

Management of diabetes

Quick Reference Guide

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INTRODUCTION

Diabetes mellitus is a major cause of morbidity and mortality in Scotland and worldwide, with an increasing prevalence.

In 2009 there were around 228,000 people with diabetes in Scotland, an increase of 3.6% from the preceding year.

This increase relates, in part, to the increasing age of the population, an increase in obesity and also perhaps increased survival of those with diabetes.

This Quick Reference Guide provides a summary of the main recommendations in **SIGN guideline 116; Management of diabetes** and **SIGN guideline 154: Pharmacological management of glycaemic control in people with type 2 diabetes**. Recommendations are arranged in the following sections:

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Recommendations are graded **A B C D** to indicate the strength of the supporting evidence.

Good practice points are provided where the guideline development group wishes to highlight specific aspects of accepted clinical practice.

Details of the evidence supporting these recommendations can be found in the full guideline, available on the SIGN website: www.sign.ac.uk

DIAGNOSIS AND SCREENING

WHO criteria for diagnosis of diabetes:

The presence of diabetic symptoms (polyuria, polydipsia, and unexplained weight loss) plus

- fasting plasma glucose (FPG) ≥ 7.0 mmol/l **or**
- plasma glucose ≥ 11.1 mmol/l at two hours after a 75g oral glucose load (OGTT).

Screening recommendations

PSYCHOSOCIAL	B	<p>Regular assessment of a broad range of psychological and behavioural problems in children and adults with type 1 diabetes is recommended.</p> <ul style="list-style-type: none"> ▪ In children this should include eating disorders, behavioural, emotional and family functioning problems. ▪ In adults this should include anxiety, depression and eating disorders.
TYPE 1 DIABETES	B	<p>Screening for pre-type 1 diabetes is not recommended in either the general population or in high risk children and young people.</p>
ASSOCIATED CONDITIONS	C	<p>Patients with cystic fibrosis should be screened annually for diabetes from 10 years of age.</p>
	C	<p>Young people with diabetes should be screened for thyroid and coeliac disease at onset of diabetes and at intervals throughout their lives.</p>
GESTATIONAL DIABETES	<input checked="" type="checkbox"/>	<ul style="list-style-type: none"> ▪ At booking all women should be assessed for the presence of risk factors for gestational diabetes. ▪ All women with risk factors should have HbA1c or fasting glucose measured. ▪ All women with risk factors should have a 75 g OGTT at 24-28 weeks. ▪ A fasting plasma glucose at 24-28 weeks is recommended in low-risk women.
KIDNEY DISEASE	B	<p>ACR should be used to screen for diabetic kidney disease.</p>
	C	<p>Young people with diabetes should have ACR tested annually from the age of 12 years.</p>
VISUAL IMPAIRMENT	B	<p>Systematic screening for diabetic retinal disease should be provided for all people with diabetes.</p>
	C	<p>People with type 1 diabetes should be screened from age 12 years.</p>
	A	<p>People with type 2 diabetes should be screened from diagnosis.</p>
	B	<p>People with diabetes with no diabetic retinopathy could be screened every two years. All others should be screened at least annually.</p>
FOOT DISEASE	B	<p>All patients with diabetes should be screened to assess their risk of developing a foot ulcer.</p>

LIFESTYLE MANAGEMENT

Modification of adverse lifestyle factors is an important aspect of the management of all types of diabetes. In particular, appropriate management of cardiovascular risk factors such as smoking, physical inactivity and poor diet is important for the prevention of microvascular and macrovascular complications.

Delivery of lifestyle interventions

Different lifestyle interventions have been shown to improve self-management, metabolic and psychological outcomes. These include:

- intensive interventions which include frequent contact with health professionals, telephone contact, multiple injections and self monitoring of blood glucose
- computer-assisted programmes which provide education and trigger self-management
- psychological interventions which are varied and include behaviour modification, motivational interviewing, patient empowerment and activation.

A People with diabetes should be offered lifestyle interventions based on a valid theoretical framework.

B Computer-assisted education packages and telephone prompting should be considered as part of a multidisciplinary lifestyle intervention programme.

B Healthcare professionals should receive training in patient-centred interventions in diabetes.

Structured education

Educational interventions for diabetes are complex and varied. Any programme should:

- have an underpinning philosophy, be evidence based, suit the needs of the individual, have specific aims and learning objectives, and support the development of self-management attitudes, beliefs, knowledge and skills for the learner, their family and carers
- have a written, structured curriculum which is theory driven, evidence based and resource effective, with supporting materials
- be delivered by trained educators who have an understanding of the educational theory appropriate to the age and needs of the programme learners
- be quality assured, reviewed by trained, competent, independent assessors and assessed against key criteria to ensure sustained consistency
- have regular audit of programme outcomes.

Structured education programmes should adhere to the principles laid out by the Patient Education Working Group.

A Adults with type 1 diabetes experiencing problems with hypoglycaemia or who fail to achieve glycaemic targets should have access to structured education programmes based upon adult learning theories.

A Adults with type 2 diabetes should have access to structured education programmes based upon adult learning theories.

B Children and adolescents should have access to programmes of structured education which have a basis in enhancing problem solving skills.

Psychosocial factors

- Depression is more common in people with diabetes than in the general population.
- The presence of micro and macrovascular complications is associated with a higher prevalence of depression and lower quality of life.
- Remission of depression is often associated with an improvement in glycaemic control.
- Pharmacological (eg antidepressant therapy with a SSRI) and non-pharmacological treatments (eg cognitive behavioural therapy, psychotherapy programmes and coping skills training) have been shown to be effective in diabetic patients with depression and may also improve glycaemic control.

B **Regular assessment of a broad range of psychological and behavioural problems in children and adults with type 1 diabetes is recommended.**

- **In children this should include eating disorders, behavioural, emotional and family functioning problems.**
- **In adults this should include anxiety, depression and eating disorders.**

A **Children and adults with type 1 and type 2 diabetes should be offered psychological interventions (including motivational interviewing, goal setting skills and CBT) to improve glycaemic control in the short and medium term.**

- Healthcare professionals working with adults and children with diabetes should refer those with significant psychological problems to services or colleagues with expertise in this area.

Self monitoring of glycaemia

B **Self-monitoring of blood glucose is recommended for patients with type 1 or type 2 diabetes who are using insulin where patients have been educated in appropriate alterations in insulin dose.**

B **Routine self-monitoring of blood glucose in people with type 2 diabetes is not recommended.**

B **Routine self-monitoring of urine glucose in people with type 2 diabetes is not recommended.**

- SMBG may be considered in the following groups of people with type 2 diabetes who are not using insulin:
- those at increased risk of hypoglycaemia
 - those experiencing acute illness
 - those undergoing significant changes in pharmacotherapy or fasting, for example, during Ramadan
 - those with unstable or poor glycaemic control (HbA1c > 8.0% (64 mmol/mol))
 - those who are pregnant or planning pregnancy.

Weight management in type 2 diabetes

Type 2 diabetes is associated with obesity (defined as body mass index > 30 kg/m²). Obesity is associated with a significant negative impact on morbidity and mortality. Weight loss in obese individuals has been associated with reductions in mortality, blood pressure, lipid profiles, arthritis-related disability and other outcomes. The SIGN guideline on the management of obesity (SIGN 115) provides detailed recommendations on the prevention and treatment of obesity within the clinical setting, in children, young people and adults.

A **Offer obese adults with type 2 diabetes individualised interventions to encourage weight loss (including lifestyle, pharmacological or surgical interventions) to improve metabolic control.**

Smoking cessation

- B**
- **Advise all people who smoke to stop and offer support to help facilitate this to minimise cardiovascular and general health risks.**
 - **Offer intensive management plus pharmacological therapies to people with diabetes who wish to stop smoking.**
 - **Healthcare professionals should continue to monitor smoking status in all patient groups.**

Exercise and physical activity

- Regular physical activity is associated with a reduced risk of development of type 2 diabetes.
- A rate of perceived exertion scale is useful for estimating exercise intensity.
- Adults (aged 18–64 years) should build up to achieve a minimum of 2.5 hours each week of moderate-intensity, or 75 minutes each week of vigorous-intensity aerobic physical activity, or an equivalent combination of both. Aim for 30 minutes of aerobic activity on at least five days of the week.
- Older adults (aged 65 years and older) should follow the adult guidelines. If this is not possible due to limiting chronic conditions, they should be as physically active as their abilities allow.
- In people with type 2 diabetes physical activity or exercise should be performed every second or third day to maintain improvements in glycaemic control. In view of insulin adjustments, it may be easier for people with type 1 diabetes to perform physical activity or exercise every day.

B **All people should be advised to increase their level of physical activity to achieve current physical activity recommendations and supported to maintain this level across the lifespan.**

D **Exercise and physical activity (involving aerobic and/or resistance exercise) should be performed on a regular basis.**

D **Advice about exercise and physical activity should be individually tailored and diabetes specific and should include implications for glucose management and foot care.**

C **Individualised advice on avoiding hypoglycaemia when exercising by adjustment of carbohydrate intake, reduction of insulin dose, and choice of injection site, should be given to patients taking insulin.**

D **People with existing complications of diabetes should seek medical review before embarking on exercise programmes.**

D **A gradual introduction and initial low intensity of physical activity with slow progressions in volume and intensity should be recommended for sedentary people with diabetes.**

Healthy eating

B **People with type 2 diabetes can be given dietary choices for achieving weight loss that may also improve glycaemic control. Options include simple caloric restriction, reducing fat intake, consumption of carbohydrates with low rather than high glycaemic index, and restricting the total amount of dietary carbohydrate (a minimum of 50 g per day appears safe for up to six months).**

B **Overweight individuals and those at high risk of developing diabetes should be encouraged to reduce this risk by lifestyle changes including weight management and physical activity.**

B **Clinical interventions aimed at dietary change are more likely to be successful if a psychological approach based on a theoretical framework is included.**

Alcohol

B **People with diabetes can take alcohol in moderation as part of a healthy lifestyle but should aim to keep within the target consumption recommended for people without diabetes.**

MANAGEMENT OF DIABETES IN PREGNANCY

Type 1 diabetes is a high risk state for the woman and her fetus due to increased risks of:

complications of diabetes:	obstetric complications:	fetal and neonatal complications:
<ul style="list-style-type: none"> ▪ ketoacidosis ▪ severe hypoglycaemia ▪ progression of microvascular complications. 	<ul style="list-style-type: none"> ▪ miscarriage ▪ maternal infection ▪ pre-eclampsia ▪ premature labour. 	<ul style="list-style-type: none"> ▪ congenital malformation ▪ late intrauterine death ▪ fetal distress. ▪ hypoglycaemia.

Pre-pregnancy care

Pregnancy should be planned and good contraceptive advice and pre-pregnancy counselling are essential.

C Pre-pregnancy care should be provided by a multidisciplinary team.

Pre-pregnancy care should include:

- review of medical, obstetric and gynaecological history
- advice on glycaemic control to optimise HbA1c
- screening for complications of diabetes and counselling for maternal and fetal complications.

C Pre-pregnancy glycaemic control should be maintained as close to the non-diabetic range as possible, taking into account risk of maternal hypoglycaemia.

B All women with diabetes should be prescribed high dose pre-pregnancy folate supplementation, continuing up to 12 weeks gestation.

Statins, ACE inhibitors and angiotensin receptor blocking medications should be reviewed pre-pregnancy and their use avoided during pregnancy.

Glycaemic control

B Continuous glucose monitoring may be considered in women with type 1 or type 2 diabetes.

C Postprandial glucose monitoring should be carried out in pregnant women with gestational diabetes and may be considered in pregnant women with type 1 or type 2 diabetes.

B Rapid-acting insulin analogues (*lispro and aspart*) appear safe in pregnancy and may be considered in individual patients where hypoglycaemia is problematic.

Nutrition

D Dietetic advice should be available in all diabetic antenatal clinics.

Complications during pregnancy

Obstetric complications:
manage as for all pregnant women

Metabolic complications:
make emergency contact arrangements explicit

Microvascular complications:

C

- Examine the retina prior to conception and during each trimester.
- Early referral of women with referable retinopathy to an ophthalmologist.

Pregnant women with diabetic nephropathy should be managed according to the advice in the kidney disease section, but avoid ACE inhibitors and ARBs. Suitable antihypertensive agents, include methyl dopa, labetalol and nifedipine.

Gestational diabetes

GDM is defined as carbohydrate intolerance of variable severity with onset or first recognition during pregnancy.

Screening for GDM

RISK FACTORS

- BMI > 30 kg/m²
- previous macrosomic baby weighing 4.5 kg or more
- previous GDM
- family history of diabetes (first degree relative)
- family origin with high prevalence of diabetes (South Asian, black Caribbean, Middle Eastern).

B A suitable programme to detect and treat gestational diabetes should be offered to all women in pregnancy.

Diagnosis of GDM

The adoption of internationally agreed criteria for gestational diabetes using 75 g OGTT is recommended:

- fasting venous plasma glucose ≥ 5.1 mmol/l, or
- one hour value ≥ 10 mmol/l, or
- two hours after OGTT ≥ 8.5 mmol/l.

Management of GDM

A Pregnant women with GDM should be offered dietary advice and blood glucose monitoring and be treated with glucose lowering therapy depending on fasting and postprandial targets.

B Metformin or glibenclamide may be considered as initial pharmacological glucose lowering treatment in women with gestational diabetes.

Follow up of women with GDM

C Women who have developed GDM should be given diet, weight control and exercise advice.

C Women who have developed GDM should be reminded of the need for pre-conception counselling and appropriate testing to detect progression to type 2 diabetes.

Fetal assessment

There is evidence of an increased incidence of congenital malformation in the infants of women with pre-existing diabetes.

All women should be offered scanning to include:

an early viability scan

- a gestational scan between 11 and 13 weeks (+6 days) in association with biochemical screening and nuchal translucency measurement to risk assess for trisomies.

B a detailed anomaly scan including four chamber cardiac view and outflow tracts between 20 and 22 weeks.

C Where intrauterine growth restriction is suspected, regular monitoring including growth scans and umbilical artery Doppler should be carried out.

Delivery

Delivery in a consultant led maternity unit under the combined care of a physician with an interest in diabetes, an obstetrician and a neonatologist.

- Women should have a mutually agreed written plan for insulin management at delivery and immediately after.
- Monitor progress of labour as for other high-risk women, including continuous electronic fetal monitoring.
- IV insulin and dextrose should be administered as necessary to maintain blood glucose levels between 4 and 7 mmol/l.

Infants with mothers with diabetes

Early feeding is advised to avoid neonatal hypoglycaemia and to stimulate lactation.

B Breast feeding is recommended, but mothers should be supported in the feeding method of their choice.

MANAGEMENT OF DIABETIC CARDIOVASCULAR DISEASE

RISK FACTORS

- smoking
- dyslipidaemia
- hypertension
- hyperglycaemia

Morbidity and mortality from cardiovascular disease (CVD) are two to five times higher in people with diabetes compared to non-diabetics.

This excess mortality is evident in all age groups, most pronounced in young people with type 1 diabetes, and exacerbated by socioeconomic deprivation.

There is an increased prevalence of cardiovascular disease in South Asian individuals with diabetes.

Primary prevention

SMOKING	Follow lifestyle modification recommendations.
GLYCAEMIC CONTROL	Follow recommendations for glycaemic control in type 1 and type 2 diabetes.
BP LOWERING	A Hypertension in people with diabetes should be treated aggressively with lifestyle modification and drug therapy.
	A Target diastolic blood pressure in people with diabetes is ≤ 80 mm Hg.
	D Target systolic blood pressure in people with diabetes is < 130 mm Hg.
	A Patients with diabetes requiring antihypertensive treatment should be commenced on: <ul style="list-style-type: none"> ▪ an ACE inhibitor (<i>ARB if ACE inhibitor intolerant</i>), or ▪ a calcium channel blocker, or ▪ a thiazide diuretic.
	A Beta blockers and alpha blockers should not normally be used in the initial management of blood pressure in patients with diabetes.
	B Low-dose aspirin is not recommended for primary prevention of vascular disease in patients with diabetes.
LIPID LOWERING	A Lipid-lowering drug therapy with simvastatin 40 mg or atorvastatin 10 mg is recommended for primary prevention in patients with type 2 diabetes aged > 40 years regardless of baseline cholesterol.
	B Lipid-lowering drug therapy with simvastatin 40 mg should be considered for primary prevention in patients with type 1 diabetes aged > 40 years.

MANAGEMENT OF DIABETIC CARDIOVASCULAR DISEASE

Management of established CVD

Acute coronary syndromes

B	Intensive insulin treatment to be continued for at least 24 hours in patients with MI.
A	Treat patients with an ST elevation immediately with primary percutaneous coronary intervention.
D	When primary percutaneous coronary intervention cannot be provided within 90 minutes of diagnosis, patients with an ST elevation acute coronary syndrome should receive immediate thrombolytic therapy.
A	Long term aspirin (75 mg per day) should be given routinely.
B A	In addition to long term aspirin, clopidogrel therapy should be continued for: <ul style="list-style-type: none"> ▪ three months in patients with non-ST elevation ▪ up to four weeks in patients with ST elevation.
A	Patients with clinical MI should be maintained on long term beta blocker therapy.
A	Patients with clinical MI should be commenced on long term ACE inhibitor therapy within the first 36 hours.
A	Consider intensive lipid-lowering therapy with atorvastatin 80 mg for patients with diabetes and acute coronary syndromes, objective evidence of coronary heart disease on angiography or following coronary revascularisation procedures.
B	Consider fibrate treatment in patients who are intolerant of statins.

Heart failure

A	ACE inhibitors should be considered in patients with all NYHA functional classes of heart failure due to left ventricular systolic dysfunction.
A	All patients with heart failure due to left ventricular systolic dysfunction of all NYHA functional classes should be started on beta blocker therapy as soon as their condition is stable (unless contraindicated by a history of asthma, heart block or symptomatic hypotension).

Stable angina

A	All patients with stable angina due to atherosclerotic disease should receive long term standard aspirin and statin therapy.
A	Consider treatment with ACE inhibitors.
B	For patients with diabetes and multivessel disease, CABG with use of the internal mammary arteries is preferred over PTCA.
A	Patients undergoing angioplasty should be treated with stents where feasible, and receive adjunctive therapy with a platelet glycoprotein IIb/IIIa receptor antagonist.
A	Drug-eluting stents are recommended as opposed to bare metal stents in stable coronary heart disease or non-ST elevation myocardial infarction.

1st LINE In ADDITION to lifestyle measures		SET GLYCAEMIC TARGET: HbA1c <7% (53 mmol/mol) OR INDIVIDUALISED AS AGREED			
		USUAL APPROACH		ALTERNATIVE APPROACH: if osmotic symptoms or intolerant of metformin	
	METFORMIN*	<div style="border: 1px solid black; border-radius: 10px; padding: 5px; width: fit-content; margin: 10px auto;"> ONCE OSMOTIC SYMPTOMS RESOLVED, ADD </div>		SULPHONYLUREA*	<i>The following are also accepted by the SMC for first-line use where metformin and sulphonylureas are not tolerated:</i> <ul style="list-style-type: none"> • canagliflozin, dapagliflozin or empagliflozin (SGLT2 inhibitors); • linagliptin, sitagliptin or vildagliptin (DPP-4 inhibitors); • pioglitazone (thiazolidinedione) <div style="border: 1px solid black; border-radius: 10px; padding: 5px; width: fit-content; margin: 10px auto;"> IF SEVERE OSMOTIC SYMPTOMS WITH WEIGHT LOSS OR POSSIBILITY OF TYPE 1 DIABETES (URGENT - PHONE SECONDARY CARE IMMEDIATELY) </div>
EFFICACY	MODERATE			HIGH	
CV BENEFIT	YES			NO	
HYPOGLYCAEMIA RISK	LOW			HIGH	
WEIGHT	REDUCTION			GAIN	
MAIN ADVERSE EVENTS	GASTROINTESTINAL			HYPOGLYCAEMIA	
IN CKD STAGE 3A	MAXIMUM 2 g DAILY			CAREFUL MONITORING ¹	
2nd LINE In ADDITION to lifestyle measures		IF NOT REACHING TARGET AFTER 3–6 MONTHS ² , REVIEW ADHERENCE: THEN GUIDED BY PATIENT PROFILE			
ADD ONE OF:					
	SULPHONYLUREA* OR	SGLT2 INHIBITOR* OR	DPP-4 INHIBITOR* OR	PIOGLITAZONE*	
EFFICACY	HIGH	MODERATE	LOW/MODERATE	MODERATE	
CV BENEFIT	NO	YES (SPECIFIC AGENTS) ³	NO	PROBABLE (BUT FLUID RETENTION)	
HYPOGLYCAEMIA RISK	HIGH	LOW	LOW	LOW	
WEIGHT	GAIN	LOSS	NEUTRAL	GAIN	
MAIN ADVERSE EVENTS	HYPOGLYCAEMIA	GENITAL MYCOTIC	FEW	OEDEMA/FRACTURES ⁶	
IN CKD STAGE 3A	CAREFUL MONITORING ¹	DO NOT INITIATE ⁴	REDUCE DOSE ⁵	DOSE UNCHANGED	
3rd LINE In ADDITION to lifestyle measures		IF NOT REACHING TARGET AFTER 3–6 MONTHS, REVIEW ADHERENCE: THEN GUIDED BY PATIENT PROFILE ⁷			
ADD EITHER AN ADDITIONAL ORAL AGENT FROM A DIFFERENT CLASS					
	SULPHONYLUREA* OR	SGLT2 INHIBITOR* OR	DPP-4 INHIBITOR* OR	PIOGLITAZONE*	
OR AN INJECTABLE AGENT					
	<i>If BMI >30 kg/m²</i>		<i>If BMI <30 kg/m²</i>		
	GLP-1 AGONIST*		BASAL INSULIN*		
EFFICACY	HIGH	<ul style="list-style-type: none"> • stop DPP-4 inhibitor • consider reducing sulphonylurea • continue metformin • can continue pioglitazone • can continue SGLT2 inhibitor 	HIGH	<ul style="list-style-type: none"> • inject before bed • use NPH (isophane) insulin - or longer-acting analogues according to risk of hypoglycaemia¹⁰ • can continue metformin, pioglitazone, DPP-4 inhibitor or SGLT2 inhibitor • can reduce or stop sulphonylurea 	
CV BENEFIT	YES (SPECIFIC AGENTS) ³		NO		
HYPOGLYCAEMIA RISK	LOW		HIGHEST		
WEIGHT	LOSS		GAIN		
MAIN ADVERSE EVENTS	GASTROINTESTINAL		HYPOGLYCAEMIA		
IN CKD STAGE 3A	DOSE UNCHANGED ⁸	DOSE UNCHANGED ⁹			
4th LINE In ADDITION to lifestyle measures		IF NOT REACHING TARGET AFTER 3–6 MONTHS, REVIEW ADHERENCE: THEN GUIDED BY PATIENT PROFILE ADD ADDITIONAL AGENT(S) FROM 3rd LINE OPTIONS (<i>NEED SPECIALIST INPUT</i>)			
<div style="border: 1px solid black; border-radius: 10px; padding: 5px; width: fit-content;"> ADD PRANDIAL INSULIN OR SWITCH TO TWICE-DAILY MIXED BIPHASIC INSULIN </div>					

Algorithm summarises evidence from the guideline in the context of the clinical experience of the Guideline Development Group. It does not apply in severe renal or hepatic insufficiency.

Prescribers should refer to the British National Formulary (www.medicinescomplete.com), the Scottish Medicines Consortium (www.scottishmedicines.org.uk) and Medicines and Healthcare products Regulatory Agency (MHRA) warnings for updated guidance on licensed indications, full contraindications and monitoring requirements.

***Continue medication at each stage if EITHER individualised target achieved OR HbA1c falls more than 0.5% (5.5 mmol/mol) in 3–6 months. Discontinue if evidence that ineffective.**

NOTES: 1. Consider dose reduction, 2. Do not delay if first line options not tolerated / inappropriate, 3. See guideline pages 23 & 26-27, 4. See BNF: specific agents can be continued at reduced dose, 5. See BNF: no dose reduction required for linagliptin
6. Pioglitazone is contraindicated in people with (or with a history of) heart failure or bladder cancer, 7. Do not combine dapagliflozin with pioglitazone, 8. Caution with exenatide when eGFR<50 ml/min/1.73 m², 9. Adjust according to response, 10. Driving, occupational hazards, risk of falls, previous history.

ABBREVIATIONS: CKD 3A = chronic kidney disease stage 3A (estimated glomerular filtration rate 45–59 ml/min/1.73 m²) CV = cardiovascular

MANAGEMENT OF TYPE 1 DIABETES

Type 1 diabetes accounts for >90% of diabetes in young people <25 years.

- 12-15% of young people <15 years with diabetes have an affected first degree relative.
- Children are three times more likely to develop diabetes if their father has diabetes than if their mother has diabetes.
- 20% of patients with cystic fibrosis (CF) will develop secondary diabetes by the age of 20, with the incidence increasing to 80% by age 35 years.

Diagnosis and screening

B Screening for pre-type 1 diabetes is not recommended in either the general population or in high risk children and young people.

C Patients with CF should be screened annually for diabetes from 10 years of age.

There is no evidence that routine screening for autonomic neuropathy or hyperlipidaemia are of benefit in children and adolescents with type 1 diabetes.

C Young people with diabetes should be screened for thyroid and coeliac disease at onset of diabetes and at intervals throughout their lives.

Initiating therapy at diagnosis

C A home-based programme for initial management and education of children with diabetes and their families is an appropriate alternative to a hospital-based programme.

Long term complications

A To reduce the risk of long term microvascular complications, the target for all young people with diabetes is the optimising of glycaemic control towards a normal level.

Continuing management

Insulin therapy

B Intensive insulin therapy should be delivered as part of a comprehensive support package.

B An intensified treatment regimen for adults with type 1 diabetes should include either regular human or rapid-acting insulin analogues.

B Basal insulin analogues are recommended in adults with type 1 diabetes who are experiencing severe or nocturnal hypoglycaemia and who are using an intensified insulin regimen.

B Children and adolescents may use either insulin analogues (*rapid-acting and basal*), regular human insulin and NPH preparations or an appropriate combination of these.

C The insulin regimen should be tailored to the individual child to achieve the best possible glycaemic control without disabling hypoglycaemia.

Continuous subcutaneous insulin infusion

A CSII therapy is associated with modest improvements in glycaemic control and should be considered for patients unable to achieve their glycaemic targets.

B CSII therapy should be considered in patients that experience recurring episodes of severe hypoglycaemia.

Dietary management

B Dietary advice as part of a comprehensive management plan is recommended to improve glycaemic control.

Management of diabetes at school

- Educational and health services should work together to ensure that children with diabetes have the same quality of care within the school day as outside of it.
- Children at school should be supported with all necessary aspect of diabetes care, such as glucose monitoring, insulin injection and treatment of hypoglycaemia.

MANAGEMENT OF KIDNEY DISEASE IN DIABETES

RISK FACTORS

- hyperglycaemia
- raised blood pressure
- baseline urinary albumin excretion
- increasing age
- duration of diabetes
- smoking
- genetic predisposition
- raised cholesterol and triglyceride levels
- male sex

Definitions

Microalbuminuria - a rise in urinary albumin loss to between 30 and 300 mg day. Alternatively, to avoid a timed urine collection, a urinary albumin:creatinine ratio (ACR) > 2.5 mg/mmol in men and > 3.5 mg/mmol in women or a urinary albumin concentration > 20 mg/l defines microalbuminuria.

It is the earliest sign of diabetic nephropathy and predicts increased total mortality, cardiovascular mortality and morbidity, and end-stage renal failure.

Diabetic nephropathy - the presence of a raised urinary albumin excretion rate (> 300 mg/day) with or without a raised serum creatinine level.

This represents a more severe and established form of renal disease and is more strongly predictive of total mortality, cardiovascular mortality and morbidity, and end-stage renal failure than microalbuminuria.

Screening

B ACR should be used to screen for diabetic kidney disease.

B Young people with diabetes should have ACR tested annually from the age of 12 years.

Prevention and treatment

D Individuals with diabetes and mild to moderate CKD should be managed in a setting that can provide appropriate investigation, monitoring and intensive clinical management.

A Maintain intensive glycaemic control in people with type 1 and 2 diabetes to reduce the risk of developing diabetic kidney disease.

A Reduce proteinuria regardless of baseline urinary protein excretion.

A Reduce blood pressure to the lowest achievable level to slow the rate of decline of glomerular filtration rate and reduce proteinuria.

A Treat people with type 1 diabetes and microalbuminuria with an ACE inhibitor irrespective of blood pressure. An ARB may be used if an individual is intolerant of an ACE inhibitor.

A Treat people with type 2 diabetes and microalbuminuria with an ACE inhibitor or an ARB irrespective of blood pressure.

A ACE inhibitors and/or ARBs should be used as agents of choice in patients with chronic kidney disease and proteinuria (≥ 0.5 g/day, approximately equivalent to a protein/creatinine ratio of 50 mg/mmol) to reduce the rate of progression of chronic kidney disease.

A Dietary protein restrictions (<0.8 g/kg/day) are not recommended in patients with early stages of chronic kidney disease (stages 1-3).

Managing anaemia

D Patients with diabetes and CKD stage 3-5 should have their haemoglobin checked at least annually.

D Consider erythropoiesis stimulating agents in all patients with anaemia of chronic kidney disease, including those with diabetic kidney disease.

PREVENTION OF VISUAL IMPAIRMENT

Up to 39% of people with type 2 diabetes have retinopathy at diagnosis, 4-8% being sight-threatening.

B Patients with multiple risk factors should be considered at high risk of developing diabetic retinal disease.

Rapid improvement in glycaemic control can lead to short term worsening of diabetic eye disease.

B Good glycaemic control (*HbA1c ideally around 7% or 53 mmol/mol*) and blood pressure control (<130/80 mm Hg) should be maintained to prevent onset and progression of diabetic eye disease.

RISK FACTORS

- poor glycaemic control
- raised blood pressure
- longer duration of diabetes
- microalbuminuria and proteinuria
- raised triglycerides and lowered haematocrit
- pregnancy
- serum cholesterol for macular exudates and oedema

Retinal screening

B Systematic screening for diabetic retinal disease should be provided for all people with diabetes.

B Patients with diabetes with no diabetic retinopathy could be screened every two years. All others should be screened at least annually.

Type 1 diabetes	C	Screen from age 12.
Type 2 diabetes	A	Screen from diagnosis.
Systematic screening	C	Use retinal photography or slit lamp biomicroscopy.
Grading	C	Retinal photographs should be graded using digital images by an appropriately trained grader.

Treatment

LASER PHOTO-COAGULATION	A	All people with: <ul style="list-style-type: none"> type 1 or type 2 diabetes with new vessels at the disc or iris new vessels elsewhere with vitreous haemorrhage type 2 diabetes and new vessels elsewhere
	D	type 1 diabetes with new vessels elsewhere
VITRECTOMY	A	Patients with severe or very severe non-proliferative diabetic retinopathy should receive close follow up or laser photocoagulation.
	B	Patients with: <ul style="list-style-type: none"> type 1 diabetes and persistent vitreous haemorrhage tractional retinal detachment threatening the macula
CATARACT EXTRACTIONS	B	Vitrectomy should be considered for severe fibrovascular proliferation.
	C	Cataract extraction should not be delayed. Cataract extraction is advised when sight-threatening retinopathy cannot be excluded.

Rehabilitation

D Community support, maximising disability benefits, low vision aids and training in their use should be provided to people with diabetes and visual impairment.

MANAGEMENT OF DIABETIC FOOT DISEASE

Diabetic foot problems are a common complication of diabetes. The absence of reliable symptoms and high prevalence of asymptomatic disease make foot screening essential.

Risk factors for peripheral arterial disease include:

- smoking
- hypertension, and
- hypercholesterolaemia.

Risk factors for foot ulceration include:

- peripheral arterial disease and peripheral neuropathy
- previous amputation
- previous ulceration
- the presence of callus
- joint deformity
- visual/mobility problems, and
- male sex.

B All patients with diabetes should be screened to assess their risk of developing a foot ulcer.

Prevention

The result of a foot screening examination should be entered onto an online screening tool, such as SCI-DC, to provide automatic risk stratification and a recommended management plan, including patient information (see *diabetic foot risk stratification and triage figure*).

B Foot care education is recommended as part of a multidisciplinary approach in all patients with diabetes.

Management of active foot disease

Antibiotic therapy

Treatment of a patient with an infected diabetic foot ulcer and/or osteomyelitis should be commenced immediately with an antibiotic in accordance with local or national protocols. Subsequent antibiotic regimens may be modified with reference to bacteriology and clinical response.

Charcot's foot

Charcot's foot is a neuroarthropathic process with osteoporosis, fracture, acute inflammation and disorganisation of foot architecture.

Suspected Charcot neuroarthropathy of the foot is an emergency and should be referred immediately to the multidisciplinary foot team.

A multidisciplinary foot team should include:

- podiatrist
- diabetes physician
- orthotist
- diabetes nurse specialist
- vascular surgeon
- orthopaedic surgeon
- radiologist.

Multidisciplinary foot care

Multidisciplinary foot care teams allow intensive treatment and rapid access to orthopaedic and vascular surgery. In their absence, foot lesions are more likely to lead to amputation.

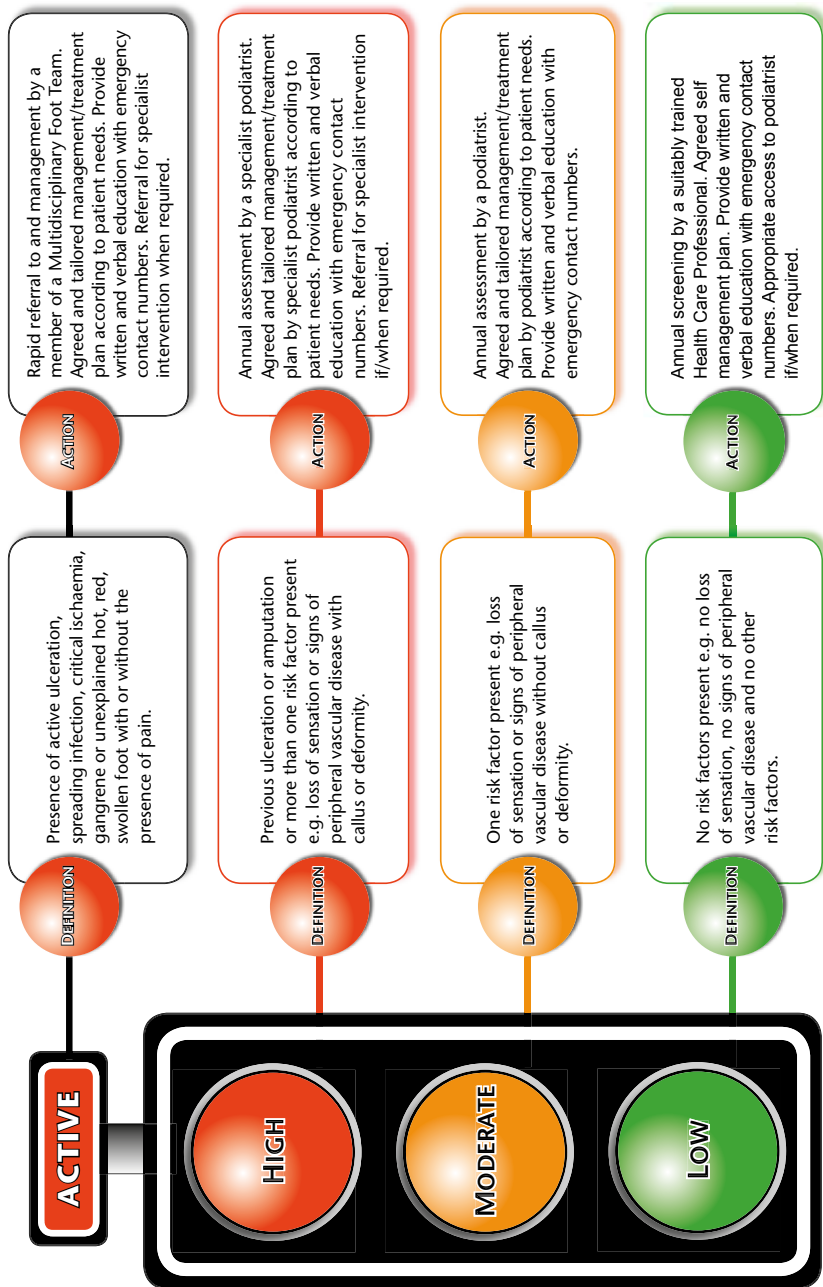
C Patients with active diabetic foot disease should be referred to a multidisciplinary diabetic foot care service.

Painful diabetic peripheral neuropathy

The initial treatment of DPN is dependent on individual patient choice, dosing regimens, cost and side effect profile.

A Consider antidepressants or anticonvulsants for treatment of painful DPN.

DIABETIC FOOT RISK STRATIFICATION AND TRIAGE



Produced by the Scottish Diabetes Group - Foot Action Group

SOURCES OF FURTHER INFORMATION

NATIONAL ORGANISATIONS

Diabetes Information Plus

www.diabetesinfoplus.scot.nhs.uk

Provides access to diabetes information leaflets, and information on diabetes support groups, social security benefits, medicines and treatments and the evidence on which treatments are based.

Diabetes in Scotland

www.diabetesinscotland.org.uk

The website of the Scottish Diabetes Group, the steering group responsible for supporting the implementation of the National Action Plan. It contains links to national publications on diabetes, details of events and links to the topic specific subgroups working in key areas of diabetes.

Diabetes UK (Scottish office)

The Venlaw, 349 Bath Street, Glasgow, G2 4AA

Tel: 0141 245 6380 • Careline 0845 120 2960

www.diabetes.org.uk • Email: Scotland@diabetes.org.uk

Diabetes UK provides a range of information on diabetes including leaflets, fact sheets and Diabetes UK's magazine Balance. They provide advice on all aspects of diabetes including diabetic care, diet, holidays and insurance.

Driver and Vehicle Licensing Agency

www.dft.gov.uk/dvla/medical.aspx

Healthtalkonline

www.healthtalkonline.org

Healthtalk online is the website of the DIPEX charity. It provides access to people's experiences of living with diabetes.

Juvenile Diabetes Research Foundation

Suite 5, 2nd Floor, Salvesen Tower, Blaikies Quay, Aberdeen, AB11 5PW

Tel: 01224 582777

www.jdrf.org.uk • Email: info@jdrf.org.uk

Provides a range of information and support to families and individuals affected by type 1 diabetes. They produce a magazine produced specifically for children and young people.

My Diabetes My Way

www.mydiabetesmyway.scot.nhs.uk

NHSScotland interactive diabetes website to help support people who have diabetes and their family and friends. It provides leaflets, videos, educational tools and games containing information about diabetes.

CONVERSION TABLE FOR HbA1c FORMATS

From June 2009 to June 2011 HbA1c will be dual reported in DCCT-aligned format (%) and IFCC-aligned format (in mmol/mol). The conversion formulae for these formats are as follows:

DCCT-aligned HbA1c value = (0.0915 x IFCC-aligned value) + 2.15 %

IFCC-aligned HbA1c value = (10.93 x DCCT-aligned value) – 23.5 mmol/mol

DCCT-aligned HbA1c (%)	IFCC-aligned HbA1c (mmol/mol)	DCCT-aligned HbA1c (%)	IFCC-aligned HbA1c (mmol/mol)
4.0	20	8.0	64
4.1	21	8.1	65
4.2	22	8.2	66
4.3	23	8.3	67
4.4	25	8.4	68
4.5	26	8.5	69
4.6	27	8.6	70
4.7	28	8.7	72
4.8	29	8.8	73
4.9	30	8.9	74
5.0	31	9.0	75
5.1	32	9.1	76
5.2	33	9.2	77
5.3	34	9.3	78
5.4	36	9.4	79
5.5	37	9.5	80
5.6	38	9.6	81
5.7	39	9.7	83
5.8	40	9.8	84
5.9	41	9.9	85
6.0	42	10.0	86
6.1	43	10.1	87
6.2	44	10.2	88
6.3	45	10.3	89
6.4	46	10.4	90
6.5	48	10.5	91
6.6	49	10.6	92
6.7	50	10.7	93
6.8	51	10.8	95
6.9	52	10.9	96
7.0	53	11.0	97
7.1	54	11.1	98
7.2	55	11.2	99
7.3	56	11.3	100
7.4	57	11.4	101
7.5	58	11.5	102
7.6	60	11.6	103
7.7	61	11.7	104
7.8	62	11.8	105
7.9	63	11.9	107
		12.0	108