TREATMENT OF HYPOGLYCEMIA - ADULT

OBJECTIVE

- To support assessment, early recognition, and prompt intervention for adult patients experiencing a hypoglycemic event, presenting to or admitted to an Alberta Health Services (AHS) Acute Care setting.

APPLICABILITY

Compliance with this document is required by all Alberta Health Services employees, members of the medical and midwifery staffs, Students, Volunteers, and other persons acting on behalf of Alberta Health Services (including contracted service providers as necessary) working within Acute Care settings.

ELEMENTS

1. Points of Emphasis

1.1 For the purposes of this policy suite only, Acute Care setting(s) includes all AHS urban and rural hospitals (including the Emergency Department), psychiatric facilities, and Urgent Care facilities.

1.2 This document may be used in non-acute care settings. Site/unit managers are responsible for determining whether this document in whole or in part is appropriate to their patient care setting and communicating that out to staff.

1.3 For patients with diabetes or gestational diabetes, this procedure applies only to those who are on at least one of the following medications: insulin or sulphonylureas (glyburide, gliclazide, glimepiride) or repaglinide.
1.4 An order is not required to implement this procedure, provided that a health care professional has determined that the patient meets the specific circumstances and implementation criteria outlined within the procedure.

**Exception:**

A patient-specific order from the most responsible health practitioner is required to administer dextrose 50 percent in water (D50W) via intravenous (IV), as this is a schedule 1 medication; this should not delay treatment. In emergent situations where it is not possible to obtain an order prior to administering D50W; obtaining an order can happen at the same time, or immediately following treating the patient with D50W via IV.

1.5 Blood glucose targets are 5-10 millimoles per litre (mmol/L) for the majority of non-critically ill adult inpatients, as long as these targets can be safely achieved.

1.6 It is important to avoid overtreatment of hypoglycemia, since this can result in rebound hyperglycemia.

1.7 The patient should not be sent off the Unit, especially for physical activity, until their blood glucose is greater than or equal to 4 mmol/L after treatment; and they have had the opportunity to have a snack or meal containing carbohydrate and protein (or Parenteral Nutrition [PN] or tube feed re-established).

1.8 Holding of insulin requires an order from the most responsible health practitioner.

1.9 Holding basal or bolus insulin after a hypoglycemic event commonly results in significant hyperglycemia 3 to 4 hours later.

1.10 Treatment of hypoglycemia shall be initiated when a patient's blood glucose reading is below 4 mmol/L. The patient may be symptomatic or asymptomatic. Refer to Appendix A: Adult Hypoglycemia Treatment Algorithm.

1.11 Timing of insulin administration should be coordinated with meals and blood glucose testing.

   a) Blood glucose testing should be done within 30 minutes prior to meal; and

   b) Insulin should be administered based on this test no more than 30 minutes prior to meals in most instances.

      (i) Short acting insulin should be given 30 minutes prior to a meal; and

      (ii) rapid acting insulin should be given just before a meal.

      (iii) Meal/bolus insulin may be given immediately after the meal/feed in certain situations (e.g., gastroparesis or concern that the patient may not be able to ingest or retain the full meal).
1.12 Capillary blood is not recommended for blood glucose testing for patients with severely impaired peripheral circulation (e.g., hypovolemia, shock).

1.13 Blood glucose testing may be repeated and/or verified by laboratory testing at the health care professional’s discretion if the point of care testing (POCT) blood glucose reading is:

   a) Inconsistent with the patient's clinical status (i.e., the patient is not exhibiting signs and symptoms of hypoglycemia); or

   b) suspected to be related to equipment failure.

   **Note:** Verification is not required for a patient who is known to have asymptomatic hypoglycemia or hypoglycemia unawareness and the blood glucose meter result is less than 4 mmol/L.

2. **Personnel**

2.1 Care and management of hypoglycemic patients shall be provided by all health care professionals within their scope of practice.

2.1 Point of care testing (POCT) with glucose meters must be performed by health care providers who have received appropriate glucose meter clinical education and training, and have maintained the ongoing competency requirements.

3. **Identification of Hypoglycemia**

3.1 Hypoglycemia is defined by blood glucose level of less than 4 mmol/L. This is most often seen in patients treated with insulin or an insulin secretagogue (i.e. sulfonylureas and meglitinides).

3.2 A hypoglycemic state may be asymptomatic or symptomatic.

3.3 Symptoms of hypoglycemia may include, but are not limited to:

   a) **Early / Non-severe** symptoms: headache, mood changes, irritability, tremors, tiredness, tachycardia, excessive hunger, diaphoresis, pallor, paresthesia, and/or inability to concentrate.

   b) **Advanced/Severe** symptoms may include all of the above as well as: being unable to recognize and treat hypoglycemia by self; disorientation, altered level of consciousness (including unconscious state), and/or seizure.

4. **Treatment of Hypoglycemia in Patients Who Are Conscious and Able to Swallow (includes Patients with Dysphagia) or Conscious and Have a Tube Feed**

4.1 Refer to Appendix A: *Adult Hypoglycemia Treatment Algorithm*.
**Note:** For patients who are ordered nothing by mouth (NPO) follow the section on the algorithm for Altered Consciousness/Unable to Swallow.

4.2 Where the health care professional identifies a state of hypoglycemia, treatment shall be initiated, as per this procedure.

4.3 The most responsible health practitioner shall be contacted and informed if the patient’s condition changes to an advanced/severe state of hypoglycemia; and when otherwise specified in this procedure.

4.4 Provide 15 grams (or as close as possible) of a quick acting carbohydrate. Choose one (1) of the following:

- a) 4 dextrose tablets (16 grams [g] of carbohydrate); or
- b) three-quarters (3/4) cup or 175 mL juice or regular pop; or
- c) 2 individual packages (or 15 mL) of honey; or
- d) 4 packets of sugar dissolved in water.

**Exceptions:**

(i) If the patient is taking acarbose (Glucobay) for glycemic control, use dextrose tablets or honey only, as acarbose delays the absorption of sucrose.

(ii) If the patient has a tube feed, provide juice and flush with water (pre and post juice).

(iii) For patients with dysphagia, give honey.

4.5 Repeat blood glucose test in 15 minutes.

a) If the patient’s blood glucose result is below 4 mmol/L, repeat treatment with 15 grams of quick acting carbohydrate.

   (i) Retest in 15 minutes.

   (ii) If blood glucose remains below 4 mmol/L, contact the most responsible health practitioner for further treatment.

   • If the patient becomes unresponsive or has altered level of consciousness, proceed to Section 5 of this document.

b) If the patient’s blood glucose result is greater than or equal to 4 mmol/L and the next meal is more than one hour away, provide a snack consisting of approximately 15 grams of carbohydrate and a protein source. Choose one of the following suggested snack options:
(i) 3 packages of soda crackers (two crackers per package) with either:
   - 1 package of peanut butter (1 tablespoon or 15 g per package); or
   - 1 package of cheese (1 ounce or 30 g per package); or

(ii) 2 packages of arrowroot cookies (2 cookies per package) with either:
   - 1 package of peanut butter (1 tablespoon or 15 g per package); or
   - 1 package of cheese (1 ounce or 30 g per package); or

(iii) 1 slice of toast/bread with either:
   - one (1) package of peanut butter (1 tablespoon or 15 g per package); or
   - 1 package of cheese (1 ounce or 30 g per package); or

(iv) one-half (1/2) of a meat or cheese sandwich (1 slice of bread and 1 ounce or 30 grams of meat or cheese).

Exceptions:

- For patients with dysphagia on minced/puree diets provide:
  - 1 container of Ensure or Boost pudding (113 g/142 g); or
  - 1 container smooth Greek yogurt (100 g).
  
  If neither is available; discuss appropriate snack options with dietitian, or most responsible health practitioner.

- For patients on tube feed:
  - If tube feed is continuous, continue regular feeding at established rate; or
  - if tube feed is intermittent, give 100 mL bolus of ordered formula and resume feeding at next scheduled time.

  c) If the patient’s blood glucose result is greater than or equal to 4 mmol/L; and the meal is less than one hour away, give the meal only and do not provide a snack.

4.6 Document patient’s symptoms, treatment provided and response to treatment in the patient’s health record.
4.7 Notify the most responsible health practitioner, at the next contact, regarding the patient’s hypoglycemic event.

4.8 Repeat blood glucose test one hour after the hypoglycemic event.

4.9 Resume insulin schedule or other anti-hyperglycemic medications unless otherwise ordered. Contact the most responsible health practitioner if unsure.

5. Treatment of Hypoglycemia in Patients with Altered Consciousness/Unable to Swallow (includes Patients who are NPO)

5.1 Refer to Appendix A: Adult Hypoglycemia Treatment Algorithm.

5.2 Where the health care professional identifies an advanced/severe state of hypoglycemia, the most responsible health practitioner shall be contacted and informed of the patient’s change in status.

   a) A patient-specific order from the most responsible health practitioner is required to administer D50W via IV, as this is a Schedule 1 medication; however this should not delay treatment. In an emergent situation obtaining an order can happen at the same time, or immediately following treating the patient with D50W via IV.

5.3 If patient has an altered level of consciousness, place in the recovery position to maintain an open airway.

5.4 If patient does not have intravenous (IV) access, attempt to establish in a large vein (i.e., antecubital). Avoid using small peripheral veins for the administration of IV D50W, as this hyperosmolar solution can cause extravasation and consequential complications including tissue injury and loss of limb.

   a) If unable to initiate IV within 2 minutes, administer glucagon 1 mg subcutaneously or intramuscularly (SC or IM) and continue to attempt IV access. Administer glucagon while the most responsible health practitioner is being contacted regarding the patient’s condition. Do not delay treatment.

5.5 Once IV access is established in a large vein (i.e., antecubital vein) or central line, administer 1 pre-filled 50 mL syringe of D50W (25 g of dextrose) via direct IV over 1 to 3 minutes, as per AHS parenteral monograph.

   a) If health care professional is unable to administer D50W via direct IV (i.e., IV “push”), add 50mL of D50W (25 g of dextrose) to a 50 mL mini-bag of dextrose 5 percent in water (D5W) or 0.9 percent normal saline (NS) and infuse over 15 to 20 minutes, as per AHS parenteral monograph.
b) If a smaller peripheral vein is the only IV access, infuse D50W (25 g of dextrose) in a 50 mL mini-bag of D5W or NS and infuse over 30 minutes, as per AHS parenteral monograph.

c) A patient-specific order from the most responsible health practitioner is required to administer dextrose D50W via IV, as this is a Schedule 1 medication; however this should not delay treatment. In an emergent situation, obtaining an order can happen at the same time, or immediately following treating the patient with IV D50W.

5.6 Following administration of D50W, infuse IV with D5W at 30 mL/hr to keep the vein open, or rate ordered by the most responsible health practitioner.

5.7 Repeat blood glucose test in 15 minutes:

a) If blood glucose is greater than or equal to 4 mmol/L and patient is conscious, proceed to Section 5.8 in this document.

b) If blood glucose is below 4 mmol/L and patient is conscious/able to swallow:

(i) provide 15 grams (or as close as possible) of a quick acting carbohydrate. Choose one (1) of the following:

- 4 dextrose tablets (16 g of carbohydrate); or
- three-quarter (3/4) cup or 175 mL of juice or regular pop; or
- 2 individual packages (or 15 mL) of honey ; or
- 4 packets of sugar, dissolved in water.

Exceptions:

- If the patient is taking acarbose (Glucobay) for glycemic control, use dextrose tablets or honey only, as acarbose delays the absorption of sucrose.

- If the patient has a tube feed, provide juice and flush with water (pre and post juice).

- For patients with dysphagia, give honey.

(ii) Repeat blood glucose test in 15 minutes.

- If the patient's blood glucose result is less than 4 mmol/L, repeat treatment with 15 grams of quick acting carbohydrate.

- Retest in 15 minutes.
If blood glucose remains below 4 mmol/L, contact the most responsible health practitioner for further treatment orders.

c) If blood glucose is below 4 mmol/L, and patient continues to have altered level of consciousness, is unable to swallow or is NPO, and IV access is established, repeat administration of intravenous D50W (25 g of dextrose) followed by:

   (i) Repeat blood glucose test in 15 minutes; and

   (ii) contact the most responsible health practitioner for further treatment if blood glucose remains below 4 mmol/L.

d) If blood glucose is below 4 mmol/L, and patient continues to have altered level of consciousness, is unable to swallow or is NPO, and there is no IV access, repeat administration of glucagon 1 mg SC or IM followed by:

   (i) Continued attempts to establish IV access;

   (ii) repeat blood glucose test in 15 minutes; and

   (iii) contact the most responsible health practitioner for further treatment if blood glucose remains below 4 mmol/L.

5.8 Once blood glucose is greater than or equal to 4 mmol/L:

a) If the patient is conscious, able to swallow and the meal is less than one hour away, give the meal only and do not provide a snack.

b) If the patient is conscious, able to swallow, and the next meal is more than one hour away, provide a snack consisting of approximately 15 grams of carbohydrate and a protein source. Choose one of the following suggested snack options:

   (i) 3 packages of soda crackers (2 crackers per package) with either:

      • 1 package of peanut butter (1 tablespoon or 15 g per package); or

      • 1 package of cheese (1 ounce or 30 g per package); or

   (ii) 2 packages of arrowroot cookies (2 cookies per package) with either:

      • 1 package of peanut butter (1 tablespoon or 15 g per package); or

      • 1 package of cheese (1 ounce or 30 g per package); or

   (iii) 1 slice of toast/bread with either:
- 1 package of peanut butter (1 tablespoon or 15 g per package); or
- 1 package of cheese (1 ounce or 30 g per package).

(iv) one-half (1/2) of a meat or cheese sandwich (1 slice of bread and 1 ounce or 30 grams of meat or cheese); or

Exceptions:
- For patients with dysphagia on minced/puree diets provide:
  o 1 container of Ensure or Boost pudding (113 g/142 g); or
  o 1 container smooth Greek yogurt (100 g).

If neither is available; discuss appropriate snack options with dietitian, or most responsible health practitioner.

c) If the patient is on tube feed only:
(i) If tube feed is continuous, continue regular feeding at established rate; or
(ii) if tube feed is intermittent, give 100 mL bolus of ordered formula and resume feeding at next scheduled time.

d) If the patient is receiving Parenteral Nutrition (PN) - infuse D5W at a rate of 30 mL/hr, and notify most responsible health practitioner. If PN is not running then infuse 150 ml bolus of D10W over one hour and contact the most responsible health practitioner for ongoing orders.

e) If the patient is NPO or unable to swallow and has IV access infuse 150 mL bolus of D10W over one hour; and contact the most responsible health practitioner for ongoing orders.

f) If the patient is NPO or unable to swallow and does not have IV access discuss treatment options and nutrition plan with the most responsible health practitioner and/or dietitian.

5.9 Document patient’s symptoms, treatment provided and response to treatment in health record.

5.10 Repeat blood glucose test 1 hour after blood glucose of 4 mmol/L or greater has been established.

5.11 Resume insulin schedule or other anti-hyperglycemic medications unless otherwise ordered. Ask the most responsible health practitioner to review medication orders.
6. **Ongoing Patient Monitoring and Education**

6.1 Once the patient's glycemic status has stabilized, recommence routine blood glucose monitoring and/or increase monitoring as ordered.

6.2 Discontinue intravenous when no longer required, as per the most responsible health practitioner order.

6.3 Review the recent hypoglycemic event and look at efforts to prevent a recurrence.

6.4 Review patient understanding of their situation; and provide education/training as required.

6.5 It is not recommended that basal insulin and/or other anti-hyperglycemic medication be withheld however, adjustments to insulin regime or other anti-hyperglycemics may be required.

6.6 Referral to a Certified Diabetes Educator (CDE) or diabetes specialist (when available), if required.

7. **Documentation**

7.1 The following information shall be documented in the patient's health record:

   a) All blood glucose test results;

   b) associated patient symptoms observed/reported;

   c) any treatment provided, including interventions and medications administered to control or manage the patient's hypoglycemic event;

   d) notification of members of the health care team;

   e) possible contributing factors and other observations; and

   f) patient/family teaching provided.

*Note: Administration of IV D50W push without an order, in an emergent situation, is endorsed by the CARNA medication guidelines 2015; guideline 10. Obtaining an order can happen at the same time, or immediately following treating the patient.*

**DEFINITIONS**

**Health care professional** means an individual who is a member of a regulated health discipline, as defined by the Health Disciplines Act or the Health Professions Act, and who practises within scope and role.

**Health record** means the Alberta Health Services legal record of the patient's diagnostic, treatment and care information.
**Most responsible health practitioner** means the health practitioner who has responsibility and accountability for the specific treatment/procedure(s) provided to a patient and who is authorized by Alberta Health Services to perform the duties required to fulfill the delivery of such a treatment/procedure(s), within the scope of their practice.

**Order** means a direction given by an authorized prescriber to carry out specific activity (-ies) as part of the diagnostic and/or therapeutic care and treatment, to the benefit of a patient. An order may be written (including handwritten and or electronic), verbal, by telephone or facsimile.

**Patient** for the purposes of this document means an adult who receives or has requested health care or services from Alberta Health Services and its health services providers or individuals authorized to act on behalf of Alberta Health Services.

**Schedule 1 medication** means the medications that are defined by the National Association of Pharmacy Regulatory Authorities and provincial legislation as requiring a prescription or order from an authorized prescriber.

**REFERENCES**

- Appendix A: *Adult Hypoglycemia Treatment Algorithm*
- Alberta Health Services Governance Documents:
  - Glycemic Management - Adult Policy (HCS-206)
  - Point of Care Testing (POCT) Policy (PS-90)
- Non-Alberta Health Services Documents:
  - Canadian Diabetes Association 2013 Clinical Practice Guidelines
  - CARNA Medication Guidelines 2015

**VERSION HISTORY**

<table>
<thead>
<tr>
<th>Date</th>
<th>Action Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 27, 2017</td>
<td>Revised</td>
</tr>
</tbody>
</table>
Adult Hypoglycemia Treatment Algorithm

**Step 1 - Recognize**

Blood Glucose is below 4.0 mmol/L

**Step 2 - Treat**

**Conscious / Able to Swallow or Tube Feed**

1. Give 15 grams of quick acting carbohydrate:
   - 4 Dextrose tablets (16 g of carb), or
   - ¾ cup (175 mL) juice or regular pop, or
   - 2 packages (or 15 mL) of honey, or
   - 4 packets sugar, dissolved in water
   *Patients on Acarbose, use dextrose tablets or honey
   *For tube feeds, use juice – flush with water pre and post
   *For dysphagia patients, use honey

2. Repeat blood glucose in 15 minutes. If below 4.0 mmol/L, repeat #1 above, and then proceed to #3 below.

3. Repeat blood glucose in 15 minutes. If below 4.0 mmol/L, call most responsible health practitioner for further treatment.

**Altered Consciousness / Unable to Swallow**

(or Patient NPO)

**IV ACCESS**

Establish or use large IV access (central line or antecubital). Do NOT use small peripheral vein.

*Attempt to establish IV access for 1-2 minutes*

**Treat: IV**

1a. Give 50ml of D50W direct IV (push) over 1-3 minutes (=25 g of carb).
1b. Must call most responsible health practitioner *(This should not delay above treatment.)*
1c. If health care professional not able to give IV push; give D50W in 50mL minibag of D50W or NS over 15-20 minutes

2. IV D5W at 30 mL/hr (to keep vein open)

3. Repeat blood glucose in 15 minutes. If below 4.0 mmol/L, **if conscious/able to swallow**, complete #1 under that heading. **If altered consciousness**, repeat #1 above, and then proceed to #4 below.

4. Repeat blood glucose in 15 minutes. If below 4.0 mmol/L, call most responsible health practitioner for further treatment.

**Treat: SC or IM**

1a. Give Glucagon 1 mg SC or IM, and continue to attempt to start IV.
1b. Must call most responsible health practitioner *(This should not delay above treatment.)*

**IV access**

**no IV access**

**Once blood glucose is greater than or equal to 4.0 mmol/L, see step 3 (on back of this page) for follow-up instructions**

2017-04-05

***Do not send patient off unit until blood glucose greater than or equal to 4.0mmol/L***
Step 3 – Follow-Up

This section outlines follow-up instructions for patients who have blood glucose greater than or equal to 4.0 mmol/L after hypoglycemia treatment.

Able to Swallow

1. If meal is more than one hour away, give snack of a carbohydrate and protein source (see options in table below)***
2. If meal is less than one hour away give meal only (do not give snack)

Tube Feed

1. If tube feed is continuous, continue regular feeding schedule at established rate.
2. If tube feed is intermittent and next feed is more than one hour away, give 100 mL bolus of ordered tube feed formula and then resume next scheduled feeding.

Parenteral Nutrition

-If PN running- Maintain IV D5W at 30 mL/hr
-If PN not running- IV D10W at 150mL/hr for 1 hour

Notify most responsible health practitioner for orders.

Unable to Swallow / NPO

IV D10W at 150mL/hr for 1 hour; and notify most responsible health practitioner for ongoing orders

Unable to Swallow / NPO

Discuss treatment options and nutrition plan with most responsible health practitioner and/or dietitian

---

1. In one hour, recheck blood glucose to ensure it remains greater than or equal to 4.0 mmol/L.
   - If below 4.0 mmol/L, call most responsible health practitioner, and initiate appropriate algorithm (on reserve page).
   - If greater than or equal to 4.0 mmol/L, resume routine blood glucose monitoring.
2. Evaluate patient for cause: e.g. missed meal, exercise, change in medication (increase in insulin dose, decrease in steroids, etc)
4. Discuss nutrition plan and medications with most responsible health practitioner and dietitian.

*** SUGGESTED SNACK OPTIONS OF APPROXIMATELY 15 grams OF CARBOHYDRATE AND A PROTEIN SOURCE: Choose only 1 of the following:

- 3 packages of soda crackers (2 crackers per package) with 1 package of peanut butter (1 Tbsp or 15g) or 1 package of cheese (1 oz or 30g)
- 2 packages of arrowroot cookies (2 cookies per package) with 1 package of peanut butter (1 Tbsp or 15g) or 1 package of cheese (1 oz or 30g)
- 1 slice of toast/bread with 1 package of peanut butter (1 Tbsp or 15g) or 1 package of cheese (1 oz or 30g)
- Half a meat or cheese sandwich (1 slice of bread and 1oz [30g] of meat or cheese) --may not be available at all locations

***for Dysphagia patients (those on minced/pureed diets only) if available: 1 container Ensure/Boost pudding (113g/142g) or 1 container of smooth Greek yogurt (100g). If not available; discuss appropriate snack options with dietitian and/or food service.