

# Guidelines for Diabetes Care

A Desktop Guide  
to  
Type 1 (Insulin-dependent)  
Diabetes Mellitus

*European Diabetes Policy Group 1998*

International Diabetes Federation  
European Region

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# A Desktop Guide to Type 1 ( Insulin-dependent ) Diabetes Mellitus

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## Preface

### ***A desktop guide***

In 1993 the European IDDM Policy Group published the Consensus Guidelines for Management of Insulin-dependent ( Type 1 ) Diabetes on behalf of the St Vincent Declaration Initiative.

The current initiative builds on those earlier guidelines, in the light of newer understandings, and attempts to provide a more direct and more accessible format.

Furthermore, we have tried to use language that can be followed by the educated person with diabetes, remembering that “the primary resource for diabetes care is the person with diabetes themselves, supported by enthusiastic and well-trained professionals”.

The special requirements of children are not addressed here.

### ***Evidence***

The 1993 Consensus Guidelines were explicit about the knowledge base used. In an attempt to raise clarity, the current Desktop Guide is more prescriptive. However, we will also be publishing a source document in a major journal; this will go even further than the previous Guidelines in documenting the strength of the recommendations given here.

### ***Aims of diabetes care***

The aim to which these guidelines aspire is to enable a life of normal length and fulfilment for people with diabetes through:

- provision of skills to adapt insulin therapy to lifestyle;
- development of understanding to allow coping with new challenges;
- control of risk factors for eye, kidney, foot, and arterial damage;
- early detection and management of any complications of diabetes.

### ***A way forward***

The 1998 European Diabetes Policy Group worked on both the major types of diabetes – there is a sister publication on Type 2 diabetes. The working group came from richer and poorer nations throughout Europe, and included people with diabetes, as well as members of multi-disciplinary teams.

We hope you will enjoy implementing these shared ideas. The practice of diabetes care is not always easy, but the human interest and gain to health are potentially large.

*European Diabetes Policy Group, 1998*

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# 1 Framework of Diabetes Care

## A framework for quality diabetes care

**Ensure** provision of the following :

- £ A diabetes team ( professionals ) with up-to-date skills
  - doctors
  - educators ( diabetes nurse specialists )
  - nutritionists ( dieticians )
  - podiatrists ( chiropodists )
- £ Structure
  - easy access for people with diabetes
  - protocols for diabetes care
  - facilities for education
  - information for people with diabetes
  - structured records
  - recall system for Annual Review / eye surveillance
  - database / software for quality monitoring and development
  - continuing education for professional staff
- £ Process
  - service for regular review
  - service for Annual Review
  - education service
  - foot care service
  - emergency advice line
  - joint obstetric / medical pregnancy and pre-pregnancy service
  - adolescent service
  - access to related professionals ( heart, renal, eye, vascular specialists )
- £ Feedback from people with diabetes on service performance
- £ Regular review of service performance

## 2 The Diabetes Consultation

### Consultation infrastructure

**Make available** for consultations the following :

- £ necessary members of the diabetes team
- £ adequate time and adequate space
- £ records and information for the individual with diabetes
- £ means of communication to other health professionals involved in the individual's care

### Consultation process

**Include** the following in any diabetes consultation :

- Welcome
  - 1 Friendly greeting of the individual and early establishment of rapport
- Problems review
  - 2 Understanding of any recent events disturbing the person's life-style
  - 3 Enquiry after general well-being and identification of new difficulties
  - 4 Review of self-monitored results, and discussion of their meaning
  - 5 Review of dietary behaviours and physical activity
  - 6 Review of diabetes education, skills, and foot care
  - 7 Review of insulin therapy and experience of hypoglycaemia
  - 8 Review of other medical conditions and therapy affecting diabetes
  - 9 Management of arterial risk factors identified at Annual Review
  - 10 Management of complications and other problems identified at Annual Review
- Analysis and planning
  - 11 Summary of, and agreement on, main points covered in consultation
  - 12 Agreement on targets for future months
  - 13 Agreement on, and explanation of, changes in therapy
  - 14 Agreement on interval to next consultation
- Recording
  - 15 Completion of a structured record / patient-held record of the consultation

### Annual Review

**Include** additionally, at Annual Review, surveillance of the following:

- 1 Symptoms of ischaemic heart disease, peripheral vascular disease, neuropathy, impotence
- 2 Feet including footwear, deformity or poor skin condition, ischaemia, ulceration, absent pulses, sensory impairment ( see *Foot problems* )
- 3 Visual acuity
- 4 Retinopathy by ophthalmoscopy / retinal photography ( see *Eye damage* )
- 5 Kidney damage by albumin excretion and serum creatinine ( see *Kidney damage* )
- 6 Hypertension ( see *Kidney damage* )
- 7 Dyslipidaemia ( see *Arterial risk factors* )
- 8 Injection sites
- 9 Attendance at podiatry / ophthalmology / other if indicated

### 3 Organization of Clinical Monitoring

#### Schedule for clinical monitoring at different types of visit

<b>Review topics</b>	<b>Initial review / referral</b>	<b>Regular review</b>	<b>Annual Review</b>
Long-term and / or recent diabetes history			
Social history / lifestyle review			
Diabetes understanding / self-management			
Self-monitoring skills / results			
Complications history and / or symptoms			
Smoking		If problem	
Other medical history / systems review			
Family history diabetes / arterial disease			
Drug history / current drugs			
Weight / body mass index			
General examination			
Foot examination / injection sites		If problem	
Eye / vision examination		If problem	
Blood pressure		If problem	
Glycated haemoglobin			
Lipid profile*		If problem	
Urine protein			
Urine albumin excretion**		If problem	
Serum creatinine		If problem	
* 3-yearly if previously normal			
** not required if proteinuria			

## 4 Monitoring Quality of Care

### Protocol for quality development and monitoring of performance

**Aggregate**

€ the data gathered at Annual Review onto a computerized database

**Choose**

€ indicators ( see below ) to reflect outcome as well as process of care

**Analyse**

€ data in line with published recommendations

**Compare**

€ performance with pre-determined standards or other providers of diabetes care

**Review**

€ performance at regular meetings of your diabetes team

**Discuss**

€ the performance of education programmes

### Indicators for quality development and monitoring

**Measure**

**Calculate**

Intermediate outcomes

HbA<sub>1c</sub>

Percent >7.5 %Hb

Albumin excretion

Percent abnormal albumin excretion

Eye damage

Percent with retinal damage

True outcomes

Amputation above ankle

Incidence

Myocardial infarction

Incidence

Stroke

Incidence

Foot ulceration

Incidence

Risk factor control

Hypertension

Percent  $\geq$ 135/85 mmHg

Smoking

Percent people still smoking

Process of care

Eyes screened

Percent people examined in year

Education performed

Percent people seeing nurse educator in year

Feet examined

Percent people examined in year

*These are examples; many other indicators are possible*

## 5 Patient Empowerment

A salient goal for diabetes care is to enable each person with diabetes to lead the health-care team involved in the management of their diabetes

### Assessment of empowerment

**Assess** whether the person with diabetes :

- £ has the knowledge, behavioural skills, and sense of awareness necessary for optimum self-care
- £ makes early and effective responses to everyday problems
- £ has the confidence to obtain the best input from the diabetes health-care team

### Achieving empowerment

**Ensure** that empowerment is :

- £ a primary objective of your consultations and education programme
- £ supported by availability of diabetes publications and other information sources
- £ the active policy of your diabetes service

**Provide** :

- ⊖ positive encouraging responses to requests for information and understanding
- ⊖ a copy of the European Patients' Charter or a similar national or local statement of rights and roles
- ⊖ a copy of the person's diabetes health-care record
- ⊖ information on the results and meaning of all investigations

It is the right of each person with diabetes to become empowered to derive the maximum benefit from the health-care system

It is the responsibility of the diabetes team to ensure that the person with diabetes can follow the life-style of their educated choice, based on the three elements of empowerment: knowledge, behavioural skills, and self-responsibility

## 6 Patient Education

### Assessment of patient education ( needs and achievements )

#### **Use :**

- £ review of diabetes skills  
( self-monitoring, injections, hypoglycaemia management, food identification )
- £ biomedical measures ( changes in body weight, glycated haemoglobin )
- £ evidence of appropriate behaviours  
( footwear, use of injection sites, membership of diabetes associations )
- £ assessment of life-style, emotional adjustment, and perceptions of barriers to life-style activities and self-care
- £ perceptions of desired short-term goals ( glucose control, weight ), and long-term vulnerability ( to late tissue damage )
- £ knowledge ( as a basic measure )
- £ diabetes-specific well-being and health profile assessments (as global measures)

#### **Perform :**

- £ as part of routine care visits, by direct enquiry
- £ as part of Annual Review, or first contact, more formally

The aims of education and training are to provide information in an acceptable form, in order that people with diabetes develop the knowledge to self-manage their diabetes and empower them to make informed choices in their life

### Patient education targets

#### **Aim** to optimize :

- £ knowledge of diabetes, and the aims of its management
- £ motivation
- £ attitudes to self-care
- £ behaviours which interact with diabetes management
- £ empowerment in handling health-care and other professionals

#### **Aim** to provide skills :

- £ to ensure optimal and appropriate use of insulin therapy
- £ to deal with the social and life-style consequences of insulin therapy
- £ to be able to detect and manage hypoglycaemia and other complications of therapy
- £ to be able to monitor the results of therapy and act appropriately on the results
- £ to manage effectively nutrition and exercise
- £ to enable appropriate self-management during intercurrent illness
- £ to be able to formulate and agree health-care targets and strategies for meeting them
- £ to use the professional members of the diabetes care team effectively
- £ to understand and cope appropriately with the late tissue damage of diabetes
- £ to make appropriate responses to unpredicted and new problems in diabetes care
- £ to avoid self-destructive behaviours and deal adequately with stress

## Provision of education

**Integrate** into regular clinical care by providing your own curriculum and programme

**Ensure** your diabetes team has adequately trained personnel

**Assess** special needs of each individual ( see above )

**Be aware** of needs of special groups ( young people, pregnant women, the elderly )

**Provide** education within three time frames :

- £ At and shortly after diagnosis :
  - the minimum skills to obtain control over the new situation
  - supportive information on the nature and outcomes of diabetes
  - basic information on self-injection, self-monitoring, hypoglycaemia, dietary carbohydrate distribution
- £ In the months following diagnosis ( on a one-to-one basis ) :
  - a comprehensive coverage
  - topics covered previously, plus
  - coping with illness, targets of insulin therapy, healthy eating
  - complications of diabetes, associated risk factors, foot care
  - employment or schooling, insurance, driving and travel
  - pregnancy, genetic counselling, contraception
- £ In the long term :
  - reinforcement periodically after annual evaluation ( see above )

**Include** family members and significant others as appropriate

**Use** group education to uncover problems and provide solutions and behavioural change through peer example

The tools of diabetes care can only be used effectively and optimally when combined with the process of patient education and with continuing evaluation of the outcomes of care

## 7 Self-monitoring of Blood Glucose

### Use and assessment of self-monitoring

**Advise** use of self-monitoring for : insulin dose self-adjustment; education on effects of life-style on blood glucose; coping with illness and new situations; hypoglycaemia management and avoidance

**Assess** ability to use self-monitored information as part of routine care

**Assess** skills yearly or if self-monitoring problems

**Check** meters yearly or if self-monitoring problems

**Evaluate** reliability of self-test results ( if indicated ) by :

- assessment of self-test technique
- comparison with acute results obtained at consultation
- consistency with the results of glycated haemoglobin estimation
- review of the quality of self-test record diaries

Unreliable records suggest a failure of patient education by the diabetes health-care team

### Achieving effective self-monitoring

#### Use

- £ for all people with Type 1 diabetes
- £ reagent strips with or without meters, or electrode strips

**Provide** appropriate training and regular review of technique

#### Recommend :

- results are recorded ( with date and time, insulin dose, hypoglycaemia ) to provide a cumulative record as a basis for day-to-day changes in therapy
- different patterns of testing according to need :
  - four or more times a day during illness, life-style changes, pre-conception, in pregnancy, with hypoglycaemia unawareness
  - at night ( 0200-0400 h ) if unrecognized night-time hypoglycaemia is suspected
  - one or two multi-point profiles a week ( on different types of day )
  - once daily testing is the minimal acceptable frequency ( different times of day )
- day-time tests preprandially and 1-2 h after meals
- regular bed-time tests in people prone to nocturnal hypoglycaemia
- testing to cope with variations in eating or activity
- special equipment for those with visual impairment
- urinalysis for glucose where blood glucose monitoring is not possible or the patient does not wish to continue with it
- urinalysis for ketones when hyperglycaemia, illness, or vomiting is present

## 8 Life-style Issues – Living with Diabetes

### Assessment

**Ask** regularly about diabetes interfering with :

- £ employment or studies
- £ social / sports activities
- £ travel

### Topics

#### **Employment**

**Provide :**

- £ individualized advice
- £ counselling and contacts for those whose aspirations are frustrated
- £ special advice for shift work, high-risk occupations
- £ employer contact on request of the person with diabetes

#### **Insurance**

**Be aware** of where appropriate and up-to-date premiums can be obtained

**Provide** advice to patients wishing to enter into insurance contracts

#### **Driving licences**

**Provide :**

- £ sympathetic and supportive advice where driving is no longer reasonable
- £ individual assessment for people with hypoglycaemia unawareness
- £ rapid and appropriate reports on request

#### **Psychological problems**

**Provide**

- £ counselling, as required, by appropriately skilled members of the diabetes care team
- £ appropriate education ( see *Patient education* ) to alleviate some of the concerns underlying the diagnosis of diabetes or development of complications

#### **Travelling**

**Provide** advice on :

- £ insulin dosage and food intake during travel
- £ transport of insulin and monitoring and injection equipment in hand-luggage
- £ special health risks in visited countries
- £ differences in insulin types and concentrations between countries
- £ the need for valid travel insurance

**Review** coping skills for acute illness, especially gastroenteritis

**Give** written details of a person's condition when appropriate  
( and contact telephone numbers )

## 9 Assessing Blood Glucose Control

### Using assessment levels to set targets

**Use** the published assessment levels :

- £ as an integral part of diabetes care – never manage diabetes on symptoms
- £ to indicate need for further intervention
- £ as the basis for short-term and longer-term individualized targets
- £ as an educational tool to help the person with diabetes

**Ask** questions of yourself continually :

- ⊖ Is it possible for the individual to approach each target more closely, without a counter-balancing deterioration in quality of life?
- ⊖ For what percentage of patients is the service achieving these targets?

**Be concerned** about targets :

- ⊖ Failure to attempt to approach the targets more closely is inadequate care, unless this would lead to deterioration in quality of life
- ⊖ Do not attempt to approach target levels too closely where this adversely affects the quality of life of the person with diabetes

### Assessment of blood glucose control

**Measure** glycated haemoglobin 2–4 monthly in every patient ( depending how stable )

**Think** of hypoglycaemia if glycated haemoglobin level is normal or close to normal

**Use** the assessment levels ( below ) to set blood glucose targets

Attention to the non-metabolic target of “diabetes interfering little with the patient’s general and social well-being” will help metabolic control

### Glucose control assessment levels

	Non-diabetic	Adequate	Inadequate
HbA <sub>1c</sub> (DCCT standardized) %Hb	<6.1	6.2-7.5	>7.5
Self-monitored blood glucose			
Fasting/pre-prandial			
mmol/l	4.0-5.0	5.1-6.5	>6.5
mg/dl	70-90	91-120	>120
Post-prandial (peak)			
mmol/l	4.0-7.5	7.6-9.0	>9.0
mg/dl	70-135	136-160	>160
Pre-bed			
mmol/l	4.0-5.0	6.0-7.5	>7.5
mg/dl	70-90	110-135	>135

*It can be dangerous to strive for non-diabetic glucose levels*

## 10 Providing Eating and Drinking Advice

### Reviewing dietary management

**Make** recommendations and review eating :

- £ at diagnosis
- £ on adjustment or change to insulin regimens
- £ on change in professional advisor
- £ every other year as a routine, or more often as required
- £ on request

**Review** dietary management regularly :

- ⊖ Is healthy eating ( see box ) a normal part of life-style?
- ⊖ Does calorie distribution reflect the patient's life-style and desires, as well as insulin regimen and local circumstances?
- ⊖ Is calorie intake appropriate to desired body weight?
- ⊖ Are regular meals and snacks taken at appropriate times?
- ⊖ Is money being spent unnecessarily on special 'diabetes' food products?
- ⊖ Is alcohol intake moderate? Could it be exacerbating hypertension or hypertriglyceridaemia? Could it be contributing to early or late hypoglycaemia? Is this understood by the person with diabetes?
- ⊖ Do kidney damage or raised blood pressure suggest a benefit from special recommendations ( protein intake <0.8 g/kg, salt intake <7 g/day, respectively )?

Nutritional management is an integral part of initial and continuing education programmes

### Meal patterns

**Multiple injection regimens :**

**Advise** snacks will help to attain better blood glucose control, but use self-monitoring to learn what is necessary and desirable

**Advise** on flexibility to adjust meal timing and content ( together with insulin doses ) without affecting blood glucose control. But **warn** about the temptations of extra total calories

**Rapid-acting insulin analogue regimens :**

**Advise** snacks only if self-monitoring suggests a need; check particularly if a high insulin analogue dose is needed to correct hyperglycaemia present pre-prandially

## Healthy eating

**Advise** carbohydrate intake should be higher, and fat intake lower than that of most Europeans, but not different from recommendations for the population in general

The proposed contribution to energy intake should be :

- £ Fat : saturated fat <10 %; replace excess saturated fat with monounsaturates, or polyunsaturates ( up to 10 % ), or carbohydrate
- £ Carbohydrate : around 50-55 %. Use foods containing soluble fibre in a carbohydrate rich diet. Simple sugars need not be rigorously excluded from the diet, but often need to be limited
- £ Protein : around 15 % or less

**Recommend** a high intake of fresh fruit and vegetables ( five items a day )

## 11 Physical Exercise

### Management

**Advise** that physical exercise :

- £ can benefit insulin sensitivity, hypertension, and blood lipid control
- £ should be taken at least every 2-3 days for optimum effect
- £ may increase the risk of acute and delayed hypoglycaemia

**Manage** physical exercise using :

- self-monitoring to learn about the exercise response, and the effects of insulin and dietary changes on this
- a prospective reduction in insulin dose for regular exercise
- additional carbohydrate as necessary
- warnings :
  - about delayed hypoglycaemia, especially with more prolonged, severe, or unusual exercise, and a possible need for less insulin overnight and the next day
  - that exercise during insulin deficiency will raise blood glucose and ketone levels
  - that alcohol may exacerbate the risk of hypoglycaemia after exercise

## 12 Using Insulin Effectively

### 12.1 Insulin, injections, and associated education

#### **Advise :**

- the use of unmodified ( soluble, regular ) human insulin before each meal, and human NPH insulin in combination unless :
  - multiple injection therapy is not wanted by the person with diabetes
  - flexibility of life-style is not important
  - insulin secretory capacity is high ( honeymoon period )
  - insulin analogue therapy is indicated ( see below )
- the use of pen systems for insulin delivery
- the use of the abdominal wall for meal-time injections, and the thigh for extended-acting insulin; advise also rotation of sites within these areas

#### **Enable** the person with diabetes to :

- handle the injection device proficiently and confidently, including re-suspension of NPH crystals, insulin storage, and disposal
- self-monitor accurately and easily at appropriate times
- place insulin consistently into deep subcutaneous tissue, usually by means of a lifted skin flap with the injection device at a 45° angle
- prevent, recognize and manage hypoglycaemia
- understand the absorption characteristics of the two insulin preparations used, and changes of insulin requirement with meal size and physical activity, thus allowing them to learn insulin dose self-adjustment
- access the diabetes professional team freely for advice
- manage sickness and travel successfully

### 12.2 Insulin dose requirements – general considerations

#### **Review :**

- patterns of food intake and patterns of physical activity
- previous experience of insulin therapy as a guide to :
  - total insulin dose requirement ( do not use weight-determined insulin doses)
  - diurnal variations in insulin requirement
  - experience of hypoglycaemia
  - state of injection sites

#### **Expect :**

- overnight basal requirements to require up to 50 % of total dose
- unmodified insulin to last for 6-8 hours, and therefore sometimes to overlap into the next meal or into the night; reduce doses accordingly
- high pre-breakfast insulin requirements, due to insulin deficiency at the end of the night
- young people's insulin requirements to be high and changing

#### **Monitor :**

- achieved control and hypoglycaemia; empathy with insulin injections; impact of insulin injections on life-style; understanding and needs; acquisition of injection skills; injection sites; at intervals determined by individual needs and wishes

#### **Adjust :**

- insulin doses to meet agreed targets and experience of hypoglycaemia ( see below )

### 12.3 Rapid-acting insulin analogue regimens

**Anticipate** different diurnal profiles of blood glucose control and hypoglycaemia than for human insulin, and thus a need for different dose regimens and different monitoring schemes

**Give** careful attention to these details, as any improvement in glycated haemoglobin concentration will be dependent on this

**Make** the following changes when using rapid-acting analogues compared to unmodified human insulin :

- monitor the effect of a short-acting analogue post-prandially ( at 1-2 h ), and always less than 4 h after injection
- expect to use lower pre-meal insulin doses than with human insulin
- use combined NPH + analogue injection before meals, if the between-meal interval is to be greater than 5 h
- use a higher late-evening NPH dose ( unless the aim is specifically to deal with a problem of night-time hypoglycaemia )
- use late-evening NPH no longer than 4 h after the evening analogue injection

*Our knowledge of the optimal use of rapid-acting ( and new long-acting ) analogues is evolving month by month – we anticipate a need to modify this advice early on*

### 12.4 Insulin dose adjustment

This section deals with insulin dose adjustment for optimization of long-term blood glucose control

#### **Background basics**

**Review** first :

- £ the match of education, doses, meals, and activity to the *Insulin, injections, and associated education* box given above
- £ the individual's perception and experience of hypoglycaemia and hyperglycaemia

**Review** section 13 ( below ) if hypoglycaemia problems

**Ensure** then that :

- £ the person with diabetes has confidence in your advice
- £ self-monitoring and HbA<sub>1c</sub> data are available to you, and are reliable
- £ you are familiar with the person's life-style habits, in particular eating and activity patterns, and times of insulin injections
- £ injection skills and injection sites are in good order

## **Dose adjustment for different insulin preparations**

**Consider** the previous two pages first

### **Short-acting unmodified insulin**

**Consider :**

- the median glucose level at the time of the injection to be adjusted
- the median glucose level at the time of the next injection
- the experience of hypoglycaemia or subnormal glucose levels ( <4.0 mmol/l; <70 mg/dl ) between the two injections

**If :**

- glucose levels are high at the beginning of the relevant period
- review the insulin dose affecting the previous time period first

**Otherwise if :**

- glucose levels are above target, and hypoglycaemia is not an issue
- increase insulin dose by 10 %; arrange to monitor and review result

**Otherwise if :**

- hypoglycaemia is an issue or glucose levels <4.0 mmol/l ( <70 mg/dl )
- decrease insulin dose by 10 %; arrange to monitor and review result

**Otherwise :**

- no simple adjustment is possible; consider more complex adjustment, or accept the status quo

### **Rapid-acting insulin analogues**

**Read** the box on insulin analogues above

**Consider** the median post-prandial ( 2-4 h ) glucose level / hypoglycaemia experience ( and not the next pre-prandial / pre-injection level )

**Proceed** otherwise as for short-acting unmodified insulin ( see above )

### **Extended-acting NPH insulin at bed-time**

**Consider**

- the median glucose level at bed-time
- the median glucose level before breakfast
- any information on glucose levels during the night

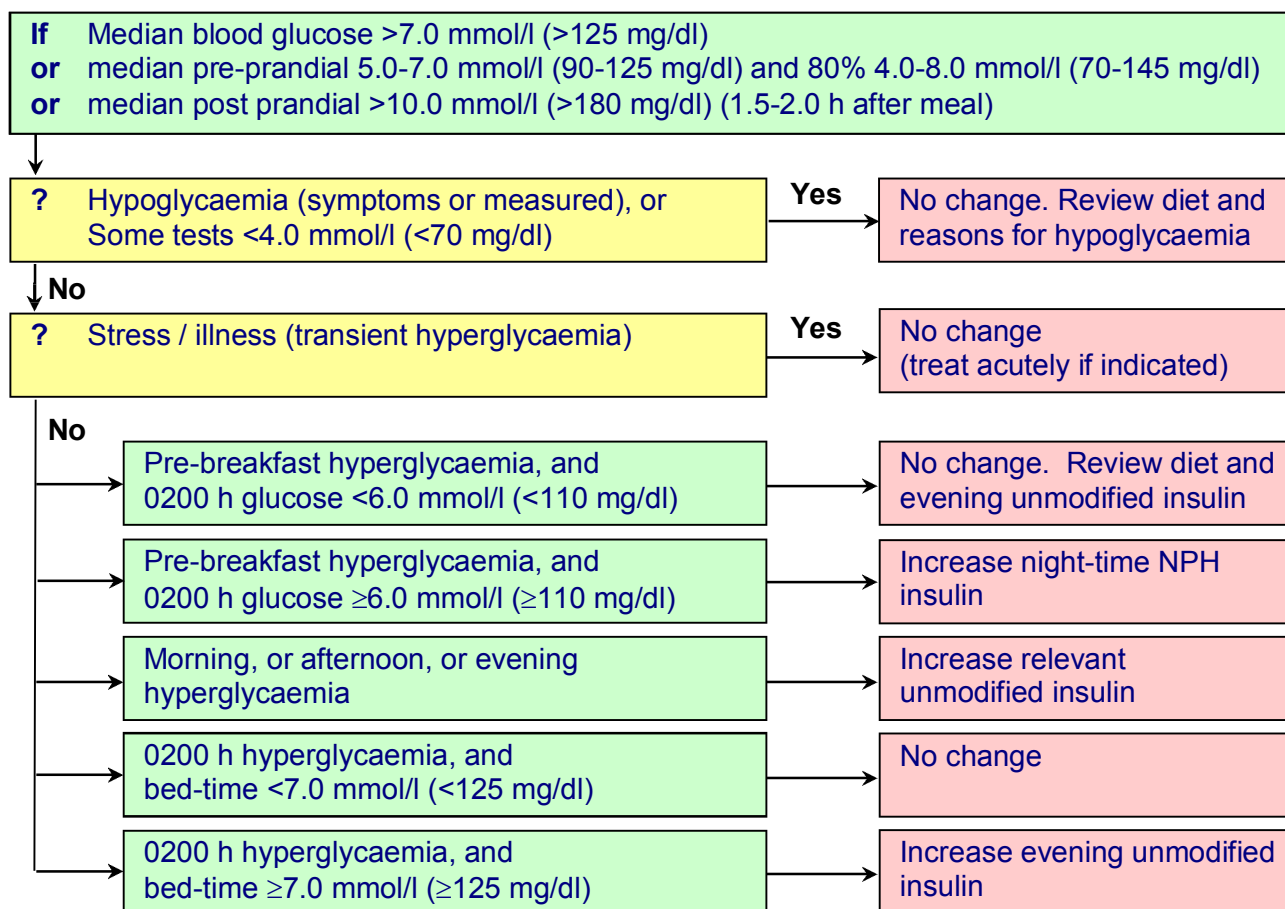
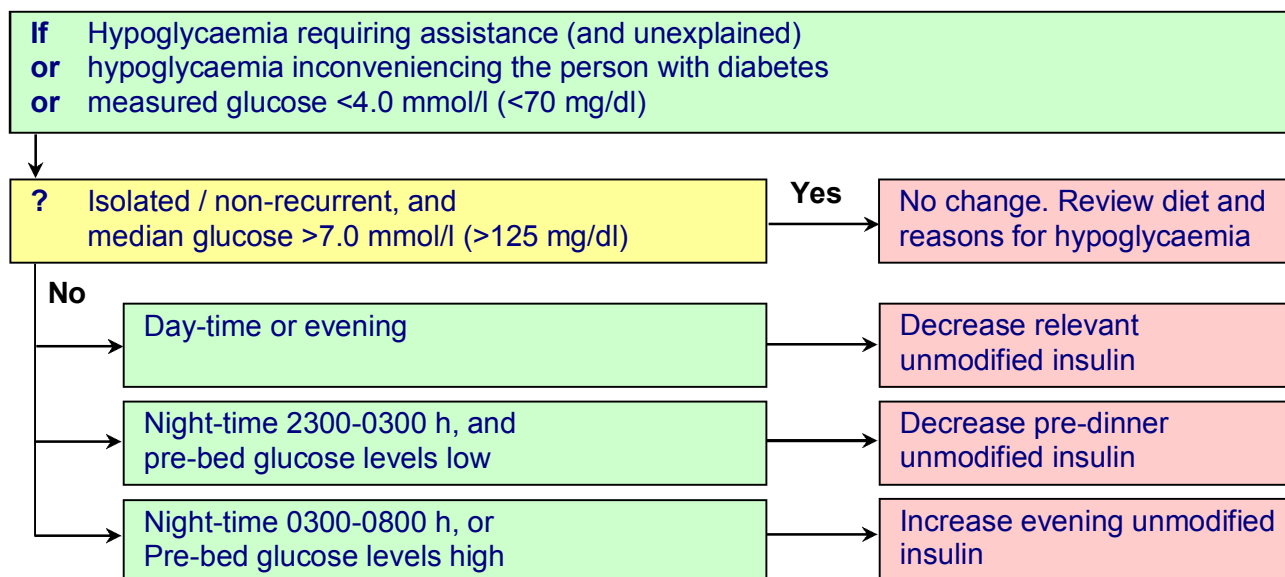
**Adjust** insulin dosage as for short-acting unmodified insulin ( see above )

### **Extended-acting NPH insulin at other times**

**Consider**

- the blood glucose profile over the 12 h after the injection
- the experience of hypoglycaemia or subnormal glucose levels ( <4.0 mmol/l; <70 mg/dl ) over the same time period
- the expected effect of other insulin used in the same time interval

**Adjust** insulin dosage as for short-acting unmodified insulin ( see above )

**Algorithm for insulin adjustment when glucose levels are above target****Algorithm for insulin adjustment when glucose levels are below target**

The insulin algorithms on this page :

- do not address the use of rapid-acting analogues
- cannot cope with more complex regimens ( when two insulins are injected together )
- should be used only in the context of the material on the previous three pages

## 13 Hypoglycaemia Problems

### **Recurrent hypoglycaemia**

at a particular time or times of day implies a mismatch of insulin therapy to meal pattern and/or physical activity :

**Review** whether a repeated change in meal or activity behaviour is occurring; if so advise on a specific insulin adjustment for that change

**Consider** change in underlying insulin sensitivity ( age / renal / endocrine )

**Refer** to the insulin dose adjustment section

### **Erratic hypoglycaemia**

needs thorough assessment of a range of possible causes :

**Consider** :

- |                                   |                                           |
|-----------------------------------|-------------------------------------------|
| £ missed / varied meals or snacks | £ rotation between injection sites        |
| £ erratic physical activity       | £ errors in insulin administration / dose |
| £ alcohol                         | £ inappropriate dose distribution         |
| £ injection site abnormalities    | £ gastroparesis                           |

### **Hypoglycaemia unawareness**

is often partially reversible; hypoglycaemia can induce hypoglycaemia unawareness :

**Consider** ( by self-testing ) the possibility of undetected night-time or other hypoglycaemia, especially if HbA<sub>1c</sub> is lower than average

☉ **Use** adjustment of insulin doses or food intake to ameliorate such problems

☉ **Avoid** any glucose excursion to <4.0 mmol/l ( <70 mg/dl )

**Provide** education and training in recognizing early cognitive dysfunction for people with the problem and their carers

**Provide** counselling on any resultant life-style problems; caution over driving

### **Nocturnal hypoglycaemia**

can be ameliorated by careful attention to insulin therapy :

**Consider** :

- ☉ reduction in evening unmodified insulin dose if large or late; this is a major contributor to 2400-0300 h hypoglycaemia
- ☉ taking the evening NPH insulin as late as possible – thus separating the effects of the evening unmodified and NPH insulin preparations
- ☉ taking a slowly absorbed carbohydrate snack as late as possible
- ☉ using a rapid-acting insulin analogue before the main evening meal

### **Hypoglycaemic coma / fitting :**

**Give** 20 % glucose IV if unconscious, or 1 mg glucagon IM. Beware of poor glucagon effect in the starved or inebriated patient. Follow with oral carbohydrate and review for possible relapse

**Train** carers to use glucagon if recurrent, unresolved problem; ensure supplies remain in date

## 14 Managing Arterial Risk Factors and Ischaemic Heart Disease

### Managing arterial risk

Manage arterial risk aggressively in people with Type 1 diabetes if any other risk factor is abnormal including family history of arterial disease

#### **Review arterial risk factors :**

- **blood lipid profile**      **blood pressure**      **albumin excretion rate**
- **smoking**                      **family history**                      **arterial / heart symptoms**
- £ at diagnosis
- £ at 18 years of age
- £ three-yearly for lipids if all risk factors consistently normal
- £ yearly
- £ more frequently if abnormal or treated

#### **Educate** people :

- about the risks of heart disease from the time of diagnosis
- about not smoking and smoking cessation programmes ( see box )
- about healthy eating ( see *Healthy eating* )

#### **Prescribe :**

- a programme of regular physical exercise
- healthy eating
- lipid lowering therapy if profile is abnormal ( see box ) and another risk factor present
- ACE inhibitors if indicated by kidney damage ( see *Kidney damage* )
- anti-hypertensives if blood pressure remains >135/85 mmHg ( but see *Kidney damage* if raised albumin excretion rate )
- low-dose aspirin for those with known arterial problems
- selective  $\beta$ -adrenergic blockers if known ischaemic heart disease
- hormone replacement therapy post-menopausally ( if agreed )

#### **Diagnose :**

- silent myocardial ischaemia in higher risk patients

#### **Manage :**

- £ smoking aggressively ( see box )
- £ ischaemic heart disease and other arterial disease otherwise as for the non-diabetic person

**Blood lipid control targets**

	Low risk	At risk	High risk
Serum total cholesterol mmol/l	<4.8	4.8-6.0	>6.0
mg/dl	<185	185-230	>230
Serum LDL cholesterol mmol/l	<3.0	3.0-4.0	>4.0
mg/dl	<115	115-155	>155
Serum HDL cholesterol mmol/l	>1.2	1.0-1.2	<1.0
mg/dl	>46	39-46	<39
Serum triglycerides mmol/l	<1.7	1.7-2.2	>2.2
mg/dl	<150	150-200	>200

**Blood pressure control targets**

Kidney status	mmHg
Normal albumin excretion rate	<135/85
Abnormal albumin excretion rate	<130/80, or lower if easily attained

**Smoking cessation and control****Identify** smoking habits :

- at diagnosis and referral
- as a routine part of Annual Review

**Emphasize** importance :

- at diagnosis and if critical events occur
- regularly on a face-to-face basis

**Provide** information on :

- health risks and benefits of stopping / reducing
- techniques for reducing tobacco consumption
- use of pharmacological substitutes

## 15 Kidney Damage

### Detection and surveillance

Detection and surveillance of kidney problems and blood pressure are a routine part of Annual Review

**Check** for proteinuria yearly using reagent strips

**Measure** urinary albumin excretion yearly ( if not proteinuric ) using :

- £ pre-breakfast albumin:creatinine ratio, or
- £ pre-breakfast urinary albumin concentration
- if ratio >2.5 mg/mmol ( >30 mg/g ) in men or >3.5 mg/mmol ( >40 mg/g ) in women or concentration >20 mg/l :
  - Repeat to confirm
  - Monitor progression of kidney damage by more frequent measurement

**Check** for infection and **consider** other renal disease if proteinuria positive

- exclude infection with leucocyte strips and mid-stream urine microscopy / culture

**Measure** serum creatinine yearly ( more often if abnormal )

**Measure** blood pressure yearly for surveillance purposes ( sitting, 1st/5th sounds, 5 min rest )

### Blood pressure management if raised albumin excretion rate

**Treat** aggressively with a target of <130/80 mmHg or lower if easily attained

- stop smoking
- reduce salt intake
- reduce protein intake with target of <0.8 g/kg
- use ACE inhibitors as first-line drug therapy
- add loop diuretics,  $\alpha$ -blockers, other agents if necessary
- avoid the combination of  $\beta$ -blockers and thiazides if dyslipidaemia

### Other management

**Maintain** good blood glucose control and tight arterial risk factor control ( see above )

**Treat** urinary infections aggressively; consider papillary necrosis if recurrent

**Arrange** early evaluation by a nephrologist ( at creatinine <200-300  $\mu$ mol/l ( <2.5-3.5 mg/dl ) )

No patient should be excluded from renal replacement programmes solely on the basis of having diabetes

## 16 Eye Damage

### Detection and surveillance

Detection and surveillance of eye problems are a routine part of Annual Review

**Organize** a recall system to ensure it occurs regularly for every individual

**Measure or assess** yearly :

- £ visual acuity ( glasses or pinhole )
- £ the lens and vitreous ( ophthalmoscopy )
- £ the retina ( dilated pupils, retinal photography or skilled ophthalmoscopy )
- £ related factors ( smoking / blood pressure )

**Reassess** after shorter interval ( 3-6 mo ) if :

- £ pregnant ( see below )
- £ new or progressive early or moderate non-proliferative retinopathy
- £ blood glucose control recently improved

### Eye disease management

**Refer** to ophthalmologist if :

- £ severe non-proliferative retinopathy
- £ proliferative retinopathy
- £ macular oedema or exudative maculopathy
- £ visual disability from cataract
- £ unexplained deterioration of visual acuity
- £ other eye disease of visual significance
- £ unrecognized eye lesions

**Review and intensify** management of :

- £ diabetic kidney disease
- £ blood pressure ( target <135/85 mmHg, or lower if kidney damage )
- £ blood glucose control
- £ blood lipid control ( if hard exudates )
- £ smoking

**Attend** to the psychological and social aspects of visual impairment where it develops

The primary management of diabetic eye disease is by careful attention to blood glucose control targets from the time of diagnosis

## 17 Foot Problems

### Detection and surveillance

Detection and surveillance of foot problems are a routine part of Annual Review

**Organize** a recall system to ensure it occurs regularly for every individual

**Examine** yearly :

- £ foot shape, deformity, and shoes
- £ foot skin condition ( fragility, cracking, oedema, callus, ulceration )
- £ foot and ankle pulses
- £ sensitivity to monofilament or vibration, and pin prick

**Assess** yearly :

- £ history of foot problems since last review
- £ visual and mobility problems preventing self-foot care
- £ self-care behaviours and knowledge of foot care

**Categorize** as :

- foot ulcer : active foot ulceration
- or high risk : neuropathy or vascular disease or previous ulcer
- or at risk : deformity or self-care problem or simple skin problem
- or low current risk

**Monitor** related factors ( blood glucose control, claudication, drug therapy, smoking )

### Foot management – preventative

#### High risk foot

**Involve** a specialist in diabetes foot care

**Provide** :

- £ regular foot assessment
- £ local preventative attention to callus
- £ relief of pressure using foam spacers, bespoke shoes, shoe inserts
- £ regular foot care education – the commandments of foot care
- £ vascular surgical referral if symptoms or critical arterial supply

#### At risk foot

**Provide** :

- £ routine foot care according to need
- £ advice on appropriate footwear
- £ foot care education at routine visits
- £ advice to carers

## Foot management – advanced disease

### ***Established foot ulceration / infection***

***Involve*** your local diabetes foot team without delay

***Use*** local measures including :

- £ debridement and trimming of callus
- £ dressings to absorb exudate
- £ foot casts to relieve pressure
- £ surgical drainage

***Use*** systemic and proximal measures including :

- £ intravenous or oral antibiotic therapy – usually staphylococcal coverage, plus wider spectrum, anaerobes, or streptococcal as specifically indicated
- £ vascular referral, investigation, and reconstruction / angioplasty if indicated

***Reserve*** amputation for :

- £ uncontrolled pain ( secondary to vascular disease )
- £ debilitating, long-term, non-healing ulceration
- £ a useless and disabling Charcot foot

Foot ulceration is usually preventable

Amputation, even if foot ulceration occurs, is nearly always preventable

## 18 Nerve Damage

- for *Foot problems* see above

### Detection and surveillance

Detection and surveillance of nerve damage are a routine part of Annual Review

**Enquire** yearly for :

- £ painful and other symptomatic neuropathy
- £ erectile impotence in men

**Enquire** for other manifestations of autonomic neuropathy if :

- £ other complications (especially kidney)
- £ before anaesthesia
- £ erratic blood glucose control

### Management of painful neuropathy

**Counsel** for the depressing and disabling nature of the condition

**Consider** initially :

- bed foot cradles for night-time problems
- simple analgesia taken in advance of diurnal symptoms
- contact dressings

**Consider** therapeutic trials of :

- tricyclic drugs ( amitriptyline )
- carbamazepine at high doses ( 600-1200 mg/day )
- phenytoin
- capsaicin cream

### Management of autonomic neuropathy

#### **Erectile impotence**

- sildenafil may be helpful if not contraindicated
- intracavernosal alprostadil can be useful in some men
- referral to professionals with specialist expertise can be useful for :
  - advice on mechanical or surgical prostheses
  - vascular investigation and reconstruction
  - psychological assistance

#### **Gastroparesis**

- investigation using radiological or radioisotope methods may help in diagnosis
- investigation of cardiovascular autonomic neuropathy may help diagnosis
- cisapride, metoclopramide, and domperidone are worth a trial

#### **Diabetic nocturnal diarrhoea**

- investigation must exclude other causes of intestinal upset
- codeine, loperamide, or diphenoxylate in high doses may help

#### **Gustatory sweating**

- explanation and counselling are often required
- try topical or oral anticholinergic agents

## 19 Pregnancy and Contraception in Women with Diabetes

Avoid destroying the normal experience of pregnancy through  
overzealous application of medical technology  
But good blood glucose control from before conception is critically important

### Contraception

#### **Enquire :**

- £ as to need for contraceptive advice if pregnancy not intended

#### **Advise :**

- £ on barrier methods, or low-dose oral contraceptives if low arterial risk ( see above )
- £ not to discontinue contraception until adequate metabolic control achieved

### Pre-pregnancy management

#### **Enquire** as part of Annual Review as to pregnancy intentions :

- ⊖ emphasize repeatedly the need for pregnancy planning
- ⊖ educate about diabetic pregnancy, including risks to fetus

**Start** folic acid 400 µg daily

**Stop** statins

#### **Optimize** blood glucose control :

- £ targets: pre-prandial 3.5-5.5 mmol/l ( 65-100 mg/dl )  
post-prandial 5.0-8.0 mmol/l ( 90-145 mg/dl )
- £ recommend highly purified human / pork insulin preparations

#### **Assess and normalize** blood pressure :

- ⊖ replace ACE inhibitors with methyldopa / nifedipine / labetolol

**Assess** retina and **treat** as indicated

**Review** education and **repeat** as needed

**Urge** to stop smoking

## Pregnancy care

**Organize** joint obstetric care in a designated centre

- € include a diabetologist, a diabetes teaching nurse, a dietician, an obstetrician, a midwife, and a neonatologist

**Provide** support for continuing good blood glucose control :

- frequent review ( every 1-2 weeks )
- appropriate educational support
- regular self-monitoring of blood glucose with reliable system
- target blood glucose as close to normal as possible, while avoiding hypoglycaemia
  - fasting blood glucose : 3.5-5.5 mmol/l ( 65-100 mg/dl )
  - post-prandial blood glucose : 5.0-8.0 mmol/l ( 90-145 mg/dl )
  - glycated haemoglobin close to the upper limit of normal
- multiple insulin injection regimen with highly purified human / pork insulin
- food intake
  - adequate to maintain maternal and fetal nutrition
  - frequent small meals may facilitate improved blood glucose control

**Examine** eyes each trimester

**Provide** regular obstetric care :

- ultrasound examination early and repeated for dates and fetal malformation
- fetal monitoring in later stages
- frequent antenatal review

**Provide** a normal safe delivery :

- deliver at term unless obstetric or diabetes risk
- deliver vaginally unless obstetric or diabetes risk
- provide optimal neonatal care :
  - access to specialized neonatal intensive care
  - neonatologists warned of expected delivery
- good blood glucose control during / after labour
- IV infusion of glucose and insulin with frequent blood glucose measurement
- rapid return to pre-pregnancy insulin requirements at delivery

**Provide** easily accessible advice for post-pregnancy blood glucose control

**Caution** about hypoglycaemia risk if breast feeding; may need further insulin dose reduction

## 20 Management of Diabetes during Surgery

### Organization

- Prepare** a local care protocol
- Disseminate** the protocol to relevant professionals

### Management

- Optimize** blood glucose control pre-operatively ( see *Assessing metabolic control* above )
- Delay** major surgery if possible when HbA<sub>1c</sub> >9.0 % or
  - £ fasting glucose >10.0 mmol/l ( >180 mg/dl ), or
  - £ post-prandial >13.0 mmol/l ( >230 mg/dl )
- Screen** for complications which may affect surgery risk; alert the surgical team :
  - £ heart or kidney problems
  - £ autonomic or peripheral nerve damage
  - £ proliferative retinopathy
- Manage** blood glucose / insulin :
  - use IV glucose-insulin-potassium infusion ( GIK )
  - start at 0800 h and continue until eating normally
  - monitor blood glucose before, during, and after ( 1-4 hourly ) surgery
    - use a quality-assured method
  - aim for blood glucose levels of 6.0-10.0 mmol/l ( 110-180 mg/dl )
  - treat hypoglycaemia with glucose and restart GIK at lower insulin dose
  - never stop intravenous insulin infusions
  - return to normal timing of insulin injections as soon as practicable
- Encourage** supervised self-management while in hospital

#### Surgical glucose-insulin-potassium (GIK) regimens

- Use 500 ml 10 % ( 100 g/l ) glucose ( dextrose ) containing :
  - unmodified ( soluble, regular ) human insulin 16 U
  - potassium chloride 10 mmol
 Infuse at 80 ml/h from a volumetric pump
- Consider higher dose ( 20 U ) if obese, or initial blood glucose high
- Consider lower dose ( 12 U ) if very thin, or usual insulin dose low
- Adjust dose by -4 U if glucose falling and normal or low
- Adjust dose by +4 U if glucose rising or high
- Continue the GIK infusion until 30-60 min after first meal
- Use higher strength glucose solutions if water volume a problem
- Check for dilutional hyponatraemia daily

## 21 Management of Diabetic Ketoacidosis

### Organizational

**Prepare** a local care protocol

**Disseminate** the protocol to relevant professionals

### Management

#### **Fluid replacement :**

- give 2 litres of isotonic saline ( 0.15 mol/l ) over the first 4 h
- give 2 litres over the next 8 h, then 1 litre every 8 h
- consider colloid if systolic blood pressure <100 mmHg after 2 h
- use hypotonic saline only very cautiously ( plasma  $\text{Na}^+$  >155 mmol/l, 1 litre over 8 h )
- monitor central venous pressure if cardiac disease
- be more cautious in the elderly

#### **Insulin :**

- infuse initially at 6 U/h ( alternatively 20 U IM followed by 6-10 U each hour )
- check pump and infusion lines and double dose if no response in 2 h

#### **Potassium :**

- give 20 mmol/h from the time of initiation of insulin infusion
- discontinue temporarily if laboratory  $\text{K}^+$  >6.0 mmol/l
- check every 2.0 h as a routine
- if potassium falls to <4.0 mmol/l, increase accordingly
- continuously monitor ECG

#### **Bicarbonate :**

- only use if pH is 6.9 or less
- if indicated, give 100 mmol with 20 mmol  $\text{K}^+$  over 30 min
- repeat blood gases and plasma  $\text{K}^+$  30 min later

#### **Infection :**

- arrange urinalysis, chest X-ray, blood cultures
- do not rely on temperature and leucocytosis
- use antibiotics even if uncertain

#### **General care**

- when glucose <13.0 mmol/l (<230 mg/dl ) :
  - start glucose-insulin-potassium regimen :
    - 500 ml 10 % glucose ( dextrose ) + 24 U insulin + 20 mmol  $\text{K}^+$ , at 80 ml/h
    - aim for blood glucose 10.0-13.0 mmol/l ( 180-230 mg/dl ) by change of insulin dose
    - start SC insulin therapy when able to eat
- insert a nasogastric tube if the patient is comatose
- insert a urinary catheter if no urine passed within 3 h
- heparinize if coma, hyperosmolar, other risk factors

**Review** cause to reduce risk of recurrence

## European Diabetes Policy Group 1998

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### Statement of Duality of Interest

A number of members of the Policy Group, personally or through their employers, hold research contracts with, or provide consultation to, governmental and commercial organizations ( including the sponsors ) with an interest in areas covered by these Guidelines.

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