mmol/L and blood glucose remains above 13 mmol/L following two correction doses given 2 hours apart.

Insulin adjustment: no ketones

If ketones are normal (below 0.6 mmol/L on blood test OR negative/trace on urine test), the person with diabetes should be advised to:

- Continue to check blood glucose levels at least every 2 hours and ketones at least every 4 hours.
- Use their usual carb ratio when eating or drinking carbohydrate foods or fluids.
- Use their usual correction doses to correct elevated blood glucose levels every 4 hours, even if they are not eating.

Insulin adjustment: elevated ketones

If ketones are present (0.6 mmol/L or higher on blood test OR more than trace on urine test) the person should be advised to adjust insulin doses according to **Table 1** on the following page and increase blood glucose and ketone monitoring to every 2 hours.

Table 1: Insulin adjustment: multiple daily injections with elevated ketones

KETONES	GLUCOSE LEVEL			
	Less than 4 mmol/L	4.1-8.0 mmol/L	8.1-13.0 mmol/L	Above 13.0 mmol/L
Blood: 0.6-1.5 mmol/L Urine: small (+)	» Treat hypoglycaemia with 15g fast-acting carbohydrate » Recheck blood glucose and repeat hypo treatment every 15 minutes until blood glucose is above 4 mmol/L » Recheck ketones in 2 hours	» Check blood glucose and ketones every 2 hours » Eat or drink carbohydrate foods or fluids and give rapid acting insulin using your usual carb ratio » Continue usual basal insulin	» Check blood glucose and ketones every 2 hours » Give 5-10% of TDD as rapid-acting insulin every 2 hours until ketones are less than 0.6 mmol/L » Use usual carb ratio when eating or drinking carbohydrate foods or fluids » Continue usual basal insulin	» Check blood glucose and ketones every 2 hours » Give 10-15% of TDD as rapid-acting insulin every 2 hours until ketones are less than 0.6 mmol/L » Use usual carb ratio when eating or drinking carbohydrate foods or fluids » *If glucose levels remain high, increase usual basal insulin by 10% and continue until ketones are less than 0.6 mmol/L*
Blood: above 1.5 mmol/L Urine: moderate/large (++/+++)	» Treat hypoglycaemia with 15g fast-acting carbohydrate » Recheck blood glucose and repeat hypo treatment every 15 minutes until blood glucose is above 4 mmol/L » Recheck ketones in 2 hours	» Check blood glucose and ketones every 2 hours » Eat or drink carbohydrate foods or fluids and give rapid acting insulin using your usual carb ratio » Continue usual basal insulin	» Check blood glucose and ketones every 2 hours » Give 10-15% of TDD as rapid-acting insulin every 2 hours until ketones are less than 0.6 mmol/L » Use usual carb ratio when eating or drinking carbohydrate foods or fluids » Continue usual basal insulin	» Check blood glucose and ketones every 2 hours » Give 15-20% of TDD as rapid-acting insulin every 2 hours until ketones are less than 0.6 mmol/L » Use usual carb ratio when eating or drinking carbohydrate foods or fluids » *If glucose levels remain high, increase usual basal insulin by 20% and continue until ketones are less than 0.6 mmol/L*

Type 1 diabetes: insulin pump therapy

Individuals with type 1 diabetes using insulin pump therapy (IPT) should be advised to follow their sick day management plan when they experience one or more of the following:

- They feel unwell, even if their blood glucose level is within their target range.
- Their blood glucose level is greater than 13 mmol/L for 2 hours or more, even if they feel well.
- They have positive ketones in their urine or blood.

Sick day plan: basic guidelines

Individuals with type 1 diabetes using IPT who are unwell should be advised to:

- Check blood glucose and ketone levels every 2 hours, even if they are using CGM. Capillary blood glucose monitoring is recommended in addition to CGM.
- Always keep taking their basal insulin (via their pump basal delivery).
- Continue to eat and drink if possible.
- Try to have 125-250 mL of fluid per hour to avoid dehydration (for individuals without fluid restrictions).
- Treat episodes of hypoglycaemia with 15g rapid-acting carbohydrate and repeat hypo treatment every 15 minutes until above 4 mmol/L (note: less carbohydrate, ~5-10g, is required on hybrid closed-loop pump).
- If blood glucose and/or ketones are elevated, change their insulin cartridge and infusion set (or Pod for the Omnipod DASH) and use the guidelines below to adjust insulin doses.
- If they have significant vomiting and/or diarrhoea, see separate guidelines on page 17.
- Present to hospital if blood ketones remain >1.5 mmol/L and blood glucose remains >13 mmol/L following two correction doses given 2 hours apart.

Insulin adjustment: no ketones

If ketones are normal (below 0.6mmol/L on blood test OR negative/trace on urine test), the person should be advised to:

- Continue to check blood glucose levels every 2 hours and ketones every 4 hours.
- Continue to bolus for carbohydrate foods and fluids using usual their usual carb ratio (via their pump bolus calculator).
- Give regular correction doses (every 2 hours) using their pump bolus calculator, even if they are not eating.

Insulin adjustment: elevated ketones

If ketones are present (0.6 mmol/L or higher on blood test OR more than trace on urine test) the person should be advised to adjust insulin doses according to **Table 2** on the following page.

To find their total daily dose (TDD) on each of the currently available pumps:

Pump	Instructions to find Total Daily Dose (TDD)
Medtronic 780G	Options → History → Summary → 7 days: Insulin Delivery Overview **OR** Check Carelink reports
Tandem TSlim:X2	Options → History → Pump History → TDD **OR** Check Glooko reports
Ypsopump	On pump: Data → Therapy Data **OR** App → Logbook **OR** Check Glooko reports
Omnipod DASH	Insulin and BG History → Scroll to 7 days → Insulin and carbs → Average total insulin **OR** Check Glooko reports

Table 2: Insulin adjustment: insulin pump therapy (no hybrid closed loop) with elevated ketones

KETONES	GLUCOSE LEVEL			
	Less than 4 mmol/L	4.1-8.0 mmol/L	8.1-13.0 mmol/L	Above 13.0 mmol/L
Blood: 0.6-1.5 mmol/L Urine: small (+)	» Treat hypoglycaemia with 15g fast-acting carbohydrate » Recheck your glucose level and repeat hypo treatment every 15 minutes until glucose is above 4 mmol/L » Recheck ketones in 2 hours	» Check glucose and ketones every 2hrs » Eat or drink foods or fluids containing at least 15-20g carbs and bolus using your usual carb ratio » Continue your usual basal rate	» Check glucose and ketones every 2hrs » Give 5–10% of TDD as correction bolus using a pen » Change infusion set and cartridge or Pod » If ketones remain high, continue to give correction doses of 5-10% of TDD every 2 hours using the pump (override pump bolus calculator and enter insulin units) » Bolus using usual carb ratio when eating or drinking carbohydrate foods or fluids	» Check glucose and ketones every 2hrs » Give 10-15% of your TDD as correction bolus using a pen » Change infusion set and cartridge or Pod » If ketones remain high, continue to give correction doses of 10-15% of TDD every 2 hours using the pump (override pump bolus calculator and enter insulin units) » Bolus using your usual carb ratio when eating or drinking carbohydrate foods or fluids » *If glucose levels remain high, increase pump basal rate by 20-30% (a temporary rate of 120-130%) and continue until ketones are less than 0.6 mmol/L*
Blood: above 1.5 mmol/L Urine: moderate/large (++/+++)	» Treat hypoglycaemia with 15g fast-acting carbohydrate » Recheck blood glucose and repeat hypo treatment every 15 minutes until blood glucose is above 4 mmol/L » Recheck ketones in 2 hours	» Check glucose and ketones every 2hrs » Eat or drink foods or fluids containing at least 15-20g carbs and bolus using your usual carb ratio » Continue your usual basal rate	» Check glucose and ketones every 2hrs » Give 10-15% of your TDD as correction bolus using a pen » Change infusion set and cartridge or Pod » If ketones remain high, continue to give correction doses of 10-15% of TDD every 2 hours using the pump (override pump bolus calculator and enter insulin units) » Bolus using your usual carb ratio when eating or drinking carbohydrate foods or fluids » *If glucose levels remain high, increase pump basal rate by 10-20% (a temporary rate of 110-120%) and continue until ketones are less than 0.6 mmol/L*	» Check glucose and ketones every 2hrs » Give 15-20% of your TDD as correction bolus using a pen » Change infusion set and cartridge or Pod » If ketones remain high, continue to give correction doses of 15-20% of TDD every 2 hours using the pump (override pump bolus calculator and enter insulin units) » Bolus using your usual carb ratio when eating or drinking carbohydrate foods or fluids » *If glucose levels remain high, increase pump basal rate by 30-50% (a temporary rate of 130-150%) and continue until ketones are less than 0.6 mmol/L*

Type 1 diabetes: hybrid closed-loop insulin pump therapy

Sick day plan: basic guidelines for hybrid closed-loop pumps

If the closed loop isn't managing the high blood glucose levels (blood glucose above 13 mmol/L for more than 2 hours) and/or ketones are present (above 0.6 mmol/L on blood test or small/moderate/large on urine test) the person with diabetes should be advised to:

1. Give the first correction dose via a pen using their usual correction factor if ketones are negative or using a percentage of total daily dose (TDD) according to the Table 2 on page 16 if ketones are present.
2. Change pump cartridge and entire infusion set.
3. Turn off the closed loop (Medtronic 780G Smartguard, Ypsopump Cam APS Automode or Tandem TSlim:X2 Control IQ) and follow sick day guidelines according to Table 2 on page 16. Individuals using the Tandem TSlim:X2 with Control IQ who have a sick day profile programmed can instead switch to the sick day pump profile with settings based on guidelines in Table 2.
4. When blood glucose levels return to target and ketones are normal, switch back to closed loop (Medtronic 780G Smartguard, Ypsopump Cam APS Automode or Tandem TSlim:X2 Control IQ) or to the usual pump profile (if using Tandem TSlim:X2 with a sick day profile) and continue to monitor blood glucose levels and ketones.
5. Present to hospital if blood ketones remain above 1.5 mmol/L and blood glucose remains above 13 mmol/L following two correction doses given 2 hours apart.

This process should also be followed if ketones are present due to an infusion set failure.

More detailed instructions for managing sick days on each of the currently available hybrid closed loop pumps are available in **Appendix 3**

Type 1 diabetes: vomiting and/or diarrhoea

If a person with type 1 diabetes has significant vomiting and/or diarrhoea and is finding it difficult to eat or drink, they are at a high risk of developing ketones (starvation ketones), even if blood glucose levels are low or within their target range. Nausea, vomiting and stomach pain are also symptoms of high ketones.

It is therefore important for individuals with type 1 diabetes to check blood glucose levels and ketones every 1-2 hours while they are unwell with vomiting and/or diarrhoea.

To reduce the risk of ketones, they should be advised to:

- Always keep taking their basal insulin (basal delivery on a pump or long-acting insulin injections), however the dose may need to be reduced if they have persistent low blood glucose levels.
- Try to have 125-250 mL of fluid per hour to avoid dehydration (for individuals without fluid restrictions). See page 24 for more details on maintaining hydration and fluid choices.
- Continue to eat and drink if possible and choose carbohydrate-containing foods and fluids. If they do not eat their usual meals, they should aim for around 15g of carbohydrate per hour (from either food or fluids) during waking hours.
- If they are vomiting, they should wait for 30 minutes after eating to give rapid-acting insulin for carbohydrate (to make sure they have kept the food down and their blood glucose level has risen).

They should also be advised to go to hospital if they:

- have persistent vomiting
- can't keep fluids down
- are unable to maintain their blood glucose level above 4.0 mmol/L
- develop high ketones (above 1.5 mmol/L on blood test or moderate/large in urine)
- are too unwell to self-manage their diabetes.

If a person with type 1 diabetes has significant vomiting and/or diarrhoea and is unable to eat or drink, they are at a high risk of developing ketones, even if blood glucose levels are low or within their target range.

Key concepts for sick day management – type 2 diabetes

1. A sick day management plan should be tailored to the individual needs of the person with diabetes and be initiated at the first signs of an illness that impacts their metabolic status (i.e. causing hypoglycaemia, hyperglycaemia and/or ketosis) and/or their ability to manage their diabetes.
2. People with type 2 diabetes (and/or their carers) should be alert to the signs and symptoms of significant hyperglycaemia and HHS including:
   - excessive thirst and/or a dry mouth
   - increased urination
   - feeling drowsy, weak or confused
   - warm, dry skin
   - fever.
3. More frequent blood glucose monitoring (using capillary glucose monitoring or continuous glucose monitoring) is needed during episodes of illness:
   - every 2-4 hours if blood glucose levels are above 15.0 mmol/L for 8 hours or more
   - every 10-15 minutes if blood glucose levels are 4.0 mmol/L or below and then hourly for 3-4 hours once levels are back above 4.0 mmol/L (for those at risk of hypoglycaemia).
4. People with type 2 diabetes should continue to take most diabetes medications but may need to cease certain medications if they have persistent vomiting and/or diarrhoea or poor food and fluid intake. See guidelines on page 20.
5. People with type 2 diabetes using insulin should continue to take their insulin but doses may need adjusting. See guidelines on page 20.
6. Maintenance of food and fluid intake is important to reduce the risk of dehydration and to prevent hypoglycaemia and the development of ketones (in those at risk).
7. People who take SGLT2 inhibitors are at risk of DKA/euglycaemic DKA if they have significant vomiting and/or diarrhoea, or poor oral intake.
8. Although uncommon, in some circumstances including concurrent illness or an insult to the pancreas, people with type 2 diabetes can also develop ordinary (hyperglycaemic) DKA.
9. It is not usually necessary for individuals with type 2 diabetes to check ketone levels at home, but those at risk should be made aware of the risks, symptoms (including abdominal pain, nausea, vomiting and fatigue) and when to seek urgent medical care if DKA is suspected. In some cases, education on ketone testing may be appropriate.

Adjustment of diabetes medications – type 2 diabetes

In individuals with type 2 diabetes managed with oral or non-insulin injectable diabetes medications:

- In individuals with nausea, vomiting and/or diarrhoea temporarily stop metformin and GLP-1 receptor agonists which may aggravate these symptoms, worsening dehydration and hypovolaemia, and may increase the risk of acute renal impairment due to dehydration.
- If there is an acute gastrointestinal illness, cease SGLT2 inhibitors, which may further aggravate dehydration and hypovolaemia and increase the risk of DKA.[4]
- If illness is causing a loss of appetite and marked reduction of carbohydrate intake, SGLT2 inhibitors should be ceased to reduce the risk of DKA/ euglycaemic DKA.[4]
- DKA/euglycaemic DKA should be suspected and investigated in those who are taking SGLT2 inhibitors if they develop abdominal pain, nausea, vomiting, fatigue, or metabolic acidosis.[4]
- If illness is causing a loss of appetite and reduction of carbohydrate intake, there is an increased risk of hypoglycaemia from sulphonylureas, which may require dose adjustment or temporary cessation.
- Other diabetes medications should usually be continued.
- Persistent and symptomatic hyperglycaemia needs further investigation including consideration of other causes of hyperglycaemia e.g. newly diagnosed pancreatic cancer.

In individuals with type 2 diabetes managed with insulin:

- If blood glucose levels are persistently elevated, an increase in intermediate or long-acting insulin dose by 10–20% may be needed, with further adjustment of subsequent doses of rapid-acting insulin during the day if the glucose levels remain elevated.
- Those taking rapid or short-acting insulin need advice on adjusting doses according to blood glucose levels and carbohydrate intake.
- For those taking ultra-long-acting basal insulins, such as glargine U300 (Toujeo) and degludec (Ryzodeg 70/30) dose changes should be less frequent and advice may need to be sought from an appropriate clinician regarding dose adjustment, as dose changes may take 4–7 days for effect. With Ryzodeg, consideration also needs to be given to the impact of dose changes on both rapid and long-acting components.
- Those taking basal only or premixed insulin require appropriate medical advice and may need a prescription for additional rapid-acting insulin to use as a supplemental insulin dose – this should be considered as part of their sick day management plan.

For individuals managed with diet alone who have worsening glycaemia, the introduction of medication and management of symptomatic hyperglycaemia should be considered if the intercurrent illness is unlikely to resolve within a few days.

Other medications

Many people with diabetes may be taking other medications that may need to be ceased if they have significant vomiting and/or diarrhoea, including diuretics, some blood pressure medications (angiotensin-converting enzyme inhibitors and angiotensin II receptor blockers) and anti-inflammatory pain medications (nonsteroidal anti-inflammatory drugs). They should be encouraged to discuss with their general practitioner whether they need to stop taking any of these if they become unwell.

Corticosteroids cause acute hyperglycaemia and increase medication needs in people with diabetes. Risk factors for the development of hyperglycaemia include a previous history of diabetes, a higher prevalence of comorbidities/risk factors for diabetes, older age and a higher dose and/or prolonged treatment with steroids.[8]

While management of steroid-induced hyperglycaemia is beyond the scope of these guidelines, people with diabetes who require treatment with corticosteroids should be made aware of the impact on their blood glucose levels and the need for appropriate monitoring and adjustment or commencement of medication while undergoing corticosteroid treatment.[8] Depending on the dose of corticosteroids, medications, including insulin doses, may need to be increased significantly. The glycaemic impact of different types of corticosteroids also varies and insulin types and doses need to be prescribed accordingly.[8]

Many people with diabetes choose to take complementary and alternative medicine (CAM), including nutritional and herbal supplements, and may be more likely to take these during times of illness. A small Australian study of adults with diabetes found that almost half the respondents (46.3%) used CAM and 28% used CAM specifically to treat their diabetes.[9] Individuals born overseas were significantly more likely to use CAM than those born in Australia. It is important that health professionals ask about the use of complementary medicines and that people with diabetes are made aware of the potential interactions and adverse effects, particularly when taken in combination with diabetes medications. While most herbal medications are relatively safe, they have the potential to alter the pharmacokinetic and/or pharmacodynamic properties of some diabetes medications and to increase the risk of hypoglycaemia.[10,11]

Monitoring

Ketone monitoring

Ketone bodies (formed naturally in the body) are produced by the liver when glucose is not readily available, providing the body with an alternative source of energy.[12]

There are three ketones produced in the body:[12]

- Acetoacetate (AcAc)
- 3-beta-hydroxybutyrate (3βHB)
- Acetone.

When glucose is not readily available, fat is broken down by the liver into fatty acid molecules. In the process of ketogenesis, the fatty acids are broken down further into acetoacetate, which is then converted into either 3βHB or acetone. Acetone is responsible for the sweet odour on the breath of individuals with DKA but is produced in only small amounts.[12] AcAc and 3βHB are the main two ketone bodies produced.

There are two methods available to measure ketones. First is the estimation of acetoacetate (AcAc) levels in urine. The second method for monitoring ketone levels is using a capillary blood sample that measures 3-beta-hydroxybutyrate (3βHB) based on a specific enzyme reaction.[12]

Blood ketone testing is recommended over urine ketone testing for detecting and monitoring ketones in people with diabetes, for the following reasons:[12]

- In DKA, the ratio of 3βHB:AcAc rises from normal levels (1:1) to 3:1 or higher (as high as 10:1) making blood ketone monitoring a more accurate way of assessing ketone levels during illness in people with diabetes.
- Urine testing is more likely to give false negative and false positive results (than blood ketone monitoring. This can occur in the presence of certain medications, when the test strips have been exposed to air for an extended period of time and following ingestion of large doses of ascorbic acid, or vitamin C. Hydration status can also affect accuracy.
- In response to insulin therapy, 3βHB levels usually decrease well before AcAc levels, which makes urine testing less reliable for monitoring recovery. Ketone bodies may be detected in urine long after blood concentrations have returned to normal levels.
- Urine testing can be unpleasant and more time-consuming, which can be a barrier to ketone testing.
- Urine testing involves reading a colour change on the test strip, which can be a problem for those with poor vision.
- Urine ketone testing is a semi-quantitative test, only indicating if large, moderate, small or trace amounts of ketones are present, and this can introduce user variability in interpretation.
- Blood ketone testing has been shown to facilitate earlier identification and treatment of ketosis than urine ketone testing and to reduce diabetes-related hospitalisations and emergency visits.

The capacity to test for ketones is crucial for all individuals with type 1 diabetes and those with type 2 diabetes who are at risk of ketosis.

There are currently only a few meters available that can be used for blood ketone testing (FreeStyle Optium Neo, FreeStyle Libre Reader, CareSens Dual, GlucoKey Connect and LifeSmart Twoplus Blood Glucose & Ketone Meter). It is important that individuals with type 1 diabetes have access to one of these meters, even if it is not their preferred meter for day-to-day blood glucose monitoring. Test strips can be purchased through pharmacies but are not currently subsidised through the NDSS.

If blood ketone testing is not available, urine ketone testing can be used. For those using urine ketone testing, it is important that they are aware that the integrity of the urine ketone strips may be a problem if the canister lid had not been firmly closed after opening and that strips need to be discarded three months after opening the canister, regardless of expiry date.

Interpretation of ketone levels

Blood ketone level	Urine ketone level	Interpretation
Less than 0.6 mmol/L	Negative	Normal
0.6-1.5 mmol/L	Trace or small	Increased ketone production
1.5-3.0 mmol/L	Moderate	Impending DKA
Over 3.0 mmol/L	Large	Probable DKA

Continuous glucose monitoring

Individuals using continuous glucose monitoring (CGM) during periods of intercurrent illness should be made aware:

- Of the need to confirm out of range readings with a fingerprick blood glucose check before taking action to correct them, remembering that there is a lag time between the two readings.
- That severe dehydration may affect the accuracy of sensor readings due to their measurement of glucose in the interstitial fluid.
- That pain medications containing acetaminophen (paracetamol) can affect the accuracy of certain continuous glucose monitors (Medtronic Guardian 4), falsely raising sensor glucose readings which could lead to episodes of hypoglycaemia to be missed.[13,14] Dexcom G6 is only affected with higher doses of these medications (more than 1000mg every 6 hours).[14,15]
- That ascorbic acid (vitamin C) supplements of 500mg or higher may affect the accuracy of the FreeStyle Libre 2 monitor, falsely raising sensor glucose levels, which could lead to episodes of hypoglycaemia to be missed.[14,16]
- That with all interfering substances, the level of inaccuracy depends on the amount of the interfering substance active in the body and varies between individuals.[14]

Maintenance of hydration and carbohydrate intake

People with diabetes should be encouraged to maintain oral carbohydrate intake during illness to reduce the risk of hypoglycaemia, maintain energy requirements and prevent the development of ketones (in those with type 1 diabetes and those with type 2 diabetes who have low insulin production, who are taking SGLT2 inhibitors or are pregnant). Antiemetic therapy may be required to ensure adequate hydration and carbohydrate intake.

Recommendations for food and fluid intake:

- Unless otherwise stated by a medical practitioner (for example if someone requires a fluid restriction), 125–250 mL of fluid (1/2 to 1 cup) per hour is suggested during acute illness. If blood glucose levels are above 10 mmol/L, low energy fluids can be used.
- If unable to eat regular meals, encourage a regular intake of carbohydrate-containing foods – around 15g of carbohydrate per hour during waking hours. Easy to digest foods include bread or toast, plain cracker biscuits, plain sweet biscuits, plain rice or pasta, mashed potato, and bananas.
- If the person is unable to consume food, it is recommended that:
  - Carbohydrate-containing fluids are consumed if blood glucose levels are below 10.0 mmol/L
  - Carbohydrate-free fluids are consumed if blood glucose levels are 10.0 mmol/L and above unless fluids are replacing their usual carbohydrate-containing meals and/or insulin is given to cover the carbohydrate.
- Oral rehydration solutions (ORS), such as Gastrolyte® and Hydralyte®, should be considered, to help replenish fluid and electrolytes lost through vomiting and/or diarrhoea, particularly in the elderly.[17] They have a relatively low concentration of carbohydrate and therefore additional carbohydrate maybe be required to avoid hypoglycaemia. ORS are available in sachets to be added to water and as ice blocks.
- Sports drinks e.g. Gatorade® or Powerade® can be a good alternative to ORS, however they are slightly higher in carbohydrate (see table below).
- Hypertonic or sweetened fluids should be taken in small quantities or avoided if diarrhoea is present or develops, as these beverages can exacerbate this condition. They may require dilution of up to 1-5 times for optimum tolerance and absorption. This needs to be taken into consideration when calculating carbohydrate intake.
- Fluids should be sipped slowly over a period as rapid consumption when unwell can result in increased vomiting and/or diarrhoea.
- Carbonated fluids should be left to go flat prior to consumption, as effervescence can result in increased nausea and/or vomiting.
- Excessive intake of caffeinated drinks should be discouraged as these may make dehydration worse and caffeine is a gastric irritant thus has the potential to exacerbate nausea and vomiting.

Carbohydrate-containing and carbohydrate-free fluids

Carbohydrate-containing fluids*	Carbohydrate-free fluids
Fruit juice (10g/100 mL)	Water
Regular lemonade (9g/100 mL)	Diet lemonade
Regular cordial (10g/20 mL concentrate)	Diet cordial
Gatorade original (6g per 100 mL)	Broth
Tea with sugar (5g per teaspoon sugar)	Tea without milk or sugar
Milk (5g/100 mL)	Herbal tea
Regular jelly (15g per half cup)	Sugar-free jelly
Lemonade ice-block (~11g per 75g serve)	Hydralyte ice-block (~1g per serve)

*approximate carbohydrate values given in brackets – may vary between brands

Management of hypoglycaemia during sick days

While illness often leads to hyperglycaemia, illness associated with nausea, vomiting and diarrhoea (e.g. gastroenteritis) may lower blood glucose levels and result in hypoglycaemia rather than hyperglycaemia.[3] The person with diabetes (and/or their carers or support team) should remain alert to the signs and symptoms of hypoglycaemia during illness.

- People with diabetes who develop hypoglycaemia while unwell should be encouraged to treat their hypoglycaemia according to their usual management guidelines, where possible.
- Some people will also need a reduction in their insulin to reduce the risk of, or to help in managing hypoglycaemia during illness, but it is important that insulin is never ceased, particularly in those with type 1 diabetes, due to the risk of DKA. Basal insulin should always be continued.
- People treated with sulfonylureas should cease them if there is a tendency to hypoglycaemia during illness.
- People with diabetes who are at risk of hypoglycaemia should be encouraged to keep a range of rapid-acting carbohydrate foods and fluids in their sick day management kit. This could include glucose tablets, glucose gels, jellybeans and ordinary (sugar-sweetened) soft drink or cordials.
- People with diabetes at risk of severe hypoglycaemia should have an in-date glucagon injection available and their family members/ carers and/or support persons must be provided with education on how and when to administer glucagon in response to severe hypoglycaemia.
- Pregnant women with diabetes are at higher risk of hypoglycaemia if emesis occurs and should be provided with appropriate guidance on managing morning sickness.

Discontinuation of a sick day management plan and presentation to acute medical service

The following situations are an indication for seeking immediate medical attention:

- Blood glucose levels have not improved or have deteriorated despite two supplemental insulin doses. *In some cases (for example if blood glucose levels are below 20.0 mmol/L and the person does not feel particularly unwell) it may be appropriate to wait until additional supplemental insulin doses are given.*
- Blood ketone levels have not improved or have deteriorated following two doses of supplemental insulin. *In some cases (for example if blood ketone levels are below 3.0 mmol/L and the person does not feel particularly unwell) it may be appropriate to wait until additional supplemental insulin doses are given.*
- Signs of DKA or HHS such as vomiting, drowsiness, confusion, disorientation, hyperventilation, dehydration or severe abdominal pain.
- Vomiting that is persistent, especially if greater than four hours, or becomes blood or bile stained.
- Signs of severe dehydration including increased thirst, dry mouth and swollen tongue, weakness, dizziness/fainting, palpitations, headache, confusion/delirium, reduced sweating and reduced urine output (oliguria or anuria).
- Persistent hypoglycaemia.
- If the individual or support person(s) are unable to carry out the sick day plan and require additional support.
- If the diagnosis of the underlying illness is unclear.
- If the person has a known complex medical history, end-stage organ failure, is frail and/or elderly.
- If physical or cognitive impairment occurs, making the implementation of the sick day management plan impossible.

Note: the person with diabetes should not drive in this situation. If they require emergency care and do not have someone to drive them to the hospital, they should call 000 for an ambulance.

Checklist for sick day management kit

People with diabetes are recommended to have a sick day management kit and advised to check their kit at least every three months to ensure it is fully stocked and items are within the expiry date.

Recommended items include:

- [ ] a copy of their individual sick day management action plan
- [ ] telephone numbers to call – e.g. support people, general practitioner, local hospital/diabetes clinic, Credentialled Diabetes Educator, endocrinologist
- [ ] food and fluid for sick days (carbohydrate-containing and carbohydrate-free)
- [ ] a range of rapid-acting carbohydrate foods and fluids for treatment of hypoglycaemia (for those at risk)
- [ ] pain relief medications (taking into account interactions if they are using CGM - see page 23)
  rapid-acting insulin (if prescribed) – this should be stored in the fridge
- [ ] insulin syringes or insulin pen plus an adequate number of pen needles (if insulin is prescribed)
- [ ] a blood glucose meter and in-date (non-expired) blood glucose testing strips (for those with type 2 diabetes who don't usually monitor but have been provided with education and advised to monitor when unwell; for other people with diabetes, a blood glucose meter and test strips will be part of their usual diabetes management)
- [ ] thermometer
- [ ] blood ketone testing meter and in-date ketone blood test strips or in-date urine ketone testing strips for those with type 1 diabetes and individuals with type 2 diabetes who are at risk of DKA.
- [ ] glucagon injection for those at risk of severe hypoglycaemia (requires education of family members/ carers and/or support person on how and when to administer glucagon in response to severe hypoglycaemia)
- [ ] scripts for any medications that may need to be commenced in accordance with the persons sick day plan (e.g. rapid-acting insulin for someone with type 2 diabetes using only basal insulin).

Expiry dates for blood and urine ketone test strips need to be regularly reviewed. Out of date blood ketone test strips will not be operational in the meter and urine ketone strips need to be discarded three months after opening the canister, regardless of expiry date. Integrity of the urine ketone strips may also be a problem if the canister lid had not been firmly closed after opening. Expiry dates for glucagon or any scripts for diabetes medications also need to be checked regularly.

Appendix 1: Considerations for sick day management while travelling

Sick day management plans should be prepared for all people with diabetes planning to travel, particularly to remote areas or overseas.

The following should be considered:

- If travelling overseas, obtain advice on relevant vaccinations at least six weeks prior to departure. These may include measles, tetanus, hepatitis B (hepatitis A may also be required), COVID-19, influenza and pneumococcus. Anti-malarial medications may also be recommended for travel to certain areas. Detailed information can be found on the Travel Doctor website **traveldoctor.com.au**.
- Preparation and maintenance of a sick day management kit (which will require modification from a home sick day kit) suitable for travel. This may include the addition of antiemetics, antidiarrhoeal agents, paracetamol, broad- spectrum antibiotics, oral rehydration solution, antiseptic cream/ lotion, and basic wound dressing products. The person will need prescriptions from their general practitioner or endocrinologist for certain medications (e.g. antibiotics).
- Obtaining appropriate travel insurance in advance in case of an emergency. Diabetes is a pre-existing condition that will need to be listed on the policy. Australia has reciprocal arrangement with several countries in Europe and in New Zealand, which enables Australian citizens to be eligible for emergency medical treatment overseas. However, this is not a substitute for travel insurance. More information can be found at: **https://www.servicesaustralia.gov.au/reciprocal-health-care-agreements**
- Carrying a letter/health summary (preferably multiple copies) from their general practitioner, endocrinologist or nurse practitioner outlining any medical conditions, allergies, medications, medical devices and diabetes supplies they are travelling with. Where relevant, this should also be translated into the languages of the countries the person will be visiting.
- Carrying scripts for their diabetes medications in case they need to purchase more while travelling within Australia. However, when travelling overseas it is important to take enough medication for the entire trip. More information can be found at: **www.tga.gov.au/products/travelling-medicines-and-medical-devices/leaving-australia**
- Having health-related documents translated into the language(s) of the countries being visited.
- Obtaining and wearing medical ID, particularly for those who require insulin.
- Storing insulin correctly while travelling.
- Understanding potential food safety risks at their travel destination(s) and how to minimise the risk of food-borne illness.

Further advice on travelling can be obtained from the Smart Traveller website: smartraveller.gov.au

Appendix 2: Consumer Sick Day Resources

ADEA consumer sick day resources

My diabetes sick day action plan: Type 2 diabetes not using insulin

My diabetes sick day action plan: Type 2 diabetes using insulin

My diabetes sick day action plan: Type 1 diabetes multiple daily injections

My diabetes sick day action plan: Type 1 diabetes insulin pump therapy

My diabetes sick day action plan: Type 1 diabetes Medtronic 780G insulin pump

My diabetes sick day action plan: Type 1 diabetes Tandem TSlim:X2 insulin pump

My diabetes sick day action plan: Type 1 diabetes Ypsomed Ypsopump in Auto mode with CamAPS

My diabetes sick day action plan: Type 1 diabetes Omnipod DASH insulin pump

Appendix 3: Sick day management with hybrid closed-loop insulin pump therapy

Medtronic 780G with SmartGuard

Individuals using the Medtronic 780G insulin pump should be advised to follow the sick day plan basic guidelines for insulin pump therapy (pages 15-17) and follow the additional guidelines below for their pump if needed.

Low blood glucose levels (below 4 mmol/L), no ketones (below 0.6 mmol/L on blood check or negative/trace on urine check)

1. Treat episodes of hypoglycaemia (hypo) with 8–10g rapid-acting carbohydrate and repeat hypo treatment every 15 minutes until above 4 mmol/L.
2. If your blood glucose levels are staying low, turn on the temporary target function and continue until blood glucose level is above 10 mmol/L.
3. If blood glucose levels remain low despite using the temporary target, consider changing your blood glucose target in SmartGuard (*Home Screen > SmartGuard> SmartGuard Settings > Target*) to a higher target (e.g. if your current target is 5.5mmol/L, change to 6.1mmol/L; if your current target is 6.1 mmol/L, change to 6.7 mmol/L).
4. If blood glucose levels remain low despite the temporary target/change of target, turn off SmartGuard (*Home Screen > SmartGuard> SmartGuard on and off*) and reduce your pump basal rate by 20–30% (by programming a reduced temporary basal rate on your pump: *Home Screen > Insulin > Basal > Temp Basal*). Continue to monitor blood glucose levels and continue the lower basal rate until your blood glucose level is above 10 mmol/L.
5. Once your blood glucose level has reached 10 mmol/L, turn off the temporary basal rate and turn SmartGuard back on (*Home Screen > SmartGuard> SmartGuard on and off*).

High blood glucose levels (above 13 mmol/L for 2 or more hours), no ketones (below 0.6 mmol/L on blood check or negative/trace on urine check)

1. If your blood glucose levels are staying high (above 13 mmol/L for 2 or more hours), first change your pump cartridge and entire infusion set.
2. Turn off SmartGuard (*Home Screen > SmartGuard> SmartGuard on and off*) and increase your pump basal rate by 30–50% (by programming an increased temporary basal rate of 130–150% on the pump: *Home Screen > Insulin > Basal > Temp Basal*). Continue to monitor blood glucose levels and continue the higher basal rate until your blood glucose levels return to your target range.
3. Bolus for carbohydrate foods and fluids using your usual carb ratio (via pump bolus calculator)
4. Give regular correction doses (every 2 hours) using your pump bolus calculator, even if you are not eating.
5. Once your blood glucose levels have returned to your target range, turn SmartGuard back on (*Home Screen > SmartGuard> SmartGuard on and off*).

High blood glucose levels (above 13 mmol/L for 2 or more hours) and high ketones (0.6 mmol/L or higher on blood check OR small or higher on urine check)

1. Turn off SmartGuard (*Home Screen > SmartGuard> SmartGuard on and off*) and follow the guidelines in Table 2 on page 16.
2. Once your ketones are below 0.6 mmol/L on blood check or negative/trace on a urine check, turn SmartGuard back on (*Home Screen > SmartGuard> SmartGuard on and off*).

For individuals using the Medtronic 780G, review manual mode settings every 3 months to make sure they are correct.

Tandem TSlim:X2 with Control IQ

Individuals using the Tandem TSlim:X2 with Control IQ should be advised to follow the sick day plan basic guidelines for insulin pump therapy (pages 15-17) and follow the additional guidelines below for their pump if needed.

Low blood glucose levels (below 4 mmol/L), no ketones (below 0.6 mmol/L on blood check or negative/trace on urine check)

1. Treat episodes of hypoglycaemia (hypo) with 8–10g rapid-acting carbohydrate and repeat hypo treatment every 15 minutes until above 4 mmol/L.
2. If your blood glucose levels are staying low, turn on Exercise Activity in the pump activity menu (*Options > Activity > Exercise)*.
3. If your blood glucose levels remain low despite using Exercise Activity, turn off Control IQ (*Options > My Pump > Control IQ and toggle off)* and use a temporary basal rate of 70–80% (*Options > Activity > Temp Rate; note the Temp Rate is found at bottom of the Activity menu and can only be accessed when Control IQ is turned off).* You can also ask your endocrinologist or diabetes educator to help you set up a sick day pump profile for illness with low blood glucose levels.
4. Once your blood glucose level is above 10 mmol/L, turn off the Temp Rate and turn Control IQ back on (*Options > My Pump > Control IQ and toggle on*), or switch back to your usual pump profile if you are using a sick day profile.

High blood glucose levels (above 13 mmol/L for 2 or more hours), no ketones (below 0.6 mmol/L on blood check or negative/trace on urine check)

1. If your blood glucose levels are staying high (above 13 mmol/L for 2 or more hours), first change the pump cartridge and entire infusion set.
2. Switch to your sick day pump profile if you have one set up or turn off Control IQ (*Options > My Pump > Control IQ and toggle off)* and use a temporary basal rate of 110–120% (*Options > Activity > Temp Rate; note the Temp Rate is found at bottom of the Activity menu and can only be accessed when Control IQ is turned off).*
3. Continue to monitor blood glucose levels and continue temporary basal rates or sick day pump profile until blood glucose levels return to your target range.
4. Bolus for carbohydrate foods and fluids using your pump bolus calculator.
5. Give regular correction doses (every 2 hours) using your pump bolus calculator, even if not eating.
6. Once blood glucose levels have returned to your target range, turn off Temp Rate and turn Control IQ back on (*Options > My Pump > Control IQ and toggle on*) or switch back to your usual pump profile if you are using a sick day profile (*Options > My Pump > Personal Profiles > open active pump profile, choose usual pump profile and then choose 'Activate')*.

High blood glucose levels (above 13 mmol/L for 2 or more hours) and high ketones (0.6 mmol/L or higher on blood check OR small or higher on urine check)

1. If blood glucose levels are staying high (above 13 mmol/L for 2 or more hours) and ketones present, first change the pump cartridge and entire infusion set.
2. Switch to your sick day pump profile if you have one set up or turn off Control IQ (*Options > My Pump > Control IQ and toggle off)* and follow the sick day guidelines in Table 2 on page 16. To set up a temporary basal rate: *Options > Activity > Temp Rate; note the Temp Rate is found at bottom of the Activity menu and can only be accessed when Control IQ is turned off).*
3. Continue to monitor blood glucose levels and continue using sick day pump profile or temporary basal rates according to the guidelines in Table 2 on page 16.
4. Bolus for carbohydrate foods and fluids using the pump bolus calculator.
5. Give regular correction doses (every 2 hours), even if not eating. If you have a sick day profile set up, use your pump bolus calculator for corrections. If you have turned off Control IQ and are using a temporary basal rate, use the guidelines in Table 2 on page 16 to give correction doses, based on your usual total daily dose (TDD) of insulin.
6. Once your blood glucose levels have returned to your target range, switch back to your usual pump profile if you are using a sick day profile (*Options > My Pump > Personal Profiles > open active pump profile, choose usual pump profile and then choose 'Activate')* or turn off Temp Rate and turn Control IQ back on (*Options > My Pump > Control IQ and toggle on*).

When providing sick day management education for those using the Tandem TSlim:X2, set up sick day pump profiles for low and high blood glucose levels and update these whenever changes are made to the individuals usual pump profile settings.

Ypsomed Ypsopump with Cam APS FX System

Individuals using the Ypsomed Ypsopump with Cam APS should be advised to follow the sick day plan basic guidelines for insulin pump therapy (pages 15-17) and follow the additional guidelines below for their pump if needed.

Low blood glucose levels, no ketones (below 0.6 mmol/L on blood test or negative/trace on urine test)

1. Treat episodes of hypoglycaemia with 5-10g rapid-acting carbohydrate and repeat hypo treatment every 15 minutes until above 4 mmol/L.
2. If blood glucose levels are persistently low, turn on the Ease-off mode and continue, until blood glucose level is above 10 mmol/L *(In the app, click on the 'Ease-off' mode tab on bottom right of screen to turn on)*.
3. If blood glucose levels remain persistently low despite using the Ease-off mode, consider raising the personal glucose target by 0.5-1.0 mmol/L above where it is usually set. Continue to use the Ease-off mode if needed.
4. Once the blood glucose level has reached 10 mmol/L, turn off Ease-off mode and change personal glucose target back to usual target *(In the app, click on the 'Ease-off' mode tab on bottom right of screen to turn off)*.

***Note:* The Ease-off mode reduces insulin delivery depending on glucose levels, raises the glucose target by 2 mmol/L temporarily and stops insulin delivery if the glucose level is predicted to fall below the user's personal glucose target.**

High blood glucose levels, no ketones (below 0.6 mmol/L on blood test or negative/trace on urine test)

1. If blood glucose levels are persistently high (above 15 mmol/L for 2 or more hours), first change the pump cartridge and entire infusion set.
2. Turn on the Boost mode *(In the app, click on the 'Boost' mode tab on bottom left of screen to turn on)* and continue to monitor blood glucose levels and continue Boost mode until blood glucose levels return to target range.
3. Bolus for carbohydrate foods and fluids using pump bolus calculator
4. Once blood glucose levels have returned to target range, turn off Boost mode *(In the app, click on the 'Boost' mode tab on bottom left of screen to turn off)*.

***Note:* The Boost increases insulin delivery by ~35% if glucose levels are high but stops boosting when the glucose level is predicted to reach the users personal glucose target.**

High ketones (0.6 mmol/L-1.5 mmol/L on blood test or trace/small on urine test)

1. If blood glucose levels are persistently high (above 15 mmol/L for 2 or more hours) and small ketones are present, first change the pump cartridge and entire infusion set.
2. Turn on the Boost mode *(In the app, click on the 'Boost' mode tab on bottom left of screen to turn on)* and continue to monitor blood glucose and ketone levels and continue Boost mode until blood glucose levels return to target range and ketones are below 0.6 mmol/L on blood test or negative/trace on urine test
3. Bolus for carbohydrate foods and fluids using pump bolus calculator.
4. Once blood glucose levels have returned to target range and ketones are below 0.6 mmol/L on blood test or negative/trace on urine test, turn off Boost mode *(In the app, click on the 'Boost' mode tab on bottom left of screen to turn off)*.

High ketones (Above 1.5 mmol/L on blood test or moderate/large on urine test)

1. Turn off Auto Mode *(In the app, go to the Auto Mode On/Off switch at bottom right and toggle off)* and follow sick day guidelines for insulin pump therapy according to Table 2 on page 16.
2. Once ketones are below 1.5 mmol/L on blood tests or negative/trace/small on urine test, turn Auto Mode back on *(In the app, go to the Auto Mode On/Off switch at bottom right and toggle on)* and use Boost mode again if needed (i.e. if blood glucose levels remain above 15 mmol/L and/or ketones remain above 0.6 mmol/L on blood tests or more than trace on urine test; *In the app, click on the 'Boost' mode tab on bottom left of screen, to turn on)*.
3. Once blood glucose levels have returned to target range and ketones are below 0.6 mmol/L on blood test or negative/trace on urine test, turn off Boost function *(In the app, click on the 'Boost' mode tab on bottom left of screen, to turn off)*.

For individuals using the Ypsopump, review manual mode settings every 3 months to make sure they are correct.

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Notes

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