

Diabetes Emergencies

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Acknowledgement of Country

Artwork: Emma Bamblett - Wurla Wurla Journey: Commitment & Respect

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Session Overview

- Hypoglycaemia
- Hyperglycaemia
- Hyperglycaemic emergencies
 - Diabetic Ketoacidosis (DKA)
 - Hyperglycaemic hyperosmolar state (HHS)
- Discuss sick day management

ndss

National Diabetes Services Framework
An Australian Government initiative

The NDSS is administered by Diabetes Australia. The NDSS Agent in Victoria is Diabetes Victoria.

diabetes victoria

The NDSS Agent in Victoria

Hypoglycaemia Definition

- Hypoglycaemia (often referred to as Hypo)
 - hypo – low
 - glycaemia – glucose
 - aemia – blood
- Usually blood glucose level (BGL) ≤ 3.9 mmol/L (International Diabetes Federation 2020)

Hypoglycaemia

Only occurs in people treated with insulin or sulphonylureas

- It is a side effect of diabetes treatment
- Must treat if $BGL \leq 4.0$ mmol/L, with or without symptoms
- Follow your facility protocol for hypoglycaemia

Available Sulphonylureas

- GLICLAZIDE Standard formulation**
 - Glyade®, Mellihexal®, Nidem®, Genrx Gliclazide®
- GLICLAZIDE Extended release**
 - Diamicon MR®, Glyade MR®, Oziclide MR®
- GLIBENCLAMIDE** : Daonil®, Glimet®
- GLIPIZIDE** : Melizide®, Minidiab®
- GLIMEPIRIDE** : Amaryl®, Dimirel®, Aylide®, Diapride®, Gilmepride Sandoz®

Causes of hypoglycaemia

- Insulin/Sulphonylureas
 - Dose
 - Timing of insulin injection
- Delayed or missed meal/ not enough CHO for insulin/sulphonylurea
- Physical activity (more than usual)
- Alcohol intake
- Vomiting or illness

At increased risk of hypoglycaemia

- Long duration of diabetes
- Longer acting sulphonylureas e.g. glibenclamide
- The young or elderly
- People who are fasting
- People trying to achieve 'tight' control

Impact of hypoglycaemia

- Falls and accidents
- Impaired cognition
- Fear, apprehension, embarrassment
- Loss of independence
- Stroke and heart attack in elderly
- Fitting and unconsciousness
- Death



Hypoglycaemia

Early symptoms/signs (autonomic)

- Weakness, shaking
- Sweating
- Dizziness
- Hunger
- Anxiety
- Pallor
- Tingling around the lips
- Palpitations

Late symptoms/signs (neuroglycopenia)

- Behaviour changes: irritability, crying, aggression
- Lack of concentration
- Blurred vision, headache
- Confusion, poor co-ordination
- Impaired consciousness
- Seizures

Classification of hypoglycaemia

- Mild**
- A mild hypo is one where the individual is able to treat the episode themselves
- Severe**
- Needs assistance from another person to treat hypo



Hypo Treatment
RULE of 15 / 15 / 15

- Step 1**
- Check BGL: less than 4.0mmol/L or symptoms (if unable to check)
- Give 15 g quick acting carbohydrate such as:
 - 6-7 jelly beans (depends on size)
 - 3 teaspoons sugar / glucose powder
 - 150 mls normal soft drink/juice
 - Glucose tablets / gel 15 g



Hypo Treatment

- Step 2**
- Re-check BGL in 15 minutes
- If still less than 4.0 mmol/L repeat step 1
 - Above 4.0 mmol/L give 15 g low GI carbohydrate
 - Do NOT withhold next insulin/sulphonylurea for mild hypoglycaemia
 - If taking Acarbose treat with glucose (not fructose i.e. fruit juice)



Impaired consciousness

- Give nothing orally: no gel, no liquids or food
- Recovery position, clear and maintain airway
- Call emergency
 - Call code if in hospital
 - Call 000 for ambulance and state "Diabetes Emergency"
- Check BGL
- IV glucose for adults according to hospital protocol
- Out of hospital: Glucagon IM may be given by trained person/ family member



Impaired Awareness of Hypoglycaemia (IAH)

- Reduced or absent ability to perceive onset of hypo**
- No symptoms until BGL very low
 - Associated with 6 fold risk of severe hypoglycaemia
 - May become unconscious suddenly
- At risk**
- Long duration of diabetes
 - Tight glycaemic control / frequent hypos
 - Elderly

Hypo awareness can be regained

Hyperglycaemia

Diabetes is a condition where there is too much glucose in the bloodstream

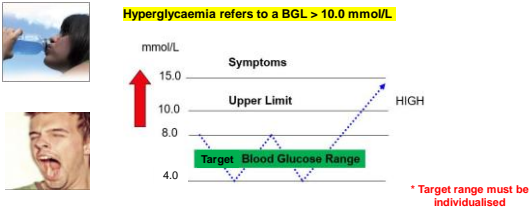
Management goals include keeping blood glucose levels (BGLs) within target range for around 70% of the time

In the long term chronically elevated BGLs can increase risk of developing diabetes related complications

In the short-term, hyperglycaemia can cause symptoms such as: Polyuria, polydipsia, lethargy & increased risk of infection

People with diabetes can also experience hyperglycaemic emergencies which can be fatal if left untreated

Hyperglycaemia



Causes of hyperglycaemia

- Delayed/missed medications or insulin
- Infections- Bacterial or viral e.g. gastro, flu, UTI
- Undetected stroke/ heart attack
- Wound, ulcer, cellulitis,
- Stress and pain
- Tooth decay, gum disease
- Some medications: steroids, antipsychotics
- Extra food/ unexpected carbohydrates in meals



Illness and hyperglycaemia

- Illness can lead to hyperglycaemia due to the activation of counterregulatory hormones (including cortisol and adrenaline)
- BGLs and insulin requirements are sometimes increased for a few days before the onset of the illness and may persist for a few days after the illness has passed
- Illnesses most likely to increase BGLs include viral illnesses or bacterial infections, particularly if with fever
- If not managed appropriately, acute illness or infection can quickly lead to hyperglycaemia and in some cases may develop into DKA & HHS
- DKA & HHS are serious acute complications of diabetes that can be life-threatening

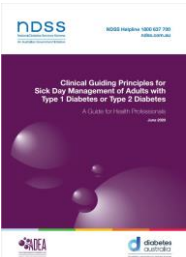
What is a sick day?

According to ADEA (Australian Diabetes Educators Association):

A sick day is a short-term illness or infection which requires a person with diabetes to make changes to their usual diabetes management to prevent hyperglycaemia, hypoglycaemia and the development of Diabetic Ketoacidosis (DKA) or Hyperglycaemic Hyperosmolar State (HHS).



(Clinical Guiding Principles For Sick Day Management of Adults With Type 1 and Type 2 Diabetes 2020)



Sick day guidelines

Develop “sick day action plan” when well

- At diagnosis
- Review at least every 1-2 years or when change in treatment

Initiate when 1 or more of these apply:

- Feeling unwell
- Noticing signs of an illness
- Ketones in blood $\geq 1.0\text{ mmol/L}$ ($\geq 0.6\text{ mmol/L}$ if at high risk) or urine small to moderate
- BGL $\geq 15.0\text{ mmol/L}$ on two consecutive readings (e.g. within a 2- 6 hour time frame)

Sick day management flowchart – Insulin injections



Key principles:

- Treat underlying cause of hyperglycaemia
- **Never omit basal insulin**, may need extra quick acting insulin
- Seek help early for insulin advice
- If unable to eat, and at risk of hypoglycaemia:
 - Drink carb free fluids if BGL $\geq 15.0\text{mmol/L}$
 - Drink fluids containing carbs if BGL $\leq 15.0\text{mmol/L}$
- Blood glucose checks: 2- 4 hourly – overnight also
- Blood ketone checks (type 1 and some type 2): 2 - 4 hourly

Diabetic Ketoacidosis (DKA)

- DKA is a life threatening metabolic complication of insulin deficiency
- Occurs in type 1 diabetes (rarer in type 2 diabetes)
- The resulting hyperglycaemia results in loss of electrolytes, hyperosmolality and fluid depletion
- Common causes:
 - undiagnosed type 1 diabetes
 - insulin omission/ marked reduction
 - acute illness or infection

Presenting Signs & Symptoms: DKA

Symptoms	Signs
Polyuria/polydipsia/thirst	Altered conscious state
Nausea/vomiting	Kussmaul breathing, rapid respiratory rate
Abdominal pain	Ketotic breath – smells like acetone
Weight loss	Dehydration*

Diagnosis of DKA

Diagnostic criteria:

- Hyperglycaemia $\geq 11.1\text{ mmol/L}$
- Venous pH < 7.3 or bicarbonate $< 15\text{mmol/L}$
- Presence of blood ketones (> 0.6), or large urinary ketones

Onset can be very quick

Ketones

- Ketones are produced by the body as an alternative source of energy to glucose. The body produces ketones by breaking down fats, this process is known as ketosis.
- Insufficient insulin, illness/ infection can lead to hyperglycaemia and ketone production
- Blood ketones of $\geq 1.0\text{mmol/L}$ ($\geq 0.6\text{mmol/L}$ if at high risk) should instigate 'sick day' management
 - Blood ketones at these levels must be treated with extra quick acting insulin

When to check blood ketones

- BGL $\geq 15.0\text{mmol/L}$
- Feeling unwell
- Symptoms of hyperglycaemia
- Symptoms of DKA



When to seek urgent medical help

- If blood ketones ≥ 3.0mmol/L
- If blood ketones ≥ 1.5mmol/L not cleared after 2 supplemental doses of quick acting insulin
- Signs and symptoms of DKA
- Persistent vomiting, especially if more than 4 hours
- Severe hypo or BGL can't be kept ≥ 4.0 mmol/L
- Too unwell to do own monitoring and management
- If BGL ≥ 15.0mmol/L for > 24 hours or BGL continues to rise despite 2 supplemental insulin doses

Euglycaemic ketoacidosis with SGLT2 inhibitor

- SGLT2 inhibitors are oral medications that promote glucose excretion in the urine for treatment of T2DM
- They carry a risk of DKA with near normal or only mildly elevated BGL

Recommendations:

- SGLT2's should be ceased 3 days prior to surgery and only restarted when patient eating and drinking (3-5 days)
- Routinely check both BGL and blood ketone levels if patient has been unwell, fasting or limited oral intake
- Remember blood glucose level doesn't have to be elevated

Hyperglycaemic Hyperosmolar State(HHS)

Serious complication of type 2 diabetes:

- Severe hyperglycaemia
- Severe hyperosmolarity
- Severe dehydration
- In the absence of ketoacidosis
- Slower onset – evolves over days or weeks
- Mortality rate 15-20%
- Often occurs in older people with multiple comorbidities and people with undiagnosed type 2 diabetes
- May occur in younger people as initial type 2 diabetes presentation

Presenting Signs & Symptoms: HHS

• Signs and symptoms of hyperglycaemia	• Weight loss
• Tachycardia	• Hypotension
• Weakness	• Poor skin turgor
• Dry mucous membranes	• Drowsiness/coma

Aged Care residents can be at higher risk

- They become dehydrated quickly
- May not be aware of or able to treat increasing thirst/dehydration
- Staff may not know warning signs

Prevent Hyperglycaemic emergencies

- Sick day management plan essential before illness occurs
- Prompt recognition and treatment of hyperglycaemia
- Prompt start of sick day plan when unwell
- Never stop insulin, may need more for those on insulin
- Check BGLs and blood ketones (T1D) more frequently
- Prevent dehydration
- Be aware of when to call for assistance

Patient Resources

- [Managing hypoglycaemia - NDSS Fact sheet](#)
- [Hypoglycaemia Management - Baker Institute](#)
- [Managing sick days for type 1 diabetes](#)
- [Living with type 2 diabetes – what to do when you are sick](#)



More Information

- [ADEA Clinical Guiding Principles for Sick Day Management of Adults with Type 1 and Type 2 Diabetes \(2020\)](#)
- [The McKellar Guidelines for Managing Older People with Diabetes in Residential and Other Care Settings \(2014\)](#)
- [RACGP Management of type 2 diabetes: A handbook for general practice \(2020 Edition\)](#)
- [ADS Emergency management of hyperglycaemia in primary care \(2018\)](#)
- [International Diabetes Federation - Hypoglycaemia](#)
- [NDSS Diabetes management in aged care: A Practical Handbook](#)



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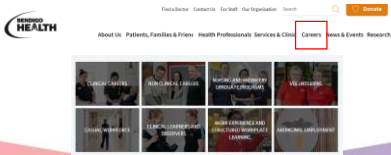
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