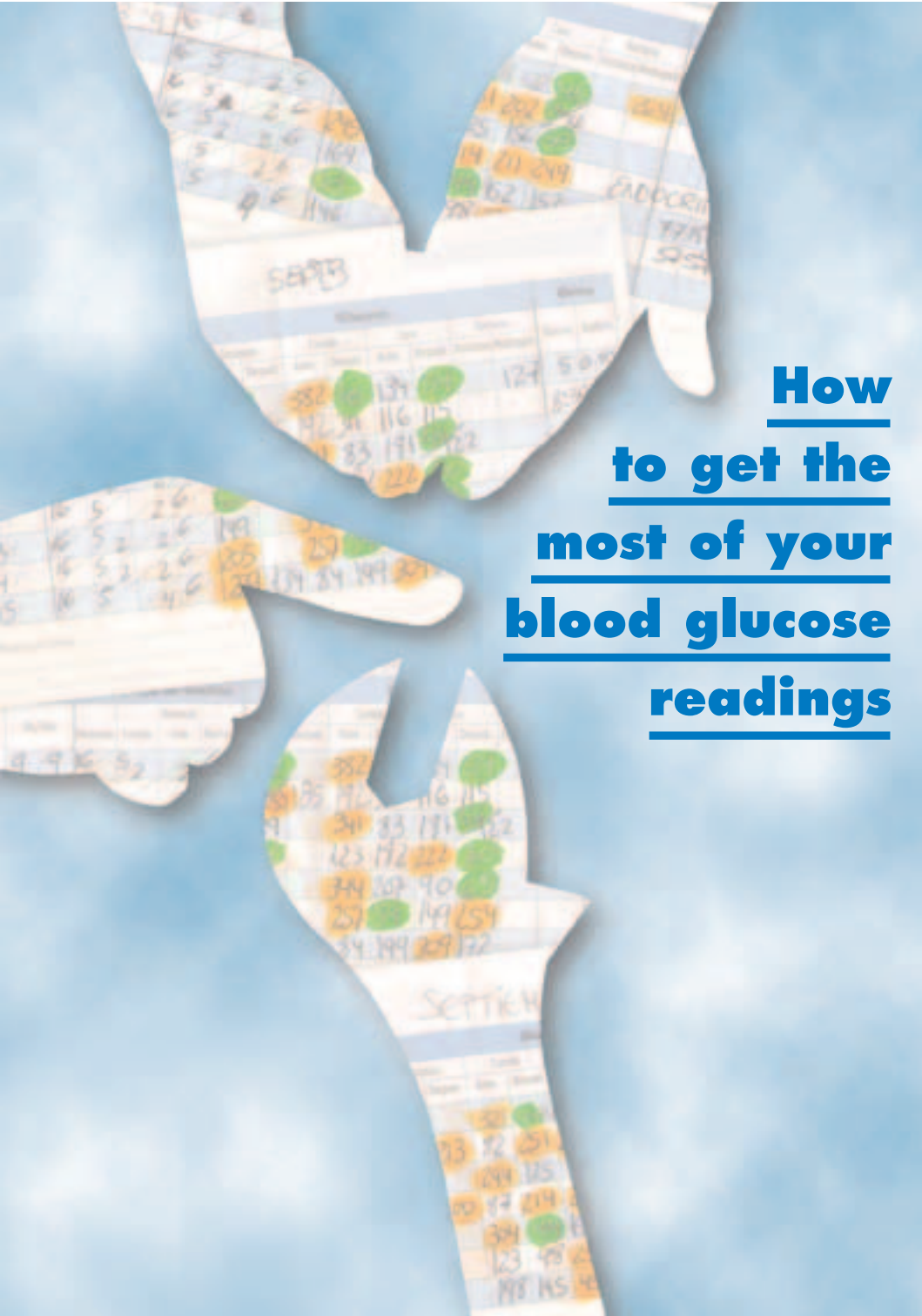


How to get the most of your blood glucose readings

1

Why you should do blood glucose monitoring?

Blood glucose testing is an essential part of the treatment in all types of **diabetes.**

There is no magic formulas that will exactly predict how your **blood glucose levels** will respond to exercise, insulin, stress etc.

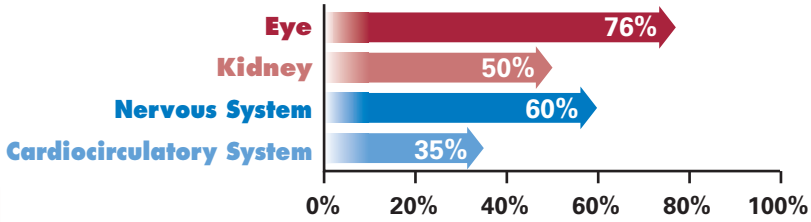
Every person with diabetes is different the only way to understand what is happening in your body is to perform **blood glucose testing** because except when your blood glucose is extremely low or high you can feel perfectly even when your glucose levels are pretty high.

In conclusion you cannot only trust yourself in order to keep you glucose levels under control. Think for example how difficult will be to drive a car when your speedometer is broken, and you must guess all the time how fast you drive, I am pretty sure you will collect a lot of speed tickets.

When you test your BG you get an **essential information** allowing your to make timely and correctly decisions. That also will help you to avoid or delay the risk of developing late diabetic complications as was shown in the DCCT and other pandmark studies.

In brief all this studies reached the conclusion that by keeping your blood glucose levels as close as possible to the **non diabetic range** your chances of developing such complications as diabetic retinopathy or nephropathy will diminish.

Long term complications risk reduction



Patient with type 2 diabetes were no included in these studies but is very likely that by achieving a better glucose control they also will benefit. A similar prospective study involving type 2 diabetic patients is underway (UKPDS) and hopefully will give some answers by late 1998.

2

How to do it correctly?

1. First you must **wash your hands** with soap and water. **DON´T USE ALCOHOL.**

2. If you apply a **massage** to your finger as shown in the scheme that will help to obtain a good blood drop, sometimes it is useful to place a rubber around the finger if you are having difficulties for getting a good drop.

3. You can prick your finger with any of the **lancer devices** available in the market some of them may be adjusted to the different types of skins.

4. Apply the blood drop directly on the **reactive strip.** The latest blood glucose monitor require a very small drop to perform correctly.

5. Read your result at the screen of your **meter.**

It is mandatory that you have being introduce to the self blood glucose monitoring by your certified diabetes educator. It is also important to check at least annually if your glucose meter is functioning properly, so take it with you on your diabetes follow up visits. You can compare the results of your glucose meter with the results obtained at you laboratory. The difference between them should no exceed 15%. Sometimes may be advisable to check your glucose meter more often specially if there are discrepancies between your blood glucose results and the glycated hemoglobin level.

Relation between Hgb A1c and glycemia in DCCT

% HgbA1c:	4	5	6	7	8	9	10	11	12	13
Glycemia Averages:	60	90	120	150	180	210	240	270	300	310

- Medium Level: 5 - 6,05 %
- Non Diabetics Medium Level: 5,05 ±05 %
- Normal Highest Level: 6,05 %

6. It is advisable to **do it in both sides of your fingers** avoiding the middle tip of your finger.

3

Who should monitor their blood glucose?

Generally specking ideally **all the people with diabete**s should do it, but it is obvious that you have to adapt it to the individual circumstances and the treatment goals that have been agreed upon with your diabetec team. We have remark here some circumstances that make it more necessary:

- All type 1 diabetic patients.
- All type 2 diabetes patients insulin treated and all the patients with gestational diabetes.
- Some type 2 diabetes patients on oral medications that may induce hypoglycemia episodes or when they have already developed late diabetic complications.
- All type 2 diabetes patients that have an altered renal threshold for glucose.

4

How often and when to test?

The frequency of blood glucose testing must be negotiated between you and your medical team in a manner that you will perform **as many tests as you need,** because you are really the expert in your diabetes and you play the most important role in your own diabetes care, the rest of the diabetes medical team members are just co-participants in your struggle to live well with diabetes.

Finally the frequency will vary depending in the glycemic goals that have been established for your own diabetes.

Generally speaking we have to aim for an optimization of the treatment in all the type 1 diabetic patients and you should do at least **4 BG TESTS a day.** Less than that has been associated in many studies with a worsening for of your diabetes control. Sometimes you may require less than 4 BG a day for instance in the beginning of your diabetes when you may have some residual insulin secretion.

In type 2 diabetic patients **1 or 2 BG TESTS a day** maybe enough but we would like to remember you that you better negotiate it with your medical team.

About the **time of the day** to do the BG testing please, again you should talk with your medical team. If you are under an intensive insulin treatment as we have outlined here the most convenient times are:

Recommended times for BG testing

- 30 min. Before mealtime.
- Just before going to sleep.
- 90 min-120 min after meals.
- At 2 or 3 a.m. (minimum recommended once a week in order to rule out nocturnal hypos)

Sometimes beside those basic BG values you should check your glucose more often specially under the following circumstances:

- If you are sick.
- If you suspect you may be experiencing an hypo.
- Before driving or working in dangerous conditions.
- If you plan to modify your usual diet.
- Before and after exercise.
- 15-30 min after treating an hypoglycemic episode.

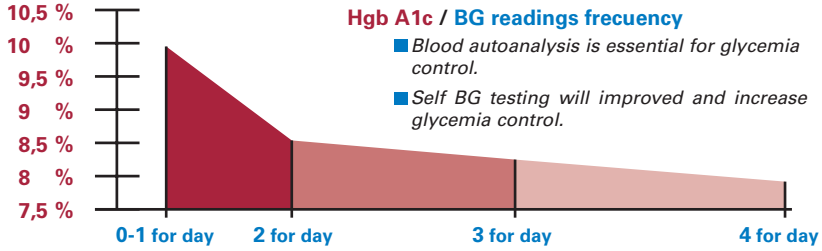
5

Benefits of self blood glucose testing

The BG monitoring is a **tool** that will provide you with an essential information but it is not a goal by itself.

The BG testing should be done only after intensive **diabetic education** and it have been shown that when the well informed patient use this information to adjust and modify the treatment then the degree of diabetic control will improve in both type 1 and type 2 diabetes patients.

Hgb A1c readings by blood autoanalysis frequency



6

How can I better use the results?

Self blood glucose testing must be done for YOU ONLY and by not means to please your diabetes educator, because you are the one who must **make daily changes** in your treatment depending on these results.

Generally you will use the results of your glucose meter for:

1. Helping your struggle to reach the **agreed goals**.
2. Evaluate the **insulin action** and adjust the dose depending upon your own experience and the rules that you agreed with your diabetes team.
3. Helping you to figure out the glycemic effect of the **different foods** you have eaten.
4. Modify your **treatment** when you are sick.
5. Helping you to avoid or **reduce the hypoglycemic episodes** especially when your alarm warning signs have diminished.
6. Understanding how the **exercise** affects your blood glucose values.
7. Changing your **treatment plan** (food and insulin) in response for changes in physical activity.
8. Trying to **better know your body and your diabetes**. For instance eating an extra pizza slide or walking 2 extra miles etc.

After using the data of your BG results for your everyday decisions you can have an extra value for them if you write them down in your BG diary, first by closely looking back to your results and learning from patterns and secondly helping your diabetes medical team to better understand your own diabetes so they can help you better.

7

Which are the glycemic goals?

Thanks to the information provided for the blood glucose monitoring you can find out how your treatment plan works (food, exercise, insulin) making possible to achieve the ideal treatment goal that is to maintain your blood glucose values **as close as possible to those in people with a correctly functioning pancreas.**

In the following scheme we have written the BG values in a person without diabetes, you and your diabetes medical team must **find out which levels are advisable** and achievable in your own case.

Daily glucose levels in non diabetic people

Before breakfast	60-110
Before meals	60-140
1 hour after meals	= ó < a 180
2 hours after meals	= ó < a 140
2-4 hours after meals	< ó = 70
Hgb A1c	4-6 %

It is extremely important to remember that when you have diabetes your glucose values will vary in a wider range than in people without diabetes.

SO PLEASE DON´T BE DISAPPOINTED and DON´T GET MAD, don´t waste your energy by getting angry because you have got a high glucose value.

All you must do is to react by taking the right measures in order to regain control or your glycemic values as soon as possible.

It is also important to remember that the results of your glucose meter are just numbers these number may be high, low or in range but there is not such a thing as good o bad results, because NOBODY is judging you because a number and much less your own glucose meter.

Please be indulgent with yourself. Things are usually grey and almost never are completely black or white, when you get a «high number» (that may happens to anyone) just act by adjusting your treatment.

Remember that your chances to develop late diabetic complications only will increase when you continuously maintain high levels of blood glucose.

8

Advantages

- ✔ **Improvement of your overall health status,** because using the information provided by checking regularly your blood glucose level will make you feel that you are the one «behind the wheel» and this sense of control will help you feel better.
- ✔ **Prevention of diabetic acute complications,** because checking your glucose levels will help you to avoid o greatly reduce the incidence of severe hyper or hypo episodes. It is really the best way to avoid emergencies.
- ✔ **Prevention of infections,** because they occur mainly when your glucose levels are high and during the hyperglycemic episodes the mechanism for fighting infections are impaired.
- ✔ **Sense of control,** thanks to the blood glucose testing you can control your diabetes and not allowing your diabetes to control you.
- ✔ **Increase your freedom,** allowing you to add more flexibility to your lifestyle.

9 Disadvantages

Disappointment and confusion

Some of your «glucose numbers» may be impossible to understand and disappointing but not only for you also for your diabetes medical team.

Please don´t give up, if you keep on doing blood glucose monitoring and searching possible explanations and looking for solutions it will pay in the long run by achieving a better control of your diabetes.

Pain

In your fingers while getting the blood drop but this have been diminish with the new ultrafine lancets and the latest meters that require less blood.

Giving Up

If is just human to feel «fed up» with BG testing and that may happens sometimes to anyone but it is more often seem in the people doing BG testing without using the results because they have not received clear instructions during their the diabetic education.

Cost

Lately the cost of the glucose meter have diminish a lot but the cost of the reactive strip is high, and not always covered by your insurance company some states in the US start recently to provide them free of charge for medicare patients. Here in Spain and the rest of Western Europe our National Health Service provide it for free.

10

What to expect for the near future?

First we are close to have **non-invasive devices** that will allow us to obtain a drop of blood **without the hassle and pain,** with **laser technologies.** Recently the «Lassette» a pricking laser device has an FDA approval and it is already commercially available but has a bulky size and it is expensive.

Our current glucose meters have different areas where they should improve, talking about the **ideal glucose meter** it should be able to **check your blood glucose levels almost continuously.** Under investigation are non-invasive glucose meters working with infrared technology there are also some companies working on implantable glucose sensors and when widely available will allow to maintain a reasonably good control without increasing the hypoglycemic risk and with less effort.

Lately it has been proven that the glucose concentration in the **interstitial subcutaneous tissue** is closely related to those in whole blood. There is a small but important advantage and it is because you can get a sample of it with **less pain** that you are experiencing now with your finger pricking device. Pending FDA approval is the device known as «Life guard» using this technology.

The new millennium will bring us **close loop systems** that will be the ideal solution, using continuous non-invasive glucose meters that will pass the information to an intelligent insulin pump and it will work like an small wearable artificial pancreas, but there are some problems to be overcome before it will be a reality.

All that and much more is coming... in the exciting near future.

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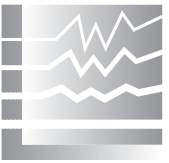

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