

Diabetes in children: what you should know

Short and multilingual class

Introduction

"Freedom in the greatest gift in the world"
Mary Cassat
(French impressionist painter, 1844-1926)

We dedicate this work to our little patients and to their parents, with the wish that they could live the "diabetes condition" free of useless limitations.

After the first impact with the disease at the diagnosis, they begin a whole life walk to regain health and their freedom, with all respect to the rules diabetes command. To allow children and their families to be healthy, trustful in themselves and in their future, is vital to define clearly what has to be done and to write it down. We decided to do it in the child language, when possible. We did it through some short and simple cards, which represent what we explain to our patients.

Nowadays our reality is multilingual and multicultural, so a further effort is asked to the persons who approach the care and education of diabetic children, to communicate in other languages besides italian and to steady the knowledge acquired in the hospital at the disease onset. Moreover, presenting our "pathway to diabetes care" in more languages we want to facilitate a real confrontation between different lifestyles, nutrition habits and thoughts. We believe that the presence of different families and cultures in our Country can represent an enrichment that has to be gathered and emphasize to improve first of all ourselves as doctors.

We would like to thank in particular Roche Diagnostics, that hailed this initiative and made possible the publication and spreading of this work.

Gianni Bona

Francesco Cadario

Cards summary

1. What is diabetes?
2. How you treat it
3. Insulin types
4. Insulin injections
5. What you have to check on the child
6. Hypoglycaemia
7. Nutrition
8. Everyday life: home, sport, school and concomitant diseases
9. Prevention of complications
10. The national health service, the general practitioner and the diabetes ambulatory: psychological aspects, family, young diabetics associations.

CARD 1:

What is diabetes?

Diabetes Mellitus type 1 is a disease characterized by a elevated value of sugar in the blood (i.e. **glycaemia**). That's why it's called mellitus, which means sweet.

In children the cause it's not a wrong feeding or because you eat too much sugar, it's rather caused by the lack of insuline, a substance (hormone) produced by the pancreas. For this reason the disease is treated by insulin injections and it's also called insulin-dependent diabetes (or type 1).

Insulin is produced in the β cells of the so called pancreatic insulae, that are like little islands of cells inside the glandular pancreatic tissue.

For this reason, in the future you'll hear about transplant of pancreatic insulae and of β cells

Maybe in the future diabetes will be treated in a different way, but for now it requires everyday injections of insulin. The current treatment allows anyway an everyday life which is normal both in quality and in length, in the school such as in the work, with normal fisical growth and wellness.

Insulin must be administrated subcutaneous, because when taken orally it undergoes digestion in the bowel. The injection is easy and painless because special instruments are used: pens with very thin needles or insulin pump.

Sugar (or **glucose**) gives energy to our body but insulin is necessary to be able to use it. When the pancreas doesn't produce enough insulin, glycaemia (usually under 100 mg/dl) rises, a situation called **iperglycaemia**. When glycaemia exceeds 180 mg/dl (which is the maximum quantity that kidneys can hold back) glucose passes in the urine; the presence of glucose in the urine is called **glycosuria**. Together with sugar, a lot of water passes in the urine too; that's why the diabetic children has an exaggerated thirst. If the lack of insulin is more

severe or more protracted in the urine shows up also ketones (ketonuria): this is a sign of greater severity.

Symptoms of diabetes are:

- to urinate great quantity and frequently
- important thirst and drinking frequently
- weight loss and weakness

Diabetes **diagnosis** is usually easy and it's confirmed by the finding of:

- elevated glycaemia (over 200 mg/dl) = iperglycaemia
- glucose in the urine = glycosuria
- ketones in the urine = ketonuria

Remember the meaning of the following words

Glucose = sugar

Insulin = hormone produced by the pancreas

Glycaemia = measure of sugar in the blood

Iperglycaemia = very high glycaemia

Glycosuria = sugar in the urine

Ketonuria = ketones in the urine

Remember diabetes symptoms

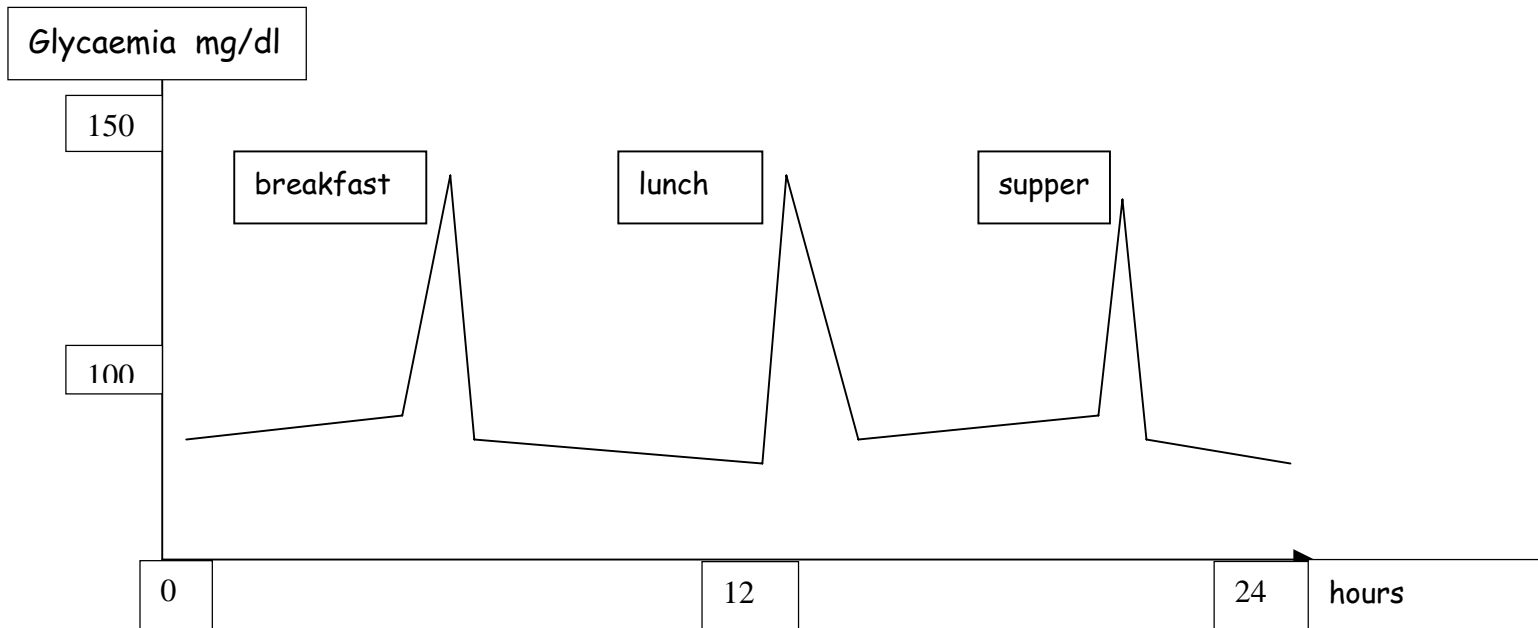
1. to urinate great quantity and frequently
2. important thirst and drinking frequently
3. weight loss and weakness

CARD 2:

How you treat it?

Glucose (sugar) is present in foods and it's the main factor which rises glycaemia after meals. Normally glycaemia is between 80 and 100 mg/dl and it rises up to 150 mg/dl 2 hours after meals. Insulin is the substance (hormone) that adjusts glycaemia and it increases concomitantly to glycaemia from basal values of 10 µg/ml up to 8-10 times greater after meals (80-100 µg/ml). The pancreas controls glycaemia with little amounts of insulin during fasting and with greater amounts during meals. To supply the right amount of insulin, the pancreas measures continually glycaemia.

If you measure glycaemia in a non diabetic subject you'll find a pattern like this



In the diabetic child, lack of insulin must be compensated with **administration of INSULIN as a drug**, with **boluses in correspondence to meals** and with a **basal dose for the fasting periods**. For the insulin administration appropriate **insulin pens** or **pumps** are used.

The **pump** injects insulin in a continuous mode in the subcutaneous area through a plastic catheter, with different rhythms depending of the different time of the day: faster in correspondence to meals (boluses) and slower in the rest of the day (basal dose).

With the insulin pens it's necessary to make little subcutaneous injections: boluses of rapid insulin in correspondence to meals (before breakfast, lunch and supper) and slow insulin as the basal dose (usually one injection before going to bed).

In both cases, the diabetes treatment tries to recreate a glycaemic pattern similar to the one of a non diabetic subject, with injection of insulin as "boluses" in correspondence to meals and a basal administration for the whole 24 hours.

Comprehend and remember:

in the traetment of diabetes you must administer insulin as

- 1. boluses, in correspondance to meals*
- 2. basal, in the evening, to give insulin for the night and in the fasting periods between meals*

CARD 3:**Insulin types and their actions?**

Numerous types of insulin are on sale. Basically there are **insulin with rapid action** (clear like water) and **insulin with slow action**, these ones can be clear or opaque (if they contain protamyn). If you use an opaque insulin you have to make it homogeneous with a slow **suspension** (15-20 rotations and 15-20 turnover of the cartridge).

Pay attention: check that the vial does not contain flakes or lumps.

If they're present, continue with the suspension until the content is perfectly homogeneous.

It's essential for every diabetic to comprehend the absorption periods after the injection and the length of time of action of the insulin used.

We suggest you to clarify with your doctor this important aspect of your therapy. Keep in mind names, absorption times and duration times of the insulins you use; to help you, write here names and action times of your insulin:

<i>Fast (bolus)</i>	<i>beginning of action</i>	<i>maximum action</i>	<i>end of action</i>
<i>Slow (basal)</i>	<i>beginning of action</i>	<i>maximum action</i>	<i>end of action</i>

Boluses avoid the excessive rise of glycaemia after meals, while the basal component maintains glycaemia normal in the fasting periods.

Insulin boluses have a rapid absorption (they require 15 minutes to be absorbed and to begin their action) and they're injected before meals, usually 3 times a day. When you eat you have to administer insulin to contain the rise of glycaemia after meal; the quantity of insulin administered depends on what and how much the child eats in that particular meal.

The basal amount is given with long acting insulin (the greater length of action is due to a long absorption time or to a long disposal time after absorption) given usually once a day or with rapid insulin given in very small quantity during the whole day, through a pump.

When you have an important hyperglycaemia (usually over 250-300 mg/dl) you have to administer a bolus of rapid insulin to correct it. The extent of the reduction of glycaemia in a given child is usually predictable and it's called

INSULIN SENSIBILITY

ask your doctor to define this very important value: it will be useful every day
1 U of insulin in you, lowers glycaemia of _____ mg/dl

You have to set a "glycaemic goal" (i.e. 150 mg/dl), then with the insulin sensibility you can calculate how much rapid insulin you have to administer to lower high values of glycaemia. Moreover, given that a diabetic child usually measures glycaemia before meals (3-4 times a day), you can use the insulin sensibility to control even better the glycaemia: you calculate

the units of insulin for the meal (depending on what and how much you eat) and then you add or subtract units to reduce or rise the glycaemia to the predetermined goal.

wait 2 hours after the correction bolus, to verify that the insulin sensibility value is correct

The effect of glycaemia lowering requires a certain amount of time, so is useful to wait that the glycaemia actually decreases before eating (with a consequent new rise).

Generally speaking, the waiting times between rapid insulin injection and meal are:

from 80 to 150 mg/dl	wait 10 minutes
from 150 to 200 mg/dl	wait 20 minutes
from 200 to 250 mg/dl	wait 30 minutes
over 250 mg/dl	wait 45 minutes

If glycaemia is under 80 mg/dl it's better to eat immediately after the injection.

if nausea or lack of appetite, administer insulin after the meal. It's better a greater rise of glycaemia after meal than a hypoglycaemia

On the basis of the insulin sensibility it's possible to develop an outline of doses to add or to detract to take the glycaemia back to the "goal":

ask your doctor to set a correction outline based on your insulin sensibility, as in the examples below

1 U of insulin lowers glycaemia of 50 mg/dl:

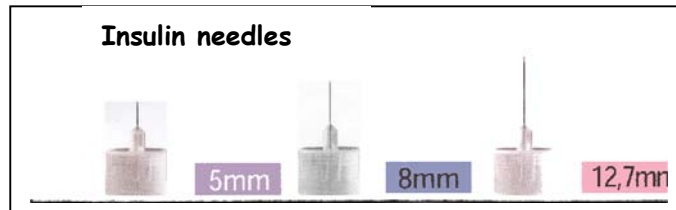
<i>if glycaemia under 80 mg/dl</i>	<i>lower the dose of</i>	<i>-1</i>
<i>if glycaemia from 80 to 150 mg/dl</i>	<i>keep the same dose</i>	<i>0</i>
<i>if glycaemia from 151 to 200 mg/dl</i>	<i>rise the dose of</i>	<i>1</i>
<i>if glycaemia from 201 to 250 mg/dl</i>	<i>rise the dose of</i>	<i>2</i>
<i>if glycaemia from 251 to 300 mg/dl</i>	<i>rise the dose of</i>	<i>3</i>
<i>if glycaemia over 300 mg/dl</i>	<i>rise the dose of</i>	<i>4</i>

1 U of insulin lowers glycaemia of 100 mg/dl:

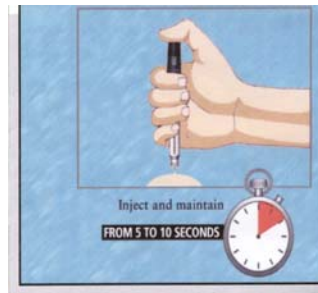
<i>if glycaemia under 80 mg/dl</i>	<i>lower the dose of</i>	<i>- 0.5</i>
<i>if glycaemia from 80 to 150 mg/dl</i>	<i>keep the same dose</i>	<i>0</i>
<i>if glycaemia from 151 to 200 mg/dl</i>	<i>rise the dose of</i>	<i>0.5</i>
<i>if glycaemia from 201 to 250 mg/dl</i>	<i>rise the dose of</i>	<i>1</i>
<i>if glycaemia from 251 to 300 mg/dl</i>	<i>rise the dose of</i>	<i>1.5</i>
<i>if glycaemia over 300 mg/dl</i>	<i>rise the dose of</i>	<i>2</i>

CARD 4:**Insulin injections?**

Proper pens are used to give an insulin injection. You have to lift up the skin in a wrinkle and then insert the needle. The needles are very thin and they don't hurt.



After the needle introduction in the subcutaneous, you release the wrinkle and you push the pen end opposite to the needle. You have to wait some seconds (counting to 10) before pulling out the needle.



It's essential to:

- **change the needle every time**
- **assemble it on the pen just before the injection**
- **rotate the injection sites daily (you can use a proper injection grid)**

If the insulin injections are made always in the same site you could possibly develop zones of lipoatrophy (distruction of subcutaneous adipose tissue) or of lipohypertrophy (buildup of subcutaneous adipose tissue, i.e. lumps). In these zones the insulin absorption is not optimal.

You can do the insulin injections at the following sites:

- **abdomen**
- **tights**
- **buttocks**
- **arms**

At the abdomen the absorption is faster, while at tights and buttocks insulin is absorbed slower. It's also important to remember that if you do the injection in the tights or in the buttocks and soon after you walk or run insulin is absorbed faster.

The injection done at a certain hour (for example before breakfast) should be made always in the same site. **Same hour - same site**. Within each site you should do a rotation, shifting from the previous injection spot of about 1 cm and switching left and right side.

Insulin conservation

Spare insulin cartridges or pens must be conserved in the fridge till the expiration date, in the fruit and vegetables compartment to avoid freezing.

Before using them you have to wait till they reach room-temperature. You have to avoid injection of cold insulin because it hurts.

Instead, cartridges or pens in use can be kept outside the fridge but they have to be replaced every 4 weeks.

To much hot temperatures damage insulin. During travels or trips the conservation doesn't require specific devices if the outside temperature doesn't exceed 25-28 degrees. If the temperature is over 28 degrees, instead, you have to use an isothermic case without ice.

CARD 5:

What you have to check on the child

It's essential to fill in a **diary**, day by day, with glycaemia, glycosuria and ketonuria values, units of insulin administered and any hypoglycaemia or particular events.

Glycaemia must be measured at least **3 times a day**, to know exactly the dose of insulin to inject at breakfast, lunch and dinner.

Hyperglycaemia

If glycaemia remains elevated for long periods (hyperglycaemia) the diabetes symptoms come up: thirst, copious quantity of clear urine (like water) and sickness with loss of weight.

This is caused by loss of glucose (i.e. nourishment) with urine. So even if you eat a lot you lose weight and energy.

Pay attention to the child who urinates frequently, or is always thirsty, or who wakes up in the night to urinate, or loses weight.

The causes of hyperglycaemia are:

- **excessive food load**
- **insufficient dose of insulin**
- **reduced physical activity**
- **fever or elapsing disease**

Glycosuria and ketonuria

The presence of sugar in the urine (glycosuria) is frequent in diabetic people. You seek for it with reactive strips that allow the finding of ketonuria too (i.e. ketones in the urine).

Glycaemia and glycosuria give complementary information: glycaemia tells you about the situation in that precise moment while glycosuria tells you about the glycaemia status in the previous hours, during which the urine formed.

The presence in the urine of ketones without glucose indicates lack of nourishment and you can find it also in non diabetic children: to resolve it you only need to eat some food containing sugar or sugar itself.

Instead, the contemporary presence of glycosuria and ketonuria is an alarm bell because it indicates that diabetes is not compensate and that the lack of insulin must be adjusted rapidly.

When you find hyperglycaemia (above 25 mg/dl or 300 mg/dl after meal) you always have to look for ketones in the urine (or eventually in the blood, if it's not possible to collect urine).

The presence of glycosuria + ketonuria should lead to the suspect of **DIABETIC KETOACIDOSIS** and you have to inform immediately your doctor to correct this situation. If the following symptoms are present, you don't have to lose any time and take the child urgently to a hospital:

- **abdominal pain**
- **vomiting**
- **difficulty in breathing**
- **altered consciousness**

The correction of an initial ketoacidosis is relatively easy and you do it by administration of rapid insulin in boluses and fruit juice (to restore liquids and salts lost in the ketoacidosis). Instead, if the ketoacidosis endure from more time the treatment is more difficult and the result is uncertain.

Only the daily search for glucose and ketones in the urine, together with the glycaemic controls, allow a safe treatment of diabetes in the child.

Ketoacidosis develops more frequently during illness, diarrhea, accidents (such as distortions or bone fractures, that lead to immobility).

In this circumstances, then, glycosuria and ketonuria should be looked for more frequently. Moreover, ketoacidosis can develop if the insulin injections are forgotten or if the pump is not working properly (does not supply insulin) because the catheter is folded in the subcutaneous tissue.

CARD 6:

Hypoglycaemia

When glycaemia is below 60 mg/dl we talk about **hypoglycaemia**. Usually it's useful to correct a glycaemia below 80 mg/dl, to avoid rebounds of glycaemia due to counterregulation. If glycaemia is very low (30-40 mg/dl) there can be more serious symptoms. You should always try to understand the cause of the hypoglycaemia, in order to avoid a new similar event.

Usually the causes of hypoglycaemia are:

- **excessive dose of insulin**
- **scarce meal, with insufficient intake of nourishments**
- **increased physical activity**

the symptoms of hypoglycaemia are:

- **sweating, agitation, hunger, tremblings, shivers, abdominal cramps**
- **confusion, dizziness, blur or double vision, troubled sleep or headache (especially at wakening after nightly hypoglycaemia)**
- **difficulty at keeping attention, irritability, sudden problems in writing or speaking**
- **when hypoglycaemia is severe, altered consciousness or convulsions**

Almost always the treatment required is easy and it's based on 3 points:

1. when you suspect hypoglycaemia you should stop all your activity and rest
2. if possible, do a glycaemia measurement
3. give a sugar cube for every 20 kg of weight

We advice to use a controlled quantity of sugar because an excessive correction together with the sensation of great hunger dued to hypoglycaemia leads to an excessive rise of glycaemia. We advice to give **fruit candy which contain 6 g of glucose each**, are enjoyed by the most of the children and are easy to find in the supermarkets and to keep in the pocket.

In a subject

up to 20 kg to raise glycaemia of 35 mg/dl	you need half candy
up to 20 kg to raise glycaemia of 70 mg/dl	you need one candy

You have to check after 15 minutes if the glycaemia is back to normal and eventually you can eat 1/2 bread roll to stabilize the glycaemia till the next meal. If hypoglycaemia happens at meal time you have to eat before the insulin injection.

If the administration of sugar by mouth is not possible, because swallowing is not safe or if the consciousness is altered, you must give an injection of **glucagon: 1 vial (1 mg) intramuscular (1/2 vial if weight under 20 kg)**.

Therefore it's necessary to have glucagon ready in hand, both at home and at school, and during holidays, when the physical activity is increased and hypoglycaemias are more frequent.

always remembe to have in hand a vial of Glucagen Hypokit not expired

Equivalences

fruit CANDY	g 6 CHO
SUGAR bar bag	g 6 CHO
3 BREAD-STICKS (stirato di Torino)	g 6 CHO

CARD 7:

Nutrition

The nutrition of a diabetic chid is the one that any child, even without diabetes, should have. Unluckily, children often eat foods with too much calories and a poor nutritional value. Overweight, dental caries and diseases dependent on excessive cholesterol in the blood are the consequences of these errors, especially in the adult age. If diabetes is present, these bad habits are twice as disadvantageous, because they also facilitate the diabetes complications.

PREMISE

It's important that the **meal overlaps with insulin injection**. So, given that you take insulin boluses at breakfast, lunch and dinner, any snack outside meal time has to be avoided or limited to the maximum.

For example, the afternoon snack is useful to give glucose and calories when you practice sport and in case of hypoglycaemia it's even necessary. In any other case, if it's not associated with a proper dose of insulin, produces hyperglycaemia in the late afternoon and before dinner. So, if you eat a snack rich in carbohydrates (and all of them are) you have to do a further insulin injection. At school parties or at birthdays you always have to do an injection of insulin just before.

WHICH IS THE CORRECT NUTRITION FOR A CHILD

The nutrition of a child with diabetes, such as in all other persons, should provide a right calories intake, distributed in 3 principal meals: **breakfast, lunch and dinner**. A "good" meal should:

- **give mostly an intake of carbohydrates (CHO)**, i.e. a first course
- **be poor of meat and cold cuts**
- **prefer whole-wheat foods**

The mid-morning snack and the afternoon snack can be done and the ideal food is fruit. Any meal should contain roughage as cornflakes or whole-wheat cookies, legumes or vegetables. Moreover, it's better to use legumes instead of meat as proteins source and to prefer fish to cold cuts. As dressing olive oil alone is better and you should limit the use of butter and fatty cheese.

CARBOHYDRATES COUNT

It's useful to be able to calculate the amount of insulin you need for a certain meal. In this way you can limit the rise of glycaemia after meal and you can be free to choose the food you want to eat. This goal can be reached by learning the **carbohydrates count**.

To do it you need:

- to identify the foods which contain CHO in every meal
- a table with the amount of CHO in each food (it's always expressed as g of CHO in 100 g of food)
- a balance (or a photographic atlas) to determine how much CHO are present in each portion so that you can add all the amounts and count the CHO for the whole meal

1 unit of insulin "metabolizes" a certain amount of CHO (which is different in each person).

This amount is called CHO/I ratio. Knowing this number, you can define the amount of insulin you need for that given meal.

THE CHO/I (CARBOHYDRATES/INSULIN) RATIO is usually 1/3 of the insulin sensibility index and can be calculated:

500 / number of unit of insulin a day necessary to be compensated

write here the CHO/insulin ratio given by your doctor:

1 U of insulin metabolizes

g of carbohydrates

Another concept to understand is the *GLYCAEMIC INDEX OF FOOD*. In fact, even on equal values of carbohydrates the effect on glycaemia can be different. That's because some foods are absorbed faster than others:

bread	100
boiled rice	80
normal pasta	65
whole-wheat bread	65
whole-wheat pasta	55

Moreover, the effect on the glycaemia is also reduced by the presence of roughage. In a mixed meal, i.e. with first and second course, fruit and vegetables or legumes, a small amount of dessert doesn't rise glycaemia as would do if taken alone.

PAY ATTENTION TO THE FATS IN THE FOODS. They are present in cheese, milk (especially if whole) but also in meat (especially if "red"). They can rise the cholesterol and be more harmful than the carbohydrates excess.

Some foods (for example pizza and chocolate) are rich in fats and absorbed slower, so it's better to **DO THE INSULIN INJECTION SOON AFTER** eating them rather than before.

Another important point is to **DO NOT EAT A MEAL WITH PROTEINS ALONE**: in fact, half of the proteins are changed in glucose 2 hours after ingestion. With the carbohydrates count results necessary a low amount of insulin for that meal, but you'll have a hyperglycaemia anyway.

MEDITERRANEAN NUTRITION

at the end, the better choice about nutrition is to adopt a balanced diet, as the Mediterranean one: always eat a first course, which gives you the right intake of carbohydrates (50% of the energetic need), few proteins and few fats of animal origin. Also the nutrition model of the Arabic populations, with a single-course with rice and vegetables, is useful in diabetic patients.

You don't have to use the so called "foods for diabetics" because they only have a trading meaning and they're usually rich in sugars other than **saccharose**, i.e. fructose, **maltodestrine and sorbitol**. Instead, foods like biscuits "without sugar" can be useful because they contain roughage and so they rise glycaemia less than the normal biscuits.

For the same reason it's better a homemade cake than a bakery one because they usually have less sugar and less fats.

SWEETENERS

You can eventually use sweeteners (**aspartame**, saccharin or **cyclamate**) in limited quantity to sweeten foods and drinks. Anyway, it's better that a child with diabetes gets used to slightly sweet tastes.

An example of balanced diet

Breakfast

A cup of semi-skimmed milk or a yoghurt with
Bread or
slices of crispy toast-like bread or
cornflakes

Mid-morning break

Fresh fruit

Lunch

Whole-wheat pasta or cornmeal porridge or rice with vegetables souce
Meat / fish / eggs
Uncooked or cooked vegetables
Extra-virgin olive oil
Bread or potatoes

Afternoon-break

Fresh fruit or
Fruit salad or
Fruit milkshake or
Yoghurt without fruit

Dinner

Pasta or cornmeal porridge or rice with vegetables or legumes
Uncooked or cooked vegetables
Extra-virgin olive oil
Bread or potatoes

CARD 8:

Back to everyday life

Cooperation between general practitioner and the hospital diabetic centre is very important for the diabetic child management. Not less important is the role of the parents, who will have to give explanations to the child about diabetes, in proportion to his/her age and his/her capacity of comprehension. As the child grows and reach the adult age he/she will raise consciousness and will take personal responsibility of diabetes management.

Usually, after the hospitalization, going back to everyday life highlights some diversities that can cause depression both in the child (especially if he/she is grownup) and in the family. So it's important to get in contact with **reference persons**, first of all doctors, nurses and nutritionists who met the child during the hospitalization. It's also useful to get in touch with a volunteering association for diabetic children or to meet families tat already have some practice in the diabetes management. In fact it's particularly depressing if you live this "diabetes condition" alone, without contacts or references. Each group activity, such as summer camps, trips or meetings, enriches everyone and shows pictures of diabetes lived in absolute normality, lightheartedness and joy.

After the onset each child with diabetes should go back to everyday life as soon as possible and keep doing whatever activity he/she did before, except for the rules about disease care and nutrition. Another advice is to **not hide the diabetes**: this would prevent to receive help whenever needed (especially at school and in sport contests) and could create fear of getting caught.

It's better to take to school a letter that gives simple information about the disease itself, hypoglycaemias, nutrition and the necessity to take insulin for the lunch.

SPORT

Physical activity and sports must be promoted because they allow important wasting of sugar and so they are good to decrease glycaemia. Moreover, they are important for the general and psycho-physical wellness. Finally, they show to the child and to the family that the diabetic child can have a normal life, in respect of the rules.

Since glycaemia can vary roughly during and after physical activity, it's important to properly modify the therapy.

Before practicing sport it's better to reduce the insulin amount and it's useful to eat carbohydrates (for example a sandwich) after 1 hour of movement. You also have to reduce the insulin dose in the evening, after the physical activity, to avoid night hypoglycaemias. Some sport with "performance anxiety or competition" can produce an increase in the glycaemia.

Generally speaking, enduring sports (but not exhausting) are more useful to reduce glycaemia but also basket, football, tennis, etc are not counter-indicated.

It's important to avoid sport in a imbalance phase (i.e. with hyperglycaemia and ketonuria) because it would worsen the already inadequate control of the disease.

HOLYDAYS

During holidays usually the insulin demand decreases greatly, due to physical activity. So, to avoid hypoglycaemias, the daily insulin amount must be decreased, both for the rapid one (boluses) and the slow one (basal).

If you travel very far abroad, the therapy must be rearranged according to the time zone and the meals time.

ELAPSING DISEASES

In general, every elapsing disease, even if unimportant, produces an increase of the glycaemia and of the insulin demand. Particularly, immobility and surgical interventions

produce a strong increase in the insulin demand. Few days after the end of the event, though, the demand goes back to normal.

During illness it's possible that the child has difficulty in eating meals, especially the younger ones that can refuse to eat. In this case, injecting insulin before the meal could be dangerous so it's better to do it after, adjusting the dose to the quantity of food actually eaten. The practice of the carbohydrates count and the count of the correction of the insulin dose depending on glycaemia are particularly useful in these situations.

During illness it's particularly important to look for ketones in the urine and to maintain the glycaemia control.

CARD 9:

Prevention of complications

Glycated haemoglobin (HbA1C)

In children with diabetes it's important to keep under control the value of the glycated haemoglobin. It can be done with a blood drawing, usually once every 3 months.

This test gives us precious medical information, such as the indication of the mean value of glycaemia in the previous 2-3 months and so it's useful to the doctor to adjust the therapy.

Moreover, the glycated haemoglobin it's the main predictive factor of complications risk.

Glycated haemoglobin values below 7 reduce the risk of ocular, renal, neurological and cardiovascular complications. So it's very important to check this value because it allows the prevention of the chronic complications that can take over if a good metabolic control is not reached.

Microalbuminuria

Microalbuminuria measures little amounts of albumin in the urine. We use this exam to understand if there's a kidney damage due to diabetes. To perform this exam it's needed to collect the whole day urine or, better, the night urine and then to measure the albumin amount produced. We also need to know the time frame during which the urine was produced and collected. To do so, the child must urinate before going to bed (and this urine is thrown away) and than the night urine together with the awakening one is collected. In this way the time frame during which the urine was produced goes from the last urination before going to bed to the awakening urination.

The normal value of microalbuminuria is below 10 µg/ml. To reach significance, an altered value (<10 µg/ml) must be present in 3 urine samples collected in 3 non consecutive day.

Fundus oculi

Fundus oculi evaluates the vessels net of the eye, that can be damaged by diabetes. To perform this exam it's needed a pupil dilation with proper drops, after which the oculist examines the fundus with a light and a proper instrument called ophthalmoscope. Usually it's done once a year. It's also possible to take some pictures of the fundus oculi, to compare the different images in different years, usually every 2-3 years.

The initial treatment of diabetes is usually performed in a hospital, as hospitalization totally in relief of the Regional Health Service. Sometimes, in case of foreign citizens it's necessary to reimburse the expense through insurance or other health service. These administrative procedures are carried out by the **Direzione Sanitaria** of the Hospital.

At the diabetes onset a series of bureaucratic procedures are needed; these will allow the child to get free of charge all the material needed for the monitoring of glycaemia, for the diabetes treatment and to do free of charge all the periodic blood exams.

To gain access to the welfare benefits you need to be a regular resident in Italy or to register to the SSN (National Health Service) with a small amount of money. The registration is possible at the ASL (Azienda Sanitaria Locale) offices.

The SSN supply free of charge the essential material for the diabetes care, on indication of the specialty centre that treat the child:

- insulin, Lantus and Levemir
- glucagon
- diagnostic tools
 1. pen needles
 2. needles for blood withdrawal
 3. glycaemia sticks
 4. glycosuria/ketonuria sticks

or supply "on use loan":

1. insulin pumps
2. all the material to use it (subcutaneous catheter and insulin **tube**)

Moreover, the periodic outpatient checkups are free of charge as the routine exams.

Some exams need the payment of a health ticket, such as the blood exams for celiac and thyroid diseases.

Our address:

Clinica Pediatrica di Novara
Corso Mazzini 18 - 28100 Novara
tel. 0321 3733793, o 474, o 482

e-mail: francesco.cadario.@maggiore.osp.novara.it