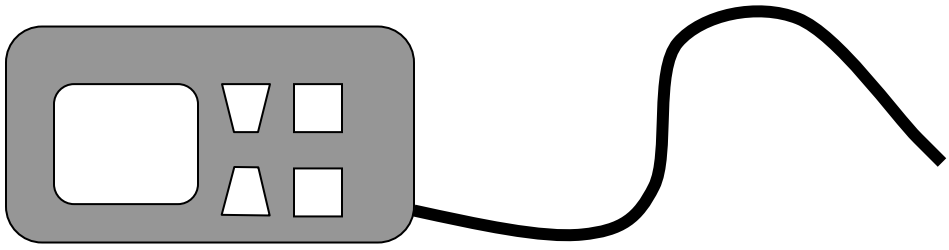
L'Hôpital de Montréal pour enfants
The Montreal Children's Hospital
Centre universitaire de santé McGill
McGill University Health Centre

Living well with your insulin pump!

Reference manual

Montreal Children's Hospital
Pediatric Insulin Pump Centre



Anne Bossy, BSc(N), CDE
Evelyne Pytka, PDt, CDE
March 2008

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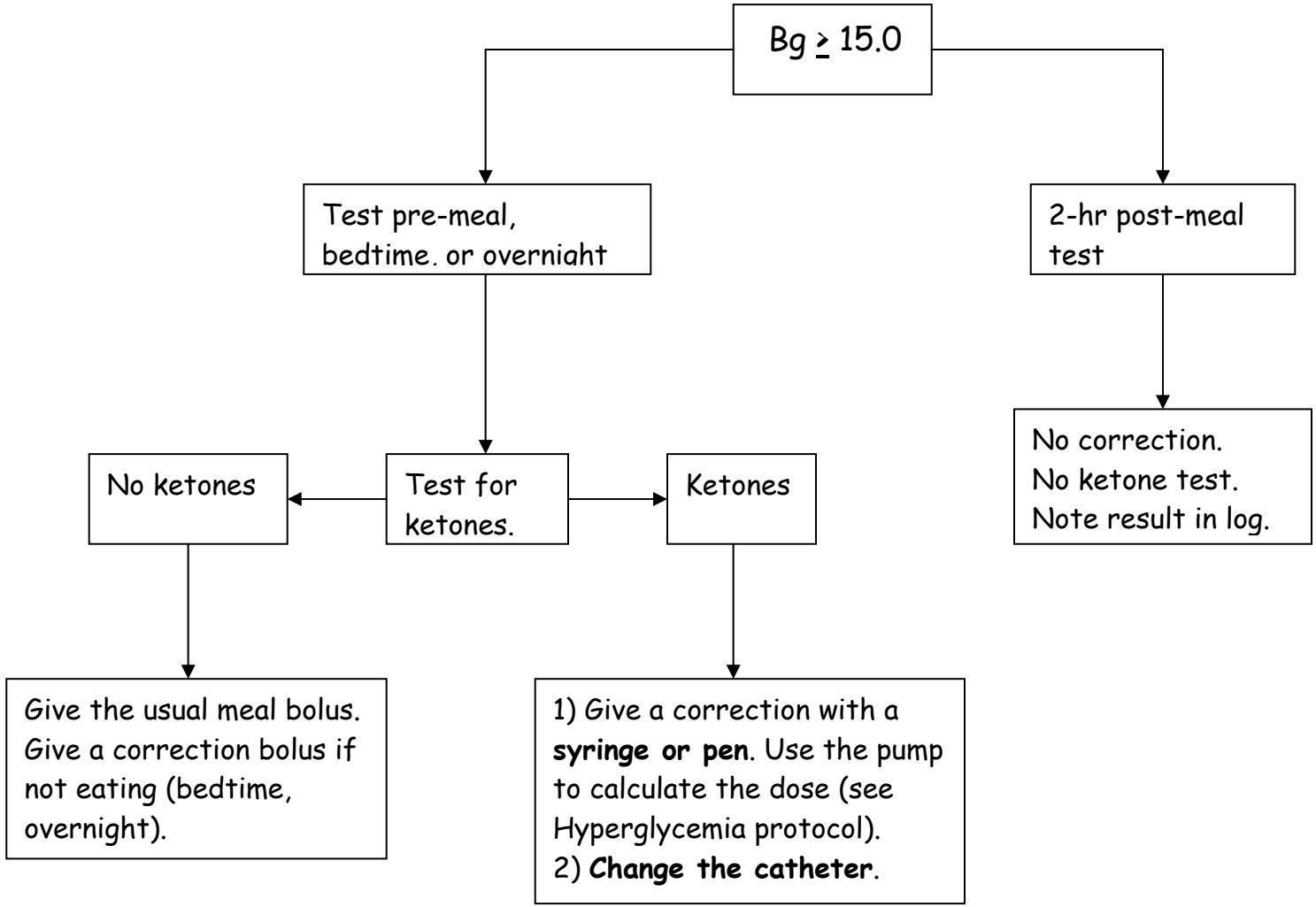
Correction bolus protocol for Pump Start (first two or three weeks)



Bedtime test **<** ___ : take ___g carbs containing protein, with no bolus.

Anne Bossy BSc(N), CDE
2009/07/08

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HYPERGLYCEMIA /KETONE PROTOCOL

Use ONLY the Precision Xtra for monitoring ketones – not urine sticks.

- Check ketones if the glucose is ≥ 15.0
- During illness, check ketones even if the blood sugar is normal or low.

KETONES 0.6 or less *(Negative)*

- Check for leaks, bubbles, or other problems.
- Give a correction and recheck in 2 hrs.

If glucose still ≥ 15.0 …

- Check ketones.
- **Change catheter and infusion set.**
- Give a 2nd correction and recheck in 2 hrs.

If glucose still ≥ 15.0 …

- **Check ketones & call the Doctor on-call.**

KETONES 0.7 – 1.4 *(Medium)*

- Use your pump to help you calculate a correction dose, **but** …
- **Give it by syringe or insulin pen.**
- Then …

- **Change the catheter and infusion set.**
- Recheck the glucose and ketones in 2 hrs.

- **If ketones are still present, call the Doctor on-call.**

KETONES 1.5 or over *(Strong)*

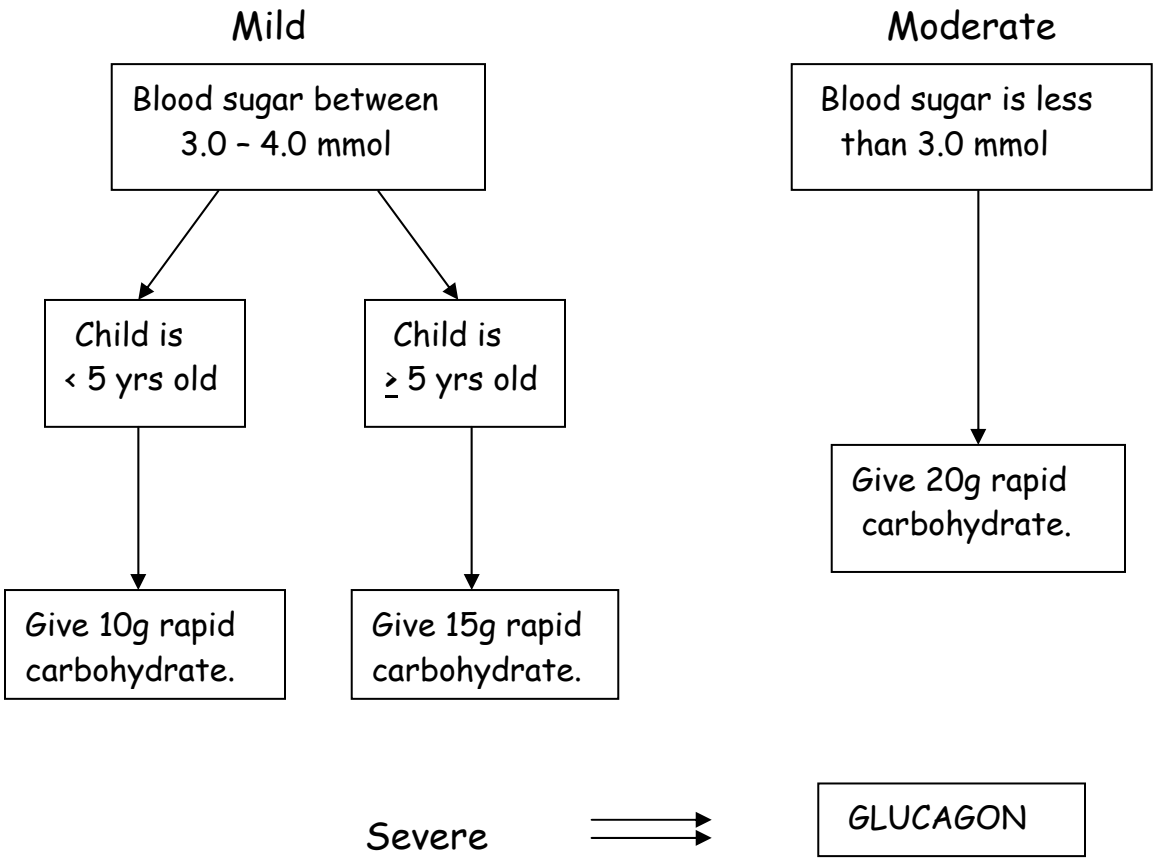
- Use your pump to help you calculate a correction dose, **but** …
- Multiply the amount by **1.5** and …
- **Give it by syringe or insulin pen.**
- Then …

Remember : "HI" on the glucometer means the reading is approximately ≥ 30.0. Follow the protocol as usual.

Anne Bossy BSc(N), CDE
Evelyne Pytka PDt, CDE
08/08/14

HYPOGLYCEMIA PROTOCOL FOR THE INSULIN PUMP

The 2003 Clinical Practice Guidelines from the Canadian Diabetes Association recommends:



(convulsion, unconscious, or unresponsive)

Always RECHECK the blood sugar 15 minutes after treatment, to verify that it has risen above 4.0 mmol.

There is no need to give a snack afterwards, unless the child is engaged in sports or activity.

Anne Bossy BSc(N), CDE
Version 4: 17/03/2008

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GLUCAGON PROTOCOL FOR CHILDREN WITH DIABETES

Glucagon is a hormone that releases glucose from the liver into the circulation, causing a rise in blood sugar levels. It can be administered by subcutaneous injection (the same as insulin), into muscle, or by IV.
Store the package between 15 – 30° C. Check the expiry date.
Glucagon is used to correct a severe hypoglycaemic reaction where it would be dangerous to give anything by mouth:

- Unconsciousness
- Convulsion
- Awake but unresponsive

Emergency kit:
Contains - one vial of glucagon in pill-form. It must be diluted before injection.
- one syringe with diluting solution (mostly water).

WHAT TO DO:
If possible, check the blood sugar level first to ensure that the affected child is indeed in hypoglycemia.

Mix the glucagon:

1) Remove the gray cap from the glucagon vial.
2) Remove the gray needle cover from the syringe.
3) Inject the solution from the syringe into the glucagon vial.
4) Remove the needle from the vial.
5) Shake lightly until dissolved (about 5 – 10 seconds). It should be a clear solution.
6) Reinsert the needle into the vial, and turn the vial upside-down.
7) Making sure the tip of the needle stays in solution, withdraw all the solution into the syringe (1.0 mg).

Inject the glucagon:
The injection is done in the outer thigh.
It is possible to inject through the clothing if it is impossible to remove quickly.

1) Hold the child as steady as possible. This might be difficult if the child is convulsing.
2) Inject the needle into the outer thigh at a 90° angle.
3) Push the plunger all the way to the bottom, to inject the medication.
4) Withdraw the needle.

Afterwards:
Place the child on his/her side.
The most common side-effect of Glucagon is vomiting (a severe hypoglycemic reaction can also cause vomiting).
Glucagon takes up to 15 minutes to work (usually much less).
If the child can eat, offer a small snack.
GLUCAGON IS A SAFE, NATURAL HORMONE AND CANNOT BE OVERDOSED.

Anne Bossy BSc(N), CDE
2008/03/12

Guidelines for Meals and Snacks During Insulin Pump Stabilization

Purpose: To help adjust basal rates and boluses (carb and correction) as efficiently as possible.

During this time, your child should eat three meals and carbohydrate-free (<3 g), low-calorie snacks (i.e. low in fat, protein and carbohydrate).

1. **Meals:** Please be sure that meals contain known amounts of carbohydrate (use food labels, measuring cups/spoons and a digital scale). Restaurant meals are difficult to calculate precisely, so it is best to eat at home until basal rates and boluses are established.

   Because large amounts of fat and protein may also affect blood sugars, please avoid the following foods **until your child's basal rates and boluses are established**:
   - Pizza
   - Deep-fried foods (e.g. French fries, poutine, etc.)
   - Portions of meat, fish, eggs, cheese, poultry that are **larger than usual**
   - Chocolate
   - Ice cream
   - Nuts (other than peanut butter on toast or in a sandwich)

   These foods will be re-introduced once the basic settings of your child's pump are set. Remember that there is no limit on the amount of carbohydrate at a meal. Please allow your child to eat for his/her appetite and remember that the rules of healthy eating apply to the entire family!

2. **Snacks:** Your child may eat snacks that have little or no carbohydrate (≤ 3 g) and a small amount of protein (1 oz or 30 g of weight, or < 7 g protein on the food label) or fat (<5 g) to avoid any effect that these nutrients may have on blood sugars. Any foods that have <30 calories are acceptable.
   Examples of low carbohydrate/low energy snacks:
   - "light" *Jell-O™*
   - *Crystal Light™* popsicles
   - Green salad with 1 Tbsp dressing
   - Tossed salad (lettuce), cucumber, celery or 125 ml free vegetables (broccoli, cauliflower, zucchini, etc) with 1 Tbsp dip or salad dressing
   - Sugar-free gum
   - *Crystal Light™* or other diet drinks

Evelyne Pytka PDt, CDE

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Pumpers' Emergency Kit

Make sure you or your child has access to the following, in case of problems with the pump or catheter:

Infusion sets 

Reservoirs 

Batteries 

Alcohol swabs
IV Prep or other brand
Tegaderm or other brand
Emla cream or patch

Insulin syringes or pens
Rapid insulin – at school, keep an unopened vial or cartridge of rapid insulin in a refrigerator

Glucometer strips (for blood sugar and ketones)
Glucose tablets or juice

** Keep long-acting insulin (N/NPH/Levemir/Lantus) at home in case of pump malfunction or loss (see "Temporary Removal of Pump protocol).

Anne Bossy RN, CDE
09/05/2008

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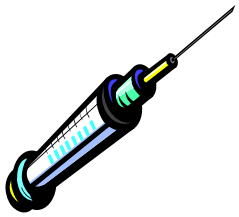
McGill University Health Centre

KETONES

Ketone testing should be always be done when you are sick. Ketones should also be tested if the blood sugar is 15.0 mmol or over, even if you feel well. Using a Precision Xtra glucometer is preferable and will give the most precise results, but a urine test can also be done.

If ketones are not present, give your usual correction using your insulin pump, and recheck the blood sugar in 2 hours. If the blood sugar has not started to decrease, check for ketones again and change your catheter and tubing. Give another correction and recheck in two hours.

If ketones are present,
a dose of rapid insulin must be given
immediately by syringe or insulin pen.



Check with your clinic about the dose protocol for ketones, and when you should contact the Endocrinologist on-call for help.

Symptoms of ketones include nausea and vomiting.
If someone with diabetes is experiencing these symptoms, ***a ketone check should be done immediately even if the blood sugar is normal.***

Ketones mean that the body does not have enough insulin. If left untreated, ketones can result in diabetic ketoacidosis (DKA), coma, brain damage, and/or death.

Anne Bossy BSc(N), CDE
2008/03/12

HOW CAN YOU OR YOUR CHILD GET KETONES USING THE PUMP?

1) A blocked catheter:
   - make sure to change your catheter every two to three days.
   - If possible, change your catheter before giving a bolus (meal or correction) and check your blood sugar 2 hours later to make sure it's working.
   - never do your catheter change just before bed – if it blocks, you might not realize it until the next morning when it's too late.
   - always check your blood sugars a ***minimum*** of 4 times per day!

2) Air in the line:
   - check the tubing for air bubbles regularly.
   - keep your opened insulin vial at room temperature; this will cause less bubble formation in the reservoir and tubing.
   - make sure all connections are appropriately tightened.
   - don't forget to PRIME or FILL CANULA after a new catheter insertion.

3) Illness:
   - colds, fever, sore throat, gastro, etc. will often cause ketones.
   - check for ketones early in order to get treatment started as soon as possible, even if your blood sugars are not elevated.
   - broken bones, sprains, or other physical stressors can bring on ketones too.

4) Your insulin has degraded:
   - it has passed it's expiry date.
   - the bottle has been opened more than one month.
   - it has been exposed to summer heat or winter cold.
   - The insulin has been in the pump reservoir too long (ie more than a week)

5) Human error:
   - forgetting to give your meal boluses!
   - leaving the pump disconnected for too long without checking your blood sugar.

Anne Bossy BSc(N), CDE

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ACTIVITÉ ACTIVITY	GLUCIDES SUPPLÉMENTAIRES EXTRA CARBS	DÉBIT BASAL TEMPORAIRE TEMPORARY BASAL RATE	CHANGEMENT DE BOLUS REPAS MEAL BOLUS CHANGE

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TRAVEL LIST FOR PUMPERS

- Pack DOUBLE what you think you will need for the length of your vacation.
- Keep supplies in separate carry-on bags in case one is lost or stolen.
- Do not pack insulin in a bag that will go into the baggage compartment of the plane, it will freeze.
- Avoid exposing your pump to X-rays and other scans. It can be removed safely for about an hour. Always check your blood sugar before pump removal, and after re-attaching.

Pump supplies: • Rapid insulin in a small cooler or "Frio" bag. • Infusion sets • Reservoirs • 2 glucometers; strips • Batteries (for pump and glucometer) • Emla cream • Alcohol swabs • IV Prep (if used) • IV 3000 or Tegaderm transparent tape	Pump malfunction or lost/stolen: • Long-acting insulin (N/NPH, Lantus, Levemir) ** refer to "Guidelines for Temporary Removal of the Insulin Pump" • Insulin syringes or pens • Check with your pump rep if you can borrow or rent a spare pump during your vacation.
Hypoglycemia: • Glucose tablets • Juice boxes • Small snacks • Glucagon	Hyperglycemia and/or Illness: • Precision Xtra glucometer with ketone strips • Ketostix urine dips as back-up • Insulin syringes or pens • Gravol

OTHER THINGS TO REMEMBER:

- Travel letter for Customs
- Phone numbers:
  - your doctor
  - nurse
  - the on-call service
  - your pharmacy

Anne Bossy BSc(N); CDE;

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Date:_____

Subject: Name: _____
Date of Birth:_____
MCH Medical Chart#:_____

To Whom It May Concern:

_____ is followed regularly in our Diabetes Clinic. He/she requires daily blood tests. He/she must wear an insulin pump, which should never be removed. He/she must carry at all times: insulin, pump supplies, syringes and/or insulin pens, testing equipment including a glucose meter and lancets. The Diabetes Team advises patients to prepare more than the necessary amount of equipment in case of malfunction, loss, or theft.
DO NOT EXPOSE THE INSULIN PUMP TO X-RAY's. X-rays may affect the mechanical functioning of the device, causing grave risk to the wearer.

This letter also confirms that _____can travel without danger and that he/she can lead a normal life.

Should further information be required, please contact the Diabetes Clinic at 514-412-4436.

Sincerely,

_____

Pediatric Endocrinology & Metabolism
Diabetes Section

Cc: MCH Medical Chart

Guidelines for Temporary Removal of the Insulin Pump

Why remove your pump?

1) the pump is broken and a new one won't arrive for a few days
2) the pump is lost or stolen
3) you need to be admitted to the hospital and will be unable to operate your pump
4) you want to take a "pump break" (eg. while at the beach)

When off the pump, it is best to stick as close as possible to a "basal-bolus" routine. The following are ***guidelines only*** for calculating an insulin dose. Extra blood sugar testing will be needed including overnight, to assess how it's working for you or your child. Please let your doctor or nurse know when you need to go back on injections, so that we can help you with the "fine-tuning". *These guidelines are dependent on your knowing your pump's settings, ie. basal rates, meal bolus ratio's, and correction factors (insulin sensitivity factors).*

ALWAYS KEEP RECORDS OF YOUR CURRENT PUMP SETTINGS. Insulin pumps are machines that can break or malfunction. Don't rely on your doctor or nurse to have all your data up-to-date.

1) **Short term off pump** (less than 24 hrs): Rapid-acting insulin (Novorapid or Humalog) will need to be given approximately every 3 – 4 hours.

   Combine:
   - 3 - 4 hours of basal insulin
   - a pre-meal bolus for carbs
   - a correction bolus if needed

Example: AT 8AM – the blood sugar reading is 14.8
- breakfast is 40 grams
- carb ratio is 1/15g
- correction factor (insulin sensitivity factor) is 4.0
- the basal rate is 0.60 units/hr until noon

- 4 hours of basal: 4 X 0.60 = 2.4 units
- breakfast food bolus: 40/15 = 2.7 units
- correction bolus: $\frac{14.8 - 6.0}{4.0}$ = 2.2 units

Total dose: 2.4 + 2.7 + 2.2 = 7.3 units, rounded off to 7.0

Anne Bossy BSc(N), CDE

2) **Long term off pump** (24 hrs or more): There are 3 options –
    - Give long-acting insulin (Lantus or Levemir) as basal, and rapid insulin for boluses
    - Give intermediate-acting insulin (NPH or N) ** call the doctor on-call for this dose
    - Give rapid-acting insulin every 4 hours including overnight, as per the "short term" example

Using Lantus or Levemir

Calculate the total daily **basal** amount of insulin and give as a single dose of Lantus or Levemir. It can be given as soon as convenient. Then continue every 24 hours thereafter.

Note:

- These insulins cannot be mixed with other insulins in a syringe
- Take rapid insulin for meal, snack and correction boluses
- The carb ratio's and correction factors remain the same as for the pump
- Children who are too young to give their own insulin may need to have a parent go to school to give the lunchtime dose.

Example: the basal rate is 0.50 units from midnight to 6AM, and 0.40 units for the rest of the day until midnight. The total basal is 10.2 units. The dose of Lantus or Levemir will be rounded off to 10.0 units, given once every 24 hours until the insulin pump is resumed.

Note:

- Since Lantus and Levemir are basal insulins, you cannot have a basal rate running when you restart the pump or severe hypoglycemia may result!
- Restart your basal approximately 18 hours after the last Levemir dose; 22 hours after the last Lantus dose.
- If you want to re-start the pump earlier, set the basal rate at 0.00 units/hr until all the Lantus or Levemir has worn off.

Important things to remember:

- Extra blood sugar checks will be needed to see how your adjustments are working, especially after the first injection of Lantus or Levemir.
- Insulin may need to be decreased for activity
- Check for ketones when the blood sugar is over 15.0
- Be sure to double-check all the settings on the pump and the battery before reconnecting.
- Always keep an unopened vial of long-acting or intermediate-acting insulin at home, and take it with you when travelling.

MANAGING SICK DAYS ON A PUMP

1. Never omit basal insulin. Do not disconnect or stop insulin pump unless patient is receiving insulin by injection.

2. Increase frequency of blood glucose and urine ketone monitoring to every 2 to 4 hours throughout the entire day and night. **N.B. ketones must be checked during illess even if the blood glucose is normal or low**.

3. During illness, increase basal rate by 20% to 50% until illness resolves and blood sugars are back in range.

   *** for diarrhea, the basals may need to be *reduced.*

4. Adjust boluses to carbohydrates intake. Increase boluses by 20-50% as needed to return blood sugars to their targets range.

   *** for diarrhea, the bolus may need to be *reduced.*

5. Increase fluid intake as needed to help clear ketones.

6. Examine infusion site as possible source of occult infection and cause of hyperglycaemia and ketosis.

7. Check pump and infusion device. If blood sugars and ketones remain elevated for more then 3-4 hours (see hyperglycaemia protocol), give supplemental insulin by syringe or pen. Determine the dose according to your usual correction x 1.5 (e.g. usually 10 units x 1.5 = 15 units). Change pump infusion set-up. Call the diabetes doctor on call.

8. Call health care team if patient has persistent nausea or vomiting for more than 4 hours, if symptoms of diabetic ketoacidosis develop (chest or abdominal pain, deep breathing) or if question or concerns arise.

Anne Bossy BSc(N)
version 1: 05/04/04

Testing Basal Rates and Boluses

1. **Testing basal rates**
   If your child is old enough, skipping or delaying a meal will allow you to determine if the basal rates are adequate. This is the time to allow your child to sleep late. Please continue to test the blood sugar every 2 hours during this time. A basal rate that is set correctly will allow your child to sleep in, delay or miss a meal with running the risk of a low or high blood sugar.

   Children who are unable to delay or skip a meal, may have a ***low-carbohydrate/low energy snack*** (≤ 3 g carbohydrate; < 7 g protein; <5 g fat; <30 calories).

   Please do not try to test basal rates for more than one mealtime per day.

2. **Testing meal boluses (insulin to carb ratios)**
   Test meal/carb boluses at a meal where the pre-meal blood sugar level is in target (i.e. there is no correction bolus required). Eat a meal with ***known carbohydrate quantities***. Frozen meals (e.g. Michelina dinner) work well. Test the blood sugar 2 and 4 hours after the meal.

   Because ratios can vary at different times of the day, you will need to try this at each meal.

   A meal bolus should return the blood sugar to target range within 4 hour if the ratio is corrects.

3. **Testing correction boluses**
   This is best done at a time when there will be no meal or snack within 4 hours, and when basal rates are well established. Correct the high blood sugar using the bolus calculator program in the pump, or according to ***correction formula***:

   (Actual blood sugar – target blood sugar) / sensitivity factor

   Target blood sugar _____
   Sensitivity factor _____

   A correction bolus should return the blood sugar to target range within 4 hours.

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Preparing to Start an Insulin Pump: Carbohydrate Counting

To get the most out of your insulin pump, you will need to learn how to count the grams of carbohydrate you/your child eats. This must be done before you can start the pump. Please do not purchase your insulin pump before you have been told that you are ready.

These are the steps to take to get ready for your pump.

1. Contact the dietitian to book a carbohydrate counting review.

2. Prepare a detailed, seven-day food, insulin, blood glucose and activity record. Do not be surprised if you need to prepare more than one food record. Be sure to include:
   - details about the type of food, and the quantity (either in cups/milliliters/grams/ounces) and the carbohydrate that you have calculated for these foods E.g. 250 ml milk = 12 g carbohydrate
   - All blood glucose tests. You need at least 4 per day: 1 before each meal and another one at bedtime.
   - All insulin doses
   - Information on how you treated low blood glucose or tested for ketones if these occur.
   - Any other comments that might be helpful (activity, illness, etc)

3. Once your food record is complete and the dietitian has given her approval, you are ready to move ahead.

Carbohydrate counting resources and tools:

Databases:

- Canadian Nutrient File http://www.hc-sc.gc.ca/fn-an/nutrition/fiche-nutri-data/index_e.html
- USDA Database http://www.ars.usda.gov/Services/docs.htm?docid=7783
- Nutrient Value of Some Common Foods http://www.hc-sc.gc.ca/fn-an/alt_formats/hpfb-dgpsa/pdf/nutrition/nvscf-vnqau_e.pdf

Digital Scales

- Salter 1400: contains a database and a booklet of codes (French and English) Fibre must be subtracted
- Salter 1450: Contains a database. Foods are keyed in. The scale subtracts the amount of fibre and calculates the *available* or *net carbs.* (English only). You can add 99 of your favourite foods or recipes

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Carb Factors for Various Foods

Using A Digital Gram Scale And Carb Factors To Calculate Your Carbohydrate

What is a *carb factor?*

A carb factor represents the amount of carbohydrate found in 1 gram of a food. It corresponds to the amount of carbohydrate that is available to *raise* the blood glucose, and does not include fibre. This is another way of calculating the carbohydrate in the foods that you eat. This method is especially useful for people interested in more precise carbohydrate calculations, and is better for certain foods that are difficult to measure using a measuring cup.

How to use the carb factor

To use the carb factor, you will require a digital gram food scale that can weigh foods in 1 gram increments. After weighing your portion of a food, you should multiply its weight by the carb factor for that food to calculate the amount of carbohydrate in your serving.

Example:

A whole apple weighing 174 g

Carb factor = 0.11

Total carbohydrate in your apple = 174 X 0.11 = 19 gm

Calculating the carb factor for your favourite recipes

You may wish to calculate the carb factor for your own recipes. This is especially useful for breads, cakes and combined dishes such as lasagna.

To calculate you carb factor, you will need to add up the total carbohydrate for the entire recipe using food tables such as the *Nutrient Value of Some Common Foods.* Remember to *subtract* all dietary fibre. Once the food is cooked, you will need to weigh the *cooked/baked* product.

To calculate the carb factor for that food, *divide the weight (in grams) into the total grams of carbohydrate* (total carb ÷ total weight). The number should be less than 1. This is the carb factor for that food. You need only weigh your portion of this food and multiple the weight by its carb factor to calculate the carb content of your serving.

Example:

Banana bread recipe.

Total carbohydrate of all ingredients = 347 g

Total weight after baking = 630 g

Carb factor = 347 ÷ 630 = 0.55

Carb Factors for Various Foods

Beverages		Grains and Cereals	
Soft drinks	0.10	Bagel	0.51
Chocolate milk	0.1	Bread, crumbs	0.67
Eggnog	0.14	French	0.49
Milk	0.05	Italian	0.47
Fruit Punch	0.13	Pita, white	0.54
Alcoholic beverages		Pita. whole wheat	0,48
Beer, de-alcoholized	0.13	Rye	0.43
Light	0.01	Sticks	0.65
Regular	0.03	White	0.52
Liquor	0.45	Whole wheat	0.39
Wine: sweet	0.14	Cornstarch	0.9
Cereal, cold, ready-to-eat		Flour. Wheat, all-purpose	0,73
All Bran	0.42	French Toast	0.29
Cheerios, regular	0.64	Matzo	0.81
Corn Flakes	0.84	Muffin, English	0.43
Granola, Harvest Crunch	0.68	Muffins, commercial	0.45
Grape nuts	0.70	Pancake, buttermilk mix	
Raisin Bran	0.68	Mix alone,	0.69
Rice Krispies	0.85	Prepared	0.42
Shredded Wheat	0.69	Rice, long or short grain, cooked	0.28
Special K	0.74	Wild	0.2
		Spaghetti: plain	0.27
Cereals, hot, cooked in water		Tortellini, cheese	0.40
Oatmeal, minute	0.1	Tortillas, corn	0.4
Cream of Wheat, quick	0.10	Wheat	0.52

Prepared dishes			
Burrito, beef	0.24	Pizza, cheese, thin-crust	0.27
Lasagna, vegetarian	0.16	Stew, beef and vegetable	0.06
Meat	0.12	Salad, coleslaw	0.11
Macaroni and cheese	0.22	Salad, potato	0.12
Pie, chicken-pot	0.24	Shepherd's Pie (with corn; Pâté chinois)	0.12

Carb Factors for Various Foods

Fruits			
Apple, cored, seeded, not peeled	0.13	Lemon	0.07
Fresh, whole	0.11	Lime	0.08
Applesauce, unsweetened	0.1	Mango, sliced, cubed	0.15
Apricots: fresh	0.09	Melon, cantaloupe, peeled, seeded	0.08
Canned, light syrup	0.15	With peel, seeded	0.06
Dried, uncooked	0.55	Honeydew, cubed, peeled	0.08
Banana, peeled	0.21	With peel, seeded	0.09
Whole, with peel	0.15	Orange, peeled	0.1
Blackberry, raw	0.04	Navel, including peel	0.07
Blueberries, raw	0.12	Tangerine, clementine, peeled	0.12
Cherries, Canned, in water	0.1	Tangerine, clementine, unpeeled	0.09
Fresh, sour, whole	0.1	Papaya, peeled, seeded	0.08
Fresh, sweet, whole	0.15	Peach, whole, fresh	0.07
Maraschino	0.39	Canned, in juice	0.1
Cranberries, raw	0.08	Canned, in water	0.05
Sauce, sweetened	0.38	Pear, whole, fresh	0.12
Dried, sweetened	0.77	Canned, in juice	0.11
Dates, dried and pitted	0.68	Pineapple: fresh, diced/sliced	0.11
Fig, fresh	0.16	Canned in water	0.08
Dried	0.54	Canned in juice or light syrup	0.15
Fruit cocktail, canned in water	0.08	Plum, fresh, whole	0.11
Packed in water		Prunes, dried	0.56
Grapefruit, peeled	0.07	Raisins	0.77
With peel	0.04	Raspberries	0.06
Grapes, seedless	0.17	Strawberries	0.05
With seeds	0.15	Watermelon, cubed	0.07
Kiwi	0.11		

Juice			
Apple: juice	0.12	Lemon, fresh	0.09
Cider	0.14	Lemonade, from frozen concentr	0.1
Apricot, nectar	0.14	Orange: all types, unsweetened	0.1
Carrot	0.08	Canned, unsweetened	0.1
Cranberry, cocktail	0.14	Papaya	0.12
Grape: frozen, from concentrate	0.13	Pineapple, canned	0.14
Bottled	0.15	Prune	0.16
Grapefruit, fresh or canned, unsweet.	0.09	Tomato	0.04
From frozen / with orange:	0.1	V-8	0.04

Carb Factors for Various Foods

Vegetables and Legumes			
Artichoke, hearts	0.06	Corn, Cream style, canned	0.17
Asparagus	0.02	Cucumber	0.01
Avocado	0.02	Eggplant, cooked	0.06
Bamboo, sprouts	0.02	Lentils	0.16
Bean sprouts	0.06	Lettuce, romaine	0.01
Beans, black, kidney, cooked	0.13	Iceberg	0.02
Garbanzo (chick peas), cooked	0.23	Mushrooms, cooked	0.02
Green/string	0.05	Onion, raw	0.07
Lima, cooked	0.18	Parsnips, cooked	0.14
Navy, cooked	0.19	Peas, green	0.1
Pinto, cooked	0.17	Peppers, green, raw, seeded	0.03
Soy, cooked	0.04	Red, raw, seeded	0.05
Beets, boiled and drained	0.06	Potato, baked, flesh and peel	0.19
Broccoli	0.05	Boiled, peeled	0.19
Cabbage, raw	0.04	Hash brown	0.26
Cooked	0.03	French fried	0.28
Chinese, raw	0.02	Pumpkin, cooked, canned	0.05
Chinese, cooked	0.02	Radish	0.02
Brussels sprouts, cooked	0.04	Sauerkraut	0.02
Carrot, raw	0.06	Spinach	0.01
Carrot, cooked	0.06	Squash, summer, cooked	0.03
Cauliflower, raw	0.04	Winter, cooked	0.07
Cooked	0.01	Tomato, slices; cherry	0.03
Celery	0.01	Whole, raw	0.02
Corn, kernels, canned	0.16	Turnip, cooked	0.03
on the cob, cooked	0.09		
Sauces and condiments			
Bacon bits, artificial	0.16	Sauce, chili	0.14
Ketchup	0.24	Soy	0.07
Pickles, sweet	0.31	Steak	0.14
Relish, sweet	0.34	Sweet and sour	0.25
Salsa, Mexican	0.05	Tartar	0.08
Sauce,		Tomato	0.06
BBQ	0.12	Tomato paste	0.14

Carb Factors for Various Foods

Sweets			
Banana bread	0.53	Danish, cheese	0.36
Brownie	0.62	Fruit	0.46
Cake: Angel food	0.57	Donut, plain	0.48
Fruit	0.58	Iced	0.46
Sponge	0.61	Honey	0.82
Candies: caramel	0.76	Ice cream	
Fudge, chocolate with nuts	0.65	Plain	0.27
Hard	0.98	Cone alone (waffle)	0.76
Jelly beans	0.84	Jam	0.68
Lollypop	0.99	Pie: apple	0.32
Cookies: animal	0.72	Blueberry	0.34
Chocolate chip	0.7	Cherry	0.39
Chocolate chip, gourmet	0.61	Lemon meringue	0.46
Fig	0.66	Pecan	0.54
Gingersnap	0.75	Pumpkin	0.25
Oatmeal raisin	0.66	Sherbet	0.27
		Syrup, chocolate, thin	0.63

Snack foods			
Almonds, dry-roasted, unbalanced	0.07	Muffin, commercial	0.45
Banana chips	0.51	Nuts, walnut	0.07
Cashews, dry-roasted	0.3	Mixed, dry-roasted	0.07
Chips: tortilla	0.56	Pecans, dry-roasted	0.04
Chips	0.5	Pistachios, in shell	0.22
Crackers:		Peanut, dry-roasted	0.14
Soda	0.75	Butter	0.14
Graham	0.71	Popcorn, microwave, low-fat	0.59
Marshmallows	0.81	Sunflower seeds	0.13

Adapted by Evelyne Pytka PDt, CDE from:
Pumping Insulin, 3rd edition. by John Walsh;
Canadian Nutrient File, 2007;
USDA 2007.

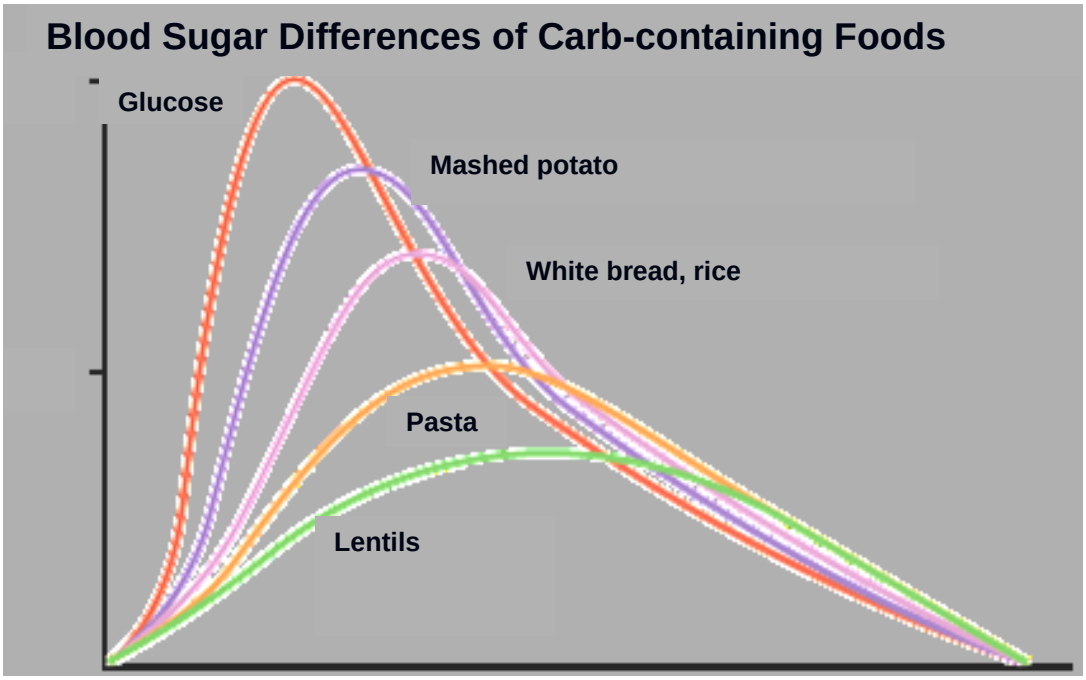
Using "Advanced Bolus" Options

Once your basal rates and ratios are established, many pumpers find that certain foods cause unusual blood sugars. This can happen even if you count your carbs correctly.

Some foods raise the blood sugar quickly, while others raise it more slowly. If the blood sugar rises slower than your insulin peaks, this can cause a low blood sugar 1-2 hours after the meal, and then a high blood sugar many hours later. These foods are called "slow carbs."

"Fast carbs" cause the blood sugar to rise faster than your insulin peaks.

The graph below shows the differences in blood sugar increase between different carbohydrate foods.



Reference: DiabSurf

Slow carbs

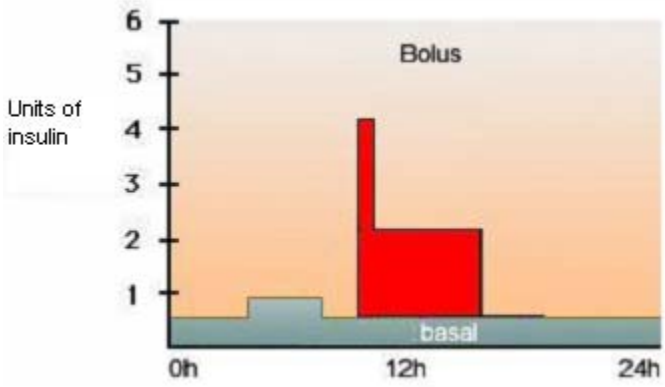
1. High fat foods such as pastries, chocolate, pizza, ice cream; fried foods such as french fries, poutine.

2. Foods that are less processed, less cooked or high in certain fibres (low glycemic index) such as "al dente" pasta, legumes (chick peas, lentils, etc) old-fashioned (not instant) oats.

You can control your blood sugars after eating slow carbs by using a combination-type bolus. Depending on the make of pump you are using, this may be called a ***dual wave, combination, combo or multi-wave bolus.***

If you notice that some foods cause a low blood sugar 1-2 hours after eating, or very high readings several hours after your meal, you may want to try this type of bolus.

A good way to start, is to calculate your bolus for the amount of carbohydrate, and program your pump to give 50% (half) of this amount immediately, and extending the remaining 50% over 2 hours. Test your blood sugar every 2 hours. Six hours after the start of your bolus (4 hours after all the insulin is delivered) your blood sugar should be back in your target.

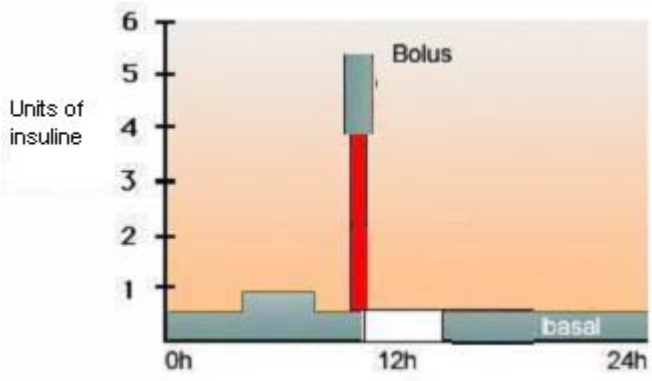


You may need to try different percentages as well as different times to extend the second part of your bolus. Keeping good notes will help you and your diabetes team decide what works best.

Fast carbs

1. Low fat, low fibre, processed foods such as bagels, white rice, breakfast cereals. These foods are often a big problem in the morning, when most people are more "resistant" to the action of their insulin. These foods cause a very high blood sugar 2 hours after you eat but your blood sugar may return to target before the next test.

   You can control your blood sugars after eating fast carbs by using a "super bolus". **This bolus is not found in your pump menu.**



Program a temporary basal rate of 0% for 1 or 2 hours.
Give a meal bolus for the CHO grams + correction bolus (if needed) + the insulin missing from the basal rate.

Test your blood sugar every 2 hours. Your blood sugar should be back in your target 4 hours after the start of your bolus.

Example : meal bolus = 4 units
basal = 1.0 units/h
Temporary rate = 0% X 2 hours

Super bolus = 4 units + (2 X 1.0 u of basal) = 6 units

You may need to try different temporary rates and different lengths of time. Testing every 2 hours, and keeping good notes will help you and your diabetes team decide what works best.

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IMPORTANT : PLEASE READ

Information provided in this pamphlet is for educational purposes. It is not intended to replace the advice or instruction of a professional healthcare practitioner, or to substitute medical care. Contact a qualified healthcare practitioner if you have any questions concerning your care.