

MANAGEMENT OF THE INSULIN DEPENDENT DIABETIC

A holistic, team-based approach

Diabetes implies lifelong disease with virtually all patients having complications after ten years. Prevention and reduction of severity of complications require optimal glycaemic control.

The patient with diabetes should not just be regarded as an elevated blood glucose level but multisystem involvement necessitates a holistic team-based approach.

As mentioned in a previous article on the patient with NIDDM (*see SAFP Vol. 18 No. 3, May 1997*), patient education to enable self management of the disease is mandatory. Compliance is only possible once the patient has a minimum understanding of the disease and its management.

Education

Several aspects of diabetes need to be covered in either a formal or informal diabetes education programme. These aspects are: diabetes as disease (basic pathology in layman's terms!), treatment options, the importance of a correct diet, exercise, symptomatology of hyper and hypoglycaemia, management of intermittent illness and the psychological effects of diabetes.

Dietary measures

Avoid falling into the trap of simply handing out written instructions concerning diet. It is both an opportunity and obligation for you as physician to make sure the patient understands the principles involved and that he is indeed making the appropriate lifestyle and dietary changes. Stress the positive rather than the negative; emphasise what is permissible rather than expanding on all the foods that are now forbidden!

The patient must eat at least three regular meals per day. He must choose low fat foods and avoid using fat for cooking purposes. Carbohydrates, especially those high in fibre, are advised. Approximately 50-65% of the total energy content must be from carbohydrates. Patients should be encouraged to eat food with a low glycaemic index since it won't elevate the blood glucose as rapidly as those with a high glycaemic index. Moderate amounts of sweeteners are allowed, but remember that they may contribute significantly to the intake of kilojoules.

Alcoholic drinks should be restricted to one or two per day with meals or a snack in well controlled diabetics and remember the effect on kilojoules. It is not necessary to buy special "diabetic foods".

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Education

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Dietary importance
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Exercise programme
Guidelines when feeling unwell

Diet

Diabetes, obesity and lipids

Monitoring

Weight
Blood pressure
Blood glucose
Glycohaemoglobin
Lipids

Insulin therapy

Combination therapy

Complication screening and management

Cardiovascular
Neuropathy
Ocular
Nephropathy

Table 1. Management strategies in the insulin dependent diabetic

MONITORING

Blood glucose

Home blood glucose monitoring is essential if good glycaemic control is to be achieved in the insulin dependent diabetic. If the patient is unable to acquire a glucometer, test strips alone may be used. Both the meter and the patient's technique should be checked from time to time by the responsible doctor. The patient is encouraged to note his glucose value in a diary, also listing factors that may have influenced results, eg. exercise, party, illness.

The number of times a day that testing is needed depends on the duration of therapy, the stability of control and the patient's lifestyle. After starting insulin it may be necessary to monitor the blood glucose before and after meals, at bedtime and at around 3am, three to five times a day depending on the patient. As the glucose values stabilise and adjustments to the insulin regimen have been made, it may be necessary to monitor only once or twice daily.

Without home monitoring it is virtually impossible to make the changes needed to suit the specific patient.

Urine tests

If it is impossible for the patient to do blood glucose measurements, he can use

the urine test. It is important to remember that it gives an average impression of the glucose control over the hours after the previous voiding.

Every diabetic on insulin must test their urine for ketones if they are not feeling well or if they have persistent elevated blood glucose measurements, as the presence of ketonuria can be a warning sign of possible serious metabolic derangement.

BP

The patient must have regular BP measurements and treatment should be started earlier than usual in order to preserve kidney function.

Weight

Weight assessments must also be part of the routine checkups and act according to findings. Do the BMI (mass/length²) and if the patient is overweight he should follow a lower calorie diet.

Height and weight should be measured at the initial visit in order to determine the body mass index (BMI = mass in kg/length in m².) Thereafter, the patient should be weighed at every visit. A BMI > 28kg/m² indicates obesity. In such cases a hypocaloric diet is needed.

Lipids

Do the patient's lipid profile yearly and if dietary measures are not adequate after three months for lowering cholesterol and/or triglycerides, start with medical therapy.

Complex algorithms exist for management of dyslipidemias. In essence, not all patients can be treated in the same manner. Risk increases as other risk factors increase: smoking; HDL < 0.9mmol/l; diabetes mellitus; family history of IHD before age of 60 years; premature menopause without hormone replacement therapy; hypertension, male > 45yrs, female > 55yrs.

The complete lipogram is needed to evaluate the contribution of both LDL and triglycerides to the total cholesterol. The recent 4S study has highlighted the benefit of lowering cholesterol in diabetics with ischaemic heart disease. In this study the initial total cholesterol values were 5.5 to 6.8mmol/l. The opinion was voiced in accordance with the NCEP guidelines that diabetics should be regarded as having coronary artery disease and thus managed as if they are in the highest category of risk. The level for initiating therapy (dietary initially) is an LDL level of > 2.6mmol/l.

These recommendations could probably be extrapolated to our caucasian

Group action	Examples	Onset	Peak	Duration
Ultra short acting	EliLilly: Humalog	Immediately		
Short acting	Novo: Actrapid EliLilly: HumulinR	20-30 minutes	1-5 hours	5-8 hours
Intermediate acting	EliLilly: HumulinN Novo: Protaphane Monotard	30-90 minutes	2-12 hours	18-22 hours
Long acting	Novo: Ultratard EliLilly: HumulinL HumulinU	2-4 hours	6-24 hours	22-28 hours
Biphasic action	EliLilly: Humulin mixtures Novo: Actraphane Mixtard	30 minutes	1,5-12 hours	14-24 hours

Table II. Different types of insulin

	Good	Borderline	Poor
Fasting blood glucose mmol/l	4.4 - 6.1	6.2 - 7.8	>7.8
Postprandial glucose mmol/l	5.5 - 8.0	8.1 - 10.0	> 10.0
HbA1C g%	<6.5	6.5 - 7.5	> 7.5
BMI - Females	<24	24 - 26	> 26
BMI - Males	<25	25 - 27	> 27

Table III. Metabolic control aims

Blood glucose before meals	Change in usual short acting insulin
<3mmol/l	Reduce by 1-3 units and eat first
3-5mmol/l	Reduce by 0-1 units
5-7mmol/l	Increase by 0-1 units
7-10mmol/l	Increase by 1-2 units
10-13mmol/l	Increase by 2-3 units
13-17mmol/l	Increase by 3-4 units
17-22mmol/l	Increase by 4-6 units

If you have difficulty with blood sugar control, refer to a physician or endocrinologist.

Figure 1. Example of a supplementation scale for the basal bolus regimen

patients. Black patients, however, will show a greater variation in risk and here it is difficult to specify cut off levels for commencing treatment. Associated risk factors should once again be taken into consideration when making management decisions.

Never make treatment decisions on one value alone. Use at least two values taken a couple of weeks apart.

If the primary abnormality is a raised triglyceride level (excluding alcohol abuse and after improvement of glycaemic control as first intervention) then a fibrate is the drug of choice if dietary therapy alone fails. If the main concern is a raised cholesterol, a statin is preferred.

Glycohaemoglobin

Glycosylated haemoglobin assays should be done 3-6 monthly if available. Compare it with the patient's home blood glucose measurements and adjust the insulin accordingly.

Insulin therapy

There are different insulin delivery systems: vials and syringes; pens with pen-fills; and disposable pensets. Discuss the different modalities with your patient and

decide which one to use.

Insulin that is not in use should be kept in the fridge. Never put your pen with a needle on in the fridge. Insulin is usually stable at 25°C for 6 weeks.

The patient must rotate his sites of injection to avoid local reactions. Speed of absorption of insulin will depend upon site and depth of injection and activity at injection site. After injection the device must remain in place for a couple of seconds to ensure complete delivery of the dose.

Regimens

Total amount of insulin/day: 0.6E/kg

- 1) *Twice daily injections:* 2/3 in the morning, 1/3 in the evening.
- 2) *Multiple injections:*
 - a) Basal bolus: Intermediate to long acting insulin at around 22h00; Short acting (60% of total insulin) in divided doses before meals.
 - b) Three injections/day: Intermediate and short acting combinations.

The doctor must discuss the different regimens with the patient and decide on the best regimen. If the patient's blood glucose stays uncontrolled, adjust the amount

of insulin gradually, according to the patient's home monitoring readings. The patient's control will be better with more frequent injections, thus the basal bolus regimen.

If your patient understands his treatment you can give him a supplementation scale to change his own insulin at home.

The adolescent

Children should eat enough food for normal development and growth and their insulin should be adjusted accordingly. They require more insulin during the growth spurt. Their control should not be as tight as in the adult patients due to the fact that hypoglycaemia is a greater risk in these patients.

Exercise

The IDDM patient with disease of longer duration (eg > 10yrs), or the older patient, should be evaluated by a physician before he starts with an exercise programme. The patient's insulin dose must be decreased before strenuous exercise and the patient must monitor his glucose carefully during and after exercise. Hypoglycaemia can occur up to 24 hours after exercise. ●

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