
Diabetes Mellitus

DEFINITION OF DIABETES MELLITUS

- It is a syndrome in which insulin production is decreased or absent.
- Lack of insulin leads to elevated blood glucose levels.
- There are two classifications.
 - insulin dependent diabetes mellitus (type I)
 - non-insulin dependent diabetes mellitus (type II).

SIGNS AND SYMPTOMS

- Excessive thirst
- Fatigue
- Increased urination
- Increased appetite
- Slow-healing wounds
- Itching
- Changes in vision
- Weight loss

IMPORTANT MEASURES IN MANAGEMENT OF DIABETES MELLITUS

- Follow prescribed diabetic diet.
- Monitor blood sugars. (Glucometer or chem strips can be used at home.)

- See your doctor, dentist, and eye doctor regularly.
- Take medications as ordered.
- Achieve and maintain ideal weight.
- Exercise regularly.
 - Stop immediately if any chest pain, shortness of breath, dizziness, or nausea occurs.
 - Always carry a carbohydrate snack when exercising.
- Wear a Medic-Alert bracelet containing the necessary information for care.

IMPORTANT MEASURES IN FOOT CARE

- Inspect feet daily.
- Report any foot problems to podiatrist or doctor.
- Wash feet daily with warm water and soap and pat dry, especially between toes.
- Clip nails straight across and gently file with an emery board.
- Wear shoes that support and fit properly.
- Wear socks that are clean and fit properly.
- Avoid going barefooted.
- Avoid exposing feet to extreme temperatures.
- Avoid tobacco.

Insulin Storage and Prefilling Syringes

STORAGE

Insulin is very stable and does not have to be refrigerated. It will inject more comfortably at room temperature. It should be protected from extremes of temperature, both hot and cold. Many people keep the bottle(s) in use at room temperature and store the reserve supplies in the refrigerator for safekeeping.

PREFILLING

If you have poor vision or a physical disability, you may need someone to prepare your insulin injections for you. Syringes may be prefilled and stored in the refrigerator or other cool, dry places for up to seven days. Single or mixed doses of insulin can be prepared.

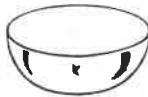
If a mixture is used, gently roll the syringe between the palms of your hands before injecting. Keep the mixture refrigerated until the day of use. Remember to allow the mixture to warm to room temperature before injecting.

If you are on multiple, mixed, and varied doses of insulins during the course of the day and have poor vision, try using short or tall cups and glasses in a consistent pattern when stored, for example:

7:00 A.M.



12:00 Noon



4:00 P.M.



Bedtime



Always begin left to right.

Mixing Insulins in a Syringe

Your doctor has prescribed regular (clear) and either intermediate or long-acting (cloudy) insulin to control your diabetes. To avoid giving yourself separate injections, you can mix these two types of insulin in a syringe and administer them together. It is easiest to form the habit of withdrawing the insulins in the same order every time, that is, clear first, cloudy second.

1. Wash your hands with soap and water and assemble all the things you will need to prepare your insulins. Then mix the contents of the vials by rolling each gently between your palms.
2. Using an alcohol swab, clean the rubber stopper on the vial of CLOUDY insulin. Then draw air into the syringe by pulling the plunger back to the prescribed number of insulin units. Insert the needle into the top of the vial, making sure the point doesn't touch the insulin. Push in the plunger and withdraw the syringe.
3. Clean the rubber stopper on the CLEAR insulin vial with an alcohol swab. Then pull back the plunger on the syringe to the prescribed number of insulin units, and inject air into the vial. With the needle still in the vial, turn the vial upside down and withdraw the prescribed dose of regular (CLEAR) insulin.
4. Clean the top of the CLEAR insulin vial. Then insert the needle into it without pushing the plunger down. Invert the vial and withdraw the prescribed number of units for the total dose. For example, if you have 10 units of regular (CLEAR) insulin in the syringe and you need 20 units of intermediate or long-acting (CLOUDY) insulin, pull the plunger back to 30 units.

Giving Yourself a Subcutaneous Insulin Injection

INSULIN ADMINISTRATION*

In order to offset the effect of food on your blood glucose level, insulin should be taken about 30 minutes before a meal.

To inject insulin subcutaneously, wash your hands thoroughly and remove your prescribed insulin from the refrigerator if it's stored there.

1. Warm and mix the insulin by rolling the vial between your palms.
CAUTION: Never shake the vial. Check the expiration date; then read the label to make sure the medication is the correct strength and type. Use an alcohol swab to cleanse the rubber stopper on top of the vial.
2. Before drawing up the insulin, inject an equal amount of air into the vial. With the bottle right-side up, push the needle into the center of the rubber cap of the insulin bottle.
3. Push the plunger down so that all the air in the syringe is transferred into the bottle.
4. Turn the bottle upside-down with the needle still in it; slowly pull the plunger back to two or three units more than your dose and allow the insulin to flow into the syringe.
5. Flick your finger against the syringe lightly to remove any air bubbles.
6. Push the plunger to your exact dose, this will force any air bubbles out through the needle.
7. Remove the needle from the bottle carefully.
8. Put the syringe down, making sure the needle does not touch anything.
9. Select an injection site. Use the fatty tissue of your upper arms, abdomen, thighs, or buttocks. It is necessary to rotate your injection sites, leaving at least an inch between injections. Repeated use of one injection site can cause the tissue to become fibrous. Fibrous tissues absorb insulin poorly. Raised, toughened areas or deep skin indentations indicate overuse of an injection site.
10. Wipe the site with an alcohol swab.
11. Pinch the skin with one hand, or stretch the skin taut. Either is acceptable.
12. With your other hand, grasp the syringe on the barrel (like holding a pencil). Plunge the needle into the skin, straight down (90-degree angle), up to its hub.
13. Release the injection site and grasp the plunger, slowly pulling back to see if any blood appears. (If this does happen, discard everything and start again. The newer needles are so short that there is little likelihood of reaching a blood vessel).
14. Inject the insulin by pushing on the plunger.
15. Pull the needle out of the skin, then apply pressure over the injection site with an alcohol swab.

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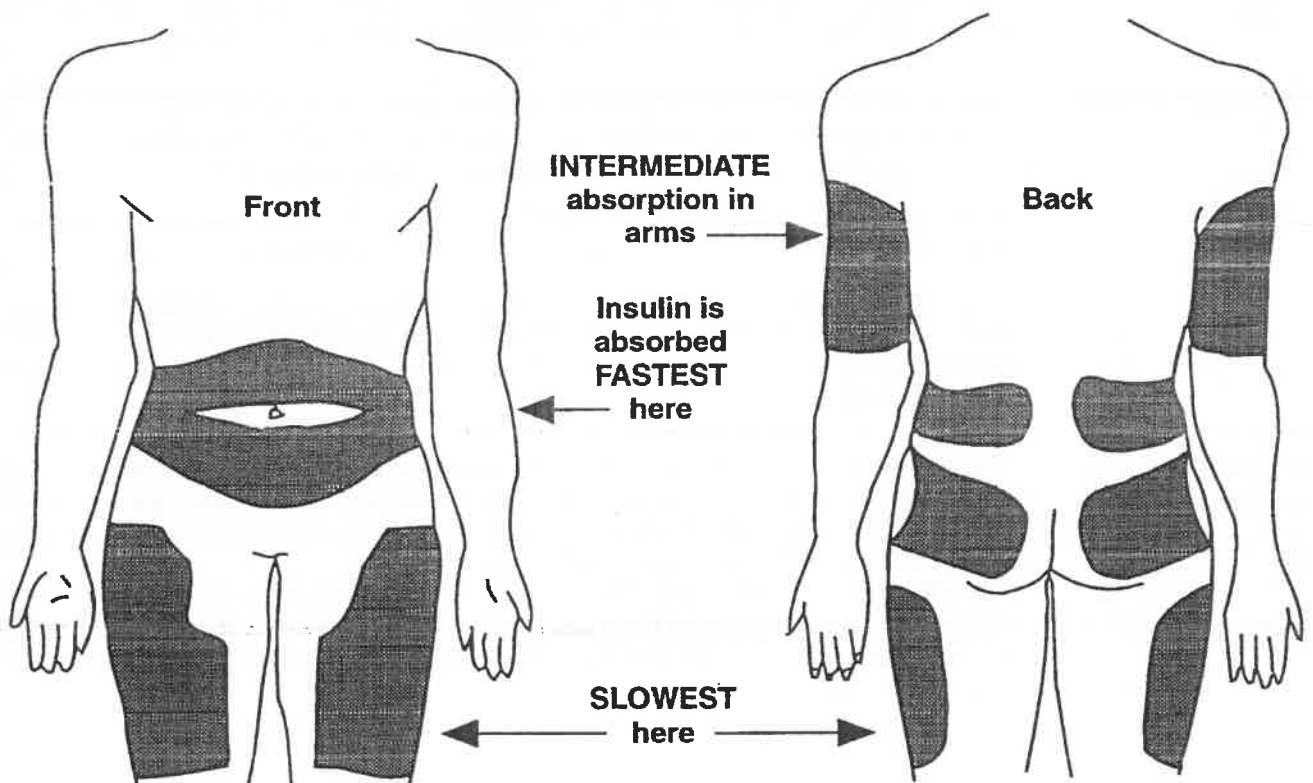
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Many people reuse their disposable syringes and needles without any problem. If you do reuse a disposable, recap the needle immediately after use. The needle will become dull after about two injections.

Dispose of used needles and syringes carefully to prevent accidents to others. The following tips are also important:

- Destroy your used needles and syringes in a manner which makes each unit unfit for reuse in any way.
- Be cautious: Conceal the discarded needles and syringes in a well-sealed, impervious, opaque container.

INJECTION SITES**



*Courtesy of Hospital Home Health Care Agency of California, Torrance, California.

**Courtesy of Medical Center Hospital of Vermont, Burlington, Vermont.

Oral Hypoglycemic Agents

WHAT THEY ARE



Oral hypoglycemic agents are medications that your doctor may prescribe to help control your blood sugar levels. You may also hear them referred to as "sulfonylureas."

Oral hypoglycemic agents are not "oral insulin" or "insulin pills." Insulin is destroyed by the digestive system and therefore is not effective if taken by mouth. Since you have what is called "Type II or non-insulin dependent diabetes," your pancreas is still making insulin. However, it is not making enough, or the cells in your body are not able to use it effectively.

Oral hypoglycemic agents help to control diabetes in a variety of ways. Some help your pancreas to produce more insulin. Others help the cells to use insulin more effectively. Some of these medications also slow down the production of sugar by the liver, thus lowering your blood glucose.

TREATMENT PLAN



It is important for you to take these medications exactly as prescribed. Do not take more or fewer pills without consulting your doctor.

Oral agents are a supplement, not a substitute, for your diabetes regimen. It is still very important for you to follow your diet carefully, exercise regularly, and maintain a normal weight. It is also helpful to check your blood sugar regularly to make sure your diabetes is under control. Your diabetes educator can help you plan a schedule of blood sugar testing.

SIDE EFFECTS



Some side effects may occur when you start taking the medication and will go away after a few weeks. Others may mean your dosage needs to be changed or the medication should be discontinued. If any of the following symptoms occur, *call your doctor*:

- nausea/stomachache
- skin rash
- hives
- acne
- vomiting
- dizziness

It is also important to watch for symptoms of low blood sugar—such as feeling weak, shaky, sweaty, or irritable. Low blood sugar (less than 60 mg) can last many hours with oral hypoglycemic agents; therefore, treat with food or sugar, and notify your doctor if these symptoms occur.

DRUG INTERACTIONS



Certain medications may increase or decrease the effect of oral hypoglycemic agents, including aspirin (salicylate) and alcohol. Consult your doctor about using aspirin or alcohol while take oral agents. If another doctor prescribes medication for you, be sure that the doctor is aware that you take an oral hypoglycemic agent.

You should not take oral hypoglycemic agents if you become pregnant or are breastfeeding. Your doctor will prescribe alternative means of controlling your blood sugar. Birth defects can occur in pregnancies of women with diabetes if their blood sugars are not in excellent control.

Managing Hyperglycemia

GENERAL INFORMATION

- Hyperglycemia generally occurs when a blood glucose is higher than 140–160 mg/dL.
- It does not occur suddenly. The onset is slow and gradual over a period of hours or days.
- It can be caused by insufficient amounts of insulin; not following the diet; infection, fever, trauma, emotional distress, and/or some medications.

SYMPTOMS OF HIGH BLOOD SUGAR

- Increased thirst and urination
- Blood glucose consistently above 160 mg/dL
- Ketones in urine
- Abdominal pains, weakness, general aches
- Loss of appetite, nausea, and vomiting
- Unusual deep breathing pattern
- Sweet or fruity odor to breath

WHAT TO DO

- Notify your physician!
- Drink lots of no-calorie fluids.
- Test your urine for ketones if your blood sugar is more than 240 mg/dL.

Without intervention, this process can escalate into severe hyperglycemia and hospitalization.

Managing Low Blood Sugar

CAUSES OF LOW BLOOD SUGAR (HYPOGLYCEMIA)

- Taking your medication and either not eating or delaying mealtimes
- Taking too much medicine
- Not eating enough food
- Exercising an unusual amount

SYMPTOMS OF LOW BLOOD SUGAR

Early

- Anxiety
- Irritability
- Shakiness or trembling
- Sweating
- Increased heart rate, palpitations

Late

- Loss of balance and coordination
- Slurred speech, trouble with words
- Aggressive, possibly combative
- Loss of consciousness

ACTIONS TO TAKE

1. Test blood sugar (fingerstick).
2. Take **one** of the food items listed below. The blood sugar should rise by 40 or 50 mg within 10 to 15 minutes.
3. Test the blood sugar again (fingerstick).
4. Temporary improvement of your blood sugar could be followed by a **recurrence**

- of low blood sugar. To prevent this, drink a glass of milk, or eat some crackers or high-fiber fruit.
5. Phone your doctor.
 6. Record your blood sugar results in your diary.

REVERSING LOW BLOOD SUGAR

The following foods provide 10 grams of glucose:

<i>Food</i>	<i>Amount</i>	<i>Food</i>	<i>Amount</i>
Plain orange juice*	4 oz.	Sugar cubes	4
Regular jelly	1 tbsp.	Raisins	1 small box
Regular cola	6 oz.	Glucose tablets	2
Packets of sugar	2	Fruit roll-up	1
Life Saver candies	7-9	Cake decorating gel**	2 oz. tube

*Do not add sugar to the orange juice. This can actually slow your recovery.

**If the person cannot swallow, this can be placed under the tongue and absorbed through the membranes.

Be Prepared for Sick Days

When you have an infection like a cold or the flu, your body automatically responds to that stress with hormones. These hormones elevate your blood sugar and interfere with the action of your diabetes medication. **Sickness can cause your diabetes to go out of control.** You can avoid serious complications of your diabetes by preparing ahead of time.

Phone your doctor if you have any of the following:

- an illness that continues for one or two days without improvement
- vomiting or diarrhea that continues for longer than six hours
- moderate to large amounts of ketones in your urine
- blood tests that continue to run higher than 240 after you take your diabetes medication
- symptoms of high blood sugar: thirst, stomach pain, drowsiness, dry cracked lips, fruity odor to breath

You should also call your doctor if you are unsure about what you need to do to take good care of yourself.

Doctor's Name: _____ Telephone: _____

When you phone your doctor, he or she will want to know:

Blood sugar level: _____ Time of test: _____

Urine ketone results: _____

Amount and type of diabetes medicine: _____

Other medications you've taken: _____

How long you've been sick: _____

Your temperature: _____

How well you can take food and fluids: _____

Any weight loss while sick: _____ How much: _____

Any other symptoms: _____

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WHEN YOU ARE ILL

- Phone your doctor at the beginning of the illness.
- **Do not stop your diabetes medicine.** Remember, the illness makes your body produce higher levels of blood sugar.
- If you take insulin, test your blood sugar and urine ketones at least every four hours.
- If you take pills for your diabetes, test your blood sugar four times a day (before meals and bedtime). If your blood sugar level is more than 240, test your urine for ketones.
- Go to bed, rest, and keep warm.
- It is best to have someone with you. If you live alone, initiate regular phone contact or brief visits from a friend or neighbor.

SICK DAY FOODS

If you can't eat your regular food, replace it with carbohydrates in the form of liquids or soft foods. Eat at least 50 grams of carbohydrates every three to four hours.

<i>Serving Size</i>	<i>Food</i>	<i>Grams of Carbohydrates</i>
1/2 cup	Apple juice	15 g
1/3 cup	Cranberry juice	15 g
1/2 cup	Orange juice	15 g
1/2 cup	Regular ginger ale	10 g
1/2 cup	Regular 7UP	12 g
1 twin pop	Popsicle	24 g
1/2 cup	Regular gelatin	20 g
1/3 cup	Grape juice	15 g
1/2 cup	Cooked cereal	15 g
1 cup	Chicken noodle soup	10 g
1/2 cup	Ice cream (vanilla)	15 g
1/2 cup	Sherbet	30 g
1/2 cup	Instant pudding	30 g
1/2 cup	Custard	15 g
1/2 cup	Fruit-flavored yogurt	20 g
6	Saltine crackers	15 g

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SICK DAY MEDICINES

You may use the following with your doctor's approval:

- aspirin or Tylenol
- sugar-free cough medicine
- sugar-free throat lozenges
- antiemetic (prescription) medicine

SICK DAY MEAL PLAN

If you can, maintain your usual meal plan and supplement it with additional **noncaloric** and **caffeine-free** fluids (broth, soft drinks, water). Extra fluids are needed if you have fever or diarrhea or are vomiting. The fluids help rid your body of the excess glucose and ketones from the stress of the illness.

Keep fluid intake at about $\frac{1}{2}$ cup per each waking hour.

NOTES:

Diabetes and Your Kidneys

Some people with diabetes will develop kidney problems. These problems are serious because the kidneys remove waste materials from your body. Doctors feel there are two main reasons that influence whether people with diabetes will develop kidney problems:

1. contracting diabetes at a young age
2. having diabetes for a long time

You can take steps to decrease the possibility that you will have kidney problems. Studies have shown that people with diabetes are less likely to develop kidney problems if they do not have high blood sugar levels. Therefore, maintain a level of blood sugar as nearly normal as possible.

High blood pressure also increases your risk of developing kidney problems. Your blood pressure should be checked each time you see your doctor. The earlier the doctor discovers high blood pressure, the sooner it can be treated. If your doctor finds that you have high blood pressure, he or she may prescribe a drug to treat it.

Eating a lot of salt can increase your chances of getting high blood pressure. It is a good idea to cut down on the amount of salt you eat.

- Leave the salt shaker off the dinner table.
- Cook with unsalted water.
- Avoid buying canned soups and foods with a high salt content. (Some grocery stores have special shelves for low-salt foods.)

People with diabetes are more likely to have kidney infections. If you have a kidney infection, you may feel as if you have to urinate all the time. You may also have a burning feeling when you urinate. If you have either of these feelings, see your doctor immediately. He or she will want to collect a urine sample to detect the infection. The doctor may prescribe a drug to help your body fight infection.

Your doctor may want to test your urine and take blood samples regularly. These steps will allow the doctor to detect a developing kidney problem early. If you do develop kidney disease, your doctor may refer you to a special medical center.

Diabetes and Your Eyes

DIABETIC RETINOPATHY

Diabetes is a major cause of blindness in the United States. Blindness from diabetes is caused by changes in the small blood vessels of the eye retina, the thin light-sensitive inner lining of the back of the eye. This disease is called **diabetic retinopathy**.

About half of all people with diabetes have some changes in the retina after they have had the disease for 10 years. After 15 years, almost all people with diabetes have some changes in the retina. These changes do not affect vision in most cases. But in a small group of people, the changes are serious enough to threaten eyesight. In general, scientists feel the following key points influence whether a person with diabetes will develop vision problems:

- how old the person was when he or she contracted diabetes
- the length of time the person has had diabetes

PREVENTION

Blood Sugar Control

There may be a link between how well blood sugar levels are controlled and whether eye problems develop later. Some studies suggest that retinopathy occurs only in patients who have blood sugars above 200. Therefore, many physicians now support efforts to maintain excellent control of blood sugar levels in people with diabetes. This control might help to prevent retinopathy. You should follow closely the treatment plan your physician designs for you. If you do not follow this treatment plan, you could be taking chances with your health and your eyesight. It is also important to keep your blood pressure in the normal range.

Early Detection

Your physician should dilate your pupils and examine the back of your eyes every one or two years. He or she may refer you to an ophthalmologist (eye specialist) who has experience in diagnosing eye changes caused by diabetes. If these changes develop, physicians can offer different kinds of treatment. Your physician may also refer you to an ophthalmologist for specific treatment.

TREATMENT

Treatments include **laser photocoagulation** and **vitrectomy**. In laser photocoagulation, a physician uses a laser (light) beam to eliminate abnormal small blood vessels from the retina. A

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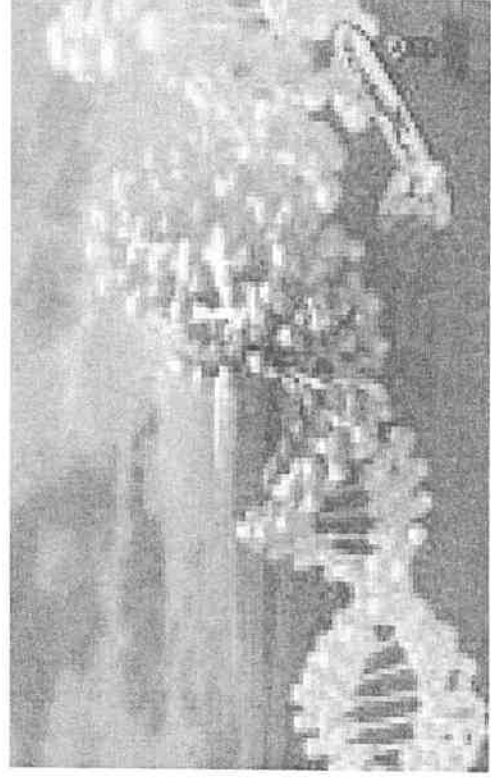
study conducted by the National Eye Institute showed this treatment to be effective in most patients who have medium to serious eye disease. In many cases, the best time for treatment is **before** any vision problem is noticed by the patient. Another treatment, vitrectomy, involves the removal by surgery of the vitreous, the clear fluid filling the eye, when it has become cloudy from bleeding. This operation is also sometimes used to remove scar tissue.

Frequent eye checkups are necessary, even though your vision may be normal. You should also stick carefully to the treatment plan your physician gives you.

NOTES:

Basic Facts of Diabetes

- 7th leading cause of death in the U.S.
- Cause is unknown.
- Obesity and family history are known risk factors.



Hyperglycemia (High Blood Sugar)

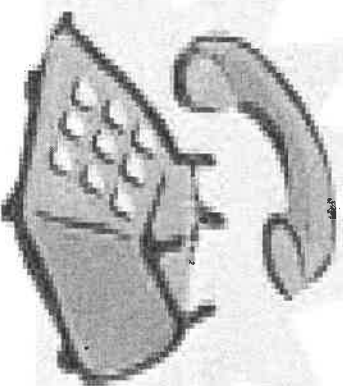
- Symptoms are slow and gradual
- Increased thirst and urination
- Loss of appetite
- Nausea/vomiting
- Weakness
- General aching



I'm thirsty

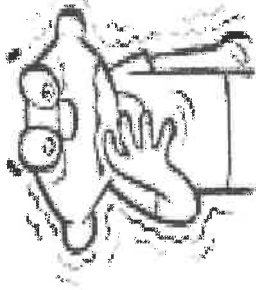
Treatment of Hyperglycemia

- If blood sugar above 200 observe patient and ask if he is feeling any symptoms.
- Call supervisor to report blood sugar and any symptoms patient is having.



Hypoglycemia (Low Blood Sugar)

- Symptoms can occur suddenly and worsen quickly
- May occur because of not eating, too much medicine, or excessive exercise
- Shakiness, sweating, irritable, anxious.
- Progress to drowsiness, slurred speech loss of balance, combative
- If BS drops low enough patient can lose consciousness and possibly die



Treatment of Hypoglycemia

- If blood sugar is less than 70 take whatever action is outlined on assignment sheet (i.e. 4 oz orange juice).
- Have patient check blood sugar again after 10-15 minutes. Call supervisor
- Have patient drink a glass of milk or eat crackers to keep from dropping again.

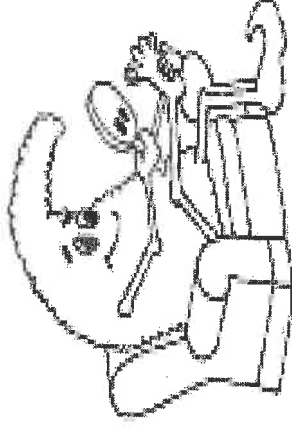
Foot Care

- Diabetics are very prone to foot problems.
- Foot care will be one of your most important duties.



Foot Care Considerations

- Check the feet very carefully at each visit
- Look for cuts, blisters, sores, red spots, swelling, cracks, corns or calluses.
- Check for ingrown, long, or poorly trimmed nails
- Wash the feet in warm (not hot) water and rinse well. Do not soak the feet (unless assigned to do so) as this tends to dry them out.



Foot Care Considerations

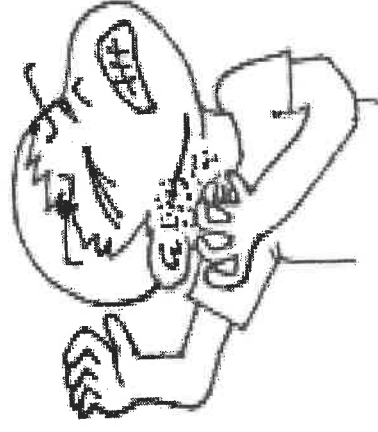
- Dry the feet thoroughly, especially between the toes.
- Apply lotion on the tops and bottoms of feet-not between the toes.
- Put on a clean pair of socks-smooth out wrinkles.
- Check before patient puts them on.

Foot Care Considerations

- Never apply hot water bottles or ice packs to feet.
- Do not trim toenails nor do anything with corns or calluses.
- Report any unusual findings and if patient refuses to wear socks and shoes at all times.
- Also report if shoes do not fit well.

Skin Care

- Diabetics often have problems with their skin.
- May have certain areas that hurt even though the skin looks fine.
- Many have problems with itching and dry skin.



Skin Care Considerations

- Bathe or assist thoroughly with mild soap and lukewarm water-carefully rinse off all soap residue.
- During bath look for dryness, cracking, blisters, scrapes, redness or swelling.
- Look for signs of yeast infection, especially in groin, between toes, abdominal folds and under breasts.



Skin Care Considerations

- Apply small amount of lotion to keep skin soft.
- Do not apply lotion to groin area, skin folds, between toes, or under breasts-can use talcum powder or corn starch.
- Report any abnormalities you observe.

Other Responsibilities

- Some diabetics simply choose not to follow information given to them to manage their illness.
- It is up to you to report risky behaviors (eating lots of junk food, walking around barefoot, don't check blood sugars) to the nurse.

Other Responsibilities

- Often the patient will be more honest with the home health aide than the nurse because they will tell the nurse what they think she wants to hear.
- It is your responsibility as a home health aide to let the nurse know what is going on.

Know the difference

HIGH BLOOD SUGAR

(Symptoms noticed within
hours to several days)

Watch for:

- increased thirst and urination
- large amounts of sugar in the blood
- ketones in urine
- weakness, pains in stomach, aching all over
- heavy, labored breathing
- loss of appetite, nausea and vomiting
- fatigue

What to do:

- call doctor immediately
- take fluids *without sugar* if able to swallow
- test blood sugar frequently
- test urine for ketones

Causes:

- not enough insulin
- too much food
- infection, fever, illness
- emotional stress

(Symptoms noticed within
minutes to hours)

Watch for:

- cold sweats, faintness, dizziness
- headache
- pounding of heart, trembling, nervousness
- blurred vision
- hunger
- inability to awaken
- grouchiness
- personality change

What to do:

- take 2-3 B-D Glucose Tablets, liquids or food containing sugar (e.g. orange juice, regular soda)
- check blood sugar level
- do not give insulin
- do not give anything by mouth if unconscious
- if unconscious, give Glucagon according to package directions
- call doctor

Causes:

- too much insulin
- not enough food
- unusual amount of exercise
- delayed meal

LOW BLOOD SUGAR

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Take control today to be healthy tomorrow.

What you do right now can make all the difference as the days go by.

Today, you and your doctor have several choices of insulins that allow you to tailor the management of your diabetes to the needs of your body.

If you have a difficult time maintaining good blood glucose control, you and your doctor should consider including basal insulin therapy. Basal insulin can help you to reach your A_{1c} goal of 7% or less.⁴

Basal insulin is a term used to describe the slow, steady release of insulin needed to control blood glucose and to keep cells supplied with energy when no food is being digested.⁵

The addition of the appropriate insulin may help you get closer to your target A_{1c}. Ask your doctor which insulin treatment would work well as part of your diabetes therapy.

REFERENCES: 1. The Diabetes Control and Complications Trial: Results of Feasibility Study. *Diabetes Care*. 1987;10:1-19. 2. Skyler JS. Diabetic complications: the importance of glucose control. *Endocrinol Metab Clin North Am*. 1996; 2:243-254. 3. UK Prospective Diabetes Study (UKPDS). Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes. *Lancet*. 1998; 352:837-53. 4. Rosenstock J, Riddle M, Dailey G, et al. Presented at: 61st Annual Scientific Session; June 22-26, 2001; Philadelphia, Pa. 5. Skyler JS. Insulin therapy in type II diabetes: who needs it, how much of it, and for how long? *Postgrad Med*. 1997;101(2):85-96. 6. U.S. Food and Drug Administration Web site. FDA Consumer Magazine. January-February 2002. Available at: http://www.fda.gov/fdac/features/2002/chrt_insulin.html.

TARGET BLOOD GLUCOSE LEVELS

BEFORE MEALS or UPON WAKING

80-120 mg/dL

AT BEDTIME

100-140 mg/dL

The American Diabetes Association's (ADA's) recommended guidelines for a healthy range of blood glucose levels.

Types of insulin to help you control diabetes⁶

Long-acting (basal)

Duration of action: 24 hours

Intermediate-acting

Duration of action: 18-24 hours

Short-acting

Duration of action: 5-8 hours



