

Preventing and Managing Diabetic Ketoacidosis (DKA) in Adults

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When you are sick and have diabetes, your body can make hormones that break down fat for energy. This can make ketones. Ketones raise the acid levels in your blood. This can cause you to get very sick with diabetic ketoacidosis (DKA). Usually when you have ketones, your blood glucose is high. You may also have ketones when your blood glucose is not high.

DKA can happen in a person with diabetes who is sick or does not take enough insulin. **It is important to check both your glucose and your ketones when you are sick.** If you catch DKA early, you may be able to treat it successfully at home. DKA can become severe (very bad) or even life-threatening. If this happens, go to the Emergency Department right away.

- **NEVER stop taking your long-acting insulin even if you are not eating.**
- **DKA can happen if you forget to take insulin or do not give yourself enough insulin.**
- **When you are sick, you need to check your glucose more often.**
- **Know the early warning signs of DKA so you can check your ketones right away before you get really sick.**
- **If you have ketones, you must quickly give yourself more fast-acting insulin and drink more fluids.**
- **Usually your glucose will be high if you have ketones, but your glucose can also be low or normal. If you have ketones and your glucose is low, drink fluids with carbs and go to the nearest Emergency Department (ED).**

If you are sick and take a medication called an SGLT-2 inhibitor (such as empagliflozin, canagliflozin, dapagliflozin), stop taking it (even if you do not have ketones) until you are better. People on these medications can get DKA even if their glucose is normal, especially if they are sick, or have just had surgery.

Check for blood or urine (pee) ketones every 2 to 4 hours if:

- you are sick or wake up with a glucose of 14 mmol/L or more for no clear reason. **Do not wait until you have symptoms of DKA to check for ketones.**
- you have any symptoms of DKA, such as:
 - › nausea (feeling sick to your stomach)
 - › vomiting (throwing up)
 - › pains in your stomach or chest
 - › drowsiness or tiredness
 - › trouble breathing
 - › sunken eyes
 - › signs of dehydration (not enough fluids) like dry, cracked lips, or dry mouth or tongue
 - › breath that smells fruity (like nail polish remover)
- **your blood glucose is over 14 mmol/L for more than 3 hours.**

How do I check for ketones?

Blood ketones

- Using a ketone meter with blood ketone strips to test your blood is the most accurate (correct) way to check for ketones.
- **Follow the instructions on the package carefully.**

Urine ketones

- Dip a urine ketone test strip in a fresh sample of urine. Compare the colour change to the chart on the package of strips.

If your ketones are positive, follow the instructions on page 3 and the rest of the instructions in this pamphlet. But if at first, your glucose is over 14 mmol/L with small, trace, or no ketones, retest your glucose and ketones after 1 to 2 hours. If your blood glucose has not gone down by at least 3 mmol/L or the ketones have now turned positive, follow the instructions on page 3 and the rest of this pamphlet.

What to do if you are sick

S Sugar	I Insulin	C Carbs	K Ketones
<ul style="list-style-type: none"> • Check your blood glucose every 2 to 4 hours, or as needed. 	<ul style="list-style-type: none"> • Always take your long-acting insulin. Not taking your insulin could lead to DKA. 	<ul style="list-style-type: none"> • Drink lots of liquids. • If your glucose is high, drink sugar-free liquids. • If your glucose is low, drink liquids with carbs (sugar). 	<ul style="list-style-type: none"> • Check your blood or urine for ketones every 2 to 4 hours. • If you have ketones, take extra fast-acting insulin 3 to 4 hours apart.

Adapted from “Virus Alert!”, 2007, Building Connections: The Maestro Project Participant Newsletter, 30, p. 4. The Maestro Project. Adapted with permission.

Fluids

- You need to drink a **LOT** of fluids (1 to 2 cups every hour) if you have ketones because you will be dehydrated. If your glucose is high, drink sugar-free fluids like broth or unsweetened sports drinks so you get the salt and potassium that your body needs.
- If your glucose is dropping toward the normal range, you will need fluids with sugar to prevent low blood glucose.

When you have ketones:

Usual correction dose + extra illness dose = Total injection dose

Hydration plus extra fast-acting insulin is the best practice.

Preventing hypoglycemia (low blood sugar)

- Many people find that their blood glucose is high when they are sick, but some people find that it is low. **It is important to follow your meal plan as closely as possible when you are sick to prevent hypoglycemia.**
- If you are able to eat small amounts, but are not ready for your regular meal plan, eat 15 grams of carbs every 1 to 2 hours with some liquids.
Examples of 15 grams of carbs:
 - › 7 soda crackers
 - › 1 slice of toast
 - › 3 arrowroot biscuits
 - › 4 plain Melba toast crackers or salted crackers
 - › 2 digestive biscuits
 - › 7 Ritz® crackers
- If you are not able to eat, take 10 to 15 grams of carbs in liquid form **every hour. Examples of 15 grams of liquid carbs:**
 - › 3/4 cup regular pop
 - › 3/4 cup regular juice
 - › 1 regular popsicle (2 sticks)
 - › 1/2 cup regular Jell-O
 - › 1/2 cup regular Kool-Aid®
 - › 1 cup Gatorade Perform®
 - › 3/4 to 1 cup Powerade® **OR**
1 cup AllSport®
- **Read the label carefully to make sure the food has the amount of carbs you need.**

Insulin adjustment guidelines for sick days

To decide if you need extra fast-acting insulin and how much of it to take, you will need to know:

- › the amount of ketones that you have in your blood or urine.
- › your blood glucose (BG) reading.
- › your total daily dose (TDD) of insulin.

To calculate your extra fast-acting insulin doses when you are sick:

Step 1: Calculate your TDD of insulin.

To calculate your TDD of insulin, add up the number of units of insulin (all types) that you usually take each day. Now calculate YOUR TDD:

Time	Type of insulin	Amount of insulin

TDD:

Step 2: Based on your TDD from Step 1, calculate 5%, 10%, 15%, and 20% of your TDD. See examples below:

Total daily dose	5% of TDD	10% of TDD	15% of TDD	20% of TDD
16 to 25 units	1 unit	2 units	2 to 3 units	4 units
26 to 35 units	1.5 units	3 units	3.5 to 4.5 units	6 units
36 to 45 units	2 units	4 units	6 units	8 units
46 to 55 units	2.5 units	5 units	7.5 units	10 units
56 to 65 units	3 units	6 units	9 units	12 units

5% of _____ = _____ (your TDD)
10% of _____ = _____ (your TDD)
15% of _____ = _____ (your TDD)
20% of _____ = _____ (your TDD)

Step 3: If you are on insulin injections, use the chart below to find out how much extra fast-acting insulin you need to take, based on your ketones and blood glucose measurements.

Ketones			
Blood (mmol/L)	Urine*	Blood glucose (mmol/L)	Fast-acting insulin needed if you are on insulin <u>injections</u>
Less than 0.6	Negative	Less than 6	Lower usual dose 5 to 10% and drink sugar-containing fluids.
Less than 0.6	Negative	6 to 20	Usual correction dose.
Less than 0.6	Negative	More than 20	Usual correction dose PLUS 10% of TDD. If your glucose does not drop at least 3 mmol/L, give usual correction dose PLUS 10 to 15% of TDD.
0.6 or more	Positive (any value)	6 to 14	Usual correction dose PLUS 5 to 10% of TDD. Drink sugar-containing fluids to prevent hypoglycemia. If ketones do not drop, give usual correction dose PLUS 10% of TDD and go to the Emergency Department (ED).
0.6 to 1.4	Small (+)	14 or more	Usual correction dose PLUS 10% of TDD. If ketones do not drop, give usual correction dose PLUS 15% of TDD and go to the ED.
1.5 to 3	Moderate (++)	14 or more	Usual correction dose PLUS 15% of TDD. If ketones do not drop, give usual correction dose PLUS 20% of TDD and go to the ED.
Over 3	Large (+++/++++)	14 or more	Usual correction dose PLUS 20% of TDD. If ketones stay over 3 or large (+++/++++), repeat dose and go to the ED.

*Negative urine ketones: Trace or negative.

“Usual correction dose” means the dose you would normally give for that blood sugar. **The extra dose of fast-acting insulin is taken in addition to your usual correction dose of fast-acting insulin.**

If you take insulin injections:

Remember to take your usual dose of long-acting insulin (such as Basaglar™, Humulin®N, Lantus®, Levemir®, Novolin® NPH, Toujeo®, Tresiba®) at the usual time.

If you have an insulin pump:

- Remember that a poorly working infusion set or site that blocks insulin from flowing well is a common cause of DKA.
- Give injections of fast-acting insulin until your ketones are negative. **Do not rely on the pump.**
- If you have **blood ketones of at least 0.6 mmol/L OR positive urine ketones**, give an **injection** of 1.5 times your usual correction dose (figured out by pump calculator), and **change your infusion set, site, and insulin.**
- Keep checking your glucose and ketones every 2 hours until the ketones become negative. **If the ketones do not drop in 2 hours, repeat the injection and go to the nearest ED.**
- If your glucose is below 14 mmol/L, drink fluids with carbs.
- If you do not have ketones but your blood glucose is over 20 mmol/L, give the usual correction dose through the pump. If the glucose does not drop at least 3 mmol/L within 2 hours, and even if the ketones are still negative, give 1.5 times the usual dose by injection then change your infusion set, site, and insulin.
- **You may need to use the temporary basal rate feature on your pump if you are sick for more than one day.**

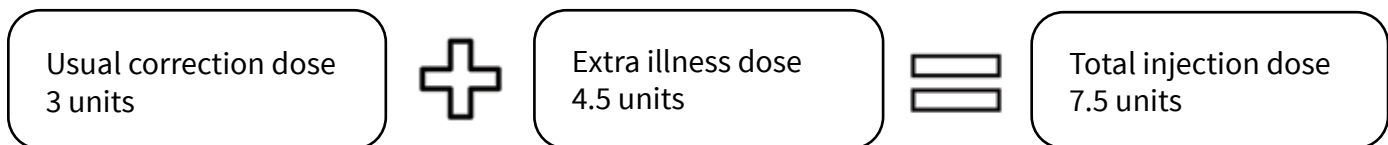
Key points for everyone:

- If the ketones continue to stay positive, give repeated doses of insulin every 3 to 4 hours as outlined above until the blood ketones become less than 0.6 mmol/L or the urine ketones become trace or negative. More than 1 dose of insulin may be needed.
- Keep checking your glucose and ketones every 2 to 4 hours until you are better and the ketones turn negative.
- **Do not go to bed with high glucose or ketones without a plan to get up and recheck them overnight.**
- Make sure that your ketone strips, glucose strips, and insulin are not expired.
- **Do not eat until your ketones turn negative and your sugars are better.**

When you have ketones:

Usual correction dose + extra illness dose = Total injection dose
Hydration plus extra fast-acting insulin is the best practice.

Example: A person on insulin injections with a TDD of 30 units has 2.1 blood ketones and their glucose is 18 mmol/L. According to the chart on page 6, they need 15% of their TDD **in addition to** their usual correction dose. They would normally take 3 units of fast-acting insulin for a glucose of 18 mmol/L.



Go to the nearest Emergency Department if:

- › you feel very sick.
- › you have taken 1 to 2 extra doses of insulin, but your blood glucose and ketones are not lower.
- › you have taken 1 to 2 extra doses of insulin, but your blood ketones are still over 3 mmol/L or your urine ketones are still large (+++/++++).
- › you have vomited more than once in 4 hours or the vomiting will not stop.
- › you have had severe diarrhea (loose, watery poop) for more than 4 to 8 hours or the diarrhea will not stop.
- › you are severely dehydrated (dry, cracked lips, dry mouth or tongue).
- › you start having severe stomach pains.
- › you cannot keep down liquids.
- › you cannot keep your blood glucose over 6 mmol/L.
- › you are drowsy or confused.

These are guidelines only — you can make changes based on your experience with sick days or advice from your health care team.

Looking for more health information?

Find this pamphlet and all our patient resources here: <https://library.nshealth.ca/PatientEducation>

Contact your local public library for books, videos, magazines, and other resources.

For more information, go to <http://library.novascotia.ca>

Connect with a registered nurse in Nova Scotia any time: call 811 or visit <https://811.novascotia.ca>

Learn about other programs and services in your community: call 211 or visit <http://ns.211.ca>

Nova Scotia Health Authority promotes a smoke-free, vape-free, and scent-free environment.

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www.nshealth.ca

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The information in this pamphlet is to be updated every 3 years or as needed.

