Guidelines for Diabetes Care

A Desktop Guide to Type 2 Diabetes Mellitus

European Diabetes Policy Group
1998-1999

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International Diabetes Federation
European Region

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Published in : ***Diabetic Medicine*** **1999; volume 16 (September)**

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Acknowledgements

The production of these Guidelines was made possible by the financial support of a consortium of industry partners of the St Vincent Declaration Initiative and IDF (Europe). The members of this consortium are :

AstraZeneca
Bayer Corporation, Diagnostics
Eli Lilly and Company
Glaxo Wellcome
Novo Nordisk
Roche Diagnostics
Servier Laboratories.

Additionally the European Diabetes Policy Group would like to thank Elizabeth Dempsey Becker of Novo Nordisk and Joachim Thiery of Roche Diagnostics for their organizational assistance and advice, and their companies for continuing their support of the original guidelines.

The Group is grateful to Hazel Glass for administrative support.

Editing of style, content and language is by Elizabeth Home.

ISBN 0 7017 0085 8

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16 ave Emile de Mot
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Belgium

Printed in Germany by Walter Wirtz Druck & Verlag, August 1999

A Desktop Guide to Type 2 Diabetes Mellitus

Preface

A desktop guide

In 1989 the European NIDDM Policy Group published its first Desktop Guide for the management of Non-insulin-dependent (Type 2) Diabetes, and in 1993 that document was revised on behalf of the St Vincent Declaration Initiative.

The current Desktop Guide builds on those guidelines, in the light of newer understandings, and attempts to provide a more direct and more accessible format. Our aim here is to provide Guidelines which can offer easy access to high quality and better integrated care, while reducing health inequalities.

The greater emphasis on arterial risk factor management, rather than just good blood glucose control, is given particular prominence.

Furthermore, this time language that can be followed by the educated person with diabetes has been used, remembering that “the primary resource for diabetes care is the person with diabetes themselves, supported by enthusiastic and well-trained professionals”.

Evidence

In an attempt to maintain clarity, accessibility and usefulness, the current Desktop Guide remains didactic in its approach. However, a source document to be published later will go further than the previous guidelines in referencing the evidence and strength of the recommendations given here.

Aims of diabetes care

The aim of these Guidelines is to enable people with diabetes to have a life of normal length and fulfilment through :

- provision of skills to adapt life-style to ensure optimum health;
- development of understanding to allow coping with new challenges, and to give maximum flexibility;
- control of risk factors for arterial disease, and for eye, kidney and nerve damage;
- early detection and management of any existing vascular damage.

A way forward

The 1998-1999 European Diabetes Policy Group has worked on both the major types of diabetes – the sister publication on Type 1 diabetes appeared last year. The working group came from richer and poorer nations throughout Europe, and included people with diabetes, as well as members of multi-disciplinary teams.

European Diabetes Policy Group, 1999

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1 Diagnosis of Hyperglycaemic States

Management classification – hyperglycaemic states

Diagnostic background

The purpose of diagnosis is to identify those at risk of developing the complications of diabetes, both arterial (macrovascular) and microvascular, as well as to deal with any symptoms

The levels of blood glucose vary for these different risks, and determine management

1. Symptomatic (biochemically confirmed) ⇨ "Diabetes"
2. At risk of arterial and microvascular damage ⇨ "Diabetes"
3. At risk of arterial damage from hyperglycaemia and of progression to diabetes ⇨ "Impaired Glucose Tolerance (IGT)" "Impaired Fasting Glycaemia (IFG)"

Diagnostic algorithm

1. **Symptomatic *or* glycosuria *or* incidental hyperglycaemia**
   - ⇨ Check random venous plasma glucose (see below for capillary / venous equivalents)
     - *If* >11.0 mmol/l (≥200 mg/dl) ⇨ "Diabetes"
     - *If* >5.5 mmol/l (≥100 mg/dl) *then* proceed to next step (2.) (and review cause of symptoms)
2. **Random *or* fasting screening glucose >5.5 mmol/l (≥100 mg/dl)**
   - ⇨ Check fasting venous plasma glucose
     - *If* ≥7.0 mmol/l (>125 mg/dl), repeat and if confirmed ⇨ "Diabetes"
     - *If* >6.0 mmol/l (≥110 mg/dl) do oral glucose tolerance test (OGTT)
     - *If* >5.0 mmol/l (>90 mg/dl), consider yearly reassessment of arterial risk factors, including plasma glucose

     OGTT (venous plasma glucose) :
     - *If* 2-h >11.0 mmol/l (≥200 mg/dl) ⇨ "Diabetes"
     - *If* 2-h ≤11.0 mmol/l (<200 mg/dl) and ≥7.8 mmol/l (≥140 mg/dl) ⇨ "IGT"
     - *If* fasting >6.0 mmol/l (≥110 mg/dl) and 2-h <7.8 mmol/l (<140 mg/dl) ⇨ "IFG"

Diagnostic equivalents for plasma and blood

	Plasma glucose*		**Whole blood glucose**	
	*Venous**	*Capillary*	*Venous*	*Capillary*
	mmol/l mg/dl	*mmol/l mg/dl*	*mmol/l mg/dl*	*mmol/l mg/dl*
Fasting				
"*Diabetes*"	≥ 7.0 >125	≥ 7.0 >125	> 6.0 ≥110	> 6.0 ≥110
"IFG"	> 6.0 ≥110	> 6.0 ≥110	> 5.5 ≥100	> 5.5 ≥100
OGTT 2-h				
"*Diabetes*"	>11.0 ≥200	≥12.2 ≥220	≥10.0 ≥180	>11.0 ≥200
"IGT"	≥ 7.8 ≥140	≥ 8.9 ≥160	≥ 6.7 ≥120	≥ 7.8 ≥140

** preferred measure*

OGTT: 75 g glucose in 300 ml water over 3-5 min

See cautions on next page

Diagnostic aids and cautions

1. **Fasting glucose estimations** require a certainty of no previous calorie intake
   - be suspicious if HbA_{1c} not consistently elevated
   - if suspicious repeat after 2-h supervision, or consider OGTT
   - diagnosis cannot be based on a single abnormal glucose estimation in the absence of symptoms
2. Venous plasma glucose estimation is preferred
   - for convenience, equivalents for **whole blood and capillary glucose estimations** are given on previous page
3. **HbA_{1c}** (glycated haemoglobin) can be useful in clinical diagnosis
   - provided that confirmatory venous plasma glucose estimations are obtained
   - provided the assay is DCCT standardized, an HPLC chromatogram is reviewed for presence of abnormal haemoglobins, and erythrocyte turnover is not abnormal
   - approximately, HbA_{1c} >7.5 % ≈ fasting plasma glucose ≥7.0 mmol/l (>125 mg/dl)
     >6.5 % ≈ fasting plasma glucose >6.0 mmol/l (≥110 mg/dl)
4. Diagnostic procedures should not be performed :
   - in the presence of **acute illness or after trauma or surgery**
   - during short courses of **blood glucose raising drugs**
5. Diagnostic tests should be interpreted with reservation :
   - in people on long-term **blood glucose raising drugs**
   - in people with reversible **endocrine conditions**
   - in **pregnant women** (*see section 20*)
6. If suspicion or high risk of diabetes, but fasting glucose normal, do OGTT, particularly in the elderly
7. The above procedures are not applicable to people with **hepatic cirrhosis** or other extreme forms of peripheral insulin resistance
   - in people with normal fasting but elevated post-prandial glucose levels, diagnose according to 2-h OGTT criteria

2 Framework of Diabetes Care

A framework for quality diabetes care

Ensure provision of the following :

- **A diabetes team** (professionals) with up-to-date skills, including :
  - doctors
  - diabetes nurse specialists/assistants and educators
  - nutritionists (dieticians)
  - podiatrists (chiropodists)
- **A solid infrastructure**
  - easy access for people with diabetes
  - protocols for diabetes care
  - facilities for education and foot care
  - information for people with diabetes
  - structured records
  - recall system for Annual Review / eye surveillance
  - access to quality-assured laboratory facilities
  - database / software for quality monitoring and development
  - continuing education for professional staff
- **A range of services**
  - for regular review (often 3-monthly)
  - for Annual Review
  - for education
  - for foot care
  - for eye surveillance
  - emergency advice line
  - access to heart, renal, eye, vascular specialists
  - joint obstetric service
- **A system of quality development**
  - feedback from people with diabetes on service performance
  - regular review of service performance (*see section 5*)

3 The Diabetes Consultation

Consultation infrastructure

Make available for consultations the following :

- diabetes team members
- time and space
- printed information for the individual with diabetes
- records and means of communication to other health professionals

Consultation process

Include the following :

⇨ **Welcome**

Friendly greeting and early establishment of rapport

⇨ **Problems review**

Identification of :
- recent life-events / new symptoms
- new difficulties in self-management of diabetes

Review of :
- self-monitored results; discussion of their meaning
- dietary behaviours, physical activity, smoking
- diabetes education, skills, and foot care
- blood glucose, lipid and blood pressure therapy and results
- other medical conditions and therapy affecting diabetes

Management of :
- arterial / foot risk factors identified at Annual Review
- complications and other problems identified at Annual Review

⇨ **Analysis and planning**

Agreement on :
- main points covered
- targets for coming months
- changes in therapy
- interval to next consultation

⇨ **Recording**

Completion of :
- structured record / patient-held record

Annual Review

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

Symptoms	ischaemic heart disease, peripheral vascular disease neuropathy, erectile dysfunction (*see section 19*)
Feet	footwear, deformity / joint rigidity, poor skin condition, ischaemia, ulceration, absent pulses, sensory impairment (*see section 18*)
Eyes	visual acuity and retinal review (*see section 17*)
Kidney damage	albumin excretion and serum creatinine (*see section 16*)
Arterial risk	blood glucose, blood pressure, blood lipids, and smoking (*see section 8*)
Attendance	podiatry / ophthalmology / other, as indicated

4 Organization of Clinical Monitoring

Schedule for clinical monitoring at different types of visit

Review topics	*Initial review / referral*	*Regular review*	*Annual Review*
Background history			
Social history / life-style review			
Long-term / recent diabetes history			
Complications history / symptoms			
Other medical history / systems			
Family history diabetes / arterial disease			
Drug history / current drugs			
Current skills / well-being			
Diabetes self-management			
Self-monitoring skills / results			
Vascular risk factors			
HbA_{1c} (glycated haemoglobin)			
Lipid profile		If problem	
Blood pressure		If problem	
Smoking		If problem	
*Urine albumin excretion		If problem	
Examination / complications			
General examination			
Weight / body mass index			
Foot examination		If problem	
Eye / vision examination		If problem	
Urine protein			
Serum creatinine		If problem	

** not required if proteinuria*

5 Monitoring Quality of Care

Protocol for quality development and monitoring of performance

Aggregate	the data gathered at Annual Review onto a 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 performance of education programmes
↓	
Act	to design and implement action plans for improvement

Examples of indicators for quality development and monitoring

Measure :	***Calculate*** :
Intermediate outcomes	
HbA_{1c}	Percent with HbA_{1c} >7.5 and >6.5 %
Albumin excretion	Percent with 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 with blood pressure ≥140/85 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

6 Patient Education

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

Patient education – *Taking responsibility*

Assess whether the person with diabetes :

- has the knowledge and behavioural skills 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

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

Consider :

- need for assisted self-care for those with cognitive or physical impairment

Patient education – *Assessment*

Use :

- review of diabetes skills (self-monitoring, food identification)
- biomedical measures (changes in body weight, glycated haemoglobin)
- evidence of appropriate behaviours
  (footwear, physical activity, smoking cessation, 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 arterial disease)
- knowledge (as a basic measure)
- diabetes-specific well-being and health profile assessments (as global measures)

Perform assessment :

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

Patient education – *Goals*

Aim to optimize :

- knowledge of diabetes, its progressive nature, and the aims of its management
- ability to define personal health-care targets
- motivation and attitudes to self-care
- behaviours which interact with diabetes management
- empowerment in using the skills of health-care and other professionals

Aim to provide skills to :

- manage nutrition and physical activity
- understand and agree health-care targets, and develop strategies for meeting them
- manage complications of therapy including hypoglycaemia
- use the professional members of the diabetes care team effectively
- respond to new problems in diabetes care
- monitor and use the results of therapy
- avoid self-destructive behaviours and deal adequately with stress
- ensure appropriate use of glucose-lowering therapies
- empower self-management during intercurrent illness
- cope appropriately with the late tissue damage of diabetes

Patient education – *Provision*

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

Ensure that the diabetes team has personnel adequately trained in patient education

Assess special needs of each individual (see above)

Be aware of needs of special groups (language problems, physical / mental disabilities)

Provide education within three time frames :

- At and shortly after diagnosis :
  - basic information on healthy eating, physical exercise, and smoking cessation
  - supportive information on the nature and outcomes of diabetes
  - the minimum skills to obtain control over the new situation
- In the months following diagnosis :
  - a comprehensive coverage
  - topics covered previously, plus
    - targets of therapy, eating at home and away
    - complications of diabetes, arterial risk factors, foot care
    - employment, insurance, driving and travel
- In the long term :
  - reinforcement periodically after annual evaluation (see previous page)

Include carers and family members as appropriate

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

Review, evaluate, and improve the impact of your education programmes regularly

Patient education – *Life-style issues*

Assessment

Ask regularly about diabetes interfering with :

- employment
- social and leisure activities
- travel

Topics

Employment

Provide :

- individualized advice
- counselling and contacts for those affected by a change to insulin therapy

Insurance and driving licences

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

Provide :

- advice to patients wishing to enter into insurance contracts
- rapid and appropriate reports on request
- informed comment and advice on legal restrictions on licences

Travelling

Provide advice :

- on the need for valid travel insurance
- on special health risks in visited countries
- as appropriate for those using insulin (see *Desktop Guide to Type 1 Diabetes, 1998)*

Review coping skills for acute illness, especially gastroenteritis, and hypoglycaemia

The aims of patient 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 to empower them to make informed choices in their lives

7 Self-monitoring of Blood Glucose Control

Use and assessment of self-monitoring

Advise use of self-monitoring for :

- education on effects of diet and physical activity on blood glucose
- assurance of satisfactory blood glucose control
- coping with illness and new situations
- insulin dose adjustment and hypoglycaemia management where relevant

Assess skills (and meters if used) yearly or if problems with self-monitoring

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

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

Achieving effective self-monitoring

Use :

- for all people with Type 2 diabetes
- blood reagent strips / meters, or self-urinalysis according to individual need

Provide appropriate training and regular review of technique

Recommend :

- results are recorded (with date and time)
- different patterns of testing according to need :
  - urine glucose post-prandially 1-7 times a week if results consistently negative and glucose control targets met (*see section 8*)
  - blood glucose 1-4 times a day according to need if glucose control is deteriorating or if using insulin therapy (see *Desktop Guide to Type 1 Diabetes, 1998*)
  - blood glucose 4-8 times a day during illness, life-style changes, in pregnancy
- tests 1-2 h after meals and not just pre-prandially
- testing to cope with variations in eating or activity
- urine glucose testing if blood glucose monitoring is indicated but not possible, or if the patient does not wish to continue with it

8 Assessing Blood Glucose, Blood Lipid, and Blood Pressure Control

Using assessment levels to set targets

Use the assessment levels (next page) for glucose, lipids, and blood pressure :

- as an integral part of diabetes care – do not manage diabetes on symptoms alone
- 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 yourself the following at consultations :

- ⇨ Is it possible for the individual to approach each target more closely, without a counter-balancing deterioration in quality of life?

Be concerned about targets :

- ⇨ Failure to attempt to reach agreed targets is inadequate care, unless this would lead to deterioration in quality of life

Assessment of blood glucose, blood lipid, and blood pressure control

Measure :

⇨ glycated haemoglobin 2-6 monthly

⇨ the blood lipid profile (total, LDL, and HDL cholesterol, and triglycerides) 2-6 monthly if previously above assessment levels (see next page), otherwise annually

⇨ blood pressure at each consultation unless known to be below assessment levels

Use the assessment levels (next page) to set individual blood glucose, blood lipid and blood pressure targets, depending on overall risk and what it may be possible to achieve within a foreseeable time period

Modify individual targets at least yearly in the light of past success, and if any change in clinical circumstances

Smoking target : Stop, or reduce to as low as possible

Identify smoking habits :

- at diagnosis / referral and Annual Review

Emphasize importance :

- at diagnosis and if critical events occur
- at every appropriate opportunity

Provide information on :

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

Blood glucose control assessment levels

	Low risk	Arterial risk	Microvascular risk
HbA_{1c} (DCCT standardized) %Hb	≤6.5	>6.5	>7.5
Venous plasma glucose			
Fasting/pre-prandial			
mmol/l	≤6.0	>6.0	≥7.0
mg/dl	<110	≥110	>125
Self-monitored blood glucose			
Fasting/pre-prandial			
mmol/l	≤5.5	>5.5	>6.0
mg/dl	<100	≥100	≥110
Post-prandial (peak)			
mmol/l	<7.5	≥7.5	>9.0
mg/dl	<135	≥135	>160

Fasting capillary blood glucose is around 1.0 mmol/l (18 mg/dl) lower than venous plasma; post-prandial capillary blood glucose is the same as venous plasma

Blood lipid control assessment levels

	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 assessment level

Low risk (mmHg)	<140/85

9 Providing Nutritional Advice

Reviewing dietary management

Review dietary management regularly :

- ⇨ Is healthy eating (see box) a normal part of life-style?
- ⇨ Is calorie intake appropriate to desired body weight?
- ⇨ 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?
- ⇨ Is money being spent unnecessarily on special 'diabetes' food products?
- ⇨ Does calorie distribution reflect the patient's life-style and preferences, as well as glucose lowering therapy and regional eating habits?
- ⇨ Do raised blood pressure or kidney damage suggest a benefit from special recommendations (protein intake <0.8 g/kg, salt intake <6 g/day, respectively)?

Make recommendations and review eating :

- ➢ at diagnosis
- ➢ at each consultation if overweight or vascular risk factor control sub-optimal
- ➢ formally every other year as a routine, or more often as required
- ➢ on beginning insulin therapy
- ➢ on request

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

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 :

- ➢ Saturated fat : <10 % of calories
- ➢ Polyunsaturated fat : <10 % of calories
- ➢ Carbohydrate : use foods containing soluble fibre in a carbohydrate rich diet
- ➢ Simple sugars : need not be rigorously excluded from the diet, but should be limited
- ➢ Protein : <15 % of calories
- ➢ Monounsaturated fat : use to maintain palatability and balance calorie intake
- ➢ Total calories : as required for normal body mass index
- ➢ Fresh fruit / vegetables : encouraged as part of meal-time calorie intake
- ➢ Alcohol : if desired, as part of total daily calorie intake

Individualize intake to match needs, preferences and culture

10 Physical Exercise

Assessment of physical activity

Review :

- activity at work, and in getting to and from the workplace
- physical activity practice and opportunities in domestic activities and hobbies
- the possibility of formal physical exercise on a regular basis

  Examples :
  - ⇨ brisk walking 30 min per day
  - ⇨ active swimming for 1 h three times a week

Management

Advise that physical exercise :

- can benefit insulin sensitivity, blood pressure, 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 :

- ⇨ formal recording of levels of physical activity
- ⇨ identification of new exercise opportunities (see box above), and encouragement to develop these
- ⇨ appropriate self-monitoring, additional carbohydrate, and dose adjustment of glucose lowering therapy for those using insulin or insulin secretagogues
- ⇨ warnings :
  - about delayed hypoglycaemia, especially with more prolonged, severe, or unusual exercise for those using insulin therapy
  - that alcohol may exacerbate the risk of hypoglycaemia after exercise
  - about risks of foot damage from exercise
  - need to consider ischaemic heart disease in those beginning new exercise programmes

Dietary management, physical activity, and drug therapies are partners in the battle to achieve and maintain low risk blood glucose, blood lipid and blood pressure levels

11 Therapy for High Blood Glucose Concentrations

Life-style management of raised blood glucose levels should be given a good trial before beginning glucose lowering drugs

⇨ Patient education : *see section 6, page 11*
⇨ Self-monitoring : *see section 7, page 14*
⇨ Blood glucose targets : *see section 8, page 16*
⇨ Dietary management : *see section 9, page 17*
⇨ Physical exercise : *see section 10, page 18*

Using oral glucose-lowering drugs (*for **insulin therapy** see next page*)

Begin oral agent therapy when :

- an adequate trial of life-style intervention / education has been given
- *either* (usually) :
  HbA_{1c} >6.5 %, fasting venous plasma glucose >6.0 mmol/l (≥110 mg/dl)
- *or* (occasionally) if thin and no other arterial risk factor :
  HbA_{1c} >7.5 %, fasting venous plasma glucose ≥7.0 mmol/l (>125 mg/dl)

Use :

- metformin
- insulin secretagogues (sulphonylureas and repaglinide)
- α-glucosidase inhibitors
- thiazolidinediones and related PPARγ-agonists

Choice of agents

Metformin : strong evidence base in the overweight, lowers LDL cholesterol, but gastro-intestinal side effects in some patients; dose titration may help tolerance

- *contraindicated (risk of lactic acidosis)* if renal impairment, overt liver disease, or severe cardiac failure; monitor renal function at least yearly

Sulphonylureas : good evidence base, provided patient has useful islet B-cell function

- *hypoglycaemia a significant problem* glibenclamide > glipizide ≡ chlorpropamide > gliclazide > tolbutamide (some other agents lack data); avoid glibenclamide / chlorpropamide particularly if renal impairment or in the thin insulin-sensitive patient (especially if elderly)

Repaglinide : new rapid-acting insulin secretagogue; possible advantage in hypoglycaemia avoidance and control of post-prandial glucose excursions

α-Glucosidase inhibitors : effective control of post-prandial hyperglycaemia, but poorly tolerated by many patients; dose titration may help tolerance

PPARγ-agonists : new agents, offering effective glucose-lowering particularly in combination with insulin and insulin secretagogues

- *contraindicated* if any history of liver disease, and require organized monitoring of liver function tests until hepatic safety assured

A number of new drugs are currently entering clinical practice; we anticipate the need to modify the above advice as the role of such drugs becomes better understood

Maintaining good blood glucose control with oral glucose-lowering drugs

Expect **:**

- ⇨ continuous deterioration of glucose control with time
- ⇨ a need to increase therapy and add new agents with time
- ⇨ insulin therapy to be needed in many patients after a variable number of years

Monitor (*see section 4, Clinical monitoring – page 9*) :

- ➢ dietary quality and quantity, physical exercise level
- ➢ HbA_{1c} (or fasting venous plasma glucose), and self-test results
- ➢ body weight
- ➢ other vascular risk factors (blood lipids, blood pressure)

Adjust therapy :

- ⇨ Increase dose of individual agent at each visit up to maximum tolerated / effective dose, if targets are not met
- ⇨ Decrease dose of individual agent, if therapy-related problems arise, or if glucose control well into the non-diabetic range

Combination therapy

- ⇨ Add another agent of therapy when maximum dose of current drugs reached
- ⇨ Use triple therapy when control targets cannot be reached on maximum tolerated doses of two agents

(*For combination therapy with* ***insulin*** *see next box*)

Insulin therapy in Type 2 diabetes

Begin when HbA_{1c} has deteriorated to >7.5 % after maximum attention to dietary control and oral glucose-lowering therapy (unless poor life-expectancy and asymptomatic)

- ⇨ Arrange dietary review when starting insulin therapy
- ⇨ Review (or start) self-monitoring of blood glucose before starting insulin
- ⇨ Continue therapy with metformin / insulin secretagogues / PPARγ-agonists

Use :

- ➢ NPH insulin at night with oral glucose-lowering drugs in people with good insulin secretory reserve
- ➢ pre-mixed insulin twice daily in the majority of people
- ➢ twice daily NPH insulin in people with high pre-breakfast blood glucose concentrations relative to their HbA_{1c}

Adjust therapy :

- ➢ frequently at first, using self-monitored results, until insulin dose is adequate to reach blood glucose targets (*see section 8*), or hypoglycaemia becomes a risk
- ⇨ Consider more intensive insulin regimens
  - in the more active patient if control remains sub-optimal
  - if control remains sub-optimal due to hypoglycaemia (but not if due to insulin insensitivity)
  - to assist achievement of more flexible life-styles

  See *Desktop Guide to Type 1 Diabetes, 1998*

12 Therapy for Abnormal Blood Lipid Concentrations

Life-style management of abnormal blood lipid profiles should be given a good trial before beginning lipid lowering drugs

- ⇨ Patient education : *see section 6, page 11*
- ⇨ Blood lipid targets : *see section 8, page 16*
- ⇨ Dietary management : *see section 9, page 17*
- ⇨ Physical exercise : *see section 10, page 18*

Using blood lipid lowering drugs

Monitor (*see section 4, Clinical monitoring – page 9*) :

- dietary quality and quantity (including alcohol)
- physical exercise level
- body weight
- blood glucose control
- lipid profile including triglycerides and LDL cholesterol

Begin :

- ⇨ Optimize blood glucose control as far as is possible
- ⇨ Establish lipid profile before beginning a trial of therapy

Use :

- a statin *if* : LDL cholesterol ≥3.0 mmol/l (≥115 mg/dl)
  (>4.0 mmol/l (>155 mg/dl) if low risk including thin elderly)
- a fibrate *if* : triglyceride >2.2 mmol/l (>200 mg/dl)
  and LDL cholesterol <3.0 mmol/l (<115 mg/dl)
- a fibrate first if triglyceride markedly elevated (>6.8 mmol/l (>600 mg/dl)); check thyroid, renal, and liver function (and apoE genotype if available); consider combination therapy with a statin if LDL cholesterol remains elevated
- combination therapy beginning with statin for high LDL cholesterol and triglyceride

Choice of agents

Statin : choice will usually be determined by relative cost-effectiveness locally

Fibrates : ciprofibrate and fenofibrate are probably more effective than bezafibrate in lowering triglycerides

Other drugs : in general not recommended, unless severe hyperlipidaemia and intolerance to statins and/or fibrates

13 Therapy for Raised Blood Pressure

Life-style management of raised blood pressure should be given a good trial before beginning anti-hypertensive drugs

- ⇨ Patient education : *see section 6, page 11*
- ⇨ Blood pressure targets : *see section 8, page 16*
- ⇨ Dietary management : *see section 9, page 17*
- ⇨ Physical exercise : *see section 10, page 18*

Using anti-hypertensive drugs

Monitor (*see section 4, Clinical monitoring – page 9*) :

- dietary quality and quantity (including alcohol), physical exercise, body weight
- sitting blood pressure (after 5 min rest, 1st and 5th phase)
  - ⇨ Use : family doctor / occupational health services to obtain monthly records
    patient-held record card to provide cumulative record of progress
    self-monitoring devices if available

Use :

- single agent therapy at rising doses until target achieved (or intolerance)
- multiple therapy if targets not reached on maximum doses of single agents
- once daily drug administration regimens

Available drug classes

ACE-inhibitors : good evidence base in diabetes, advancing renal disease, cardiac failure
- monitor renal function / K^+ (risk of renal artery stenosis with arterial disease)

β-Adrenergic blockers : good evidence base in diabetes and useful where angina or previous myocardial infarction
- avoid combination with thiazides (metabolic deterioration), and if peripheral vascular disease. Ask about tiredness and impotence

Calcium channel antagonists : some evidence base in diabetes and in advancing renal disease
- use only long-acting preparations
- fluid retention a problem with some agents (avoid if history of foot ulceration)

Thiazides : some evidence base in diabetes
- use low doses only and avoid combination with β-adrenergic blockers (metabolic deterioration). Ask about impotence

Loop diuretics : useful synergistic action with ACE-inhibitors

α-Adrenergic blockers : effective blood pressure lowering and metabolically beneficial
- use only long-acting drugs (postural hypotension)

Angiotensin II receptor blockers : no special advantages

Choice of agents – summary

Multiple therapy is often required; add loop diuretic to ACE-inhibitor, and avoid thiazides with β-adrenergic blocker; otherwise most combinations neutral

Many older and less expensive agents are as effective as newer agents

If abnormal albumin excretion, particularly if progressive, begin with ACE-inhibitor, or calcium channel antagonist if ACE-inhibitor not tolerated

If ischaemic heart disease, consider β-adrenergic blocker first

14 Managing Arterial Risk Factors

Integrated management of arterial risk

Arterial damage is the major cause of death and disability in people with Type 2 diabetes

Review arterial risk factors :

- **blood glucose**
- **blood lipids**
- **blood pressure**
- **smoking**
- **body weight / abdominal adiposity**
- **family history**
- **albumin excretion rate**
- **arterial / heart symptoms**

- at diagnosis
- yearly
- more frequently if abnormal or treated

Define risk level as :

- **Average risk** : any one arterial risk factor
- *or* **High risk** : established disease, *or* any two arterial risk factors
- *or* **Very high risk** : established disease + any arterial risk factor *or* any three arterial risk factors

Manage as follows :

- *If* **High risk** manage blood glucose, blood lipids, blood pressure to assessment levels
- *If* **Very high risk** manage blood glucose, blood lipids, blood pressure to lowest possible risk levels
- *If* **Smoking** manage problem aggressively (*see box, section 8*)

Educate people :

- about the risks of heart disease / stroke from the time of diagnosis
- about not smoking and smoking cessation programmes (*see box, section 8*)
- about healthy eating (*see box, section 9*)

Prescribe :

- a programme of regular physical exercise (*see section 10*)
- glucose, lipid, and blood pressure lowering therapy as indicated
- low-dose aspirin for those in the *High risk* or *Very high risk* categories
- selective β-adrenergic blockers if known ischaemic heart disease

Consider :

- hormone replacement therapy post-menopausally (if agreed)

Diagnose :

- silent myocardial ischaemia in higher risk patients (*see section 15*)

15 Ischaemic Heart Disease

Ischaemic heart disease develops in over three-quarters of people with Type 2 diabetes, and kills half of them.
It is often silent, often accompanied by cardiac failure, and is less amenable to surgical intervention than usual

Assessment and diagnosis

Investigate if :

- classical angina or suspicious symptoms
- unexplained breathlessness
- cardiac failure, cardiomegaly, or cardiac rhythm disorder
- arterial thrombotic event

The threshold for investigation is lower if albumin excretion rate is abnormal

Investigate by :

- standard 12-lead ECG and chest X-ray
- cardiac ultrasound scan
- exercise stress ECG
- angiography / stress echo if indicated

Management

Intensify :

- management of arterial risk factors (*see section 14*)
- education on life-style management including smoking (*see sections 6, 8-10*)

Review :

- choice of blood pressure lowering drugs (indication for β-adrenergic blockers)
- use of aspirin / other anti-thrombotic therapy (all patients)
- use of cardiac failure drugs (indication for ACE-inhibitors)

Advise :

- early coronary bypass therapy / angioplasty / stenting if indicated

Use :

- intravenous insulin to control blood glucose levels after admission for myocardial infarction

Consider :

- hormone replacement therapy in post-menopausal women (if agreed)

16 Kidney Damage

Detection and surveillance

Raised albumin excretion rate in Type 2 diabetes is often a sign of general vascular damage rather than specific renal damage. It is a useful arterial risk marker

Abnormal serum creatinine in Type 2 diabetes is often due to renal arterial disease and/or diuretic therapy for cardiac failure rather than to diabetic nephropathy

Detection and surveillance of specific kidney problems therefore depends on identifying progression of albumin excretion rate and serum creatinine, in the absence of other causes

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 any progression of kidney damage by more frequent measurement

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

⇨ exclude infection with leucocyte/nitrate strips and microscopy / culture if positive

Measure serum creatinine yearly (more often if abnormal, or if rising and metformin-treated)

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

Management if raised albumin excretion rate

If serum creatinine normal :

⇨ monitor albumin excretion rate yearly to detect progression suggestive of specific diabetic kidney damage

⇨ intensify management of modifiable arterial risk factors (glucose, lipids, blood pressure)

If serum creatinine abnormal :

⇨ review other possible causes of renal impairment (recurrent infection, renal arterial / hypertensive damage, loop diuretic therapy / cardiac failure, glomerulonephritis)

⇨ monitor albumin excretion and serum creatinine more frequently to detect progression of renal damage

If specific diabetic kidney damage (diabetic nephropathy) suspected :

⇨ treat blood pressure aggressively with a target of <130/80 mmHg

- ⇨ reduce salt intake
- ⇨ use ACE-inhibitors as first-line drug therapy
- ⇨ add loop diuretics, other agents if necessary

⇨ reduce protein intake with target of <0.8 g/kg

⇨ maintain good blood glucose control and tight arterial risk factor control (see above)

⇨ treat urinary infections aggressively; consider papillary necrosis if recurrent

⇨ arrange evaluation by a nephrologist before creatinine rises to 250 µmol/l (3.0 mg/dl)

17 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 section 20*)
- new or progressive early or moderate non-proliferative retinopathy
- blood glucose control recently improved in people with retinopathy

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 <140/85 mmHg)
- 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

18 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, joint rigidity, 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-care of feet
- self-care behaviours and knowledge of foot care (including carer if appropriate)

Categorize as :

⇨ **Foot ulcer** : active foot ulceration
or **High risk** : neuropathy *or* vascular disease *or* previous ulcer *or* Charcot foot
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, made-to-order shoes, customized insoles
- regular foot care education – the commandments of foot care
- vascular 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 infected or Charcot foot

19 Nerve Damage

✸ for *Foot problems* see previous section

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)

Management of autonomic neuropathy

Erectile impotence

- ⇨ sildenafil may be helpful if not contraindicated (beware of nitrate therapy)
- ⇨ intracavernosal / intraurethral alprostadil can be useful in some men
- ⇨ referral to professionals with specialist expertise can be useful for :
  - advice on vacuum devices, or 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 and domperidone are worth a trial

Diabetic nocturnal diarrhoea

- ⇨ investigation must exclude other causes of intestinal upset
- ⇨ may be helped by high doses of codeine, loperamide or diphenoxylate, or by erythromycin / tetracycline

Gustatory sweating

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

20 Pregnancy and Contraception in Women with Type 2 Diabetes

Women of child-bearing age with Type 2 diabetes are almost invariably overweight and have a high relative risk of arterial damage / thrombotic problems

Women who develop diabetes in pregnancy and revert to normal after delivery (gestational diabetes) are at high risk of developing Type 2 diabetes in later life

Contraception / pre-pregnancy management

Enquire :

- as to need for contraceptive advice if pregnancy not intended
- as part of Annual Review as to pregnancy intentions

Advise :

- on barrier methods, or low-dose oral contraceptives if low arterial risk (see above)
- not to discontinue contraception until adequate metabolic control achieved
- repeatedly the need for pregnancy planning
- on the intensity of diabetic pregnancy management, and the risks to the fetus

If pregnancy is intended :

- start folic acid
- stop oral glucose-lowering drugs (consider insulin therapy)
- stop statins
- optimize blood glucose control :
  - self-monitoring 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)
- assess and normalize (<130/80 mmHg) blood pressure :
  - replace ACE-inhibitors with methyldopa / nifedipine / labetalol
- assess retina and treat as indicated
- review education and repeat as needed
- urge to stop smoking

Diagnosis of diabetes in pregnancy

If venous plasma glucose >6.0 mmol/l (≥110 mg/dl) at any time :

- perform 75 g oral glucose tolerance test
- manage as diabetes :
  if fasting plasma glucose ≥7.0 mmol/l (>125 mg/dl)
  or 2-h plasma glucose ≥7.8 mmol/l (≥140 mg/dl)

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
  - self-monitored blood glucose fasting : 3.5-5.5 mmol/l (65-100 mg/dl)
    post-prandial : 5.0-7.5 mmol/l (90-135 mg/dl)
  - glycated haemoglobin close to the upper limit of normal
- food intake
  - weight controlling but adequate to maintain maternal and fetal nutrition
  - frequent small meals may facilitate improved blood glucose control
- insulin therapy if blood glucose control remains above targets

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 if necessary with frequent blood glucose measurement
- cessation of insulin therapy at delivery if started during pregnancy (and no suspicion of Type 1 diabetes)

If diabetes before pregnancy provide advice for post-pregnancy blood glucose control

If diabetes diagnosed in pregnancy :

- confirm remission at post-natal follow-up
- advise patient / family doctor of need for regular arterial risk factor review for rest of life

Evaluate quality of care

- monitor outcomes of pregnancy of women with diabetes
- compare outcomes with other diabetes services
- review any need for improvements in pregnancy care

21 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 section 8*)

Delay major surgery if possible when :

- HbA_{1c} >9.0 %, *or*
- fasting blood 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 :

- ⇨ *If* diet / oral agents *and* good blood glucose control *and* minor surgery :
  - ⇨ omit therapy on morning of surgery
  - ⇨ restart when eating normally (metformin only after renal function check)
  - ⇨ avoid glucose-containing IV infusions
- ⇨ *If* insulin therapy *or* unsatisfactory blood glucose control *or* major surgery :
  - ⇨ 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)

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
- ⇨ Decrease dose by 4 U if glucose falling and normal or low
- ⇨ Increase 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

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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.

While travel and subsistence costs of the Policy Group's consensus meeting were covered by a grant to the University of Newcastle upon Tyne by the sponsors, no member of the Group has received any fee in connection with this activity. A fee commensurate with the editorial work performed was however received by the spouse of one of the Chairmen.

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DIABETES TYPE 2 DESKTOP GUIDELINES

EUROPEAN DIABETES POLICY GROUP 1999