How to BBIT

An Educational Resource for Prescribers
AHS Adult Subcutaneous Basal Bolus Insulin Therapy (BBIT)

The Basics, New Concepts and Practical Pearls
for Basal Bolus Insulin Therapy

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1. The Basics

Basal Bolus Insulin Therapy (BBIT) is scheduled physiologic insulin dosing. It involves giving the right type of insulin, in the right amount, at the right time to meet the needs of a patient.

BBIT has 3 components:

- **Basal insulin** – scheduled long or intermediate-acting insulin given once or twice daily to cover basal insulin needs (largely due to hepatic glucose production) and to prevent diabetic ketoacidosis (DKA) in patients with Type 1 diabetes or insulin deficiency.

- **Bolus (meal) insulin** – scheduled rapid or short-acting insulin given prior to meals to cover rise in blood glucose due to intermittent caloric intake or feeding, either orally or enterally. It may also be used to cover intake provided continuously, as in the case of continuous parenteral or enteral feeds.

- **Correction (supplemental) insulin** – rapid or short-acting insulin given with meal insulin (patient eating or receiving feeds) or on its own (patient NPO) when blood glucose measurement is above target for that patient, at that time. The correctional insulin is designed to correct unanticipated hyperglycemia in the event that the patient's previously scheduled insulin dose did not match their needs and ensures that high glucose values are not left untreated. The dosing scale is based on patient's sensitivity to insulin.

Type of Diabetes – it is very important to differentiate the type of diabetes mellitus (DM) when patients are using insulin. Not every patient on basal and bolus insulin has Type 1 diabetes mellitus (T1DM).

- People with T1DM produce very little to no insulin, tend to be more insulin sensitive (require lower total daily dose) and have a higher risk of hypoglycemia and/or Diabetic Ketoacidosis (DKA). Patients with T1DM for more than 5 years lose their glucagon response to hypoglycemia and are therefore at risk for severe hypoglycemia.

- Most people with Type 2 diabetes mellitus (T2DM) can produce some insulin, but have underlying issues with insulin resistance and often cannot produce enough insulin to overcome this resistance without treatment. People with diabetes of long duration will often require supplemental exogenous insulin therapy. However, the pancreas is usually still able to make some glucagon, which lowers their risk of severe hypoglycemia. Patients with T2DM tend to be more insulin resistant (require higher insulin doses). Over time, the ability of the pancreas to make insulin in patients with T2DM can decline, progressing to insulin deficiency.

- Diabetes in pregnancy can include women with Pre-Gestational diabetes (T1DM, T2DM) or Gestational Diabetes Mellitus (GDM). Gestational diabetes refers to glucose intolerance with onset or first recognition during pregnancy. Most women with diabetes in pregnancy are treated with insulin. Insulin therapy must be individualized and regularly adapted to the changing needs of pregnancy. Individualized intensive insulin therapy with basal-bolus therapy is recommended to achieve glycemic targets prior to and during pregnancy.

- Other specific types of diabetes include a wide variety of relatively uncommon conditions, primarily specific genetically defined forms of diabetes or diabetes associated with other diseases or drug use (e.g. steroid induced hyperglycemia). See the Diabetes Canada Appendix 2 for more information.

Insulin deficient patients – These people are prone to DKA so they MUST always receive some exogenous (basal) insulin, even if fasting.

- **Includes people with**: T1DM, T2DM on insulin for more than 5 years, history of DKA or pancreatectomy.

Glycated Hemoglobin (A1C or HbA1C) – measure of glycemic control in previous 2-3 months

- Target for most patients is ≤ 7.0%; consider higher target of 8.0 to 8.5% for the frail elderly (older adults assessed as physically and/or cognitively frail at risk for confusion, agitation or falls), those with multiple comorbidities, patients with limited life expectancy and patients at risk for severe or recurrent hypoglycemia (e.g. hypoglycemia unawareness).
- **A1C result should be obtained from Netcare or ordered on admission if the test has not been performed in the last three months.** If patient does not have known diabetes but is hyperglycemic during their hospital stay, an A1C should be ordered.
- For people with known diabetes, A1C value will assist in identifying those patients who would benefit from improved glycemic control in hospital and/or upon discharge. Patients with A1C levels above 8.5% at time of admission should undergo optimization (and escalation) of their diabetes regimen prior to discharge and receive close follow-up after discharge.
- For people at risk for T2DM, A1C result of greater than 6.5% may confirm diagnosis and guide diabetes management in hospital.
- There are several factors that may affect A1C, mainly influencing red blood cell survival. See Diabetes Canada Clinical Practice Guidelines (CPG), chapter 9.

Target blood glucose (BG) range –

- For the majority of non-critically ill patients, random blood glucose should be in the target range of five (5.0) – ten (10.0) millimoles per litre (mmol/L).Exceptions include, but may not be limited to:

- For women with diabetes in pregnancy, blood glucose target range:
  - antepartum:
    - fasting and pre-prandial: 3.8 to 5.2 mmol/L; and
    - one (1) hour post prandial: below 7.8 mmol/L; and
    - two (2) hour post prandial: below 6.7 mmol/L; or
    - individualized targets determined by MRHP.
  - during active labour targets are four (4.0) – seven (7.0) mmol/L;

- Patients with a guarded prognosis (i.e., end of life); those who have been identified to have hypoglycemia unawareness and patients with multiple co-morbidities (where the individualized target range may be modestly higher).

- For critically ill patients blood glucose target range is six (6.0) – ten (10.0) mmol/L.
    - Exception: For patients with acute coronary syndrome the blood glucose target range is seven (7.0) – ten (10.0) mmol/L.

- For frail elderly and/or those with dementia, blood glucose target range is five (5.0) – twelve (12.0) mmol/L.

- For patients whose blood glucose is anticipated to be outside of the recommended range, the **most responsible health practitioner** should define the target range on the patient's chart.

Diet considerations – patients in hospital often have a significant change in their dietary carbohydrate intake as compared to home. They may experience nausea, decreased or variable appetite, or have a medical condition that may affect their oral intake or absorption. Moreover, they may have to undergo procedures that require that they not eat (NPO) at some point in their hospital stay. It is important to take into consideration whether they are NPO or eating, and if they are eating, whether their intake is consistent or reduced as this will affect whether the bolus insulin is held or reduced, respectively.

Diet	Adjustment to Bolus insulin
Consistent - at least 75% of the tray is consumed by the patient at mealtime	Continue scheduled bolus insulin
Reduced – no more than 50% of the tray is consumed by patient at mealtime	Consider reducing bolus (meal) insulin by ~50%
NPO - patient is receiving no oral nutrition	Hold bolus (meal) insulin and still order correction insulin

Physical activity considerations- patients in hospital typically have a change in their physical activity. Physical activity can include but is not limited to: activities of daily living, physiotherapy or rehabilitation exercises as well as general walking. Physical activity may vary during a hospital stay, dependent on the patient's medical condition. Changes in physical activity may affect blood glucose levels and insulin doses.

Managing injections of large doses of subcutaneous insulin – When a patient is receiving an insulin injection dose of greater than or equal to 50 units, it is recommended that the dose be administered in two equally divided injections, administered in separate sites at the same time.

- E.g. insulin NPH 66 units qhs – is given in two separate injections of 33 units each, at two different injection sites, at bedtime

Reference: http://guidelines.diabetes.ca/fullguidelines

2. Types of Insulin Available in AHS Hospitals

Insulin Type (trade name)	Onset	Peak	Duration	Cost per cartridge
Bolus (meal) Insulins				
Rapid-acting insulin analogues (clear)				
Insulin aspart (Novorapid®)	10-20 min	1-3 h	3-5 h	$12.45
Insulin lispro (HumaLOG®)	30-45 min	0.75-2.5 h	3.5-4.75 h	$11.25
Short-acting insulin (clear)				
Insulin regular (HumuLIN®-R)	30 -60 min	0.75-4.5 h	5-7.5 h	$9.12
Basal Insulins				
Intermediate-acting insulin (cloudy)				
Insulin NPH (HumuLIN®-N)	1-2 h	4-12h	14-24 h	$9.12
Long-acting basal insulin analogues (clear)				
Insulin detemir (Levemir®)	3-4 hours	Not applicable	16-24 h	$21.56
Insulin glargine (Lantus®)	3-4 hours	Not applicable	24 h	$18.57
Insulin glargine (Basaglar ®)*	3-4 hours	Not applicable	24 h	$13.93
Ultra Long-acting basal insulin analogues				
Insulin degludec (Tresiba®)**		Not applicable	42 h	
Premix Insulin				
Insulin regular 30% / Insulin NPH 70%(HumuLIN®30/70)	0.5 h	NPH: 6-10h R: 0.8-2 h	18-24 h	$9.12
25% lispro/75% lispro protamine (HumuLIN® Mix 25)	0.25-0.5 h	1 - 6.5 h	14-24 hours	$11.37

* A biosimilar medicine is developed to be similar to an existing biological medicine (reference product already approved for use). Many biological medications have exclusive patents and periods of marketing. When these patents expire, a biosimilar version of the medicine may become more widely available e.g. insulin glargine (Basaglar®). These biosimilar medications go through rigorous scientific testing to ensure the product is highly similar with no clinically meaningful differences from the original reference medication e.g. glargine (Lantus®).

** Formulary Restricted, for information on degludec (Tresiba®) insulin refer to section 5b & 6

For more information about the AHS insulin formulary, please visit the provincial pharmacy website: http://insite.albertahealthservices.ca/13292.asp.

References:

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3. Glycemic Management

*** The provincial Glycemic Management policy suite with procedures for HYPOglycemia and HYPERglycemia, became effective September, 2017 for AHS and Covenant Health March, 2018.*

Points of Emphasis

- Blood glucose targets are **5.0 – 10.0 mmol/L** for the majority of non-critically ill adult inpatients.
- Treatment is for all appropriate patients with a blood glucose less than four (4.0) mmol/L, who meet the criteria below:
    - Patients with diabetes or gestational diabetes, even those with no symptoms, who are on at least one of the following medications: insulin or insulin secretagogues (e.g., glyburide, gliclazide, glimepiride or repaglinide).
    - Patients without diabetes who have symptomatic hypoglycemia due to insulin or insulin secretagogue overdose (e.g., glyburide, gliclazide, glimepiride or repaglinide), malnutrition, liver failure, or more rare conditions (e.g., insulinoma, late dumping syndrome, etc.)
    - The hypoglycemia protocol should not be applied to:
        - patients with diabetes who are not taking insulin or insulin secretagogues.
        - asymptomatic patients who do not have diabetes (since healthy people who are fasting can have blood glucose levels below four (4.0) mmol/L)
- It is important to avoid overtreatment of hypoglycemia, since this can result in rebound hyperglycemia.
- The patient should not be sent off the unit (especially for physical activity), until their blood glucose is greater than or equal to 4.0 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).
- Some patients should not be sent off the unit, especially for physical activity, when their blood glucose is greater than eighteen (18.0) mmol/L. These include:
    - Patients with type 1 diabetes and positive ketones; and
    - Patients on a Sodium-glucose co-transporter 2 (SGLT2) inhibitor and positive ketones.
- **Holding of insulin requires an order** from the most responsible health practitioner. **Note:** Holding basal or bolus insulin after a hypoglycemic event commonly results in significant hyperglycemia 3 to 4 hours later.
- Diabetic Ketoacidosis (DKA) is a diabetic emergency. It is caused by a deficiency of insulin and elevated level of counter-regulatory hormones. The ensuing hyperglycemia results in a combination of osmotic diuresis, electrolyte abnormalities and ketone production/acidosis that can lead to significant morbidity and mortality.
- Timing of insulin administration should be coordinated with meals and blood glucose testing.
    - Blood glucose testing should be done within 30 minutes prior to meal, and
    - Insulin should be administered based on this blood glucose test no more than 30 minutes prior to meals.
        - Short-acting insulin should be given 30 minutes prior to a meal.
        - Rapid acting insulin should be given immediately prior to a meal.
        - **Exception:** rapid acting meal/bolus insulin may be given immediately after the meal/feed and short acting insulin may be given immediately prior to the

meal in certain situations (e.g., gastroparesis or concern that the patient may not be able to ingest or retain the full meal).

3a. Hypoglycemia Protocol

Identification of Hypoglycemia

- Hypoglycemia is defined by **blood glucose level of less than 4.0 mmol/L**.
- A hypoglycemic state may be asymptomatic or symptomatic.
- Symptoms of hypoglycemia may include, but are not limited to:
    - Early / Non-severe symptoms: headache, mood changes, irritability, tremors, tiredness, tachycardia, excessive hunger, diaphoresis, pallor, paresthesia, and / or inability to concentrate.
    - 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.

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

Refer to Appendix 1: Adult Hypoglycemia Treatment Algorithm.

Note: *Patients who are ordered nothing by mouth (NPO) should be treated the same as the patient with Altered Consciousness/Unable to Swallow.*

1. 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. 1 ½ individual packages (or 15 mL) of honey
    d. 4 packets (16 grams [g] of carbohydrate) of sugar dissolved in water
    Exceptions:
        i. If the patient is taking acarbose for glycemic control, use dextrose tablets or honey only
        ii. If the patient has a tube feed, provide 4 crushed dextrose tablet dissolved in water and flush with water (pre and post treatment).
        iii. For patients requiring thickened fluids, provide thickened juice according to the patients diet order.
2. Repeat blood glucose test in **15 minutes**.
    a. If the patient's blood glucose result is below 4.0 mmol/L, repeat treatment with 15 grams of quick acting carbohydrate.
        i. Retest in 15 minutes.
        ii. If blood glucose remains below 4.0 mmol/L, contact the most responsible health practitioner for further treatment.
    b. If the patient's blood glucose result is greater than or equal to 4.0 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.

c. If the patient's blood glucose result is greater than or equal to 4.0 mmol/L; and the meal is less than one hour away, give the meal only and do not provide a snack. Patient is to be given bolus (meal) insulin as ordered with the meal.

3. Document patient's symptoms, treatment provided and response to treatment.
4. Notify the most responsible health practitioner, at the next contact, regarding the patient's hypoglycemic event.
5. Repeat blood glucose test one hour after the hypoglycemic event.
6. Resume insulin schedule and/or other oral/injectable antihyperglycemic medications unless otherwise ordered. (Contact the most responsible health practitioner if unsure.)
7. The most responsible health practitioner shall be contacted and informed if the patient's condition changes to an advanced/severe state of hypoglycemia.

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

- Refer to current site policy.
- These patients will require intravenous dextrose, or an injection of glucagon.
- Contact the most responsible health practitioner.

Follow up

- Review the recent hypoglycemic event and look at efforts to prevent a recurrence.
- Review patient understanding of their situation; and provide education/training as required.
- It is not recommended that basal insulin and/or other oral/injectable antihyperglycemic medication be withheld however, adjustments to insulin regimen or other oral/injectable antihyperglycemic may be required.
  See Appendix 1: Adult Hypoglycemia Treatment Algorithm

3b. Hyperglycemia Protocol

Identification of Hyperglycemia

- Symptoms of significant hyperglycemia or diabetic ketoacidosis (DKA) include: thirst, fatigue, dizziness, tiredness, polyuria, nausea, vomiting, blurred vision, lethargy, sweet smelling breath, and hyperventilation.
- Hyperglycemia in acute care settings may be identified as:
  - Mild hyperglycemia when blood glucose level is between 10.0 to 14.0 mmol/L.
  - Moderate hyperglycemia when blood glucose level is between 14.1 to 18.0 mmol/L.
  - Severe hyperglycemia when blood glucose level is greater than 18.0 mmol/L.
- Hyperglycemia may be due to: insufficient insulin; insulin omission; and/or recent ingestion of carbohydrate.

Treatment of Hyperglycemia

Refer to Appendix 2: Adult Hyperglycemia Algorithm

1. If blood glucose is greater than:
   - 18.0 mmol/L; OR

- 14.0 mmol/L if patient is on an insulin pump or is taking an SGLT2 inhibitor

2. Provide insulin or other oral/injectable antihyperglycemic medications as ordered

3. If unable to decrease blood glucose levels below 18.0 mmol/L OR 14.0 mmol/L if patient is on an insulin pump or is taking an SGLT2 inhibitor with additional treatment;
    a. Contact the most responsible health practitioner for further orders. The most responsible health practitioner should consider physical and/or lab assessment to rule out DKA in patients with T1DM.

4. If patient has T1DM and blood glucose is greater than 18.0 mmol/L OR blood glucose is greater than 14.0 mmol/L if patient is on an insulin pump or is taking an SGLT2 inhibitor;
    a. STAT ketone testing is recommended, and should be ordered by the most responsible health practitioner (available method of ketone testing varies across acute care sites; so will be site dependent.).
    b. If ketones are positive, contact the most responsible health practitioner immediately. Do not promote physical activity/exercise (i.e. physiotherapy).
    c. patients with T1DM shall be assessed for DKA. Assessment includes but is not limited to:
        i. symptoms of DKA including: *polyuria, thirst, nausea/vomiting, abdominal pain, weakness, mental status change, weight loss, and coma*;
        ii. vital signs;
        iii. medication review (i.e. insulin dosing schedule, timing of last insulin administration, held or missed insulin, etc.);
        iv. last carbohydrate administration/ingestion; and
        v. previous history/episodes of DKA; and
        vi. review of clinical status (i.e. acute coronary syndrome, infection, addition of medications that can cause hyperglycemia, etc.)

5. If DKA or other hyperglycemia emergent concern is suspected, notify the most responsible health practitioner. Implement site and/or unit protocol in consultation with the most responsible health practitioner.

Follow up

- Once the patient's glycemic status has stabilized, recommence routine blood glucose monitoring and/or increased monitoring as ordered.
- Review the recent hyperglycemic event(s) and look at efforts to prevent a recurrence.
    1. Review patient understanding of the hyperglycemic event, and provide education/training as required.
    2. Review to see if hyperglycemia followed a hypoglycemic episode.
    3. **Note:** Holding of basal insulin and/or other oral/injectable antihyperglycemic medication following a hypoglycemic episode may result in subsequent hyperglycemia. However, adjustments to insulin regimen may be required.

See *Appendix 2: Adult Hyperglycemia Algorithm*

4. Stepwise Approach to Use of Subcutaneous Insulin Order Sets

- Before completion of order set – the Prescriber will need to consider:
  - Type of diabetes
  - Patient's weight – Used to calculate total daily dose (TDD)
  - Diet consideration – Assess patient's nutritional status
    - NPO or on advancing fluid diet
    - Reduced diet (no more than 50% of their tray)
    - Full diet
  - Target blood glucose range - BG range is 5.0 - 10.0 mmol/L for most non-critically ill adults. Higher BG target of 5.0 -12.0 mmol/L may be acceptable in the frail elderly and or with dementia (older adults assessed as physically and/or cognitively frail at risk for confusion, agitation or falls) with multiple comorbidities, patients with limited life expectancy and patients at risk for severe or recurrent hypoglycemia (e.g. hypoglycemia unawareness).
  - Oral/injectable antihyperglycemic medications – can/should they be continued? (see Section 7)

- Order diabetic diet if patient eating.

- Use pre-printed **AHS Basal Bolus Insulin Therapy (BBIT) Adult Inpatient Order Set** (form 19885) for adult patients requiring subcutaneous insulin or BBIT electronic order set in Sunrise Clinical Manager (SCM) in Calgary Zone Hospitals.

- Use the pre-printed **Covenant Health Basal Bolus Insulin Therapy (BBIT) Adult Inpatient Order Set** (form CV-0701) for adult patients requiring subcutaneous insulin

- Daily review of BG results, the amount of correction insulin used, and then appropriate titration of insulin is essential to the successful management of diabetes in hospital.

Algorithm for Diabetes Management in Hospital

Blood Glucose Targets in Hospital: **5.0-10.0 mmol/L** for most non-critically ill adults

Patient:
- Is well controlled at home, and blood glucose targets are ***safely*** being met with current anti-hyperglycemic agents including: oral and/or non-insulin injectable and/or insulin doses

→ Continue home dosing of oral and/or non-insulin injectable and/or insulin doses

→ Reassess Daily

If targets not being met consider titrating doses of home therapies or starting BBIT

Patient:
- Is poorly controlled at home
- Requires oral and/or non-insulin injectable agents to be held
- Is not achieving glycemic targets in hospital
- Has a new diagnosis of Diabetes Mellitus

→ Use Basal Bolus Insulin Therapy

Use **LOWER** TDD IF:**

Type 1 DM, Slim Type 2 DM
History of hypoglycemia unawareness
Reduced renal function (eGFR < 30 mL/min)
Age greater than 70 with moderate/severe frailty
Liver failure

Use **HIGHER** TDD IF:**

Insulin resistance
Overweight Type 2 DM
Steroid Treatment
Infection

→ Reassess Daily

If targets not being met, titration of insulin doses required

Titration Algorithm

If **Breakfast** BG is:		If **Lunch** BG is:		If **Supper** BG is:		If **Bedtime** BG is:		If **Overnight** BG is:
LOW (below 5.0 mmol/L)	HIGH (above 10.0 mmol/L)	LOW (below 5.0 mmol/L)	HIGH (above 10.0 mmol/L)	LOW (below 5.0 mmol/L)	HIGH (above 10.0 mmol/L)	LOW (below 5.0 mmol/L)	HIGH (above 10.0 mmol/L)	LOW (below 5.0 mmol/L)
Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease
Bedtime BASAL		**Breakfast** BOLUS		**Lunch** BOLUS or **Breakfast** BASAL		**Supper** BOLUS		**Bedtime** BASAL

If ALL BG are HIGH (greater than 10.0mmol/L), Calculate TDD from last 24 hours, Increase TDD by 10-20% and Recalculate all Basal, Bolus and Correction Doses

- If **HYPER**GLYCEMIA **OR HYPO**GLYCEMIA**:** Discuss with patient to determine if change in activity or oral intake was the cause. If yes, monitor carefully. If otherwise unexplained, increase or decrease doses by 10-20% as per Titration Table above.

Legend:
Blood Glucose (BG), Total Daily Dose (TDD), Diabetes Mellitus (DM)

5. How to Determine Starting Doses of Insulin for Basal Bolus Insulin Therapy (BBIT) (for Prescribers)

Total Daily Dose Insulin (TDD) = combined total number of all units of basal + bolus + correction insulin used in 24 hour period. Insulin dose requirement is determined by a patient's insulin sensitivity, which is weight dependent in most cases.

5a. Calculation / Estimation of Total Daily Dose (TDD)

- If the patient is on basal and bolus (+/- correction) insulin at home and has adequate glycemic control (A1C less than 8.5%) – calculate the TDD by adding all insulin doses used in the preceding 24 hour period. Prescribe the same or similar basal and bolus/meal insulin doses previously used at home.
    - **If patient reports any significant hypoglycemia, or will have less nutritional intake than usual, prescribe a lower TDD on admission,** and adjust doses as needed while in hospital (consider a 10-20% reduction).
    - To determine the safety of a patient's reported TDD, one can calculate a weight-based TDD and compare the two doses; if there is a significant discrepancy and there is concern about hypoglycemia in hospital, use the lower TDD and in the day(s) following, adjust insulin doses based on BG values and the amount of correction insulin used.

For example: A 70 kg patient self-reports taking 20 units of basal insulin once daily and 8 units of bolus insulin with each meal.

e.g. Home TDD= 20 units +8 units + 8 units + 8 units = 44 units/day.

e.g. Weight based calculation (Patient weight is 70 kg):

TDD= weight (kg) x 0.3-0.5 units/kg

- Calculation if 0.3 units/kg/day is estimated: 70 kg x 0.3 units/kg/day = 21 units/day
- Calculation if 0.5 units/kg/day is estimated: 70 kg x 0.5 units/kg/day = 35 units/day
  Suggest TDD of 35 units/day in hospital and titrate as necessary.

- **For all other patients** (new to insulin or poor glycemic control) estimate the TDD based on weight and type of diabetes:
    - **TDD = Weight (kg) x 0.3 - 0.5 units/kg**
        - **T1DM or Slim T2DM (BMI equal to or less than 25 kg/m^2)**
        - **Others**: Patients with reduced renal function (eGFR less than 30 mL/min), decreased oral intake, liver failure, and history of hypoglycemia and the elderly (age over 75)
        - Some people with T1DM or those who have undergone a pancreatectomy are very sensitive to insulin and may require significantly lower doses.
    - **TDD = weight x 0.5 – 1 unit(s)/kg**
        - **T2DM, overweight (BMI greater than 25 kg/m^2)**
        - An increase in TDD may be required if patient on steroids or if infection present.
        - If uncertain about level of insulin resistance, it is safest to start with TDD of 0.5 units/kg/day and adjust doses within 24 hours based on BG values and use of correction insulin.

- Some obese patients with T2DM will require significantly higher insulin doses.

5b. How to Divide Total Daily Dose (TDD) into Scheduled Basal, Bolus and Correction Insulin Orders

- **Basal insulin – estimated at 50% of TDD**
  - Total basal = TDD x 0.5
    - Given initially as equal, twice daily doses at breakfast and bedtime of detemir (Levemir®), insulin NPH (HumuLIN® N) or glargine (Lantus® or Basaglar®).
    - Alternatively, the entire basal dose may be given as glargine (Lantus® or Basaglar®) once daily, typically at bedtime.
  - Should be given even if patient is not eating (may need to decrease dose of basal if patient not eating for more than 12 hours).
  - At optimal doses, basal insulin should never cause hypoglycemia, even if the patient is not eating.
  - Basal insulin must **never** be held for patients with T1DM, as they may rapidly develop DKA.

- **Bolus insulin – estimated at 50% of TDD**
  - **Total bolus = TDD x 0.5, then** divided equally among the meals or tube feeds
  - **Bolus insulin must not be given if NPO**
  - Bolus insulin may be provided as lispro (HumaLOG®), aspart (Novorapid®), or insulin regular (HumuLIN® R)
  - If patient is on basal and bolus insulin at home, bolus insulin may be continued at the same dose if the hospital diet matches the patient's usual carbohydrate consumption. If the hospital diet has lower carbohydrate content than the patients' usual diet, consider a reduction in the home dose by 25-50%.
  - Bolus insulin needs to be reduced if the nutritional intake is reduced (see Section 1 – Diet Considerations).
  - For patient receiving Bolus Enteral Tube Feeds, bolus insulin is administered in divided doses to match feed times. Short-acting regular insulin is preferred over rapid-acting insulin analogues because the longer duration of action better matches feed infusion time.
    - If tube feeding is interrupted, IV dextrose may be required to prevent hypoglycemia.

- **Correction Insulin** – Choose correction insulin based on patient's TDD.
  - Lower dose insulin correction is used for patients who are sensitive to insulin, particularly those with T1DM or low BMI. Moderate to high dose correction is used for people with insulin resistance, such as patients with obesity or those treated with steroids.
  - Correction insulin may be administered along with meal/feed insulin using the same type of rapid or short-acting insulin, or may be given as correction alone at scheduled times, even if the patient is NPO, to correct hyperglycemia.

- Correction insulin **is not routinely recommended at bedtime due to risk of hypoglycemia**, and if used at bedtime, must be given as a one-time order by the most responsible health practitioner.
- A custom scale may be created for those individuals with T2DM who require are very resistant to insulin, those who have a higher BG target (e.g. frail elderly [older adults assessed as physically and/or cognitively frail at risk for confusion, agitation or falls]) or for those who are exceedingly sensitive to insulin (e.g. TDD predicted to be 14 units or less).

☐ TDD 15-30 units		☐ TDD 31-50 units		☐ TDD 51-80 units		☐ TDD 81 units or more		☐ Custom	
BG	Units	BG	Units	BG	Units	BG	Units	BG	Units
4.1-10	+0	4.1-9	+0	4.1-10	+0	4.1-9	+0		
10.1-14	+1	9.1-12	+1	10.1-12	+2	9.1-11	+2		
14.1-18	+2	12.1-15	+2	12.1-14	+3	11.1-13	+4		
		15.1-18	+3	14.1-16	+4	13.1-15	+6		
				16.1-18	+5	15.1-17	+8		
						17.1-18	+10		

- For patients on premix insulin pre-hospitalization, it is best to change to basal and bolus insulin so doses can be adjusted more readily depending on patient's BG values, nutritional intake and medical condition (see Section 12).

- For patients using glargine U300 (Toujeo®) a concentrated glargine insulin that are meeting their in-hospital BG targets that are able to supply their own Toujeo® insulin (Toujeo® is not on the AHS simplified insulin formulary) they can stay on this regime. If the patient is not meeting their in-hospital BG targets or not able to supply their own insulin, they could be switched to glargine once daily at the same time the Toujeo® is administered at home. The dose should be reduced by to 10% to start, as studies have shown that patients tend to need approximately 10% more Toujeo® than glargine U100 (Lantus® or Basaglar®).

- For patients on home regimen using degludec (Tresiba®) an ultra-long acting insulin please consider:
  - This is an AHS formulary restricted insulin and patients must supply their own or be transitioned to a basal insulin on the AHS insulin formulary
  - This ultra-long acting insulin is a peakless insulin with a duration of 42 hours. The pharmacodynamics of this insulin has challenges around titration (see section 6). These challenges make it difficult to respond to changing BG values in the acute care setting.
  - If a patient is on degludec (Tresiba®) at home and their own supply is not available (necessitating a switch to one of the other formulary basal insulin options), consider delaying the start of the new formulary basal insulin for 2 days after admission. Degludec is an ultra-long acting insulin and the goal is to avoid stacking the basal insulins and the risk of causing hypoglycemia

- **Avoidance of Hypoglycemia** – goal of optimal insulin therapy is avoidance of hypoglycemia, particularly significant hypoglycemia (BG below 2.5 mmol/L). If the most responsible practitioner is concerned that patient is at high risk for hypoglycemia, it is acceptable to initially prescribe a lower, more conservative dose of scheduled insulin

and adjust doses within 24 hours if patient has high BG levels requiring consistent correction insulin.

- **Blood Glucose Monitoring** – Should be completed four times daily. Timing will be determined by the patient's clinical condition and whether eating. Blood glucose testing and bolus insulin administration are timed with meals/feeds:
    - If eating oral diet or bolus feeds – order BG testing before each meal/feed and at bedtime.
    - If continuous feeds, consider testing four times daily at usual mealtimes and at bedtime (e.g. 0800h, 1200h, 1800h, 2200 h) or q6hours (e.g. 0600h, 1200h, 1800h, 2400h).

6. Guidelines for Titrating Insulin Doses

- Blood glucose (BG) records and insulin administered, including the correction insulin, should be reviewed daily in order to determine whether targets of 5.0 – 10.0 mmol/L are being achieved.
- It is very important to recognize that initial calculations provide only a rough estimate of insulin doses. The calculations are designed to be conservative to prevent hypoglycemia. Insulin doses will require titration to achieve targets. Begin by evaluating causes of hypoglycemia and hyperglycemia during the preceding 24 hours. Adjust insulin dose responsible for unexpected low BG (less than 4.0 mmol/L) readings, and then adjust insulin dose that accounts for unexpected high BG readings.

- Hypoglycemia:
  - If blood glucose is low, discuss situation with patient to determine if change in activity or intake was the culprit. If so, monitor carefully. If otherwise unexplained, reduce appropriate basal or bolus doses as needed (typically a 10-20% reduction is sufficient).
  - If all blood glucose values throughout the day are low, we suggest decreasing the TDD by 10-20%, and recalculating the basal, bolus and correction doses and completing a new order set.
  - If, however, most BG are in target, but BG remain below target at a specific time of day for the last 24-48 hours, it is reasonable to reduce the PRECEDING dose of insulin (typically 10-20%), to reduce the likelihood of hypoglycemia recurring the next day.
- Hyperglycemia:
  - If all blood glucose remain above target (with frequent use of correction insulin), we suggest increasing the TDD by 10-20%, and recalculating the basal, bolus and correction doses.
  - If, however, most BG are in target, but BG remain elevated above patient's blood glucose target at a specific time of day for the last 24-48 hours, it is reasonable to add the correction dose needed at that time of day to the PRECEDING bolus dose of insulin, to reduce the likelihood of hyperglycemia recurring the next day.

- **degludec (Tresiba®) insulin**: If the patient is using their own supply of degludec (Tresiba®) insulin, see section 5b, it is important to remember the effect of a dose change on BG values will not be seen for 2-3 days.

If **Breakfast** BG is:		If **Lunch** BG is:		If **Supper** BG is:		If **Bedtime** BG is:		If **Overnight** BG is:
LOW (below 5.0 mmol/L)	HIGH (above 10.0 mmol/L)	LOW (below 5.0 mmol/L)	HIGH (above 10.0 mmol/L)	LOW (below 5.0 mmol/L)	HIGH (above 10.0 mmol/L)	LOW (below 5.0 mmol/L)	HIGH (above 10.0 mmol/L)	LOW (below 5.0 mmol/L)
Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease
Bedtime BASAL		**Breakfast** BOLUS		**Lunch** BOLUS or **Breakfast** BASAL		**Supper** BOLUS		**Bedtime** BASAL
If ALL BG are HIGH (greater than 10.0 mmol/L), Calculate TDD from last 24 hours, Increase TDD by 10-20% and Recalculate all Basal, Bolus and Correction Doses								

- If **HYPER**GLYCEMIA **OR HYPO**GLYCEMIA**:** Discuss with patient to determine if change in activity or oral intake was the cause. If yes, monitor carefully. If otherwise unexplained, increase or decrease doses by 10-20% as per Titration Table above.

7. Orders for Patients with Type 2 Diabetes Mellitus on Oral/Injectable Antihyperglycemic Agents

- If glycemic control acceptable, medical condition stable, patient eating and not receiving medications likely to raise blood glucose (e.g. corticosteroids) – continue same pre-admission antihyperglycemic medications.

- Discontinue SGLT2 inhibitors 3 days prior to surgery and during hospital stay, as they are associated with dehydration and place individuals at risk of volume depletion, renal injury and euglycemic DKA. May be restarted 1-2 days prior to discharge, assuming no contraindications develop during the hospital stay.

- Consider holding metformin if patient has acute kidney failure, chronic kidney disease with eGFR below 30 ml/min, heart failure, intravascular depletion, severe diarrhea, nausea/vomiting, or planned exposure to IV contrast, or exposure to IV contrast in preceding 24-48 hours. Metformin may be restarted, as these conditions improve. Note: It may take up to 1-2 weeks for peak effect of metformin to resume. It is safe to overlap metformin with BBIT, but insulin doses may decrease as metformin effect improves.

- If oral/injectable antihyperglycemic medications continued, provider may order correction insulin alone to address unanticipated hyperglycemia. Consider adding basal insulin within 24-48 hours if blood glucose not meeting targets of 5-10 mmol/L, despite correction insulin.

- If patient appears to require insulin while in hospital (e.g. poor glycemic control/A1C above 8.5%, hyperglycemia due to acute illness and/or corticosteroids, NPO and receiving IV fluids), discontinue all oral/injectable antihyperglycemic agents except metformin (see above statement regarding metformin). Order insulin according to **AHS Basal Bolus Insulin Therapy (BBIT) Adult Inpatient Order Set** (form 19885) or BBIT electronic order set in Sunrise Clinical Manager (SCM) in Calgary Zone Hospitals or **Covenant Health Basal Bolus Insulin Therapy (BBIT) Adult Inpatient Order Set** (form CV-0701). (see Sections 4, 5, 6)

- Oral/injectable antihyperglycemic agents may be re-introduced prior to discharge once the patient's condition is stable, if their pre-admission glycemic control was reasonable and insulin requirements are determined. If glycemic control was near but not achieving targets, consider titration of these agents prior to discharge if possible.

    - Use of BBIT during hospitalization, even transiently while their acute illness is at its peak and associated stress response hormones are their highest, will allow an easier transition back to oral/injectable antihyperglycemic agents, as patient's BG should be at or near target at the time of transition.

❖ ***See Appendix 5 for a list of type 2 oral and non-insulin injectable medications***

8. Orders for Patients Requiring Insulin – Eating or Bolus Enteral Tube Feeds

- Please refer to sections 4-7 above.
- Discontinue all oral/non-insulin injectable antihyperglycemic agents, except metformin (see Section 7 or Appendix 5).
- Patients who are insulin deficient MUST receive basal insulin at ALL times. Most patients are more likely to benefit from stable glycemic control with basal insulin.
- Use the **AHS Basal Bolus Insulin Therapy (BBIT) Adult Inpatient Order Set** (form 19885) or BBIT electronic order set in Sunrise Clinical Manager (SCM) in Calgary Zone Hospitals) – to be used for all patients requiring subcutaneous insulin.
- Use the **Covenant Health Basal Bolus Insulin Therapy (BBIT) Adult Inpatient Order Set** (form CV-0701) - to be used for all patients requiring subcutaneous insulin.
- Order blood glucose monitoring – Should be completed four times daily. Timing will be determined by patient's clinical condition and whether they are eating.
    - If eating oral diet or bolus feeds – order BG testing before each meal/feed, and at bedtime. Testing should occur no more than 30 minutes before meal/feed.
    - If continuous feeds, consider testing four times daily at usual mealtimes and bedtime (e.g. 0800h, 1200h, 1800h, 2200h) or every 6 hours (e.g. 0600h, 1200h, 1800h, 2400h).
- Determine the total daily dose of insulin (TDD). Use TDD to calculate basal, bolus (meal/feed) doses and correction.
- For patients receiving bolus enteral tube feeds, bolus insulin is administered in divided doses to match feed times. Short-acting insulin regular (HumuLIN® R) is preferred over rapid- acting insulin (aspart (Novorapid®) or lispro (HumaLOG®) because the longer duration of action better matches feed infusion time. If bolus feed held, bolus insulin must be held.

9. Orders for Patients Requiring Insulin – Not eating (NPO) or Transitioning from NPO to Full Fluids

- Please refer to sections 4-7 above.
- Discontinue all oral/non-insulin injectable antihyperglycemic agents, except metformin (see Section 7 or Appendix 5).
- Patients who are insulin deficient MUST receive basal insulin at ALL times and must have an exogenous source of glucose – IV fluids containing dextrose.
    - Order glucose containing IV fluids (2/3-1/3, D5W, D5W-saline or parenteral nutrition (PN)) in patients who are insulin deficient and who will be NPO for more than about 6 hours.
        - May consider use of non-dextrose containing IV fluids in patients with T2DM when NPO status is not prolonged, or when patient drinking clear fluids.
- Use the **AHS Basal Bolus Insulin Therapy (BBIT) Adult Inpatient Order Set** (form 19885 or BBIT electronic order set in Sunrise Clinical Manager (SCM) in Calgary Zone Hospitals) – for all patients requiring subcutaneous insulin.
- **Covenant Health Basal Bolus Insulin Therapy (BBIT) Adult Inpatient Order Set** (form CV-0701) - for all patients requiring subcutaneous insulin.
- Order blood glucose monitoring – should be completed four times daily. Timing will be determined by patient's clinical condition and whether fluid tray is being given at mealtime.
    - If consuming fluids at mealtime – order BG testing before each meal/enteral feed, and at bedtime. Testing should occur no more than 30 minutes before meal/enteral feed.
    - If NPO with no carbohydrate source or continuous carbohydrate source, consider testing four times daily at usual mealtimes and bedtime (e.g. 0800h, 1200h, 1800h, 2200 h), or every 6 hours (e.g. 0600h, 1200h, 1800h, 2400h)
- Determine the total daily dose of insulin (**TDD**) based on patient weight (see Sections 5a, 5b).
    - Basal dose is estimated as 50% of TDD (**0.5 x TDD**)
    - Do **NOT** order bolus insulin as patient is not consuming meal carbohydrate
    - Choose appropriate correction based on TDD.
        - NOTE: Because patient may not have bolus dose ordered, the TDD is based on the patient's estimated requirements once they are eating. Therefore, it is important to choose correction based on calculated TDD rather than the actual number of units of insulin actively ordered at this time.

- For correction scale, specify type of rapid or short-acting insulin and frequency of insulin administration – four times daily or every 6 hours to match BG testing schedule.

- If NPO status is prolonged (greater than 48 hours) and the patient is not meeting glycemic targets with basal and correction subcutaneous insulin, or if patient is peri-operative, consider IV insulin infusion.

10. Orders for Patients Requiring Insulin – on Continuous Enteral Feeds

- Insulin requirements will vary depending on rate and carbohydrate content of feeds.

- No regimen is clearly superior.

- All options below involve calculating TDD as indicated in sections 5a, 5b.

- Subcutaneous insulin options:

a. BBIT with basal, bolus and correction insulin:
   - Provide half the TDD (**0.5 x TDD**) as basal insulin detemir (Levemir®), Insulin N (HumuLIN® N), or glargine (Lantus®), preferably dosed twice daily
   - Half TDD (**0.5 x TDD**) as short-acting insulin regular (HumuLIN® R) in 4 equally divided doses, administered every 6 hours (q6h).
   - Order Correction insulin dose based on TDD, and administer q6h together with bolus insulin.
   - E.g. 80 kg patient:
     - Estimate TDD = 0.5 units/kg/day = 0.5 x 80 kg = 40 units/day
     - Basal= 0.5 x TDD = 0.5 x 40 units = 20 units daily (if given twice daily, the dose would be 10 units twice daily)
     - Bolus = 0.5 x TDD/4 feeds/day = 0.5 x 40 units/4 = 5 units sc four times daily (q6h)
     - Correction insulin dose based on TDD = 40 units, administer q6h together with bolus insulin
   - If feeds held or stopped, the bolus dose must be held. Basal and correction may continue as previously ordered. BG monitoring should occur every 2 hours for 6-8 hours to monitor for hypoglycemia due to previously administered insulin.

b. BBIT with basal and correction insulin alone:
   - Provide the entire TDD as basal insulin alone, preferably ordered twice daily.
   - Order Correction insulin dose based on TDD, choose a correction insulin (insulin regular (HumuLIN® R), aspart (Novorapid®) or lispro (HumaLOG®)) and administer every 6 hours.
   - E.g. 80 kg patient:
     - Estimate TDD = 0.5 units/kg/day = 0.5 x 80kg = 40 units
     - Basal= 40 units daily or 20 units twice daily

  - Correction insulin dose based on TDD = 40 units, administered every 6 hours.
- If feeds held or stopped, basal dose of insulin must be reduced by approximately 50% and titrated to achieve target. BG monitoring should occur every 2 hours for 6-8 hours to monitor for hypoglycemia due to previously administered insulin.

c. For non-insulin deficient patients consider TDD divided into four equally divided doses of insulin regular (HumuLIN® R) administered every 6 hours along with a correction insulin dose based on TDD:
   - E.g. 80 kg patient:
     - Estimate TDD = 0.5 units/kg/day = 0.5 x 80 kg = 40 units
     - Bolus (HumuLIN® R) = 40 units/4 = 10 units every 6 hours
     - Correction insulin dose based on TDD = 40 units, administer q6h together with bolus insulin
   - If feeds held or stopped, dose of insulin regular (HumuLIN® R) must be reduced by approximately 50% and titrated according to patient's response. BG monitoring should occur every 2 hours for 6-8 hours to monitor for hypoglycemia due to previously administered insulin.

- Titrate as required to achieve BG targets of 5.0 – 10.0 mmol/L.

- If enteral feeds are held or stopped, BG should be checked every 2 hours x 6-8 hours, watching closely for hypoglycemia

  a. D5W/D10W infusion must be started if enteral feeds are stopped and BG decreasing, to prevent hypoglycemia from occurring BG monitoring should occur every 2 hours for 6-8 hours to monitor for hypoglycemia due to previously administered insulin.

11. Orders for Patients Requiring Insulin – on Parenteral Nutrition (PN)

- Consider consulting a dietitian to determine the rate and carbohydrate content of the parenteral nutrition (PN), as insulin requirements will vary depending on these two important parameters. See the AHS provincial parenteral nutrition management policy suite and AHS nutrition support manuals (found on the AHS Insite webpage) for more information.

- There are several options for providing insulin while patient is receiving parenteral nutrition, with no single option being superior. Ordering providers need to be aware of the method of administration before completing orders, as IV insulin and insulin added to PN bag cannot be ordered using the **AHS Basal Bolus Insulin Therapy (BBIT) Adult Inpatient Order Set** (form 19885) nor in the BBIT electronic order set in Sunrise Clinical Manager (SCM) in Calgary Zone Hospitals nor in the **Covenant Health Basal Bolus Insulin Therapy (BBIT) Adult Inpatient Order Set** (form CV-0701). Consider consulting Pharmacy for clarification and guidance with insulin dosing if required.

- Options include:

a. IV insulin (insulin regular (HumuLIN® R)) infusion separate from PN bag
   - Advantage: Very precise titration of insulin allows for excellent glycemic control, which can be immediately stopped if glucose supply (e.g. PN) is stopped. Continuous IV insulin should be continued at a reduced dose, even if PN is stopped, to prevent DKA in those with T1DM and insulin deficient diabetes.
   - Disadvantage: Requires intensive nursing management and very frequent (every 1-2 hours) BG testing and insulin IV rate adjustment. Difficult to administer outside of ICU/CCU setting.

b. Insulin regular (HumuLIN® R) added to PN bag and administered together
   - Advantage: This matches intake to insulin. If PN stopped, insulin is immediately stopped.
   - Disadvantages:
     - More challenging to titrate insulin dose when PN composition is changing frequently.
     - IMPORTANT: If held (both the PN + insulin) it is UNSAFE in patients with T1DM and insulin deficient patients who need basal insulin to prevent DKA. So **if PN is interrupted**, subcutaneous or IV insulin will be required in insulin deficient patients to prevent DKA. It is safe if stopped in most patients with Type 2 diabetes.
   - Order **subcutaneous correction insulin** to prevent hyperglycemia from going untreated. Choose correction insulin dose based on:
     - The total daily dose of insulin administered in the last 24 hours (e.g. Amount of insulin infused with PN and amount of subcutaneous correction insulin required) OR weight based calculation of TDD (0.3-0.5 units/kg/day).
     - Must specify the type of correction insulin (insulin regular (HumuLIN® R), aspart (Novorapid®) or lispro (HumaLOG®)) and should be administered every 6 hours, coordinated with BG testing schedule.

c. Subcutaneous Insulin options:
   - BBIT with basal, bolus and correction insulin: Provide half the TDD (**0.5 x TDD**) as basal insulin detemir (Levemir®), insulin NPH (HumuLIN® N), or glargine (Lantus® or Basaglar®), preferably dosed twice daily, and half TDD (**0.5 x TDD**) as regular insulin (HumuLIN® R) in 4 equally divided doses, administered every 6 hours. Order Correction insulin dose based on TDD, and administer every 6 hours together with bolus insulin.
     - If feeds held or stopped, bolus dose must be held. Basal and correction may continue as previously ordered. BG monitoring should occur every 2 hours for 6-8 hours to monitor for hypoglycemia due to previously administered insulin.
   - BBIT with basal and correction insulin alone: Provide the entire TDD as basal insulin alone, preferably ordered twice daily. Order Correction insulin dose based on TDD, choose a correction insulin (HumuLIN® R,

aspart (Novorapid®) or lispro (HumaLOG®)) and administer every 6 hours.
    - If feeds held or stopped, basal dose of insulin must be reduced by approximately 50% and titrated to achieve target. BG monitoring should occur every 2 hours for 6-8 hours to monitor for hypoglycemia due to previously administered insulin.
- For non-insulin deficient patients consider TDD divided into four equally divided doses of insulin regular (HumuLIN® R) administered every 6 hours along with a correction insulin dose based on TDD.
    - If feeds held or stopped, dose of insulin regular (HumuLIN® R) must be reduced by approximately 50% and titrated according to patient's response. BG monitoring should occur every 2 hours for 6-8 hours to monitor for hypoglycemia due to previously administered insulin.

- Titrate as required to achieve BG targets of 5.0 – 10.0 mmol/L. Titration of basal and bolus doses may be guided by the new TDD (Total basal+bolus+correction+IV/PN insulin over past 24 hours).

- If subcutaneous insulin is used and if parenteral feeds are held or stopped, BG monitoring should occur every 2 hours for 6-8 hours to monitor for hypoglycemia due to previously administered insulin.
    a. D5W/D10W infusion must be started if parenteral feeds are stopped and BG decreasing, to prevent hypoglycemia from occurring.

12. Orders for Patients Requiring Insulin – Premix Insulin

Key message: *Premix insulin is rarely useful in hospital, cannot be easily adjusted in the acute care setting and often results in the patient experiencing hypoglycemia or hyperglycemia. Conversion to basal bolus insulin is preferred.*

- Premix insulin consists of a bolus and basal insulin component in a ratio of 30%/70%, 25%/75%, 40%/60% or 50%/50% (represented as % bolus/%basal). Premix insulins are given at breakfast and supper, and are not given at bedtime due to the risk of hypoglycemia.

- In general, premix insulins are **not** the preferred choice of therapy for patients with diabetes, especially those patients with T1DM. Patients who benefit from using premix insulins are metabolically stable and eat a consistent number of carbohydrates at consistently scheduled meals, in the absence of acute illness. Premix insulins may be useful in those patients that have difficulty with adherence, those who are only able to tolerate two injections per day or as outpatients rely on caregivers/home care to administer insulin.

- Premix insulin is **not** recommended for patients who are acutely ill, NPO or receiving fluid diets. These patients should be switched to separate basal and bolus insulin as doses can be adjusted more readily depending on the blood glucose values, nutritional intake and medical condition.

- When converting premix insulin to basal and bolus insulin, calculate TDD by adding all insulin doses used in 24 hour period and use TDD to calculate the basal and bolus insulin doses (see Sections 5a, 5b).

    - Example: Patient is on 30/70 insulin – 51 units with Breakfast and 45 units with supper
        - TDD = 51 + 45 = 96 units/day
        - Basal = TDD x 0.5 = 96 x 0.5 units/kg/day = 48 units
            - For insulin NPH (HumuLIN® N) or detemir (Levemir®), divide into two equal doses at breakfast and bedtime:
                - 48 units/2 = 24 units at breakfast and 24 units at bedtime
            - For glargine (Lantus®) 48 unit dose either once daily at bedtime or twice daily 48units/2 = 24 units at breakfast and 24 units at bedtime
        - Bolus = TDD x 0.5 = 96 x 0.5= 48 units to be divided evenly at each meal = 16 units per meal, delivered as aspart (Novorapid®), lispro (HumaLOG®), or insulin regular (HumuLIN® R).
        - Order correction insulin based on patient's Total Daily Dose (TDD).

- If ordering/continuing Premix insulin:
    - Order twice daily given at breakfast and suppertime.
      Do not give Premix insulin at bedtime!

- Separate orders must be written for premix insulin, as they are not included in the **AHS Basal Bolus Insulin Therapy (BBIT) Adult Inpatient Order Set** (form 19885) nor in the BBIT electronic order set in Sunrise Clinical Manager (SCM) in Calgary Zone Hospitals nor on the **Covenant Health Basal Bolus Insulin Therapy (BBIT) Adult Inpatient Order Set** (form CV-0701).
- Correction insulin can be administered to help achieve blood glucose levels within the in-hospital target range. The correction dose is based on the patient's insulin sensitivity and chosen based on their TDD (see above).

- The following premix insulins are available commercially:

Insulin	Components	AHS formulary?
HumuLIN® 30/70	30% insulin regular/70% isophane (N)	**Yes**
NovoLIN® 30/70	30% insulin Toronto/70% NPH	No
NovoLIN® 40/60	40% insulin Toronto/60% NPH	No
NovoLIN® 50/50	50% insulin Toronto/50% NPH	No
HumaLOG® Mix 25	25% lispro/75% lispro protamine	**Yes**
HumaLOG® Mix 50	50% lispro/50% lispro protamine	No
NovoMIX® 30	30% aspart/70% aspart protamine	No

Reference:

- CPS [Internet]. Ottawa (ON): Canadian Pharmacists Association c2015 [cited 2017-Oct-25]. Available from http://www.e-therapeutics.ca. Also available in paper copy from the publisher.
- U.S. Food and Drug Administration. Information regarding insulin storage and switching between products in an emergency. http://www.fda.gov/Drugs/EmergencyPreparedness/ucm085213.htm cited August 13, 2015
- Cradock S, Cranston I. Changing insulins a practical approach. Diabetes Update (part of Diabetes U.K.) Lan 07/1317 November 2007.

13. Special Populations

13a. Suggestions for Patients with Renal Impairment

The risk of hypoglycemia is increased in patients with renal impairment due to a reduced clearance of insulin and impaired gluconeogenesis by the kidney.

- **Acute Kidney Injury:**
  a. If a patient's GFR decreases below 60 mL/min an adjustment in their insulin doses may be required. While this must be individualized, consider the following guidelines for calculation of TDD:
     i. GFR 30 – 60 mL/min – 0.3 units/kg/day
     ii. GFR 15 – 30 mL/min – 0.2 units/kg/day
     iii. GFR below 15 mL/min – 0.15 units/kg/day
  b. As renal function improves, patients may begin to experience hyperglycemia, and as such more correction insulin. Review blood glucose results and titrate insulin (basal, bolus and correction) dosing daily using TDD as a guide. Review and adjust insulin every 1-2 days.

- **Chronic Kidney Disease:**
  a. Patients on a stable dose of insulin do not need any special adjustments unless they are experiencing recurrent hypoglycemia.
  b. Adjust insulin administration as outlined above if patient becomes NPO or has poor oral intake (see Section 9). If this state is prolonged, their TDD may need to be reduced (see Sections 5a, 5b).
  c. For patients new to insulin, adjust weight-based TDD as for acute renal failure above (see Section 13a). If they have been on an IV insulin infusion, use the insulin TDD (IV+basal+bolus+correction) to guide calculation of subcutaneous basal, bolus and correction doses orders. (See sections 5a, 5b Section 5).

13b. Suggestions for Patients Receiving Corticosteroid Therapy

Corticosteroids, specifically glucocorticoids (GC) usually raise blood glucose 4 to 8 hours after being given orally, or sooner following IV administration. GCs frequently cause hyperglycemia even in people without known diabetes. These effects are usually transient and reversible upon stopping the GC. This hyperglycemic effect is usually seen with the administration of supraphysiologic doses of steroid (prednisone greater than 5 mg or equivalent dose of alternative synthetic GC) but some patients may develop hyperglycemia at lower doses, so clinical vigilance is recommended at any dose.

When administered as a single daily GC dose in the morning (e.g. prednisone), there is usually a significant increase in glucose before lunch, after lunch and before supper with less increase in fasting blood glucose. Intermediate acting insulin NPH (HumuLIN® N) insulin usually works best as the basal insulin to prevent the rise in BG after steroid administration, since the peak of insulin NPH (HumuLIN® N) matches the rise in blood glucose from the GC.

Hyperglycemia throughout the 24 hour period can be seen with multiple daily doses of GC (IV hydrocortisone) or longer acting glucocorticoid (GC) such as dexamethasone. A long-acting basal insulin such as detemir (Levemir®) and glargine (Lantus®) can be considered in this situation.

- All patients should be informed of the risks of hyperglycemia upon initiation of GC treatment.

- Blood glucose monitoring:

  a. Should occur in all patients (even in those that do not have a previous diagnosis of diabetes) at baseline before starting GC and for 48 hours after starting GC.

  b. Recommended frequency of blood glucose monitoring:

     iv. For patients with no previous diagnosis of diabetes: twice daily, before lunch and supper.
     v. For patients with known diabetes: four times daily, before meals and bedtime
     vi. Thresholds for the diagnosis of GC diabetes are the same as for Type 1 and Type 2 diabetes, but it is important to remember that often, fasting blood glucose may be the least elevated. Two hour post-prandial blood glucoses are more likely to be elevated in GC diabetes.

  c. If all blood glucose levels are less than 8.0 mmol/L without insulin for 48 hours, glycemic monitoring can be discontinued.

  d. If BG levels are between 8.0 – 10.0 mmol/L, testing should continue at recommended frequencies outlined above.

e. If patients have blood glucoses equal or greater than 10.0 mmol/L, blood glucose lowering therapy should be started

- Suggested blood glucose lowering therapy:
  a. For patients with no previous diagnosis of diabetes:
     i. Consider starting gliclazide 40 mg po once daily in the morning (if no contraindications), and titrate dose as necessary to a maximum dose of 160 mg po twice daily.
     ii. If blood glucose substantially above target 5.0 – 10.0 mmol/L at the onset, or remain elevated despite gliclazide therapy, start a morning dose of insulin NPH (HumuLIN® N) 10 units and titrate up by 10-20% every 1-2 days until target blood glucose of 5.0 – 10.0 mmol/L are achieved.
  b. For patients with known diabetes but insulin naïve:
     i. Suggest starting insulin NPH (HumuLIN® N) 10 units and add correction scale using 0.5 units/kg/day. Use new TDD (all basal+bolus+correction insulin) to titrate up insulin NPH (HumuLIN® N) dose daily until target blood glucose of 5.0 – 10.0 mmol/L are achieved. If TDD exceeds 25-30 units consider full BBIT (see Sections 5a, 5b).
     ii. Patient on multiple daily doses of GC (IV hydrocortisone) or longer acting glucocorticoid (GC) such as dexamethasone – calculate TDD based on 0.3-0.5 units/kg/day. Order basal insulin, bolus insulin and correction insulin based on TDD (see Sections 5a, 5b). Titrate doses daily (see Section 6).
c. For known insulin users:
     i. Existing morning basal insulin dose and/or the bolus insulin doses at lunch and supper should be increased by 10-20% with initiation of steroid, and titrated accordingly (see Section 6).
     ii. If doses are unknown, use BBIT and suggest starting at 0.5 – 1.0 units/kg/day. It is preferable to use intermediate acting basal insulin and distribute the basal insulin with 60-70% in am and 30-40% at bedtime. Order bolus insulin and correction insulin based on TDD, as outlined in Sections 5a, 5b. Be cautious of nocturnal hypoglycemia if large doses of insulin are given late in day.
     iii. For patients on multiple daily dose of GC (IV hydrocortisone), or long-acting GC (dexamethasone), use BBIT and suggest starting at 0.5 – 1.0 units/kg/day. As hyperglycemia persists throughout the 24 hour period, any basal insulin may be considered. Order bolus insulin and correction insulin based on TDD, as outlined in sections 5a, 5b.
     iv. Titrate doses daily (see Section 6).

Reference:

- http://www.diabetologists-abcd.org.uk/JBDS/JBDS_IP_Steroids.pdf
- Steroid hyperglycemia: Prevalence, early detection and therapeutic recommendations: A narrative review. Héctor Eloy Tamez-Pérez, Dania Lizet Quintanilla-Flores, René Rodríguez-Gutiérrez, José Gerardo González-González, and Alejandra Lorena Tamez-Peña. World J Diabetes. 2015 Jul 25; 6(8): 1073–1081

13c. Suggestions for Patients with Gastroparesis

Gastroparesis is the delayed gastric emptying that can accompany diabetes due to chronic neuropathy of the gastric enteric neurons. It is often difficult to detect clinically, as it develops slowly and symptoms can be nonspecific. Symptoms of gastroparesis include bloating, abdominal pain, early satiety, prolonged satiety, nausea, and vomiting. Gastroparesis should be considered if anticipated glucose rise after meals does not follow predictable patterns.

Gastroparesis can make glycemic control difficult because of unpredictable food absorption. Patients can present with both unexplained hypoglycemia and hyperglycemia. Hypoglycemia within 1 hour of eating should raise suspicion of this condition as the insulin is peaking before the carbohydrate is absorbed. Gastroparesis tends to worsen when the patient is experiencing high blood glucose.

A gastric emptying test is the confirmatory test, and proper clinical evaluation must be done to rule out other causes.

Diet considerations: Fat, protein, and fibre further slow the rate of carbohydrate absorption, so foods normally suggested for diabetes such as complex carbohydrates may not be suitable for those with gastroparesis. Small, frequent meals four to five times a day that are low in fat and contain only soluble fibre are recommended. Hydration should be provided. Patients with refractory symptoms may require enteral or parenteral supplementation. Consultation with a dietitian should be considered.

Insulin options: Consider adjusting the type and timing of Bolus insulin:

- Rapid-acting insulin (lispro (HumaLOG®) or aspart (Novorapid®)) may be given after the meal. This moves the peak of the insulin later, better matching the delayed carbohydrate absorption and subsequent blood glucose rise. It also allows adjustment of bolus dose to account for amount of meal consumed and any postprandial vomiting. For example, if half of the meal is consumed, one would expect that only half of the bolus insulin may be required.
- Short acting insulin regular (HumuLIN® R) may be injected **with the meal** (not 30 minutes before). The slower peak of this insulin may better match with the delayed carbohydrate absorption.

More frequent BG monitoring (e.g. before and 2 hr after meals) may be required to establish the pattern of glucose rise or fall after oral intake.

Medications: Avoiding medications that slow gastric emptying is recommended (narcotics, anticholinergics, and GLP-1 agonists). Prokinetic medications (e.g., metoclopramide, domperidone and erythromycin) should be considered to increase the rate of gastric emptying and administration should be 10-15 minutes before the meal and in some individuals, before bedtime. Antiemetics (e.g., dimenhydrinate, ondansetron) may also be required. Note: the use of these medications alone or in combination with SSRIs may result in prolonged QT.

Reference:

- Koch KL, Calles-Escandón J. Diabetic Gastroparesis. Gastroenterol Clin North Am. 2015 Mar;44(1):39–57.

- Camilleri M, Parkman HP, Shafi MA, et al. Clinical guideline: management of gastroparesis. Am J Gastroenterol 2013; 108:18.
- Ogorek CP, Davidson L, Fisher RS, Krevsky B. Idiopathic gastroparesis is associated with a multiplicity of severe dietary deficiencies. Am J Gastroenterol 1991; 86:423.

13d. Suggestions for Patients Going for Surgery or Procedure Requiring Fasting

- Perioperative Guidelines for Patients with Diabetes Mellitus are available online on the AHS Clinical Knowledge Viewer.

- Carbohydrate loading is **not** recommended for patient with diabetes as per the perioperative guidelines for patients with diabetes mellitus clinical knowledge topic. See the provincial guidelines for pre-operative fasting and carbohydrate loading prior to surgical interventions for more information.

- **Insulin deficient patient:**
  Requiring long surgical procedures or general anaesthesia
  a. It is preferable for the patient to be scheduled as the first procedure of the day, if possible.

  b. **Basal insulin, correction insulin** and an **exogenous source of IV dextrose** will be required while the patient awaits the surgery, while NPO.
     - Bolus (meal) insulin must be held when the patient becomes NPO.
     - IV dextrose may start at midnight or after 6 hours of fasting.
     - Long-acting basal insulin [(detemir (Levemir®) or glargine (Lantus® or Basaglar®)]
       – The day prior to surgery/procedure, consider reducing by 10-20% if patient at higher risk of hypoglycemia.
     - Ultralong-acting basal insulin [degludec (Tresiba®)]:
       – 3 days prior to surgery/procedure, consider reducing by 10-20% if patient at higher risk of hypoglycemia.
     - Intermediate-acting basal insulin (e.g. insulin NPH (HumuLIN N®)) twice daily, morning dose may be administered but consider a reduced dose (e.g., 20-50% reduction).
     - The correction insulin does not require adjustment while patient is NPO.

  c. In these patients, hypoglycemia is less likely to occur if using a long-acting, basal insulin (e.g. detemir (Levemir®) or glargine (Lantus® or Basaglar®) or glargine U300 (Toujeo®) or degludec (Tresiba®)). This also applies to patients who are waiting for surgery and will be NPO or have minimal nutritional intake for days prior to surgery.

  d. Patient may be converted to IV insulin therapy during surgery if prolonged anesthesia or prolonged NPO status post-op.

  e. Ensure basal insulin is restarted 2 hours **prior to** discontinuation of IV insulin to avoid rapid development of DKA post-procedure for insulin deficient patients.

- **Type 2 diabetes patient on insulin:**
  a. It is preferable for the patient to be scheduled as the first procedure of the day, if possible.
  b. **Basal insulin and correction insulin** will be required.

- Bolus insulin must be held when the patient becomes NPO.
- Long-acting basal insulin (detemir (Levemir®) or glargine (Lantus® or Basaglar®)]:
  - The day prior to surgery/procedure, consider reducing by 10-20% if patient at higher risk of hypoglycemia.
- Ultralong-acting basal insulin [degludec (Tresiba®):
  - 2 days prior to surgery/procedure, consider reducing by 10-20% if patient at higher risk of hypoglycemia.
- Intermediate-acting basal insulin (e.g. insulin NPH (HumuLIN N®)) twice daily, morning dose may be administered but consider a reduced dose (e.g. 20-50% reduction).
- The correction dose does not require adjustment.

c. It is important to remember that some patients with Type 2 diabetes may be insulin deficient as well, particularly those who have been on insulin for 5 or more years. These patients may require IV insulin during the procedure to maintain adequate glycemic control.

- **Type 2 diabetes patient currently on oral/injectable antihyperglycemic agent(s):**
  a. It is preferable for the patient to be scheduled as the first procedure of the day, if possible.

  b. Order subcutaneous correction insulin if BG higher than 10.0 mmol/L.

  c. Continue usual oral/injectable antihyperglycemic medications up to and including the evening before surgery or procedure.
     - EXCEPTION: patients taking SGLT2i medications are at risk for euglycemic DKA. **HOLD SGLT2i medications 3 days prior** to procedure. If blood glucose values are above recommended target initiate BBIT temporarily and transition back to home regime when appropriate. See Appendix 4 for more information.

  d. **Hold** oral/injectable antihyperglycemic medications the morning of surgery.

- **Patients undergoing Whipples procedure or Pancreatectomy (distal or total) surgical procedure:**
  a. Patients are at increased risk for hyperglycemia that may require insulin therapy in hospital. Long-term they may need ongoing insulin therapy or other antihyperglycemic agents.
  b. Patients on insulin are at increased risk for hypoglycemia post procedure, related to absent or decreased glucagon production.
  c. POCT blood glucose monitoring is recommended.
  d. Order subcutaneous correction insulin if BG higher than 10.0 mmol/L. If hyperglycemia is persistent, consider a conservative basal bolus insulin approach, using **0.2units/kg/day**.
  e. A referral to a community diabetes educator and/or specialist on discharge is recommended to support long-term diabetes self-management.

14. Transitioning from IV to Subcutaneous Insulin

Patients should be transitioned from IV to subcutaneous insulin once they can eat and drink and/or are medically stable. Intravenous infusions of insulin are designed to replace basal insulin only, and will not work well in a patient who is eating or receiving bolus feeds.

Steps:

- If the patient is well enough to return to usual activities and diet, consider resuming their home regimen. Otherwise, calculate the TDD using current insulin doses (all IV insulin in last 24 hours) or the weight based TDD calculation, and for safety use the lower of these TDD calculations to determine basal, bolus and correction doses (Outlined in Sections 5a, 5b).

Remember: Remain aware of patient's clinical status and nutritional intake while on IV insulin, as TDD may change as patient recovers from acute illness/surgical stress and diet progresses.

- Continue IV insulin until the first scheduled subcutaneous basal insulin dose.

- Discontinue the IV insulin 2 hours after the administration of basal (intermediate or long-acting) insulin (IV insulin has duration of action of about 7 minutes).

- Review blood glucose measurements daily and adjust the insulin doses every 1-2 days.

15. Patients on Insulin Pump Therapy

Refer to the provincial AHS Guidelines for the Safe Management of Insulin Pump Therapy in Hospital. These guidelines are under review with Covenant Health. The guidelines can be found on www.ipumpit.ca and specific named guidelines below:

- **If the insulin pump must be discontinued, the patient should be placed on subcutaneous basal/bolus insulin 2 hours prior to pump withdrawal or an intravenous insulin infusion immediately upon pump withdrawal. If this is not done, hyperglycemia and DKA may occur within 2-4 hours.**
    a. *Guidelines for switching from insulin pump to basal/bolus insulin* https://extranet.ahsnet.ca/teams/policydocuments/1/clp-ahs-scn-don-guidelines-for-safe-management-of-ipt-in-hospital.pdf#page=21

- Patients on insulin pump therapy do not necessarily need to discontinue this type of therapy while hospitalized. They are often very knowledgeable about diabetes management and should be encouraged to self-manage their diabetes when appropriate.

- The determination of whether a patient may self-manage their diabetes with their insulin pump during the hospital stay is dependent on their mental and physical capacity as well as their medical stability. These factors must be assessed at admission and daily throughout the hospital stay.
    a. *Guidelines for Assessing Self-Management of Insulin Pump in Hospital* https://extranet.ahsnet.ca/teams/policydocuments/1/clp-ahs-scn-don-guidelines-for-safe-management-of-ipt-in-hospital.pdf#page=5

- To self-manage diabetes with the insulin pump, the patient must agree to the expected roles and responsibilities which includes having adequate insulin pump supplies, including infusion sets, reservoirs, batteries, etc. Pump manufacturers provide 24-hour help lines that the patient can contact for device-related problems. The telephone number can usually be found on the back of the insulin pump.
    a. *Patient Agreement to Self-Manage Insulin Pump In-Hospital* http://www.albertahealthservices.ca/frm-20369.pdf

- The insulin pump should be removed for all radiologic procedures, except ultrasound, due to exposure to electromagnetic fields. The pump should be discontinued (most often temporarily), and subcutaneous or IV insulin treatment should be initiated before the procedure, for any procedure longer than 2 hours
    a. *Guidelines for managing pump during radiologic procedure* https://extranet.ahsnet.ca/teams/policydocuments/1/clp-ahs-scn-don-guidelines-for-safe-management-of-ipt-in-hospital.pdf#page=20

- If a patient is undergoing general anesthetic or conscious sedation where the post-procedure cognitive impairment will be equal to or greater than 2 hours, the pump should be discontinued and subcutaneous or IV insulin treatment should be initiated

   a. *Guidelines for the safe use of insulin pump during procedures and surgery* *https://extranet.ahsnet.ca/teams/policydocuments/1/clp-ahs-scn-don-guidelines-for-safe-management-of-ipt-in-hospital.pdf#page=19*

- If the patient does not meet criteria to self-manage, the insulin pump should be discontinued and the patient placed on a subcutaneous insulin regimen using the **AHS Adult Subcutaneous Basal Bolus Insulin Therapy Order Set** (form 19885) or BBIT electronic order set in Sunrise Clinical Manager (SCM) in Calgary Zone Hospitals or **Covenant Health Basal Bolus Insulin Therapy (BBIT) Adult Inpatient Order Set** (form CV-0701).
   a. *Guidelines for switching from insulin pump to basal/bolus insulin (https://extranet.ahsnet.ca/teams/policydocuments/1/clp-ahs-scn-don-guidelines-for-safe-management-of-ipt-in-hospital.pdf#page=21)*

16. Transitioning from BBIT and Discharge Planning

Discharge planning around diabetes management should begin as early as possible during the hospital admission.

Not all insulins available in the outpatient setting are included on the provincial acute care simplified insulin formulary, so patients may be transitioned to different insulin(s) during their hospital stay.

A patient with diabetes may require BBIT only *transiently* in hospital. Please see Appendix 4: **Transition algorithm** for steps to consider in the transition process of moving from "*BBIT in-hospital"* to the diabetes regimen on which that the patient will be discharged.

In deciding which diabetes regimen is most appropriate for discharge, consider the following:

1. What was the patient's pre-admission glycemic control, as indicated by the A1C within the preceding 3 months?
2. Where is the patient's discharge destination?
    a. Home or
    b. Continuing Care (Home Care, Supportive Living vs. Long-term Care)
        i. Remember- professional staff availability may vary in each setting, influencing the complexity of the treatment regimen
3. What is the patient's ability to self-manage medications orally or with injections?
4. What is the cost to the patient?
5. What resources are available for the patient in the discharge setting?
    a. Diabetes Care Team
    b. Chronic Disease Management
    c. Home Care – consider staff availability and frequency of visits
    d. Family Support
6. What are the patient's unique needs/wants/therapeutic goals?
7. What are the patient's individualized glycemic targets and what diabetes regimen may support achieving this goal?

If discharge on insulin is anticipated:

1. Plan insulin injection teaching early, encouraging patient to self-inject and participate in diabetic management as early as possible prior to discharge.
2. Consider the possibility of basal insulin alone or in combination with other anti-hyperglycemic agents, as this is the most simple insulin regimen for patients.
3. If BBIT is required (i.e.T1 DM, T2 DM with inadequate prandial control with basal insulin alone), attempt to simplify doses prior to discharge.
    a) Discontinue correction scale in most cases
        - For patients with a good understanding of their diabetes management, sometimes the use of a correction scale at home is appropriate.
        - However, the goal should be to titrate insulin doses to the point where the correction insulin is rarely needed, such that the correction doses can be discontinued prior to discharge.
4. For patients whose insulin brand (trade) was substituted during their hospital stay (due to the simplified provincial formulary), remember to transition the patient back to their

home trade insulin regimen if appropriate. Discuss with patient which medication(s) they are to be using in the outpatient setting.
5. Ensure family physician and outpatient diabetes care team (diabetes educator and/or diabetes specialist) is notified of hospital discharge and any changes to their diabetes regimen.
6. Patients are encouraged to arrange follow up with their diabetes care team within 1-2 weeks of discharge for ongoing diabetes care.
7. Refer patient to outpatient diabetes education and self-management support, especially if patient is new to insulin or newly diagnosed with diabetes.

Ensure the patient and their family or caregiver is aware of the discharge plan. Provide written and oral instructions specifically regarding:

- A reconciled diabetes medications list including insulin and other antihyperglycemic medications (timing and frequency). This is especially important if different from their pre-admission home diabetes medications
- Recommendations for timing and frequency of home blood glucose monitoring
- Comprehensive instructions for the identification and management of hypoglycemia (when applicable to patient)
- Contact information for health-care providers who will be responsible for ongoing diabetes care and adjustment of glucose-lowering medications

PEARLS for patients moving to **Continuing Care** when insulin therapy is the best option at the time of discharge (including Home Care, Supportive Living and Long-term Care):

1. If patient discharged to Long-term Care, ensure that diabetes medications are on formulary
2. Consider moving once daily basal insulin to a *morning* administration
3. Consider switching twice daily basal insulin to once daily basal *morning* insulin administration
4. Consider switching to a pre-mix insulin dosed at breakfast and supper

- Premix insulins may be useful in those patients that have difficulty with adherence, those who are only able to tolerate two injections per day or as outpatients rely on caregivers/home care to administer insulin
- A higher glycemic target in the outpatient setting (blood glucose values of 6.0 – 14.0 mmol/L and A1C of 8.0 – 8.5%) is acceptable for the frail elderly and or with dementia (older adults assessed as physically and/or cognitively frail at risk for confusion, agitation or falls), those with multiple comorbidities, patients with limited life expectancy and patients at risk for severe or recurrent hypoglycemia (e.g. hypoglycemia unawareness)

The **Basal Bolus Insulin Therapy (BBIT) Adult Inpatient Order Set** (AHS form 19855 or Covenant Health form CV-0701) is **for acute care use only.**

- A separate prescription is required for a patient's transition between facilities outside of the acute care site.
- **Do not** send AHS/Covenant Health order set with patient as a prescription

17. References

Diabetes Canada Clinical Practice Guidelines

- http://guidelines.diabetes.ca/fullguidelines

Types of Insulin

- CPS [Internet]. Ottawa (ON): Canadian Pharmacists Association c2015 [cited 2015-Oct-30]. Available from http://www.e-therapeutics.ca. Also available in paper copy from the publisher.
- Lexi-Comp [database on the Internet – updated daily] Hudson, OH: Lexi-Comp Inc. c. 1978 cited date: October 30, 2015. http://online.lexi.com/lco/action.home
- Alberta Blue Cross Drug Benefit List. Alberta Health and Wellness. Cited 2015-Oct-30. https://www.ab.bluecross.ca/dbl/pdfs/dbl_full_list.pdf.
- Micromedex® 2.0, (electronic version). Truven Health Analytics, Greenwood Village, Colorado, USA. Available at http://www.micromedexsolutions.com/ (cited October 30, 2015)

Pre-Mix Insulin

- CPS [Internet]. Ottawa (ON): Canadian Pharmacists Association c2015 [cited 2015-Oct-30]. Available from http://www.e-therapeutics.ca. Also available in paper copy from the publisher.
- U.S. Food and Drug Administration. Information regarding insulin storage and switching between products in an emergency. http://www.fda.gov/Drugs/EmergencyPreparedness/ucm085213.htm cited August 13, 2015
- Cradock S, Cranston I. Changing insulins a practical approach. Diabetes Update (part of Diabetes U.K.) Lan 07/1317 November 2007.

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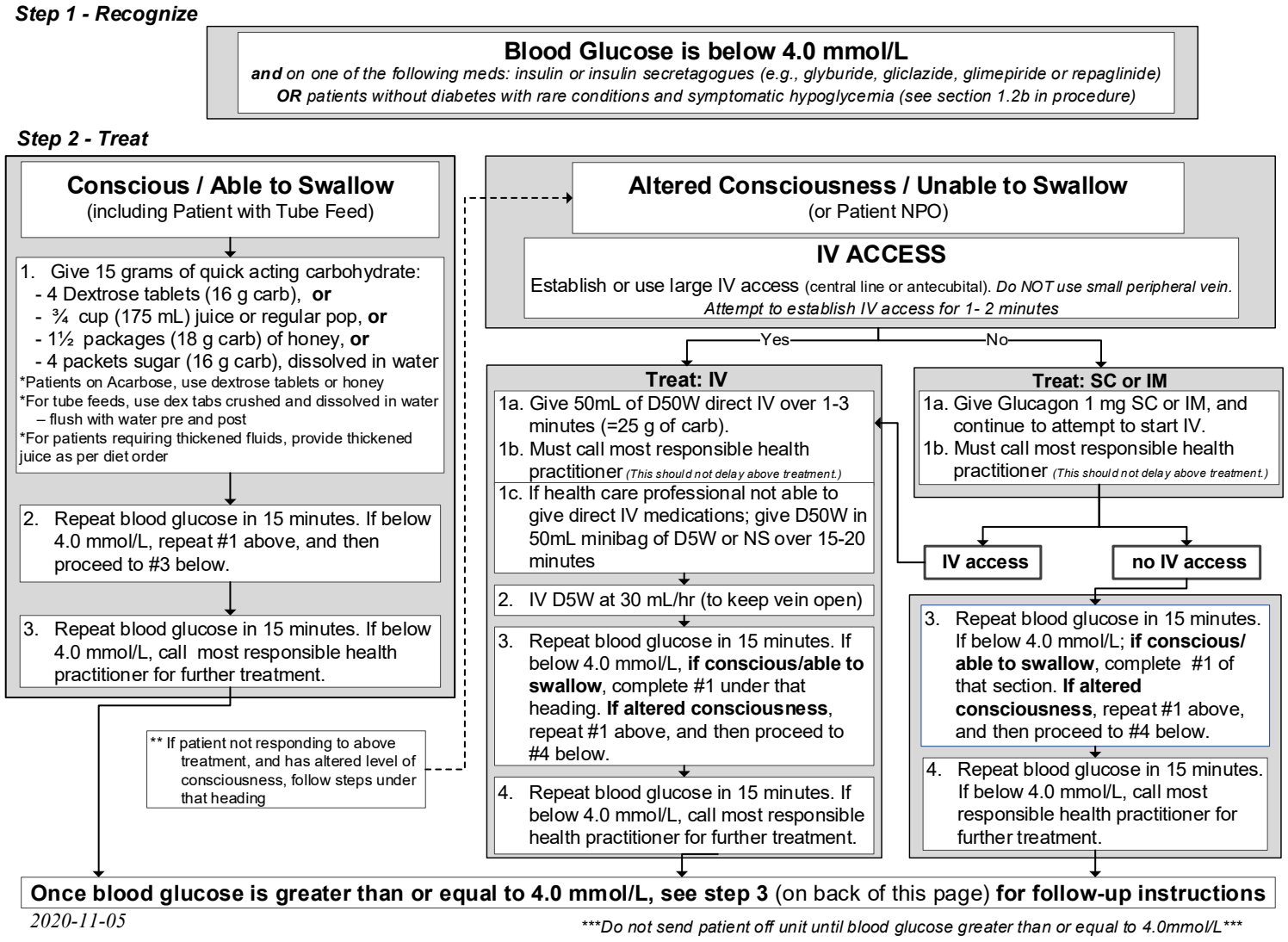
- http://www.diabetologists-abcd.org.uk/JBDS/JBDS_IP_Steroids.pdf
- Steroid hyperglycemia: Prevalence, early detection and therapeutic recommendations: A narrative review. Héctor Eloy Tamez-Pérez, Dania Lizet Quintanilla-Flores, René Rodríguez-Gutiérrez, José Gerardo González-González, and Alejandra Lorena Tamez-Peña. World J Diabetes. 2015 Jul 25; 6(8): 1073–1081

Gastroparesis

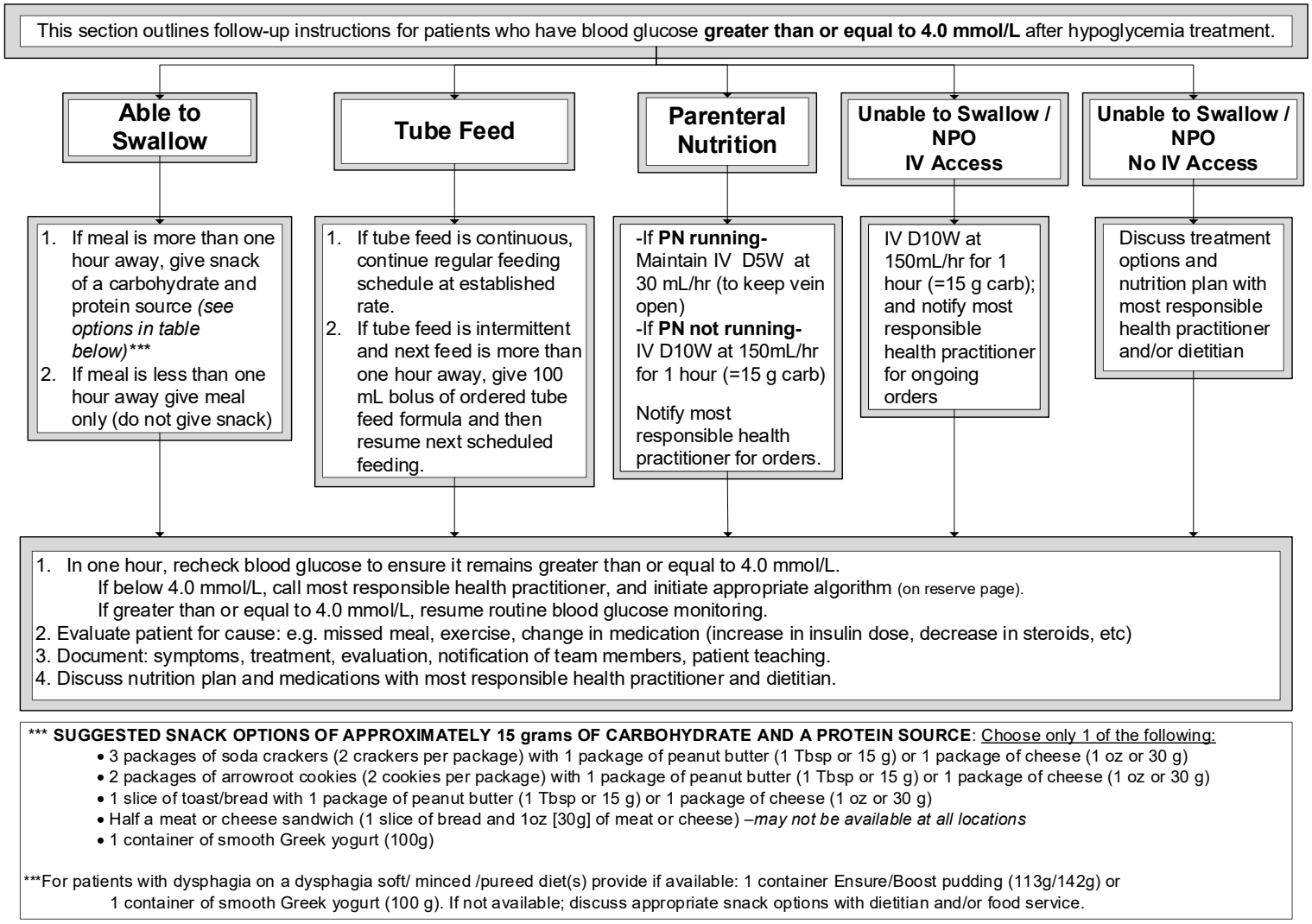
- Koch KL, Calles-Escandón J. Diabetic Gastroparesis. Gastroenterol Clin North Am. 2015 Mar;44(1):39–57.
- Camilleri M, Parkman HP, Shafi MA, et al. Clinical guideline: management of gastroparesis. Am J Gastroenterol 2013; 108:18.
- Ogorek CP, Davidson L, Fisher RS, Krevsky B. Idiopathic gastroparesis is associated with a multiplicity of severe dietary deficiencies. Am J Gastroenterol 1991; 86:423.

Appendix 1 – Adult Hypoglycemia Treatment Algorithm

*** The provincial AHS Glycemic Management policy suite, became effective September 1, 2017. Covenant Health Glycemic Management Policy became effective March 8, 2018.*



Step 3 – Follow-Up



*** **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 15 g) or 1 package of cheese (1 oz or 30 g)
- 2 packages of arrowroot cookies (2 cookies per package) with 1 package of peanut butter (1 Tbsp or 15 g) or 1 package of cheese (1 oz or 30 g)
- 1 slice of toast/bread with 1 package of peanut butter (1 Tbsp or 15 g) or 1 package of cheese (1 oz or 30 g)
- Half a meat or cheese sandwich (1 slice of bread and 1oz [30g] of meat or cheese) *–may not be available at all locations*
- 1 container of smooth Greek yogurt (100g)

***For patients with dysphagia on a dysphagia soft/ minced /pureed diet(s) provide if available: 1 container Ensure/Boost pudding (113g/142g) or 1 container of smooth Greek yogurt (100 g). If not available; discuss appropriate snack options with dietitian and/or food service.

2020-11-05

Appendix 2 – Hyperglycemia Treatment Algorithm

*** The provincial AHS Glycemic Management policy suite, became effective September 1, 2017. Covenant Health Glycemic Management Policy became effective March 8, 2018*

Adult Hyperglycemia Algorithm

Step 1: Recognize

Blood Glucose is above 18.0 mmol/L

Exception
Intervention required earlier (with a blood glucose above 14.0 mmol/L) *for:*
- Patients on Insulin Pump Therapy
- Patients on SGLT2 inhibitors

Step 2: Treat

Provide insulin or other antihyperglycemic medications as ordered

Review chart and confer with patient for possible causes (insulin or other antihyperglycemic meds held, dietary intake)

Contact most responsible health practitioner (MRHP) for orders

Stat ketone testing is recommended for patients:
- With Type 1 diabetes
- On SGLT2 inhibitors
  e.g.canagliflozin (Invokana®), dapagliflozin (Forxiga®) empagliflozin (Jardiance®) ertugliflozin (Steglataro®)

IF Ketones are positive;
- Contact MRHP for further orders
- Monitor for signs and symptoms of DKA
- Patient should refrain from exercise or physical activity

Retest blood glucose according to direction from MRHP

If unable to decrease blood glucose below 18.0 mmol/L with additional treatment; patients with Type 1 diabetes shall be assessed for DKA. Assessment includes but is not limited to:
- Symptoms of DKA including: polyuria, thirst, weight loss, nausea/vomiting, abdominal pain, weakness, mental status change, coma
- Vital signs
- Medication review (regular insulin dosing schedule, timing of last insulin administration, held or missed insulin, etc.)
- Last carbohydrate administration / ingestion
- Previous history / episodes of DKA
- Review clinical status (eg: acute coronary syndrome, infection, etc.)

If DKA is suspected, notify the most responsible health practitioner. Implement site and/or unit DKA protocol in consultation with the MRHP.

Step 3: Follow-up

Once patient's glycemic status stabilized:
- Commence routine blood glucose testing, or as ordered
- Review event, and look at efforts to prevent a recurrence
- Review to see if hyperglycemia followed a hypoglycemic episode.
- Review patient understanding. Provide education if required.
- Reassessment of diabetes medication by MRHP
- Referral to Certified Diabetic Educator, or diabetes specialist, if required
- Documentation of hyperglycemic event

2020-11-05

Appendix 3 – Adult Inpatient BBIT Order Set

Alberta Health Services

Affix patient label within this box

Basal Bolus Insulin Therapy (BBIT)

Adult Inpatient Subcutaneous Insulin Order Set

1. Discontinue all previous insulin and blood glucose monitoring orders.
2. All adult subcutaneous BBIT insulin orders (except STAT orders) must be documented using this order set. Any change in insulin orders requires completion of a new BBIT order set (Stroke out entire page and initial, when starting new order set).
3. Orders marked with ☑ are active by default, unless crossed out and initialed by prescriber. Boxed orders (☐) require prescriber check mark (☑) to be initiated.

Blood Glucose (BG) Monitoring

☑ 4 times per day (15 - 30 minutes before scheduled meals and at bedtime), as well as PRN for suspected hypoglycemia
and: ☐ 0200h x _____ days ☐ 2 hours after meal time ☐ Other *(specify)* _____
☑ **If** BG less than 4.0 mmol/L initiate **Hypo**glycemia Procedure. **Do Not Hold Insulin without prescriber order**
☑ **If** BG greater than 18.0 mmol/L initiate **Hyper**glycemia Procedure and call prescriber

Total Daily Dose (TDD) ***See calculation instructions on reverse for Prescriber Guidance only***

Calculated TDD for this order *(Physician to use as guide for Basal, Bolus & Correction Calculations)* →

Basal Insulin
Home dose or ½ TDD (given initially as equal, twice daily doses at breakfast and bedtime; glargine may be given once daily)

Choose One Basal Insulin
☐ glargine *(Lantus®)*
☐ glargine *(Basaglar®)*
☐ detemir *(Levemir®)*
☐ HumuLIN® N

Units _____	Units _____
☐ With Breakfast or	☐ At Bedtime or
☐ Time *(hh:mm)* _____	☐ Time *(hh:mm)* _____

Bolus and Correction Insulin *Use the same insulin (rapid or short-acting) for bolus and correction.*

Choose One Bolus/Correction Insulin
☐ lispro *(HumaLOG®)* sc with meal
☐ aspart *(Novorapid®)* sc with meal
☐ HumuLIN® R sc 30 min before meal

Bolus Insulin *Home dose (consider reduction of 25-50% for hospital diet) or ½ TDD divided initially into 3 equal doses*

☑ **Hold if no caloric intake, NPO or bolus feeds stopped. Continue basal and correction insulin.**
☐ Patient may determine and administer own dose and report dose to nurse *(Order insulin type and acceptable dose range)*

Units _____	Units _____	Units _____	Units _____
☐ With Breakfast or feed at time *(hh:mm)* _____	☐ With Lunch or feed at time *(hh:mm)* _____	☐ With Dinner or feed at time *(hh:mm)* _____	☐ With Other _____ at time *(hh:mm)* _____

Correction for hyperglycemia: *Choose one based on current Total Daily Dose (TDD)*

☑ Correction dose to be determined and administered with/before meal/feed OR at scheduled mealtime if NPO. Bedtime dose not routinely recommended. Correction and bolus doses can be combined and administered as a single subcutaneous injection.

☐ TDD 15-30 units		☐ TDD 31-50 units		☐ TDD 51-80 units		☐ TDD 81 units or more		☐ Custom	
BG	Units	BG	Units	BG	Units	BG	Units	BG	Units
4.1-10.0	+0	4.1-9.0	+0	4.1-10.0	+0	4.1-9.0	+0		
10.1-14.0	+1	9.1-12.0	+1	10.1-12.0	+2	9.1-11.0	+2		
14.1-18.0	+2	12.1-15.0	+2	12.1-14.0	+3	11.1-13.0	+4		
		15.1-18.0	+3	14.1-16.0	+4	13.1-15.0	+6		
				16.1-18.0	+5	15.1-17.0	+8		
						17.1-18.0	+10		

Prescriber Name *(print)*	Signature	Date *(yyyy-Mon-dd)*	Time *(hh:mm)*

20889(Rev2019-04)

Covenant Health

Basal Bolus Insulin Therapy (BBIT)
Adult Inpatient Subcutaneous Insulin Order Set

Affix patient label within this box

1. **Allergies**: Check Caution Record before ordering.
2. Shaded box ■ indicates mandatory orders.
3. Open boxes left blank ☐ will not be processed.
4. Orders may be deleted by a single stroke through the order and initialing the deletion.

Date: _____ Time: _____ Weight (kg): _____

■ Discontinue ALL previous insulin and bedside blood glucose monitoring orders
■ **IF** previous BBIT order set filled out: Stroke out entire page and Initial, before starting new BBIT order set

Blood Glucose (BG) Monitoring:

■ 4 times per day (15 – 30 minutes before scheduled mealtimes or time of feed and at bedtime)
AND as needed for suspected **hypo**glycemia
AND ☐ at 0200 hours X _____ days ☐ 2 hours after meals ☐ Other: _____

ALERT	■ **IF** BG less than 4.0 mmol/L, initiate **Hypo**glycemia Procedure DO NOT HOLD INSULIN WITHOUT PRESCRIBER ORDER ■ **IF** BG greater than 18.0 mmol/L, initiate **Hyper**glycemia Procedure, **AND** Call Prescriber

Total Daily Dose (TDD) of Insulin: *An **ESTIMATION** for Basal, Bolus & Correction Calculations, see reverse for instructions*

Calculated Total Daily Dose (TDD) for this order → _____ units

Basal Insulin: *Do NOT hold Basal Insulin if skipping a meal, or for hypoglycemia* WITHOUT PRESCRIBER ORDER
(Home dose or ½ TDD)

Choose **ONE** Basal Insulin:	_____ Units subcutaneous	_____ Units subcutaneous
☐ insulin glargine (Lantus®) ☐ insulin glargine (Basaglar®) ☐ insulin detemir (Levemir®) ☐ insulin NPH (human) (HumuLIN® N)	☐ With Breakfast **OR** ☐ at _____ hours	☐ At Bedtime **OR** ☐ at _____ hours

Bolus and Correction Insulin:

Choose **ONE** insulin **for BOTH** Bolus **and** Correction Insulin:
☐ insulin lispro (HumaLOG®) subcutaneous with meal
☐ insulin aspart (Novorapid®) subcutaneous with meal
☐ insulin regular (human) (HumuLIN® R) subcutaneous 30 minutes before meal

Bolus Insulin: *Home dose (consider reduction of 25-50% for hospital diet) or ½ TDD divided initially into 3 equal doses*

■ **IF** no caloric intake, or nothing by mouth (NPO), or feeds stopped, **HOLD** Bolus Insulin dose
AND ■ **Continue** Basal Insulin, *AND* Correction Insulin (*if required*)

_____ Units	_____ Units	_____ Units	_____ Units
☐ With Breakfast	☐ With Lunch	☐ With Dinner	☐ With Other _____
OR ☐ feed at _____ hours	**OR** ☐ feed at _____ hours	**OR** ☐ feed at _____ hours	at _____ hours

Correction Dosing for Hyperglycemia: Choose **ONE** Correction Regimen based on calculated TDD

☐ TDD **15 – 30** units		☐ TDD **31 – 50** units		☐ TDD **51 – 80** units		☐ TDD **81 units or more**		☐ Custom	
BG	Units	BG	Units	BG	Units	BG	Units	BG	Units
4.1 – 10.0	+ 0	4.1 – 9.0	+ 0	4.1 – 10.0	+ 0	4.1 – 9.0	+ 0		
10.1 – 14.0	+ 1	9.1 – 12.0	+ 1	10.1 – 12.0	+ 2	9.1 – 11.0	+ 2		
14.1 – 18.0	+ 2	12.1 – 15.0	+ 2	12.1 – 14.0	+ 3	11.1 – 13.0	+ 4		
		15.1 – 18.0	+ 3	14.1 – 16.0	+ 4	13.1 – 15.0	+ 6		
				16.1 – 18.0	+ 5	15.1 – 17.0	+ 8		
						17.1 – 18.0	+ 10		

■ **Combine** the Correction dose (*if required*) AND Bolus dose
and **Administer** as ONE single subcutaneous injection with/before mealtime OR time of feed.
(Bedtime Correction Dose is not routinely recommended)
■ **IF** NPO, Hold Bolus Insulin dose
AND Continue Basal Insulin, *AND* Correction Insulin (*if required*) with/before mealtime OR time of feed.

Prescriber's Printed Name: _____ Prescriber's Signature: _____

Do Not Write in This Space – Will Not Scan

Do Not Write in This Space – Will Not Scan

Guidelines for the completion of the BBIT Adult Inpatient Order Set
This guide does not replace clinical judgment. Refer to www.BBIT.ca for further information and educational resources.

- Use home dosing of oral/injectable antihyperglycemic agents and/or insulin if safe and blood glucose targets are being met.
- Basal Bolus Insulin Therapy (BBIT) should be used if the patient is poorly controlled at home, requires oral/injectable antihyperglycemic agents to be held, or is not achieving glycemic targets in hospital. BBIT is recommended even if therapy is expected to be temporary, peri-procedural, or for patients not previously requiring insulin. Diabetic therapy will be optimized to suit patient needs prior to discharge.
- Review glucose record **daily**. If targets of 5.0-10.0mmol/L are not achieved, consider the causes and adjust insulin doses where appropriate.

Total Daily Dose (TDD): Total number of all units of basal + bolus + correction insulin used in 24 hour period

How to calculate TDD:

- If currently on BBIT in hospital and requires titration (see titration table below): ***TDD = all insulin doses within past 24 hour period.***
- If on Basal and Bolus insulin at home with good control: ***TDD = all insulin doses in a usual 24 hour period.***
- **If patient has poor control or requires insulin** (even transiently) **in hospital** to achieve targets of 5.0 -10.0 mmol/L:

Use **LOWER** TDD IF	*Type 1 DM, slim Type 2 DM, history of hypoglycemia unawareness, reduced renal function (eGFR less than 30mL/min), liver failure, age greater than 70 with moderate/severe frailty*	***TDD=Weight (kg) x 0.3 to 0.5 Units/kg/day***
Use **HIGHER** TDD IF	*Insulin resistance, overweight Type 2 DM, steroid treatment, infection*	***TDD=Weight (kg) x 0.5 to 1 Units/kg/day***

Basal Insulin: Intermediate/long-acting insulin required to cover rising blood glucose between meals and overnight

How to calculate Basal Insulin

- If patient is well controlled on insulin at home, use pre-admission basal insulin doses and timing.
- If insulin required in hospital or patient requires titration of BBIT: **Total Basal = TDD x 0.5** glargine *(Lantus®/Basaglar®)* dosed once daily OR detemir *(Levemir®)* or HumuLIN® N dosed twice daily breakfast and bedtime.

Clinical Pearls

- At optimal doses, basal insulin should never cause hypoglycemia, even if the patient is not eating.
- **All patients with Type 1 Diabetes require basal insulin, even when not eating, in order to prevent rapid development of diabetic ketoacidosis (DKA).**
- No basal required if patient well controlled without basal at home **and** meeting hospital targets **OR** if receiving continuous enteral feeds and achieving targets on QID timed bolus plus correction insulin alone.

Bolus Insulin: Rapid/short acting insulin, required to cover rising blood glucose after meals caused by carbohydrate intake

How to calculate Bolus Insulin

- If patient is well controlled on insulin at home, use pre-admission bolus insulin doses. Consider reducing bolus doses by 25-50% if hospital diet less than home diet.
- If insulin required in hospital or patient requires titration of BBIT: **Total Bolus = TDD x 0.5 divided by 3** (three equal doses with meals) lispro *(HumaLOG ®)*, aspart *(Novorapid ®)*, or HumuLIN ® R.
- Blood glucose testing and bolus insulin administration are to be coordinated with meal/feed.

Correction Insulin: Additional rapid/short acting insulin administered to correct blood glucose if above target

- Selection based on TDD.
- May be combined with the scheduled bolus insulin dose and administered as a single subcutaneous injection.
- If NPO, correction dose to be administered at scheduled meal/feed time, in coordination with blood glucose testing.
- **Use of bedtime Correction dose is not routinely recommended.** Prescriber may use discretion for STAT bedtime insulin dose if blood glucose over 18.0mmol/L.

Titration: For most patients, the recommended target is a blood glucose range of **5.0-10.0mmol/L**

If **Breakfast** BG is:		If **Lunch** BG is:		If **Supper** BG is:		If **Bedtime** BG is:		If **Overnight** BG is:
LOW (below 5.0mmol/L)	HIGH (above 10.0mmol/L)	LOW (below 5.0mmol/L)	HIGH (above 10.0mmol/L)	LOW (below 5.0mmol/L)	HIGH (above 10.0mmol/L)	LOW (below 5.0mmol/L)	HIGH (above 10.0mmol/L)	LOW (below 5.0mmol/L)
Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease
Bedtime BASAL		**Breakfast** BOLUS		**Lunch** BOLUS or **Breakfast** BASAL		**Supper** BOLUS		**Bedtime** BASAL

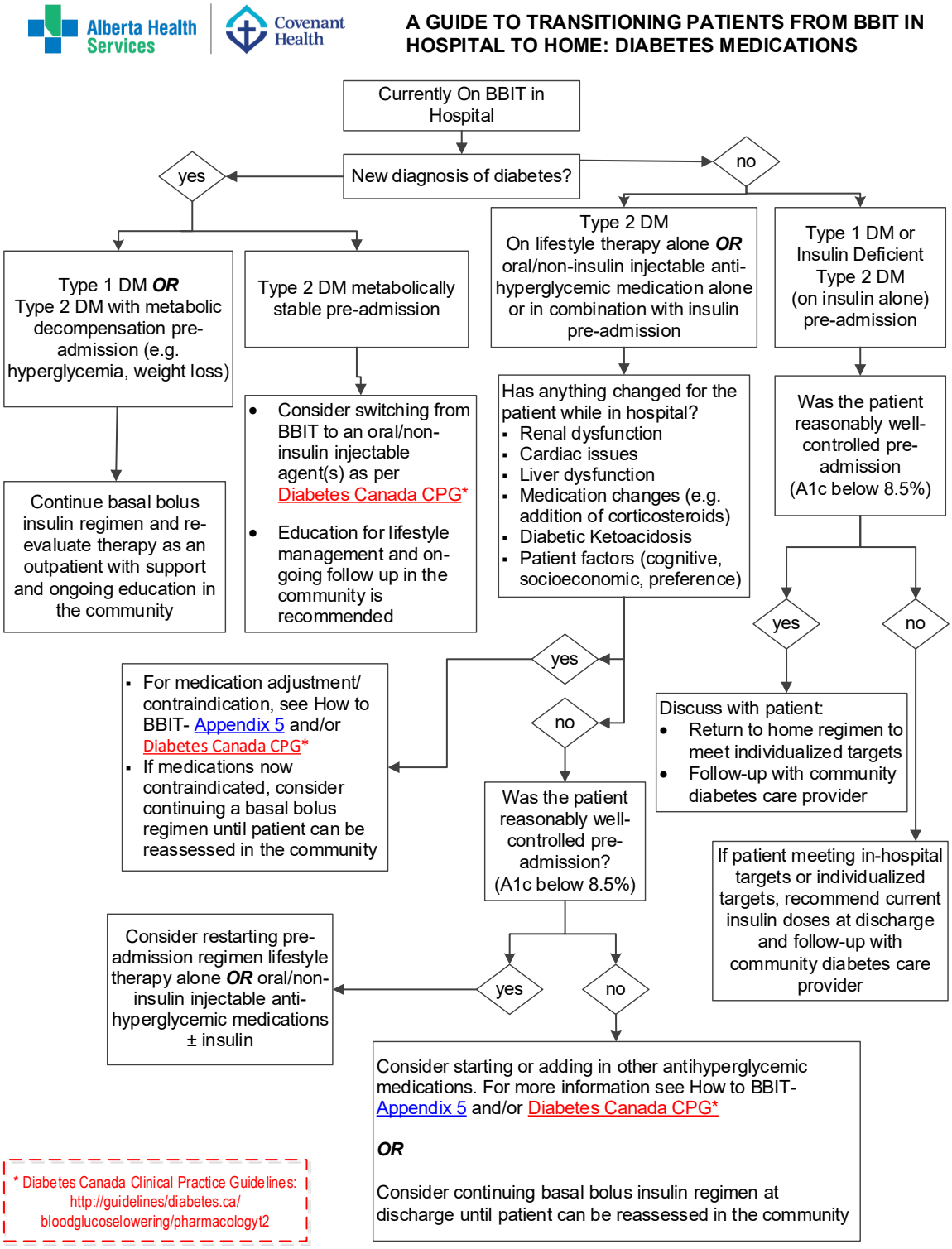
If ALL BG are HIGH (greater than 10.0mmol/L), Calculate TDD from last 24 hours, Increase TDD by 10-20% and Recalculate all Basal, Bolus and Correction Doses

- If **HYPER**GLYCEMIA **OR HYPO**GLYCEMIA: Discuss with patient to determine if change in activity or oral intake was the cause. If yes, monitor carefully. If otherwise unexplained, increase or decrease doses by 10-20% as per Titration Table above.

Enteral Tube Feeds / Parenteral Nutrition: Insulin requirements will vary depending on rate and carbohydrate content

For more details: see How to BBIT document on www.BBIT.ca website.

Appendix 4 – Transition Algorithm



Appendix 5 – Oral and non-insulin injectable Medications for Use in Type 2 Diabetes

Medication Class	Medications Included	AHS Formulary?	Reduce Dose	Discontinue Medication	Use with BBIT in Hospital?
Biguanides	Metformin	Yes	GI side effects GFR 30-60 mL/min	GFR less than 30 mL/min Severe hepatic dysfunction, dehydration	Yes
Meglitinides	Repaglinide	Yes	Hypoglycemia	If clopidogrel and/or gemfibrozil required	Basal insulin ONLY
Sulfonylureas	Glyburide	Yes	GFR less than 50 mL/min Hypoglycemia	GFR less than 30 mL/min Severe hepatic dysfunction	No
	Gliclazide	Yes	GFR less than 30 mL/min Hypoglycemia	GFR less than 15 mL/min Severe hepatic dysfunction If miconazole required	
	Glimepiride	No	GFR less than 30 mL/min Hypoglycemia	GFR less than15 mL/min	
GLP-1 Agonists	Exenatide	No	GFR less than 50 mL/min	GFR less then 30mL/min; history of MEN2 or thyroid cancer, pancreatitis	No
	Liraglutide	No		GFR less than 50 mL/min; history of MEN2 or thyroid cancer, pancreatitis	
	Dulaglutide	No		History of MEN2 or thyroid cancer; Use with caution with GFR less than 30 mL/min, pancreatitis	
	Lixisenatide	No		GFR less than 15 ml/min; History of MEN2 or thyroid cancer; pancreatitis	
	Semaglutide	No		GFR less then 30mL/min; history of MEN2 or thyroid cancer, pancreatitis	
DPP-4 Inhibitors	Sitagliptin	Yes (restricted)	GFR less than 50 mL/min	pancreatitis	No
	Saxagliptin	Yes (restricted)	GFR less than 50 mL/min	GFR less than 15 mL/min	
	Linagliptin	Yes (restricted)	GFR less than 15 mL/min	pancreatitis	
	Alogliptin	No	GFR less than 50 mL/min	pancreatitis	
SGLT-2 Inhibitors	Canagliflozin	Yes (restricted)	GFR less than 60 mL/min (100 mg daily)	GFR less than 45 mL/min if using for glycemic control stop when GFR less than 30 mL/min Signs of DKA (nausea, vomiting, confusion), foot issues (amputation risk)	No
	Dapagliflozin	Yes (restricted)		GFR less than 45 mL/min when being used for glycemic control; stop when GFR less than 30 mL/min; Signs of DKA (nausea, vomiting, confusion)	
	Empagliflozin	Yes (restricted)	GFR less than 60 mL/min	GFR less than 45 mL/min if using for glycemic control; stop when GFR less than 30 mL/min Signs of DKA (nausea, vomiting, confusion)	
	Ertugliflozin	No		GFR less than 45 mL/min; Signs of DKA (nausea, vomiting, confusion)	
Thiazolidinediones	Pioglitazone Rosiglitazone	Yes (restricted)	GFR less than 30 mL/min	Congestive heart failure, severe liver dysfunction, bladder cancer (pioglitazone)	No
Alpha-glucosidase inhibitors	Acarbose	Yes	Hypoglycemia	GFR less than 25 mL/min Chronic intestinal disease	No

References:
Harper W et al. Policies, Guidelines and Consensus Statements: Pharmacologic management of type 2 diabetes – 2015 update. Can J Diabetes 2015; 39:250-252
Product Monographs. Health Canada Drug Product Database. www.hc-sc.gc.ca Accessed February 16, 2017