Centre intégré universitaire de santé et de services sociaux de l'Estrie – Centre hospitalier universitaire de Sherbrooke



Educational program for people with diabetes

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Hypoglycemia
Hyperglycemia
Physical Activity
Sick days
Driving
Leaving on a trip

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We also wish to acknowledge the contribution of all authors of previous editions.

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HYPOGLYCEMIA

Hypoglycemia is an abnormally low blood sugar. This means that your

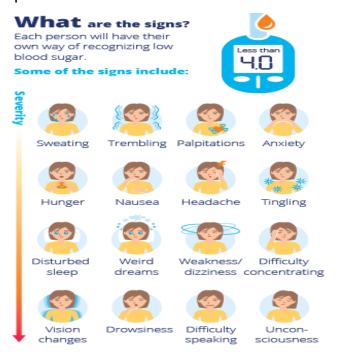
glycemia or blood glucose reading is less than 4 mmol/l.

Diabetic people who are treated with insulin or with medications such as DiabetaTM, DiamicronTM, AmarylTM, or GluconormTM may have hypoglycemia.

On the other hand, if you are treated with $Actos^{TM}$, $Adlyxine^{TM}$, $Bydureon^{TM}$, $Byetta^{TM}$, $Forxiga^{TM}$,

GlucobayTM, GlucophageTM, InvokanaTM, JanuviaTM, JardianceTM, Metformin, NesinaTM, OnglyzaTM, OzempicTM, TrajentaTM, TrulicityTM or VictozaTM or if you take no medication for diabetes, there is little risk that you will face this problem.

Hypoglycemia



If hypoglycemia is not treated, it may lead to seizures or coma, but this rarely happens.

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Special recommendations for travelling

- ◆ During the flight, frequently use your leg muscles by doing some exercises such as ankle rotations and foot flexes. Every hour or two, stretch your legs by walking for a few minutes;
- ◆ For long car trips, plan on frequent stops and regular snacks;
- ◆ Check your blood sugar often as possible during your trip and before driving a car;
- ◆ Try as much as possible to keep to a regular meal schedule;
- Drink bottled water; avoid unwashed vegetables, unpeeled and unwashed fruit, tap water and ice cubes;
- Wear comfortable shoes and check your feet every day;
- Use sunscreen to protect your skin.

These recommendations should help you enjoy your holiday.

Bon voyage!

TREATMENT

1. Check your blood sugar; if it is lower than 4 mmol/L, **act immediately**;

HOW TO TREAT HYPOGLYCEMIA:

2. Take 15 g of fast-acting sugar (or the equivalent of 3 teaspoons of sugar) in solid or liquid form;

For example:

- > 15 grams of glucose in the form of glucose tablets;
- Or ➤ 15 ml (1 tablespoon) of honey, molasses, corn syrup of maple syrup;
- Or > 15 ml (1 tablespoon) de sucre blanc dissous dans l'eau;
- Or > 175 ml (2/3 cup) of regular soft drink or fruit juice;_
- Or ➤ 15 grams of fast-acting sugar (e.g. 6 LifeSaversTM or 2 rolls of Rocket^{MD} candy).

N.B.: If your blood sugar reading is less than 2.8 mmol/L, take 20 g of carbohydrates rather than 15 g, that is, add the equivalent of 1 tsp. of sugar.

3. Wait for 15 minutes then take another blood sugar test. If there is no improvement in the symptoms or if your result is again below 4 mmol/L, repeat step 2;

Avoid foods rich in fats (e.g.: chocolate, ice cream, etc.). Fat retards absorption of the sugar you need immediately to treat your hypoglycemia.

And finally...

4. Have a snack if you are not planning to eat a meal in the hour following the episode of hypoglycemia. This snack should include 15 g of carbohydrates and a source of protein.

E.g.: 6 soda biscuits + 30 g (1 ounce) of cheese or peanut butter

OR

175 ml (3/4 cup) of cereal 125 ml (4 ounces) of milk

OR

1 fruit + 30 g (1ounce) of cheese

N.B. If an episode of hypoglycemia occurs immediately before a meal, **you must correct** it as described on the previous page, then have your meal.

ARE YOU DRIVING?

After correcting a low, wait until your blood sugar is above 5 mmol/L to start driving. Your brain might need up to 40 minutes to recover before you can safely drive again.

Precautions to take for your treatment supplies

 Keep everything you need for treatment in your hand luggage (and not in the baggage compartment);



- Have extra test strips and lancets, medication, insulin, syringes or pen-injectors, needles;
- ♦ Keep your test strips under the required storage conditions;
- ♦ Keep your insulin in an insulated holder;
- Bring a supply of food in case the meal is delayed;
- ◆ Always keep with you some fast-acting sugar (glucose tablets, packets of sugar, etc.) to quickly correct if you experience hypoglycemia.

- ◆ Prepare medication and supplies for a little bit longer than the planned duration of your trip, in case something comes up;
- ♦ Have with you something to identify you as diabetic (e.g.: Medic-Alert bracelet);
- ♦ Have a travel insurance plan that includes provision for care and an eventual return to Canada:
- Get more information about the dietary habits of the country you will visit; consult your nutritionist if you need to;
- ◆ Bring medication to treat nausea, vomiting or diarrhea;
- ♦ Know how to adjust your treatment if necessary; a trip in which you quickly cross 3 time zones may require you to adjust your insulin on the day of your departure and your return;
- ♦ Have with you a Glucagon kit;
- ◆ Arrange for the necessary vaccinations (contact your **CSSS** or the Clinique Voyageur international at 819-564-5160);
- the ♦ Advise the travel company as well as persons with whom you will be travelling that you are diabetic (several offer companies specific menus);
- ♦ For travel tips, you may consult the following link on the Canadian Diabetes Association Website: www.diabetes.ca/diabetes-and-you/living/guidelines/ travel

CAUSES

- ♦ Too much insulin or oral medication (pills for diabetes);
- Skipping or postponing a meal or a snack;

◆ An incomplete meal;

- ◆ An unplanned or unusual physical activity not compensated for by eating more and/or adjusting the insulin dose;
- ♦ Alcohol, particularly on an empty stomach:
- ◆ An excessive loss of liquid by diarrhea or vomiting. This may cause a severe episode of hypoglycemia. It is important to take your blood glucose reading more often when you are sick.

PREVENTION

- Regularly check your blood sugar;
- Follow your eating plan with respect to the time of meals, their content and snacks, if they are recommended;
- Take your insulin or your medications as prescribed;
- Modify your meals or snacks in relation to physical activity;
- If you are being treated with insulin:
 - At supper (R, Toronto or premixed) or;
 - At bedtime (N or NPH);
 - Have a snack before going to bed if your evening blood sugar reading is lower than 7 mmol/L.
- Always have with you (in the car, your purse, etc.) rapid action sugar (glucose tablets, packets of sugar) in case of hypoglycemia;
- Wear a bracelet indicating that you are diabetic;
- Tell your family and friends and those you work with about the symptoms of hypoglycemia and the ways of treating it;
- Avoid drinking alcohol on an empty stomach;
- If you have frequent hypoglycemia reactions and/or you do not know the cause, **tell your doctor**. It may be necessary to reduce the quantity of your medications.



LEAVING ON A TRIP

Diabetes does not keep you from travelling. However, it is necessary to plan carefully, especially if you are being treated with insulin, so you can avoid various difficulties and make your trip much more fun.



Planning before your departure

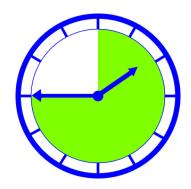
- ♦ See your doctor;
- Make sure that your diabetes is well under control;
- ◆ Ask your pharmacist to give you a list of your medications;
- ♦ It is advised to ask the doctor for a **medical note** attesting that you have diabetes and that you must have with you the equipment you need for your treatment (lancets, needles), to avoid a long wait at security or customs.

An example of such a letter is available of the Diabète Québec website, at the following address: www.diabete.qc.ca/html/vivre avec diabete/voyageur.html;

DRIVING (CONTINUED)

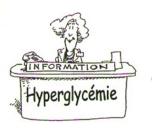
- √ If your blood sugar is lower than 4.0 mmol/L before driving (HYPOGLYCEMIA):
 - \Rightarrow Do not drive;
 - ⇒ Treat hypoglycemia with 15 grams of fast-acting sugar;
 - ⇒ Wait 15 minutes and check your blood sugar again. If it is still lower than 4.0 mmol/L, take 15 grams of fast-acting sugar again.

WARNING: After a hypoglycemia, once the blood sugar is back over 4.0 mmol/L, it is recommended to wait 45 minutes before driving. Your brain might need up to 40 minutes to recover before you can safely drive again.



- √ If you feel hypoglycemia symptoms while driving:
 - ⇒ Stop your vehicule
 - ⇒ Check your blood sugar
 - ⇒ Take fast acting carbs if your blood sugar is lower than 5 mmol/L

HYPERGLYCEMIA



Hyperglycemia means having many blood sugar readings that are higher than normal during a certain period of time.

Your blood	-26.0	
glucose is HIGH (hyperglycemia)	-20.0	
	-17.0	
	-15.0	
	-13.0	
	- 10.0 - 7.0	AFTER MEALS (5-10)
TARGET VALUES	- 6/0 - 5/0	BEFORE MEALS (4-7)
Hypoglycemia	mmol/L	

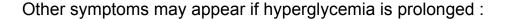
Warning:

Your body does not always detect the symptoms (signs) of high blood sugar. It may even adapt to hyperglycemia.

If hyperglycemia occurs gradually, it is possible and even frequent that you may not feel any symptoms or that they fail to bother you. It is often said that diabetes is a sneaky disease.

SYMPTOMS

- More frequent urination and more important quantities of urine;
- ♦ Intense thirst, dryness of the mouth;
- ◆ Frequent need to eat;
- Fatigue, drowsiness.



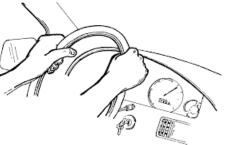
- Dryness and itching of the skin;
- Tingling of the fingers and toes;
- More frequent infections;
- Slower scarring of wounds;
- Blurry vision for a while;
- Frequent headaches.

It is possible that you feel only a few of those symptoms. Every person reacts differently to a high blood sugar level.

DRIVING (CONTINUED)

If you are at risk for hypoglycemia (if you are taking insulin, DiabetaTM (Glyburide), DiamicronTM (Gliclazide), AmarylTM (Glimepiride), or GluconormTM (Repaglinide)), you **must**:

- √ <u>Never drive</u> without having eaten if you have just taken your diabetes medication (insulin or pills);
- √ <u>Always have your blood sugar meter</u> within easy reach, as well as a source of fast-acting sugar, so that you may treat a possible hypoglycemia;
- √ Take your blood sugar:
 - ⇒ <u>Immediately before you drive</u> as well as every 4 hours during a long trip:
 - If your blood sugar is between 4.0 and 5.0 mmol/ L, eat a 15 grams of carbs snack.
 - * If your blood sugar is over 20 mmol/L and that you feel any discomfort (somnolence, blurred vision), it is best to avoid driving.
 - ⇒ More often (every 2 hours) if you do not feel early symptoms of hypoglycemia or if you have ever had a hypoglycemia episode that needed third party assistance.



DRIVING

Driving a vehicle is not an absolute right, but a privilege.

In Quebec, it is mandatory for anyone holding a driver's license to inform the Société d'Assurance Automobile du Québec (SAAQ) of any change in health status.

The SAAQ claims that people with diabetes may drive a passenger vehicle and a motorcycle (classes 5 and 6) as long as they meet the following criteria:

- √ Regular medical follow-up;
- √ Adequate health and vision;
- √ Adequate blood sugar control and a good understanding of diabetes:
- √ Avoid severe hypoglycemia (that necessitates third party assistance) and take necessary precautions to prevent and treat any hypoglycemia that might occur while driving.



CAUSES

- ◆ Eating too much;
- Insufficient quantity of oral medication or insulin (you forgot or made a mistake);
- ♦ Reduced physical activity;
- ◆ Infection, illness, stress;
- ♦ Weight gain;
- ◆ Taking certain medications (e.g. Cortisone).



PREVENTION

- ◆ Follow your treatment plan, including proper diet, physical activity and taking your oral medications or insulin, as prescribed;
- Monitor your blood sugar level regularly and at different times of the day; note the results in your logbook;



◆ Try to identify for yourself what causes your blood sugars to rise; modify your habits, if necessary;



- ◆ See your doctor or diabetes educator regularly so your treatment (medication or insulin) can be adjusted to your needs;
- ♦ If you need help, workers with training related to diabetes can help you;
- ◆ If your blood glucose levels remain high despite these recommendations, drink lots of liquid without sugar and talk to your doctor.

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TYPE 1 DIABETES (CONTINUED)

CONTACT A DOCTOR OR GO TO THE HOSPITAL IF YOU FEEL IT IS NECESSARY OR IF:

- ◆ Your blood sugar remains higher than 17 mmol/L even if you increased your insulin;
- ♦ If your blood sugar is higher than 14 mmol/L, do a ketone test:

Blood sugar	Urine result	Blood result	What to do
13-14 mmol/L	0.5 mmol/L	Less than 0.6 mmol/L	Stay hydrated Check blood sugar every 6 hours
14-20 mmol/L	1.5 mmol/L	0.6 to 1.5 mmol/L	 Stay hydrated Check blood sugar every 4 hours Adjust insulin or contact your doctor/ diabetes educator
14-20 mmol/L	4 mmol/L	1.5 to 3.0 mmol/L	Check blood sugar and ketones every 4 hours Adjust insulin immediately according to your blood sugar Contact your doctor/diabetes educator
More than 20 mmol/L	8 to 13 mmol/L	More than 3.0 mmol/L	Go to the hospital

- ♦ You have been unable to drink or eat for more than 6 hours;
- ♦ You have persistent diarrhea;
- ♦ You have run a fever over 38.5°C or 100.4°F for more than 48 hours.

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TYPE 1 DIABETES

- ◆ Measure your blood sugar at least 4 times per day or every 2 hours if the results are high;
- ◆ If your blood sugar is higher than 17 mmol/L, check for the presence of ketones in the urine (Ketostix strips) or with a drop of blood (only some readers make that analysis);
- ◆ Never stop your insulin injections even if you are not eating because your blood sugar will tend to be higher when you have an infection;
- ◆ If your appetite decreases, eat small snacks more often and go back to your regular meals as soon as possible;
- Drink lots of liquids (water, broths) to avoid becoming dehydrated;
- ♦ If you cannot eat, drink sweetened liquids in small amounts every hour, depending on your blood sugar reading;
- ♦ Check your temperature;
- ◆ Adjust your insulin if you have received the necessary information: adjust rapid-acting insulin instead of basal. In case of doubt, speak to your doctor or diabetes educator.

PHYSICAL ACTIVITY

Immediate benefits: - Allows to meet new people;

- Lowers stress;

Makes you feel more energetic;Brings on a feeling of well-being;

- Improves mood;

- Is a source of entertainment.

Regular physical activity will make it possible to :

Prevent : - Muscle pain (eg. back);

- High blood pressure;

- Colon, prostate and breast cancer;

- Cardiovascular disease;

- Osteoporosis;

- Obesity.

Improve : - Mobility and balance;

- Cardiovascular capacity;

- Strength, endurance and flexibility

Weight control;Bone density;

Lipid profile (cholesterol);Sleep (quantity and quality);

- Quality of life and autonomy;

- Blood pressure control;

- Blood glucose control.



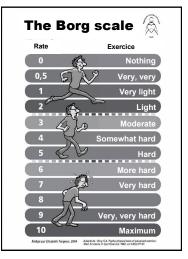
By increasing your basal metabolism, you will burn more sugar by simply moving while increasing the sensitivity of cells in the body to insulin and decreasing insulin resistance.

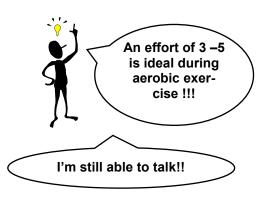
RECOMMENDATIONS FOR THE TYPE OF ACTIVITY, DURATION AND INTENSITY

Do some physical activity including:

Aerobic exercises

- Do at least 150 minutes per week at a moderate intensity, which corresponds to marked pace increased breathing.
 - Example: Walking, cycling, swimming, cross-country skiing, any exercise that pace increase breathing;
- Spread out your aerobic activity over a minimum of 3 non -consecutive days. Try to avoid having more than 2 consecutive days without exercise. Physical activity is a health-promoting way of life, in the same category as taking a shower and brushing your teeth!;





In general, walking is an excellent aerobic exercise (free, easily accessible and usually safe).

TYPE 2 DIABETES

If you are sick:

- ◆ Check your blood sugar more frequently, that is, at least 4 times a day;
- ◆ Continue to take your medication or insulin because your blood sugar level will tend to be higher;
- ♦ If, however, your blood sugar falls below 5 mmol/L, decrease the dose of your medication/rapid-acting insulin by half;
- Drink lots of liquids (water, broth);
- ◆ Take the amount of carbohydrates recommended at meals and snacks in the form of foods that are easy to digest or as sweetened liquids;
- ◆ If you have important diarrhea or vomiting, you <u>must stop</u> taking Forxiga, Invokana or Jardiance, and you may reduce by half the dose of Metformin, Ozempic, Victoza, Trulicity or Glucobay and start taking it again progressively, over a few days, when symptoms have ceased;
- ◆ If it is impossible to eat or drink because you are vomiting a lot, consult a doctor.

CONTACT A HEALTH PROFESSIONAL OR GO TO THE HOSPITAL IF:

- ◆ Your blood sugar remains higher than 20 mmol/L, you have persistent vomiting or you are unable to drink liquids;
- ♦ You have a fever (over 38.5°C or 100.4°F for more than 48 hours).

SICK DAYS



Diabetes puts stress on the body. In a situation of stress, your blood sugar tends to rise even if you have changed nothing in your daily routine or if you eat less. Whether it is a cold, the flu or a gastroenteritis (stomach flu), these illnesses, no matter how mild, will have a tendency to upset the balance of your diabetes.

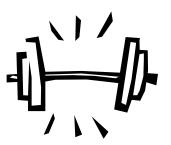
The following information is important; it could help you to avoid a major diabetic upset, more specifically, a serious hyperglycemia, which could require you to be hospitalized or, on the contrary in certain cases, severe hypoglycemia. Depending on your treatment, the procedures to follow may vary. In the next pages, look for the information relative to your situation.

WARNING



Some diabetes and blood pressure medication may put you at risk for dehydration. If you are sick and unable to hydrate yourself properly, talk to a health care professional to see if there are some medications you should stop temporarily.

Muscle exercises



 Include resistance exercises to your exercise routine (exercises using gym apparatus, dumbbells, swiss ball, training using your own weight, etc.) at least 2 times per week,, and ideally three times per week. These exercises help to increase your basic metabolism (and use more sugar) and decrease the resistance to insulin.

Moving in your daily life



It is recommended to get up and move a little every 20 to 30 minutes, to avoid prolonged sitting, even if you practised your physical activity during the day.

Create opportunities to get moving:

- Walk when you go to grocery store;
- Park you car a bit farther away;
- Take the stairs instead of using the elevators.

Consult your physician if you want to begin a high-intensity exercise program and/or one that demands an extended effort (ex.: high intensity interval training or a long-distance run). Your doctor will assess your general state of health (heart, eyes, nerves, etc.).

If you have retinopathy, check with your doctor that the type of exercise you want to practice is suitable.

EXERCISING SAFELY

It is considered safe to start your physical activity if your blood sugar is ≥ 5.5 mmol/L if you are treated with medication that can cause hypoglycemia.

If you are in **hypoglycemia**, you should correct it adequately before beginning your physical activity.

If you are in **hyperglycemia**, you should **avoid** physical activity in the following cases:

Type 1 diabetes

If your blood glucose level is \geq 16.7 mmol/L **AND** if there are ketones in the urine (2+ or \geq 4 mmol/L) or blood (\geq 1.5 mmol/L), exercising may increase your blood glucose and thus cause a deterioration in your condition.

Type 1 and type 2 diabetes

If your blood glucose level is higher than 16.7 mmol/L and that you feel hyperglycemia symptoms (intense thirst, nausea, severe fatigue, blurred vision and headache).

If your blood sugar is higher than 16.7 mmol/L but that the ketone test is negative or that there is only trace amounts (type 1 diabetes) and you do not have hyperglycemia symptoms, you may try a low to moderate intensity physical activity, while making sure you hydrate well (with water).

In case of heart problems, choose a program of physical activity with supervision. If you have symptoms such as chest pain, severe shortness of breath with effort and/or loss of consciousness, **stop** exercising and talk to your doctor as soon as possible.

In case of eye problems with a risk of hemorrhage, any type of exercise requiring strength, jumps, rapid movements or contact exercises must be avoided.

HOW TO STAY MOTIVATED

- Check your blood sugar before and after physical activity:
 See the effect for yourself!
- Use a pedometer (a classic one or within a watch) and set objectives to reach;



- Keep a calendar of the physical activities that you do:
- Register for a program of physical activity directed by a professional with recognized training;
- Learn when and where community activities are taking place within your region, some of the physical activities may interest you;
- Be open to trying new activities;
- Set yourself realistic objectives;
- Ancitipate the barriers that may keep you from reaching your goals, and find solutions to get around them;
- Have fun doing your chosen physical activity.





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If moderate or intense exercise <u>was not planned</u> and you take insulin

It is even more important to control your blood sugar **before** beginning to exercise. If needed, you should have a snack of 15 to 30 g of carbohydrates upon leaving, then regularly every 30 to 60 minutes, depending on your blood sugar. Here are a few ideas for snacks:



- ♦ 1 fruit or:
- ♦ 4 crackers or:
- ♦ 175 ml (6 ounces) of fruit juice or;
- ♦ 250 ml of Gatorade or;

Your snacks will vary according to the type, the duration and the intensity of physical activity you practice. Experience will help you decide what you need.

GENERAL PRECAUTIONS

- Warm up your muscles before beginning any physical activity (wrist, ankle, arm and leg movements, start walking at a slow pace, etc.);
- Wear comfortable shoes adapted to the activity;
- Examine your feet before and after exercising; watch for blisters, redness or cuts;



- Drink sufficient water to avoid dehydration, which can interfere with controlling diabetes;
- If outside temperature is elevated, preferably practice your physical activity where there is air conditioning, or instead earlier or later during the day so that the temperature is more bearable. If it is impossible, make sure to take frequent breaks where there is shade or in a cool place, and hydrate yourself well.
- Avoid drinking alcohol before, during and after exercise;
- Stop all activity if you feel weak, have discomfort or if you feel some pain. Wear your Medic-Alert bracelet, making it easier for people to help you if necessary (fast access).

Important principle

Light to moderate physical activity lowers blood sugar while intense physical activity may raise it temporarily during and after the activity.

Try it out : check your blood sugar before and after your exercise and see for yourself!



ADDITIONAL PRECAUTIONS

if you use **insulin** or if you take drugs such as **Diabeta**^{MD} (glyburide), **Diamicron**^{MD}(gliclazide), **Amaryl**^{MD} (glimepiride), **Gluconorm**^{MD} (repaglinide)

- ◆ The following information is intended to prevent hypoglycemia that could result from an unplanned, moderate or prolonged physical activity. This particularly applies to people treated with the medication mentioned above. People with diabetes who do not take that medication have less risk of having a hypoglycemic episode so no adjustment is necessary (e.g.: no snack is necessary before physical activity), but hydration always remains important;
- Check your blood sugar before and after exercising; your experience with the impact of exercise on your blood sugar will guide you in the adjustments to make; nothing replaces personal experience in the matter;
- Adjust your eating accordingly (increase food intake in the meal before exercise or add a snack if necessary);



• If you take insulin, adjust the dose of rapid or ultrarapid insulin before the activity, according to the recommendations of your care team. The dose of insulin must be reduced if you plan to less than 2 hours after the injection. The percentage of decrease in the insulin dose (generally 25 % to 75 %) will depend on the duration, the intensity and the type of activity;



- ◆ You can integrate maximum intensity 10-seconds sprints either at the beginning or at the end of your exercise session, or intermittently, as a strategy to avoid hypoglycemia—with the agreement of your care team. Practicing muscle exercises right before an aerobic exercise is another way of preventing hypoglycemia.
- Avoid injecting insulin in an area of the body involved in the exercise (e.g.: the arm or thigh during a rapid walk) because the speed of absorption of the insulin might be increased (risking hypoglycemia).
 The abdomen is preferred as the site of the injection;
- If you take medication, and you often experience hypoglycemia during or after physical activities, discuss it with your doctor. Adjusting your medication would be better than having extra snacks that may interfere with your weight control;
- Bring a **reserve of rapid-acting** sugar with you, in case your blood sugar goes low during the exercise.
- Bring a snack containing 15 to 30 grams of complex carbs, in case you decide to continue your physical activity longer than planned.



◆ Do your physical activity, if possible, every day, at the same time, for the same duration and at the same intensity; this will make it easier to make changes in your treatment.

