

DiABETES



Agenda

- Understanding Type 2 Diabetes
- Diabetes and Hypoglycemia
- Sick Day Management

What is Diabetes?

- To put it simply...Diabetes occurs when the body is unable to regulate the amount of glucose (sugar) in the blood resulting in high blood glucose levels
- Diabetes is a chronic, often debilitating and sometimes fatal disease, in which the body either cannot produce insulin or cannot properly use the insulin it produces

- There are different factors that determine why there is not enough insulin or no insulin production, and those factors determine the diagnosis
 - Type 1
 - Type 2
 - Gestational diabetes
 - Other types of diabetes

How the Body Processes Sugar

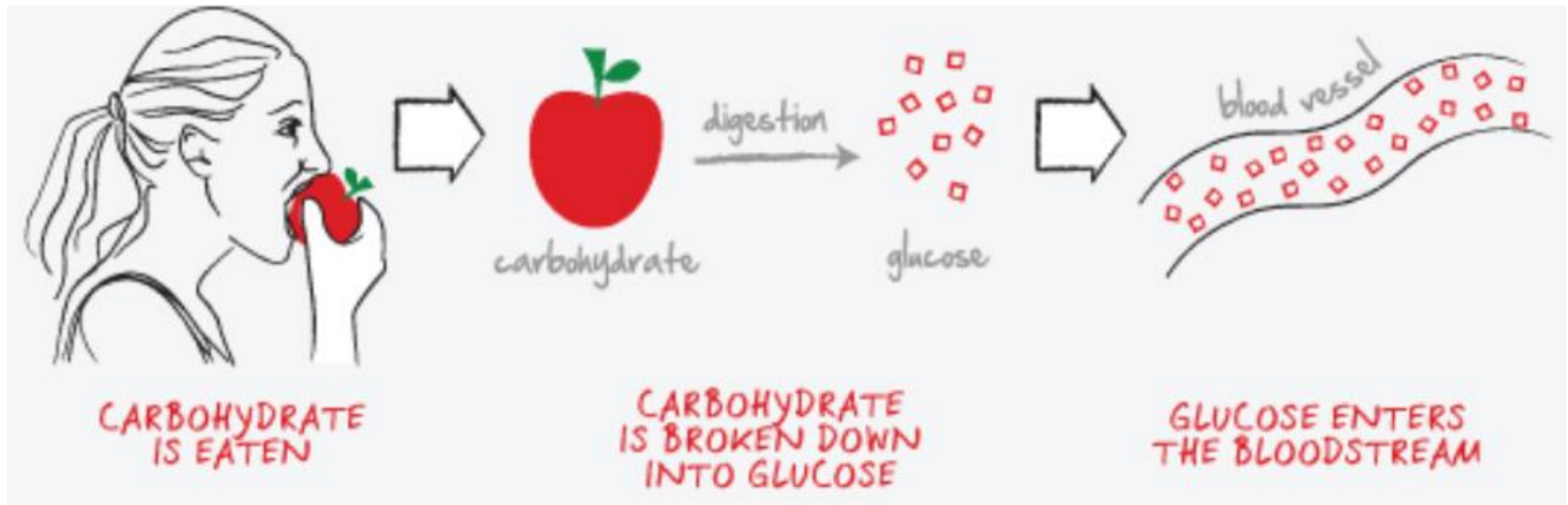
- It is important to understand what is supposed to happen in the body, and what is different in people with diabetes
- Sugar, also known as glucose, is an important and necessary fuel for the body
- So necessary, that both the liver and the kidneys produce it naturally; however, we get the most sugar from the foods we consume
- The levels of glucose in the blood are controlled by a hormone called insulin

What is Insulin?

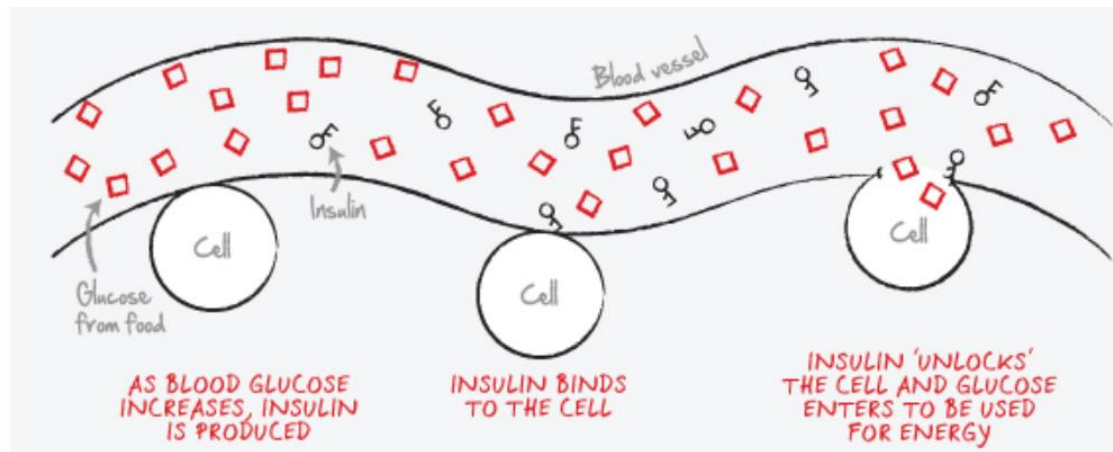
- Insulin is a hormone that is produced by the beta cells and is continuously released into the blood stream
- Beta cells are found in the pancreas, which is an organ located behind the stomach
- Insulin removes glucose from the blood and transports it into the cells of the body where it is needed for energy
- Insulin also regulates the production of glucose by the liver and switches off production when the BG is high

Pathophysiology

- When food is eaten, it is digested in the stomach and intestines where it is broken down into glucose and then absorbed into the blood stream



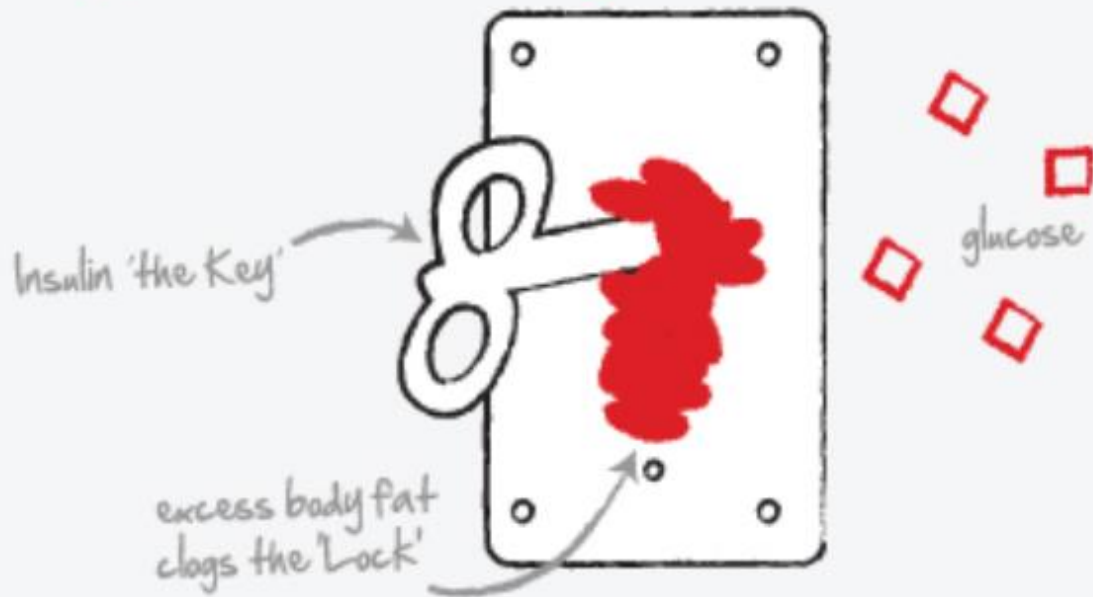
- As the BG level increases, insulin is produced in response
- Each cell has a 'door' (receptor) that can allow glucose to enter
- The door is locked until insulin arrives as the key to 'unlock' it
- When insulin is present, and the door is opened, glucose can enter the cell to be used as fuel



Diabetes Explained

- With diabetes, glucose is unable to travel into the cells due to a **lack of insulin** or **insulin resistance**
- This means too much glucose remains in the blood, causing high BGs
- Excess body fat 'clogs' the lock, making it harder for the insulin to open the door
- By losing weight, it is easier for the insulin to do its job

THE 'DOORWAY' TO THE CELLS



Types of Diabetes

1. Type 1 diabetes
2. Type 2 diabetes
3. Gestational diabetes
4. Other types

Type 1 Diabetes

- Occurs when the immune system mistakenly attacks and kills the beta cells of the pancreas
- Very little or no insulin is released into the body
- As a result, sugar builds up in the blood instead of being used as energy
- About 5% to 10% of people with diabetes have type 1 diabetes
- Generally develops in childhood or adolescence, but can develop in adulthood
- Is **always** treated with insulin

Gestational Diabetes (GDM)

- Is a temporary condition that causes glucose intolerance during pregnancy
- Screening occurs at 24-28 weeks of pregnancy, however women who have risk factors may be screened earlier
- It affects approximately 2% to 4% of all pregnancies
- Involves an increased risk of developing diabetes for both mother and baby
- Elevated maternal glucose levels can lead to pregnancy complications and poses risks to the health of the baby
- Can be managed by diet, exercise and/or medications/insulin

Type 2 Diabetes

- Occurs when the body can not properly use the insulin (called insulin resistance) or does not make enough insulin
- A **dual defect** of resistance to the action of insulin combined with an inability to make enough insulin to overcome the resistance
- Type 2 diabetes is the most common form of diabetes and represents 80% to 90% of diabetes worldwide
- Usually diagnosed in adulthood
- Can be managed by diet, exercise and/or medications/insulin

Diagnosis of Diabetes

FPG ≥ 7.0 mmol/L

or

A1C $\geq 6.5\%$ (in adults)

or

2hPG in a 75 g OGTT ≥ 11.1 mmol/L

or

Random PG ≥ 11.1 mmol/L

Hypoglycemia



What is Hypoglycemia?

- Also called low blood glucose or low blood sugar, occurs when blood glucose drops below 4 mmol/L
- Considered a medical emergency
- It is important to **prevent, recognize** and **treat** hypoglycemia

It is safer and more effective to prevent hypoglycemia than to treat it after it occurs

Severity of Hypoglycemia

- **Mild**
 - Autonomic symptoms present (trembling, sweating, hunger, palpitations)
 - Individual is able to self-treat
- **Moderate**
 - Autonomic and neuroglycopenic symptoms (confusion, dizziness, weakness, difficulty concentrating)
 - Individual is able to self-treat
- **Severe**
 - Requires the assistance of another person
 - Unconsciousness may occur
 - Plasma glucose is typically <2.8 mmol/L

When Blood Sugar Is Too Low



What can cause it?

- Too little food or carbohydrates
- Skipped or delayed meals
- More active than usual
- Too much insulin or too many diabetes pills

How do you feel?

- Hungry
- Angry/tense
- Sick to stomach
- Light-headed
- Clammy/sweaty/pale
- Shaky
- Tired

Does everyone feel the same?

- People have different symptoms
- Some people have no symptoms at all

Who Should be Concerned?

- Can happen to anyone who takes insulin or taking any of the medications listed to the right
 - Insulin of any kind
 - Glyburide
 - Gliclazide
 - Glimeperide
 - Repaglinide
 - Nateglinide
 - Combination medications that contain any of these
- If not taking insulin or any of the medications listed, there is a very small chance of having hypoglycemia

Treating Hypoglycemia

Recognize and Confirm

- If experiencing the signs of hypoglycemia, BG immediately
- If no meter is available, it is important to treat the symptoms anyway...it is better to be safe than sorry!

Treat

The Rule of 15...Eat or drink 15g of a fast-acting carbohydrate

- 15g of glucose tablets
- 15ml (1 tbsp) or 3 packages of sugar dissolved in water
- 175ml (3/4 cup) of juice or regular pop
- 15ml (1 tbsp) honey
- 8 jelly beans
- 2 pkgs of "rockets" or 5 jumbo "rockets"

Recheck

Wait **15 minutes** and check BG again...if still low

- Treat again with 15g of fast-acting carbohydrate and rerecheck in 15 minutes (this may need to be done more than once)

******It is important to avoid overtreatment of hypoglycemia, since this can result in rebound hyperglycemia and weight gain ******

Eat

- Once blood glucose is $> 4\text{mmol/L}$, have usual meal or snack that is due at that time of the day
- If next meal in more than 1 hour away or planning on being active, eat a snack containing 15g of carbohydrates with some protein

Treatment of Severe Hypoglycemia

If BG is $<2.8\text{mmol/L}$ and conscious:

1. **Treat** with 20 g of fast-acting carbohydrate
2. **Recheck** in 15 minutes to ensure the $\text{BG} > 4.0\text{ mmol/L}$ and retreat with a further 15 g of carbohydrate if needed
3. **Eat** usual snack or meal due at that time of day or a snack with 15 g carbohydrate with some protein

Diabetes and Driving

Diabetes can affect driving performance due to:

- Chronic complications which impair sensory or motor function (retinopathy, neuropathy, amputation, vascular disease)
- Transient cognitive dysfunction or loss of consciousness from antihyperglycemic medication-induced hypoglycemia
 - Primarily related to insulin or insulin secretagogues
- Other medical disorders associated with type 2 diabetes such as sleep apnea

Driving Guidelines



Safe blood glucose (BG)
prior to driving = Over 5.0 mmol/L
to drive

Consider measuring your blood glucose
level immediately before driving

Driving Continued

If BG is <4 mmol/L prior to driving:

- Follow low treatment guidelines
- Should not drive until at least 40 minutes after successful treatment of hypoglycemia has increased BG level to at least 5 mmol/L

If BG is 4 to 4.9 mmol/L prior to driving

- Have a small carbohydrate snack before driving and ensure that BG ≥ 5 mmol/L

While Driving



- If hypoglycemia is suspected, stop the vehicle in a safe location
- Treat low BG
- Remember to remove keys from ignition
- Always carry blood glucose meter and have a quick sugar and carbohydrate within easy reach

Should not drive until at least 40 minutes
after effective treatment

Important Points

- Consider measuring BG level immediately before and at least every 4 hours while driving or wear a continuous glucose monitoring system (CGMS)
- Consider checking BGs more frequently if there are factors that may increase the risk of hypoglycemia
- History of recurrent severe hypoglycemia or hypoglycemia unawareness, must measure BG immediately before and at least every 2 hours while driving or wear CGMS

The best way to treat hypoglycemia is to avoid it!




Diabetes Canada Clinical Practice Guidelines


www.guidelines.diabetes.ca – for health-care providers

1-800-BANTING (226-8464)


www.diabetes.ca – for people with diabetes

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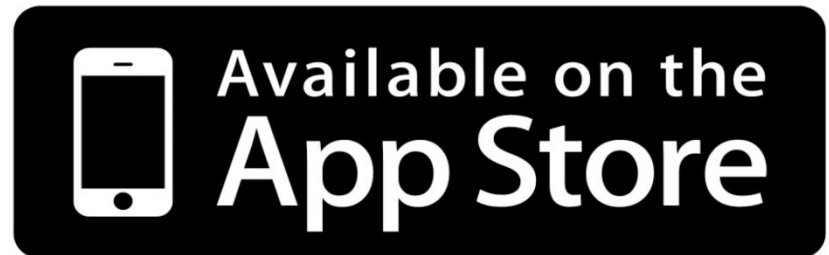
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guidelines.diabetes.ca





Type 2 Diabetes: Sick Day Management

Illness may make managing BGs more challenging

Be prepared and know how to manage
diabetes during illness

What Happens During Illness

- The body reacts by releasing hormones to fight infection
- These hormones raise BG levels and at the same time make it more difficult for insulin to lower BGs
- With diabetes, a minor illness can lead to dangerously high BGs
- This may cause **life-threatening** complications, such as
 - Type 1: diabetic ketoacidosis (DKA)
 - Type 2: hyperosmolar hyperglycemic state (HHS)

Diabetic Ketoacidosis (DKA)

- Most common among patients with type 1 diabetes
- There is not enough insulin and as a result are unable to use glucose for energy
- When glucose cannot be used, the body burns fat which produces ketones
- Ketones are toxic to the body and can cause weakness, fatigue, weight loss, stomach pain, rapid breathing, nausea and vomiting
- DKA must be treated immediately! Failure to do so may lead to coma and death

Hyperosmolar Hyperglycemic State (HHS)

- Is a state of extreme hyperglycemia, marked dehydration, serum hyperosmolarity, and altered mental status
- Buildup of ketones in the body (ketoacidosis) may also occur, but it is unusual and is often mild compared with DKA
- More often seen in people with type 2 diabetes who do not have their diabetes under control. It may also occur in those who have not been diagnosed with diabetes.

How to Manage Sick Days: Think SICK

S = Sugar/BG checking

I = Insulin/Medication

C = Carb and Food

K = Ketones (Type 1 diabetes)

S = BG Checking

- Check BGs every 2 to 4 hours when blood sugars are high (above 14 mmol/L) or more often if needed
- Target BG levels can be 'relaxed' a little during illness.
- Discuss target BG goal during an illness with health care team
- Keep a record of BG readings

I = Insulin/Medication

- Never omit basal insulin, even if eating is greatly diminished
- Often extra rapid acting or short acting insulin is needed especially if BGs are elevated or ketones are present
- However, if experiencing low BGs you may need to reduce your insulin dose(s)
- Take usual diabetes medication, unless instructed otherwise by HCP...Remember SADMANS

C = Carb and Food

- The body needs carbohydrates for energy and to balance with insulin/medications
- Follow usual meal plan if possible or
 - choose lighter foods to provide about the same amount of carb as missed meal or snack
- If only able to eat a small amount, focus on consuming carb containing foods

- If unable to eat solid food, replace uneaten food with carb containing fluids to provide about the same amount of carb as your missed meal or snack
- It is not necessary to drink all the fluid at once: Sip 1 portion of carb-containing fluids (~15 grams of carb each) every hour throughout the day

Sick Day Foods and Fluids

Drink plenty of fluids to stay hydrated.

- Illness, vomiting, diarrhea, fever and high blood sugar can lead to dehydration.
 - As the body tries to get rid of extra sugar, urination increases
 - Dehydration can make you even sicker
-
- If BG is below 14 mmol/L, have both sugar-containing and sugar-free fluids
 - If BG is 14 mmol/L or more, have sugar-free fluids

K = Ketones

- Ketones are a sign that you are burning lots of fat for energy and need more insulin
- Most people with type 2 diabetes do not need to check for ketones

When to Call the Doctor?

- A BG that stays lower than 4 mmol/L for two consecutive readings and does not respond to hypoglycemia treatment
- A BG that stays higher than the level the doctor recommended for two or more readings and does not respond to increased insulin and fluids
- Symptoms of dehydration, such as dry mouth and or dark urine
- Difficulty breathing
- Chest pain
- High fever (greater than 38 C or 100.40 F)

- Cold, infection or flu that is getting worse
- Diarrhea that is ongoing or getting worse
- Vomit 2 times or more in a 6 hour period OR take type 2 medication and/or insulin and are unable to eat or drink due to vomiting
- Symptoms of DKA such as abdominal pain, vomiting, rapid breathing, fruity-smelling breath, or severe drowsiness
- Moderate or large amounts of ketones in the urine or a high level of blood ketones

Medication Adjustment

If unable to maintain adequate fluid intake, or have an acute decline in renal function (e.g. due to GI upset or dehydration), hold medications that will:

1. Increase risk for a decline in kidney function:
 - ACE inhibitor • ARBs • Direct renin inhibitors • NSAIDs •
 - Diuretics • SGLT2 inhibitors
2. Have reduced clearance and increase risk for adverse effects:
 - Metformin • Sulfonylureas

Think SADMANs

S sulfonylureas

A ACE-inhibitors

D diuretics, direct renin inhibitors

M metformin

A ARBs (angiotensin receptor blockers)

N non-steroidal anti-inflammatory

S SGLT2 inhibitors

Thank you!

