Practice Guidelines for the Management of Type 2 Diabetes

Treatment goals:

The goal of treatment is to keep blood sugar at normal or near-normal levels. This reduces the risk of complications associated with diabetes. A normal fasting blood sugar is less than 100 mg/dl. Along with testing blood glucose levels, control can also be estimated using a blood test called A1c. The A1c blood test measures the average blood sugar level during the prior two to three months.

Monitoring

Self blood glucose monitoring with a meter:

The fasting blood glucose level done in the home is often used to monitor control of diabetes. In individuals with type 2 diabetes, the frequency for checking blood glucose levels depends on the medications used for treatment. Testing frequency and target goals should be determined by the primary care physician or an endocrinologist if one is involved in the care of the individual. Different targets may be required for specific individuals including the very old or very young and those with serious medical conditions. In general, target goals are as listed below. Often these targets are not achieved due to several reasons including compliance in taking medications, alcohol or tobacco use, inactivity, dietary indiscretions, stress, and infrequent follow-up with the physician.

Target goals

Fasting glucose_____80 to 120 mg/dl

Post-prandial glucose
(1-2 hrs after a meal)_____below 160 mg/dl
                                    best if 120-140mg/dl

Bedtime glucose:_____100 to 140 mg/dl

Glucose meters are about 10% to 15% less accurate than laboratory tests. Glucose meters which are reasonably accurate include Precision QID, Fast Take, Accu-chek, Advantage and Complete with Comfort Curve strips, Glucometer Elite, and Glucometer Dex. Ways to improve blood glucose meter accuracy include: testing the meter once a month, recalibrating the meter whenever a new packet of strips is used, using fresh strips, keeping the meter clean, and periodically comparing the meter results with the results from a laboratory.

Hemoglobin A1c (A1c):

A1c levels are measured periodically to determine the average blood sugar level over the previous 2 to 3 months. An A1c level should be obtained at least twice yearly in patients who are meeting treatment goals and who have stable glycemic control. But they should be done quarterly in patients whose therapy has changed or who are not meeting glycemic controls.

The goal for most people with type 2 diabetes is less than 6.5 to 7 percent. An A1c level of 7% corresponds to an average blood sugar level of 150 mg/dl. The average blood sugar goal is higher than the fasting blood sugar goal for several reasons. Blood sugar increases after eating. The amount it increases depends upon the type and amount of food eaten and the person's activity level. The healthcare provider will set a target goal for A1c levels. The target level should balance the improvement in complications related to diabetes with the risk of hypoglycemia.

Urine tests:

Diabetes can alter the normal function of the kidneys. A urine test that measures the amount of protein (albumin) in the urine can help determine if diabetes is affecting the kidney's filtering action. Microscopic amounts of albumin in the urine (microalbuminuria) can be an early indicator of diabetes-related kidney complications called nephropathy.

Urine screening tests should begin at the time of diagnosis and be done at least yearly. If the test shows that there is protein in the urine, tight blood sugar and lipid control is recommended.

Complications of Diabetes and Risk Factor Management

Cardiovascular complications

The most common long-term complication of diabetes is heart disease. The risk of heart disease is estimated to be at least twice that of persons without diabetes.

In addition to controlling blood glucose, attention should be paid to reducing other risk factors for heart disease which include smoking, high blood pressure, elevated cholesterol levels, and obesity.   Taking aspirin daily will also reduce the risk for heart disease.

Hypertension:

Hypertension is a common problem in type 2 diabetes. Blood pressure should be measured at every office visit but should be checked a minimum of twice a year. Early and effective treatment prevents heart disease and minimizes the progression of diabetes related nephropathy (kidney disease) and retinopathy (eye problems).

The recommended blood pressure for most diabetic patients is less than 130/80 mmHg, but even lower values may be beneficial.

One common blood pressure medication called an ACE inhibitor (such as Lisinopril) may be prescribed by a physician even if the blood pressure is not elevated. This is because ACE inhibitors can help delay the onset of microalbuminuria and slow or prevent nephropathy.

There are things that can increase blood pressure and they should be avoided. These include:

- Over-the-counter medications such as decongestants (Sudafed®)
- Anti-inflammatory medications (Advil®)
- Many appetite suppressants (including herbal products)
- Tobacco products
- Alcohol
- Salt

Lipid abnormalities:

Elevated lipids are common in individuals with diabetes mellitus. Screening for elevated lipids should be done at least once a year and more often if needed to achieve goals.

The goal levels for lipids are:
- **LDL**:   under 100 mg/dl
                        under 70 mg/dl if cardiovascular disease is present
- **Triglycerides:**   under 150 mg/dl
- **HDL**:   over 40 mg/dl for men and over 50 mg/dl for women

Retinopathy:

Retinopathy is the abnormality of blood vessels in the back part of the eye. Patients with diabetes are at an increased risk for visual loss. Visual loss can be

due to refractive errors which are correctable and to retinopathy which is now treatable with laser photocoagulation surgery.

A comprehensive eye examination should be done at the time that diabetes is diagnosed and then at least yearly thereafter.

Diabetes Foot Care:

The foot is a common place for problems to develop in individuals with diabetes. Loss of feeling, coldness, numbness, pain, blisters, or sores may be signs that diabetes is not controlled or that nerve damage is occurring. Corns, calluses, and bunions increase the risk for foot ulcers to develop. Infection in ulcers can lead to hospitalization and even to amputation of the foot.

A comprehensive foot examination by a physician or podiatrist should be done annually on all patients with diabetes.

Recommendations for foot care:
- Look at feet daily
- See a health care provider at the first sign of redness, swelling, infection, prolonged pain, or new onset of numbness or tingling of any part of the foot.
- Wash feet daily with lukewarm water and mild soap
- Dry feet well, especially between the toes
- Keep foot skin smooth by applying creams or lotions, especially on the heels
- Wear cotton socks that fit loosely and change socks every day.
- Select shoes that are snug but not tight and break in new shoes slowly to prevent blisters from forming.

Avoid the following when caring for the feet:
- Use care when trimming the nails. The nail should be trimmed along the shape of the toe and a file should be used to remove any sharp edges.
- Never cut the cuticles.
- Do not open blisters, try to free ingrown toenails, or otherwise break the skin on the feet.
- Don't use hot water, a heating pad, or a massaging machine on the feet
- Don't place feet against hot surfaces
- Don't expose feet to cold weather
- Don't walk in wet shoes
- Don't wear shoes without socks

Mouth Care

- Have teeth cleaned and checked by a dentist every 6 months if possible, annually if more frequent checks are not possible.
- Brush at least twice a day
- Use a soft nylon brush with rounded ends on the bristles
- See a dentist if:
  - there is bleeding of the gums or gums are red, swollen or tender
  - there is pus between teeth and gums when the gums are touched
  - there is any change in the way the teeth fit together when biting

Vaccinations

Patients with diabetes should receive influenza vaccination yearly and a pneumococcal vaccination. The pneumococcal vaccination should be repeated once after age 65 if the initial vaccination was prior to age 65. Tetanus and diphtheria vaccinations should also be updated.

Lifestyle and Nonpharmacologic Therapy

Diet

Diet modification not only helps to control blood glucose levels, but can improve many other aspects of diabetes including obesity, high blood pressure, and insulin release and responsiveness. Weight reduction can help the body to produce and use insulin more efficiently. Several studies have looked at the long-term efficacy of diet and exercise alone in patients with type 2 diabetes. In one study, even with strict diets, after three years, only 3 percent of those treated with diet had maintained the desired fasting blood glucose concentration below 108 mg/dl. Most individuals require treatment with a pharmacologic agent along with diet, exercise and weight loss to achieve and maintain glucose control.

Caloric intake:

The recommended calorie intake needed to maintain weight depends upon age, sex, height, weight, and activity level.

In general to **maintain the current weight** the caloric intake per day should be:
- Men, active women – 15 kcal per pound
- Most women, sedentary men, and adults over 55 years – 13 kcal per pound
- Sedentary women, obese adults – 10 kcal per pound

To lose 1 to 2 pounds per week which is a safe rate of weight loss, subtract 500 to 1000 calories from the total number of calories needed to maintain weight. As an example: an overweight man who weighs 250 lbs would need to eat 2500 calories per day to maintain his weight (10 kcal per pound times 250 pounds). To lose 1 to 2 pounds per week, he should eat 1500 to 2000 calories per day. As weight is lost, the recommended calorie intake should be recalculated.

Body mass index (BMI) is now commonly used as a classification of weight status. To calculate:

BMI = (weight in pounds X 704) divided by (height in inches X height in inches)

- Overweight = BMI greater than or equal to 27
- Obesity = BMI greater than or equal to 30
- Morbid obesity = BMI greater than or equal to 40

General diet recommendations:

- Between 25 to 35 percent of calories per day should come from fat.
- Total cholesterol intake should be less than 200 mg per day.
- Between 15 and 20 percent of calories should be from protein.
- A diet that is high in fiber (25 to 30 grams per day) may help to control blood glucose levels.
- A diet that is low in sodium and high in fruits, vegetables, and low fat dairy products is recommended.
- Artificial sweeteners (aspartame, saccharin, acesulfame-K, neotame, and sucralose) do not affect blood glucose levels and may be consumed in moderation. However sugar alcohols (sorbitol, xylitol, lactitol, mannitol, and maltitol) which are often used to sweeten sugar-free candies and gum, can increase blood glucose levels slightly. Eating too much sugar alcohol can cause cramping, gas, and diarrhea.

Exercise:

Exercising regularly can help with weight loss and keep it off. The recommended amount of exercise is 30 minutes per day most days of the week.

Pharmacologic Treatment

The metabolic abnormalities that characterize type 2 diabetes worsen with age. Starting therapy early to treat diabetes, when the A1c level is not significantly elevated, is associated with improved glycemic control over time and decreased long-term complications. The American Diabetes Association and the

European Association for the Study of Diabetes recommend that metformin therapy (if there are no contraindications for its use) be initiated along with diet, exercise and weight loss interventions, at the time that diabetes is diagnosed. Metformin is recommended because of efficacy in controlling glucose levels, as well as favorable cost, general tolerability, and the absence of weight gain and hypoglycemia. If therapy with metformin is contraindicated other medications such as a sulfonylurea should be used. The medications used to treat diabetes will not be covered here.

Summary:
Monitoring of patients with diabetes:

A1c testing	Every 3 to 6 months
Blood pressure reading	At least twice a year
Eye exam including retinal exam	At least once a year
Comprehensive foot exam	At least once a year
Urinary protein/microalbumin test	Once a year
Lipid profile	Once a year

Also of importance:
- **Diet**
- **Weight loss**
- **Exercise**
- **Smoking cessation**