1. INTRODUCTION

In the European Union, the many patients (more than 19 million people) affected by diabetes mellitus (DM) currently named as diabetes or DM in this information tool can do a lot, with the help of their doctors [medical doctor (MD) and pharmacist doctor (Pharm D)], to minimize the health impact of diabetes. The condition is a long-term one (chronic) and, if not properly treated, may lead to other serious diseases (or complications). In many cases, treatment in hospital can be avoided with proper outpatient management and treatment.

The onset and the progression of some forms of diabetes may be delayed through the adoption of healthy lifestyles. Maintaining your weight within recommended limits, eating a healthy diet and taking regular exercise will greatly reduce the risk of developing diabetes. Ideally, thirty minutes of exercise should be taken at least five times a week. But regular exercise does not have to be a chore - walking instead of taking the bus and using the stairs instead of the lift are healthy choices. A healthy diet is one that is low in saturated fat, salt and sugary snacks and drinks. Eating regular meals throughout the day with at least five portions of fruit and vegetables every day will help prevention, as will avoiding smoking and ensuring alcohol intake is moderate. Foods such as chocolate and sweets can still be eaten as long as the overall diet is kept healthy.
Patients who play an active and informed role in managing their condition are likely to cope better with living with diabetes. Self-management is therefore a very important element of diabetes treatment. A diagnosis of diabetes will affect the treatment and care of that person over their lifetime, involve self education and impact on participation in society. In these three areas, the person with diabetes needs to play his/her roles and to make informed choices.

This fact sheet aims to provide patients affected by diabetes with trustworthy information in an understandable way. It consists of three main components:

- Treatment, care and other medical issues;
- Education and self-education;
- Participation in society.

This paper is written from a European viewpoint. Some information can only be provided from a national perspective. The sections which also require a national view are identified throughout the paper by means of a star (*).

2. TREATMENT, CARE AND OTHER MEDICAL ISSUES

2.1 Definitions

There are two main types of diabetes mellitus: type 1 (or insulin-dependent) and type 2 (or non-insulin-dependent) diabetes mellitus. Type 1 DM is also known as juvenile diabetes mellitus or early onset DM because it usually develops before the age of 40, often in the teenage years. Type 2 diabetes is also referred to as maturity onset diabetes because in the past it was said to occur mostly in people over the age of 40. However, because more people are overweight than in the past, people are now presenting with type 2 diabetes at a much younger age.

Gestational diabetes (or diabetes in pregnancy) is a special type 2 DM affecting, in general, less than 1 in 20 pregnant women. As an average, nine out of ten people with DM have type 2 diabetes and over 80% of these people are overweight. Besides these two main types of diabetes, there are also other specific types of diabetes but these are more rare.

2.2. Causes

One function of the pancreas, a gland situated behind the stomach, is to produce a hormone called insulin, from specialised cells called the beta cells. Diabetes is caused by these cells either not producing enough insulin or because the body cannot use the insulin produced properly. The main role of insulin is to allow transfer of glucose (a type of sugar) present in the diet or produced from digestible carbohydrates (like cereals, potatoes, rice…) out of the blood stream into muscle cells, where it can be broken down to produce energy.

2.2.1. Type 1 DM

If you have type 1 diabetes mellitus, your body is unable to produce insulin, or is not
able to produce enough. This is usually because your immune system attacks the cells in your pancreas, destroying them or damaging them enough to reduce insulin production. You are more at risk of developing type 1 DM if it runs in your family.

Those with this type of diabetes need insulin treatment for the rest of their life. They must check the levels of glucose in their blood regularly and watch out for complications. Self-monitoring is an essential part of managing diabetes and it also supports the quality of the treatment.

2.2.2. Type 2 DM
If you have type 2 diabetes mellitus, your body does not react properly to insulin, (insulin resistance) or you are unable to produce sufficient amount of insulin (insulin requerent) to meet your body’s needs. A major cause of type 2 diabetes is excess body weight, particularly when you carry this excess weight as fat around the abdomen. When you have a genetic susceptibility to diabetes, it is this kind of fat which drives progression to the disease.

You are more at risk of developing type 2 diabetes if:
- you are overweight or have high blood pressure or high cholesterol;
- type 2 diabetes runs in your family;
- you are of Asian, Afro-Caribbean or Middle-Eastern background; or
- you are a woman who has given birth to a large baby
- you have had gestational diabetes in pregnancy only, which was treated with insulin

The risk of developing type 2 diabetes also rises partially as you get older due to increasing weight. As the population ages also the number of people with diabetes increases among the elderly. There are also other causes of diabetes. Certain medical conditions such as acromegaly or Cushing disease can lead to increased insulin resistance and diabetes. Chronic pancreatitis can damage the insulin producing cells, meaning that patients with the disease eventually may present with diabetes.

2.3. Control and regulation of blood glucose level
If your blood glucose levels become too high, you can suffer from symptoms of hyperglycaemia. These can include dehydration, drowsiness and a frequent need to pass water.

In type 1 diabetes, high blood glucose levels can lead to diabetic ketoacidosis - when your body begins to break down fats for energy instead of glucose, leading to a build up of ketone acids in your blood. This process can lead to severe dehydration, problems with the levels of salts in your blood and kidney failure and even death if left untreated.

Ketoacidosis doesn’t occur in type 2 diabetes as patients usually have at least some production of insulin, they do however still suffer from symptoms of high blood sugar. Hyperglycaemia can occur if the dose of your blood glucose
lowering medication or insulin is too low, or you have missed out on doses. It can also occur if you have an acute illness or infection.

If your glucose levels become too low you can suffer a dramatic hypoglycaemic attack. This can happen if you have taken too much insulin or you are on certain blood glucose lowering tablets. Symptoms of a ‘hypo’ include sweating, feeling shaky and irritable and can be brought under control by eating or drinking something containing fast-acting carbohydrates, such as a fizzy drink, sugar cubes or raisins.

If you are diabetic, you need to keep an eye on your glucose levels as an effective regulation of blood glucose level is the most efficient system to prevent complications of diabetes (see Section 2.4). This can be done at home using a simple blood test or a urine test.

Your GP (or other physician, pharmacist or nurse) will talk to you about your ideal glucose level in blood as it varies between people, and varies throughout the day. The normal level is between 4 and 7 mmol/l before meals, and less than 10 mmol/l two hours after meals, (mmol/l are the units which are used to measure the quantity of glucose in the blood). Home blood glucose monitoring is most important for type 1 diabetes as your blood sugar is more likely to vary substantially from day to day and with regular HbA1c control 4 fold a year with value no higher than 7 %. (DCCT-1993 recommendations).

In type 2 diabetes an average glucose check and HbA1c measurement 4 times a year with an objective of value no higher than 6.5 % (UKPDS), taken by your physician every 3-6 months is more useful.

Make sure you to have a healthy diet and take regular exercise because this will help to reduce the level of glucose in your blood.

2.4. Complications

Type 2 diabetes tends to produce a number of other problems. These include hypertension (raised blood pressure), high levels of energy fats (triglycerides) and low levels of good cholesterol (HDL) in the blood. The reason for this is that insulin has effects on blood fats as well as glucose, so that being insulin resistant leads to problems. Hypertension and the changes to lipids in the blood are both associated with an increased risk of complications, affecting both small blood vessels (microvascular complications including eye vision loss, nerve damage and kidney damage), and larger blood vessels, (macrovascular complications such as heart attack and stroke).

Type 1 diabetes is less associated with hypertension and abnormal lipids, but it is still important to manage these risk factors.

Additional specific complications are as follows:

- **Hands and feet**: High blood sugar can lead to nerve damage in the hands and feet. About 1 in 10 people with diabetes get foot ulcers because of abnormal sensation or blood flow. These can be liable to serious infection which may result in surgery.

- **Eyes**: High blood sugar can also interfere with the blood supply to the retina, leading to visual disturbance because of retinopathy. Cataracts may occur due to high blood sugar. All this can result in blindness in some
Kidneys: Over time, high blood glucose can cause damage to the small blood vessels in the kidneys, which results in damage to their filtering ability and can lead to kidney failure.

Impotence: On average, more than 30% of men with diabetes report erectile dysfunction/impotence. This number increases substantially with time from diagnosis and age.

Pregnancy: Pregnant women with diabetes are at increased risk of miscarriage and stillbirth.

2.5. Symptoms
The main symptoms of untreated diabetes are:
- feeling very thirsty,
- producing excessive amounts of urine (going to the toilet a lot),
- tiredness, and
- weight loss and muscle wasting (loss of muscle bulk).
Other symptoms can include:
- itchiness around the vagina or penis or getting thrush regularly, due to the excess sugar in your urine encouraging infections,
- blurred vision, caused by the lens of your eye becoming very dry

Symptoms of type 1 diabetes can develop quickly, over days or weeks, whereas those of type 2 diabetes usually develop over weeks or months. Some people with type 2 diabetes have few symptoms or even no symptoms at all and may only be diagnosed when other complications such as heart attack, are diagnosed. Even those without complications need to have treatment to reduce the risk of complications in future years.

2.6. Diagnosis
In order to diagnose diabetes, your doctor will ask for a urine sample. He or she will test this to see if it contains glucose. If it does contain glucose your doctor will ask you after an overnight fast to measure the level of sugar in the blood.

If the diagnosis is in doubt, then you may need to have an oral glucose tolerance test. Your doctor will give you a glucose drink and take blood samples every half an hour for two hours to see how your body is dealing with the glucose, through measurement of the blood glucose level.

It is important to diagnose diabetes as early as possible so that you can start treatment. If you experience some of the above-listed symptoms, you should see your doctor as soon you can.

2.7. Treatment (*)
This chapter need to remember professional recommendations:
- first : dietary treatment;
- second : avoid hypoglycaemia ;
- third hygienic precaution for insulin injection and
- forth : multidaily glycaemia autocontrole with glucometer.
Once diagnosed as having diabetes, you can control the symptoms and help to prevent health problems later on in life, but you will have the condition for the rest of your life and will need to manage the symptoms and their impact on your life.

If you have diabetes, you need to keep a regular check on your glucose levels. This is usually done with a blood test. You will need to see your doctor for regular check-ups to see how well you are managing the symptoms of your diabetes.

You will have regular blood tests and blood pressure tests. Your doctor will also need to check your eyes, feet and nerves regularly as these can be affected by diabetes (see Section 2.4). Your doctor may also refer you to a dietician who will be able to give you advice on maintaining a healthy lifestyle.

2.7.1. Type 1 diabetes

If you have type 1 diabetes, you will need to take regular insulin injections for the rest of your life to keep your glucose levels normal. Insulin injections can be taken using a syringe or an injection pen. Most people need either 2 or 4 injections a day and your doctor or diabetes nurse will teach you and/or a friend or relative how to inject the insulin properly.

There are different types of insulin available in the market. Your doctor will prescribe the most appropriate to you and you should not change the insulin type unless advised to do so by your doctor.

An alternative to injecting insulin is insulin pump therapy. An insulin pump is a small device - about the same size as a pack of cards – that holds the insulin. The pump is attached to you via a long piece of thin tubing with a needle at the end, inserted under your skin. Most people insert the needle into their stomach, but the hips, thighs, buttocks or arms can also be used. The pump allows insulin to flow into your bloodstream at a rate that you can control. This means that you no longer need to give yourself injections.

A new device for delivering insulin without using a needle is now available. Known as the insulin jet system, it can be used on the stomach, buttocks and thighs. It works by forcing a very small stream of insulin through a nozzle placed against the skin. The insulin travels at such high speed that it goes through the skin.

2.7.2. Type 2 diabetes

Traditionally, type 2 diabetes is treated stepwise - a period of diet and exercise, followed by oral tablets and patients eventually needing to progress on to insulin. In total, studies show that from time of diagnosis to commencement of insulin is around 7 years. Comment: Reference to 7 year for insulin treatment is inappropriate, inexact and false: we propose the following redaction:

"The professional consensus is:
After a regular dietary order respect, when HbA1c level becomes higher than 8.0%:
• First pharmacologic step: Initial monotherapy (usually metformin 3.0 g/d)
• Second pharmacologic step: when HbA1c level becomes higher than 8.0 % two iterative folds, biotherapy (usually insulin sensitizer + insulin secretor) is the next pharmacologic phase.
• Third pharmacologic step: when HbA1c level becomes higher than 8.0 % with bitherapy medicine, treatment requires regular insulin injection.

The time of each step is about 7 years with large personal variations (New England Journal of Medicine 1999). HbA1c is the accurate marker of glucose homeostasis.”

Diet, exercise and weight loss are particularly important throughout the course of the disease.

Initial tablet treatment for type 2 diabetes is usually with metformin, especially in obese patients. Metformin works primarily by reducing the amount of sugars produced by the liver. As well as being good at reducing blood glucose, metformin also reduces weight a little and has been shown to reduce the risk of heart disease in patients with diabetes.

Next, either a sulphonylurea or a glitazone is usually added. Sulphonylureas work by increasing insulin release from the pancreas, whereas glitazones reduce insulin resistance, meaning that the pancreas has to work a little less hard with respect to producing insulin to get the blood sugars down. Clinical trials to determine which of these two approaches is best in the long term are currently ongoing. Because they treat insulin resistance, glitazones also have modest positive effects on blood pressure and blood fats.

Other oral tablets include alpha-glucosidase inhibitors which work by blocking digestion of starch in the diet and slowing the passage of glucose from the gut into the blood stream.

Available evidence also indicates that in diabetes we should aim for a blood pressure target of less than 130/80mmHg in patients without complications, and a lower target in patients with complications. For this reason your doctor may need to treat you with a number of medications for blood pressure but it is very important that you take them all. Similarly, there is a body of evidence from studies that even patients with diabetes who have an average cholesterol level gain benefit from treatment with statins. If your doctor has started you on this type of medication it is very important that you maintain it.

When you need treatment with insulin because tablets are no longer controlling your diabetes, then your doctor will make a choice about the most appropriate type of insulin for you (see options in type 1 diabetes).

2.7.3. Therapy: concordance

Patients with type 2 diabetes are often taking multiple tablets for blood sugar, blood pressure, blood fats and any other complications associated with the disease. Because of this you may be taking up to 10 different pills every day. When you do have problems with the number of tablets you are taking, combination products containing two medicines in one pill are available and
may help reduce this burden. If you are concerned about the number of pills you have to take, it may be worth discussing this with your doctor to see if the number of pills can be reduced by using combination drugs.

2.8 Prevention of diabetes complications

It is important to check your blood pressure to prevent problems such as heart disease, stroke, angina and poor circulation. You should monitor your blood pressure regularly and try to make sure it stays at the right level by maintaining a healthy lifestyle. This means eating a healthy diet, stopping smoking and avoiding stress.

To prevent nerve damage in the hands and feet you should keep your diabetes under control with the treatment your doctor has advised, and you should also take good care of your feet. Keep your nails short and your feet clean. Wear shoes that fit properly and see a podiatrist or chiropodist regularly so that any problems are found early. To prevent blindness, due to cataracts or retinopathy (damage to the back of the eyes), your eyes should be examined regularly.

If blood-glucose level is not carefully controlled in the early stages of pregnancy there is also an increased risk of the baby developing a serious birth defect. Pregnant women with diabetes will usually have their antenatal check-ups in hospital or in a diabetic clinic, where doctors can keep a close watch on their blood-sugar levels and control their insulin dosage more easily.

3. EDUCATION AND SELF-EDUCATION (*)

In the process of learning to live with diabetes you will be helped to learn to live with diabetes. How you do that is based on knowledge, attitude and skills. Your will need to combine theoretical knowledge of diabetes with the right attitude towards the disease. It is important you have knowledge about:
- how do I accept my diabetes?
- how do I deal with self-control and self-regulation?
- what can I eat and drink and how much?
- how can I exercise and how much?
- why do I have to quit smoking?
- how do I deal with stressful situations? and
- how can I sustain to deal with my diabetes?

Education and self-education are an important part of the treatment and care for people with diabetes.

It can be useful to become a member of a patient association which can provide information, education and support.

4. PARTICIPATION IN SOCIETY (*)

The person with diabetes is a member of society just like anybody else, but with diabetes. Diabetes should not have any discriminatory effects.

Information enabling people to make informed choices for themselves and their role in society should be available.

In order to be able to play a full role in society, including with your doctor, your employer, partner, travel agent, or insurance company, learning
resources are often available, linked to the learning of skills. Information Technology (IT) provides opportunities to share the information people need. Some of the main sectors in which information is important includes:

- **In healthcare**, people need information about the most suitable insurance, reimbursements and provisions, which can help them to manage the disease. Information about the best available care – what represents good care and the respective rights and duties of the patient.

- **In the family**, information about how to deal with prevention and treatment of “hypos” and with the fact to be a partner of a person with diabetes, about the consequences of having diabetes for sexuality is essential as well as that on how to deal with a child who has diabetes.

- **At work**, information about what kind of jobs are not suitable for people with diabetes and information about how to deal with diabetes while at work should be provided.

- **During leisure time**, Information about how to deal with diabetes and sport as well as information about how to deal with diabetes while away from home should be available.

- **Traffic**, information about obtaining and renewal of a drivers’ licence should be readily available

- **Insurances**, information about the insurance offers (e.g. car or medical insurance) without discrimination would also very helpful.

12

5. SELECTED LINKS (*)
These links have been provided by Member States, patient organisations, pharmaceutical industry and other relevant non-governmental organisations. The following Member States have provided links that could be useful:

**Diabetes links**

International Diabetes Federation  
www.idf.org

Luxembourg  
www.ald.lu

United Kingdom  
1. Diabetes UK [Website]  
http://www.diabetes.org.uk/

2. NHS Direct [Website]  
http://www.nhsdirect.nhs.uk/articles/article.aspx?articleId=128

This website provides general information on the symptoms, causes, diagnosis, treatment, complications and prevention of diabetes.

3. BBC Health [Website]
This website provides general information on diabetes including how to maintain a healthy lifestyle and managing the condition, personal stories from sufferers and useful contacts.

http://www.bbc.co.uk/health/conditions/diabetes/index.shtml

4. NetDoctor.co.uk [Website]
This website provides information on type 1 and type 2 diabetes, managing the condition, diabetes in children and during pregnancy, and the different treatments available.

http://www.netdoctor.co.uk/diseases/facts/diabetes.htm

5. Patient.uk [Website]
This website provides information on all aspects of diabetes and diabetes care.

http://www.patient.co.uk/

6. Best treatments: clinical evidence for patients from the BMJ [Website]
This website presents research about diabetes and weighs the evidence about how to treat it. Information on symptoms, diagnosis, and the sort of questions you should ask health professionals about the condition

http://www.besttreatments.co.uk/btuk/conditions/6537.html

7. NHS National Library for health: Diabetes Specialist Library [Website]
This website is primarily aimed at supporting healthcare professionals by providing high quality information on all aspects of diabetes including both clinical and organisational issues, but is available to all. The site includes information on prediabetes and obesity, type 1 & type 2, complications, living with diabetes, delivery of Care, research, news sources and statistics.


8. Juvenile Diabetes Research Organisation [Website]

http://www.jdrf.org.uk/

9. The National Institute for Health and Clinical Excellence [Website]
The National Institute for Health and Clinical Excellence (NICE) is an independent organisation providing UK guidance on the promotion of good health and the prevention and treatment of ill health.

http://www.nice.org.uk/

France
http://www.has-sante.fr
http://www.cnamts.fr
http://alfediam.fr

Finland
http://www.kaypahoito.fi

Germany
Website of the German Federal Ministry of Health referring to diabetes mellitus:

14

Hungary
http://www.mcd.hu/diab_online/szovodmenyek/index.htm
http://www.mcd.hu/cukbet_magazin/index.htm
http://www.mcd.hu/diab_online/diab_abc/index.htm
http://www.diabet.hu/

Sweden
http://www.lakemedelsverket.se/upload/Allm%C3%A4nhet/behandlingsrek/Diabetes.pdf
http://www.lakemedelsverket.se/upload/Allm%C3%A4nhet/behandlingsrek/Insulin analoger.pdf
The Swedish Diabetes Association:
The national association of county councils and the national association of pharmacies:
http://www.lakemedelsverket.se/upload/Hälsoc%20och%20sjukvård/behandlingsrek/primärprevention_rek.pdf
http://www.sjukvardsradgivningen.se/artikel.asp?CategoryID=16989
http://www.sjukvardsradgivningen.se/artikel.asp?CategoryID=23937
http://www.sjukvardsradgivningen.se/artikel.asp?CategoryID=23943

Slovenia
http://www.diabetes-zveza.si/definicija_sladkorne.php#

(*) This sign identify the sections that need to be dealt with also at a national as well as a European level due to the fact that the information to be provided may largely differs from one country to another.

15

Links for information on medicines and treatment options
European Medicines Agency (EMEA)
You can find information on specific medicinal products that have been authorised by the EMEA
http://www.emea.eu.int/htms/human/epar/eparintro.htm

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19
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