

Provincial Clinical Knowledge Topic
Perioperative Management of Patients with
Diabetes Mellitus, Adult – Inpatient
V 1.1

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Revision History

Version	Date of Revision	Description of Revision	Revised By
1.0		Completion of Topic	Dr. Shannon Ruzycski, Leta Philp
1.1	February, 2020	Updates related to patient safety to prevent adverse events with the use of SGLT2i medications in the perioperative patients with diabetes	Dr. Shannon Ruzycski, Leta Philp

Important Information Before You Begin

The recommendations contained in this knowledge topic have been provincially adjudicated and are based on best practice and available evidence. Clinicians applying these recommendations should, in consultation with the patient, use independent medical judgment in the context of individual clinical circumstances to direct care. This knowledge topic will be reviewed periodically and updated as best practice evidence and practice change.

The information in this topic strives to adhere to [Institute for Safe Medication Practices \(ISMP\)](#) safety standards and align with Quality and Safety initiatives and accreditation requirements such as the Required Organizational Practices. Some examples of these initiatives or groups are: [Health Quality Council Alberta \(HQCA\)](#), [Choosing Wisely](#), [Safer Healthcare Now](#), and [Accreditation Canada](#) etc.

Guidelines

This Clinical Knowledge Topic is based on the following guidelines and/or resources:

- [The Diabetes Canada Clinical Practice Guidelines](#)
- [Peri-operative Management of the Surgical Patients with Diabetes 2015](#)
- [Perioperative Hyperglycemia Management: An Update 2017](#)
- [Enhanced Recovery After Surgery: Subject Guide](#)
- [Basal Bolus Insulin Therapy Website](#)
 - [How to BBIT: An Educational Resource for Prescribers AHS Adult Subcutaneous Basal Bolus Insulin Therapy \(BBIT\)](#)

Keywords

- Diabetes
- Insulin
- Pre op Diabetes
- Post op Diabetes
- Diabetes mellitus
- Perioperative
- Preoperative
- Intraoperative
- Postoperative

Decision Making

Goals

Patients with diabetes represent between 10 to 40% of patients undergoing surgery¹. Patients with diabetes are known to have a greater number of complications, higher mortality, and longer length of stays postoperatively compared with patients without diabetes². Poor outcomes are more common in patients with diabetes who have worse glycemic control in the preoperative, intraoperative, and postoperative period^{2,3}. Fortunately, perioperative euglycemia has been demonstrated to improve these outcomes^{2,3}.

Patients with diabetes represent a heterogeneous population including well-controlled patients or poorly-controlled patients with type 1 diabetes, well-controlled patients or poorly-controlled patients with type 2 diabetes, monogenic diabetes and other non-type 1, non-type 2 diabetes who may or may not require insulin, and patients with unrecognized diabetes. Each group requires individualized preoperative, intraoperative, and postoperative management to maintain euglycemia and reduce perioperative morbidity and mortality.

The Perioperative Management of Patients with Diabetes Order Sets are intended to provide best-practice recommendations for management of patients with diabetes in the perioperative period. The order sets address two populations, patients with type 1 diabetes and patients with type 2 diabetes in the pre-admission clinic and the immediate preoperative area and postoperatively. Principles from this order set can be applied to patients with non-type 1, non-type 2 diabetes who require insulin (such as post-pancreatectomy patients). This order set is not intended to be used for pregnant women with diabetes. Dose guidance provided within the order set may not be relevant and will require clinical judgment"

Pre-Admission Clinic Management of Patients with Diabetes

Requiring Insulin Order Set – *This order set provides instructions for insulin management for patients undergoing surgery. It can be used for emergent/urgent surgery. It can be used in conjunction (not to replace ERAS) with any surgery order set (ERAS or non-ERAS)*

Order Set Restrictions: Not for pregnant women with diabetes, patients younger than 18 years of age

Order Set Keywords: Perioperative diabetes management

Before Day of Procedure

Patients with diabetes who require insulin should be booked as the first case of the day when possible

- Clinical communication: Please book surgery as first case of the day for patients with diabetes.

Diet and Nutrition

*Carbohydrate loading is **not recommended** for patients with diabetes undergoing scheduled surgical intervention requiring anesthesia care. Current available evidence has shown no clear benefit with routine use of carbohydrate loading among patients with diabetes. There is potential harm arising from hyperglycemia in the peri-operative period for this population. The Clinical Knowledge Topic working group recommends against carbohydrate loading in patients with diabetes until prospective trials have been completed in this population.*

- Teach: [AHS Eating and Drinking Before Surgery: Patient Instructions.](#)

Laboratory Investigations Routine

Chemistry

For patients with a Hemoglobin A1C greater than 8.5%, consider a referral to the appropriate services as per hospital/site availability (i.e Endocrinology, General Internal Medicine, diabetes education program/health care team or Family Physician with diabetes expertise). Hemoglobin A1C should be done within 3 months prior to surgery.

Order if not already completed in the last 3 months

- Hemoglobin A1C

Medications

Diabetic Agents

Perioperative insulin management in patients with type 1 diabetes. Add orders for insulin dose and type of insulin below. Adapted from Barker et al. 2015.

For patients self-managing with insulin pump therapy at home, refer to [AHS Guidelines for Safe Management of Insulin Pump Therapy in Hospital](#) and consult the patient's diabetes care team or endocrinologist or internist.

Table 1 Perioperative insulin recommendations for patients with diabetes who require basal and bolus insulin

Insulin Type		Administration	
<i>Basal Insulin</i>	<i>Long-acting and Ultra-long insulin</i>	<i>Administer usual dose of insulin prior to surgery. If patient has higher risk of hypoglycemia as defined by consult with GIM or Endocrinology consider reducing dose to 80-90% of usual dose in 24 hours prior to surgery</i>	
	<i>Intermediate-acting insulin</i>	Evening Before Surgery: <i>Administer the usual dose of insulin on the night before surgery</i>	Morning of Surgery: Administer <i>50% of the usual insulin dose morning dose on the day of surgery</i>
<i>Bolus Insulin</i>	<i>Short-acting and Rapid-acting insulin</i>	Evening Before Surgery: <i>Administer usual dose if patient is eating and drinking well</i>	Morning of Surgery: <i>Hold while NPO</i>
<i>Correction Insulin</i>	<i>Short-acting and Rapid-acting insulin</i>	<i>Administer usual dose if blood glucose is out of target even while NPO</i>	

- Teach: Authorized Prescriber to complete insulin dosage below. Provide patient instructions for Preoperative Diabetes Medications as per below:
- Basal insulin SHOULD NOT be held if you have type 1 diabetes EVEN when you are not eating/drinking for surgery.
 - Basal insulin
 - insulin _____ (*glargine {Lantus®} OR detemir {Levemir®} OR other: specify*) _____ units SUBCUTANEOUSLY ONCE _____ on the (**AM on the day before surgery OR PM on the day before surgery OR AM on the day of surgery**)
 - Intermediate-acting insulin
 - insulin _____ (*NPH {HumuLIN® N} OR other: specify*) _____ units SUBCUTANEOUSLY ONCE _____ on the (**PM on the day before surgery OR AM on day of surgery**)
 - insulin _____ (*other: specify*) _____ units SUBCUTANEOUSLY ONCE in the PM on the day before surgery

- Bolus and Correction insulin
 - Take as per your home regimen. Do NOT take bolus insulin when you are not eating/drinking for surgery. You may take correction insulin if your blood sugar is out of target.

Consults/Referrals

Inpatient Specialty Consults

For patients with a Hemoglobin A1C greater than 8.5%, wide fluctuation in glucose and frequent hypoglycemic, consider a referral to the appropriate services as per hospital/site availability (i.e Endocrinology, General Internal Medicine, diabetes education program/health care team or Family Physician with diabetes expertise). For patients on insulin pump therapy, consult the patient's diabetes care team, endocrinologist or internist and refer to Insulin Pump In-Hospital Therapy – ipumpit.ca

- Consult Internal Medicine
- Consult Endocrinology
- Consult Hospitalist
- Consult Family Physician with diabetes expertise

Consult (other): _____

Referrals

- Referral to Diabetes Education Program/Health Care Team (resources as applicable)

Day of Surgery Management for Patients with Diabetes on Insulin

Order Set - This order set provides instructions for general management for patients undergoing surgery and is intended to be completed in the pre-admission clinic for use in the immediate preoperative area on the day of surgery. It can be used for emergent/urgent surgery.

Order Set Restrictions: Pregnant women with diabetes, patients younger than 18 years of age

Order Set Keywords: Perioperative diabetes management

Order Set Requirements: Weight

Day of Procedure

Diet and Nutrition

The minimum duration of pre-operative fasting prior to the administration of anesthesia should be 8 hours after a meal that includes meat or fried or fatty foods, 6 hours after a light meal (such as toast and a clear fluid), 2 hours after clear fluids.

Pre-operative eating and drinking

- Clinical Communication: Final snack 8 hours prior to scheduled surgery
- Clinical Communication: Clear Fluids until 3 hours prior to scheduled surgery
- NPO 2 hours prior to scheduled surgery

Patient Care

Point Of Care Testing Glucose

- Blood Glucose Monitoring POCT: AM of surgery

For Type 1: suggest every 2 hours in fasting patients who require insulin and every 4 hours in patients with diabetes who do not require insulin.

- Blood Glucose Monitoring POCT: every _____ hour(s)
- Clinical Communication – If blood glucose less than 4.0 mmol/L initiate [Hypoglycemia Procedure](#)
- Clinical Communication – If blood glucose is greater than 18.0 mmol/L OR if patient on insulin pump and blood glucose is greater than 14.0 mmol/L, initiate [Hyperglycemia Procedure](#), notify Authorized Prescriber and collect ketones

Laboratory Investigations Routine

For Ketone Testing for Suspected Diabetic Ketoacidosis.

- Nursing Communication: If patient has symptoms of Diabetic Ketoacidosis order Beta-Hydroxybutyrate if available. Symptoms include but not limited to polyuria, thirst, nausea/vomiting, abdominal pain, weakness, mental status change, recent weight loss, and coma)
 - Conditional Order: Available for nurse to activate if
 1. Patient has a blood glucose of greater than 18.0 mmol/L
 2. Patient has a blood glucose of greater than 14.0 mmol/L on self-management of insulin pump therapy

Chemistry

Serum Ketones preferred over Urine Ketones for diagnosis of DKA

- Beta-Hydroxybutyrate

Urine

If patient has symptoms of Diabetic Ketoacidosis order Beta-Hydroxybutyrate if available

- Urine Ketones
- POCT Urine Ketones Dipstick Urinalysis if available

Medications

Diabetic Agents

Calculated Total Daily Dose (TDD) for this order: _____

When NPO, if Blood Glucose is Greater than 10.0 mmol/L – Use Correction Insulin for Hyperglycemia:

*For patients with known home regimen – use custom option to order patient’s usual correction insulin brand and dosing. For patients with unknown home insulin regimen, calculate the patient’s total daily dose (TDD) of home insulin using 0.3 units/kg/day and choose correction dose below. **Patients who are not eating and drinking must still receive basal and correction insulin***

Choose ONE

Use the same insulin (rapid or short-acting) for bolus (when eating) and correction

- insulin lispro (HumaLOG®) SUBCUTANEOUSLY PRN for Blood Glucose greater than 10.0 mmol/L
- insulin aspart (Novorapid®) SUBCUTANEOUSLY PRN for Blood Glucose greater than 10.0 mmol/L
- insulin regular (HumuLIN® R) SUBCUTANEOUSLY PRN for Blood Glucose greater than 10.0 mmol/L
- Clinical Communication - Correction dose to be determined and administered with/before meal/enteral feed OR at scheduled mealtime if NPO. Bedtime correction not routinely recommended. Correction and bolus doses can be combined and administered as a single subcutaneous injection.
- Nursing Communication: Patients who are not eating and drinking must still receive basal and correction insulin

Choose ONE correction insulin (below) based on current Total Daily Dose (TDD)

Use the same insulin (rapid or short-acting) for bolus (when eating) and correction

If TDD is 15-30 units

- insulin correction SUBCUTANEOUSLY TID with mealtime based on Blood Glucose reading
 - 0 unit if Blood Glucose 4.1 – 10.0 mmol/L
 - 1 unit if Blood Glucose 10.1 – 14.0 mmol/L
 - 2 units if Blood Glucose 14.1 – 18.0 mmol/L

If TDD is 31-50 units

- insulin correction SUBCUTANEOUSLY TID with mealtime based on Blood Glucose reading
 - 0 unit if Blood Glucose 4.1 – 10.0 mmol/L
 - 1 unit if Blood Glucose 10.1 – 12.0 mmol/L
 - 2 units if Blood Glucose 12.1 – 15.0 mmol/L
 - 3 units if Blood Glucose 15.1 – 18.0 mmol/L

If TDD is 51-80 units

- insulin correction SUBCUTANEOUSLY TID with mealtime based on Blood Glucose reading
 - 0 unit if Blood Glucose 4.1 – 10.0 mmol/L
 - 2 units if Blood Glucose 10.1 – 12.0 mmol/L
 - 3 units if Blood Glucose 12.1 – 14.0 mmol/L
 - 4 units if Blood Glucose 14.1 – 16.0 mmol/L
 - 5 units if Blood Glucose 16.1 – 18.0 mmol/L

If TDD is 81 units or more

- insulin correction SUBCUTANEOUSLY TID with mealtime based on Blood Glucose reading
 - 0 unit if Blood Glucose 4.1 – 10.0 mmol/L
 - 2 units if Blood Glucose 10.1 – 11.0 mmol/L
 - 4 units if Blood Glucose 11.1 – 13.0 mmol/L
 - 6 units if Blood Glucose 13.1 – 15.0 mmol/L
 - 8 units if Blood Glucose 15.1 – 17.0 mmol/L
 - 10 units if Blood Glucose 17.1 – 18.0 mmol/L

Custom (Known Home Regimen, Post-pancreatectomy, Extreme Insulin Sensitivity or Resistance)

- insulin correction SUBCUTANEOUSLY TID with mealtime based on Blood Glucose reading
 - _____ units if Blood Glucose _____ – _____ mmol/L
 - _____ units if Blood Glucose _____ – _____ mmol/L
 - _____ units if Blood Glucose _____ – _____ mmol/L
 - _____ units if Blood Glucose _____ – _____ mmol/L
 - _____ units if Blood Glucose _____ – _____ mmol/L

Intravenous Insulin

Subcutaneous insulin is preferred to intravenous insulin when possible. Consider intravenous insulin in patients with diabetes who will miss more than one meal, who have missed their basal insulin dose, patients with a Hemoglobin A1C greater than 8.5% or with patients who present with significant hyperglycemia (based on clinician’s judgement).

If blood glucose is greater than 10.0 mmol/L consideration should be given to continuous or intermittent bolus of IV insulin with blood glucose monitoring every 30-60min, while the patient is in the OR with the goal of keeping the blood glucose between 7.0 – 10.0 mmol/L (Bhamidipate et al 2011).

Continuous or intermittent IV bolus are superior to SC injections for long cases due to large variations in skin perfusion and therefore absorption during the preoperative period (Kadio et al 2012 and Alexanain et al 2011).

Recommend to transition to SC insulin before leaving the OR or to consult Endocrinology or Internal Medicine to transition if patient transferred to surgical unit on IV insulin, especially in patients with type 1 diabetes mellitus

Standard Concentration for Intravenous Insulin - 100 units per 100 mL (IV fluid provides 1 unit/mL). Mix as per AHS provincial Parenteral Monograph

IV insulin titration protocol

- Insulin regular (HumuLIN® R) IV infusion in Normal Saline in units/hour. Adjust insulin infusion every 1hour according to blood glucose results – see table below

Blood Glucose (mmol/L)	Insulin Dose (units/hour)
Less than 4.0	0 unit and activate Hypoglycemia Protocol
4.0 - 6.5	0.5 units/hour
6.6 - 9.0	1 unit/hour
9.1 - 12.0	2 units/hour
12.1 - 15.0	3 units/hour
15.1 - 18.0	4 units/hour
18.1 -21.0	5 units/hour
21.1 - 24.0	6 units/hour
Greater than 24	8 units/hour

Postoperative Management for Patients with Diabetes on Insulin Order Set

Order Set Restrictions: Not for use in pregnant women with diabetes, patients younger than 18 years of age.

Order Set Keywords: Perioperative diabetes management

Post procedure Care

Diet and Nutrition

- Post-Surgical Transition Diet: start on POD 0
- Regular Diabetic – Adult Diet: start on POD 1
- Other diet _____

Patient Care

Point Of Care Testing Glucose

- Blood Glucose Monitoring POCT on arrival to unit (Post Anesthesia Care Unit and ward)
- Blood Glucose Monitoring POCT 4 times per day (15 - 30 minutes before scheduled meals and at bedtime) and PRN for suspected hypoglycemia
- Blood Glucose Monitoring POCT every _____ hour(s)
- Clinical Communication – If blood glucose less than 4.0 mmol/L initiate [Hypoglycemia Procedure](#)
- Clinical Communication – If blood glucose is greater than 18.0 mmol/L OR if patient on insulin pump and blood glucose is greater than 14.0 mmol/L, initiate [Hyperglycemia Procedure](#), notify Authorized Prescriber and collect ketones

Laboratory Investigations Routine

For Ketone Testing for Suspected Diabetic Ketoacidosis.

- Nursing Communication: If patient has symptoms of Diabetic Ketoacidosis order Beta-Hydroxybutyrate if available. Symptoms include but not limited to polyuria, thirst, nausea/vomiting, abdominal pain, weakness, mental status change, recent weight loss, and coma)
 - Conditional Order: Available for nurse to activate if
 1. Patient has a blood glucose of greater than 18.0 mmol/L
 2. Patient has a blood glucose of greater than 14.0 mmol/L on self-management of insulin pump therapy

Chemistry

Serum Ketones preferred over Urine Ketones for diagnosis of DKA

- Beta-Hydroxybutyrate

Urine

If patient has symptoms of Diabetic Ketoacidosis order Beta-Hydroxybutyrate if available

- Urine Ketones
- POCT Urine Ketones Dipstick Urinalysis if available

Medications

Diabetic Agents

Patients with type 1 diabetes require ongoing insulin in hospital. Patients with well-controlled diabetes should be transitioned to their home regimen when they are eating and drinking.

Patients who are not eating and drinking must still receive basal and correction insulin.

Patients who are eating and drinking will also require bolus insulin.

For IV insulin infusion - If required in ICU, critical units or specialty units with appropriate competency

- Nursing Communication: Patients who are not eating and drinking must still receive basal and correction insulin
- 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)
- [Basal Bolus Insulin Therapy Order Set](#)
- [In-Hospital Orders for Self-Management of Insulin Pump](#)
- Other medication(s): _____

Consults/Referrals

Inpatient Specialty Consults

For management of diabetes in hospital, consider a referral to the appropriate services as per hospital/site availability (i.e Endocrinology, General Internal Medicine, diabetes education program/health care team etc)

- Consult Internal Medicine
- Consult Endocrinology
- Consult Hospitalist
- Consult (other): _____

Referrals

- Consult/Referral to Diabetes Education Program/Health Care Team (resources as applicable)

Discharge

Discharge Referrals

- Ensure diabetes follow up in the community

Pre-Admission Clinic Management of Patients with Diabetes NOT on Insulin Order Set

- This order set provides instructions for management for patients with type 2 diabetes undergoing surgery and is intended for use in the pre-admission clinic. It can be used in conjunction (not to replace ERAS) with any surgery order set (ERAS or non-ERAS)

Order Set Restrictions: Not for use in patients with type 1 diabetes mellitus, pregnant women with diabetes, patients younger than 18 years of age

Order Set Keywords: Perioperative diabetes management

Before Day of Procedure

Patients with diabetes who require insulin should be booked as the first case of the day when possible

- Clinical communication: Please book surgery as first case of the day for patients with diabetes.

Diet and Nutrition

*Carbohydrate loading is **not recommended** for patients with diabetes undergoing scheduled surgical intervention requiring anesthesia care. Current available evidence has shown no clear benefit with routine use of carbohydrate loading among patients with diabetes. There is potential harm arising from hyperglycemia in the peri-operative period for this population. The Clinical Knowledge Topic working group recommends against carbohydrate loading in patients with diabetes until prospective trials have been completed in this population.*

- Teach: [AHS Eating and Drinking Before Surgery: Patient Instructions](#)

Laboratory Investigations Routine

Chemistry

For patients with a Hemoglobin A1C greater than 8.5%, consider a referral to the appropriate services as per hospital/site availability (i.e Endocrinology, General Internal Medicine, diabetes education program/health care team or Family Physician with diabetes expertise). Hemoglobin A1C should be done within 3 months prior to surgery.

Order if not already completed in the last 3 months

- Hemoglobin A1C

Medications

Diabetic Agents

Table 2 Perioperative medication recommendations for patients with type 2 diabetes who are on oral/non-insulin injectable antihyperglycemic agents¹

Medication Class [*]	Perioperative Management
DPP-IV inhibitors	Continue in the perioperative period
GLP-1 agonist	Continue in the perioperative period. This class is non-formulary on the AHS Provincial Drug Formulary (inpatient use if continued post operatively). Instruct patient to bring own supply.
Biguanides (Metformin)	Can safely be continued in the perioperative period. Consider holding the morning of surgery for patients at significant risk of acute kidney injury
Acarbose	Hold morning of surgery
Meglitinides (Repaglinide)	Hold morning of surgery
SGLT-2 inhibitors	Hold 3 days before surgery ⁷
Sulfonylureas	Hold morning of surgery

*Please note this not a comprehensive list of drugs, examples only.

- Teach: Authorized Prescriber to complete medication dosage below. Nurse to provide Patient Instructions for Preoperative Diabetes Medications as per below
- Continue the following medications on the day before and day of surgery:

 - Do not take the following medications on the day of surgery:

 - Administer one-half of your usual insulin dose of _____ on the morning of surgery

Table 1 Perioperative insulin recommendations for patients with diabetes who require basal and bolus insulin

Insulin Type		Administration	
Basal Insulin	Long-acting and Ultra-long action insulin	Administer usual dose of insulin prior to surgery. If patient has higher risk of hypoglycemia as defined by consult with GIM or Endocrinology consider reducing dose to 80-90% of usual dose in 24 hours prior to surgery	
	Intermediate-acting insulin	Evening Before Surgery: Administer the usual dose of insulin on the night before surgery	Morning of Surgery: Administer 50% of the usual insulin dose morning dose on the day of surgery
Bolus Insulin	Short-acting and Rapid-acting insulin	Evening Before Surgery: Administer usual dose if patient is eating and drinking well	Morning of Surgery: Hold while NPO
Correction Insulin	Short-acting and Rapid-acting insulin	Administer usual dose if blood glucose is out of target even while NPO	

- Teach: Authorized Prescriber to complete insulin dosage below. Provide patient instructions for Preoperative Diabetes Medications as per below:
- Basal insulin
 - insulin _____ (*glargine {Lantus®} OR detemir {Levemir®} OR other: specify*) _____ units SUBCUTANEOUSLY ONCE _____ on the (**AM on the day before surgery OR PM on the day before surgery OR AM on the day of surgery**)
 - Intermediate-acting insulin
 - insulin _____ (*NPH {HumuLIN® N} OR other: specify*) _____ units SUBCUTANEOUSLY ONCE _____ on the (**PM on the day before surgery OR AM on day of surgery**)
 - insulin _____ (*other: specify*) _____ units SUBCUTANEOUSLY ONCE in the PM on the day before surgery
 - Bolus and Correction insulin
 - Take as per your home regimen. Do NOT take bolus insulin when you are not eating/drinking for surgery. You may take correction insulin if your blood sugar is out of target.

Consults/Referrals

Inpatient Specialty Consults

For patients with a Hemoglobin A1C greater than 8.5% or patients with preoperative blood glucose equal to or greater than 10.0 mmol/L, consider a referral to the appropriate services as per hospital/site availability (i.e Endocrinology, General Internal Medicine, diabetic education program/health care team or Family Physician with diabetes expertise).

- Consult Internal Medicine
- Consult Endocrinology
- Consult Hospitalist
- Consult Family Physician with diabetes expertise
- Consult (other): _____

Referrals

- Consult/Referral to Diabetes Education Program/Health Care Team (resources as applicable)

Preoperative Management for Patients with Diabetes NOT on Insulin

Order Set - This order set provides instructions for management for patients with type 2 diabetes undergoing surgery and is intended to be completed in the pre-admission clinic for use in the immediate preoperative area on the day of surgery

Order Set Restrictions: Not for use in patients with type 1 diabetes mellitus, pregnant women with diabetes, patients younger than 18 years of age

Order Set Keywords: Perioperative diabetes management

Order Set Requirements: Weight

Day of Procedure

Diet and Nutrition

Carbohydrate loading is **not recommended** for patients with diabetes undergoing scheduled surgical intervention requiring anesthesia care. Current available evidence has shown no clear benefit with routine use of carbohydrate loading among patients with diabetes. There is potential harm arising from hyperglycemia in the peri-operative period for this population. The Clinical Knowledge Topic working group recommends against carbohydrate loading in patients with diabetes until prospective trials have been completed in this population.

The minimum duration of pre-operative fasting prior to the administration of anesthesia should be 8 hours after a meal that includes meat or fried or fatty foods, 6 hours after a light meal (such as toast and a clear fluid), 2 hours after clear fluids.⁷

Pre-operative eating and drinking

- Clinical Communication: Final snack 8 hours prior to scheduled surgery
- Clinical Communication: Clear fluids until

Patient Care

Point Of Care Testing Glucose

- Blood Glucose Monitoring POCT: AM of surgery
- Blood Glucose Monitoring POCT every _____ hour(s)
- Clinical Communication – If blood glucose less than 4.0 mmol/L, and patient is or has been on insulin or secretagogues, initiate [Hypoglycemia Procedure](#)
- Clinical Communication – If blood glucose is greater than 18.0 mmol/L, initiate [Hyperglycemia Procedure](#) and notify Authorized Prescriber
- Clinical Communication - If blood glucose is greater than 14.0 mmol/L and on SGLT2 inhibitors, initiate [Hyperglycemia Procedure](#), notify Authorized prescriber and collect ketones

Laboratory Investigations Routine

For Ketone Testing for Suspected Diabetic Ketoacidosis.

- Nursing Communication: If patient has symptoms of Diabetic Ketoacidosis order Beta-Hydroxybutyrate if available. Symptoms include but not limited to polyuria, thirst, nausea/vomiting, abdominal pain, weakness, mental status change, recent weight loss, and coma)

- Conditional Order: Available for nurse to activate if
 1. Patient has a blood glucose of greater than 14.0 mmol/L AND on SGLT2 inhibitors medication

Chemistry

Serum Ketones preferred over Urine Ketones for diagnosis of DKA

- Beta-Hydroxybutyrate

Urine

If patient has symptoms of Diabetic Ketoacidosis order Beta-Hydroxybutyrate if available

- Urine Ketones
- POCT Urine Ketones Dipstick Urinalysis if available

Medications

Diabetic Agents

Calculated TDD for this order: _____

When NPO, if Blood Glucose is Greater than 10.0 mmol/L – Use Correction Insulin for Hyperglycemia:

*For patients with known home regimen – use custom option to order patient's usual correction insulin brand and dosing. For patients not on home insulin or unknown home insulin regimen, calculate total daily dose (TDD) of insulin using 0.3 to 0.5 units/kg/day for lower TDD and 0.5 to 1 units/kg/day for higher TDD and choose correction dose below. **Patients who are not eating and drinking must still receive basal and correction insulin***

Choose ONE

Use the same insulin (rapid or short-acting) for bolus (when eating) and correction

- lispro (HumaLOG®) SUBCUTANEOUSLY PRN for Blood Glucose greater than 10.0 mmol/L
- aspart (Novorapid®) SUBCUTANEOUSLY PRN for Blood Glucose greater than 10.0 mmol/L
- insulin regular (HumuLIN® R) SUBCUTANEOUSLY PRN for Blood Glucose greater than 10.0 mmol/L
- Clinical Communication - Correction dose to be determined and administered with/before meal/enteral feed OR at scheduled mealtime if NPO. Bedtime correction not routinely recommended.
- Nursing Communication: Patients who are not eating and drinking must still receive basal and correction insulin

Choose ONE correction insulin (below) based on current Total Daily Dose (TDD)

Use the same insulin (rapid or short-acting) for bolus (when eating) and correction

If TDD is 15-30 units

- insulin correction SUBCUTANEOUSLY TID with mealtime based on Blood Glucose reading
 - 0 unit if Blood Glucose 4.1 – 10.0 mmol/L
 - 1 unit if Blood Glucose 10.1 – 14.0 mmol/L
 - 2 units if Blood Glucose 14.1 – 18.0 mmol/L

If TDD is 31-50 units

- insulin correction SUBCUTANEOUSLY TID with mealtime based on Blood Glucose reading
 - 0 unit if Blood Glucose 4.1 – 10.0 mmol/L
 - 1 unit if Blood Glucose 10.1 – 12.0 mmol/L
 - 2 units if Blood Glucose 12.1 – 15.0 mmol/L
 - 3 units if Blood Glucose 15.1 – 18.0 mmol/L

If TDD is 51-80 units

- insulin correction SUBCUTANEOUSLY TID with mealtime based on Blood Glucose reading
 - 0 unit if Blood Glucose 4.1 – 10.0 mmol/L
 - 2 units if Blood Glucose 10.1 – 12.0 mmol/L
 - 3 units if Blood Glucose 12.1 – 14.0 mmol/L
 - 4 units if Blood Glucose 14.1 – 16.0 mmol/L
 - 5 units if Blood Glucose 16.1 – 18.0 mmol/L

If TDD is 81 units or more

- insulin correction SUBCUTANEOUSLY TID with mealtime based on Blood Glucose reading
 - 0 unit if Blood Glucose 4.1 – 10.0 mmol/L
 - 2 units if Blood Glucose 10.1 – 11.0 mmol/L
 - 4 units if Blood Glucose 11.1 – 13.0 mmol/L
 - 6 units if Blood Glucose 13.1 – 15.0 mmol/L
 - 8 units if Blood Glucose 15.1 – 17.0 mmol/L
 - 10 units if Blood Glucose 17.1 – 18.0 mmol/L

Custom (Known Home Regimen, Post-pancreatectomy, Extreme Insulin Sensitivity or Resistance)

- insulin correction SUBCUTANEOUSLY TID with mealtime based on Blood Glucose reading
 - _____ units if Blood Glucose _____ – _____ mmol/L
 - _____ units if Blood Glucose _____ – _____ mmol/L
 - _____ units if Blood Glucose _____ – _____ mmol/L
 - _____ units if Blood Glucose _____ – _____ mmol/L
 - _____ units if Blood Glucose _____ – _____ mmol/L

Intravenous Insulin

Subcutaneous insulin is preferred to intravenous insulin when possible. Consider intravenous insulin in patients with diabetes who will miss more than one meal, who have missed their basal insulin dose, patients with a Hemoglobin A1C greater than 8.5% or with patients who present with significant hyperglycemia (based on clinician’s judgement).

If blood glucose is greater than 10mmol/L consideration should be given to continuous or intermittent bolus of IV insulin with blood glucose monitoring every 30-60min, while the patient is in the OR with the goal of keeping the blood glucose between 7-10 (Bhamidipate et al 2011).

Continuous or intermittent IV bolus are superior to SC injections for long cases due to large variations in skin perfusion and therefore absorption during the preoperative period (Kadio et al 2012 and Alexanain et al 2011).

Recommend to transition to SC insulin before leaving the OR or to consult Endocrinology or Internal Medicine to transition if patient transferred to surgical unit on IV insulin, especially in patients with diabetes mellitus type 1

Standard Concentration for Intravenous Insulin - 100 units per 100 mL (IV fluid provides 1 unit/mL). Mix as per AHS provincial Parenteral Monograph

IV insulin titration protocol

- Insulin regular (HumuLIN® R) IV infusion in Normal Saline in units/hour. Adjust insulin infusion every 1hour according to blood glucose results – see table below

Blood Glucose (mmol/L)	Insulin Dose (units/hour)
Less than 4.0	0 unit and activate Hypoglycemia Protocol
4.0 - 6.5	0.5 units/hour
6.6 - 9.0	1 unit/hour
9.1 - 12.0	2 units/hour
12.1 - 15.0	3 units/hour
15.1 - 18.0	4 units/hour
18.1 -21.0	5 units/hour
21.1 - 24.0	6 units/hour
Greater than 24	8 units/hour

Consults/Referrals

For patients with a Hemoglobin A1C greater than 8.5% or patients with preoperative blood glucose equal to or greater than 10.0 mmol/L, consider a referral to the appropriate services as per hospital/site availability (i.e Endocrinology, General Internal Medicine, diabetic education program/health care team or Family Physician with diabetes expertise).

Inpatient Specialty Consults

- Consult Internal Medicine
- Consult Endocrinology
- Consult Hospitalist
- Consult Family Physician with diabetes expertise
- Consult (other): _____

Referrals

- Consult/Referral to Diabetes Education Program/Health Care Team (resources as applicable)

Postoperative Management for Patients with Diabetes NOT on Insulin Order Set

Order Set Restrictions: Not for use in patients with type 1 diabetes mellitus, pregnant women with diabetes, patients younger than 18 years of age

Order Set Keywords: Perioperative diabetes management

Post procedure Care

Diet and Nutrition

- Post-Surgical Transition Diet: start on POD 0
- Regular Diabetic – Adult Diet: start on POD 1
- Other diet _____

Patient Care

Point Of Care Testing Glucose

- Blood Glucose Monitoring POCT on arrival to unit (Post Anesthesia Care Unit and ward)
- Blood Glucose Monitoring POCT 4 times per day (15 - 30 minutes before scheduled meals and at bedtime) and PRN for suspected hypoglycemia
- Blood Glucose Monitoring POCT every _____ hour(s)
- Clinical Communication – If blood glucose less than 4.0 mmol/L initiate [Hypoglycemia Procedure](#)
- Clinical Communication – If blood glucose is greater than 18.0 mmol/L, initiate [Hyperglycemia Procedure](#) and notify Authorized Prescriber
- Clinical Communication - If blood glucose is greater than 14.0 mmol/L and on SGLT2 inhibitors, initiate [Hyperglycemia Procedure](#), notify Authorized prescriber and collect ketones

Laboratory Investigations Routine

For Ketone Testing for Suspected Diabetic Ketoacidosis.

- Nursing Communication: If patient has symptoms of Diabetic Ketoacidosis order Beta-Hydroxybutyrate if available. Symptoms include but not limited to polyuria, thirst, nausea/vomiting, abdominal pain, weakness, mental status change, recent weight loss, and coma)
 - o Conditional Order: Available for nurse to activate if
 1. Patient has a blood glucose of greater than 18.0 mmol/L
 2. Patient has a blood glucose of greater than 14.0 mmol/L on SGLT2 inhibitors medication

Chemistry

Serum Ketones preferred over Urine Ketones for diagnosis of DKA

- Beta-Hydroxybutyrate

Urine

If patient has symptoms of Diabetic Ketoacidosis order Beta-Hydroxybutyrate if available

- Urine Ketones
- POCT Urine Ketones Dipstick Urinalysis if available

Medications

Diabetic Agents

Patients achieving targets of 5.0 - 10.0 mmol/L in hospital diabetes should be transitioned to their home regimen when they are eating and drinking

- Continue as per home dosing for insulin, oral and non-insulin injectable anti-hyperglycemic medications (list below):

*The recommended in-hospital Blood Glucose (BG) target for most patients is 5.0 - 10.0 mmol/L. Patients who do not meet these targets may require insulin, even temporarily, while in hospital. The Basal Bolus Insulin Therapy (BBIT) Order Set should be used. **Patients who are not eating and drinking must still receive basal and correction insulin.** Patients who are eating and drinking will also require bolus insulin. The AHS provincial Glycemic Management policy supports these recommendations.*

For IV insulin infusion - If required in ICU, critical units or specialty units with appropriate competency

- Nursing Communication: Patients who are not eating and drinking must still receive basal and correction insulin
- 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).
- [Basal Bolus Insulin Therapy Order Set](#)
- Other medication(s): _____

Consults and Referrals

Inpatient Specialty Consults

For patients with poor glucose control or patients with preoperative blood glucose equal to or greater than 10.0 mmol/L, consider a referral to the appropriate services as per hospital/site availability (i.e Endocrinology, General Internal Medicine, diabetes education program/health care team or Family Physician with diabetes expertise).

- Consult Internal Medicine
- Consult Endocrinology
- Consult Hospitalist
- Consult Family Physician with diabetes expertise
- Consult (other): _____

Referrals

- Consult/Referral to Diabetes Education Program/Health Care Team (resources as applicable)

Clinical Decision Support

CDS Calculator Requirements:

- Calculator to determine Total Daily Dose of insulin and then to automatically calculate insulin doses for basal, bolus, and chooses approximate correction insulin doses

Total Daily Dose (TDD)

- Calculator to determine total number of all units of basal, bolus, and correction insulin used in last 24 hour period
 - $TDD \text{ (units)} = \text{basal} + \text{bolus} + \text{correction used in the last 24 hour period}$
- If TDD from previous day is not available, or weight based calculation required, then use calculator to determine TDD by weight. Use 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 one or more of the following:

Type 1 DM, Slim Type 2 DM, History of hypoglycemia unawareness, Reduced renal function (eGFR less than 30 mL/min), Age greater than 70 with moderate/severe frailty or Liver failure	$TDD = \text{Weight (kg)} \times 0.3 \text{ to } 0.5 \text{ units/kg/day}$
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Use **HIGHER TDD** IF one or more of the following:

Insulin resistance, Overweight Type 2 DM, Steroid treatment or Infection	$TDD = \text{Weight (kg)} \times 0.5 \text{ to } 1 \text{ units/kg/day}$
--	--

Basal Insulin Dose Calculator

- Calculator to determine scheduled basal insulin doses
 - $\text{Total Basal (units)} = TDD \times 0.5$

Bolus Insulin Dose Calculator

- Calculator to determine scheduled bolus insulin doses
 - $\text{Total Bolus (units)} = TDD \times 0.5 \text{ divided by } 3 \text{ (three equal doses with meals or enteral feeds)}$

Correction Insulin Dose Calculator

- Calculator to determine correction insulin doses based on patient's TDD
 - Refer to [Correction Insulin for Hyperglycemia](#) order set component for correction doses based on TDD

Other CDS Requirements:

- Diabetes report showing blood glucose results in table format, and calculates the last 24 hours of blood glucose results as a diabetes score, thus alerting any dangerous blood glucose.
- Automatic generic/trade population of insulin type into dose boxes
 - [Basal Insulin Types](#) auto populates into:

- Basal – Daily Dose
- Basal – BID Doses boxes
- [Bolus Insulin and Correction Insulin Types](#) auto populates into:
 - Bolus Insulin – Dose Per Meal
 - Correction Insulin for Hyperglycemia

Analytics

Analytics – Outcome Measure#1

Name of Measure	Hypoglycemia on the day of surgery
Definition	Serum blood glucose less than 4.0 mmol/L, nursing documentation of POCT less than 4.0 mmol/L (in clinical flows), activation of the Hypoglycemia Order Set, MPR Document titled "Hypoglycemia" all on the date of surgical procedure.
Rationale	Hypoglycemia is an important safety outcome when tightening glycemic control.
Notes for Interpretation	Each patient should only have one event per day. A hypoglycemic event will count before a hyperglycemic event such that if a patient has both events in the same day, only the hypoglycemic event will be counted. This is because the treatment for hypoglycemia often results in hyperglycemia, and a patient undergoing treatment for hypoglycemia often has multiple recorded POCT with low blood sugars.

Baseline Analytics – Outcome Measure#2

Name of Measure	Hyperglycemia on day of surgery.
Definition	Serum blood glucose or point of care testing 10.1 mmol/L - 14.0 mmol/L (mild), 14.0 -18.0 mmol/L (moderate) or greater than 18.0 mmol/L (severe) on the day of surgery.
Rationale	Use of the order sets are intended to reduce postoperative dysglycemia. This outcome is associated with adverse events.

Baseline Analytics – Outcome Measure#3

Definition	The number of procedures that are cancelled or postponed on the day of surgery due to hypoglycemia or hyperglycemia.
Rationale	Surgery cancellations due to implementation of this order set are important.
Notes for Interpretation	Each patient should only have one event per day. A hypoglycemic event will count before a hyperglycemic event such that if a patient has both events in the same day, only the hypoglycemic event will be counted. This is because the treatment for hypoglycemia often results in hyperglycemia, and a patient undergoing treatment for hypoglycemia often has multiple recorded POCT with low blood sugars.

Baseline Analytics – Outcome Measure#4

Name of Measure	Hyperglycemia on postoperative day one.
Definition	Serum blood glucose or point of care testing 10.1 mmol/L - 14.0 mmol/L (mild), 14.0 -18.0 mmol/L (moderate) or greater than 18.0 mmol/L (severe) on postoperative day 1
Rationale	Use of the order sets are intended to reduce postoperative dysglycemia. This outcome is associated with adverse events.

References

1. Alexanian S, McDonnell M, Akhtar S. Creating a perioperative glycemic control program. *Anesthesiology Research and Practice* 2011: 1-9. <http://dx.doi.org/10.1155/201/465974>.
2. Bhamidipati C, LaPar, D, Stukenborg G, Morrison C, Kern J, Kron I, Ailawadi G. Superiority of moderate control of hyperglycemia to tight control in patients undergoing coronary artery bypass grafting. *The Journal of Thoracic and Cardiovascular Surgery* 2011 141(2): 543-551. <https://doi.org/10.1016/j.jtcvs.2010.10.005>.
3. Duggan EW, Carlson K, Umpierrez G. Perioperative Hyperglycemia Management. *Anesthesiology*. 2017. V126 (3) 547-560.
4. Ouattara A, Lecomte P, Le Manach Y, Landi M, Jacqueminet S, et al. Poor intraoperative blood glucose control is associated with a worsened hospital outcome after cardiac surgery in diabetic patients. *Anesthesiology* 2005 103:687-694.
5. Kwon S, Thompson R, Dellinger P, Yanez D, Farrohi E, Flum, D. Importance of perioperative glycemic control in general surgery. *Ann Surg* 2013;257(1):8-14.
6. Barker P, Creasey P, Dhatariya K et al. Peri-operative management of the surgical patient with diabetes 2015. *Anaesthesia*. 2015;70(12):1427-1440. doi:10.1111/anae.13233.
7. Handelsman Y et al. American association of clinical endocrinologists and American college of endocrinology position statement on the association of SGLT-2 inhibitors and diabetic ketoacidosis. *Endocrine Practice* 2016;22(6):753-762

Additional General References

Abola R, Gan T. Preoperative Fasting Guidelines. *Anesthesia & Analgesia*. 2017;124(4):1041-1043. doi:10.1213/ane.0000000000001964.

Albalawi Z, Laffin M, Gramlich L, Senior P, McAlister F. Enhanced Recovery After Surgery (ERAS®) in Individuals with Diabetes: A Systematic Review. *World J Surg*. 2017;41(8):1927-1934. doi:10.1007/s00268-017-3982-y.

Coan K, Apsey H, Schlinkert R, Stearns J, Cook C. Managing diabetes mellitus in the surgical patient. *Diabetes Management*. 2014;4(6):515-526. doi:10.2217/dmt.14.42.

Dobson G, Chong M, Chow L et al. Guidelines to the Practice of Anesthesia – Revised Edition 2018. *Canadian Journal of Anesthesia/Journal canadien d'anesthésie*. 2017;65(1):76-104. doi:10.1007/s12630-017-0995-9.

Duggan EW, Carlson K, Umpierrez G. Perioperative Hyperglycemia Management. *Anesthesiology*. 2017. V126 (3) 547-560.

Gustafsson U, Nygren J, Thorell A et al. Pre-operative carbohydrate loading may be used in type 2 diabetes patients. *Acta Anaesthesiol Scand*. 2008;52(7):946-951. doi:10.1111/j.1399-6576.2008.01599.x.

Joint British Diabetes Societies for Inpatient Care. Management of adults with diabetes undergoing surgery and elective and elective procedures: improving standards. March 2016. http://www.diabetologists-abcd.org.uk/JBDS/Surgical_guidelines_2015_full_FINAL_amended_Mar_2016.pdf

Thompson B, Stearns J, Apsey H, Schlinkert R, Cook C. Perioperative Management of Patients with Diabetes and Hyperglycemia Undergoing Elective Surgery. *Curr Diab Rep*. 2015;16(1). doi:10.1007/s11892-015-0700-8.

Additional Readings and Resources

A guide to surgical diabetes management: Prescribing subcutaneous insulin for patients with Diabetes. June 2017. <http://www.bbit.ca/assets/ahs-scen-don-guide-to-surgical-diabetes-management.pdf>

AHS Glycemic Management Policy – Adult

- [Procedure: Treatment of Hypoglycemia - Adult HCS-206-01](#)
- [Procedure: Treatment of Hyperglycemia - Adult HCS-206-02](#)
- [Resource: Glycemic Management Policy Suite FAQ](#)

Basal Bolus Insulin Therapy Website

- [How to BBIT: An Educational Resource for Prescribers AHS Adult Subcutaneous Basal Bolus Insulin Therapy \(BBIT\)](#)

Diabetes Canada Clinical Practice Guidelines

Insulin Pump In-Hospital Therapy – ipumpit.ca

- [Guidelines for the Safe Management of Insulin Pump Therapy in Hospital Diabetes Obesity Nutrition SCN](#)

Relevant Clinical Knowledge Topics

Basal Bolus Insulin Therapy, Adult - Inpatient (BBIT)
Insulin Pump Therapy, Pediatric and Adult – Acute Care
Glycemic Management

Enhanced Recovery for all Surgeries, Adult – Inpatient

ERAS Colorectal Surgery, Adult – Inpatient

ERAS Cystectomy Surgery, Adult - Inpatient

ERAS Gynecologic Oncology Surgery, Adult – Inpatient

ERAS Liver Surgery, Adult – Inpatient

Perioperative Management of Patients with Diabetes Mellitus, Adult – Acute Care V 1.1 Page 28 of 30

ERAS Pancreas Surgery, Adult – Inpatient

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