

ANZCOR 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.

Recommendations

The Australian and New Zealand Committee on Resuscitation (ANZCOR) makes 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. We recommend the use of oral glucose (swallowed) for individuals with suspected hypoglycaemia who are conscious and able to swallow.¹ [strong recommendation, very low certainty of evidence]
3. We suggest against buccal glucose administration compared with oral glucose administration for individuals with suspected hypoglycaemia who are conscious and able to swallow.¹ [weak recommendation, very low certainty of evidence]
4. If oral glucose (tablet) is not immediately available, we suggest a combined oral + buccal glucose (glucose gel) administration for individuals with suspected hypoglycaemia who are conscious and able to swallow.¹ [weak recommendation, very low certainty of evidence]
5. We suggest the use of sublingual glucose administration for suspected hypoglycaemia for children who may be uncooperative with the oral (swallowed) glucose administration route.¹ [weak recommendation, very low certainty of evidence]
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 level, manage the person as having suspected hypoglycaemia. [Good Practice Statement].

1 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 Low blood glucose (*hypoglycaemia* or 'a hypo')

2.1 Introduction

People with diabetes may develop low blood glucose levels 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; possibly delayed for up to 12 hours or more after exercise.
- in 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:

- sweating,
- pallor (pale skin), especially in young children¹
- a rapid pulse;

- shaking, trembling or weakness;
- hunger;
- light headedness or dizziness;
- headache;
- mood or behavioural changes, confusion, inability to concentrate;
- slurred speech;
- inability to follow instructions;
- unresponsive; 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 level 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, we recommend that first aid providers administer 15-20 grams glucose tablets (4 - 5 x 4 gram glucose tablets) for treatment of symptomatic hypoglycaemia.^{1,3,4,5} [ILCOR CoSTR 2020 strong recommendation, very low certainty of evidence] If glucose tablets are not available, we suggest administering:
 - Confectionary including:
 - jelly beans (5 to 20 beans depending on the brand)
 - Skittles® (20 to 25 candies)
 - Mentos® (5 to 10 mints)³ [ILCOR CoSTR 2015, weak recommendation, very low certainty of evidence]
 - Sugary drinks or sugar-sweetened beverages (approx. 200 mL), but DO NOT administer 'diet' or 'low-cal' or 'zero' or 'sugar free' beverages;
 - Fruit juices (approx. 200 mL);
 - Honey or sugar (3 teaspoons);
 - Glucose gels (15 g of glucose gel)⁶; and
- 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 OR 1 glass of milk OR 1 piece of fruit OR 2 to 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, is seizing or is unconscious, call for an ambulance.

- 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, lie the person on their side and ensure the airway is clear [Refer to 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, people with diabetes may be trained in the use of the GlucaGen® HypoKit®. These kits contain 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.

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



3 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, infections, excess carbohydrate intake, and stressful situations. Hyperglycaemia can develop over hours or days, and 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 a coma.

3.2 Recognition

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

- excessive thirst;
- frequent urination;
- dry skin and mouth, with sunken eyes (signs of dehydration);
- recent weight loss;
- rapid pulse;
- nausea and vomiting;
- abdominal pain;
- rapid 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, lie the person on their side and ensure the airway is clear [Refer to ANZCOR Guideline 3].

4 Management 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. [Refer to ANZCOR Diabetes fact sheet - appendix]

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 mmol/L and 7.8 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.⁵

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.⁵

Symptoms of hypoglycaemia may be mimicked by other conditions such as stroke, epilepsy, or migraine. If trained, checking a blood glucose will improve the accuracy of diagnosing hypoglycaemia. We suggest that if the blood glucose concentration is normal, and symptoms and signs of hypoglycaemia persist, other diagnoses need to be considered.³ [CoSTR 2015: weak recommendation/low quality evidence]

Hyperglycaemia is defined as a blood glucose level above the normal reference range. Severe hyperglycaemia is defined as a blood glucose level greater than 15 mmol/L.

References

1. Singletary EM, Zideman DA, Bendall JC, Berry DC, Borra V, Carlson JN, Cassan P, Chang WT, Charlton NP, Djärv T, Douma MJ. 2020 International Consensus on First Aid Science With Treatment Recommendations. *Circulation*. 2020 Oct 20;142(16_suppl_1):S284-334.
2. International Hypoglycaemia Study Group. Minimizing Hypoglycemia 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.
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 Sep;34(9):1205-1211.
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

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	August 2018
Question/PICO:	<i>Population:</i> 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.

	<p><i>Intervention:</i> Administration of glucose by any enteral route appropriate for use by first aid providers</p> <p><i>Comparators:</i> Administration of glucose by another enteral route appropriate for use by first aid providers</p> <p><i>Outcomes:</i></p> <ul style="list-style-type: none"> • 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). <p><i>Study Designs:</i> Randomized and nonrandomized clinical trials, observational studies were included. Unpublished studies (e.g., conference abstracts, trial protocols, methods papers) were excluded.</p> <p><i>Timeframe:</i> 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.</p>
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Other consultation	Nil
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DIABETES FACT SHEET FOR FIRST AIDERS

Diabetes is a disorder of regulation and use of sugar. It is due to a lack of insulin production or resistance of the body to insulin, one of the hormones that controls the use of glucose (a simple sugar used by the body to provide energy for various functions). 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 (the body attacks and destroys part of itself) 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, medication, and sometimes insulin. Less commonly, 'gestational diabetes' may develop in 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 medication doses, and frequently testing their own blood glucose levels.

The reasoning behind the practice of assuming hypoglycaemia for a diabetic unwell due to the diabetes is based on the CoSTR (consensus on science and treatment recommendations) published in 2018¹ which made the following recommendations:

- We recommend the use of oral glucose (swallowed) for individuals with suspected hypoglycemia who are conscious and able to swallow (strong recommendation, very low certainty of evidence).
- We suggest against buccal glucose administration compared with oral glucose administration for individuals with suspected hypoglycemia who are conscious and able to swallow (weak recommendation, very low certainty of evidence).
- If oral glucose (e.g. tablet) is not immediately available, we suggest a combined oral + buccal glucose (e.g. glucose gel) administration for individuals with suspected hypoglycemia who are conscious and able to swallow (weak recommendation, very low certainty of evidence).
- We suggest 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).

The problem is that most first aiders do not have a glucometer and are not trained in the use of one.

If a diabetic is unwell due to the diabetes, there are 2 possibilities, hypoglycaemia or hyperglycaemia. If oral glucose or glucagon is given to an unwell diabetic person with:

- hypoglycaemia and able to swallow, they will improve.
- hyperglycaemia, they will not get much worse in the short term

If oral glucose or glucagon is withheld from an unwell diabetic person with:

- hypoglycaemia, they will continue to deteriorate rapidly and may not be in a position to swallow safely in a short time
- hyperglycaemia, they will continue to deteriorate slowly till IV rehydration and insulin administration.

Thus there is no short term problems with giving oral glucose or glucagon to a person with diabetic emergency, but major problems if glucose or glucagon is withheld from some persons with a diabetic emergency. Hence ANZCOR recommends that first aiders treat an unwell person with diabetes for hypoglaemia.

Reference:

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 hypoglycemia. 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>