Guideline 9.2.9 – First Aid Management of a Diabetic Emergency

Summary

Who does this guideline apply to?

This guideline applies to adults and children.

Who is the audience for this guideline?

This guideline is for use by bystanders, first aiders and first aid training providers.

Summary of Recommendations

The Australian and New Zealand Resuscitation Committee on Resuscitation (ANZCOR) make the following recommendations:

1. When available, and trained to do so, use a blood glucometer to check the person's blood glucose level [Good Practice Statement].
2. ANZCOR recommends the use of oral glucose (swallowed) for individuals with suspected hypoglycaemia who are conscious and able to swallow [strong recommendation, very low certainty of evidence].[1]
3. ANZCOR suggests against buccal (inside of mouth along cheek) glucose administration compared with oral glucose administration for individuals with suspected hypoglycaemia who are conscious and able to swallow [weak recommendation, very low certainty of evidence].[1]
4. If oral glucose (tablet) is not immediately available, ANZCOR suggests a combined oral + buccal glucose (glucose gel) administration for individuals with suspected hypoglycaemia who are conscious and able to swallow [weak recommendation, very low certainty of evidence].[1]
5. ANZCOR suggests the use of sublingual glucose administration for suspected hypoglycaemia for children who may be uncooperative with the oral (swallowed) glucose administration route [weak recommendation, very low certainty of evidence].[1]
6. When available, and trained to do so, use a glucagon injection to manage suspected

hypoglycaemia in an unconscious or seizing person [Good Practice Statement].
7. If unsure of the blood glucose, manage the person as having suspected hypoglycaemia [Good practice statement].

1.0 | Introduction

Diabetes is a chronic, lifelong medical condition which occurs when the pancreas fails to produce sufficient insulin or the body develops a resistance to the action of its own insulin. Untreated, the absolute or relative lack of insulin will lead to a high blood glucose level. There are two main types of diabetes. 'Type 1 diabetes' is an auto-immune disease that often develops in childhood, and requires lifelong treatment with insulin. 'Type 2 diabetes' is more commonly recognised in adulthood, and requires a treatment combination of diet, exercise, oral medication, and sometimes insulin. 'Gestational diabetes' is a relatively common condition specific to pregnancy, and diabetes can also occur as a consequence of another disease or as a side effect of medication.

Normally the body tightly controls its blood glucose level within a 'normal' range. Having diabetes interferes with this control system, and people living with diabetes need to manage their own blood glucose levels by monitoring what they eat, adjusting their insulin or other medication doses, and frequently testing their own blood glucose levels.

When blood glucose levels become too high or too low, people with diabetes (and some other people without diabetes) may become unwell and need first aid, or treatment at a medical facility.

2.0 | Low blood glucose (hypoglycaemia or 'a hypo')

2.1 | Introduction

Low blood glucose is when blood glucose is less than 4.0

People with diabetes may develop low blood glucose as a result of:[2]

- too much insulin or other blood glucose lowering medication;
- inadequate or delayed carbohydrate intake after their usual insulin or oral medication dose;
- exercise without adequate carbohydrate intake;
- the setting of other illness; or
- excessive alcohol intake.

Competitors in ultra-marathon endurance events, who do not have diabetes, can also become energy deplete and develop low blood glucose levels requiring first aid management.

Hypoglycaemic events range from those that can be self-managed, to severe episodes, where

medical help is needed.

2.2 | Recognition

The brain requires a continuous supply of glucose to function normally. When blood glucose levels fall below normal levels symptoms and signs may include:

- anxiety, agitation
- sweating
- pallor (pale skin), especially in young children[1]
- a rapid pulse
- shaking, trembling or weakness
- nausea or hunger
- light headedness or dizziness
- headache
- mood or behavioural changes, confusion, difficulty concentrating
- visual disturbance, slurred speech
- difficulty or inability to follow instructions
- drowsiness, unresponsiveness (loss of consciousness) or seizure

2.3 | Management

If a person with diabetes has a diabetes management plan, then that plan should be followed. If a person with diabetes reports low blood glucose or exhibits symptoms or signs of hypoglycaemia:

- Stop any exercise, rest and reassure.
- If the person is able to follow simple commands and swallow safely, ANZCOR recommends that first aid providers administer 15 to 20 grams glucose tablets (4 to 5 x 4 gram glucose tablets) for treatment of symptomatic hypoglycaemia [CoSTR 2020, strong recommendation, very low certainty of evidence].[3,,4,,5]
- If glucose tablets are not available, we suggest administering confectionary including:
    - Glucose gels (15 g of glucose gel)[7]
    - Honey or sugar (3 teaspoons)
    - Fruit juices (approx. 200 mL)
    - Sugary drinks or sugar-sweetened beverages (approx. 200 mL), but DO NOT administer 'diet' or 'low-cal' or 'zero' or 'sugar free' beverages
    - Mentos® (5 to 10 mints) [CoSTR 2015, weak recommendation, very-low-quality evidence][2]
    - Skittles® (20 to 25 candies)
    - Jelly beans (5 to 20 beans depending on the brand).
    - Monitor for improvement – resolution of symptoms would be expected within 15

minutes.
    - If symptoms or signs of hypoglycaemia persist after 10 to 15 minutes, and the person is still able to follow simple commands and swallow safely, administer a further 4 x 4g glucose tablets or alternatives as listed above.
    - Once recovered, give a snack with longer acting carbohydrate, for example: 1 slice of bread / sandwich OR 1 glass of milk OR 1 piece of fruit OR 2-3 pieces of dried fruit OR 1 snack size tub of yoghurt (not diet or 'sugar free' yogurt). If it is a usual meal time, then eat that meal.
    - If the person deteriorates, does not improve with treatment, has a seizure or is unconscious, call for an ambulance and stay with the person.

- If the person is unresponsive and not breathing normally, commence resuscitation following the Basic Life Support Flowchart [ANZCOR Guideline 8].

If the person is unconscious but breathing, position the person into a lateral, side lying (lateral recumbent) recovery position as opposed to leaving them supine, and ensure the airway is open and clear, and call an ambulance [ANZCOR Guideline 3].

Insulin Pumps

If the person is wearing an insulin pump, then they themselves may 'suspend' their own pump if part of a personal diabetes management plan.

First aiders should ***not*** touch any insulin pump being worn by the person. They should manage and provide treatment for hypoglycaemia as listed above.

2.4 | Use of glucagon to treat severe hypoglycaemia

Family members of, and carers for children and adults with diabetes may be trained in the use of the GlucaGen® HypoKit. This kit contains an injection of glucagon, which works by triggering the liver to release stored glucose, resulting in raised blood glucose levels. The glucagon is administered by injection.

- The usual dose for adults and children who weigh more than 25 kg is 1 mg (1 mL). Use the content of the full syringe (1 mL).
- The usual dose for children who weigh less than 25 kg is 0.5 mg (0.5 mL). Gently push the plunger until it is at the 0.5 mL mark on the syringe to make sure there is 0.5 mL liquid left in the syringe.
- If you do not know how much the child weighs:

- Give a child under 6 years of age 0.5 mg (0.5 mL).

- Give a child 6 years of age and older 1 mg (1 mL).

If trained to do so, give Glucagon in the case of a severe hypoglycaemic event, when the person is unconscious or having a seizure, and/or is unable to swallow safely.[4]

The effectiveness of glucagon is reduced when food has not been eaten for more than 12 hours or in individuals with advanced liver disease.

3.0 | High blood glucose (hyperglycaemia)

3.1 | Introduction

Hyperglycaemia means having a high blood glucose level. Common causes of hyperglycaemia include inadequate levels of insulin or incorrect doses of diabetes oral medications, illness, infections, excess carbohydrate intake, and stressful situations. Many people do not experience symptoms from hyperglycaemia until their blood glucose levels are extremely high. Hyperglycaemia can also occur at the time of initial diagnosis of diabetes, and may go unrecognised until the person is clearly unwell. If untreated, the person gradually deteriorates, and can go into life threatening conditions such as Diabetic ketoacidosis (DKA), Hyperosmolar hyperglycemic state (HHS) and coma.

3.2 | Recognition

When blood glucose levels remain above normal levels symptoms and signs may include:

- excessive thirst
- frequent urination of large volumes
- dry skin and mouth (signs of dehydration)
- recent weight loss
- excessive tiredness
- rapid pulse

- nausea and vomiting
- abdominal pain
- rapid and deep breathing
- fruity sweet smell of acetone on the breath (similar to paint thinner or nail polish remover) and
- confusion, a deteriorating level of consciousness, or unresponsiveness.

3.3 | Management

If a person with diabetes has a diabetes management plan then that plan should be followed. If the person has no management plan and has symptoms or signs of *hyperglycaemia* they should be assessed by a health care professional.

- If the person is unresponsive and not breathing normally, commence resuscitation following the Basic Life Support Flowchart [Refer to ANZCOR Guideline 8]
- If the person is unconscious but breathing, position the person into a lateral, side lying (lateral recumbent) recovery position as opposed to leaving them supine, and ensure the airway is open and clear, and call an ambulance. [Refer to ANZCOR Guideline 3].

4.0 | When unsure if the blood glucose level is high or low?

When unsure if the person has a high or low blood glucose level, the safest option is to treat as for hypoglycaemia (low blood glucose level). Treatment may lead to a marked improvement if the blood glucose level is low, and is unlikely to do harm if the blood glucose level is high (see ANZCOR Diabetes fact sheet – [https://resus.org.au/download/diabetes-fact-sheet-april-30-2021-0-2-mib/?wpdmdl=13851&masterkey]).

4.1 | Use of blood glucose measuring devices (Glucometers)

If trained to do so and a glucometer is available, checking the person's blood glucose level will guide management, and can confirm hypoglycaemia or hyperglycaemia. Normal blood glucose concentrations are between 4.0 and 7.0 mmol/L.

A blood glucose level between 3.0 mmol/L and 4.0 mmol/L is an "alert value", meaning that to prevent progression to a more serious, clinically important hypoglycaemia, it is time for a normal food intake, either a snack or meal, depending on the time of day and usual food intake habits.[6]

Clinically important hypoglycaemia is defined as a blood glucose level less than 3.0 mmol/L, where there is decreased neuro-cognitive function (reasoning ability or orientation) and increased

morbidity (illness) and mortality.[6]

Symptoms of hypoglycaemia may be the same as other conditions such as stroke, epilepsy, or migraine.

If trained, checking a blood glucose will improve the accuracy of diagnosing hypoglycaemia. ANZCOR suggest if blood glucose concentration is normal, and symptoms and signs of hypoglycaemia persist, consider other diagnoses [CoSTR 2015: weak recommendation/low quality evidence].[2]

Hyperglycaemia is defined as a blood glucose level above the normal reference range.

Abbreviations

Abbreviation	Meaning/Phrase
ANZCOR	Australian and New Zealand Committee on Resuscitation
ILCOR	International Liaison Committee on Resuscitation
CoSTR	Consensus on Science and Treatment Recommendation

References

1. Borra V, Carlson JN, De Buck E, Djärv T, Singletary EM, Zideman D, Bendall J, Berry DC, Cassan P, Chang WT, Charlton NP, Hood NA, Meyran D, Woodin JA, Swain J. Glucose administration routes for first aid in case of symptomatic hypoglycaemia. Consensus on Science and Treatment Recommendations [Internet] Brussels, Belgium: International Liaison Committee on Resuscitation (ILCOR) First Aid Task Force, 2018 Aug 27. Available from:http://ilcor.org accessed 23 July 2020
2. International Hypoglycaemia Study Group. Minimizing Hypogylcemia in Diabetes. Diabetes Care. August 2015. Volume 38: 1583-159
3. Zideman, D. A., Singletary, E. M., De Buck, E.,et al. (2015). Part 9: First aid: 2015 International Consensus on First Aid Science with Treatment Recommendations. Resuscitation, 95, e225. https://cprguidelines.eu/sites/573c777f5e61585a053d7ba5/content_entry573c77e35e61585a053d7bac/573c77e65e61585a053d7bb6/files/S0300-9572_15_00368-8_main.pdf? Accessed 19/05/2017
4. Carlson JN, Schunder-Tatzber S, Neilson CJ, Hood N. Dietary sugars versus glucose tablets for first-aid treatment of symptomatic hypoglycaemia in awake patients with diabetes: a systematic review and meta-analysis. Emerg Med J 2016; 34:100–106.
5. Villani M, de Courten B, Zoungas S. Emergency treatment of hypoglycaemia: a guideline and

evidence review. Diabet Med. 2017 May 6. doi: 10.1111/dme.13379
6. International Hypoglycaemia Study Group. Glucose Concentrations of Less Than 3.0mmol/L (54mg/dL) Should Be Reported in Clinical Trials: A Joint Position Statement of the American Diabetes Association and the European Association for the Study of Diabetes. Diabetes Care. Jan 2017, 40 (1) 155-157; DOI: 10.2337/dc16-2215
7. De Buck E, Borra V, Carlson JN, Zidemann DA, Singletary EM, Diary T. First aid glucose administration routes ffor symptomatic hypoglycaemia. Cochrane Database Syst Ver 2019;4:CD013282. Doi:https//dx.doi.org/10.1002/14651858.CD013283.pub2

Further Reading

- ANZCOR Guideline 2 - Managing an Emergency
- ANZCOR Guideline 3 - Recognition and First Aid Management of the Unconscious Victim
- ANZCOR Guideline 8 - Cardiopulmonary Resuscitation
- ANZCOR Guideline 9.2.2 – Stroke

About this Guideline

Search date/s	Systematic review August 2018 and grey literature search May 2024

Question/PICO:	*Population:* Adults and children with suspected hypoglycaemia (out-of-hospital, including healthy volunteers). Neonates are excluded, as we believe the identification of hypoglycaemia in this age group is a specialized diagnostic and treatment process well beyond First Aid. *Intervention:* Administration of glucose by any enteral route appropriate for use by first aid providers *Comparators:* Administration of glucose by another enteral route appropriate for use by first aid providers *Outcomes:* • Resolution of symptoms (critical) – defined as the reversal of the initial symptoms (dichotomous outcome; yes/no). • Time to resolution of symptoms (critical) - defined as the time from the administration of the sugar containing solution until the symptoms resolved (continuous outcome). • Blood or plasma glucose concentration at 20 minutes (critical) – defined as the glucose level as measured 20 minutes after the administration of the sugar substrate (continuous outcome) or as evidence of blood or plasma glucose elevation at 20 minutes (dichotomous outcome; yes/no). • Resolution of hypoglycaemia (Important) – defined as elevation of the blood glucose level to rise above the authors' threshold for determining hypoglycaemia (dichotomous outcome; yes/no). • Time to resolution of hypoglycaemia (Important) - defined as the time from the administration of the sugar containing solution until the blood glucose concentration rose above the threshold for the authors' definition of hypoglycaemia (continuous outcome). • Any adverse event (Important) – any event resulting from the administration as defined by the study authors (e.g. aspiration). • Administration delay (Important) – defined as the delay in administering the sugar containing solution as a result of the administration arm (dichotomous outcome; yes/no). *Study Designs:* Randomized and nonrandomized clinical trials, observational studies were included. Unpublished studies (e.g., conference abstracts, trial protocols, methods papers) were excluded. *Timeframe:* All years and all languages were included provided there was an English abstract from inception to December 22, 2017 with an update performed on July 11, 2018.
Method:	Systematic Review by ILCOR with CoSTR available at ILCOR.org Grey literature search by ANZCOR May 2024
Major changes:	None
Primary reviewers:	George Lukas, Finlay Macneil, Natalie Hood
Other consultation	Nil
Worksheet	See ILCOR.org
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Referencing this guideline

When citing the ANZCOR Guidelines we recommend:

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https://www.anzcor.org/home/first-aid/guideline-9-2-9-first-aid-management-of-a-diabetic-emergency