

Saskatchewan
Insulin Dose
Adjustment
Module
for
Tests/Procedures with
Fasting

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Insulin Dose Adjustment (IDA) for Tests/Procedures When Fasting is Required

Principles to Consider When Adjusting Insulin for Procedures Which Require Fasting

1. Client assessment:
 - a. What is the current insulin regimen and what are the flexibilities e.g. MDI versus pre-mixed insulin?
 - b. What is the usual pattern of blood glucose across the day?
 - c. What is the current frequency and timing of hypoglycemia? Does this person have hypoglycemia unawareness?
 - d. Is the client able and willing to do extra blood glucose monitoring possibly before, during and after the test/procedure?
 - e. How independent is the client now in IDA so he/she can adapt the instructions given by the RN, if needed?
 - f. Does the client know how to convert carbohydrate to liquids?
 - g. What support person(s) are available to assist with care?
 - h. Does the client have previous experience with this type of fasting? How was it handled in the past and how did the changes work?
 - i. If the client provides sufficient notice, suggest he/she request the procedure be done as early as possible in the day to minimize blood glucose and insulin issues.
 - j. Ask client if he/she has been given instructions by any other care provider.

2. Test/Procedure:
 - a. What are the test/procedure instructions already given to the client?
 - b. What length of time will likely be required for fasting?
 - c. Does the procedure require clear fluids for a period of time prior to the test?
 - d. What will be the impact on ability to eat solids or drink liquids post- procedure?
 - e. Are there any expected outcomes from the procedure which may affect blood glucose monitoring or ability for self-care?
 - f. Will the procedure require sedation and/or an IV? What IV solution will be used – saline or dextrose?

Use of Clear Fluids for Procedure/Test Preparation

A document to guide clients in the use of clear fluids has been prepared by Regina Qu'Appelle Health Region and is located at the end of this section.

Making the Decisions for Insulin Dose Adjustment for MDI or BID Rapid/Short-acting and Intermediate Insulin:

- a. Prior to giving client guidelines, request, if possible, daily blood glucose monitoring and recording for at least 3 days pre-visit. This will help to determine the usual patterns.
- b. Assess usual blood glucose levels.
- c. **Adjusting insulin for overnight fasting prior to procedure**
 - i. If using long-acting basal insulin: no adjustment is needed unless there has been recent unexplained hypoglycemia or the usual fasting blood glucose is below 5.
 - ii. If using an intermediate acting insulin: if usual fasting blood glucose is below 10, or there are concerns about overnight or early morning hypoglycemia, reduce the intermediate at supper or in the evening prior to the fast. Reduce by a minimum of 10-20% depending on the results of the assessment. The percent reduction needs to be tailored to the individual client.
 - iii. Consider whether or not a bedtime snack is needed. Most procedures will allow food/drink consumption until late evening.
- d. **Adjusting insulin for fasting day of procedure/test**
 - i. Adjust the first injection of rapid or short-acting insulin on the day of the procedure.
 - Usually this insulin dose would be eliminated or delayed, depending on the timing of the procedure.
 - ii. Adjust the morning intermediate or long-acting basal insulin analogue.
 1. If the procedure time is relatively short, the probability of eating afterwards is high and the client does not usually have problems with morning hypoglycemia, no change in dose may be necessary or a minor reduction of 10-20% could be made.
 2. If the length of the procedure is more than 2 hours, or unknown, or there are concerns for hypoglycemia,
 - delay the intermediate until after the procedure is completed
 - reduce the long acting basal insulin by 10%
- e. **Adjusting insulin post-procedure/test**
 - i. If the intermediate insulin analogue injection is delayed, then the formula below can be used as a guide. If the basal insulin is reduced, there may be an impact later in the day.
 - ii. Consider the results of the calculation against the usual blood glucose readings and client's ability and confidence in adapting the result to the situation he finds at the time a dose decision needs to be made. Some clients may need to call a care provider to get advice depending on number of hours without insulin, ability to eat/drink and current blood glucose reading.

Formula:

Number of hours injection delayed divided by 24 (number of hours in a day) and then multiplied by 100 = the percent to reduce the usual dose.

Example:

- Usual morning dose of NPH 20 units is delayed by 4 hours.
- $4/24 = 0.167 \times 100 = 16.7\%$
- $20 \text{ units} \times 16.7\% = 3.34$ – rounded to 3
- Reduce dose from 20 to 17 units

- iii. Once the individual is back to usual eating, a correction of rapid/short-acting insulin may be necessary as well as rapid/short-acting insulin to cover any food or drink taken.
- iv. Clients who are not used to adjusting their own insulin may need a grid to guide them or may need to call a care provider for specific advice.

Making Insulin Dose Adjustments for Pre-mixed Insulin

- a. Prior to giving client guidelines, request, if possible, daily blood glucose monitoring and recording for at least 3 days pre-visit. This will help to determine the usual patterns.
- b. Assess usual blood glucose levels.
- c. **Adjusting insulin for overnight fasting prior to procedure**
 - If usual fasting blood glucose is below 10, or the usual pattern shows the blood glucose drops overnight or, if there are concerns about overnight or early morning hypoglycemia; reduce the pre-mix supper dose prior to the fast. Reduce by a minimum of 10-20% depending on the results of the assessment. The percent reduction needs to be tailored to the individual client.
- d. **Adjusting insulin for fasting day of procedure/test**
 - This insulin dose may be eliminated or delayed, depending on the timing and/or length of the procedure. Some clients may benefit from using basal NPH only on the morning of the procedure, at or below the usual dose provided by the pre-mixed insulin.
- e. **Adjusting insulin post-procedure/test**
 - If the fasting time has been relatively short and the client will be able to eat/drink post-procedure, when the procedure is completed, he could test blood glucose and take the usual or a slightly reduced insulin dose and then eat.
 - To account for the delay in injection time and the possibility of overlapping insulin peaks later in the day, use the following formula to recommend an insulin dose.

Formula:

Number of hours injection delayed divided by 24 (number of hours in a day) and then multiplied by 100 = the percent to reduce the usual dose.

Example:

- Usual morning dose of Humalog Mix 25, 20 units is delayed by 4 hours.
 - $4/24 = 0.167 \times 100 = 16.7\%$
 - $20 \text{ units} \times 16.7\% = 3.34$ – rounded to 3
 - Reduce dose from 20 to 17 units
-
- As there is less flexibility to fine-tune the insulin dose to correct a high blood glucose, the client needs to understand that blood glucose levels may be higher for a couple of days.

Management of Hypoglycemia While Fasting

The possibility of hypoglycemia during fasting needs to be discussed with the client. Encourage the client to test to confirm hypoglycemia if signs/symptoms are experienced.

Glucose tablets are the preferred treatment method as they are quickly absorbed and are not liquid. The treatment needs to be reported prior to the start of the procedure and it is possible the procedure may be delayed.

Managing Diabetes on a Clear Fluid Diet¹

What is a clear fluid diet?

The clear fluid diet is used short-term to prepare the bowel for certain procedures, such as surgery or a colonoscopy. It may also be used for a short time during illness if you are not able to eat solid foods due to nausea and/or vomiting.

How do I manage my blood sugars when I am not eating solid food?

- ☞ Speak to your doctor or diabetes educator about the need to change your diabetes pills or insulin dosage. You will still need to take some diabetes medication during this time.
- ☞ Drink plenty of sugar-free fluids throughout the day to prevent dehydration and relieve your thirst.

Sugar-Free Choices:	
✓	Water
✓	Clear tea + coffee
✓	Crystal Light
✓	Sugar-Free Soft Drinks
✓	Sugar-Free Gelatin
✓	Clear Chicken or Beef Broth



- ☞ **Test** your blood sugar level every **2 to 4 hours**, testing more often if your blood sugar is low.

Your blood sugar level will help you decide how much carbohydrate (sugar) containing fluid you need over the next few hours.

If Your Blood Sugar Level is ...	Number of Portions of Sugar Containing Fluids Needed (see list on next page)
➔ 4 - 10 mmol/L	➔ 1 portion each hour until next testing time
➔ Above 10	➔ You may not need sugar containing fluids. Drink sugar-free choices and check your blood sugar in 1 to 2 hours time.

¹ Developed by MEDEC, Regina Qu'Appelle Health Region (2007) and reproduced with permission.

Sugar Containing Choices	One Portion (Contain 15 g carbohydrate)
Juice: Grape, Cranberry, Apple or Orange	1/3 cup (75 ml) to 1/2 cup (125 ml)
Regular Soft Drinks:	1/2 cup (125 ml) to 3/4 cup (200 ml)
Meal Replacement Drinks Boost™ and Ensure™ (Do not use before surgery)	1/3 cup (75 ml)
Regular Popsicles	2 sticks
Regular Gelatin	1/3 cup (75 ml)

Note: if you are preparing for a test such as a colonoscopy, your doctor may provide instruction about specific colors of fluids to avoid, for example: red colored gelatin. Follow these instructions.

Hypoglycemia (Low Blood Sugar)

- ☞ If your blood sugar level is below 4.0 or you feel weak, shaky or dizzy:
 - ✓ **Take:**
 - ½ cup of juice (e.g. apple juice) OR
 - 1 tablespoon of sugar or honey OR
 - 3 - 4 glucose tablets
 - ✓ **Wait** 10 to 15 minutes and retest your blood sugar.
 - ✓ If your blood sugar is still below 4.0, repeat the treatment
 - ✓ **Follow up** - Once your blood sugar is above 4.0, have 1 portion of sugar containing fluids to carry you through until your next testing time.

Before Going to Bed:

- ☞ Test your blood sugar level
- ☞ If bedtime blood sugar is 4.0 to 7.0, have 2 to 3 portions of sugar containing fluids
- ☞ If bedtime blood sugar is above 7.0, have 1 to 2 portions of sugar containing fluids

**You may wish to set an alarm and check
 your
 blood sugar once through the night**

Seek medical help if:

- blood sugar levels have been higher than 17 for more than 12 hours
- you have moderate to large amounts of ketones in your urine or blood (ketones are greater than 1.5)

*Note: Ketones appear in people with Type 1 diabetes only

Client Assessment for Insulin Adjustment for Fasting for a Test/Procedure²

NAME: _____

PHN: _____

Requirements of the test/procedure for diet changes/fasting:

Support person(s) available to assist with care:

Insulin:

TIME	Morning		Noon		Supper		Evening		Other
BRAND									
AMOUNT									

Comments:

Usual Blood Glucose Pattern:

Morning	pc meal	Noon	pc meal	Supper	pc meal	Evening	Night

Client willing to do monitoring pre and post test/procedure: ___ no ___ yes

Current Frequency/Timing of Hypoglycemia:

___ None ___ Other, provide relevant details

Client is independent in insulin adjustment ___ yes ___ no – who will assist if needed?

Can client convert CHO to fluids? ___yes ___ no **Clear Fluid Diet given:** ___yes ___ no

Referral made to dietitian: ___yes ___ no

² This is a sample form which can be used or adapted by a Health Region.

Relevant past experience with fasting: ___ None

Instructions given by another care provider ___ none ___ yes, comment

Advice given (diet, insulin adjustment pre and post test/procedure, contact for assistance):

1.

2.

3.

Date: _____

Signature: _____
PRINT NAME SIGNED

Managing Your Diet and Insulin for a Test or Procedure³

Name: _____

PHN: _____ Type of diabetes: _____

Name of test: _____ Date/time: _____

MEAL PLAN

- No change is needed in your meal plan
- Use the clear fluid diet provided
-

Make the following changes in your insulin doses:

DATE	TIME	INSULIN

Continued on next page ...

³ This is a suggested client handout which can be used or adapted by a Health Region.

LOW BLOOD SUGARS

- If you think your blood sugar is low, try to do a test and write down the result.
- Treat the low sugar with glucose tablets. If you do not have them, use your usual treatment.
- You **MUST** tell the staff at the test/procedure you had a low sugar and how you treated it.

PROBLEMS - NOT SURE WHAT TO DO WITH FOOD OR INSULIN – Who to call

ON THE DAY OF THE TEST or PROCEDURE:

- **Take this sheet with you to the test/procedure**
- **Test your blood glucose when you first get up in the morning and write the result here _____ Write down the time the test was done: _____**
- **Write down the dose of insulin which you took this morning.**
 - **___ I did not take any insulin**
 - **This morning I took the following insulin:**

CASE STUDIES

CASE #1

Ruth is 75 yr old homemaker. She has type 2 diabetes and has been on insulin for 5 years. She is having some health issues and requires a biopsy of her liver and pancreas. She has been advised to fast from midnight the night before the procedure and to report to the hospital at 6:30 am. The exact time of the procedure is unknown.

In the last month with Ruth has had no hypoglycemia.

Present insulin dose is

- 32 units of Humulin 30/70 given with breakfast ~0730 – 0800 hrs
- 10 units of Humulin R at supper ~ 1700 – 1730 hrs
- 27 units of Humulin N at bedtime ~ 2200 hrs

Ruth eats consistent carbohydrate at meals and at regular times, she has a bedtime snack routinely.

Glucose Patterns on 3 days prior to seeing the educator:

Date	Before Breakfast	Before Lunch	Before Supper	Bedtime	Other
	6.3	8.3	6.2	9.3	
	6.1	6.6	8.5	7.3	
	7.2	7.5	6.2	9	

QUESTION – CASE #1:

What would you advise Ruth to do with her insulin dosages in preparation for the test and the morning of the test?

ANSWER - CASE #1:

First explain what fasting means. Also explain that she could still experience a low blood glucose during this time. Tell her about the proper treatment (glucose tabs) and to be sure, if she has to treat a low sugar, to inform the personnel doing the procedure about the episode and treatment taken.

Monitor her blood sugars regularly and, if she is up at night, do a middle of the night test.

Bedtime Insulin night prior to the test

At her usual bedtime, 2200 hrs., have a snack containing at least 15 gms of carbohydrate and a protein source.

Adjust insulin dose down as she is elderly and will not be eating in the morning for an unknown amount of time. Reduce the bedtime Humulin N dose by 10%
Usual dose: 27units of N at 2200 hrs.

$$27 \times 10\% = 2.7 \text{ unit}$$

$$27 - 2.7 = 24.3 \text{ units, new dose – round this down to 24 units.}$$

Morning Insulin Dose Day of the Test

Her usual morning dose is 32 units of Humulin 30/70 insulin. This is a combination of fast and intermediate acting insulin. The specific timing of the procedure is unknown. As she will not be eating, the safest action will be to delay her insulin until the procedure is completed and she is able to eat. Ruth can be given a chart to follow, basing the insulin dose on the number of hours her breakfast meal has been delayed.

Use the formula: number of hours injection delayed divided by 24 (number of hours in a day) and then multiplied by 100= the percentage to reduce the usual dose.

Example: usual morning dose of Humulin 30/70, 32 units is delayed by 4 hours

$$4/24 = .167 \times 100 = 16.7\%$$

$$32 \text{ units} \times 16.7 = 5.4, \text{ round down to 5 units}$$

Reduce the dose from 32 units to 27 units of Humulin 30/70.

The following is a suggested guide which could be given to Ruth.

- Arrival time for procedure - 0630 hrs
- Monitor blood glucose, if test is completed within the next 2 hours and she is able to eat something, then take her usual dose of Humulin 30/70, 32 units.

If test completed within <u>3 hrs of arrival</u> and able to eat	Take 28 units of Humulin 30/70 and eat carbohydrate
If test completed within <u>4 hrs of arrival</u> and able to eat	Take 27 units of Humulin 30/70 and eat carbohydrate
If test completed within <u>5 hrs of arrival</u> and able to eat	Take 25 units of Humulin 30/70 and eat carbohydrate
If test completed within <u>6 hrs of arrival</u> and able to eat	Take 24 units of Humulin 30/70 and eat carbohydrate

Although this chart could be extended, it is likely best to advise the client that if the delay is longer than 6 hours, consult the physician.

- Provide the client with written instructions for the insulin dose changes and treating low blood glucose
- Advise her to take the instructions with her to the test location
- Provide her with your contact information in case of questions and reinforce physician contact if she has concerns.

CASE # 2

John, who has type 1 diabetes, will be fasting overnight in order to have major dental work done under local anesthesia. His procedure is booked for 8 a.m. and is expected to last until 9:30 a.m. His usual blood glucose results are listed below. In the last two weeks he has had two early morning episodes of hypoglycemia with readings of 2.2 and 1.9. These were unexplained. He has not changed his insulin dose following these low readings.

His present insulin types and doses are:

Levemir 12 units with breakfast, usually taken at 0630 hours and 16 units at bedtime
Humalog with each meal using a ratio of 1:8 and a correction factor of 2

	Fasting	pc	Noon	pc	Supper	pc	Bedtime
Day 1	4.1	6.9	5.9	8.9	7.1	13.4	6.3
Day 2	4.2	7.5	5.9	7.8	6.9	12.5	5.9
Day 3	4.9	6.9		8.2	6.4	11.8	6.2

QUESTION #1:

Given these results, what recommendations would make for IDA the day prior to the procedure?

ANSWER #1:

As he has had recent hypoglycemia and fasting bg is at the lower end of target bg, reduce the HS Levemir by 20%. So $16 \times 20\% = 3.2$, round to 3 units less Levemir or 13 units.

He likely requires a permanent reduction in the evening dose of Levemir and this should be discussed with John, reviewing the insulin dose adjustment principles of reducing a dose with unexplained low blood glucose readings.

If he had not had the unexplained low readings, after assessment, it may have been appropriate to leave the evening Levemir dose unchanged the evening prior to the dental procedure.

QUESTION #2:

What recommendations would you make for the IDA for the morning of the procedure? He is booked for 0800 hrs and expects to be finished by 0930 hrs at the latest.

ANSWER #2:

No Humalog at the time of his usual a.m. insulin.

Do not take the Humalog as he will not be eating breakfast at his usual time.

As the procedure is short he has the option of taking or not taking his Levemir. As this is a basal insulin, it would be expected to sustain the fasting bg during the procedure.

QUESTION #3:

John gets home at 10:30, he feels good and wants to eat some breakfast. He estimates he will be eating 60 grams CHO. His current bg is 11.8, his usual target bg pre-meal is 6. What advice would you give?

ANSWER #3:

For the Humalog he would use 1 unit for every 8 grams CHO = $60/8 = 7.5$ units.

To correct the high bg value he would need to use a correction dose:

$$11.8 - 6 \text{ (target)} = 5.8 / 2 \text{ (correction factor)} = 2.9$$

Dose of Humalog would be $7.5 + 2.9 = 10.4 = 10$ units (rounded down)

For the Levemir if he has elected to delay the dose, he is 4 hours late with this insulin injection so

$$4/24 = 1.67 \text{ or } 16.7\%$$

$16 \text{ (usual dose)} \times 16.7\% = 2.7$ – round up to 3 and he will reduce his usual a.m. Levemir dose from $16 - 3 = 13$ units.

RESOURCE PERSONNEL

The following are Registered Nurses and/or Managers, who have experience with the Transfer of Medical Function and are willing to talk with others who are in the process of developing this delegation model.

NAME	HEALTH REGION	TELEPHONE	EMAIL
Karen Butler	Regina Qu'Appelle	766-3777	Karen.Butler@rqhealth.ca
Bev Kernohan	Heartland	948-3323	bev.kernohan@hrha.sk.ca
Nola Kornder	Saskatoon	655-2147	nola.kornder@saskatoonhealthregion.ca
Carlene Schmaltz	Kelsey Trail	862-7251	CSchmaltz.kthr@shin.sk.ca

For more information about the provincial template or to apply for the IDA exam, contact:

Leanne Neufeld
Primary Health Services Branch
Saskatchewan Health
3475 Albert Street
Regina SK S4S 6X6

Ph: 787-0886
Fax: 787-0890
email: lneufeld@health.gov.sk.ca