Patient Brochure
Type 2 Diabetes
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1. **Introduction**  
**Overview**

You have been told by your doctor, that you are suffering from type 2 diabetes? This being natural in the circumstances, that you may be worried and have many questions like “How can I live a normal life?” or “Will I have to have injections from every day now on?” and probably more questions like these.

This brochure will help you and your relatives in getting to know the answers to these and other basic questions. First and most important: You are not alone! Diabetes mellitus is a rather common disease in the Western industrialized countries: 6 to 8% of the total population have diabetes, up to 95% of them type 2 diabetes - just the same diagnosis that you have been told by your doctor. And most of the others who were also diagnosed with type 2 diabetes can lead an active and happy life - read this brochure and then join them. You can control this illness - do not let this illness control you!
2. What is Diabetes?  
General Facts and Information

Diabetes (more accurately: diabetes mellitus, DM) is a failure of carbohydrate metabolism, caused by an inadequate secretion or utilization of insulin. This results in a too high concentration of sugar (glucose) in the blood.

Glucose is generated

- by the food one eats. Especially starchy foods such as bread, rice, potatoes, etc., which is broken down into glucose by digestion. However, glucose also comes from sugar and other sweets.
- by the body itself, in the liver and the muscles.

Under normal circumstances, i.e. in non-diabetic persons, the concentration of glucose in the blood is (among others) controlled by insulin, which is a hormone generated by so called beta-cells of the pancreas. Insulin helps the glucose to get into the cells, where it is used as a kind of “fuel” for the body. If the body does not produce (enough) insulin or if the insulin does not work as it should, the glucose cannot get into the cells and therefore stays in the blood instead. If the concentration of glucose in the blood is too high over a long period, this condition will lead to serious organ damages (please see illustration below). Therefore, diabetes must be properly diagnosed and treated.
Diabetes mellitus is a rather common disease in the Western industrialized countries: 6 to 8% of the total population have diabetes, up to 95% of them type 2 diabetes.

There are two major types of diabetes:

- If diagnosed with **type 1** diabetes (also called insulin-dependent diabetes mellitus, IDDM) the body is unable to produce any insulin. This type of diabetes usually appears before the age of 40. It is usually treated by prescribing insulin and compliance of a healthy diet.

- **Type 2** diabetes (or non-insulin dependent diabetes mellitus, NIDDM) is diagnosed if the body is still able to produce insulin, however not enough, or if the insulin does not work correctly (the so called “insulin resistance”).

Type 2 diabetes is caused by several hereditary and environmental factors. In the past, people over the age of 40 were usually diagnosed with this type of diabetes, despite the fact that in the last years an increasing number of children were diagnosed with this type of diabetes. This recent increase indicates that lifestyle factors (obesity and sedentary lifestyle) may release the genetic elements that cause this type of diabetes, which can be treated by diet, tablets and/or insulin injections.
3. **Why Treatment is Important**

**Complications of Diabetes**

Type 2 diabetes mellitus is one of the main causes of:

- a majority of heart disease and strokes (by diabetic damage of the blood vessels bringing oxygen to the heart and the brain)
- kidney failure and a probable necessity for hemodialysis
- limb amputations if diagnosed with diabetic foot syndrome
- new onset blindness diagnosed by adults (caused by diabetic damages of the retina)
Why Treatment is Important

Heart and Circulation

Two out of three people with diabetes die from heart disease and stroke!

Having diabetes means that you are much more likely to have coronary artery disease (narrowing or blocking of the blood vessels of the heart). It is the most common form of heart disease. Blood vessels of your heart can become partially or totally blocked by fatty deposits. A heart attack occurs when the blood supply of your heart musculature is reduced or cut off.

A stroke occurs when the blood supply to a part of your brain is interrupted and brain tissue becomes damaged. The most common cause is a blocked blood vessel. Stroke can cause physical problems such as paralysis, problems in thinking or speaking, and emotional problems.

Though heart attack and stroke more often lead to death than damage of other blood vessels, diabetes also causes abnormalities in all big and small vessels of the body, including peripheral arteries of the lower limbs, the intestine, the kidney and the eye (please see below). Even if suffering from diabetes, you can lower your risk for heart and vessel disease and stroke by several measures mentioned in the section “Treatment Goals”.

![Diagram of heart and blood vessels]
“Diabetic nephropathy” is named to be a kidney disease as a complication of diabetes. Diabetic nephropathy is caused by damage to small blood vessels of the kidney. As the kidney disease progresses, proteins leak into the urine and the kidneys gradually lose their ability to remove waste products from the blood.

Each year, there are 50,000 people in the United States diagnosed with end-stage kidney disease. More than one third of them suffer from diabetes!

Damage to the kidneys is more likely if the blood sugars remain persistently high and hypertension (increased blood pressure) is not treated aggressively.
Nerves and Diabetic Foot

Diabetic neuropathy, a nerve dysfunction caused by diabetes, includes several disorders. The following two are the most often diagnosed clinical patterns:

- **Peripheral neuropathy.** This is the most common type of diabetic neuropathy, affecting the longest (most “peripherally” reaching) nerves in your body. Peripheral neuropathy causes numbness or pain in the feet and lower legs, the so called “diabetic foot syndrome”, which mostly leads to poorly healing sores or sores which are not healing at all.

- **Autonomic neuropathy.** This neuropathy damages important collections of nerves that control your unconscious body functions (the autonomous nervous system). It may affect digestion, blood circulation and also sexual function.

Diabetic neuropathies are most common in those patients whose blood glucose levels are not well controlled. Diabetics who smoke are especially at risk.

Diabetic foot is a term for several foot problems in patients with diabetes mellitus. Due to arterial blood circulation problems and diabetic neuropathy, as well as a tendency to delayed wound healing, infection or death of the tissue of the foot is relatively common.

Sores and blisters on feet occur for two reasons. If peripheral neuropathy causes numbness, the person will not feel an irritation or pressure point in the foot. Hence, the skin can break down and form an ulcer.

If the patient is also suffering from a poor blood circulation, this suffering can lead to a slow healing process. Left untreated, a simple sore can become infected and very large, even an amputation can become necessary, if treated to late.
Why Treatment is Important

Eye

The retina (the collection of light-sensitive cells lining the back of the eye) contains many blood vessels. In diabetic retinopathy, the small vessels of the retina are damaged by high blood glucose. Two kinds of diabetic retinopathy can decrease vision:

- In **non-proliferative retinopathy**, the pre-existing blood vessels of the retina deteriorate, become blocked or develop so-called aneurysms (balloon-like deformity of a blood vessel). Fluids leak out of the abnormal blood vessels and accumulate in the area of the retina that is responsible for sharp vision (macula). Swelling of the macula (edema) impairs the fine vision.

- In **proliferative retinopathy**, new blood vessels grow on the surface of the retina. These blood vessels are unstable, get ruptured and can cause small bleedings, which lead to local formation of scars. In these scarred areas, the clear mass between the lens and the retina (the vitreous) can become adhered to the retina, change its shape and pull apart the layers of the retina: a retinal detachment. This is one of the most serious consequences of proliferative retinopathy. Sudden bleeding into the vitreous can also obscure vision, often quite suddenly.

- **Diabetic retinopathy** takes years to develop, however, it is found in close to 80% of people diagnosed with diabetes who are treated with insulin and have had diabetes for 20 years or longer. It is the leading cause of blindness in the United States for people between the ages of 20 and 64. If diagnosed early enough, the damage to vision can be minimized by tight control of blood glucose and by laser therapy.
4. Treatment Goals

Overview

In general, the basic goals of treating your diabetes are to avoid the complications mentioned above. This goal must be to normalize the blood sugar levels. Studies have shown that avoiding peaks of blood glucose, especially after meals, are very important.
Blood Glucose Control

The blood sugar level should be as close to normal as possible (normal ranges of fasting blood sugar are 70-100 mg/dL or 3.88-5.55 mmol/L) - often this can already be reached by losing weight with a calorie-controlled diet (being overweight further increases your higher risk of heart and vessel disease) or by keeping a normal, healthy diet.

Principles of healthy eating are:
- regular meals (to prevent an irregular blood sugar)
- cut down on high sugar foods
- reduce fat intake (especially of saturated fatty acids)
- cut down on salt
- eat at least five portions of fruit and vegetables a day

Alcohol should be limited:
- Women should drink a maximum of 14 alcohol units per week.
- Men should drink a maximum of 21 alcohol units per week.

One unit is approximately 250 ml of beer, 125 ml of wine or 25 ml of spirit (40%). Talk to your doctor about drinking alcohol - some diabetes medications may not be taken together with alcoholic beverages.

Exercise is a recommended component of diabetes management.
It can increase insulin sensitivity, lower blood glucose, and have positive psychological effects. Regular physical activity improves glycaemic control, reduces hypertension, and normalizes lipids. A careful monitoring of blood glucose and attention to diet around the time of exercise will help prevent hypoglycaemia (see below “Emergencies”).

Recommended exercises are walking, jogging, biking or swimming for 30 minutes or more, at least three times a week. In addition, strength training (weight lifting) can also help to improve fitness and heart health.

If you haven’t been active until now, build up your exercise level slowly. Start by (e.g.) walking 5 minutes a day and increase length and speed as soon as you feel stronger.

And: Any exercise is better than none. Build physical activity into your day - take the stairs instead of the elevator, park at the far end of the lot for a longer walk to your office. This will help to satisfy your need for exercise.

If these lifestyle modifications are not sufficient to reach an adequate blood glucose control, your doctor probably will prescribe some tablets (antidiabetics) - these are explained in detail in the section “Medication in Diabetes”.
Heart and Circulation

The lifestyle modifications mentioned above (like adequate life style, cessation of smoking, loosing weight, physical exercise) will also lower your risk for heart attack and stroke by decreasing high blood pressure and normalizing blood fats. If these are not sufficient, perhaps you need some medication: antihypertensive agents or/and blood fat-lowering medication.
Treatment Goals

**Nerves and Diabetic Foot**

For the prevention of nerve damages, which mainly occur at the lower limbs, you might want to see a chiropodist. (Additional to essential blood glucose control.)

**Recognition of Complications**

Complications have to be recognized as diabetes-related, e.g. such as worsening of eyesight or poor healing of wounds.

In the case of heart and vessel disease, diabetes cannot be seen as the cause; hence these diseases can have many origins, such as high blood pressure, abnormal blood fats, being overweight and so on. You see - risk factors for your heart and your circulation are the same as for people who are obtaining a normal blood glucose level. The treatment will include similar approaches, regardless of diabetic or non-diabetic origin of heart and vessel disease.
5. Medication in Diabetes

The most important issue while treating diabetes is achieving blood glucose levels as close to normal as possible. Effectively diminishing high peaks in blood sugar after meals is of special importance in this context. The effective diminishment of blood glucose peaks after meals (regardless if done by insulin or by oral medication) can help to protect against long-term damages to the eyes, kidneys, nerves, heart and major arteries.

Usually for type 1 diabetes insulin is administered in mono or combination therapy. In many cases, type 2 diabetes can be controlled by lifestyle changes alone, as mentioned in detail above.

If these lifestyle changes are not sufficient to keep your blood glucose close to normal after at least three months of healthy eating and increasing exercise, your doctor may prescribe some oral medication. There are several types of oral medicine that can be used to control blood sugar in type 2 diabetes. Your doctor can consider for you the optimal treatment option.
6. **What else you can do**

**Hygiene**

Check your hygiene, especially focusing on your teeth and feet. Even minimal wounds - minimal injuries of a toe by nail cutting may lead to severe damage in diabetic patients! - see your dentist regularly, and make appointments with your chiropodist.

Foot problems can literally develop overnight. It is essential to check your feet daily to see if there are any cuts, blisters or sores, changes in temperature (hot or cold) and/or in color (pale, red, blue), signs and symptoms of infection, corns and calluses. Look at your feet every day and also use a mirror to see the bottom of your feet. Wash them well with mild soap and water every day and dry them very well, mainly between the toes. Do not go barefoot and wear shoes that fit well. Do not cut your toenails, file them instead, or have them trimmed by a chiropodist.

If you have poor circulation, nerve damage, or very thick toe nails, see a chiropodist regularly, also if you have corns or calluses. If you do get a cut or scratch, take care of it right away. Wash it with mild soap and warm water. Use a mild ointment. Cover with gauze and paper tape or a fabric bandage, which you should change often. Call your healthcare provider right away if the area does not heal, turns red or any drainage starts.

Diabetes can lead to infections on your gums and the bones that hold your teeth in place. Like all infections, gum infections can cause blood glucose to rise. Without treatment, teeth may become loose and fall out. Help prevent damage to your gums and teeth by the following:

- See your dentist twice a year, tell him or her that you have diabetes.
- Brush and floss your teeth at least twice a day.
- Keep your blood glucose as close to normal as possible.
Emergencies

Learn how to recognize signs of potential emergencies showed by a high blood glucose level (called hyperglycaemia) and low blood glucose level (called hypoglycaemia).

- **Hypoglycaemia** happens from time to time to everyone who has diabetes. It can happen even during those times when you are doing all you can to manage your diabetes. Although many times you cannot prevent it from happening, it has to be treated before it gets worse. For this reason, it is important to know what hypoglycaemia is, what symptoms of hypoglycaemia are, and how to treat hypoglycaemia.

  **Symptoms can be:**
  - dizziness and shaking
  - sweating and/or pale skin
  - hunger
  - headache
  - sudden moodiness or behavior changes
  - clumsy or jumpy movements, even seizures
  - confusion

You should check your blood whenever you feel low blood glucose coming on. If you see that your blood glucose level is low, you should treat hypoglycaemia quickly. The fastest way to raise your blood glucose is the intaking of some form of sugar, such as glucose tablets (you can buy these at the drug store), some fruit juice or hard candy.

Ask your doctor to give you a list of food items that you can use to treat low blood glucose. Just be sure you always have at least one type of sugar with you.

**Hypoglycaemia unawareness.** Some people have no symptoms of hypoglycaemia. They may lose consciousness without ever knowing that their blood glucose levels were dropping. This problem is called hypoglycaemia unawareness. Hypoglycaemia unawareness tends to happen to people who have had diabetes for many years. It is more likely to happen to people who have neuropathy (nerve damage), people on tight glucose control, and people who take certain heart or high blood pressure medicines.
Over the years the symptoms of hypoglycaemia may change. In this case, someone may not recognize a reaction because it feels different. These changes are a good reason to check your blood glucose often, and to alert your friends and family to your symptoms of hypoglycaemia. Treat low or dropping sugar levels even if you feel fine.

Hyperglycaemia also happens from time to time to all people who have diabetes. The reason can be that you ate more than intended or exercised less than planned. The stress of an illness, such as a cold or flu, can also be the cause. As well as emotional stress, such as family conflicts, school or dating problems. The signs and symptoms include: high blood glucose, high levels of sugar in the urine, frequent urination, and increased thirst. Check your blood and then treat high blood glucose early - this will help you to avoid the other symptoms of hyperglycaemia.

It is important to treat hyperglycaemia as soon as you detect it. If you fail to treat hyperglycaemia, a condition called ketoacidosis (diabetic coma) could occur. When your body breaks down fats, waste products called ketones are produced. Your body cannot tolerate large amounts of ketones and will try to get rid of them through the urine. Unfortunately, the body cannot release all the ketones and they build up in your blood. This can lead to ketoacidosis. Ketoacidosis is life-threatening and needs immediate treatment.

Symptoms include:
- shortness of breath
- fruity smelling breath
- nausea and vomiting
- dry mouth

Ketoacidosis is a medical emergency! Call an ambulance or see your doctor immediately.
7. **Important Tests**

**Diagnosis**

Type 2 diabetes usually begins gradually and progresses slowly.

**Symptoms in adults may be shown through:**
- increasing thirst
- production of a lot of urine
- tiredness
- blurred vision
- sores that heal slowly
- dry, itchy skin
- loss of sensitivity or tingling in the feet

**Symptoms in children are often different:**
Most children are obese or overweight. Increased urine production is mild or absent. Many children get a skin problem called acanthosis, which is characterized by velvety, dark colored patches of skin.

If you suffer from one or more of the above symptoms, you should see your doctor: He will perform some diagnostic tests, which include:

**Fasting plasma glucose (FPG).** This is a simple test, where a blood sample is taken after eight hours of fasting. In general results indicate the following: FPG levels are considered normal up to 100 mg/dl (or 5.55 mmol/L). Diabetes is diagnosed when FPG levels are 126 mg/dl (7.0 mmol/L) or higher on two different days.

The FPG test is not always reliable and there is controversy among experts about using it as the only basis for diagnosing diabetes. Therefore, if a person has normal FPG levels but still suffers from symptoms as described above and has a family history or other risk factors such as overweight, then diabetes should not be ruled out and an oral glucose tolerance test should also be performed.
**Oral Glucose Tolerance Test (OGTT).** An oral glucose tolerance test uses the following procedures:

At first, a FPG test is done. Afterwards, the patient drinks a special glucose solution, and a second blood sample is taken two hours later. If suffering from diabetes, the increase of blood glucose is more pronounced than in non-diabetic persons, and the level remains high, 180 mg/dL (10 mmol/L), or more.

Measurements between 7.8 and below 10 mmol/l puts a person at risk for diabetes and are referred to as impaired glucose tolerance (IGT). This condition is associated with a high risk for developing diabetes.

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**Hemoglobin A1c.** Last but not least: Blood glucose concentrations can tell only about the momentary state of your sugar metabolism. So it is quite useful to have a test which gives information about the condition of your blood glucose concentrations during the last 3 months.

This is what the so called hemoglobin A1c test does:

The higher the level of blood sugar, the more sugar attaches to red blood cells. The hemoglobin A1c test measures the amount of sugar sticking to the hemoglobin (the pigment in the red blood cells). The test should be done approximately twice a year in your doctor's office. The result is given in percent and usually should be less than 7%.
The American Diabetes Association (ADA) additionally recommends that all persons at the age of 45 and above, particularly those with a Body Mass Index (BMI) of 25 or more, should be tested for diabetes. If the test is normal, they should be re-tested every three years. Testing should be conducted at earlier ages and carried out more frequently on individuals who have any of the following diabetes risk factors:

- have a first degree relative with diabetes (i.e., parents or siblings)
- have delivered a baby weighing more than 9 pounds or have had gestational diabetes
- have impaired blood fat levels (HDL cholesterol equal or less than 35 mg/dl and/or a triglyceride level equal to or greater than 250 mg/dl)
- have high blood pressure.
**Important Tests**

**Monitoring**

The reasons for monitoring blood glucose levels have been explained in detail above - only close to normal blood glucose will keep the risk of complications as low as possible.

**Blood glucose monitoring** requires a simple capillary blood sample, usually by fingerstick, and application to a special strip to determine a glucose meter reading of the strip containing the blood sample. The American Diabetes Association recommends that patients with type 2 diabetes, who are treated with insulin or oral drugs, monitor blood glucose at least once daily. In the beginning more often measurements may be necessary, that can be up to five times a day. Later, if the blood glucose is stable under treatment, two tests a week can be sufficient (according to your doctor’s instructions).

Glucose measurements at 3 AM are important if nighttime low glucose (hypoglycaemia) is suspected.

Measuring **urine glucose** is done very simply by strips put into the urine. Your doctor will tell you, how often this test must be done - normally more often after your diabetes was newly diagnosed, and as soon as a good blood glucose control is reached, the frequency can be lowered. Positive tests which indicate that your urine contains glucose, normally means that your blood glucose is too high. If you have not tested your blood yet, you should definitely do so.

**Test for hemoglobin A1c.** This test examines the so called “glycated” hemoglobin, HbA1c. It is useful for monitoring the disease over longer periods of time. They cannot only assess your momentary status but give valuable hints about whether diabetes treatment has to be intensified. The value is normal if it is lower than 6.5 to maximum 7%.
8. Key Messages
Overview

You have been diagnosed with type 2 diabetes - do not worry about it, however, keeping in mind the following 10 points will help you coping with type 2 diabetes:

1. First of all: diabetes will not stop you from enjoying your life!

2. Improve your knowledge about your condition, e.g. acquire useful information in patients’ classes on diabetes and/or gather patients’ information from your doctor. The more you know about diabetes, the better you can live with diabetes.

3. Possibly some changes in your lifestyle are sufficient to control your blood glucose level, such as healthier food and regular exercise.

4. If you have to take oral medication(s), take it regularly and according to your doctor’s advice.

5. Make sure to regularly do your blood glucose monitoring tests in order to avoid complications. React according to the results, as taught by your doctor.

6. Stay in regular contact with your doctor (and specialists as chiropodist and dentist).

7. Have your doctor informed on short-term changes in your life, e.g. holidays or strong emotional stress - perhaps you will have to check your blood glucose more often or need some additional advice if you visit exotic countries.

8. Be aware of the symptoms of hypoglycaemia and have some glucose tablets carried with you all the time.

9. Get your environment informed that you have diabetes, so your family and friends can react appropriately in cases of emergency, e.g. sudden loss of consciousness.

10. If you suffer from newly occurring symptoms such as heart burning, numbness or pain in your feet or legs, badly (or not at all) healing wounds, blurred vision or sudden lost of sight (also if self-limiting), contact your doctor immediately.
9. Useful Internet Links

Further Information

- www.diabetes.org
- www.diabetes.org.uk
- www.idf.org
- www.joslin.harvard.edu
- www.niddk.nih.gov
- www.diabetesnet.com