FAQ for Glycemic Management Policy Suite

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1. Why were the provincial Glycemic Management policy and procedures for Hypoglycemia management and Hyperglycemia management developed?
These documents were developed to support improved glycemic management for adult patients in hospital.
There have been variable glycemic management practices followed in Alberta Health Services (AHS) Acute Care Hospitals, with some sites using outdated governance documents, forms and order sets. There was no practice direction in some units, and in other facilities there was one governance document for multiple program areas (e.g., LTC and pediatrics). More than one zone had initiated work to standardize an approach, so a provincial approach was felt to be beneficial.
Literature suggests that patients with diabetes experience hyperglycemia (high blood glucose) 38 per cent of the time they are in hospital. Alberta data collected from four urban hospitals from January to December 2014 was consistent with this figure. Hyperglycemia increases the risk of complications including: post-operative infections, pneumonia, diabetic ketoacidosis (DKA), and delays wound healing. Improving blood glucose control in hospital has been associated with shorter length of stay in hospital and decreased rates of readmission. National Guidelines recommend blood glucose targets of 5.0-10.0 mmol/L for most patients with diabetes in hospital.

2. Who does the policy suite apply to?

These documents may also be used in non-acute care settings, however the site/unit managers are responsible for determining whether the governance documents in whole or in part are appropriate to their patient care setting and communicating that out to staff.

3. Who does the Hypoglycemia procedure apply to?
Treatment is for all appropriate patients with a blood glucose less than four (4.0) mmol/L, even those asymptomatic who meet the criteria below:

   a) Patients with diabetes or gestational diabetes, who are on at least one of the following medications: insulin or insulin secretagogues (glyburide, gliclazide, glimepiride or repaglinide).

   b) Patients without diabetes who have symptomatic hypoglycemia due to insulin or insulin secretagogue overdose (glyburide, gliclazide, glimepiride or repaglinide), malnutrition, liver failure, or more rare conditions (e.g. insulinoma, late dumping syndrome, etc.)

This hypoglycemia protocol should not be applied to:

   a) patients with diabetes who are not taking insulin or insulin secretagogues (glyburide, gliclazide, glimepiride or repaglinide).

   b) asymptomatic patients who do not have diabetes (since healthy people who are fasting can have blood glucose levels below four (4.0) mmol/L)
4. What is the Policy suite trying to achieve?
   The three documents aim to achieve the following:
   - To improve adult glycemic management in AHS acute care inpatient settings, through a series of coordinated strategies which include:
     - establish an acceptable blood glucose range for adults
     - recommend blood glucose testing regimes for adults
     - identify basal bolus insulin therapy as the most appropriate treatment regimen for adults requiring subcutaneous insulin
     - support the safe management of insulin pump therapy in hospital when appropriate
     - support the review of hypoglycemic and hyperglycemic events so as to implement appropriate interventions to achieve recommended blood glucose targets
     - to support patient self-management and education needs

5. Who created these governance documents?
   These documents have been developed by a provincial multidisciplinary working group with Nursing, Pharmacy, Allied Health, Dietitian, Physician, Policy and Administration representatives from across five zones, and in consultation with Health Professions Strategy and Practice, College and Association of Registered Nurses of Alberta (CARN) and College of Licensed Practical Nurses of Alberta (CLPNA).

6. What are blood glucose targets for adult patients in hospital?
   Diabetes Canada (previously Canadian Diabetes Association) has recommended blood glucose targets of **5.0-10.0 mmol/L** for most hospitalized patients. These targets are higher and more liberal than the typical targets for patients with diabetes who are treated in the outpatient setting.

   Higher values (**5.0-12.0 mmol/L**) are acceptable for:
   - The frail elderly and those with dementia: an older adult and/or with dementia assessed as physically and/or cognitively frail at risk for confusion, agitation or falls.
   - Patients with limited life expectancy
   - Patients at risk for severe hypoglycemia (e.g. hypoglycemia unawareness)

   In critically ill patients the target BG range is **6.0-10.0 mmol/L**. with the exception for those patients with acute coronary syndrome where their blood glucose targets are 7.0-10.0 mmol/L.

   For more information; please see Diabetes Canada Clinical Practice Guidelines chapter 16 http://guidelines.diabetes.ca/browse/chapter16

7. AHS definitions used in the policy and procedure document
   a. 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
his/her practice. (This is different than the most responsible physician as defined by Canadian Medical Protective Association, or medical bylaws.)

b. **What is the difference between a protocol and a procedure?**
The AHS policy suite includes an overarching policy for glycemic management, as well as procedures for hypoglycemia management and hyperglycemia management. Both a protocol and procedure provide step-by-step direction. A procedure is tied to a policy, a protocol is stand-alone. Procedures are documents that provide detailed step by step information necessary to fulfill requirements set out in a policy. (This is the same as a protocol as described in the 2015 CARNA medication guidelines: Guideline 9: Nurses have the necessary knowledge, skill and competence to perform the interventions within a protocol.)

8. **What is the difference between Type 1 and Type 2 diabetes?**
**Type 1 Diabetes Mellitus (T1DM)**
T1DM is caused by destruction of the insulin producing βeta cells in the Islets of Langerhans, most commonly from an autoimmune process. The pancreas therefore produces very little or no insulin, so blood glucose rises (hyperglycemia). If the body cannot use glucose as an energy source, because of a lack of insulin, it breaks down fat and produces ketones, which are acidic. High levels of ketones can lead to a life threatening condition known as Diabetic Ketoacidosis (DKA).

People with T1DM need insulin therapy to survive, typically a basal bolus insulin regimen (may also be referred to as multiple daily injections). They tend to be less insulin resistant (require lower total daily doses [TDD] of insulin) and have a higher risk of developing severe hypoglycemia (the beta cells can no longer work in conjunction with the alpha cells that produce Glucagon).

People who live with T1DM are taught to carefully monitor their diet (carbohydrate intake), exercise and blood glucose levels, and to administer insulin to help manage their blood glucose levels at home.

**Type 2 Diabetes Mellitus (T2DM)**
T2DM is a progressive chronic disease, with varying degrees of insulin resistance and insulin deficiency. The pancreas produces some insulin, but the cells in the body fail to respond to the insulin properly (insulin resistance). The pancreas often cannot produce enough insulin to overcome this resistance without treatment. However, the pancreas is usually still able to make glucagon in response to insulin production, lowering the risk of severe hypoglycemia.

Initially when individuals are diagnosed with T2DM, diet and exercise lifestyle modifications are an important part of their long term treatment. There are now many medications (oral, non-insulin injections and insulin) to help treat T2DM. Some medications reduce insulin resistance, others increase insulin production, others reduce glucagon and still others increase glucose loss in the urine. People living with T2DM for a long period of time will often need supplemental insulin therapy.
Summary:

Type 1 Diabetes (T1 DM)
- Autoimmune in nature; the pancreas produces very little to no insulin
- These patients always require basal insulin
- At risk for Diabetic Ketoacidosis (DKA)
- At significant risk for Hypoglycemia

Type 2 Diabetes (T2 DM)
- A combination of insulin resistance and insulin deficiency
- The pancreas produces some insulin, but the body is resistant to its own insulin production
- Most patients will benefit from insulin supplementation in hospital

For more information; please visit the Diabetes.ca website at: https://www.diabetes.ca/about-diabetes/types-of-diabetes

9. What is Basal Bolus Insulin Therapy?
Basal Bolus Insulin Therapy (BBIT) is a way of ordering multiple daily injections of subcutaneous (sc) insulin that better replicates how our body naturally produces insulin.

Basal Bolus Insulin therapy allows clinicians to customize insulin regimes based on the unique needs of each patient. It is a proactive approach to managing blood glucose values and aims to anticipate a patient’s insulin needs. A BBIT regime can minimize the risk of having high and low blood glucose levels in hospital. Less fluctuation in blood glucose values is better for the patient and the patient feels much better. BBIT has been shown to be an effective way to manage patients’ diabetes during their hospital stay, and is more similar to how patients manage their diabetes in the community.

BBIT includes 3 components: basal insulin (long acting), bolus (short acting or meal-time) insulin, and correction insulin.

- **Basal Insulin** - covers the glucose the liver (and to a lesser extent the kidneys) makes around the clock
- **Bolus insulin** - covers the meal time carbohydrates
- **Insulin Correction** - corrects the patient’s BG back into target range if it is high
- **Titrate** - Every patient is different! The blood glucose (BG) needs to be checked regularly, and insulin doses adjusted every 1-3 days!

For more information; please visit the BBIT website at: www.bbit.ca

10. What is meal insulin?
Meal/bolus insulin is given to cover the meal time carbohydrates (the rise in blood glucose from eating). This is rapid or short acting insulin given prior to meals.

11. In what aspects are the management of Type 1 and Type 2 diabetes similar?
The management of T1DM or T2DM in the hospital can be similar if a patient requires insulin to manage their blood glucose levels. A patient with T1DM will ALWAYS require insulin. A patient with T2DM may benefit from insulin in the hospital. When subcutaneous insulin is
ordered and administered in the hospital, basal bolus insulin therapy (BBIT) is the recommended best practice as it closely mimics how the body naturally produces insulin.

12. Where do I find the guidelines for Safe Management of Insulin Pump Therapy (IPT) in hospital?
The guidelines for safe management of IPT in Hospital can be found at: www.ipumpit.ca or here. These guidelines support patients to self-manage with their insulin pumps when safe and appropriate. They also support the safe transition to another insulin regimen when patients are unable to self-manage using their insulin pump. 
Key Message of guidelines-“If pump stopped, must replace basal insulin within 2 hours to prevent Diabetic Ketoacidosis (DKA)”

13. When should blood glucose testing occur?
Timing of Testing
- BG levels are to be tested four times daily, before each meal and before bedtime.
- Test BG if any suspicion of hypoglycemia
- Ideally, testing needs to happen within 30 minutes of the patient’s meal. Meal delivery times are unit specific.
- Patients that are fasting, have a continuous tube feed, or parenteral nutrition (PN) require testing at usual scheduled meal times and bedtime, or every 6 hours.
- When the patient will be off Unit at a location where blood glucose testing is not readily available, and/or the patient will be engaging in physical activity,

Coordination of BG Testing and Insulin Administration
Both the BG test and insulin administration are to be coordinated with meal delivery and occur 15-30 minutes before the meal.
- Short acting insulin is given 30 minutes prior to mealtime
- Rapid acting insulin is given no more than 15 minutes prior to mealtime

Exception: 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).

15. Should the meal/bolus insulin be held if the patient’s pre-meal blood glucose is less than 4.0mmol/L?
When the patient experiences hypoglycemia before a meal, the hypoglycemia should be treated (according to the hypoglycemia procedure) until their blood glucose is greater than 4.0 mmol/L. The patient should then receive their meal insulin if they are eating their meal.

16. When should insulin be held?
The meal/bolus insulin dose should be held if the patient is not receiving nutritional intake, NPO or fasting for a test or procedure. (The basal insulin should be administered as prescribed, as well as the correction insulin if required, as per orders.)
If there is a change in the patient’s oral intake (increased nausea and vomiting or decreased appetite), the prescriber needs to be contacted, as the insulin dose may or may not need to be adjusted.

17. **When should 15 grams carbohydrate be given orally to a patient?**
   - When blood glucose is less than 4.0 mmol/L and the patient is considered appropriate for this procedure, see FAQ #3
   - For patients requiring thickened fluids; provide thickened juice based on the thickness indicated in the patient’s diet order.
   - Patients on acarbose (Glucobay): only dextrose tabs or honey may be used as the medication delays the absorption of sucrose.
   *Patients who are NPO or have an altered level of consciousness should not receive the carbohydrate by mouth.

18. **What are some examples of 15 grams of carbohydrate that can be given orally?**
   - 4 dextrose tablets* (16 g of carbohydrate); or
   - three-quarter (3/4) cup or 175 mL of juice or regular pop; or
   - 1 and ½ individual packages (or 15 mL or 18 g of carbohydrate) of honey; or
   - 4 packets of sugar (white or brown), dissolved in water.
   *Dextrose tablets are the preferred treatment for hypoglycemia. Other options may not be readily available in AHS facilities, as this is unit and site dependent.
   *Dextrose tablets are the preferred treatment for hypoglycemia in patients who have had bariatric surgery. Due to anatomical changes of bariatric surgery other treatment options may not be tolerated.
   *Dextrose tablets may be crushed and dissolved in water.

19. **When a conscious patient has a Tube Feed, how do I treat the hypoglycemia?**
   If the patient has a tube feed and unable to have nutritional intake by mouth, provide 4 dextrose tablets crushed and dissolved in water via tube feed AND flush with 30mL water (pre and post treatment).

   Juice, pop and honey are not acceptable treatment options as they may cause clogging or damage to the tube.

   If the patient is NPO or has an altered level of consciousness, follow the treatment recommendations outlined in the AHS procedure treatment of hypoglycemia.

20. **What are SGLT2 inhibitor medications?**
   SGLT2 inhibitors (Sodium–glucose co-transporter 2 inhibitors) are oral medications to decrease blood glucose levels by increasing the amount of glucose passed through the urine.
   The following medications are SGLT2 inhibitors: canagliflozin (Invokana®), dapagliflozin (Forxiga®), empagliflozin (Jardiance®) and ertugliflozin (Steglatro®)

   a. Are SGLT2 inhibitors on AHS formulary?
   These medications are not presently listed on the AHS formulary.
b. Are there any special considerations with SGLT2 inhibitors?
These agents may cause DKA; in some cases DKA has occurred in patients with normal, or modestly elevated blood glucose. These medications may be held by the most responsible health practitioner prior to events that may predispose the patient to DKA.

21. What is a schedule 1 medication?
A Schedule 1 medication is a medication that requires a prescription or order from an authorized prescriber. Controlled drugs and substances are included in Schedule 1. For information on medication schedules please see the Scheduled Drugs Regulation under the Pharmacy and Drug Act (2000) at http://www.qp.alberta.ca/documents/Regs/2007_066.pdf.

22. Can Nurses (RN, RPN, LPN) give D50W without a prescriber’s order?
In an emergency situation, the Nurse can administer D50W IV push without an order. The prescriber should be called at the same time.

D50W IV direct is a schedule 1 medication.

CARN A Medication Guideline 10: Nurses must have a client specific order from an authorized prescriber in order to implement a protocol that includes the administering of Schedule 1 medications within the named protocol.
CLPNA Medication Guideline Protocols: A protocol is an organizationally-approved guide for practice that is to be implemented by health care professionals managing specific client health needs in their practice environment.

In emergent situations where it is not possible to obtain an order prior to initiating a protocol, contacting the authorized prescriber can happen at the same time as the protocol and interventions within it are being implemented.

Emergent situations are defined (in the CARN A document) as circumstances that call for immediate action or attention such that a delay in treatment would place an individual at risk of serious harm.

23. What if Nurses on our unit are not competent and confident to administer IV direct medications?
If the nurse or most responsible health care practitioner treating the patient who is experiencing hypoglycemia with an altered level of consciousness is not competent and confident to provide IV direct medication, IV D50W shall be administered in a minibag (following the D50W monograph) as per the procedure and algorithm.

24. Why is a large vein required for the administration of D50W?
IV D50W is a hyperosmolar solution. It should only be administered IV direct via a large vein (i.e. antecubital). Administered into a small vein, it can cause extravasation and consequential complications including tissue injury and loss of limb.

25. Can I give D50W IV after I administer glucagon (SC or IM) if an IV is established or do I wait for 15 minutes?
Glucagon is to be administered in the patient that is unable to swallow or has an altered level of consciousness, when IV access is not available. If IV access is established, D50W IV is to be administered as D50W action time is significantly quicker than glucagon.

The BG will be re-assessed 15 minutes after the D50W is administered.

26. What do I do for patients with a BG between 4.0-5.0mmol/L?

The target for most hospitalized patients with diabetes is 5.0-10.0mmol/L.

Treatment of hypoglycemia is initiated when the blood glucose is less than 4.0mmol/L.

A BG between 4.0-5.0 mmol/L in the hospital setting does not require intervention unless the patient is symptomatic of hypoglycemia. If the patient is experiencing symptoms of hypoglycemia the hypoglycemia procedure is to be followed.

A patient with a BG between 4.0-5.0 mmol/L, should be assessed for symptoms of hypoglycemia prior to being sent off the unit for a test, procedure, physical activity, etc., and communication between departments should occur.

Frequent BG values between 4.0-5.0mmol/L with symptoms of hypoglycemia may require titration of medications for diabetes management.

27. Why shouldn’t the patient be sent off the unit when their blood glucose is less than 4.0mmol/L?

When the blood glucose is less than 4.0mmol/L, the patient may feel unwell. Symptoms of hypoglycemia include: Excessive hunger, Irritability, Tachycardia, Mood changes, Diaphoresis, Tiredness, Tremors/trembling, Inability to concentrate, Headache, Confusion, Nausea

When patients take insulin or oral insulin secretagogues (glyburide, gliclazide, glimepiride or repaglinide), these medications will continue to lower blood glucose values if not treated appropriately. If a low blood glucose is not treated the patient can develop an altered level of consciousness or have convulsions.

28. Why shouldn’t the patient with Type 1 Diabetes be sent off the unit if their blood glucose is greater than 18.0mmol/L and they are positive for ketones?

When blood glucose levels are significantly elevated the patient may feel unwell. Blood glucose levels will continue to rise if untreated. High blood glucose can put the patient at risk for the development of Diabetic Ketoacidosis (DKA) which is a medical emergency for patients with diabetes.

29. What is DKA, and why are patients at risk for DKA?

Diabetic Ketoacidosis (DKA) is a diabetes emergency. It is caused by a deficiency of insulin in patients with Type 1 diabetes (autoimmune) or Type 3c (pancreatectomy, etc.) and those with Type 2 diabetes that are insulin deficient. The ensuing hyperglycemia results in a combination of osmotic diuresis (urinary water loss) and electrolyte abnormalities with resultant dehydration. Insulin deficiency and elevated glucagon levels lead to the breakdown of fat, producing ketones/acids. Ketones are an alternate energy source used
when glucose is not available. High levels of ketones can lead to a life threatening condition known as Diabetic Ketoacidosis (DKA).

The clinical presentation of DKA includes symptoms of hyperglycemia (see above), nausea, vomiting and abdominal pain, Kussmaul respiration (deep/laboured), acetone-odoured breath (sweet/fruity breath) and ECFV (extra cellular fluid volume) contraction (dehydration). There also may be a decreased level of consciousness. DKA is associated with significant morbidity and mortality and so should be prevented whenever possible.

30. How are ketones tested?
The patient’s urine or blood serum can be tested for ketones. If patient has Type 1 diabetes and blood glucose is greater than 18.0mmol/L, stat ketone testing is recommended (to be ordered by the most responsible health practitioner). Available method of ketone testing varies across acute care sites and will be site dependent. (Exception: Stat ketone testing recommended if BG greater than 14.0mmol/l for patients on insulin pump therapy or on SGLT2 inhibitors).

31. The hypoglycemia procedure is very lengthy. How can Nurses respond in a timely manner in a crisis situation?
This 11 page governance document is summarized in a 2 page algorithm, which is included as an appendix.

32. When should BG test be repeated?
When the result is inconsistent with patient’s clinical status or there is suspected equipment malfunctioning

33. What is the rationale for re-assessing the BG 1 hour after treatment of hypoglycemia?
Reassessing a BG level 1 hour after initial treatment is a safety measure. It is recognized that recurrent hypoglycemia may impair the patient’s ability to sense subsequent hypoglycemia.

34. Where can nurses find a quick reference for treatment & management of hyperglycemia?
See algorithm attached to the hyperglycemia procedure

35. Where can I find additional resources supporting improved glycemic management in hospital?
   a. My Learning Link
      o Search “Basic Diabetes” for an interactive learning module on basic diabetes education, with a focus on in-hospital diabetes management.
   b. www.bbit.ca
      o PowerPoint presentations
      o Self-directed learning module
      o Pocket cards
36. What are the updates to the policy and procedures in February 2019?
The following is a brief summary of the elements in the 3 governance documents that were revised, and the rationale for these revisions.

Glycemic Management Policy (Adult HCS-206)
- 2.2 Blood Glucose (BG) targets for the critically ill was changed from 8.0-10.0 mmol/L to 6.0-10.0 mmol/L with the addition of an exception target for those with Acute Coronary Syndrome. BG targets were revised based on the updated 2018 Diabetes Canada CPG.
- 2.3 Frail elderly now includes those with dementia. This was revised based on the updated 2018 Diabetes Canada CPG.
- 3.8 Further clarification regarding who the procedure for hypoglycemia does and does not apply too. These revisions were made based on feedback provided by content experts.
- 3.9 Additional clarification regarding which patients to test for stat ketones when the BG is above 18.0 mmol/L and specific situations when ketones are tested when BG above 14.0 mmol/L. These revisions were made based on feedback provided from key stakeholders and content experts.
- 3.9 An additional SGLT2 medication added, as it is now available in Canada.
- 3.13 Clarification as to which patients should remain on the unit when their BG is above 18.0 mmol/L (those with type 1 diabetes and positive for ketones and those on SGLT2 medication and positive for ketones). Change made based on feedback from key stakeholders and content experts, and aligning with Diabetes Canada CPG.

Procedure for Hypoglycemia (Adult HCS-206-01)
- 1.3 & 1.4 Further clarification regarding who the procedure for hypoglycemia does and does not apply to. These revisions were made based on feedback provided by content experts.
- 1.5, 5.2 a, 5.5 c, 7 note The term “or immediately following” was removed from these statements to better align with the current wording in the CARNA and CLPNA medication guidelines. These revisions were endorsed by CARNA and CPLNA.
- 4.4 The amount of honey to treat the patient was changed as the manufacturers changed their packaging. This was revised as per feedback from provincial NFS.
- 4.4 EXCEPTION ii For conscious patients with a tube feed, juice may not be used in the tube as it can change the integrity of the tube. The recommendation that Dextrose tablets be crushed and dissolved in water for hypoglycemia treatment (as per ASPEN clinical practice guidelines) was provided by provincial NFS.
• 4.4 EXCEPTION iii
Changes to treatment for patients requiring thickened fluids. Honey for treatment in this group revised to ¾ cup thickened juice as per current diet order. Revisions made as per feedback from provincial NFS that not all patients requiring thickened fluids have dysphagia. Additionally, honey cannot be used for all patients requiring thickened beverages related to patient safety reasons.

Procedure for Hyperglycemia (HCS-206-02)
• 1.7 Clarification as to which patients should remain on the unit when their BG is above 18.0 mmol/L (those with type 1 diabetes and positive for ketones and those on SGLT2 medication and positive for ketones). Change made based on feedback from key stakeholders and content experts, and aligning with Diabetes Canada CPG.

References:
7. AHS BBIT website ([www.bbit.ca](http://www.bbit.ca))
8. AHS IPUMPIT website ([www.ipumpit.ca](http://www.ipumpit.ca))
9. CARNA Medication Guidelines 2015
10. CLPNA Medication Guidelines 2018