Guidelines for Sick Day Management for People with Diabetes

Technical Review Document

Australian Diabetes Educators Association
The Australian Diabetes Educators Association Sick Day Management Guidelines for Diabetes project was conducted by the Australian Diabetes Educators Association. The project was supported by funding from Abbott Diabetes Care.

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Disclaimer

This document is a general guide to the appropriate practice to follow subject to the clinician’s judgement and the person with diabetes preference in each individual case.

The guidelines were designed to provide information to assist decision-making and are based on the best evidence available at the time of development.

ADEA is not responsible for individual decisions or the outcomes of those decisions.
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Glossary of Acronyms

ADEA  Australian Diabetes Educators Association
ADIPS  Australasian Diabetes in Pregnancy Society
ADS   Australian Diabetes Society
APEG  Australasian Paediatric Endocrine Group
DAA   Dietitians Association of Australia
DKA   Diabetic ketoacidosis
GDM   Gestational diabetes mellitus
HHS   Hyperglycaemic hyperosmolar state
HP    Health professional
NHMRC National Health and Medical Research Council
RACGP Royal Australian College of General Practitioners

Evidence Levels

<table>
<thead>
<tr>
<th>Level of evidence</th>
<th>Study design</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Level I</td>
</tr>
<tr>
<td></td>
<td>Evidence from a systemic review of all relevant randomised controlled trials (RCT)</td>
</tr>
<tr>
<td>II</td>
<td>Level II</td>
</tr>
<tr>
<td></td>
<td>Evidence from at least one properly-designed RCT</td>
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<tr>
<td>III-1</td>
<td>Level III-1</td>
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<tr>
<td></td>
<td>Evidence from well-designed pseudo-randomised controlled trials (alternate allocation or some other method).</td>
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<tr>
<td>III-2</td>
<td>Level III-2</td>
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<tr>
<td></td>
<td>Evidence from comparative studies with concurrent controls and allocation, non-randomised (cohort studies), case-control studies, or interrupted time series with a control group</td>
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<tr>
<td>III-3</td>
<td>Level III-3</td>
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<tr>
<td></td>
<td>Evidence from comparative studies with historical control, two or more single-arm studies, or interrupted time series without a parallel control group</td>
</tr>
<tr>
<td>IV</td>
<td>Level IV</td>
</tr>
<tr>
<td></td>
<td>Evidence from case series, either post-test or pre-test and post-test</td>
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</table>

Additional Gradings

<table>
<thead>
<tr>
<th>Grade</th>
<th>Basis of grading</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Expert committee reports opinions or clinical experience / consensus statements or reports from professional organisations</td>
</tr>
<tr>
<td>GPP</td>
<td>Good practice point based on the judgement of Guideline Reference Group and drawn from work and literature in the field.</td>
</tr>
</tbody>
</table>

Evidence Levels and Additional Gradings are discussed under Guideline Development Process
Summary of Key Recommendations

Preparation for Sick Days

1. All people with diabetes require education about intercurrent illness and sick days within the diabetes education program after initial diagnosis and with review at regular intervals. (C)

2. Support people should be included in sick day education. (GPP)

3. Sick day information should be tailored to the individual’s situation, history, capacity and capabilities. (GPP)

4. Sick day education should include the key principles of sick day management, development of a sick day care plan and preparation of a home sick day management kit. (C)

Type 1 Diabetes

When to follow sick day guidelines

1. The sick day guidelines should be commenced when feeling unwell, noticing signs of an illness, ketones are present in urine or blood or when blood glucose is > 15.0 mmol/L on two consecutive readings (for example within a 2-6 hour timeframe). (GPP)

Do not cease insulin

2. Do not cease insulin with onset of illness. (C)

More frequent monitoring

3. More frequent monitoring and recording of blood glucose and ketones is recommended during illness. (C) Additional parameters measured to provide information and monitoring of the underlying illness may include temperature, oral intake, pulse, blood pressure, medications including insulin/diabetes medications and illness symptoms. (GPP)

4. Two hourly monitoring of blood glucose is recommended or more frequently if blood glucose is low or if ketones are > trace (urine) or ≥ 1.0 mmol/L in blood. (GPP)

5. Two to four hourly monitoring of ketones is recommended when blood glucose is ≥15.0 mmol/L. (GPP) If available blood ketone testing of ketones is preferred. (III-2)

Seeking support and help

6. Notify support people when ill. (GPP)

---

i C - Expert committee reports opinions or clinical experience / consensus statements or reports from professional organisations.

ii GPP- Good practice point based on the judgement of Guideline Reference Group and drawn from work and literature in the field.

iii III-2 - Evidence from comparative studies with concurrent controls and allocation, non-randomised (cohort studies), case-control studies, or interrupted time series with a control group.
7. Seek medical help early in the course of the illness, maintain regular contact and know when the condition can no longer be managed at home. (C)

8. Seek urgent medical attention or attend hospital in the following situations:
   - Individual is too unwell or unable to follow the sick day guidelines
   - Individual does not have a support person available
   - The diagnosis of the underlying illness is unclear
   - Blood glucose does not improve despite 2 supplemental insulin doses
   - Vomiting is persistent especially if frequent for more than 2-4 hours or becomes blood or bile stained
   - Ketones are moderate to heavy (urine) or >1.5 mmol/L (blood) or present and not decreasing despite supplemental insulin doses
   - Exhibiting signs of ketoacidosis such as vomiting, drowsiness, confusion, disorientation, hyperventilation, dehydration or severe abdominal pain
   - Extremes of age – children under 2 years or frail older people
   - Hypoglycaemia is severe or blood glucose cannot be kept above 4.0 mmol/L. (C)

   Note: Earlier help may be advised for women who are pregnant.

Maintaining hydration

9. Consume extra fluids to prevent dehydration. (C)

10. If unable to consume food the recommendation is:
    - Carbohydrate containing fluids if blood glucose is \( \leq 15.0 \text{ mmol/L} \)
    - Carbohydrate free fluids if blood glucose >15.0 mmol/L. (C)

Managing the underlying illness

11. Intercurrent illness needs to be diagnosed and treated. (C)

12. Symptoms from the illness need to be differentiated from the symptoms of hyperglycaemia, hypoglycaemia or ketoacidosis. (GPP)

13. Symptomatic relief of illness may include over the counter medications such as recommended doses of paracetamol and ibuprofen. (C)

14. The use of sugar free medicines is not essential. (C)

Managing hyperglycaemia and ketosis

15. Supplemental doses of rapid or short acting insulin and careful monitoring of blood glucose and ketones will help reduce blood glucose and prevent ketoacidosis. (C)

16. Supplemental insulin is given as a percentage of the total daily dose (TDD). (C)
   For example:
   - Blood glucose > 15.0 mmol/L and ketones present give 10-20% of the total daily insulin dose every 2-4 hours until blood glucose is < 15.0 mmol/L. and ketones clearing.

Managing hypoglycaemia

17. Where hypoglycaemia occurs due to illness follow regular recommendations for treatment. A reduction of insulin by 20-50% may be required. (C)

18. Glucagon in “mini dose” may prevent or treat mild hypoglycaemia in people with gastroenteritis or reduced carbohydrate intake including children. (IV)

**IV - Evidence from case series, either post-test or pre-test and post-test.**
Type 2 Diabetes

Assumption for Type 2 and gestational diabetes

The guidelines for Type 2 diabetes assume that the individual is not prone to ketoacidosis but it is recognised that there are sub groups of Type 2 who are ketosis prone including children and pregnant women with Type 2. This needs to be considered when providing sick day advice and developing a sick day action plan.

When to follow sick day guidelines

1. The sick day guidelines should be commenced when feeling unwell, noticing signs of an illness or blood glucose > 15.0 mmol/L on two consecutive readings (for example over 8 – 12 hours). (GPP)

2. Individuals and support people need to assess whether they are well enough or able to follow the guidelines. If not they should call for help or attend hospital. (GPP)

Continuing glucose lowering agents / insulin

3. Glucose lowering agents and / or insulin should be continued with the onset of illness with the exception of metformin. (GPP)

4. Metformin may need to be ceased with onset of intercurrent illness, advice of a medical practitioner required. (GPP)

More frequent monitoring

5. More frequent monitoring and recording of blood glucose and other parameters is recommended during illness. (C) Additional parameters measured to provide information and monitoring of the underlying illness may include temperature, pulse, blood pressure, oral intake, medications including diabetes medications/insulin and illness symptoms. (GPP)

6. Two to four hourly blood glucose monitoring is recommended or more frequently if blood glucose is low. (GPP)

Seeking support and help

7. Notify support people when ill. (GPP)

8. Seek medical help early in the course of the illness and know when the condition can no longer be managed at home. (C)

9. Seek urgent medical attention or attend hospital in the following situations:
   - Individual is too unwell or unable to follow the sick day guidelines
   - Individual does not have a support person available
   - The diagnosis of the underlying illness is unclear
   - Blood glucose remains > 15 mmol/L (for 24 hours) for those unable to administer supplementary insulin
   - If blood glucose does not improve despite two supplemental doses of insulin
   - Vomiting is persistent especially if frequent for more than 2-4 hours or becomes blood or bile stained
   - Severe dehydration
   - Exhibiting signs of HHS such as drowsiness, confusion, disorientation, hyperventilation, dehydration or coma
   - Frail older people
   - Oral glucose lowering agents are not tolerated and blood glucose level is > 15.0 mmol/L
Hypoglycaemia is severe or blood glucose cannot be kept above 4.0 mmol/L. (GPP)

Please note: Earlier help may be advised for pregnant women.

Maintaining hydration

10. Consume extra fluids to prevent dehydration. (C)

11. If unable to consume food the recommendation is:
   - Carbohydrate containing fluids if blood glucose \( \leq 15.0 \) mmol/L
   - Carbohydrate free fluids if blood glucose > 15.0 mmol/L. (GPP)

Managing the underlying illness

12. Intercurrent illness needs to be diagnosed and treated. (GPP)

13. Symptoms from the illness need to be differentiated from the symptoms of hyperglycaemia, hypoglycaemia or HHS. (GPP)

14. Symptomatic relief of illness may include over the counter medications such as recommended doses of paracetamol and ibuprofen. (GPP)

15. The use of sugar free medicines is not essential. (GPP)

Managing hyperglycaemia

16. If blood glucose is >15 mmol/L for two consecutive readings for individuals treated with diet and exercise, glucose lowering agents or insulin who don’t have access to rapid or short acting insulin, contact diabetes educator or medical care. (GPP)

17. If treated with insulin and have access to short or rapid acting insulin, supplemental doses of short or rapid acting insulin with careful monitoring may be required. (GPP)

18. Supplemental insulin is given as a percentage of the usual total daily dose.
   For example:
   - Blood glucose > 15.0 mmol/L give 10% of total daily insulin dose every 2-4 hours until blood glucose is < 15.0 mmol/L.
   - Blood glucose greater > 22.0 mmol/L give 20% of total daily insulin dose every 2-4 hours until blood glucose is < 15.0 mmol/L.

Managing hypoglycaemia

19. Where hypoglycaemia occurs due to illness follow the standard recommendations for managing hypoglycaemia. A 20-50% reduction of insulin or the reduction of diabetes medications may be required under the supervision of doctor or diabetes educator. (GPP)
Sick Day Management - Background

Background

Managing diabetes during an intercurrent illness is a challenging aspect of diabetes care. Intercurrent illness, if not managed appropriately and expeditiously, can result in hyperglycaemia, diabetic ketoacidosis (DKA), hyperglycaemic hyperosmolar state (HHS) or hypoglycaemia. A summary of the impact of the hyperglycaemic complications of intercurrent illness is outlined below. The impact of hypoglycaemia, while frequently discussed as occurring during periods of illness, is not well documented in the literature.

Impact of hyperglycaemic emergencies

DKA continues to be a prominent cause of morbidity and mortality in people with Type 1 diabetes with a mortality rate of 5-10% of DKA episodes in Western countries. HHS occurs less frequently but it is associated with relatively high mortality rates, approximately 15% of episodes.

There is a lack of data from Australia but data from the United States of America suggests hyperglycaemic emergencies present significant personal and financial costs to the individual and the health care system. The rate of DKA from population-based studies ranges from 4.6 to 8 per 1,000 diabetic persons per year. The annual hospital cost for patients with DKA in the USA is estimated to exceed US $1 billion per year.

The incidence of HHS is difficult to determine because of the lack of population-based studies and the multiple comorbidities often found in patients who present with HHS but it is thought to be less than 1% of all primary diabetes related admissions.

Potential for prevention

Although DKA often has a rapid onset the overall majority of patients admitted with DKA have previously diagnosed diabetes. This, coupled with the fact that the common precipitating factor for DKA is infection, highlights the potential for prevention with education and early access to medical care.

HHS usually affects middle aged or older people and two thirds of episodes occur in previously undiagnosed cases of diabetes. Infection is a common precipitating factor for HHS and symptoms usually evolve over days to weeks, which provide opportunities for early detection of hyperglycaemia and intervention to prevent HHS.

Education is important

There exists potential to significantly reduce hospitalisations from hyperglycaemic and hypoglycaemic emergencies through appropriate education, improved self-care and self-monitoring of blood glucose.

To support people with diabetes to adequately manage sick days and prevent hyperglycaemic and hypoglycaemic emergencies they require clear and specific information about appropriate actions to take when they are ill and access to their health care team for adequate advice, early intervention, supervision and support.

Improving the quality and consistency of diabetes sick day guidelines may improve self care practices and health outcomes for individuals. Education of health professionals involved in diabetes care will be required to support effective use of the guidelines. At present consensus guidelines for sick days are limited to children and adolescents with Type 1 diabetes. There is a lack of general best practice guidelines documenting evidence and consensus that can be used to inform clinical decision-making or measure best practice.
outcomes of care for adults with diabetes. As a result the Australian Diabetes Educators Association (ADEA) recognised the need for Sick Day Management Guidelines for People with Diabetes.

**Purpose of the guidelines**

The purpose of the guidelines is to:

- Improve access for people with diabetes to appropriate self management advice to enable them to manage intercurrent illness at home.
- Enhance the capacity of health professionals to provide best practice self management advice and support for people with diabetes when they have an intercurrent illness.

**Scope of guidelines**

The guidelines will apply to the home management of people with Type 1 and Type 2 (including children and adolescents) and Gestational diabetes during periods of minor intercurrent illness.

The guidelines apply to situations of intercurrent illness, which is defined as minor and acute illnesses that require changes to the person’s usual self management practices. For practicality these periods of intercurrent illness will be referred to as “sick days”.

Situations the guidelines do not cover include:

- Hospital or institutional management of diabetes and acute illnesses
- Managing very high blood glucose levels for greater than 24 hours
- Managing diabetic ketoacidosis
- Managing hyperglycaemic hyperosmolar state
- Managing blood glucose in the presence of prolonged fever, vomiting, intercurrent infection or illness.

**Target audience**

- People with diabetes, family members and support people
- Health care professionals with knowledge about diabetes and involved in the care of people with diabetes.

**Setting**

The guidelines apply to care delivery services where health professionals are involved in supporting the self care of people with diabetes at home.

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Footnote 1: For the purposes of these guidelines the term support person/people refers to non professional carers such as friends and family.
Underlying assumptions

Diagnosis of diabetes

The guidelines outline sick day advice for people with Types 1 and 2 diabetes. They assume that a clear diagnosis of diabetes and type has been made. If a clear diagnosis of type cannot be made (for example people may present as Type 2 diabetes but may in fact be slow onset Type 1 diabetes) referral to specialist medical care is required.

For clarity, these guidelines assume that Type 2 diabetes is generally not prone to ketoacidosis but it is recognised that there can be ambiguity in classification and the literature suggests there are sub groups of Type 2 who are ketosis prone including children and pregnant women with Type 2. This needs to be considered when providing sick day advice.

Prerequisite skills of health professionals

There is an assumption that health professionals utilising these guidelines have an understanding of:

- Pathophysiology of diabetes including differentiating factors between Type 1 and Type 2 diabetes
- Mechanisms of insulin action and current insulins (if providing advice on insulin adjustment)
- Methods of monitoring of blood glucose and blood and urine ketones
- Normal blood glucose levels and abnormal variations such as hyperglycaemia and hypoglycaemia.

In addition, background knowledge of the person with diabetes such as medical history, self care potential and access to support is essential.

Timely access to advice

People with diabetes exhibit better outcomes when they have timely interactions with health professionals. These guidelines assume people with diabetes have access to 24 hour help from a diabetes educator, medical practitioner or hospital where timely advice on implementation of the sick day guidelines is available.

Development of individual sick day action plans should take into consideration accessibility to 24 hour specialist advice. If 24 hour telephone advice is not available alternative options/strategies should be explored and included in action plans.

Using the sick day management guidelines

These guidelines do not sit in isolation and should be used in combination with other diabetes best practice guidelines, health professional judgement and the individual with diabetes’ needs and preferences.

Special groups

The guidelines are general in nature. Modifications to these guidelines will need to be considered before applying them to groups such as the Aboriginal and Torres Strait Islander communities, pregnant women, older people, people with a disability, culturally and linguistically diverse communities and people in remote areas.
Children and adolescents

The Australasian Paediatric Endocrine Group *Clinical practice guidelines: Type 1 diabetes in children and adolescents (2005)* form the basis for recommendations for children and adolescents and should be used in conjunction with these guidelines.

Diabetes and pregnancy

The general principles of sick day management apply to women with gestational diabetes and women with Type 1 diabetes during pregnancy. Because there is a lack of evidence regarding management of sick days during pregnancy, pregnant women should be advised to consult their medical specialist early if they become ill.

Importantly it is known that fevers, the presence of ketones in the blood, hyperglycaemia and hypoglycaemia are all factors that may have adverse outcomes for the fetus which highlights the need for prompt medical attention.\(^\text{11}\)\(^\text{12}\)
Diabetes and intercurrent illness

Acute intercurrent illness may affect diabetes control in a variety of ways. Illness may cause hyperglycaemia, hypoglycaemia or have no effect on blood glucose.

People with diabetes with good metabolic control should not experience more illness or infections than people without diabetes. People with consistently poor metabolic control may have reduced immunity resulting in:

- Increased risk of acquiring infection
- Increased chance of infections spreading quickly
- Increased risk of unusual infections (eg tuberculosis)
- Increased risk of infections from organisms that are not normally pathogenic
- Poor response to antibiotics.

Hyperglycaemia

Hyperglycaemia refers to an elevated blood glucose level (>10.0 mmol/L) due to relative or absolute insulin deficiency. The symptoms of hyperglycaemia usually occur when the blood glucose level is persistently >15.0 mmol/L.

Intercurrent illness can raise blood glucose due to higher levels of stress hormones, gluconeogenesis and insulin resistance.

The most common illness precipitating factor for hyperglycaemia, and subsequent DKA and HHS, is infection.

Typical infections likely to be associated with increased insulin resistance include:

- Viral illnesses associated with fever and systemic features, especially if associated with vomiting. Common causes are viral pharyngitis, influenza, and the childhood illnesses such as measles and varicella.
- Bacterial infections, especially if associated with fever. Common causes are tonsillitis, ear infections, cellulitis, pneumonia and urinary tract infections.

Additional triggers that may contribute to hyperglycaemia, ketosis, DKA and HHS include:

- Trauma
- Surgery
- Emotional stress
- Acute myocardial infarction or cerebrovascular accident
- Substance abuse
- Omissions of insulin and/or diabetes medications
- Insulin delivery system failure including pumps
- Medications prescribed for another reason e.g. glucocorticoids
- Eating disorders
- Sustained exercise in the presence of hyperglycaemia (Type 1)
- Co existing illnesses.

The majority of admissions for acute illness and diabetes control are related to hyperglycaemia rather than hypoglycaemia.

Untreated hyperglycaemia may lead to DKA and HHS. These serious acute metabolic complications can occur in both Type 1 and 2 Diabetes.
Ketosis and Diabetic Ketoacidosis (DKA)

Diabetic ketoacidosis is precipitated by an absolute or relative insulin deficiency and an increase in production of counter-regulatory hormones such as glucagon, catecholamines, cortisol and growth hormone leading to hepatic overproduction of glucose and ketone bodies. (Figure 1)

The presence of ketones is usually associated with elevated blood glucose and an indication of insulin deficiency but ketones can occur in the presence of normal or low blood glucose levels particularly in the presence of gastro intestinal illnesses.

Diabetic ketoacidosis is characterised by hyperglycaemia, osmotic diuresis, metabolic acidosis and dehydration. The biochemical criteria for the diagnosis of include:

- Blood glucose level > 17 mmol/L
- pH < 7.3
- Bicarbonate < 15.0 mmol/L
- Ketonaemia > 3 mmol/L

Groups at greater risk of DKA include very young or older people and during pregnancy.

Figure 1: Schematic representation of the pathogenesis of diabetic ketoacidosis (DKA) and the hyperglycaemic hyperosmolar state (HHS).

Hyperglycaemic Hyperosmolar State (HHS)

Hyperglycaemic hyperosmolar state (HHS) is a metabolic derangement that occurs principally in people with Type 2 diabetes. The condition is characterised by hyperglycaemia, hyperosmolality and an absence of significant ketosis. (Figure 1)

HHS is clinically defined by the presence of relative insulin deficiency and hyperglycaemia, usually > 55.5 mmol/L with associated elevated serum osmolality, dehydration, and stupor, progressing to coma if uncorrected, without the presence of ketosis or acidosis.

HHS usually evolves over days or weeks. Pneumonia and urinary tract infections are common underlying causes of HHS. The groups at high risk of HHS are nursing home residents or older people who become dehydrated and are unaware or unable to treat their increasingly dehydrated state.2
Hypoglycaemia

Hypoglycaemia occurs when the blood glucose level falls low enough to cause signs and symptoms. Because individual glycaemic thresholds for hypoglycaemia are dynamic no specific plasma glucose concentration definition for hypoglycaemia exists. Most education literature in Australia defines a blood glucose level below 4.0 mmol/L in people with diabetes treated with insulin or oral glucose lowering agents as the point at which to recommend treating with carbohydrate supplements. Children may exhibit hypoglycaemia at higher blood glucose levels.

Gastrointestinal symptoms may lead to a reduced oral intake and carbohydrate malabsorption which can counteract any elevations in blood glucose due to illness and result in hypoglycaemia particularly if insulin or medications are increased without monitoring of blood glucose levels.

Vomiting and abdominal pain are also symptoms of DKA. Early medical advice should be sought to help determine cause of symptoms.

Additional triggers that may contribute to hypoglycaemia during illness include:

- Errors in insulin administration or diabetes medications
- Physical activity
- Alcohol consumption
- Medications that effect carbohydrate absorption
- Insufficient carbohydrate intake in relation to insulin / medication dosage
- Early pregnancy for Type 1 diabetes.

Key issues for people with diabetes and illness

From discussions with consumer groups the following key issues emerged concerning the difficulties in following sick day guidelines:

- Lack of knowledge of sick day guidelines
- Conflicting information provided by different health professionals
- Denial that their diabetes will be affected by illness
- Remembering when to enact guidelines
- Feeling too sick to follow guidelines
- Reluctance to ketone test due to lack of perceived need, perceived cost, lack of and short shelf life of testing strips
- Reluctance to have equipment or supplies on hand that may go out of date
- Fear of hypoglycaemia is greater than concerns about hyperglycaemia.

Aims for people with diabetes and intercurrent illness

To prevent or reduce the occurrence and severity of:

- Illness
- Hyperglycaemia
- Hypoglycaemia
- Dehydration
- Ketosis and diabetic ketoacidosis (DKA)
- Hyperglycaemic hyperosmolar state (HHS).
Outcomes measures

Outcome measures for diabetes and sick day management encompass physical and self management parameters. (Table 1)

**Table 1: Outcome measures for management of sick days for people with diabetes**

<table>
<thead>
<tr>
<th>Outcome measures for management of sick days for people with diabetes</th>
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<tbody>
<tr>
<td>▪ Confidence and knowledge to undertake sick day management guidelines when unwell</td>
</tr>
<tr>
<td>▪ Frequency and severity of ketosis, DKA or HHS</td>
</tr>
<tr>
<td>▪ Frequency and severity of hypoglycaemia during periods of illness</td>
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<tr>
<td>▪ Number and duration of hospital or emergency admissions</td>
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<tr>
<td>▪ Number of days unable to perform regular activities during periods of illness</td>
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</tbody>
</table>
Key Recommendations – Preparation for Sick Days

Preparation for managing sick days

**Key recommendations**

1. All people with diabetes require education about intercurrent illness and sick days within the diabetes education program after initial diagnosis and with review at regular intervals. 

   [5 6 7 8 (C)]

2. Support people should be included in sick day education. (GPP)

3. Sick day information should be tailored to the individual’s situation, history, capacity and capabilities. (GPP)

4. Sick day education should include the key principles of sick day management, development of a sick day care plan and preparation of a home sick day management kit. 

   [6 8 (C)]

**Sick day education is essential**

Education about sick day management offers the opportunity to support individuals to manage hyperglycaemia and hypoglycaemia. Frequent monitoring of metabolic parameters, such as glucose and ketones where appropriate, as well as access to advice and timely interventions of insulin and fluid may reduce or prevent the occurrence and severity of DKA, HHS and hospitalisations. [4 16 17]

Sick day education should occur at diagnosis and be reviewed and reinforced at regular intervals particularly after first episode of intercurrent illness.

Emphasis should be made that the effect of illness on an individual’s blood glucose may differ from one episode of illness to another and that in each bout of illness the sick day guidelines should be implemented.

**Tailoring education to meet individual needs**

The health professional needs to assess the person with diabetes’ self care capacity and the capacity of their support people. Information should be tailored to ensure it is relevant for different people and their personal situations. Factors for consideration when providing advice are outlined in Table 2.

**Key areas that sick day education should include**

People with diabetes and support people require an individually documented sick day care plan covering the areas noted in Table 3.

The sick day care plan should be drawn up between the individual and the doctor or diabetes educator in advance of needing it and provide guidelines for increasing insulin dose (where applicable) to manage high glucose and ketones.

Sick day education should also provide advice on prevention of illness such as good nutrition, flu injections, prevention of common infections such as urinary tract and chest infections and preventative footcare advice.
Table 2: Issues to consider when developing individual sick day education plan

<table>
<thead>
<tr>
<th>Considerations</th>
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<tbody>
<tr>
<td>Access to a telephone and transport</td>
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<tr>
<td>Confidence and cognitive ability to follow the sick day guidelines</td>
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<tr>
<td>Capacity to monitor blood glucose levels and/or ketones</td>
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<tr>
<td>Mode of therapy - injections, pump or oral medications</td>
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<tr>
<td>Presence or access to support people</td>
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<tr>
<td>Previous history of DKA or HHS</td>
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<tr>
<td>Understanding of medication adjustment</td>
</tr>
<tr>
<td>Ability to manage stressful situations</td>
</tr>
<tr>
<td>History of intercurrent illness</td>
</tr>
<tr>
<td>Presence of diabetes complications</td>
</tr>
<tr>
<td>Previous episodes of sick days and their effect on diabetes control</td>
</tr>
</tbody>
</table>

Table 3: Key areas to include in sick day management education

<table>
<thead>
<tr>
<th>Key areas</th>
<th>Home management kit</th>
</tr>
</thead>
<tbody>
<tr>
<td>How illness may affect blood glucose levels</td>
<td>Copy of the sick day guidelines and sick day action plan</td>
</tr>
<tr>
<td>The importance of recognising the signs and symptoms of ketosis, DKA and HHS</td>
<td>Telephone numbers to call for help e.g. support people, general practitioner, local hospital, and diabetes educator.</td>
</tr>
<tr>
<td>When to enact the sick day guidelines</td>
<td>Short acting or rapid acting insulin in a pen or with a syringe (if indicated)</td>
</tr>
<tr>
<td>How to recognise if the illness is too severe to treat at home</td>
<td>Food for sick days and fluids (including carbohydrate containing drinks and low joule drinks)</td>
</tr>
<tr>
<td>When and where to seek help and advice</td>
<td>Glucose containing fluid, food or gel and glucagon (if indicated)</td>
</tr>
<tr>
<td>Supplies needed to manage sick days</td>
<td>Pain relief such as paracetamol or ibuprofen</td>
</tr>
<tr>
<td>The importance of monitoring, what to monitor, how often and documenting results</td>
<td>Monitoring equipment</td>
</tr>
<tr>
<td>Not to cease insulin</td>
<td>Blood glucose testing equipment</td>
</tr>
<tr>
<td>How to make changes to insulin (Type 1 and Type 2 insulin treated)</td>
<td>In date blood ketone testing strips with appropriate monitor or urine ketone testing strips (if indicated)</td>
</tr>
<tr>
<td>When changes to medication may be required</td>
<td>Thermometer</td>
</tr>
<tr>
<td>What to eat and drink if able</td>
<td>Record book / paper to record parameters monitored</td>
</tr>
<tr>
<td>What to do if unable to eat or drink</td>
<td></td>
</tr>
<tr>
<td>Monitoring and treating underlying illness</td>
<td></td>
</tr>
<tr>
<td>Need to check home management kit regularly for use by dates.</td>
<td></td>
</tr>
</tbody>
</table>
Key Recommendations - Type 1 Diabetes

Key areas for sick day management

The key recommendations for managing sick days for people with Type 1 diabetes relate to eight key areas:

1. When to follow sick day guidelines
2. Do not cease insulin
3. More frequent monitoring
4. Seeking support and help
5. Maintaining hydration
6. Managing the underlying illness
7. Managing hyperglycaemia and ketosis
8. Managing hypoglycaemia.

1. When to follow sick day guidelines

Key recommendations

1. The sick day guidelines should be commenced when feeling unwell, noticing signs of an illness, ketones are present in urine or blood or when blood glucose is > 15.0 mmol/L on two consecutive readings (for example within a 2-6 hour timeframe). (GPP)

2. Do not cease insulin

Key recommendations

2. Do not cease insulin with onset of illness.5 6 7 8 (C)

Glucose may rise during illness even when there is no oral intake due to gluconeogenesis and decreased insulin sensitivity which may result in increased insulin requirements.

Addressing concerns about continuing insulin and hypoglycaemia is crucial because reduction or cessation of insulin is the key basis for ketosis or DKA in Type 1 diabetes during illness.2 16 18
3. More frequent monitoring

Key recommendations

3. More frequent monitoring and recording of blood glucose and ketones is recommended during illness. Additional parameters measured to provide information and monitoring of the underlying illness may include temperature, oral intake, pulse, blood pressure, medications including insulin/diabetes medications and illness symptoms. (GPP)

4. Two hourly monitoring of blood glucose is recommended or more frequently if blood glucose is low or if ketones are > trace (urine) or ≥ 1.0 mmol/L in blood. (GPP)

5. Two to four hourly monitoring of ketones is recommended when blood glucose is ≥ 15.0 mmol/L. (GPP) If available blood ketone testing of ketones is preferred. (III-2)

More frequent monitoring of metabolic parameters including blood glucose and ketones is required to determine increasing or resolving severity of symptoms/metabolic disturbance and guide optimal management during illness.

Blood glucose

Blood glucose monitoring is recommended 2 hourly because diabetes control during illness is a dynamic situation. If significant ketones are present or blood glucose is low hourly testing is recommended.

Ketones

The presence of ketones in the blood or urine usually indicates insulin deficiency. Ketones can also be present as a result of insufficient carbohydrate intake. Ketone testing is important to guide management and prevent impending DKA.

Blood ketones should be tested 2-4 hourly. Urinary ketones should be tested 2-4 hourly or when voiding. If ketones are present, testing is recommended at least 2 hourly until negative in urine or less than 1.0 mmol/L in blood.

Blood and urine ketone testing

The capacity to test for ketones is crucial for people with Type 1 diabetes.

If the individual has a meter that supports blood ketone testing this method should be utilised. If blood ketone testing is not accessible, urine ketone testing is recommended.

Blood ketone testing measures β-hydroxybutyrate (β-OHB) in capillary blood and is preferred if available over urine testing for detecting and monitoring ketones and ketoacidosis.

Blood testing offers the following advantages over urine ketone testing:

- Assessment of blood ketones in real time
- Specificity of blood β-OHB aids in the diagnosis of impending ketosis or DKA
- Blood ketone testing produces fewer false positives and negatives than urine testing
- Cost savings in normalising blood β-OHB when managing DKA
- Similar methodology to blood glucose monitoring and less reliance on renal function
- Possibility of reduction in emergency and hospital admissions with early detection of DKA.
4. Seeking support and help

**Key recommendations**

6. Notify support people when ill. (GPP)

7. Seek medical help early in the course of the illness, maintain regular contact and know when the condition can no longer be managed at home. 5 6 7 8 (C)

8. Seek urgent medical attention or attend hospital in the following situations:
   - Individual is too unwell or unable to follow the sick day guidelines
   - Individual does not have a support person available
   - The diagnosis of the underlying illness is unclear
   - Blood glucose does not improve despite 2 supplemental insulin doses
   - Vomiting is persistent especially if frequent for more than 2-4 hours or becomes blood or bile stained
   - Ketones are moderate to heavy (urine) or >1.5 mmol/L (blood) or present and not decreasing despite supplemental insulin doses
   - Exhibiting signs of ketoacidosis such as vomiting, drowsiness, confusion, disorientation, hyperventilation, dehydration or severe abdominal pain
   - Extremes of age – children under 2 years or frail older people
   - Hypoglycaemia is severe or blood glucose cannot be kept above 4.0 mmol/L. 6 7 8 (C)

Note: Earlier help may be advised for women who are pregnant.

Successful sick day management often depends on the involvement of people other than those with diabetes.

Notifying a support person ensures that if the person with diabetes becomes too unwell to follow the guidelines the support person may assist with guideline implementation or call for help.

It is important to ensure that for those in assisted accommodation carers have the knowledge, skills and equipment to provide sick day management.

Communication with health professionals during an acute illness may help prevent further complications and facilitate a successful outcome.

5. Maintaining hydration

**Key recommendations**

9. Consume extra fluids to prevent dehydration. 5 6 7 8 (C)

10. If unable to consume food the recommendation is:
   - Carbohydrate containing fluids if blood glucose is ≤ 15.0 mmol/L
   - Carbohydrate free fluids if blood glucose >15.0 mmol/L. (C)

**Importance of hydration**

Hyperglycaemia, fever and excessive glycosuria increase fluid and electrolyte losses. 6 7
Individuals may progress quickly to severe dehydration particularly those in high risk groups. Young children will be at greater risk of dehydration because of greater surface area and difficulties with oral rehydration. Frail older people may not be able to be hydrated adequately with oral fluids.

Frequent volumes of fluids are recommended. As a guide, 125-250 mls hourly is suggested. These quantities may need to be increased with significant losses, presence of ketones or dehydration. See Table 4 for suggested fluids.

If severely dehydrated the individual will need to be assessed and hydrated in hospital.

**Types of fluids and food**

When unwell, maintaining oral intake is encouraged to reduce risk of hypoglycaemia and maintain energy requirements. Easily digestible foods that are liked or tolerated are recommended. For example plain sweet biscuits, dry biscuits, plain toast or stewed fruit.

Rehydration solutions (e.g. Gastrolyte) can help replenish fluid and electrolytes lost through vomiting, diarrhoea or dehydration. Rehydration solutions have a relatively low concentration of carbohydrate; therefore additional carbohydrate may be required.

Care should be taken with hypertonic or sweetened fluids if diarrhoea occurs. Sweetened fluids may require dilution up to 1:5 for optimum absorption.

*Table 4: Fluids for sick days*

<table>
<thead>
<tr>
<th>Unsweetened / carbohydrate free fluids when blood glucose &gt; 15 mmol/L</th>
<th>Sweetened / carbohydrate containing fluids when blood glucose &lt; 15 mmol/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Water or water iceblocks</td>
<td>• Sweetened soft drink or cordial</td>
</tr>
<tr>
<td>• Low joule or diet cordial or soft drink</td>
<td>• Sweetened icy poles</td>
</tr>
<tr>
<td>• Low joule or diet jelly</td>
<td>• Sweetened jelly</td>
</tr>
<tr>
<td>• Low joule or diet icy poles</td>
<td>• Ice-cream</td>
</tr>
</tbody>
</table>

**6. Managing the underlying illness**

<table>
<thead>
<tr>
<th>Key recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>11.</strong></td>
</tr>
<tr>
<td><strong>12.</strong></td>
</tr>
<tr>
<td><strong>13.</strong></td>
</tr>
<tr>
<td><strong>14.</strong></td>
</tr>
</tbody>
</table>

Ensuring adequate rest and avoiding strenuous activity is recommended when unwell. 8

Symptoms such as vomiting may be caused by the illness itself or be a symptom of DKA or hypoglycaemia. Therefore monitoring of blood glucose and ketones are essential to differentiate illness from hyperglycaemia, hypoglycaemia or DKA.

The use of medications for treatment of symptoms such as fever and pain should be used with caution; recommendations for use should occur when diagnosis of the underlying illness is clear.
Medications prescribed for intercurrent illnesses, such as corticosteroids, thiazides and sympathomimetic agents, may precipitate hyperglycaemia and the development of DKA. Check with prescribing doctor or pharmacist before advising on management of these medications.

Sugar free medications are not considered essential because the sugar content is minimal and therefore unlikely to have significant effect on blood glucose.

7. Managing hyperglycaemia and ketosis

**Key recommendations**

15. Supplemental doses of rapid or short acting insulin and careful monitoring of blood glucose and ketones will help reduce blood glucose and prevent ketoacidosis. (C)

16. Supplemental insulin is given as a percentage of the total daily dose (TDD). (C)

For example:

- Blood glucose > 15.0 mmol/L and ketones present give 10-20% of the total daily insulin dose every 2-4 hours until blood glucose is < 15.0 mmol/L and ketones clearing.

**Increased insulin requirements**

During hyperglycaemia supplemental doses of short or rapid acting insulin with careful monitoring is required to reduce blood glucose and help prevent ketoacidosis.

Ketones in the presence of hyperglycaemia indicate severe insulin deficiency and necessitate urgent intervention.

**Principles for administering additional insulin**

- A plan for managing high glucose and ketones should be drawn up between the individual and their doctor or diabetes educator in advance of needing it; this should include discussion of onset, peak and duration of action of insulin

- Supplemental doses of rapid or fast acting insulin should be administered in addition to the usual total daily insulin dose

- The supplemental dose should be given straight away not delayed until the next regular insulin dose is due

- Supplemental insulin doses and regular insulin doses should be recorded along with frequent monitoring and recording of blood glucose and ketone levels

- If blood glucose or ketone levels are not falling following two supplemental insulin doses direct, medical supervision is required. Supplemental insulin doses can be given 2-4 hrly as outlined in Table 5

- For those treated with premixed insulin, supplies of rapid or short acting insulin for emergency situations is recommended. If these individuals do not have access to short acting insulin they need to be managed in a medical environment.
Calculating supplemental insulin dose

Supplemental insulin is usually given as a percentage of the total daily dose (TDD) of insulin. To calculate the TDD dose add up all the insulin taken on a usual day including rapid/short acting and intermediate/long acting. Do not count supplemental insulin given during illness.

The supplemental doses and management strategies are indicated in Table 5.

Further considerations

When advising on insulin supplementation caution should be exercised with very young and frail older people due to dose sensitivity. Specialist medical advice should be sought for pregnant women due to the increased risk to the fetus with high blood glucose and/or ketone levels.

Individuals should be advised to avoid strenuous exercise especially if ketones are detected. Exercising when blood glucose is high may increase blood glucose levels further.

Urgent medical attention should be sought:

- If blood glucose continues to rise despite 2 supplemental insulin doses
- Moderate to large (urine) or > 1.5 mmol/L (blood) ketones not decreasing despite supplemental insulin doses
- Exhibiting symptoms of DKA or at increased risk of cerebral oedema.

Insulin pumps and hyperglycaemia

Individuals with insulin pumps can develop ketosis and DKA more quickly than those on injections because there is no background reservoir of long acting insulin. Ketosis and DKA may also occur due to technical problems such as; pump malfunction, catheter occlusion, skin infection. 25 26

The key principles of management are the same as for those outlined for people injecting insulin with the following additional principles:

1. Never omit basal insulin.
2. Increase the frequency of blood glucose and blood/urine ketones to every 1-2 hours through the day and night.
3. Check for problems with the pump or delivery system and infusion site. If the pump is not working or if blood glucose is high and ketones are present give supplemental short or rapid acting insulin by syringe or pen.
4. It maybe necessary to increase the basal insulin rate by 20-50% during illness when the blood glucose levels are trending high. Increase boluses of insulin by 20-50% as needed to bring the blood glucose down.
5. For comprehensive management of sick days refer to insulin pump guides. 25 27
6. Contact diabetes team or attend hospital if; nausea or vomiting is persistent, symptoms of DKA are present or if pregnant and blood glucose is > 22.0 mmol/L. 4 25
| If blood glucose (mmol/L) and ketones are
Urine | Blood* (mmol/L) | Person with diabetes | Health Professional (HP) Advice |
|-------|----------------|----------------------|--------------------------------|
| < 4.0 | Negative       | < 0.6                | ▪ Take glucose containing fluids and carbohydrate  
▪ Follow routine hypoglycaemia guidelines  
▪ Call HP if cannot raise or maintain BGL over 4.0 mmol/L within one hour  
▪ Advise reduction in insulin dose  
▪ Advise seek medical care if unable to raise or maintain BGL >4.0 mmol/L following quick acting carbohydrate or if unable to tolerate food/ fluids  
▪ Consider mini dose glucagon to prevent hypoglycaemia in people with gastroenteritis or reduced carbohydrate intake |
| < 4.0 | Positive       | ≥ 0.6                | ▪ First priority is to increase blood glucose level with fluid and carbohydrate  
▪ Follow routine hypoglycaemia guidelines  
▪ Continue to monitor ketones hourly  
▪ Advise seek medical care if unable to raise or maintain BGL >4.0 mmol/L following quick acting carbohydrate or if unable to tolerate food/ fluids  
▪ Consider mini dose glucagon to prevent hypoglycaemia in people with gastroenteritis or reduced carbohydrate intake |
| ≤ 15.0| Negative/trace | <1.0                 | ▪ No change to insulin  
▪ Check glucose and ketones again in 2 hours  
▪ Check carbohydrate intake, encourage intake of sweetened fluids if inadequate  
▪ Advise seek medical care if unable to raise or maintain BGL >4.0 mmol/L following quick acting carbohydrate or if unable to tolerate food/ fluids  
▪ Consider mini dose glucagon to prevent hypoglycaemia in people with gastroenteritis or reduced carbohydrate intake |
| Small | 1.0-1.4        |                      | ▪ Check blood glucose and ketones in two hours. May fall without supplemental insulin  
▪ Check carbohydrate intake, encourage intake of sweetened fluids if inadequate  
▪ If persistently elevated, consider a 5% supplemental insulin dose  
▪ Note: exercise caution with supplemental insulin doses in the presence of blood glucose < 10.0 mmol/L - advise increasing sweetened fluid intake first |
| Moderate/large | ≥ 1.5      |                      | ▪ Check carbohydrate intake, encourage intake of sweetened fluids if inadequate  
▪ 5-10% supplemental insulin dose, only if no response to earlier measure  
▪ Test glucose and ketones every hour  
▪ Call for HP advice  
▪ Arrange contact with client in one hour, if ketones rising or remain large advise to seek medical care  
▪ If ketones decreasing or remain moderate review in one hour, follow guidelines for further supplemental insulin  
▪ Note: exercise caution with supplemental insulin doses in the presence of blood glucose < 10.0 mmol/L - advise increasing sweetened fluid intake first |
| > 15.0-22.0 | Negative/trace | <1.0                 | ▪ Take 5% supplemental insulin dose  
▪ Monitor blood and ketones every hour  
▪ Arrange contact with client in one hour, if ketones rising or remain large advise to seek medical care  
▪ If ketones decreasing or remain moderate, review in one hour, follow guidelines for further supplemental insulin |
| Small   | 1.0-1.4        |                      | ▪ Take 10% supplemental insulin dose  
▪ Monitor blood and ketones every hour  
▪ Arrange contact with client in one hour, if ketones rising or remain large advise to seek medical care  
▪ If ketones decreasing or remain moderate, review in one hour, follow guidelines for further supplemental insulin |
| Moderate/large | ≥ 1.5      |                      | ▪ Take 15-20% supplemental insulin dose  
▪ Test glucose and ketones every hour  
▪ Call for HP advice or attend hospital  
▪ Arrange contact with client in one hour, if ketones rising or remain large attend hospital  
▪ If ketones decreasing or remain moderate, review in one hour, follow guidelines for further supplemental insulin |
| >22.0  | Negative/trace | <1.0                 | ▪ Take 10% supplemental insulin dose  
▪ Monitor blood and ketones every hour  
▪ Arrange contact with client in one hour, if ketones rising or remain large advise attend hospital  
▪ If ketones decreasing or remain moderate, review in one hour, follow guidelines for further supplemental insulin |
| Small   | 1.0-1.4        |                      | ▪ Take an supplemental 15% insulin dose  
▪ Test glucose and ketones every hour  
▪ Arrange contact with client in one hour, if ketones rising or remain large advise attend hospital  
▪ If ketones decreasing or remain moderate, review in one hour, follow guidelines for further supplemental insulin |
| Moderate/large | ≥ 1.5      |                      | ▪ Take 20% supplemental insulin dose  
▪ Test glucose and ketones every hour  
▪ Call for HP advice or attend hospital  
▪ Arrange contact with client in one hour if ketones rising or remain large advise attend hospital  
▪ If ketones decreasing or remain moderate review in one hour, follow guidelines for further supplemental insulin |

**Key:** % refers to percentage of total daily insulin dosage (TDD) given as rapid or fast acting insulin* refers to results of blood β-hydroxybutyrate (β-OHB)
8. Managing hypoglycaemia

**Key recommendations**

17. Where hypoglycaemia occurs due to illness follow regular recommendations for treatment. A reduction of insulin by 20-50% may be required.\(^5\) ^7\(^8\) (C)

18. Glucagon in “mini dose” may prevent or treat mild hypoglycaemia in people with gastroenteritis or reduced carbohydrate intake including children. \(^2\(^8\) (IV)

Ketones may be present with normal or low blood glucose levels

The presence of ketones is usually associated with elevated blood glucose and an indication of insulin deficiency but ketones can occur in the presence of normal or low blood glucose levels particularly in the presence of gastrointestinal illnesses. Increasing fluid intake with 10-15 grams of carbohydrate is recommended and frequent monitoring of ketone levels is advised under these circumstances.

Treating hypoglycaemia

Illnesses associated with nausea, vomiting or diarrhoea may cause hypoglycaemia. \(^4\) ^6\(^7\) ^8

If unable to eat, small frequent quantities of carbohydrate containing fluids and frequent blood glucose monitoring are recommended. Rehydration solutions have a low concentration of carbohydrate therefore additional carbohydrate will be required.

The regular guidelines for acute hypoglycaemia apply:

- Consumption of 15 grams of easily digestible carbohydrate such as 3 glucose tablets, 150 ml lemonade (not diet), 100 ml Lucozade or 5 jelly beans.
- Rechecking blood glucose and consumption of another 15 grams of carbohydrate if blood glucose remains low after 5-10 minutes.
- When blood glucose starts to rise follow with longer acting carbohydrate food such as fruit, sandwich or the next meal.
- If hypoglycaemia is persistent and blood glucose remains < 4.0 mmol/L medical help should be sought. Intravenous glucose may be required.
- For severe hypoglycaemia where the person is unconscious or experiencing seizures they should be placed on their side, airway cleared and an ambulance called. Administer intramuscular glucagon if available.

Glucagon

“Mini dose” glucagon refers to the use of glucagon to prevent hypoglycaemia. A smaller dose than the standard recommendation for treatment of hypoglycaemia is used to maintain glucose levels > 4.0 mmol/L.

Mini dose glucagon should be given subcutaneously, by a trained person. The purpose is to prevent or treat mild hypoglycaemia in people with gastroenteritis or reduced carbohydrate intake including children.

Under medical or diabetes educator supervision and with continued monitoring, the following glucagon doses are recommended in children and young people in managing impending hypoglycaemia:

- Children younger than 2 years - 20 mcg
- Children 2-15 years - 10 mcg per year of age
- Over 15 years – 150mcg. \(^2\(^8\)
If blood glucose does not increase within 30 minutes, administer double the initial dose. The use of mini dose glucagon in young people (14-18 years) suggests this modality of treatment may be appropriate for the adult population.

Standard high dose intramuscular glucagon (adults 1mg and children < 8 yrs or < 25kg 0.5 mg) treatment is recommended for severe hypoglycaemia. Care should be taken in individuals who are malnourished e.g. frail older people as glucagon may not be effective.

For detailed paediatric recommendations refer to the Australasian Paediatric Endocrine Group APEG Handbook on Childhood and Adolescent Diabetes.

**Insulin pumps and hypoglycaemia**

Treat hypoglycaemia in the regular way.

If food and fluid consumption is less than normal the meal boluses will be less. If gastrointestinal malabsorption occurs carbohydrate boluses may need to be reduced initially by 25%. If low blood glucose continues a reduction of the basal rate by 25 to 50% could be considered.
Key Recommendations - Type 2 Diabetes

Key areas for sick day management

The key recommendations for managing sick days for people with Type 2 diabetes relate to eight key areas:

1. When to follow sick day guidelines
2. Continuing glucose lowering agents / insulin
3. More frequent monitoring
4. Seeking support and help
5. Maintaining hydration
6. Managing the underlying illness
7. Managing hyperglycaemia
8. Managing hypoglycaemia

Assumption for Type 2 and gestational diabetes

The guidelines for Type 2 diabetes assume that the individual is not prone to ketoacidosis but it is recognised that there are sub groups of Type 2 who are ketosis prone including children and pregnant women with Type 2. This needs to be considered when providing sick day advice and developing a sick day action plan.

1. When to follow sick day guidelines

<table>
<thead>
<tr>
<th>Key recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The sick day guidelines should be commenced when feeling unwell, noticing signs of an illness or blood glucose is &gt; 15.0 mmol/L on two consecutive readings (for example over 8 – 12 hours). (GPP)</td>
</tr>
<tr>
<td>2. Individuals and support people need to assess whether they are well enough or able to follow the guidelines; if not they should call for help or attend hospital. (GPP)</td>
</tr>
</tbody>
</table>

2. Continuing glucose lowering agents / insulin

<table>
<thead>
<tr>
<th>Key recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Glucose lowering agents and / or insulin should be continued with the onset of illness with the exception of metformin. (GPP)</td>
</tr>
<tr>
<td>4. Metformin may need to be ceased with onset of intercurrent illness; advice of a medical practitioner required. (GPP)</td>
</tr>
</tbody>
</table>

Glucose may rise during illness even when there is no oral intake due to gluconeogenesis and decreased insulin sensitivity, which can result in increased insulin requirements.
Metformin should be ceased with intercurrent illnesses that have the potential to alter renal function, such as dehydration, shock, and sepsis or conditions that lead to tissue hypoxia. Metformin should be ceased while the individual is unwell, and recommenced when the illness has resolved, and renal function is shown to be normal.

Gastrointestinal illnesses may cause hypoglycaemia for individuals treated with sulphonylureas, glitinides or insulin; in this instance sulphonylureas, glitinides or insulin may need to be reduced according to blood glucose readings and in consultation with a medical practitioner or diabetes educator.

If oral glucose lowering agents are not tolerated or unable to be taken during illness and blood glucose rises > 15.0 mmol/L, medical help should be sought.

### 3. More frequent monitoring

**Key recommendations**

5. More frequent monitoring and recording of blood glucose and other parameters is recommended during illness. (C) Additional parameters measured to provide information and monitoring of the underlying illness may include temperature, pulse, blood pressure, oral intake, medications including diabetes medications/insulin and illness symptoms. (GPP)

6. Two to four hourly blood glucose monitoring is recommended or more frequently if low blood glucose. (GPP)

More frequent monitoring of metabolic parameters, including blood glucose, is required to guide optimal management during illness.

**Blood glucose**

Blood glucose monitoring is recommended 2 – 4 hourly because diabetes control during illness is a very dynamic situation.

If blood glucose is < 4.0 mmol/L, hourly testing is recommended if on sulphonylureas, glitinides or insulin.

Urine glucose testing is not recommended for sick day management as it doesn’t indicate changes in blood glucose level quickly enough to adequately manage sick days.

### 4. Seeking support and help

**Key recommendations**

7. Notify support people when ill. (GPP)

8. Seek medical help early in the course of the illness and know when the condition can no longer be managed at home. (C)

9. Seek urgent medical attention or attend hospital in the following situations:
   - Individual is too unwell or unable to follow the sick day guidelines
   - Individual does not have a support person available
   - The diagnosis of the underlying illness is unclear
   - Blood glucose remains > 15.0 mmol/L (for 24 hours) for those unable to administer supplementary insulin
If blood glucose does not improve despite two supplemental doses of insulin
- If vomiting is persistent especially if frequent for more than 2-4 hours or becomes blood or bile stained
- Severe dehydration
- Exhibiting signs of HHS such as drowsiness, confusion, disorientation, hyperventilation, dehydration or coma
- Frail older people
- Oral glucose lowering agents are not tolerated and blood glucose level > 15.0 mmol/L
- Hypoglycaemia is severe or blood glucose cannot be kept > 4.0 mmol/L. (GPP)

Please note: Earlier help may be advised for pregnant women.

Successful sick day management often depends on the involvement of people other than those with diabetes.

Notifying a support person ensures that if the person with diabetes becomes too unwell to follow the guidelines the support person may assist with guideline implementation or call for help.

Communication with health professionals during an acute illness may help prevent further complications and facilitate a successful outcome.

5. Maintaining hydration

Key recommendations

10. Consume extra fluids to prevent dehydration. (C)

11. If unable to consume food the recommendation is:
- Carbohydrate containing fluids if blood glucose ≤15.0 mmol/L
- Carbohydrate free fluids if blood glucose > 15.0 mmol/L. (GPP)

Importance of hydration

Hyperglycaemia, fever and excessive glycosuria increase fluid and electrolyte losses. Cardiac arrhythmias and mental confusion can occur due to electrolyte imbalance.

HHS is typified by dehydration. Individuals may progress to severe dehydration particularly those in high risk groups. Frail older people may not be able to be hydrated orally or may not realise they are dehydrated.

Frequent volumes of fluids are recommended. As a guide 125-250 mls hourly is suggested. These quantities may need to be increased with significant losses or dehydration. If severely dehydrated the individual will need to be assessed and rehydrated in hospital. See Table 6 for suggestions for fluids.

Types of fluids and food

When unwell maintaining oral intake is encouraged to reduce the risk of hypoglycaemia and maintain energy requirements. Easily digestible foods that are liked or are tolerated during illness are encouraged. For example plain sweet biscuits, dry biscuits, plain toast or stewed fruit.
Rehydration solutions (e.g. Gastrolyte) can help to replenish the fluid and electrolytes lost through vomiting and or diarrhoea. Rehydration solutions have a relatively low concentration of carbohydrate therefore additional carbohydrate may be required.

Care should be taken with hypertonic or sweetened fluids if diarrhoea occurs. Sweetened fluids may require dilution up to 1:5 for optimum absorption.

**Table 6: Fluids for sick days**

<table>
<thead>
<tr>
<th>Unsweetened / carbohydrate free fluids when blood glucose &gt; 15 mmol/L</th>
<th>Sweetened / carbohydrate containing fluids when blood glucose ≤ 15 mmol/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Water or water iceblocks</td>
<td>• Sweetened soft drink or cordial</td>
</tr>
<tr>
<td>• Low joule or diet cordial or soft drink</td>
<td>• Sweetened icy poles</td>
</tr>
<tr>
<td>• Low joule or diet jelly</td>
<td>• Sweetened jelly</td>
</tr>
<tr>
<td>• Low joule or diet icy poles</td>
<td>• Ice cream</td>
</tr>
</tbody>
</table>

6. Managing the underlying illness

**Key recommendations**

12. Intercurrent illness needs to be diagnosed and treated. (GPP)

13. Symptoms from the illness need to be differentiated from the symptoms of hyperglycaemia, hypoglycaemia or HHS. (GPP)

14. Symptomatic relief of illness may include over the counter medications such as recommended doses of paracetamol and ibuprofen. (GPP)

15. The use of sugar free medicines is not essential. (GPP)

Ensuring adequate rest and avoiding strenuous activity is recommended when unwell.

Symptoms such as vomiting may be caused by the illness itself or be a symptom of HHS or hypoglycaemia. Therefore monitoring of blood glucose and hydration are essential to differentiate illness from hyperglycaemia, hypoglycaemia or HHS. Pneumonia and urinary tract infections are common underlying causes of HHS.

Medications prescribed for intercurrent illnesses, such as corticosteroids, thiazides and sympathomimetic agents, may precipitate hyperglycaemia and the development of HHS. Check with prescribing doctor or pharmacist before advising on continuation of these medications.

Sugar free medications are not considered essential because the sugar content is minimal and therefore unlikely to have significant effect on blood glucose.

7. Managing hyperglycaemia

**Key recommendations**

16. If blood glucose is >15.0 mmol/L for two consecutive readings for individuals treated with; diet and exercise, glucose lowering agents or insulin who don’t have access to rapid or short acting insulin, contact diabetes educator or medical care. (GPP)
17. If treated with insulin and have access to short or rapid acting insulin, supplemental doses of short or rapid acting insulin with careful monitoring may be required. (GPP)

18. Supplemental insulin is given as a percentage of the usual total daily dose. For example:
   - Blood glucose > 15.0 mmol/L give 10% of total daily insulin dose every 2-4 hours until blood glucose is < 15.0 mmol/L.
   - Blood glucose > 22.0 mmol/L give 20% of total daily insulin dose every 2-4 hours until blood glucose is < 15.0 mmol/L.

**Increased insulin requirements**

People with Type 2 diabetes may require increased exogenous insulin including those who are not usually insulin treated. During hyperglycaemia careful monitoring, with possible additional doses of rapid or fast acting insulin, may be required to reduce blood glucose and help prevent HHS. Table 7 outlines options in relation to individual medication regimen.

**Table 7: Possible interventions for Type 2 diabetes and hyperglycaemia**

<table>
<thead>
<tr>
<th>Usual Treatment</th>
<th>Possible action</th>
</tr>
</thead>
<tbody>
<tr>
<td>No medication for hyperglycaemia</td>
<td>▪ May require the addition of sulphonylureas or insulin temporarily</td>
</tr>
<tr>
<td>Treated with glucose lowering agents</td>
<td>▪ If not on maximal dose of sulphonylureas (only applies to non slow release)</td>
</tr>
<tr>
<td></td>
<td>▪ or glitinides consider increasing</td>
</tr>
<tr>
<td></td>
<td>▪ Increasing other glucose lowering agents is not recommended</td>
</tr>
<tr>
<td></td>
<td>▪ May require supplemental rapid or fast acting insulin. See table 8:</td>
</tr>
<tr>
<td></td>
<td>Supplemental home insulin for Type 2 diabetes</td>
</tr>
<tr>
<td>Treated with glucose lowering agents and nocte protaphane</td>
<td>▪ May require supplemental rapid or fast acting insulin. See table 8:</td>
</tr>
<tr>
<td></td>
<td>Supplemental home insulin for Type 2 diabetes</td>
</tr>
<tr>
<td>Treated with mixed insulin</td>
<td>▪ May require supplemental rapid or fast acting insulin. See table 8:</td>
</tr>
<tr>
<td></td>
<td>Supplemental home insulin for Type 2 diabetes</td>
</tr>
</tbody>
</table>

There may not be flexibility for treatment in a home setting and medical care may be required for supplemental insulin.

**Principles for administering additional insulin**

- A plan for managing high glucose should be drawn up between the individual and the doctor or diabetes educator in advance of needing it. This should include discussion of onset, peak and duration of action of insulin being recommended
- Supplemental doses of rapid or fast acting insulin should be administered in addition to the usual insulin dose
- The supplemental dose should be given straight away not delayed until the next regular insulin dose is due
- Supplemental insulin doses should be accompanied with frequent blood glucose monitoring
- Supplemental doses can be given 2-4 hourly
- If blood glucose levels are not improving following two supplemental insulin doses direct medical supervision is required

- Individuals should attend hospital if signs of HHS such as drowsiness, confusion, disorientation, hyperventilation, dehydration or coma are apparent

- For those treated with premixed insulin, supplies of rapid or short acting insulin for emergency situations is recommended. If these individuals do not have access to short acting insulin they need to be managed in a medical environment

- Cease additional insulin once blood glucose have stabilised < 15.0 mmol/L.

**Calculating supplemental insulin dose**

Supplemental insulin is usually given as a percentage of the total daily dose (TDD) of insulin. To calculate the TDD dose add up all the insulin taken on a usual day including rapid/short acting and intermediate/long acting. Do not count supplemental insulin given for illness.

The supplemental doses and management strategies are indicated in Table 8:

*Table 8: Supplemental home insulin for Type 2 diabetes during illness*  
(Adapted from algorithms in; Laffel L. et al Sick day management algorithm  
Ambler G et al. Caring for Diabetes in Children and Adolescents. A parent’s manual )

<table>
<thead>
<tr>
<th>Key</th>
<th>% refers to percentage of the total daily dosage given as rapid or fast acting insulin</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>If blood glucose is (mmol/L/L)</th>
<th>Actions</th>
<th>Health Professional (HP) Advice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person with diabetes</td>
<td>Note: medical supervision required if no improvement following 2 supplemental doses of insulin</td>
<td></td>
</tr>
<tr>
<td>&lt; 4.0</td>
<td>Take glucose containing fluids</td>
<td>Advise seek medical care if unable to raise or maintain BGL above 4.0 mmol/L following quick acting carbohydrate or if unable to tolerate food/fluids</td>
</tr>
<tr>
<td></td>
<td>Call HP if cannot raise or maintain blood glucose &gt;4.0 mmol/L within one hour</td>
<td></td>
</tr>
<tr>
<td>≤ 15.0</td>
<td>No change to insulin</td>
<td>Recommend further 10% short acting insulin dose</td>
</tr>
<tr>
<td></td>
<td>Check glucose 2 hourly</td>
<td>Arrange contact with client in two hours</td>
</tr>
<tr>
<td>15 - 22.0</td>
<td>If short acting insulin available take supplemental 10%</td>
<td>If blood glucose &gt; 15 mmol/L seek medical care</td>
</tr>
<tr>
<td></td>
<td>Test blood glucose in 2 hours - if &gt;15.0 mmol/L call HP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If short acting insulin not available test glucose in 2 hours - if blood glucose &gt; 15.0 mmol/L seek medical care</td>
<td></td>
</tr>
<tr>
<td>&gt; 22.0</td>
<td>If short acting insulin available take an supplemental 20% of insulin dose</td>
<td>If after supplemental insulin blood glucose is &gt;22.0 mmol/L recommend further 20% of insulin dose</td>
</tr>
<tr>
<td></td>
<td>Test blood glucose in 2 hours if &gt; 15.0 mmol/L call for HP help</td>
<td>If after supplemental insulin blood glucose is 15-22.0 mmol/L recommend further 10% of insulin dose</td>
</tr>
<tr>
<td></td>
<td>If short acting insulin not available test glucose in 2 hours- if blood glucose remains &gt; 15.0 mmol/L seek medical care.</td>
<td>Arrange contact with client in two hours if blood glucose remains &gt; 15.0 mmol/L advise to seek medical care.</td>
</tr>
</tbody>
</table>
Avoidance of strenuous exercise is recommended during hyperglycaemia. Exercising when blood glucose is high may increase blood glucose levels further.

8. Managing hypoglycaemia

**Key recommendations**

19. Where hypoglycaemia occurs due to illness follow the standard recommendations for managing hypoglycaemia. A 20-50% reduction of insulin or the reduction of diabetes medications may be required under the supervision of doctor or diabetes educator. (GPP)

**Treating hypoglycaemia**

Individuals at risk of hypoglycaemia include those who are treated with sulphonylureas, glitinides or insulin.

Gastrointestinal illnesses and infections may cause hypoglycaemia. These infections are often associated with nausea, vomiting or diarrhea.

If unable to eat and blood glucose is low, small frequent quantities of carbohydrate containing drinks along with frequent blood glucose monitoring is recommended. Rehydration solutions have a low concentration of carbohydrate therefore additional carbohydrate may be required.

The regular guidelines for acute hypoglycaemia apply:

- Consumption of 15 grams of easily digestible carbohydrate such as 3 glucose tablets, 150 ml lemonade (not diet), 100 ml Lucozade or 5 jelly beans.
- Rechecking blood glucose and consumption of another 15 grams of carbohydrate if blood glucose remains low after 5-10 minutes.
- When blood glucose starts to rise follow with longer acting carbohydrate food such as fruit, sandwich or the next meal.
- If hypoglycaemia is persistent and blood glucose remains below 4.0 mmol/L medical help should be sought. Intramuscular glucagon or intravenous glucose may be required.
- For severe hypoglycaemia where the person is unconscious or fitting they should be placed on their side, airway cleared and an ambulance called. Intramuscular glucagon should be given if available.
Development of the Sick Day Management Guidelines

Principles underpinning guidelines

The process for developing the guidelines was informed by the National Health and Medical Research Council's; Guidelines for Developing Clinical Practice Guidelines.34 35 36 37 38 The Sick Day Management guidelines were developed according to the following principles:

- Based on evidence or good practice where evidence is lacking
- Focussed on the person with diabetes
- User friendly format with practical, concrete and consistent decision making information for people with diabetes and health professionals.

Project Reference Group and Project Officers

A reference group was convened to oversee the development of the guidelines and included diabetes educators, endocrinologists, pharmacist, representatives from ADEA, Royal Australian College of General Practitioners (RACGP), Australian Diabetes Society (ADS), Australasian Diabetes in Pregnancy Society (ADIPS) and the Australian Practice Nurses Association (APNA), with Abbott Laboratories as observers. The project officer position was undertaken by Marie Gill and Jane Willcox from gill + willcox.

Sick Day Guideline development process

1. Initial search

Technical reviews, consensus guidelines and position papers about diabetes and sick day management were accessed from key Australian and International organisations.

A first level literature search was conducted using general sick day/illness and diabetes medical index subject terms and filters. The data bases of Medline, Cochrane and CINAHL were systematically searched from inception to 7/7/2005.

2. Key topics identification

Key topics were identified from these technical reviews, consensus guidelines and position papers. These included:

Practice and setting

- Defining guidelines target and scope
- Background on illness
- Goals of sick day management
- Assessment of persons / carers capacity to administer guidelines
Practical guideline themes

- Point to enact guidelines
- Need to assess individual’s capability of following guidelines
- Insulin and/or usual medication
- Blood glucose monitoring
- Hydration and carbohydrate intake
- Ketone monitoring
- Adjusting insulin and/or medication
- Hyperglycaemia
- Hypoglycaemia
- Managing and understanding underlying illness
- When to contact health professionals or attend hospital
- Preparation for sick days.

3. Peer consultation

Health professional input, practical guidelines and education literature currently used in clinical practice were sought.

Education material databases (Medline plus and health insite) were searched for diabetes and sick day related education material.

Key stakeholders were notified about the guideline development and requests for input, clinical guidelines and education material was sought from members of ADEA, Diabetes Australia (DA), RACGP and the Dietitians Association of Australia (DAA) via national newsletters and websites.

A selection of diabetes centres in each state and territory were contacted and asked to complete a brief questionnaire seeking evidence and practice based information.

The information obtained was sorted into the key topic areas.

4. Formulating clinical questions

Clinical questions were formulated to cover areas of disparity or where there were not clear indications in the literature or clinical practice. The questions were based on information from the technical reviews, consensus guidelines and position papers and the clinical guidelines and education material obtained from key stakeholders. (Attachment 1)

5. Reviewing the evidence

A review of the literature concerning sick day management and diabetes was conducted using the clinical questions and key themes identified.

Searches were conducted using relevant medical index subject terms and filters. The data bases of Medline, Cochrane and CINAHL were systematically searched from inception to 7/2005.

The exclusion criteria included languages other than English and non human studies. The reference list at the end of each relevant paper was searched for papers not found in the electronic search.

The evidence

Only one study evaluating the advice for home management of intercurrent illness in Type 1, Type 2 or gestational diabetes was found. These limited findings are consistent with published consensus guidelines.
In addition, consensus guidelines primarily exist for children and adolescents with Type 1 diabetes. These consensus guidelines provided a basis for the ADEA sick day management in diabetes guidelines.

The limited evidence is outlined in the Evidence section on page 41.

6. Grading the evidence

The papers identified were reviewed and graded according to the NHMRC Levels of Evidence criteria.

Table 9: NHMRC Levels of evidence (1999)

<table>
<thead>
<tr>
<th>Level of evidence</th>
<th>Study design</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Level I</td>
</tr>
<tr>
<td></td>
<td>Evidence from a systemic review of all relevant randomised controlled trials (RCT)</td>
</tr>
<tr>
<td>II</td>
<td>Level II</td>
</tr>
<tr>
<td></td>
<td>Evidence from at least one properly-designed RCT</td>
</tr>
<tr>
<td>III-1</td>
<td>Level III-1</td>
</tr>
<tr>
<td></td>
<td>Evidence from well-designed pseudo-randomised controlled trials (alternate allocation or some other method)</td>
</tr>
<tr>
<td>III-2</td>
<td>Level III-2</td>
</tr>
<tr>
<td></td>
<td>Evidence from comparative studies with concurrent controls and allocation, non-randomised (cohort studies), case-control studies, or interrupted time series with a control group</td>
</tr>
<tr>
<td>III-3</td>
<td>Level III-3</td>
</tr>
<tr>
<td></td>
<td>Evidence from comparative studies with historical control, two or more single-arm studies, or interrupted time series without a parallel control group</td>
</tr>
<tr>
<td>IV</td>
<td>Level IV</td>
</tr>
<tr>
<td></td>
<td>Evidence from case series, either post-test or pre-test and post-test</td>
</tr>
</tbody>
</table>

7. Formulating the recommendations

When evidence was available it was used to formulate recommendations.

Where there was no discernable evidence, consensus guidelines or referrable sources were used to formulate recommendations. While there is limited evidence for managing sick days in people with diabetes, some strong clinical practice recommendations for sick day management exist. This was indicated in the extensive review of sick day literature from Australian and International diabetes organisations and broad canvassing of clinical care practices.

The clinical questions not able to be answered through the evidence were circulated to the Guideline Reference Group for current practice recommendations.

Where consensus guidelines or referable sources were lacking, good practice points were based on the judgement of the Guideline Reference Group and drawn from work and literature in the field. These were graded to indicate their source (Table 10).

Table 10: Additional gradings

<table>
<thead>
<tr>
<th>Grade</th>
<th>Basis of grading</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Expert committee reports opinions or clinical experience / consensus statements or reports from professional organisations</td>
</tr>
<tr>
<td>GPP</td>
<td>Good practice point based on the judgement of Guideline Reference Group and drawn from work and literature in the field</td>
</tr>
</tbody>
</table>

Recommendations were formulated on the basis of their ability to:

- Address the clinical issues on which the research questions were based
- Improve outcomes
- Do good and avoid harm
- Focus on feasible, accessible and acceptable treatment alternatives and management options.

8. **Draft guidelines**

To ensure maximum uptake, the draft guidelines were developed in multiple formats to cater for the different target audiences:

- Sick Day Management Guidelines for People with Diabetes – Full version
- Abridged “desk top” version for health professionals
- Consumer versions. (Type 1 and Type 2).

9. **External review**

Stakeholders asked to review the draft guidelines included:

- Australian Diabetes Educators Association
- Australian Diabetes Society
- Australasian Podiatry Council
- Diabetes Australia
- Dietitians Association of Australia
- Divisions of General Practice
- Practice Nurses Association
- Pharmaceutical Society of Australia
- Royal Australian College of General Practice

Stakeholder comments were identified, categorised and considered by the Reference Group.

10. **Final guidelines and dissemination**

The final guidelines will be disseminated to appropriate health professionals and consumers through ADEA.

**Consumer consultation**

Consumer consultation and input was crucial to the development of the guidelines and occurred throughout the development process including:

**Consumer input into development of the guidelines**

Consumers were asked what concerns they had for managing sick days, what information they felt they needed to manage sick days and what would be required of the guidelines to help them manage sick days.

This information was sought through:

- Notification and requests for input into the guidelines circulated nationally in the Diabetes Australia Conquest magazine and on the website.
- Two consumer focus groups comprising 62 people with Type 1 and Type 2 diabetes.

**Consumer review of draft guidelines and development of consumer friendly format**

Notification and requests for input into the draft guidelines were circulated nationally in the Diabetes Australia Conquest magazine and on the website and to other consumer interest groups.

Consumer focus groups and online surveys provided input into the practical application of the guidelines and the development of the consumer friendly format of the guidelines.
Acknowledgements

The *Sick Day Management Guidelines for Diabetes* was supported by Abbott Diabetes Care through an unrestricted educational grant to the Australian Diabetes Educators Association.

**Guideline Reference Group**

<table>
<thead>
<tr>
<th>Member</th>
<th>Organisation</th>
</tr>
</thead>
</table>
| Ms Di Roberts (Chair) | Diabetes Educator (CDE)  
Community Health ACT Health  
ADEA representative |
| Dr Geoffrey Ambler | Paediatric Endocrinologist  
The Children's Hospital at Westmead |
| Mr Mark Coles | Pharmacist/Diabetes Educator (Private Practice) |
| Ms Shirley Cornelius | Diabetes Educator (CDE)  
National President ADEA |
| Ms Janet Lagstrom | Diabetes Educator (CDE), Nurse Practitioner  
Australian Diabetes in Pregnancy Society |
| Dr Pat Phillips | Australian Diabetes Society |
| Mr Chris Thorpe | Australian Diabetes Educators Association (CEO) |
| Ms Lynne Walker | Diabetes Nurse Educator  
President Australian Practice Nurses Association |
| Ms Louise McLaren (Observer) | Abbott Diabetes Care |

**Project Management Team**

<table>
<thead>
<tr>
<th>Member</th>
<th>Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ms Marie Gill</td>
<td>gill + willcox</td>
</tr>
<tr>
<td>Ms Jane Willcox</td>
<td>gill + willcox</td>
</tr>
</tbody>
</table>

**Consumer Reference Groups**

<table>
<thead>
<tr>
<th>Member</th>
<th>Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes Interest Groups</td>
<td>Banyule Community Health Service</td>
</tr>
<tr>
<td>Kate Gilbert and members</td>
<td>Realitycheck</td>
</tr>
</tbody>
</table>

**General Practitioner Reviewers**

<table>
<thead>
<tr>
<th>Member</th>
<th>Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Ralph Audehm</td>
<td>General Practitioner (Melbourne)</td>
</tr>
</tbody>
</table>
| Dr Gary Deed | General Practitioner (Brisbane) – Chair  
Diabetes Australia Advocacy Policy Committee |
| Dr Barry Fatovich | General practitioner (Perth) |
Guideline review date

The ADEA Sick Day Management Guidelines will be reviewed in 5 years, 2011.

Legal considerations

The following NHMRC statement applies to the guidelines:

*Every attempt has been made to locate the most recent evidence. Judgement is necessary when applying evidence in a clinical setting. It is important to note that weak evidence does not necessarily mean that a practice is unadvisable, but may reflect the insufficiency of evidence or the limitations of scientific investigation. The guidelines are intended to act as a guide to practice. The ultimate decision of what to do rests with the practitioner and the consumer and depends on individual circumstances and belief.*

(NHMRC 1999).
The Evidence

Only one study was identified that evaluated recommendations or advice for the treatment of intercurrent illness for people with diabetes. The lack of findings was consistent with others.

Where there was no discernable evidence, consensus guidelines or referrable sources were used to formulate recommendations. Where these were lacking, clinical practice recommendations, based on information from the field and agreed to by the Reference Group, were utilised.

Evidence Table 11.1

<table>
<thead>
<tr>
<th>Reference number</th>
<th>Authors &amp; year</th>
<th>Study design</th>
<th>Population</th>
<th>Intervention</th>
<th>Outcome</th>
<th>Results</th>
<th>Discussion / Comments</th>
<th>Evidence level</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>Laffel LMB, Wentzell K, Loughlin C, Tovar A, Moltz K, Brink S. 2005.</td>
<td>Comparative</td>
<td>One hundred and twenty three (123) children and young people (3-22 yrs) with type 1 diabetes</td>
<td>Receiving sick day education participants randomised to either blood glucose and blood ketone (3-OHB) monitoring (BK) or blood glucose and urine ketone monitoring (UK). Participants asked to monitor blood glucose ≥ 3 times per day and ketones when unwell, blood glucose consistently elevated or symptoms of DKA exhibited for study period of 6 months and treat according to sick day guidelines.</td>
<td>Sick days Hyperglycaemia Ketosis Frequency of, and satisfaction with, ketone monitoring Incidence of hospitalisation/ emergency assessment</td>
<td>• 274 reported sick days in UK vs 304 in BK (NS) • HbA1c 7.7 ± 1.2% UK vs 8.1± 1.6% BK (NS) • Frequency of ketone testing during sick days 90.8% BK vs 61.3% UK (P&lt;0.0001) • 70% BK group preferred BK checking over UK. • Incidence acute complications 38/100 patient yrs BK vs 75 per/100 patient yrs UK (p=0.05)</td>
<td>Randomisation Not described Blinding Not stated Outcome assessment Standardised assessments Losses to follow up Not fully described. 108/123 returned monitors, 97/123 returned log books.</td>
<td>III-2</td>
</tr>
<tr>
<td>28</td>
<td>Haymond MW, Schreiner B. 2001.</td>
<td>Case series</td>
<td>Thirty-three (33) hypoglycaemic episodes in 28 children and</td>
<td>Using a standard U-100 insulin syringe, children received mini dose glucagon</td>
<td>Blood glucose concentration</td>
<td>Blood glucose was 3.44 ±0.15 mmol/L prior to and 8.11 ± 0.72 mmol/L 30 minutes following</td>
<td>Mini-dose glucagon rescue, using subcutaneous injections, is</td>
<td>IV</td>
</tr>
</tbody>
</table>
young people (6.6 ± 0.7 yrs old) with type 1 diabetes during gastroenteritis with mild impending hypoglycaemia were analysed. subcutaneously according to age. • 2 years or younger, received 2 “units” (20 mcg) of glucagon • Greater than 2 years received 1 “unit” for each year of age up to 15 “units” (150 mcg). If blood glucose did not increase within 30 minutes, the double the initial dose was given. Reoccurrence of hypoglycaemia / level of treatment glucagon. In 4 children, relative hypoglycaemia reoccurred requiring re-treatment (3.48 ± 0.18 to 6.94 ± 0.72 mmol/L). In 4 children, a third dose was required. The glucagon was well tolerated. In 28/33 episodes, the children remained at home and fully recovered. Five children were taken to local hospital because of concerns of dehydration and/or fever, but none for hypoglycaemia. effective in managing children with type 1 diabetes during episodes of impending hypoglycaemia due to gastroenteritis and/or poor oral intake of carbohydrate.

Evidence Table 11.2: Consensus and position statements and technical reports used to formulate recommendations

<table>
<thead>
<tr>
<th>Reference number</th>
<th>Consensus and position statements and technical reviews</th>
</tr>
</thead>
</table>
## Attachment 1: Clinical questions

<table>
<thead>
<tr>
<th>Topic</th>
<th>Clinical question</th>
<th>Type of diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Blood glucose monitoring</strong></td>
<td>How often should blood glucose monitoring occur during illness?</td>
<td>All</td>
</tr>
<tr>
<td><strong>Ketone testing</strong></td>
<td>How often and how should ketones be measured?</td>
<td>Type 1</td>
</tr>
<tr>
<td></td>
<td>What is the critical ketone point (blood and urine) where home sick day guidelines are no longer relevant and health professionals need to be contacted immediately?</td>
<td>Type 1</td>
</tr>
<tr>
<td></td>
<td>Are there recommendations for ketone testing for Type 2 diabetes?</td>
<td>Type 2</td>
</tr>
<tr>
<td></td>
<td>Are there recommendations for ketone testing for GDM?</td>
<td>GDM</td>
</tr>
<tr>
<td><strong>Insulin adjustment</strong></td>
<td>Which algorithms should be recommended for adjusting insulin during intercurrent illness?</td>
<td>Type 1</td>
</tr>
<tr>
<td></td>
<td>Should different algorithms be recommended for different groups eg children and adolescents compared with adults?</td>
<td>Type 1</td>
</tr>
<tr>
<td></td>
<td>Are there additional insulin adjustment guidelines for insulin pumps?</td>
<td>Type 1</td>
</tr>
<tr>
<td></td>
<td>Are there algorithms for insulin supplements in Type 2 diabetes and GDM?</td>
<td>Type 2/GDM</td>
</tr>
<tr>
<td><strong>Diabetes medication</strong></td>
<td>Are there guidelines for supplemental oral medication in Type 2 Diabetes?</td>
<td>Type 2</td>
</tr>
<tr>
<td></td>
<td>What advice, if any, should be given about metformin continuation or discontinuation during intercurrent illness?</td>
<td>Type 2</td>
</tr>
<tr>
<td><strong>Dehydration prevention</strong></td>
<td>What is the blood glucose crossover point for sweetened to unsweetened fluid?</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>Is a quantity of fluid recommended to help avoid dehydration and if so which amounts?</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>Should a quantity of carbohydrate be suggested for consumption per hour?</td>
<td>All</td>
</tr>
<tr>
<td><strong>Additional medications</strong></td>
<td>Should over the counter sugar free medications be recommended over sugar containing?</td>
<td>All</td>
</tr>
<tr>
<td><strong>Additional monitoring</strong></td>
<td>Which additional parameters should be recommended for people to monitor at home with intercurrent illness?</td>
<td>All</td>
</tr>
</tbody>
</table>
References