



Diabetes Self-Management Education and Support



Module 4 Taking Medication



In This Module You Will:

- Recognize how diabetes medications help manage diabetes.
- Identify how to correctly take prescribed medications.
- Explain how to store insulin and other diabetes medications.
- Recognize possible side effects of diabetes medications.
- State what to do when a dose of diabetes medication is missed.
- Recognize other medications that are protective with diabetes.



Diabetes Medications

Medications help you reach your blood glucose goals. Together with your healthcare team, decide what blood glucose range is best for you. Nutrition, exercise, and medications are all tools to help you manage your diabetes and meet your goal/goals.

In Type 2 diabetes, weight management, healthy eating, and regular physical activity may decrease your insulin resistance. Initially, you may be able to manage your diabetes without medication, but medications may be necessary as your diabetes progresses.

Your healthcare provider will make medication recommendations for you based on your age, your lifestyle, other health conditions such as heart disease and/or reduced kidney functions along with drug interactions.

Know the following about your medications:

- Name(s) of medication(s)
- When and how often to take medication(s)
- When medication(s) begins to work and how long it is effective
- How to store and discard your medication or supplies properly
- When medication(s) expire
- Possible drug side effects
- Drug or food interactions
- What to do if you miss a dose

Tips for Taking Medications Safely

- Never stop taking medication without first talking to your provider.
- If you experience any side effects, talk to your healthcare team. You may need a change in the dose or timing of your medication, or a different medication.
- Keep a current list of your medications, dosages, when to take, and the reason you take them.
- Tell your provider about all prescription medications, over-the-counter medications, dietary supplements or vitamins that you take.
- Talk about any allergies you have and tell your provider if you are breastfeeding or pregnant.

Why Do I Need Medication?

Most people eventually require some type of medication(s) to keep their blood glucose in a safe range.

For Type 1 diabetes, insulin is always required.

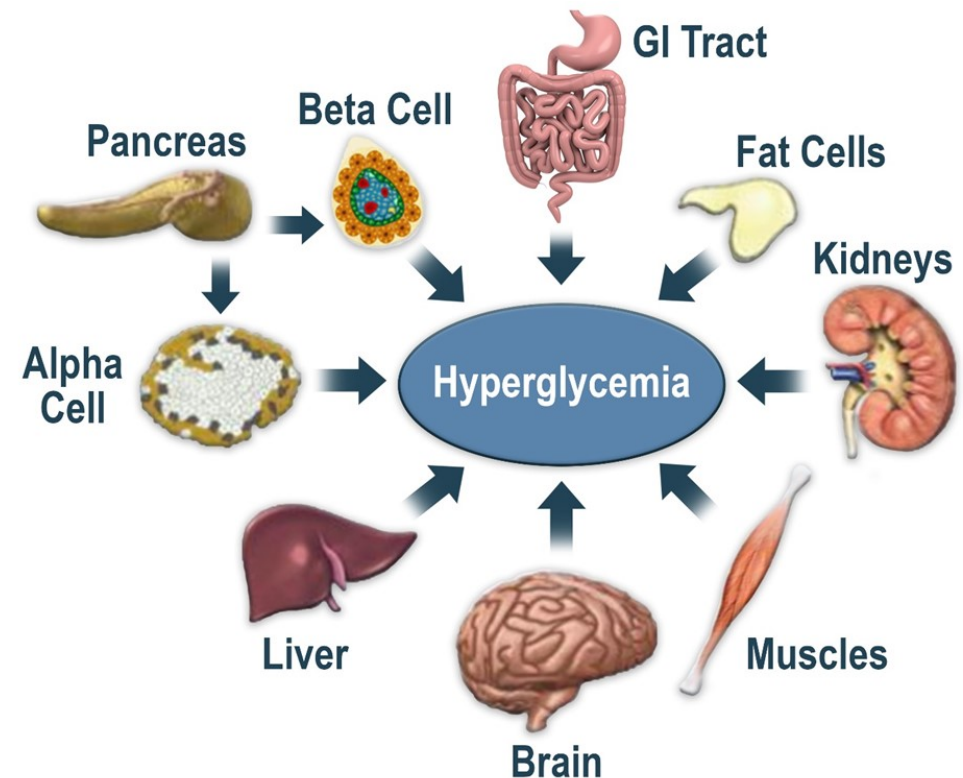
For Type 2 diabetes, oral medications, non-insulin injectable medications, and/or insulin may be used. Oral medications and non-insulin injectable medications help your body to use your own insulin better. Metformin is usually the first oral medication prescribed.

Often individuals will require more than one medication to manage blood glucose levels.

Eventually, your body may not be able to make enough insulin on its own and insulin injections may be necessary.

Work with your provider to determine what combination of medications will work best for you. It is important to tell your healthcare provider if your medication(s) make you feel sick or if you are having any other problems.

All diabetes medications work best when you eat healthy foods and participate in regular physical activity.



What Medication Am I Most Likely to Take?

Oral Medications	How It Works	Side Effects	Tips
Drug class: Biguanide Metformin (oral)	- Helps fasting (morning) glucose readings - Limits the liver from making too much glucose - Makes tissue more sensitive to insulin - Reduces cardiac risks	Upset stomach or diarrhea (The body usually adapts, and the symptoms will go away after a few weeks)	- Take with food to reduce side effects - Begin with a lower dose and increase slowly - If you miss more than a couple days of medication make sure you restart at a lower dose to avoid side effects. - Talk to your provider if having a test with contrast dye since special precautions may need to be taken.
Drug class: Sulfonylureas Glimepiride Glipizide Glyburide (oral)	- Tells the body to make and release more insulin - Helps lower after meal glucose	- Low blood glucose - Weight gain	- Works best if taken up to 30 minutes before eating - Doses must be taken at least 6 hours apart to avoid hypoglycemia. - Considered second line-therapy - Not recommended if >65 years of age. - Discuss with your provider or Pharmacist what to do if you skip or miss a meal
Drug class: DPP4 Inhibitors Alogliptin Linagliptin Saxagliptin (oral)	- Tells the body to make more insulin for meals - Decreases the amount of glucose made by the body	- Low blood glucose (rare) - Allergies (rash) - Sinus congestion and headaches - Joint pain/stiffness diffuse not one specific joint	- May be taken with or without food - Safe to use in combination with other medications. - Considered weight neutral or may promote weight loss.

Other Medications

Oral Medications	How It Works	Side Effects	Tips
Drug class: SGLT2 Inhibitors Canagliflozin Empagliflozin Ertugliflozin (oral) Dapagliflozin (oral)	- Causes glucose to exit the body in the urine - Protects the heart and kidney	- Dehydration - Yeast Infection - Urinary Tract Infection - Diabetic ketoacidosis with a normal glucose	- With this medication, do not follow a ketogenic diet - May cause mild weight loss and lowering of BP - Get regular lab work drawn for electrolytes - Hold medication at least 3 days before scheduled surgery - Stay well hydrated
Drug class: GLP-1 Agonists Liraglutide Dulaglutide Semaglutide Exenatide Tirzepatide (injection/oral)	- Causes the body to make more insulin for meals - Stops body from making too much glucose - Slows stomach emptying (helps feel fuller faster) - Helps lower after meal glucose - Evidence shows cardiovascular benefits	- Redness or pain at the injection site - Nausea or vomiting - Abdominal pain (rare) possibly caused by pancreas inflammation - Hypoglycemia if taken with sulfonylureas or insulin	- Depending on medication, may be given daily or once a week - May facilitate weight loss - May have skin bumps with Exenatide, disappear after a few weeks - Stop eating when full. Nausea and vomiting usually caused by overeating - If you experience severe abdominal pain, go to the emergency room
Drug class: TZDs Pioglitazone Rosiglitazone	- Makes tissue more sensitive to insulin - Stops body from making too much glucose	- Weight gain - Increased fluid retention and swelling that may heart failure worse - Increased risk of fractures in people who are already at risk	- May take up to 12 weeks to see effect - Do not use if you have heart failure - Liver function must be monitored regularly - Decrease effectiveness of birth control pills (pioglitazone only)

Other Medications

Oral Medications	How It Works	Side Effects	Tips
Drug class: Alpha- glucosidase Inhibitors Acarbose Miglitol	• Delays breakdown of some carbohydrates • Helps lower after meal glucose	• Nausea • Flatulence • Abdominal cramping	• With this medication, do not use sugar or candy to treat low blood glucose • Correct low glucose with glucose tablets, glucose gel, juice or skim milk
Drug class: Amylin (injection)	• Inhibits glucagon secretion • Delays gastric emptying	• Nausea/vomiting • Headache • Low blood glucose	• Used only in Type 1

List of Diabetes Medications I am Taking:



What if I Have to Take Insulin?

If your body does not produce enough insulin, you may need to inject insulin.

There are different types of insulin. There are long-acting ("basal") insulins and rapid-acting ("meal-time") insulins.

Insulin is given as an injection using a syringe, a pen-like device, or an insulin pump. A member of your healthcare team will teach you about the insulin you will be taking, what device to use, what dosage, when to give the injection, and when to monitor blood glucose. It is important to monitor your blood glucose according to your provider's instructions. This will help establish if you are on the right dose and if not, the information will be used by your provider to make necessary changes.

Insulin Myths

MYTH - Being on insulin means I am a failure.

TRUTH - Type 2 diabetes is a progressive disease and at some point your body may require insulin by injection.

MYTH - Insulin injections are painful.

TRUTH - The needles used to give insulin are very small, thin, and hurt less than most lancets used with a glucose monitor.

MYTH - Insulin must always be stored in the refrigerator.

TRUTH - Until a bottle of insulin or insulin pen is used, it should be stored in the refrigerator. Once it is used, the bottle of insulin or insulin pen can be kept at room temperature for a specified period of time. (See package insert.) Any unused insulin left in vial or pen cartridge must be thrown out once the specified time has lapsed.

MYTH - Insulin means my life will be worse.

TRUTH - You will still be independent, able to travel and eat out. Most people feel so much better with improved glucose levels.

What is Insulin?

Insulin is a hormone made in the pancreas by beta cells. Insulin is needed to help the body's cells use the glucose in the blood-stream for energy. In diabetes, the pancreas either makes no insulin (as in type 1 diabetes) or does not make enough for what the body needs (as in type 2 diabetes). Insulin resistance (in type 2 diabetes) means that although the pancreas may still make insulin, the body does not use the insulin efficiently, and so more is needed.

Without enough insulin, the glucose stays in the bloodstream and the cells will go without the fuel they need to function. Insulin moves the glucose from the bloodstream into the cells, which causes the blood glucose level to drop. The amount of glucose in the blood can be measured with a blood glucose monitor or continuous glucose monitor (CGM). By checking blood glucose, a person who takes insulin can tell if he or she is getting the right amount.



There are many different types of insulin that are available on the market and there are several ways to administer insulin. Talk with your provider to see which insulin works best with your lifestyle.

The most common side effect with insulin is low blood glucose. Refer to **Module 1—Diabetes in a Nutshell**. Symptoms of low blood glucose (also called hypoglycemia) include dizziness, blurriness, rapid heart rate, confusion, shakiness, and sweating. Note, certain medications might cause some of these symptoms, so it is important to pay attention to how you feel. If you experience a low blood glucose, it is important to verify and treat immediately to get your glucose back up into your target ranges. Remember not to overtreat.

Following the “Rule of 15” is the best way to treat a low blood glucose. Refer to **Module 1- Diabetes in a Nutshell**.

Common Insulins Used

If you experience frequent hypoglycemia, speak with your provider.

Gently roll vial or pen before drawing up and giving the dose.

Insulin	How It Works	Dose	Side Effects	Tips
Basal Glargine (Lantus and Toujeo) Degludec (Tresiba) Detemir (Levemir) (injection)	- Long lasting - Starts working in 1-4 hours and lasts approximately 24 hours - Acts like the constant, steady release of insulin that happens throughout the day in someone without diabetes - Lowers fasting glucose	Usually dosed once daily but dose can be split to twice daily	- Low blood glucose - Weight gain - Rash - Edema - Injection site reactions	- Take at the same time each day, whether you eat or not - Keep unused vials and pens refrigerated until opened - Vials and/or pens are good for 28 days at room temperature once opened - If you experience frequent hypoglycemia, speak with your provider
Meal Time Aspart (Novolog) (injection/inhaled) Glulisine (Apidra) Lispro (Humalog) (injection)	- Rapid acting - Starts in 10-20 minutes and peaks in 1-2 hours - Acts like the rapid release of insulin that occurs in response to food intake in someone without diabetes - Helps lower after meal glucose	Taken within 15 minutes of a meal or with the first bite of food	- Low blood glucose - Weight gain - Rash - Edema - Injection site reactions	- Do not take if not eating - May be used as a correction dose based on pre-meal blood glucose readings - Keep unused vials and pens refrigerated until opened - Vials and/or pens are good for 28 days at room temperature once opened
Intermediate NPH (Humulin N and Novolin N) (Injection)	- Intermediate acting - Starts working in 1-4 hours with peak activity at 4-14 hours - Can last up to 24 hours	Dose must be individualized based on patient's A1C goals	- Low blood glucose - Weight gain - Rash - Edema - Injection site reactions	- Keep unused vials and pens refrigerated until opened - Vials and/or pens are good for 28 days at room temperature once opened - If you experience frequent hypoglycemia, speak with your provider - Gently roll vial or pen before drawing up and giving the dose

Common Insulins Used

If you experience frequent hypoglycemia, speak with your provider.

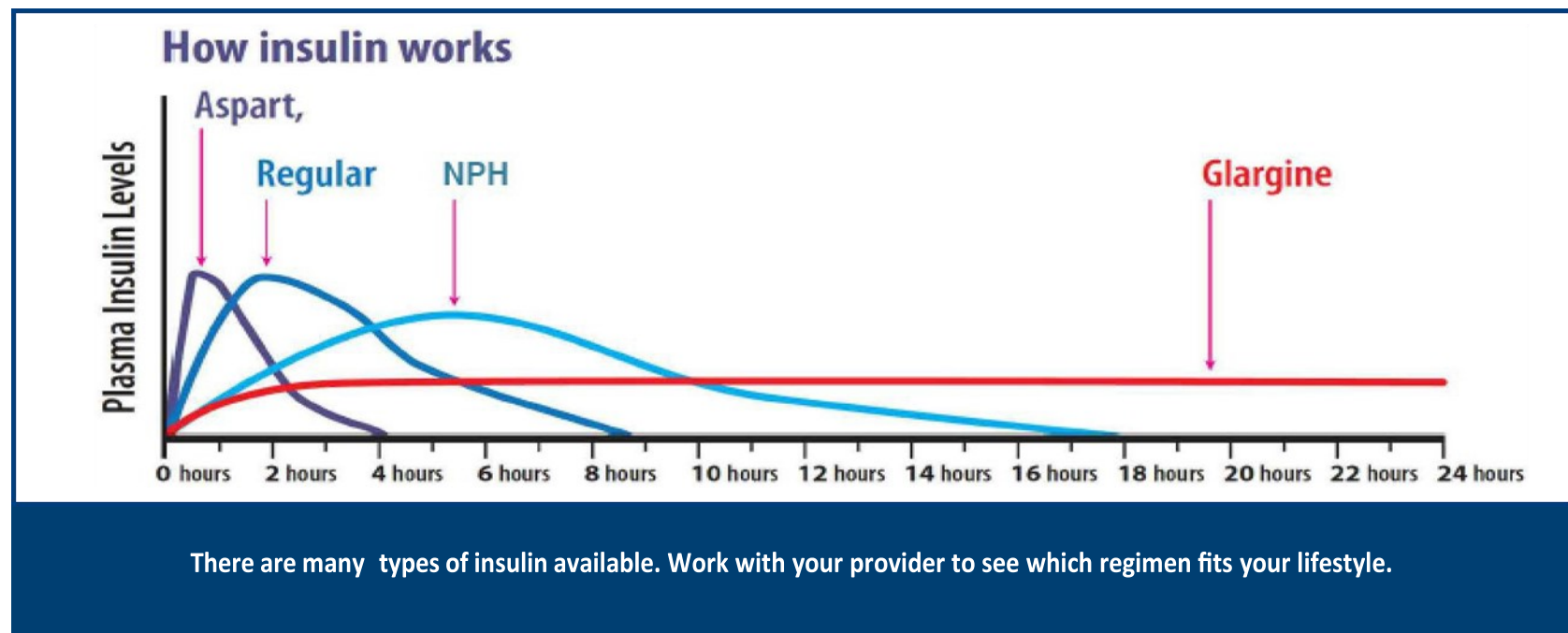
Gently roll vial or pen before drawing up and giving the dose

Insulin	How It Works	Dose	Side Effects	Tips
U500 (Concentrated Insulin) (Injection)	- Concentrated insulin that is 5x the concentration of U100 - Typically used if patient is very insulin resistant - Action is similar to NPH	Dose is individualized according to insulin needs May be given 1-4 times a day	- Low blood glucose - Weight gain - Rash - Edema - Injection site reactions	- Pen device preferred method for ease of dosing /Vial and syringe require special training before use - Keep unused vials and pens refrigerated until opened - Vials are good for 40 days/Pens for 28 days at room temperature once opened - If you experience frequent hypoglycemia, speak with your provider
Regular Insulin (Humulin R and Novolin R) (injection)	- Short acting - Starts in 30 minutes - Peak concentration at 2-5 hours - Can last up to 5-8 hours	Taken within 30 minutes before a meal	- Low blood glucose - Weight gain - Rash - Edema - Injection site reactions	- Keep in refrigerator until opened - Vial: good for 28 days once opened - Pen: good for 28 days at room temperature once opened. - If you experience frequent hypoglycemia, speak with your provider.
“Pre-mixed” Insulin Novolog 70/30 (injection)	- Short or rapid acting insulin combined with NPH (intermediate acting) insulin - Starts in 10-20 minutes - Peak concentration about 1-4 hours - Can last up to 24 hours	Taken within 15 minutes before a meal	- Low blood glucose - Weight gain - Rash - Edema - Injection site reactions	- Keep in refrigerator until opened - Vial: Good for 28 days once opened - Pen: Good for 14 days at room temperature once opened Always check manufacturer instruction for storage details for all insulins.

How Insulin Works

Insulin is classified by how long it works in the body. The diagram below represents the 4 main categories of insulin.

- Rapid-acting (aspart)
- Short-acting (regular)
- Intermediate-acting (NPH)
- Long-acting (glargine)



Type and names of Insulins	How does it work and why do I need this kind of insulin?	When do I take and how much do I take?	How long does it last?	What else do I need to know?
Long-acting (or “basal insulin”)  Lantus® (glargine)  Toujeo® (glargine)  Semglee® (insulin glargine biosimilar)  Levemir® (detemir)  Tresiba® (degludec)	Basal insulin works all day long in most people, a little at a time. It helps your body maintain normal blood sugar throughout the day, even if you are not eating. The body needs basal insulin because sugar from the liver is always entering the bloodstream.	Taken once or twice daily. Should be taken at the same time each day. Does not have to be timed with food. Do not adjust dose if blood sugar is abnormal at the time of dose. Doses should be adjusted based on patterns as discussed with your provider.	Basal insulin lasts for about 24 hours in the bloodstream. It begins working a few hours after it is taken.	Do not skip your basal insulin when you are not eating or are sick (although you may need a reduced dose).
Rapid-acting or short-acting insulin (“bolus”)  NovoLog® (aspart)  Humalog R® (lispro)  Apidra® (glulisine)  Admelog® (lispro)	Bolus insulin is designed to meet the body’s needs in relation to the surge of sugar that enters the blood when we eat. It can also be used to correct a high blood sugar, since it works quickly. When used for correction, bolus insulin is typically added to a meal-time dose.	Bolus insulin is usually taken just before you eat, with each meal. Your mealtime dose may vary depending on the meal and how much you eat. Correction dose will vary depending on pre-meal blood sugar and should be added to your mealtime dose (NOT usually taken between meals)	Bolus insulin lasts anywhere from 3 to 6 hours, depending on the person. Begins working quickly (in about 5 -15 min).	For mealtime insulin, you should skip a dose if you are skipping that meal. If your provider wants you to use correction insulin, follow the correction scale that he or she will give you.

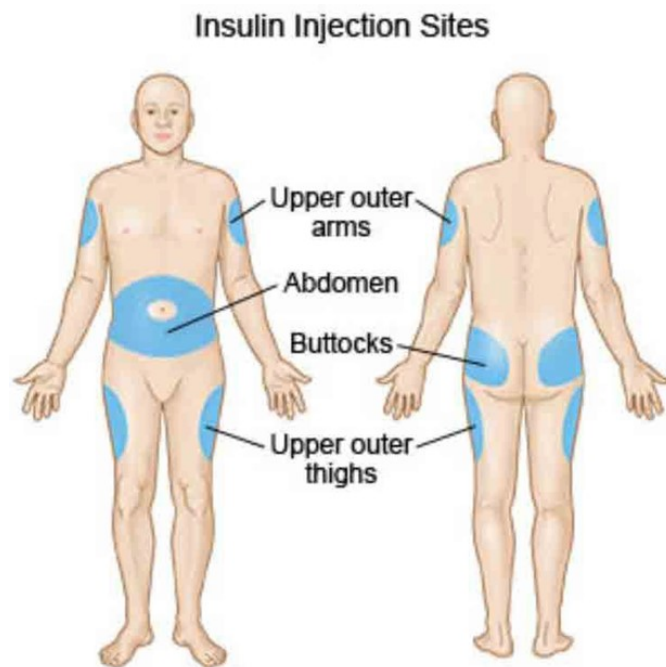
Type and names of Insulins	How does it work and why do I need this kind of insulin?	When do I take and how much do I take?	How long does it last?	What else do I need to know?
Intermediate acting insulin Humulin N (NPH)  Novolin N (NPH)	Bolus insulin is designed to meet the body's needs in relation to the surge of sugar that enters the blood when we eat. It can also be used to correct a high blood glucose, since it works quickly. When used for correction, bolus insulin is typically added to a meal-time dose.	Bolus insulin is usually taken just before you eat, with each meal. Your mealtime dose may vary depending on the meal and how much you eat. Correction dose will vary depending on pre-meal blood glucose and should be added to your mealtime dose (NOT usually taken between meals)	Bolus insulin lasts anywhere from 3 to 6 hours, depending on the person. Begins working quickly (in about 15 min).	For mealtime insulin, you should skip a dose if you are skipping that meal. If your provider wants you to use correction insulin, follow the correction scale that he or she will give you.
Short-acting insulin Humulin R (regular)  Novolin R (regular) 	Bolus insulin is designed to meet the body's needs in relation to the surge of sugar that enters the blood when we eat. It can also be used to correct a high blood glucose, since it works quickly. When used for correction, bolus insulin is typically added to a meal-time dose.	Bolus insulin is usually taken just before you eat, with each meal. Your mealtime dose may vary depending on the meal and how much you eat. Correction dose will vary depending on pre-meal blood glucose and should be added to your mealtime dose (NOT usually taken between meals)	Bolus insulin lasts anywhere from 3 to 6 hours, depending on the person. Begins working quickly (in about 15 min).	For mealtime insulin, you should skip a dose if you are skipping that meal. If your provider wants you to use correction insulin, follow the correction scale that he or she will give you.

Injection Sites

Insulin and other injectable diabetes medications should be injected into the fat layer between the skin and the muscle. This is called a subcutaneous injection.

There are many places on the body that can be used for a subcutaneous injection.

It is important to rotate your injection sites; this helps prevent scar tissue and allows the insulin to absorb better. Your provider will help you identify the best places for you to inject.



AVOID BELLY BUTTON AREA

Insulin cannot be taken as a pill because it will be destroyed in your stomach

Using Insulin Needles or Syringes

- Only use a needle ONCE to inject insulin.
- Every VA and DOD facility is different, some will accept a medical sharps container and provide you with a new one.
- Sharps and medical disposal vary from state to state. In many states, you can place sharps in a heavy plastic or metal container. Check with your local waste removal to find out how to dispose of your needles and syringes.

Storing Your Insulin

- Check storage guidelines for your insulin. This is usually in the product package insert or can be obtained from your pharmacy.
- Once a vial or insulin pen is opened, mark it with the date that it should be discarded. Read the product insert.
- Unopened insulin should be stored in a refrigerator at a temperature of 36 - 46° F. Do not freeze.
- Opened insulin may be stored at room temperature below 86° F.
- Never use insulin beyond the expiration date stamped on the vial, pen, or cartridge.
- Keep insulin out of direct sunlight and away from heat or extreme cold.



Diabetic Ketoacidosis (DKA)

This is a serious problem that can happen to people with diabetes. DKA is having high ketones and high blood glucose. DKA must be treated as a medical emergency because it can lead to coma or death.

DKA is caused by not having enough insulin in the body. It can worsen in a few hours if you are vomiting or dehydrated.

Symptoms include:

- ♦ Extreme nausea and vomiting
- ♦ Rapid breathing
- ♦ Extreme fatigue
- ♦ Extreme thirst
- ♦ Belly pain

If you have symptoms of DKA, you must call 911 or get help right away.

Treatment will include insulin, fluids, electrolytes, and possibly other medications.



Blood Pressure Medications

You might have to take a blood pressure medication in addition to making lifestyle changes. Blood pressure medications can work several different ways to keep blood pressure at a healthy level.

Blood pressure medications can:

- Help your body get rid of water, which decreases the amount of water and salt in your body
- Relax your blood vessels
- Make your heart beat with less force
- Block nerve activity that can restrict your blood vessels

There are two types of drug classes – the **Angiotension-Converting Enzyme (ACE Inhibitor)** and the **Angiotension II Receptor Blocker (ARB)**. Both medications lower blood pressure and can protect the kidneys. Your provider will order labs regularly since these medications may cause higher potassium levels. The ACE Inhibitor may also cause a dry, persistent cough.

You may need to take more than one medication to control your blood pressure. Your provider or healthcare team will know the best treatment for you.

Do not stop taking your blood pressure medication without talking to your provider or healthcare team. Stopping your medication can be dangerous.

Do not use Ibuprofen if prescribed a blood pressure medication.

Cholesterol Lowering Medications

For some, a healthy diet and exercise may prevent or treat unhealthy cholesterol levels. For others, a cholesterol lowering medication may also be needed.

Work with your provider or healthcare team to develop a treatment plan that is best for you.

The drug class known as HMG CoA Reductase Inhibitors or “**Statins**” works in the liver by decreasing cholesterol from forming thus reducing the amount of cholesterol circulating in the blood. Statins are most effective at lowering Low Density Lipoproteins (LDL) or “lousy” cholesterol. They also help lower triglycerides (blood fats) and raise High Density Lipoproteins (HDL) or “healthy” cholesterol.

Some statins may cause muscle pain and abnormal liver enzymes. Your provider will order lab tests each year to keep an eye on your liver. If you are experiencing any muscle pain, make sure to discuss this with your provider or healthcare team. Do not stop taking your medications.

When taking a statin, avoid eating grapefruit.

Some statins work best if taken at night. Your provider or healthcare team will know the best treatment for you.

Summary

This session explained how medications help manage diabetes, the importance of taking prescription medications correctly, and how to appropriately store medications. Module 4 also reviewed possible side effects of diabetes medications and what to do if a medication dose is missed. Other medications that have protective heart and kidney mechanisms were also discussed.

Key Points

- There are a variety of medications you may be prescribed to manage your diabetes.
- Do not stop taking a medication without talking to your healthcare team.
- Keep a list of all current medications including the doses and the time to take them.
- Remember to properly store and dispose of your medications
- Your healthcare team will work with you to determine the type, timing, and doses for your medications.
- Be aware of potential side effects and discuss with your provider if you are having any symptoms.
- Monitoring blood glucose, blood pressure, and weight can help evaluate the effectiveness of some medications.
- Ask your healthcare team if you have any questions.



Before Next Class

- Review **Module 5: Healthy Eating**
- Write down your questions
- Work on your healthcare goal or changing a habit/behavior

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The American Diabetes Association Recognizes this education service as meeting the National Standards for Diabetes Self-Management Education and Support

If you have any concerns about the diabetes education you receive

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