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IT ALL ADDS UP:
DIABETES PREVENTION & MANAGEMENT
video series produced by the
Angelina County & Cities Health District (ACCHD).

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MODULE IV: DIABETES MONITORING DEVICES AND TREATMENT (MEDICATIONS)

SECTION I

BLOOD GLUCOSE MONITORING

Objectives:

1. To increase understanding of the importance of blood glucose monitoring in maintaining the health of people who have diabetes.
2. To motivate residents of Angelina County who have diabetes to monitor their blood glucose regularly.

At the end of this section, you should be able to:

1. Say what blood glucose monitoring is
2. Explain why you have to monitor your blood glucose
3. Say the times when you should check your blood glucose
4. Name at least one type of blood glucose monitor
5. Say what the A1C test is
6. List the times when you should get an A1C test done
7. Say what your A1C goal should be
8. Demonstrate how to check your blood glucose using a glucometer using the 5 steps from the CDC

I. What is blood glucose monitoring[5]?

Blood glucose monitoring is checking your blood glucose on a regular basis. Your blood glucose changes throughout the day. Your blood glucose is affected by what you eat, the medications you take and physical activities you do among other things. Checking your blood glucose helps you to avoid highs and lows which can impact your health. It can help you to determine which foods cause a greater increase in your blood glucose so you can have less of that food[5].

II. When should you check your blood glucose?

Your diabetes care plan which you and your care providers will create will include when and how often to check your blood glucose. Blood glucose can be checked when you wake up before eating or drinking anything, 2 hours after a meal and at bedtime[9]. People who take insulin and those who have low blood glucose frequently may be required to check their blood glucose more often, including before and after being physically active[9]. The CDC list blood glucose target ranges as 80 to 130 mg/dL before meals and below 180 mg/dL after meals.

People who have diabetes also need to have their A1C checked at least twice per year in addition to monitoring their blood sugar on a regular basis[5].

III. Types of blood glucose monitors

Monitoring provides your health care providers with the information to create or adjust your care plan. Blood glucose is monitored using a monitoring device which can be a blood glucose meter (glucometer) or a continuous glucose monitor (CGM)[6]. Which blood glucose monitor you choose depends on whether you have health insurance coverage and how much coverage you have, your personal preference, lifestyle, the type of diabetes you have, affordability as well as other factors.

1. Blood Glucose Meter (BGM)

A blood glucose meter (glucometer) is a device used to check glucose level in blood. A device (lancet) is used to stick your finger to get blood, and a test strip is used to collect the blood. A display area shows the blood glucose reading[6]. Some BGM may use an app on your phone to track your blood glucose levels. It is important to keep a record of your blood glucose either in your phone or by writing it down.

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2. Continuous Glucose Monitor (CGM)

Continuous Glucose Monitor (CGM) are worn continuously by the patient. They work by sensing the glucose level every few minutes and sending it to a recording device (app on a phone, a reader, or a receiver)6. People who use CGM to monitor their blood glucose should also check their blood glucose using a blood glucose meter (BGM) every day to ensure that the CGM readings are accurate9.

3. A1C Test (hemoglobin A1C)7, 8

- Used to diagnose prediabetes, diabetes, and monitor blood glucose management
- Measures your average blood sugar levels over the past 3 months
- Should be checked at least twice per year
- Also called - hba1c, hemoglobin a1c, glycated hemoglobin, and glycosylated hemoglobin test.
- Is recorded as a percentage
- Results – what the ranges mean
  - Normal: below 5.7%
  - Prediabetes: 5.7% to 6.4%
  - Diabetes: 6.5% or above
- 7% or less should be the goal for most people who have diabetes
- Result may be inaccurate if the patient has:
  - Severe anemia
  - Kidney failure
  - Liver disease.
  - Certain blood disorders like sickle cell anemia or thalassemia.
  - Is on certain medicines, including opioids and some hiv medications.
  - Experienced recent blood loss or blood transfusions.
  - The patient is in early or late pregnancy

IV. How to check your blood glucose

You can check by pricking your fingertip and using your glucometer to measure your blood glucose level or by using your continuous glucose monitor (CGM). Read the user manual for instructions on how to use your glucometer. Your health care team can teach you how to use a glucose monitor5. It is important that people around you (family, friends, a trusted coworker) know how to use your glucometer in case they have to check your blood sugar in an emergency[5].

The following information and Instructions on how to monitor your blood sugar is from the CDC.

V. How to use a blood glucose meter[5]

1. Check to make sure your meter is ready to use (has batteries or is charged).
2. Wash your hands with soap and warm water, and dry well before each test.
3. Massage or shake out your hand to get blood into your fingers.
4. Use a lancet to prick your finger. Squeezing from the base of the finger gently place a small amount of blood onto the test strip.
5. Place the strip in the meter. After a few seconds, the blood sugar reading will appear.
6. Track and record your results. You may want to keep notes about anything that might have affected your reading.
7. Dispose of the lancet and strip in a trash container.
8. Do not share blood sugar monitoring equipment, especially lancets, with anyone, even other family members.

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Helpful Tips

- "When your hands are cold, this could restrict the blood flow to your fingertips. If you have trouble getting enough blood on the test strip, try warming up your hands before you wash them"[5].
- "Test strips can be damaged if exposed to moisture, humidity, or extreme temperatures. Keep the container closed tightly when you're not using your test strips and be mindful where you store them"[5].

MODULE IV: DIABETES MONITORING DEVICES AND TREATMENT (MEDICATIONS)

SECTION II:

DIABETES MEDICATIONS[1]

Objectives

1. To educate the residents of AC about the types of medications that are used to treat diabetes
2. To raise awareness about the importance of knowing about the side effects of diabetes medications and what to do if someone is experiencing them.

At the end of this section, you should be able to:

1. Say why it is important to be compliant with your treatment (take your medications the way they are prescribed)
2. Explain why you need to go to your follow-up appointments
3. Explain the benefits of the diabetes medications you are taking
4. Be able to recognize side effects of the medications you are taking

If you have diabetes, you are probably taking medication to manage it. Which medicines you are prescribed depends on the type of diabetes you have, whether you have other chronic diseases, and if that medication works well at controlling your blood glucose[1]. Your ability to afford the medication, access to insurance, who your health care provider is, and your lifestyle may determine what medicine you take for your diabetes[1]. If you have type 1 diabetes you must take insulin. If you have type 2 diabetes, lifestyle changes may help you control your blood glucose[1]. If you have type 2 diabetes and take medications to control your blood glucose and would like to use lifestyle changes to help reduce the amount or type of medications you take, talk with your care provider[1].

I. Oral medications (medications taken by mouth)

You probably take metformin pills for your type 2 diabetes. It is the oral treatment that is most prescribed. It also comes in liquid form. Metformin works by helping your body to use the insulin that it produces and reduces the amount of glucose that your liver produces[1].

Other oral medications reduce blood glucose through different mechanisms. Sometimes more than one diabetes medicine may be needed to manage blood glucose in an individual[1].

Type 2 diabetes may be treated with insulin under certain circumstances, such as during pregnancy or hospitalization.

The information in this section was put together using the information from the FDA document titled "Diabetes Medicines"[1]. All the side effects or warnings for each medicine are not listed here. Please speak with your doctor and pharmacist about the specific medicines prescribed to you.

- **Meglitinides**
  - What do they do? They help your body make more insulin when you eat.
    Brand name: Prandin Generic name: repaglinide
    Brand name: Starlix Generic name: nateglinide
  - Common side effects: hypoglycemia
  - Before staring, inform your doctor if:
    You have liver or kidney problems
    You are pregnant or breastfeeding.

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- **Alpha-Glucosidase Inhibitors**
  - What do they do? Help your body slow the digestion of sugar
    Brand name: Glyset Generic name: miglitol
    Brand name: Starlix Generic name: acarbose
  - Common side effects: stomach pain, diarrhea, gas, abnormal liver tests
  - Before staring, inform your doctor if:
    You have heart, liver, kidney problems
    You are pregnant or breastfeeding

- **Thiazolidinediones**
  - Brand name: Actos Generic name: pioglitazone
  - Brand name: Avandia Generic name: rosiglitazone
  - Common side effects: Fluid retention, weight gain, heart failure, anemia, upper respiratory tract infection
  - Before staring, inform your doctor if:
    You have heart failure
    You have heart problems
  - Additional Information
    You are more likely to suffer fracture (have broken bones) while taking Thiazolidinediones.
    If you are in perimenopause and have irregular periods or no periods you are more likely to become pregnant while taking Thiazolidinediones so talk with your doctor about birth control choices if you are taking Actos.

- **DPP- 4 Inhibitors**
  - What do they do? They help your body release more insulin
  - Brand name: Januvia Generic name: sitagliptin
  - Brand name: Onglyza Generic name: saxagliptin
  - Brand name: Nesina Generic name: alogliptin
  - Brand name: Tradjenta Generic name: linagliptin
  - Common Side Effects: Upper Respiratory Infection, headache
  - Additional Information:
    Vomiting and severe stomach pain may be a sign of a very serious side effect so call your doctor right away if you have these.

- **Sulfonylureas**
  - What do they do? They help your body make more insulin
  - Brand name: Amaryl Generic name: glimepiride
  - Brand names: Diabeta, Glynase Generic name: glyburide
  - Brand name: Diabinese Generic name: chlorpropamide
  - Brand name: Glucotrol, Glucotrol XL (extended release) Generic name: glipizide
  - No brand name: Generic name: tolbutamide
  - No brand name Generic name: tolazamide
  - Common side effects: Hypoglycemia, weight gain, headache, dizziness
  - Before staring, inform your doctor if:
    You have heart, liver, or kidney problems.
  - Additional Information
    Hypoglycemia more likely to be a side effect in older adults with kidney or liver problems

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- **Biguanides**
  - What do these medications do in your body? They stop your liver from making too much sugar (glucose). They also help the sugar get into your cells.
  - Brand name: Fortamet Generic name: metformin
  - Brand name: Glucophage Generic name: metformin
  - Brand name: Glucophage XR (long-lasting extended release) Generic name: alogliptin
  - Brand name: Glumetza Generic name: metformin
  - Brand name: Riomet Generic name: metformin
  - Common side effects: Diarrhea, indigestion, nausea/vomiting, gas, feeling weak, headache
  - Before staring, inform your doctor if:
    - You have problems with your kidneys
    - You drink a lot of alcohol

  Additional Information: A rare side effect, lactic acidosis (a buildup of acid in the blood) may happen in people who have kidney problems and people who drink a lot of alcohol.

- **Dopamine Receptor Agonists**
  - What do these medications do in your body? The pills act on dopamine in your cells but it is not clear how they work.
  - Brand name: Cycloset Generic name: bromocriptine
  - Common side effects: nausea, headache, feel very tired, feel dizzy, vomiting.
  - Before staring, inform your doctor if:
    - Breastfeeding. This medication cannot be taken if you are breastfeeding.

- **Bile Acid Sequestrants**
  - What do these medications do in your body? Though they treat diabetes it is not clear how they work.
  - Brand name: Welchol Generic name: colesevelam
  - Common side effects: constipation, dyspepsia (upset stomach/indigestion), nausea
  - Before staring, inform your doctor if:
    - You are taking other cholesterol medications as it is also used to treat high cholesterol.

- **SGLT2 Inhibitors**
  - What do these medications do in your body? They cause the kidneys to increase the amount of sugar that it excretes
  - Brand name: Farxiga Generic name: dapagliflozin
  - Brand name: Invokana Generic name: canagliflozin
  - Brand name: Jardiance Generic name: empagliflozin
  - Brand name: Steglatro Generic name: ertugliflozin
  - Common side effects: vaginal yeast infections, urinary tract infections, changes in urination
  - Before staring, inform your doctor if:
    - You have kidney or liver problems
  - Additional Information
    - You cannot take these medicines if you have severe kidney problems or are on dialysis.

- **Combination Medicines**
  - These are a combination of two types of medicines. An example of a combination medicine is Glucovance (glyburide and metformin).

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II. Injectable Medications

- GLP-1 Receptor Agonists
  - These medicines are injected under your skin. They are not to be used instead of insulin.
  - Possible side effect: nausea when you start taking the medication
  - Brand name: Adlyxin Generic name: lixisenatide
  - Brand name: Bydureon Generic name: exenatide
  - Brand name: Byetta Generic name: exenatide
  - Brand name: Ozempic Generic name: semaglutide
  - Brand name: Tanzeum Generic name: albiglutide
  - Brand name: Trulicity Generic name: dulaglutide
  - Brand name: Victoza Generic name: liraglutide

- **Amylin Analog**
  - This medicine is injected under your skin. It is not to be used instead of insulin.
  - Brand name: Symlin Generic name: pramlintide acetate
  - Additional Information
    Symlin can also be used by people who use insulin.
    It can be used by people who have type 1 diabetics.
    Symlin should not be mixed with insulin in the same injection.
    It is usually taken before meals.
    Nausea may happen in some people when they start taking this medicine.

III.Medication side effects

You may experience side effects when you take medications for diabetes. Pay attention to the information provided with your medication. Talk with your health care provider and pharmacist about possible side effects of your medications[1].

It is important to tell your care provider about any problems you are having with your medications as you may need to have the dosage changed or the medication discontinued[1].

The FDA provides current safety information on medications.

To see the full document and learn more about diabetes medicines you may click on the following link.
https://www.fda.gov/media/119148/download

MODULE IV: DIABETES MONITORING DEVICES AND TREATMENT (MEDICATIONS)

SECTION III

INSULIN

Objectives

1. To educate participants about insulin administration
2. To help residents of Angelina County understand how their behavior or the state of their health can affect how their body uses insulin.

At the end of this section, you should be able to:

1. Name at least three types of insulin
2. List at least three ways you can take insulin
3. Name the four places on your body where you inject insulin
4. Say some of the things that affect how your body uses insulin.

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I. Types of insulin

There are different types of insulin as well as different ways of taking it, and different things that affect how your body uses it. The types of insulin are listed below.

- Rapid-acting/ultra rapid-acting
- Rapid-acting, inhaled
- Regular, also called short-acting
- Intermediate-acting
- Long-acting
- Ultra long-acting
- Premixed insulin

II. Ways you can take insulin

Ways you can take insulin include using:

- Needle and syringe
- Insulin Pen
- Insulin Pump
- Inhaler
- Jet injector
- Artificial pancreas

III. Where on your body can you inject insulin?

The sites are:

- Belly – insulin works fastest when injected here.
- Thigh
- Buttocks
- Upper arm

It is important that you alternate injection sites on your belly, so the tissues do not harden.

IV. Things that affect how your body uses insulin

They are:

- How active you are
- Your diet (What you eat and drink)
- Age and lifestyle
- Illnesses

If you take insulin, it is important for you to have a have a sick day plan and create a sick day kit.

To learn more about planning for sick days you may click on the following link.
https://diabetes.org/getting-sick-with-diabetes/sick-days

To learn more about Insulin, Medicines, & Other Diabetes Treatments
https://www.niddk.nih.gov/health-information/diabetes/overview/insulin-medicines-treatments#oral

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MODULE IV: DIABETES MONITORING DEVICES AND TREATMENT (MEDICATIONS)

SECTION IV

HYPERGLYCEMIA

Objectives

1. To raise awareness of the importance of being prepared to handle episodes of hyperglycemia
2. To help people who have diabetes understand the importance of treating hyperglycemia to prevent Diabetic Ketoacidosis (DKA).

At the end of this section, you should be able to:

1. Explain what hyperglycemia is.
2. List the symptoms of hyperglycemia.
3. List some of the causes of hyperglycemia.
4. Say what to do if your blood glucose is high.
5. Say what DKA is.
6. List some of the causes of DKA.
7. List some of the symptoms of DKA.
8. Say when to test for ketones.
9. Say what to do if you have a moderate or high amounts of ketones in your urine.
10. Say when you need to call Emergency Medical Services (EMS).

I. Symptoms of high blood glucose (hyperglycemia) 3

Hyperglycemia happens when the body can't use insulin properly or does not produce enough insulin[3].
Symptoms of hyperglycemia are:

- High blood glucose
- Frequent urination
- Increased thirst
- High levels of glucose in the urine[3]

II. Causes of hyperglycemia in people who have diabetes3

- Not giving yourself enough insulin if you have type 1 diabetes
- You produce enough insulin, but it is not as effective as it should be because you have type 2 diabetes.
- Eating more than you should have or exercising less than you planned to
- You are stressed due to illnesses such as a cold or flu.
- Other types of stress such as conflicts in the family, problems at school, and dating problems
- The dawn phenomenon

III. How do you treat high blood glucose3?

- You can exercise to lower your blood glucose level.
- If your blood glucose is above 240 mg/dL check your urine for ketones.
- Do not exercise if there are ketones in your urine as doing so may cause your blood glucose to increase. It must be treated immediately to prevent diabetic ketoacidosis (diabetic coma).[3]

IV. Diabetic ketoacidosis (DKA)[10]

Diabetic ketoacidosis is a very serious and possibly life-threatening complication of diabetes. It develops when there isn't enough insulin in your body to allow blood glucose into your cells to be used for energy, so your liver has to break down fat for fuel. This produces acids which are called ketones. If too many ketones are produced at

a fast pace they can increase to dangerous levels in your body. DKA usually takes a while to develop which allows you to respond before it gets serious and life threatening. The first symptoms you are likely to experience are frequent urination and being very thirsty. When left untreated more severe symptoms can come on really fast[10]. These symptoms include:

- Fast, deep breathing.
- Dry skin and mouth.
- Flushed face.
- Fruity-smelling breath.
- Headache.
- Muscle stiffness or aches.
- Being very tired.
- Nausea and vomiting.
- Stomach pain.[10]

V. Causes of Diabetic Ketoacidosis[10]

DKA can result from very high blood sugar and low insulin levels. The most common causes:

- Illness
- Did not get enough insulin – missed a dose, insulin pump clogged, wrong dose taken[10]

Other things that may result in DKA include:

- Heart attack or stroke.
- Physical injury, such as from a car accident.
- Alcohol or drug use.
- Certain medicines, such as some diuretics (water pills) and corticosteroids (used to treat inflammation in the body).[10]

VI. When should you test for ketones?[10]

You should test for ketones when:

- You are sick
- Your blood sugar is above 240
- If you have one or more symptoms of DKA

VII. What should you do if you have moderate or high amounts of ketones in your urine?

Call your doctor right away as elevated ketones may mean that you are developing DKA.[10]

If you can't get in touch with your doctor:

- Seek immediate attention if your ketones are elevated.
- Go to the emergency room or call 911 immediately if you can't get in touch with your doctor and you are experiencing any of these:
  - Your blood sugar stays at 300 mg/dL or above.
  - Your breath smells fruity.
  - You are vomiting and can't keep food or drinks down.
  - You're having trouble breathing.
  - You have multiple signs and symptoms of DKA.[10]

More information Diabetic ketoacidosis can be found at:
https://www.cdc.gov/diabetes/about/diabetic-ketoacidosis.html

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To prevent hyperglycemia[3] (high blood glucose):

- Manage your diabetes by following your treatment plan.
- Learn how to tell when your blood sugar is high so you can treat it early.

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SECTION V

HYPOGLYCEMIA

Objectives

1. To raise awareness of the importance of being prepared to handle episodes of hypoglycemia.
2. To educate people on how to prevent and treat hypoglycemia.

At the end of this section, you should be able to:

1. Explain what hypoglycemia is.
2. List some of the symptoms of hypoglycemia.
3. List some of the causes of hypoglycemia.
4. List some of the ways to prevent hypoglycemia.
5. List the steps in treating hypoglycemia.
6. Say what to do if your blood glucose is low and you take medications that slow digestion.

I. Hypoglycemia[2]

- Is also called low blood glucose and low blood sugar.
- Results from a drop in your blood glucose to an unhealthy level.
- Is a blood glucose reading lower than 70mg/dl.
- Is more likely to happen in people who have type 1 diabetes.
- Is more likely to happen in people who have type 2 diabetes and take insulin or some other types of medication for it.

II. Symptoms of hypoglycemia[2]

Low blood glucose symptoms may be mild to moderate or severe[2].

Mild to moderate symptoms include:

- Hunger
- Tiredness
- Dizziness, lightheadedness, confusion, feeling irritable
- Change in heart rate (heart beating too fast or irregular)
- Headache
- Blurry vision or inability to speak clearly[2]

Severe symptoms are very serious and must be treated immediately. They include:

- Loss of consciousness
- Seizures[2]

III. Causes of low blood glucose in people who have diabetes[2]

- Taking more insulin than you should.
- Diabetes pills (sulfonylureas, meglitinides) – side effect of some diabetes medications.
- Not eating or drinking enough carbohydrates.
- Fasting.
- Doing more physical activity than usual.

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- Consuming too much alcohol and not eating enough food.
- Being sick.[2]

IV. How you can prevent low blood glucose if you have diabetes[2]

Actions that may help people who take insulin or other medications that lower blood glucose to prevent low blood glucose include:

- Have your blood glucose level checked by your health care provider
- Have a glucometer on hand or wear continuous glucose monitor (CGM) if you have low blood sugars often
- Have a regular eating plan that includes enough carbohydrates to keep your blood glucose in target range
- Checking your blood sugar before, during and after physical activity and eating a snack before the activity to prevent low blood sugar
- Adjusting your diabetes care plan with your health care providers

V. What to do if your blood glucose is low[2]?

Check your blood glucose if you are having symptoms of low blood glucose. If your blood glucose is below 70 mg/dL or below your target level[2]:

1. You should eat or drink 15 to 20 grams of glucose or carbohydrate immediately then wait for 15 minutes. Examples of things that contain 15 to 20 grams of carbs are:
   - Four glucose tablets or one tube of glucose gel.
   - ½ cup (4 ounces) of fruit juice – not low-calorie or reduced-sugar juice. If you have kidney disease, don't drink orange juice because it has a lot of potassium. Apple, grape, or cranberry juice are good options.
   - ½ can (4 to 6 ounces) of soda – not low-calorie or reduced-sugar soda.
   - 1 tablespoon of sugar, honey, or corn syrup2.
2. After the 15 minutes are up, check your blood glucose again. If your blood glucose is not 70 mg/dL or above or back in your target range, eat or drink another 15 to 20 grams of glucose or carbs and wait for 15 minutes[2].
3. Check your blood glucose again. Repeat (eat or drink 15-20 grams of carbs, wait 15 minutes and check your blood glucose) until your blood glucose is within your target range[2].
4. If your next scheduled meal is more than an hour away you should have a snack (crackers, fruit) to keep your blood glucose within a healthy range[2].

VI. Low blood glucose in persons who take medicines that slow digestion[2]

People who take diabetes medications that cause their digestion of carbohydrates to slow down to keep their blood glucose from rising too high after they eat, should take glucose tablets or glucose gel immediately if they have low blood glucose. Other carbohydrate sources will not raise your blood sugar quickly enough.

To learn more about low blood glucose in people who have diabetes you may click on the link below.
www.niddk.nih.gov/health-information/diabetes/overview/preventing-problems/low-blood-glucose-hypoglycemia

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