



Stanford Hospital
and Clinics

Stanford University Medical Center



Transplant
Diabetes
Program

TRANSPLANT DIABETES CLASS



Learn how good blood sugar control will benefit you through your transplant process!



- This class is especially for people who are waiting for or have received a Transplant and also have Diabetes



TRANSPLANT DIABETES PROGRAM:

- Discuss how blood sugars and diabetes affect the outcome of your transplant
- Learn and strategize ways to improve blood sugar control
- Meet people:
 - Who are part of the Transplant Diabetes Team
 - Who are in the Transplant process and have Diabetes





- Your Transplant Diabetes Team members include:
 - Certified Diabetes Educator (CDE)
 - Transplant Pharmacist (PharmD)
 - Transplant Registered Dietitian (RD)
 - Transplant Nurse Coordinator (RN)



WHAT IS DIABETES ?

- **Diabetes is a disease in which the body cannot make enough of or use insulin properly**
- **A normal blood sugar is about 70 – 110 mg/dl**



- Your Pancreas makes insulin.
- If your pancreas doesn't make enough insulin, or if your body does not use the insulin well, your blood sugars will go up.
- Transplant medicines can also make your blood sugars go up.
- High blood sugars make blood thick and sticky, and this slows blood flow to all parts of your body.



BLOOD SUGAR GOALS:

for Individuals with Diabetes

- **Fasting : 80 – 120 mg/dl**
- **Non - Fasting: 100 – 140 mg/dl**
- **Always below: 180 mg/dl**
- **HgBA_{1c} below: 7%**



- High blood sugars slow down healing, increase risk of infection, and can cause dehydration.
- High blood sugars also can make you feel tired, can make your vision blurry, can make you feel more thirsty and/or hungry.



What is your A1c?

A1c is an estimated average of your glucose readings (eAG) over a 2-3 month period



5%	97 mg/dl
7%	154 mg/dl
8%	183 mg/dl
9%	212 mg/dl
10%	240 mg/dl
12%	298 mg/dl



- High blood sugars slow down healing, This is a test that tells us how much sugar is sticking to your blood cells. A reading of 7% is the best, it shows your blood sugars are in a good range to keep you healthy and help you to heal



TYPES OF DIABETES:

- **Type 1** - This Diabetes usually occurs before 40. Your Pancreas stops making insulin
- **Type 2** - The Pancreas still makes insulin but not enough. The body can be resistant to it's own insulin it is making
- **Diabetes Due to Medication** - Often Diabetes can occur from other medications. For transplant patients, certain Immunosuppression medications can cause this (Prograf, Prednisone, Solumedrol)
- **Impaired Glucose Tolerance** - Blood sugars are higher than normal but not high enough to be diagnosed as diabetes



- Some people already have diabetes before transplant.
- Some people develop diabetes after transplant because of the transplant medicines.
- If you have a blood relative with diabetes, you have a higher life-time-risk for developing diabetes.
- If you are overweight, your risk of developing diabetes is higher, especially if you have a blood relative with diabetes, and you are on transplant medicines.
- Whatever the cause of diabetes, the high blood sugars can damage your new organs, increase risk of infection, slow down healing.



EXTREME THIRST



FREQUENT URINATION



DRY SKIN



HUNGER



BLURRED VISION



DROWSINESS

SIGNS OF DIABETES:

- **Thirst**
- **Blurry Vision**
- **Frequent Urination**
- **Weight Loss**
- **Tiredness**
- **Unusual Hunger**
- **Infection that are slow to heal**



- When there is a lot of sugar trapped in your blood because there is not enough insulin to take the sugar out of the blood vessels and into your muscles. Your muscles and your brain need the sugar (or glucose) to burn for energy.
- If glucose is not available for your muscles, you get tired easily or you may feel hungry; even if you are eating all the time, you might still be losing weight and feeling weak and tired.
- Your muscles are being burned for energy.
- The high sugar in your blood make the blood thick and slow to flow in your blood vessels. Oxygen cannot get to wounds quickly, and wound and infections are slow to heal. The tiny blood vessel leading to your eyes and other parts of your body cannot get good blood circulation either, so your vision get blurry.
- The high blood sugar can also make you thirsty all the time.



BENEFITS OF GOOD BLOOD SUGAR MANAGEMENT:

- **Maintain body health and nutrition to prepare or recover from transplant**
- **Improve survival and graft function.**
- **Lowers risk of infection**
- **Increases energy level**
- **Increases the body's healing process**
- **Helps decrease complications of diabetes - kidney, vision, vascular and nerve disease**



- Many of the signs of diabetes are the same as signs of organ failure (being tired, losing weight and muscle, increased thirst)
- You may also be tired or thirsty because of your transplant surgery or transplant medicines; your blood pressure or the water pills can also make you feel the same way.
- That's why we have a special Transplant Diabetes Program to help you know how best to take care of your transplant by taking care of your blood sugars.



The A - B - C Approach:

- **A** = Attitude
- **B** = Blood Glucose Measurement
- **C** = Controlling Glucose with Medications
- **D** = Diet
- **E** = Exercise
- **F** = Fortitude



- Knowing that you now have tools and people to help you, asking for help when you need it, and being positive all effect your attitude
- Using your blood sugar machine to check and track your blood sugars lets you know what you need to do to keep your blood sugars in the best range to feel good.
- Taking the diabetes medicines allow you to have better blood sugar control.
- You can decide what foods to eat and how much to eat in order to help control your blood sugars.
- Exercise helps you to use your own insulin better and helps you to burn the sugar in your blood for energy
- Having a never-give-up/ keep-trying-your-best approach is important.



MANAGEMENT OF DIABETES:

- **DIET**
- **EXERCISE**
- **MEDICATIONS**
- **HOME BLOOD SUGAR MONITORING**



- We will talk about each thing you can do to control your blood sugars on the following slides.



GOOD NUTRITION:

- **Protein:**
 - 15 -20% of calories
 - Lean meat, fish, poultry and eggs
- **Fat:**
 - 30% of calories
 - Vegetable oils
 - olive and canola oils
- **Carbohydrates:**
 - 55-60% of calories
 - Rice, bread, pastas, potato, cereal, fruit, juices and sugars





- Protein in food is used for building and maintaining strong bones, blood, skin, hair. Choose protein foods with the lowest amount of fat (chicken breast, filet or tenderloin cuts of meat). Most protein foods will not make your blood sugar go up too much.
- Fats are used for long-lasting energy, vitamins, and minerals. Liquid plant-based oils like Canola and Olive oils are the best for your heart.
- Fats will not make your blood sugar go up. They will help to slow down your digestion, and keep your blood sugars steady. But too much fat can make you gain weight. About 1/3 of the calories you eat should come from fat.
- Carbohydrates give your body quick-burning energy, you need at least 55% of your calories from carbohydrates (starchy foods, fruits, cereals,..). Whole grains can give you fiber in addition to the carbohydrate. Fiber helps to keep blood sugars in better control by keeping the sugar in the food from digesting too fast (like the speed bump in the parking lot)



GENERAL FOOD GUIDELINES:

- **Establish your eating patterns. Eat meals and planned snacks about the same time each day**
- **Heart disease following transplant is a very real problem. Solid or saturated fats and cholesterol from food and from transplant medications can slow or prevent blood from circulating throughout you body**
- **Maintain a low sodium intake to optimize blood pressure control**
- **Include fiber from whole grains, legumes, and vegetables to improve blood sugars and cholesterol**



- Try to eat about the same amount of food, about the same time every day.
- Don't skip meals, and don't overeat because this will make your blood sugar unpredictable and harder to control.
- Eat foods that are lower in fat to protect your heart.
- Bake, grill, steam, broil your food instead of frying, and use Canola or Olive oils when you do cook with oils. Trim away all the fats, and try not to use rich sauces and gravies because they can add extra calories that can make you gain too much weight and clog your blood vessels.
- Use less salt and salty foods and more fresh foods instead of canned or packaged foods to keep your blood pressure in a good range.
- Higher fiber food choices help to keep cholesterol/fat and sugar levels in your blood in better control. Fiber helps you to feel more satisfied and full so you don't overeat and gain too much weight.



CARBOHYDRATE COUNTING:

Items to Pay attention to when you are Counting Carbohydrate

- Find the Serving Size
- Find the Total Carbohydrate in one serving
(Sugars included in number, do not count separately)
- Compare serving size on the label to your portion
- Calculate the amount of carbohydrate in your portion
- You can count grams of carbohydrate or carbohydrate choices
 - *1 choice = 15 grams carbohydrates*

Nutrition Facts	
Serving Size 1 cup (227 g)	
Servings Per Container 1	
Amount Per Serving	
Calories 100	Calories from Fat 0
% Daily Value*	
Total Fat 0 g	0%
Saturated Fat 0 g	0%
Cholesterol <5 mg	2%
Sodium 140 mg	6%
Total Carbohydrate 17 g	6%
Dietary Fiber 0 g	0%
Sugars 13 g	
Protein 9 g	
Vitamin A 0%	Vitamin C 0%
Calcium 30%	Iron 4%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.



- Counting carbohydrate in food helps you keep track of how much carbohydrate you're eating.
- A good place to start is to try to have at least 45 to 60 grams of carbohydrate in each meal (breakfast, lunch, and dinner). Please note on the next slide a sample day's meal plan and what it could look like:



- Breakfast: (60 gm carb)

½ banana (15 gm carb) ; 1 slice wheat toast (15 gm carb);1 c. skim milk (15 gm carb) ; ½ c oatmeal (15 gm carb) ;1 egg (0 carb) ;1 tsp margarine (0 carb); Tea with lemon and Splenda sweetener (0 carb)

- Lunch: (60 gm carb)

Green salad with vinegar and 1 tsp olive oil (0 carb); Tuna sandwich on wheat bread (30 gm carb - from the bread); Lettuce and tomato for the sandwich (0 carb);1 peach (15 gm carb);1 c. unsweetened soy milk (15 gm carb)

- Dinner: (60 gm carb)

1 c whole wheat pasta (30 gm carb); 1 chicken breast (0 gm carb)
Steamed broccoli (0 gm carb); 2 slices french bread with 2 tsp margarine (30 gm carb from bread)



Calories !

The information below is to help you understand the caloric intake in the different types of food groups and how they are calculated:

- **1 gram of carbohydrate = 4 calories**
- **1 gram of protein = 4 calories**
- **1 gram of fat = 9 calories**
- **Example: 15 grams of carbohydrate = $4 \times 15 = 60$ calories**

Nutrition Facts	
SERVING SIZE →	Serving Size 1 cup (227 g) Servings Per Container 1
Amount Per Serving	
	Calories 100 Calories from Fat 0
	% Daily Value*
	Total Fat 0 g 0%
	Saturated Fat 0 g 0%
	Cholesterol <5 mg 2%
	Sodium 140 mg 6%
TOTAL CARBS →	Total Carbohydrate 17 g 6%
	Dietary Fiber 0 g 0%
	Sugars 13 g
	Protein 9 g
	Vitamin A 0% • Vitamin C 0%
	Calcium 30% • Iron 4%
	<small>*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.</small>



- Eat too many calories than you need, and you gain weight. If weight is too high, your blood sugars are harder to control.
- Eat fewer calories than you need, and you lose weight.
- It's best to eat fewer fat calories, because they contain twice the amount of calories as other foods.
- By looking on the food label, you can see what serving size and how many calories you are eating. You can also see how much fat, sodium, and protein you are eating.
- Total Carbohydrate tells you not only how much sugar and fiber is in the food, but also includes the carbohydrate that does not show on the label. Always look at Total Carbohydrate.
- A good amount of fiber to look for in foods is over 3-5 grams per serving.



WEIGHT MANAGEMENT:

- **It is important to manage your weight to help maintain blood glucoses and decrease heart disease**
- **Tips on ways to avoid weight gain and / or decrease weight:**
- **Maintain portion sizes when eating meals**
- **Improves blood sugars and fat profile**
- **Supports muscle maintenance and conditioning**
- **Improves sense of well being and quality of life**
- **Decreases fat weight**
- **3500 calories/week =1# of weight change**





- To lose weight, **what** you eat is just as important as **how much** you are eating.
- Pay close attention to the amounts of food on your plate:



BENEFITS OF EXERCISE:

- **Lower blood sugars during and after**
- **Helps insulin work better**
- **Improves blood sugars and fat profile**
- **Supports muscle maintenance and conditioning**
- **Improves sense of well being and quality of life**
- **Decreases fat weight**





- Exercise helps to keep muscles strong.
- Muscles use more energy than fat, so exercising to build your muscles will use more calories and help to control weight.
- Muscles have “insulin receptors” on them, these help your body sense and use the insulin from your pancreas better. There are a lot of insulin receptors on the muscles in your legs and arms, and stomach area.
- If the insulin receptors in these areas are covered with fat, they do not sense or use your body’s insulin very well.
- Exercise helps to uncover these insulin receptors.



DIABETES EXERCISE ADVICE:

- **Check blood sugar before and after exercising**
- **Do not exercise when blood sugar are over 300 or below 70**
- **If blood sugar is low eat before your exercise**
- **Always carry some source of carbohydrate with you when you exercise**
- **Always have identification with you that indicates you have diabetes**
- **Wear the proper fitting shoes**
- **If weather is warm watch fluid intake and wear sun protection**
- **Start 15 minutes 3 times a week and build up to your goal**
- **Check with your doctor before beginning an exercise program**



- A good goal for exercise is 150 minutes a week.
- (for example, 30 minutes exercise x 5 days a week).
- This helps to keep your fitness level the same.
- If you want to lose weight through exercise, at least 60-90 minutes of exercise most days of the week is encouraged.



ORAL ANTI - DIABETIC AGENTS:

What type do you use? _____

How does it work? _____



- Know the names and dose of diabetes medicine you take.
- You can ask your Pharmacist or your Doctor or Transplant Nurse for this information

TYPES OF DIABETES PILLS



There are many types of oral anti-diabetic medicines (pills) available. These pills help control your blood sugar. Listed below are the different classes, trademark names, and how they help your blood sugar. If you have any questions about your diabetes pills, you should consult your pharmacist or educator.



SULFONYLUREAS

- Glipizide (Glucotrol®[®], Glucotrol XL®[®])
- Glyburide (Diabeta®[®], Micronase®[®], Glynase®[®])
- Chlorpropamide (Diabinese®[®])
- Tolazamide (Tolinase®[®])
- Glimepiride (Amaryl®[®])
- Tolbutamide (Ornase®[®])
- **Sulfonylureas** decrease your blood sugar levels by helping your pancreas make more insulin. If you are taking too much of this type of medication, you may get hypoglycemia (blood glucose level less than 70 mg/dl). If this happens, eat something and measure your blood glucose level again in 15 minutes.





- These medications help your pancreas make more insulin.

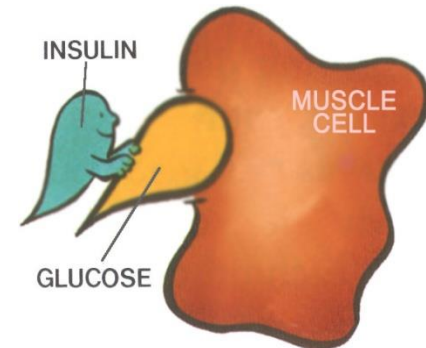
THIAZOLIDINEDIONES



- Rosiglitazone (Avandia®)
- Pioglitazone (Actos®)

Thiazolidinediones lower blood sugar levels by increasing your body's sensitivity to your own insulin. The insulin can then move glucose from your blood into your muscle cells for energy. These medications can be used with other diabetes pills or insulin. It may take up to 4 weeks until you see a decrease in your blood sugar.

Your physician may order periodic blood tests to monitor your liver function. Signs of liver disease include nausea, vomiting, stomach pain, lack of appetite, tiredness, yellowing of skin or whites of eyes.





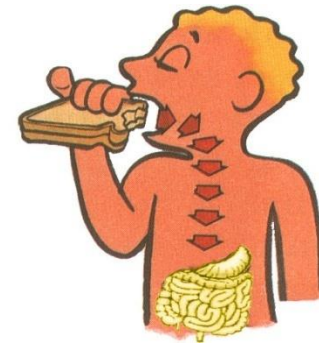
- A long name, these are sometimes called “TZDs” for short.
- Helps your body use insulin better.
- Can cause or worsen Congestive Heart Failure, so may not be used if you have this problem.

ALPHA-GLUCOSIDASE INHIBITORS



- Acarbose (Precose®)
- Miglitol (Glyset®)

Alpha-glucosidase inhibitors lower your blood sugar levels by slowing the breakdown of sugars and starchy foods in the intestines. This causes a slower and lower rise of blood sugar, mainly right after meals. These medications should be taken with the first bite of a meal. Because they work in the intestines, they may cause diarrhea, gas, bloating or nausea.





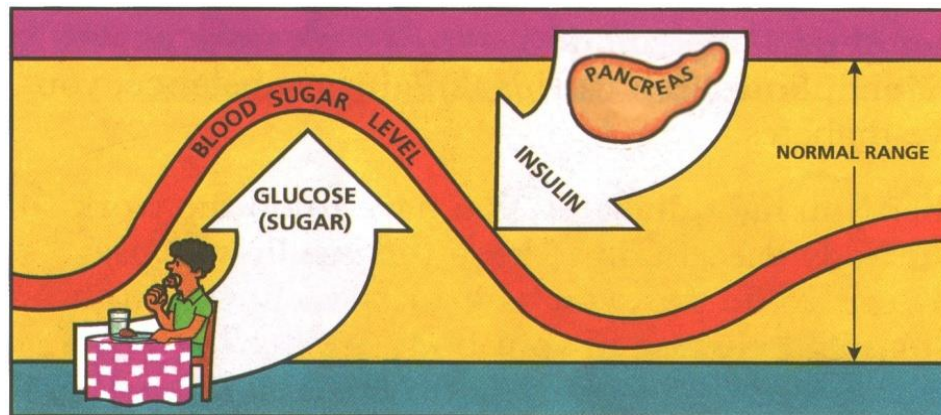
- Slows down the digestion of sugars and starchy foods in order to control blood sugar.
- Can cause bloating, gas, diarrhea, or nausea.



MEGLITINIDES

- Repaglinide (Prandin®)
- Nateglinide (Starlix®)

Meglitinides lower blood glucose by helping your pancreas make more insulin right after meals. They are fast acting and respond to high blood sugar. They must be taken with meals or shortly before eating to prevent low blood glucose. If you skip a meal, you should skip that dose, or if you eat an extra meal, you may need to take an extra dose.





- Fast “burst” of insulin from your pancreas after eating.
- Take with food to prevent low blood sugars.

Incretins



- Sitagliptin (Januvia®)

Incretins are used alone or with other type of diabetes medicine, to treat high blood sugar levels that are caused by type 2 diabetes. Januvia is a prescription medicine used along with diet and exercise to lower blood sugar in patients.

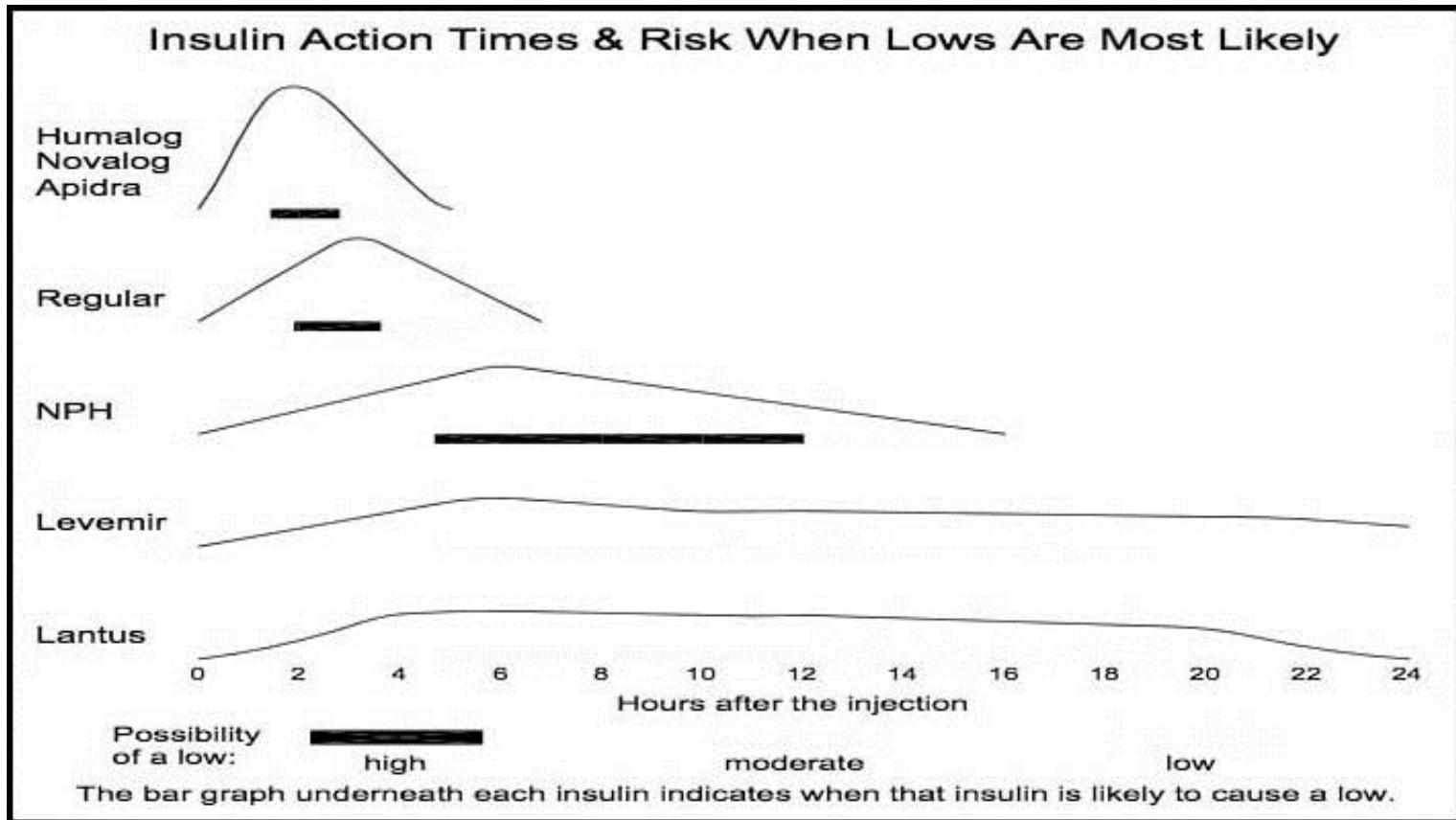
- Januvia lowers blood sugar when blood sugar is high, especially after a meal.
- Januvia also lowers blood sugar between meals.
- Januvia helps to improve the levels of insulin produced by the body after a meal.
- Januvia decreases the amount of sugar made by the body.
- Januvia is unlikely to cause your blood sugar to be lowered to a dangerous level (hypoglycemia) because it does not work when your blood sugar is low.



- Slows stomach emptying of food, increases insulin from the pancreas after eating, and decreases the amount of sugar your body naturally makes.
- This medicine was developed after studying the Gila Monsters in the Arizona desert, and how they are able to live for long periods of time on little food and water.



Insulin:





- Insulin is made by your pancreas.
- Insulin's job is to take the sugar out of your blood and help it to get into your muscles, so that the sugar can be burned by your muscles for energy.
- Glucose (or sugar) is the only fuel source that your brain can use, and it's the preferred source of fuel by your muscles.
- There are different kinds of insulin that you can inject the following slide describes the onset and action of each type of commonly used insulin:



- **Types of commonly used insulin**
- Rapid-acting insulin (Humalog, Novolog, Apidra) starts working in 5-15 minutes after you inject, works the hardest in 30-90 minutes after injecting, and is out of your body after about 5 hours.
- Regular insulin starts working 30-60 minutes after injecting, works the hardest 2-3 hours after injecting, and is out of your body after 5-8 hours.
- NPH insulin starts working 2-4 hours after injecting, works the hardest 4-10 hours after injecting, and is out of your body after 10-16 hours.
- Levemir is a long acting insulin which starts working 3-8 hours after injection and continues to work in a very slow, steady manner. It is out of your body after 6-24 hours.
- Lantus is also a long acting insulin which starts working 2-4 hours after injection and continues to work in a slow, steady manner until it's out of your body after 20-24 hours.



INSULIN TIPS:

- **Always rotate injection sites**
- **The stomach is the preferred injection site**
- **Keep unused insulin in the refrigerator**
- **Insulin is good at room temperature for about one month**
- **Dispose of syringes and lancets in a plastic container and contact disposal company to assure proper disposal procedure**
- **Keep insulin out of extreme heat or cold**



BLOOD SUGAR MONITORING - *Why is it important?*

- Gives you immediate feedback about your blood sugar control
- Helps you know which foods raise your blood sugars.
- Provides you and your diabetes team with information that helps you improve your blood sugar control

THINGS TO REMEMBER:

- Keep blood sugar logs and/or always bring meter to appointment
- Contact doctor if blood sugars are less than 60 mg/dl or higher than 200 mg/dl



- The Transplant Diabetes Program may recommend a specific blood sugar meter for you based on your insurance, health plan, or hematocrit level (red blood cell count).
- Many of the blood sugar meter companies offer patient assistance programs to help with the cost of the diabetes supplies. You can find out about this by contacting the toll-free number for your meter company.



LOW BLOOD SUGAR:

- If blood sugar falls below 70 mg/dl:
 - **Signs are shaky, weak, sweaty, anxious, fast heartbeat**
 - **Eat 15 grams of carbohydrate (lifesavers, juice, soda)**
- If blood sugar falls below 50 mg/dl:
 - **Eat 30 grams of carbohydrate (lifesavers, juice, soda)**
 - **Retest in 15 minutes if blood sugar still below 70 give 15 more grams of carbohydrate**
 - **Eat next meal or snack containing carbohydrate and protein**
 - **Problem solve why blood sugar happened - too much exercise, too little carbohydrate too much medication**
- If a low blood sugar level persists - call Doctor!



- Examples of 15 grams of carbohydrate to bring your blood sugars up quickly are:
- 3-4 glucose tablets
- ½ cup fruit juice, regular soda, milk
- 1 Tablespoon sugar in water



HIGH BLOOD SUGAR;

- **Blood sugar greater than 200 mg/dl may be a sign of:**
 - Infection
 - Rejection
 - Stress
- **Test and record blood sugar every 4 hours**
- **Rest**
- **Contact doctor if blood sugar goes over 300 mg/dl, if you have a high temperature, difficulty breathing, nausea and/or vomiting**



- If you are sick, you may not feel like eating; you may think “my blood sugars are so high, I shouldn’t eat anything”.
- But it’s important to keep yourself from getting dehydrated. Drink 4-6 ounces of liquid every hour.
- Here are examples of 15 gram carbohydrate “sick day foods” to choose if you don’t feel like eating:
 - ½ c apple juice
 - ½ c regular jello (not sugar-free)
 - ½ c regular 7-up or regular gingerale (not sugar-free)
 - 1 c broth
 - 6 saltine cracker



DO NOT FORGET YOUR FEET:

Foot infections are the most common complication for people with diabetes post transplant –

- **Put lotion on your feet every night before you go to bed**
- **Any unusual findings on your feet should be reported to your doctor**
- **Always wear shoes**
- **Always wear shoes that fit your feet properly**
- **Have the doctor check your feet at every office visit**



- Have someone help check your feet every day, if you have a hard time doing this
- Wear socks that absorb moisture to keep your feet dry
- Make sure your shoes fit well and won't cause blisters or callouses



Pearls of Wisdom:

- **Prescriptions**
 - **Medication Lists**
- **Tools**
 - **Scales**
 - **Shoes**
 - **Maps**
 - **Medical team phone #**
- **Other Essentials**





- Keep information and diabetes equipment handy
- Bring a current list of your medications, your blood sugar logs and blood sugar meter with you when you visit your doctor.



TESTS TO KEEP AN EYE ON:

- **Yearly eye exam by an eye doctor to check for diabetic eye disease**
- **Yearly urine evaluation to check for protein**
- **Yearly cholesterol evaluation, HDL, LDL, and triglyceride levels**
- **Glycosolated Hemoglobin**
- **Foot exam**
- **Every office visit write down your weight and blood pressure**



- To stay healthy, make sure you are up-to-date with all these tests



- **Set Your Goals:**

- My blood sugar should be below _____
- I need to check my blood sugars _____
- I need to exercise _____ per week for _____ minutes at a time
- I should visit my diabetes doctor _____ times per year



- It is important to set your diabetes goals with your health care team.
- Remember to keep your goals realistic.
- If you are having trouble achieving your goals; talk to one of the members of your diabetes team.
- It is essential to know that it is ok to ask for help.