



Alberta Children's Hospital
Diabetes Clinic



Caring for a Child or Teen with Type 1 Diabetes

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Diabetes Clinic
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Meet Your Diabetes Team

Your diabetes team is made up of:

- Endocrinologist (a pediatrician who takes care of children with diabetes)
- Diabetes nurse
- Dietitian
- Psychologist
- Social worker

The diabetes healthcare team:

The endocrinologist, diabetes nurse, and dietitian help families manage their child's diabetes by adjusting food and insulin doses and by teaching self-care skills and knowledge.

Psychologist:

- Helps your child adjust to diabetes, both at the time of diagnosis and over the long term
- Explores personal/mental health problems that may affect how children manage their diabetes

Social worker:

- Helps families deal with emotions such as shock, grief, and anger that a diagnosis of diabetes can often bring
- Connects families to community resources and financial resources
- Helps parents find ways to encourage their child to take good care of their diabetes
- Explores coping mechanisms for the changing emotional and physical demands of diabetes

What is Type 1 Diabetes?

After food is eaten, some of it breaks down into glucose (sugar). The pancreas, which makes insulin, helps the body use glucose for energy. Without insulin, glucose can't move into the cells. This causes glucose to build up in the bloodstream and pass into the urine. A person with Type 1 Diabetes doesn't make insulin as their immune system attacks and destroys the cells in their pancreas that make the insulin.

The common signs of diabetes at diagnosis:

- Urinating (peeing) more
- Drinking more (more thirsty)
- Unexplained weight loss
- Fatigue/feeling tired
- Nausea and vomiting (sometimes)

About 1 in 500 children have Type 1 Diabetes, also known as insulin dependent diabetes. There is no cure for Type 1 Diabetes.

What causes Type 1 Diabetes?

No one knows for sure. We do know that eating too much sugar does not cause Type 1 Diabetes. Researchers think there are a combination of 3 things that contribute to the development of Type 1 Diabetes:

- Genetic factors
- An environmental trigger (maybe a virus)
- Autoimmune response (the body destroys its own insulin producing cells)

You cannot prevent a child from developing diabetes. **No one is to blame.**

How is it treated?

There is no cure for Type 1 Diabetes. It is managed by:

- Checking *blood sugars*
- Insulin injections
- Attention to food intake

To manage diabetes means to manage 3 factors that affect the *blood sugar*:

- Food
- Insulin
- Activity

The goals of managing diabetes are:

- Keeping the blood sugar as close to target as possible or within target (4-7 mmol/L before meals)
- Making sure the child's growth and development is normal
- Ensuring the child's social and emotional well-being
- Preventing long-term complications

Remember: Your child is a child first and a child with diabetes after. Diabetes should not stop your child from taking part in normal childhood activities.

Food and Diabetes

After food is eaten, some of it breaks down into glucose (sugar), which is absorbed into the bloodstream. Insulin is released from the pancreas to transfer the sugar into cells, where it is used as energy. To treat Type 1 Diabetes you have to match injected insulin with carbohydrates (foods that will turn into blood sugar). To help balance injected insulin with carbohydrate your dietitian will set up a meal plan for your child.

Meal Planning

- Times will be set for each meal and snack, based on your family’s eating times.
- The meal plan will have 3 meals and usually 2 to 3 snacks per day.
- Taking into account your child’s usual way of eating, the dietitian will assign carbohydrate goals for each meal and snack. (These may change over time based on changes in appetite).
- ***Beyond the Basics*** food choice system will be used for meal planning.

Beyond the Basics divides food into 7 groups:

- Grains & Starches
- Fruits
- Milk & Alternatives
- Other Choices
- Vegetables
- Meat & Alternatives
- Fats

Each of these food groups has a portion size for one “choice”. The meal plan will show how many grams of carbohydrate to have from each food group at each meal and snack.

- Some foods are “free” as they don’t affect the blood sugar. They include: water, diet drinks, diet Jell-O® and most vegetables.
- Your dietitian will also help you include many foods that are family favourites.

Remember:

- Eat meals and snacks at set times.
- Measure and weigh foods for correct portion sizes.

How do I figure out recipe amounts?

Family recipes can be calculated to give a carbohydrate value for a serving.

In the beginning, your dietitian will calculate recipes for you. Later, you will be shown how to calculate the carbohydrate content of your dishes and baking recipes.

Reading Labels

Your dietitian will teach you how to use Nutrition Facts Labels information.

What do I do for special occasions and holidays?

Treats and desserts served at birthdays, school parties, Christmas, Easter, Halloween, or other celebrations are important in every child/family's life.

The best thing will be to plan ahead and know what is being served and when it will be eaten. Your dietitian can help you plan for special occasions.

There are times that food can be made less of a focus for holiday events. For example, an Easter basket could include a small amount of chocolate, plus non-food items like hair barrettes, hockey cards, and small toys, or free foods such as sugarless gum.

What are some guidelines to follow when eating out?

Eating out can be eating at restaurants or any time you're away from home for meals and snacks (for example: family gatherings or a banquet).

These basic guidelines will allow your child to enjoy eating out:

- Plan ahead when possible.
- Be familiar with portion sizes visually. This comes with practice by weighing and measuring at home.
- Use available food values for fast food restaurants (many franchised restaurants have information on the Internet).
- Try to stay as close to the meal plan as possible. Your dietitian or nurse may be able to offer some flexibility with food and insulin. Be sure to ask for help if your usual routine just doesn't work!

Monitoring

Monitoring is an important part of managing diabetes. You will need to monitor blood sugar before every meal and at bed time and check the urine or blood for ketones when needed.

Doing a Finger Poke to Check the Blood Sugar:

- Make sure your child washes their hands with soap and water before you poke. If unable to wash hands, clean their fingertip with an alcohol swab. Let it dry thoroughly.
- Change the lancet (the needle) once a day. For example, put a new one in at bedtime so that it is ready for the next morning, and replace again after bedtime check the next day. If your child says the finger poke hurts, try changing the lancet more often.
- Poke the sides of the fingertips and make sure that your child uses all their fingers. It's important to rotate well to prevent scarring and possible infection. You can use toes as well.
- **Don't** let anyone else use your child's finger pocker. Infections and diseases that are carried in the blood can be spread by sharing equipment.

Monitoring Blood Sugar

- Check the blood sugar at least 4 times a day, before meals and before going to bed. Check your child's blood sugar when they have symptoms of low blood sugar.
- You may need to check in the middle of the night if you think your child may have a low blood sugar, or if the bed time reading is low.
- Wait *at least 2 hours* after eating before you check the blood sugar.
- Record the blood sugar results and insulin doses in the logbook. Make a note of your child's activity, stress, illness, special occasions, and other changes that may affect blood sugar.
- Don't panic if **one** blood sugar is high or low. Look for *patterns* in the logbook. If you see a pattern of highs or lows or if your child is having more than 3 lows a week, call your diabetes nurse to have insulin doses changed.
- The ideal goal is to aim for 70% of pre-meal blood sugar values be between 4-10 mmol/L and no more than 4% of blood sugars be below 4 mmol/L.

Blood Sugar Targets

Age in Years	Blood Sugar Target before meals	Blood Sugar Target 2 hours after meals
under 6	6.0-10.0 mmol/L	does not apply
6-18	4.0-7.0 mmol/L	5.0-10.0

High Blood Sugar	22.0	Signs and Symptoms: - Thirst - Peeing a lot - Trouble concentrating
	17.0	
	14.0	
	12.0	
In Target	10.0	
	8.0	
	7.0	
	6.0	
	5.0	
	4.0	
Low Blood Sugar	3.0	Signs and Symptoms: - Shakiness - Hunger - Mood Swings - Paleness - Confusion
	2.0	

Taking Care of Supplies

- Store blood and urine test strips in their original containers.
- Protect blood and urine test strips from the light, moisture, and heat. Don't leave your monitoring supplies in the car.
- Don't use test strips after the expiry date. Check the package insert on blood and urine test strips. Some brands must be thrown out 4-6 months after opening.
- Learn how to use your meter
- Have a lab-to-meter comparison done when you buy a new meter, and every year thereafter.

Continuous Glucose Monitoring (CGM) or Flash Glucose Monitoring (FGM)

Continuous glucose monitors (CGM) and flash glucose monitors (FGM) are tools used to help in diabetes management, by providing real-time continuous blood sugar checks. They consist of a transmitter and a sensor, have an inserter, and require a receiver that displays the current blood glucose— which can be a hand-held device or a cell phone. CGM and FGM measure glucose in the interstitial fluid under the skin. CGM updates the displayed glucose every 5 minutes. To use the FGM system you must scan the sensor to update the blood glucose display.

CGM or FGM is helpful in identifying glucose trends and patterns between meals, seeing how the body reacts to insulin, food and activity.

Types of CGM and FGM Systems:

	Dexcom G6® (CGM)	Freestyle® Libre (FGM)	Freestyle® Libre 2 (FGM)	Medtronic Guardian™ Connect (CGM)
Indicated for	Ages 2 and up	Ages 18 and up	Ages 4 and up	Ages 14-75
Data Visibility	Continuous (reader must be within 6 metres)	Need to scan	Need to scan	Continuous (reader must be within 6 metres)
Can you make treatment decisions without a fingerpoke?	Yes, but fingerpoke is needed if: - Symptoms do not match the reading - G6® doesn't show a number, arrow, or both	Yes, but fingerpoke is needed if: - Blood glucose is rapidly changing - To confirm low blood sugar or impending low - Symptoms do not match the reading	Yes, but fingerpoke is needed if: - Blood glucose is rapidly changing - Symptoms do not match the reading	No, fingerpoke is required for all treatment decisions including: - Giving insulin injections - Treating a low blood sugar
Placement of sensor	Abdomen (for >17), upper buttocks (for 2-17 years)	Back of the arm	Back of the arm	Abdomen and back of the arm
Alerts	Yes	No	Yes (optional), but you need to scan to confirm	Yes
Calibration (with fingerpoke)	Not necessary	Not necessary	Not necessary	Yes: 2 hours after insertion, 6 hours after initial calibration, every 12 hours after that, and if the system asks
Length of wear	10 days	14 days	14 days	7 days
Display option	Smartphone, Smart watch, stand-alone receiver	Smartphone, smartwatch, stand-alone reader	Smartphone, smartwatch, stand-alone reader	Smartphone
Remote monitoring by care giver	Use the Dexcom Follow App on a smart device (internet connection required, does not work with receiver)	Use the LibreLinkUp App, see data after patient scans (internet connection required, does not work with reader)	Use the LibreLinkUp App, see data after patient scans (internet connection required, does not work with reader)	Use Care Partners app, will receive data from CareLink website when patient's smart device is connected to the internet
Water Resistant	Yes	Up to 3 feet of water, submerge up to 30 minutes	Up to 3 feet of water, submerge up to 30 minutes	Yes
Insurance coverage	Yes, depends on the individual plan (Dexcom can speak to your insurance)	Yes, depends on the individual plan	May depend on individual plan	Yes, depends on the individual plan

Getting Started:

- Do not overreact to sensor data!
- If newly diagnosed it is normal to see blood sugars higher than normal target range for several weeks after starting insulin.
- Read instruction manuals and follow instructional videos for insertion and sensor set up (for Medtronic, you may need to meet with rep for training)
- Set a target range of 4.0-10.0 mmol/L.
- Start with wide ranges for the low and high glucose alert settings. For low: 4.5 mmol/L; for high: 17.0 mmol/L. These can be changed later as you grow more comfortable with the system.
- CGM/FGM readings might be slightly different from blood glucose readings, up to a 20% difference is totally normal especially if the blood sugar is rapidly changing.
- Give insulin at the usual times, it takes about 3 to 4 hours for rapid-acting insulin to finish working. Giving a correction before the insulin has finished working may cause a low blood sugar later.
- Expect a spike, or increase in blood glucose after eating a snack or meal. Blood sugar should return to under 10.0 mmol/L, within 2 hours after eating. However, this may take longer.
- After treatment of a low blood sugar, check 15 minutes afterwards with a meter as there is a lag between blood glucose and CGM levels.
- Lying on the sensor site can cause “pooling” of the interstitial fluid, and may read as a false low blood sugar, for example, at night when you are sleeping.

Reviewing Results:

Each CGM or FGM system has a software that acts as a logbook to view trends in blood glucose. Adjustments can be made to reduce incidence of high or low blood sugars.

- Freestyle® Libre Software: Libreview®
- Dexcom G6® Software: Dexcom Clarity®
- Medtronic Guardian™ Connect: Carelink™

Goals for Blood Glucose:

- Time in Range: greater than 70%
- Low blood sugars: less than 4%

Continuous Glucose Monitoring Targets

	Glucose Level (mmol/L)	Recommended Time In This Target Range
Very High	Above 13.9	< 5%
High	10-13.9	< 25%
Target	3.9-10	> 70%
Low	Below 3.9	< 4%
Very Low	Below 3.0	< 1%

Adapted from: Diabetes Care 2019;42:1593-1603.

These are general goals and your diabetes team can help you to tailor these targets based on individual circumstances.

Low Blood Sugar

Low blood sugar is called hypoglycemia. **Any blood sugar less than 4 is low.** Knowing the causes of low blood sugar can help prevent them.

Causes of low blood sugar:

- Missed or delayed meal or snack
- Not finishing all of the meal or snack
- Too much insulin
- Extra exercise or activity
- Drinking alcohol

Signs and Symptoms of mild to moderate low blood sugar

- Sweating
- Trembling
- Hunger
- Weakness
- Paleness
- Dizziness
- Headache
- Blurred vision
- Mood changes
- Drowsiness
- Clumsiness
- Confusion

What should you do if your child is low?

- **TREAT right away! Do not wait!**
- If your child has any of the symptoms above, check the blood sugar. If the blood sugar is less than 4 mmol/L, treat it right away with a fast acting sugar.
- **Wait 15 minutes and re-check the blood sugar.** If it is still less than 4 repeat the treatment.
- If your child has a low blood sugar **before a meal or snack**, treat it, wait 15 minutes, and then give usual meal or snack
- If your child has a low blood sugar **and it's more than 1 hour until the next meal or snack**, treat it, wait 15 minutes and once blood sugar is > 4 mmol/L and then give a snack containing 15grams of carbohydrate and some form of protein or fat (e.g. granola bar, cheese and crackers, milk or yogurt.)
- If your child has a **low blood sugar during exercise**, treat it, and then have your child rest for at least 15 minutes or until feeling better

Important!

- A low blood sugar can happen at any time. Your child should always have a treatment for low blood sugar with you (see next page for treatment options).
- Your child should wear a bracelet or necklace that states they have Type 1 Diabetes.

Treatment options for LOW blood sugar:

Weight Below 15 kg	Weight 15 to 30 kg	Weight Above 30 kg
5 grams Carbohydrates	10 grams carbohydrate	15 grams carbohydrate
½ Dex4® glucose gel	2 to 3 Dex4® glucose tablets	3 to 4 Dex4® glucose tablets
½ Dex4® glucose liquiblast	2 tsp. sugar	3 tsp. sugar
1 tsp. sugar in ¼ cup water	2 large marshmallows	3 large marshmallows
1 tsp. syrup	10 skittles	15 skittles
3 TBSP. regular pop	6 gummy bear candies	9 gummy bear candies
3 TBSP apple juice	1 ½ packs of Rockets®	2 packs Rockets®
1 Dex4® glucose tablet	⅓ cup regular pop	½ cup regular pop
10 Rocket® Candies	⅓ cup apple juice	½ cup apple juice
3 Gummy Bear Candies		

Note: Liquids and syrups are recommended for infants and young toddlers. These can be given by medicine dropper or a liquid medicine dispenser. Follow with breast milk or formula.

The Honeymoon Phase

When people are first diagnosed with Type 1 Diabetes, they typically have a few insulin producing cells left in their pancreas. After starting insulin injections the pancreas is able to rest. This allows for those few remaining cells to produce insulin until they are destroyed by the immune system. These cells can last for a few weeks to even a few years. What does this mean for management of diabetes?

- Typically blood sugar levels are easier to control
- Insulin doses may start to decrease once blood sugars have returned to the target range
- You may start to see more frequent low blood sugars, which just means insulin doses may need to be decreased

Important: call the diabetes clinic to adjust doses if you start seeing patterns of lows or more than three lows a week soon after being first diagnosed with Type 1 Diabetes

Night Time Lows

Your child may drop low in the middle of the night. In response to the low, the liver releases a large amount of glucose, which is the cause of the high blood sugar in the morning. To rule out night time lows, check the blood sugar at 3 am for 2 nights.

High Blood Sugar

High blood sugar is called hyperglycemia. Knowing the causes of high blood sugar can help prevent them.

Causes of high blood sugar:

- Eating more carbohydrates than planned for without change in insulin dose.
- Less activity than usual
- Not enough insulin/Not taking insulin
- Illness or stress
- When other hormones in our bodies are increased (growth spurts, illness, infection, increased stress, hormone changes in menstrual cycle)

What are the signs and symptoms of high blood sugar?

Signs and symptoms of high blood sugar are usually seen when the blood sugar is greater than 14 mmol/L for several hours. Some signs and symptoms of high blood sugar are:

- Peeing a lot
- Dry mouth
- Being more thirsty than usual
- Having no energy
- Trouble concentrating
- Being more irritable or cranky

Monitoring for Ketones:

If the blood sugar is high, the body may start to burn fat for energy. If fat is burned instead of using glucose, the body makes ketones. Too many ketones are bad for the body, and can make you sick.

Signs and symptoms the body is producing ketones:

- Ketones in the urine
- Ketone breath (smells like nail polish remover)
- No appetite
- Nausea, vomiting, or pain in abdomen
- Deep, fast breathing
- Being very tired (may lead to unconsciousness)

Check the urine or blood for ketones when:

- The blood sugar is greater than 14 mmol/L
- Your child is sick
- Your child has thrown up (vomited)
- With urine ketone strips: if the ketones are + (small), ++ (moderate), or +++ (large) your child needs extra insulin.
- With blood ketone strips: if the reading is 0.6 mmol/L or above, your child needs more insulin.
- Call the diabetes clinic or refer to the illness management section on how to adjust insulin for ketones.

Insulin

Brands

Your child will be taking human insulin. It doesn't come from humans but is made in a laboratory. It's like the insulin our bodies make. There are 3 companies that make insulin:

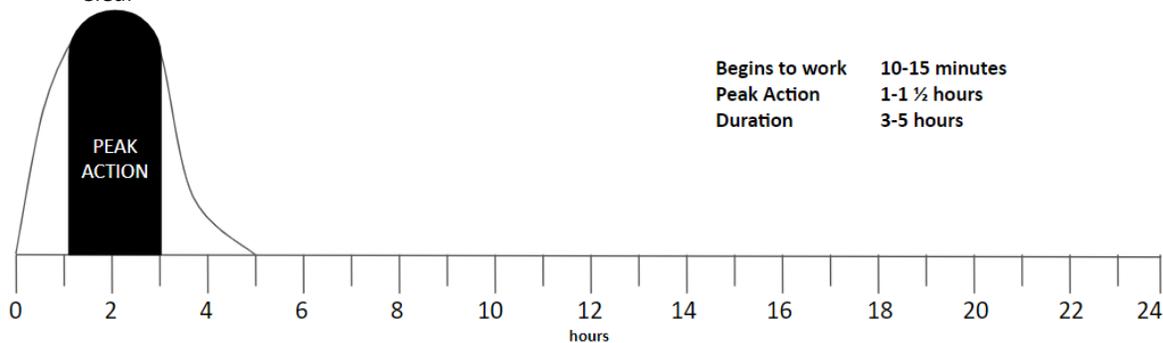
- Lilly (Humalog®, Humulin N®, Basaglar®)
- Novo Nordisk (NovoRapid®, Fiasp®, Novolin NPH®, Levemir®, Tresiba®)
- Sanofi (Apidra®, Admelog®, Lantus®, Trurapi®, Toujeo®)

Types:

There are many types of insulin. Most children will be on a rapid acting insulin in combination with an intermediate-acting insulin or a long-acting insulin.

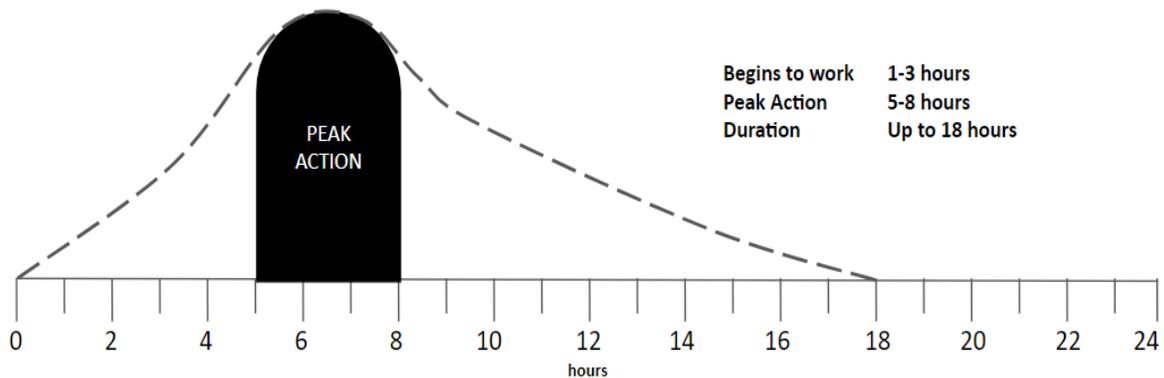
Rapid-Acting

- Called Humalog®, NovoRapid®, Fiasp®, Apidra®, Admelog®, or Trurapi®
- Clear



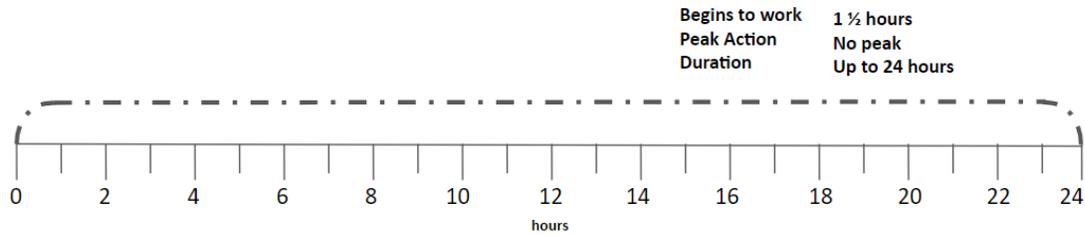
Intermediate-Acting

- Called Novolin NPH®, Humulin N®
- Cloudy



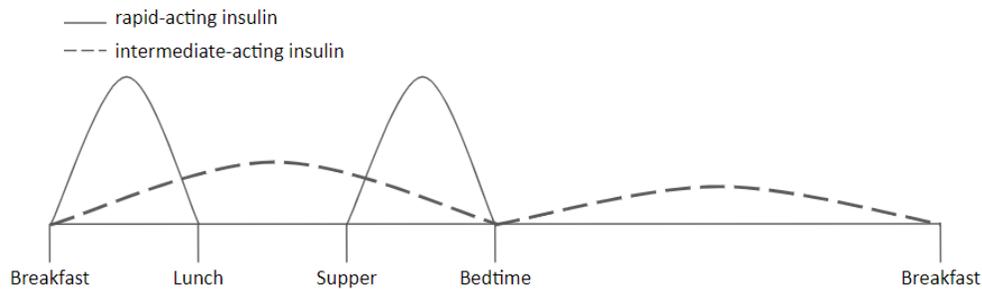
Long-Acting

- Called Basaglar®, Levemir®, Tresiba®, Lantus®, Toujeo®
- Clear



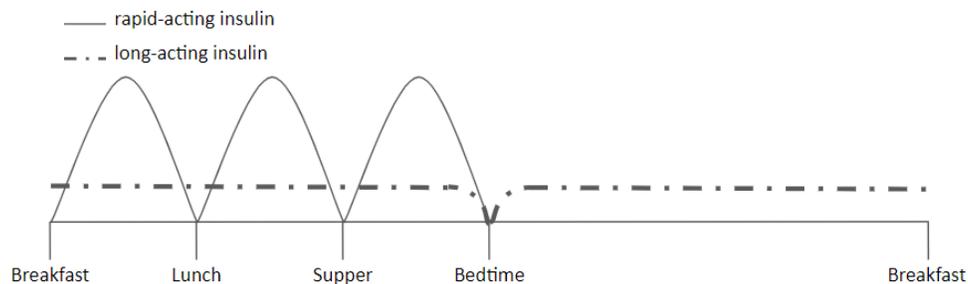
Common Insulin Programs:

Insulin at breakfast, supper and bed time (TID): This program is used with children or teens who aren't able to give insulin while at school or away from home during the day. It's important to follow carbohydrate goals and to eat all meals and snacks fully and on time. Sleeping in and delayed meals are hard to work into this program.



- Breakfast blood sugars tell you how well the bedtime intermediate insulin worked
- Lunch blood sugars tell you how well the breakfast rapid insulin worked
- Supper blood sugars tell you how well the breakfast intermediate insulin worked
- Bedtime blood sugars tell you how well the supper rapid acting insulin worked

Basal Bolus: This acts more closely to how the pancreas does when it releases insulin. Long-acting insulin is given once a day. This basal (background) insulin works with the glucose that the liver is always releasing. When the child or teen eats a meal or snack they give rapid-acting insulin, known as a bolus (burst) of insulin to work with the carbohydrates in food. This program gives flexibility with the timing of meals and amount of food eaten.



- Breakfast blood sugars tell you how well the long-acting insulin worked
- Lunch blood sugars tell you how well the breakfast rapid-acting insulin worked
- Supper blood sugars tell you how well the lunch rapid-acting insulin worked
- Bedtime blood sugars tell you how well the supper rapid-acting insulin worked

Storing insulin

- Keep unopened insulin in the fridge.
- Mark the date of starting a new cartridge on your calendar.
- Once opened and the cartridge is in the pen, it can be stored at room temperature for 28 days. The exception is Levemir, which can be stored at room temperature for 42 days.
- Insulin must not be in extreme temperatures, hot or cold. Do not let it freeze. Keep it away from direct sunlight. Do not leave it in the car. Can store in a cooler or insulated bag.
- Throw out the insulin if:
 - Clear insulin becomes cloudy
 - Cloudy insulin won't mix evenly or clumps together
 - It's been frozen or in a very hot place (+30°C or more)

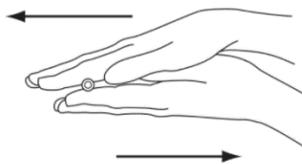
Preparing a Dose of Insulin

Using a Syringe: (only rapid-acting insulin and intermediate-acting insulin can be mixed)

1. Draw the clear insulin first: Hold the cartridge upside down and insert the needle. Pull back the right dose. If there are air bubbles, push the entire dose back into the cartridge and repeat until the bubbles are gone.
2. Mix the cloudy insulin well.
3. Draw the cloudy insulin into the syringe with the clear insulin. If you draw up too much cloudy insulin, throw out the entire dose and start again.
4. Give insulin dose right after preparing it.

Using a Pen:

1. If the insulin is cloudy mix it well. Roll the pen in your hands 10 times or turn the pen upside down gently, 10 times.



Roll the cartridge between the palms of your hands **10** times.



Turn the bottle upside down (180 degrees) **10** times.

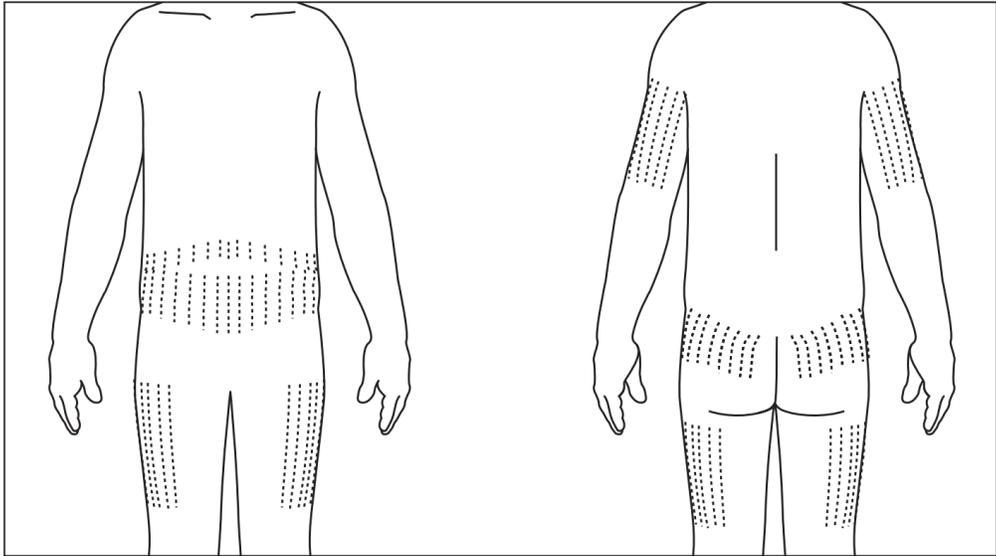
2. Screw on a new pen needle every time you give an injection. Take off the outer and inner caps.
3. Check that the pen is working before each injection. Set the dial to 2 units. With the pen needle pointing upwards, press the pen button. You should see drops or a squirt of insulin. If not repeat this step until you do. This is called 'priming' the needle.
4. Set the pen dial to the prescribed dose. The pen is now ready for an injection.
5. Choose a site, insert the needle, press the plunger, and hold the needle in place for **10 seconds**.
6. Take off the needle tip after the injection and put in the sharps container.

Injecting insulin

- Long acting insulin and intermediate acting insulin should be injected at about the same time each day. It is ok to give the injection 1 hour earlier or later than the usual time.
- Give rapid-acting insulin 10-15 minutes before the meal. This allows the insulin to start working before the food is eaten. **If the blood sugar is below 5.0 mmol/L, give it just before the meal.**
- You can give rapid-acting insulin to young children (toddlers or infants) after a meal, as they might not eat the same amount of carbohydrates at meals. The dose of insulin depends on the amount of carbohydrates the child eats. As they grow older and appetite becomes more predictable insulin should be given before meals.
- If you forget an injection, you can give it up to 1 hour after a meal. If it has been longer than 2 hours use your normal correction scale to correct high blood glucose.

Injection sites

- Insulin is injected into fatty tissue that lies in between the muscle and skin. There are 4 sites used to inject insulin: tummy, back of the arms, thighs, and upper buttocks (see diagram below).
- Make sure not to inject into the same area all the time, as this will cause a fatty lump to form under the skin. Insulin injected into these fatty lumps is not absorbed properly, which will affect blood sugars.
- It is important to use **at least 2** different areas on the body right from the beginning to develop a good system of rotating sites. It is harder to get your child to rotate sites later on if they develop favourite spots.



Front

Back

Adjusting Insulin

Pattern of adjustment

1. Review the log book every 3 to 4 days to look for patterns
2. If the blood sugar is **above** the target at the same time of day for **3 days** in a row, **increase** insulin that is working at this time. Only increase 1 insulin at a time, and wait 2 to 3 days before increasing again.
3. If the blood sugar is **below** target at the same time of day for **2 days** in a row, **decrease** the insulin working at this time. If there are 3 or more lows per week but no pattern, call the diabetes clinic.

Note: Before adjusting insulin, think about other factors such as exercise, food, less than 2 hours between food and blood glucose checks, check falsified results, etc.

By how much should I adjust?

If the insulin dose you are adjusting is:

- Less than 15 units, adjust by 1 unit
- 15-30 units, adjust by 2 units
- Greater than 30 units, adjust by 3 to 4 units

Note: if your child is very young or is on a small dose of insulin, adjust by ½ units.

How to adjust for night time lows:

Your child may drop low in the middle of the night. In response to the low, the liver releases a large amount of glucose, which is the cause of the high blood sugar in the morning. To rule out night time lows, check the blood sugar at 3 am for 2 nights. If the blood sugar is low decrease the bedtime dose of long-acting insulin or intermediate-acting insulin.

How to correct high blood sugar:

Your diabetes nurse or endocrinologist may give you a sliding scale or correction factor to correct high blood sugar using rapid-acting insulin.

If you correct high blood sugar often, you need to do a pattern adjustment and increase the insulin that's responsible for the high blood sugar.

Don't give more long-acting insulin or intermediate-acting insulin at bedtime for a high blood sugar. Give extra rapid-acting insulin using your system for correcting. Check the blood sugar 2 to 3 hours later.

Exercise, Activity, and Diabetes

An active lifestyle is important for good health and can be really fun! It helps manage weight, improves physical fitness, self esteem, helps with sleep, and reduces stress. An active lifestyle means we have to actively manage our blood sugars too.

Effects of exercise on blood sugar:

Exercise or activity usually lowers blood sugar - it makes insulin work better. During exercise, more sugar moves into the muscle cells, leaving less behind in the bloodstream. This can cause a low blood sugar during exercise or several hours after exercise (delayed low). Strenuous or extended activity late in the day can lead to low blood sugars in the middle of the night

Injecting insulin into an exercising arm or leg can cause the insulin to be absorbed faster, and can possibly cause a low blood sugar.

Sometimes exercise can cause high blood sugar (post-exercise high). Doing sports can cause a release of a stress hormone, and this raises blood sugars. If the blood sugar is high when the exercise is started, the exercise may act as a stressor, causing blood sugar to go even higher. Not drinking enough fluids during exercise can also lead to a high blood sugar.

Some guidelines to consider when exercising:

- Teach coaches and gym teachers about low blood sugar – signs and symptoms, treatment, and how to prevent it.
- Carry a rapid acting carbohydrate to treat low blood sugar.
- Drink lots of fluids during exercise.
- Don't inject insulin into an arm or leg that was just exercised or is just going to be exercised.
- Check blood sugar before, during, and after exercise.
- Check blood sugar at 3:00 am after a long active day.
- Think about decreasing insulin for planned activity.
 - Decrease by 10% for light activity (e.g. walking, baseball).
 - Decrease by 20% for moderate activity (e.g. biking, down-hill skiing).
 - Decrease by 30% to 50% for strenuous or day long activity (e.g. soccer, hiking).
 - If low blood sugar happens after a very active day decrease the bedtime long-acting or intermediate-acting insulin by 10-20%.
- Think about eating extra food for increased activity.
 - If blood sugar is less than 10 mmol/L before moderate or strenuous activity, give 10-15 gram carbohydrate snack for every 30-60 mins of activity.
 - If blood sugar is high before exercise (over 10 mmol/L) do not give extra food.
- Record insulin and food changes in logbook to see if these alterations help.
- If your child has high blood sugar after exercise, **do NOT** correct it using the usual dose, use only half the correction dose.

If the blood sugar is greater than 14 mmol/L, check for ketones. **Do not** exercise if ketones are positive.

Back to School Tips

Children with diabetes can take part in all classes and school programs. Some kids with diabetes might need some help at school with diabetes care management. You will need to meet with your child's or teen's teachers before they go back to school.

Your diabetes nurse will go through a school care plan with you to help provide some information on how to manage diabetes at school. The nurse will also give you a Type 1 Diabetes information sheet to provide to the school. www.DiabetesAtSchool.ca is an excellent resource with handouts and videos to explain Type 1 Diabetes to teachers and school administrators.

- Ask to meet with the classroom teacher, gym teacher, principal or vice-principal, and any other staff members you feel are necessary to inform. Review the diagnosis and the care plan with them.

Important Things to Explain:

1. Low Blood Sugars:

- Teach school staff about low blood sugar– the signs and symptoms, treatment, and how to prevent it. Ask the principal to let the bus driver, lunchroom supervisors, and other staff know.
- Give the teacher and your child or teen a supply of rapid-acting carbohydrates (low blood sugar treatments) to keep. Check the supply regularly and give more as needed.
- Explain to the staff that if your child or teen is having a low that the teacher or a friend must stay with them until all signs of low blood sugars have gone away.
- For outdoor classes or field trips provide the teacher and your child or teen with a backpack filled with low blood sugar treatments and diabetes supplies.

2. High Blood Sugars:

- Review symptoms of high blood sugars. Tell the teacher that your child may be thirsty and need more bathroom breaks. Also let them know that it may be difficult for your child or teen to concentrate when the blood sugar is high.
- Make sure your child or teen has a water bottle available to them at their desk.

3. Space

- Give the school a sharps container so needles and lancets can be disposed of safely.
- Ask the teacher or principal to find a private, 'clean' space where your child can do blood sugar checks and give insulin.

4. Possible Reminders

- For young children consider starting a communication book or write in the agenda about important information related to diabetes (e.g. recording blood sugar checks and insulin doses).
- If your child needs help remembering to eat snacks or check blood sugar, buy them a digital watch with an alarm
- Make sure your child wears a medic alert ID to school

A₁C Testing

What is a Hemoglobin A₁C?

A₁C measures the blood sugar control over the past 3 months. Hemoglobin is part of the red blood cell. A red blood cell lives for about 3 months. During that time, the hemoglobin picks up sugar from the blood. If the blood sugar is often high, more sugar will stick to the hemoglobin, causing a high A₁C. The A₁C reflects the average blood sugar over the past 3 months.

Average blood sugar (mmol/L)	A ₁ C Value (%)
19.5	12%
17.5	11%
15.5	10%
13.5	9%
11.5	8%
9.5	7%
7.5	6%

Diabetes Care, 2002. 25:275-278

How often should this test be done?

The A₁C should be done every 3-4 months. A blood sample is taken from a fingertip or from a vein in the arm. Your diabetes nurse will tell you what type of sample is needed and where it can be done. If your child needs to get a blood sample from a vein, you can use numbing creams to make it more comfortable.

What should the A₁C result be?

A person without diabetes will have an A₁C between 4.3% and 6.1%. Most people with Type 1 Diabetes do not have a normal A₁C. Research shows that lower A₁C levels can greatly decrease the risk of long-term complications such as nerve, kidney, and eye damage. Below is a list of the recommended A₁C targets for kids with Type 1 Diabetes:

Age (years)	A ₁ C
Less than 6	Less than 8.0%
6 to 18	Less than 7.0%

Your diabetes team will talk to you about your child's A₁C value at each clinic visit. A₁C may be individualized based on special circumstances; if it is higher than it should be, your team will help you create an action plan to help lower it.

Treating Severe Low Blood Sugar

Severe low blood sugar can cause someone to pass out or have a seizure. Emergency help is needed. Give Glucagon. If there is no Glucagon available, call 911.

A severe low blood sugar occurs when there is not enough sugar reaching the brain. This can cause:

- Confusion and poor coordination
- Seizure
- Unconsciousness
- Temporary paralysis on one side

How to Treat if Your Child is Awake:

Give one of these 20 gram rapid-acting carbohydrates:

- 5 Dex4 glucose tablets
- 2/3 cup of regular pop or apple juice

******You will need to firmly coax your child to eat or drink.***

How to Treat if Your Child is Unconscious or Having a Seizure:

- **Don't** force food or liquid into the mouth
- Place your child onto their side in a safe space
- Measure the blood sugar
- Give an injection of Glucagon[®], or use Baqsimi[®] nasal spray
 - **4 years or younger**, give **0.5 mL** (0.5 mg) of Glucagon[®]
 - **5 years or older**, give **1 mL** (1 mg) of Glucagon[®]
 - **Ages 4 and up**, give Baqsimi[®]
- Call 911 if you cannot give Glucagon[®] or Baqsimi[®], or right after giving it
- Call the diabetes clinic after treating to let them know this has occurred.
 - Glucagon[®] and Baqsimi[®] are one time use, you will need to call for a prescription renewal to get another

Glucagon

What is Glucagon?

Both Baqsimi[®] and Glucagon[®] contain the hormone glucagon. Glucagon is a hormone that triggers the liver to release stored sugar. It takes about 10 minutes for the sugar from the liver to reach the brain and for your child to wake up.

How to Give Glucagon®:

- Draw up the Glucagon® using the instruction sheet in the box
 - Remove the cap from the bottle
 - Inject the liquid from the syringe into the dry powder bottle
 - Roll the bottle gently to dissolve the powder
 - Draw the fluid back into the syringe (amount as per age on previous page)
- Inject the Glucagon® like an insulin injection. The leg is the best spot to inject.
- Once mixed, Glucagon® must be used or thrown out within 24 hours.

How to Give Baqsimi®:

- Remove plastic foil from Baqsimi® tube, and take the device out
- Place fingers on either side of the nozzle and insert into your child's nose
- Use thumb to push up on the bottom of the Baqsimi® container

After Using Glucagon

- Side effects of a severe low and Glucagon®/Baqsimi® are upset stomach, nausea, vomiting, and headache. This can last for a few days.
- When your child wakes up give ½ cup of juice or regular pop. Wait 15 minutes and then offer a snack of carbohydrates and protein (e.g. cheese and crackers, granola bar).
- Monitor the blood sugar consistently. Your child may need to come to emergency until blood sugars are stable.
- Contact your diabetes team, insulin dose will be decreased by 20% for the next 2-3 days after a severe low.

How to Prevent a Severe Low Blood Sugar

- **Decrease insulin when you see a pattern of low blood sugars or more than 3 lows per week**
- Supervise insulin injections.
- Have a safe plan for sleeping in.
- Know that the risk for severe lows goes up in the spring as kids are more active.
- Adjust for exercise (decreasing insulin/increasing food).
- Make sure meals and snacks are eaten on time and all the food is eaten.
- Check blood sugar in the middle of the night after a really active day or when the blood sugar is low at bedtime.
- Make sure that your teenager knows that alcohol can cause low blood sugars and drinking too much can cause a severe low.

Illness Management

Being sick (such as with an infection or flu) often causes **high blood sugars and ketones**, even if your child isn't eating. This has to be managed closely or your child can develop a dangerous condition called **diabetic ketoacidosis (DKA)**. Sometimes in illness blood sugars can be **low**, and this is typically seen if there is vomiting or diarrhea. Illness can cause **dehydration**. Below is a list of guidelines for how to manage diabetes during illness.

1. **Check blood sugar** every 2 to 4 hours **around the clock** (even when your child is sleeping). If you are using a continuous or flash glucose monitor, blood sugars may not be accurate if your child is dehydrated. Always double check with a finger poke if you are uncertain.
2. If the blood sugar is **greater than 14.0 mmol/L**, check the urine or blood for ketones.
3. Never stop giving insulin when your child is sick.
4. If your child **isn't able to eat** give ½ to 1 cup of clear fluids every hour
 - If the blood sugar is **below** 14.0 mmol/L the fluids should have sugar (e.g. regular pop, popsicles, or apple juice).
 - If the blood sugar is **above** 14.0 mmol/L the fluids should be sugar-free (e.g. water, diet pop, Crystal Light®).
5. If your child **is able to eat**, follow usual meal plan and offer foods that are easy to tolerate. See *What can I offer my child to eat and drink?* on next page.
6. Give sips of fluid to prevent dehydration. Your child should have ½ to 1 cup every hour.
7. Make sure your child rests. If the blood sugar is high with ketones, more activity may cause the blood sugar to go even higher and the body will produce more ketones.
8. Call your family doctor or call Health Link at 811 if you have concerns about your child's illness not related to diabetes.
9. Medication
 - You can use acetaminophen (Tylenol®) or ibuprofen (Motrin®, Advil®) for fever and pain.
 - Use sugar free products for coughs and colds (e.g. cough syrups, cough drops).
 - Use prescription medication (antibiotics, steroids) as prescribed by your family doctor.
 - Your child should still get all vaccinations and the flu shot regularly.
10. **Call the diabetes nurse or the endocrinologist on call if:**
 - You can't keep your child's blood sugars above 4 mmol/L.
 - Your child vomits more than 2 times in 4 hours.
 - Your child still has ketones after 2 extra doses of rapid-acting insulin.
 - Blood ketones are greater than 3.0 mmol/L (a sign of DKA).
 - Your child has signs of dehydration: dry mouth or tongue, cracked lips, sunken eyes, dry flushed skin, or not peeing (urinating) enough.
 - Your child has any signs of DKA: high blood glucose with ketones and nausea, stomach pain, vomiting, fast breathing, fruity smelling breath, and drowsiness.

Call (403) 955-7211

- Weekdays 8:00 am - 4:00 pm, ask for the diabetes nurse on call.
- After hours, weekends, or holidays, ask for the endocrinologist on call.

How to adjust insulin:

Remember: NEVER stop giving insulin when your child is sick

Blood sugar below 10.0 mmol/L with vomiting, diarrhea, or not eating

- **Don't** give rapid acting insulin (Humalog®, Novo Rapid®, Fiasp®, Admelog®, Apidra®, Trurapi®)
- Decrease long acting or intermediate acting insulin (Humulin N®, Novolin NPH®, Lantus®, Levemir®, Basaglar®, Tresiba®, Toujeo®) by 20%

Blood sugar above 10 mmol/L and negative ketones

- Give the usual dose of insulin

Blood sugar above 14 mmol/L with ketones

Give extra rapid-acting insulin every 3-4 hours around the clock until blood sugar is below 14 mmol/L or ketones are negative.

- If urine ketones are trace or small (+) or blood ketones are 0.6 to 1.4, use your usual method of correction for the high blood sugar (see your correction scale or correction factor).
- If urine ketones are moderate (++) to large (+++) or blood ketones are 1.5 or greater give **50% MORE** of your usual correction. To do this multiply your usual correction by 1.5. For example, if your usual correction for a blood sugar of 15.4 is 5 units of rapid acting insulin you would give 7.5 units ($5 \times 1.5 = 7.5$). If you don't have a half unit pen, round up to a full unit.

Page the diabetes nurse or endocrinologist on call if:

- You don't have a method of correcting high blood sugar or you are not sure how to give 50% more
- Your child still has ketones after 2 extra doses of rapid-acting insulin

What Can I Offer My Child to Eat and Drink?

Foods that have about 15 g carbohydrate		
<ul style="list-style-type: none"> • 1 slice of dry toast • 8 soda crackers • 3 graham wafers • ½ cup (125 mL) ice cream or sherbet 	<ul style="list-style-type: none"> • ⅓ cup (75 mL) pudding • ¾ cup (180 mL) cooked cereal • 1 cup (250 mL) soup 	<ul style="list-style-type: none"> • ½ cup (125 mL) regular flavoured yogurt • ½ cup (125 mL) unsweetened applesauce
Fluids that have about 15 g of carbohydrate		
<ul style="list-style-type: none"> • ¾ cup (180 mL) regular ginger ale • ½ cup (125 mL) regular Jell-O® • ½ popsicle • ½ cup (125 mL) regular Kool-Aid® or fruit punch 	<ul style="list-style-type: none"> • 1 cup (250 mL) Gatorade® or Powerade® • ½ cup (125 mL) fruit juice • 1 cup (250 mL) white milk • ½ cup (125 mL) flavoured milk 	
Fluids that have no carbohydrate		
<ul style="list-style-type: none"> • Water • Diet ginger ale • Diet popsicles 	<ul style="list-style-type: none"> • Sugar-free Jell-O® • Crystal Light®, Dasani®, Mio® • Clear broth 	
Diarrhea		
<ul style="list-style-type: none"> • If your child has diarrhea, use Pedialyte® or Lytren®. • Use juice, sports drinks, broth/consommé, or diet popsicles with caution, as they can make diarrhea worse. 		

Quick Review

BG less than 4.0 mmol/L	BG 4.0-10.0 mmol/L	BG 10.1-14.0 mmol/L	BG higher than 14.0 mmol/L		
			Check for urine or blood ketones		
	Vomiting, diarrhea, NOT eating	Vomiting, diarrhea, NOT eating	Ketones Urine: negative Blood: less than 0.6	Ketones Urine: positive Blood: 0.6-1.4	Ketones Urine: Positive Blood: more than <1.5
<ul style="list-style-type: none"> Decrease insulin Push sugar fluids CALL	<ul style="list-style-type: none"> Decrease insulin Push sugar fluids Call if: <ul style="list-style-type: none"> Dehydrated Vomits more than 2 times in 4 hours Lots of diarrhea 	<ul style="list-style-type: none"> Usual insulin Push sugar fluids Call if: <ul style="list-style-type: none"> Dehydrated Vomits more than 2 times in 4 hours Lots of diarrhea 	Eating or not eating, without vomiting: <ul style="list-style-type: none"> Usual insulin Push sugar-free fluids Call if: <ul style="list-style-type: none"> Dehydrated Vomits more than 2 times in 4 hours Lots of diarrhea 	Eating or not eating, without vomiting: <ul style="list-style-type: none"> Give extra insulin Push sugar-free fluids Call if: <ul style="list-style-type: none"> Dehydrated Vomits more than 2 times in 4 hours Lots of diarrhea Still has ketones after 2 extra doses of insulin 	Eating or not eating, without vomiting: <ul style="list-style-type: none"> Give extra insulin Push sugar-free fluids CALL Your child may have DKA
	No vomiting or diarrhea, and eating	No vomiting or diarrhea, and eating			
	<ul style="list-style-type: none"> Usual insulin Push sugar-free fluids 	<ul style="list-style-type: none"> Usual insulin Push sugar free fluids 			
Call (403) 955-7211: <ul style="list-style-type: none"> Weekdays 8 am to 4 pm: Ask for the diabetes nurse on call After hours, weekends, or holidays: Ask for the endocrinologist on call 					

