



# DEPARTMENT OF HEALTH

## GUIDELINE ON MANAGEMENT OF TYPE 2 DIABETES MELLITUS IN PRIMARY CARE IN HONG KONG



*Third Edition*



Professional Development & Quality Assurance  
Clinical Audit and Guideline Working Group

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**MEMBERS OF THE CLINICAL AUDIT AND  
GUIDELINE GROUP, PDQA, DEPARTMENT OF  
HEALTH**

## **DISCLAIMER**

## **GUIDELINE AVAILABILITY**

## 1. HK DIABETES EPIDEMIC:

- 1 in 10 HK people have diabetes, affecting all ages
  - half remained undiagnosed
  - among the diagnosed, less than half are under regular treatment
  - among the treated, less than half are optimally managed
- Diabetic patients have 2-3 times increased risk of death compared to non-diabetic patients
  - 20 to 50% of diabetic patients can expect to die or develop heart disease or renal failure in 10 years time
- Randomized controlled trial showed that patients treated to target by a multidisciplinary team had 50 to 70% risk reduction in the development of micro and macro-vascular complications

## 2. RISK FACTORS FOR DIABETES:

When any of the following risk factors are present, doctors should have increased valiance and should consider screening patients for glucose intolerance and other cardiovascular risk factors

- first-degree relatives with diabetes
- overweight (BMI  $\geq 23$ )
- dyslipidaemia (especially with a high level of triglycerides)
- hypertension (BP  $\geq 140/90$ )
- history of gestational diabetes
- age  $\geq 45$

## 3. DIAGNOSIS OF DIABETES:

- Criteria for the diagnosis of diabetes mellitus
  - A. Symptoms of diabetes plus casual plasma glucose concentration  $\geq 11.1$  mmol/l (casual is defined as any time of day without regard to time since last meal. The classic symptoms of diabetes include polyuria, polydipsia and unexplained weight loss).
  - B. Fasting plasma glucose (FPG)  $\geq 7$  mmol/l. Fasting is defined as no caloric intake for at least 8 hours.
  - C. 2 hour postload glucose  $\geq 11.1$  mmol/l during an OGTT.

*\* in the absence of unequivocal hyperglycemia, this criteria should be confirmed by repeat testing on a different day. The third measure (OGTT) is not recommended for routine clinical use.*

- Impaired glucose tolerance (IGT) = FPG < 7.0mmol/l and 2 hr PG  $\geq$  7.8 mmol/l or < 11.1mol/l
- New intermediate group using FPG  
FPG < 6.0mmol/l = normal fasting glucose (NFG)  
FPG  $\geq$  6.0 to <7.0 = impaired fasting glucose
- Individuals with IGT or IFG have increased cardiovascular risks and a tendency to develop DM at an average annual rate of 4-10%
- Recent studies have shown that modest weight loss and regular physical activity can reduce the rate of progression of IGT to type 2 DM

#### **4. OGTT INDICATION:**

- borderline cases in terms of fasting/random PG
- follow-up patients with IGT/IFG

#### **5. MANAGEMENT OF TYPE 2 DM:**

##### Key messages

- Lifestyle change is central to the management of all people with diabetes and requires advice on energy intake and dietary pattern, physical activity, and smoking cessation, where appropriate.
- Regular screening for renal, retinal and foot complication should occur from diagnosis of type 2 diabetes
- Tight glycaemic control reduces the risk of and slows the progression of microvascular and macrovascular complications. A stepped approach is recommended to lower and maintain HbA1c to as close to physiological levels as possible, preferably less than 7%, without hypoglycaemia.
- Optimum blood pressure control, below 130/80mm Hg, reduce the risk of and slows the progression of microvascular and macrovascular complications. Any sustained reduction in both HbA1c and blood pressure is worthwhile.
- People with diabetes and microalbuminuria or overt nephropathy should be on an ACE inhibitor or A2 receptor blocker, if tolerated, to prevent disease progression.

## **5.1 Principles**

- The importance of patient education as an indispensable and integral part of a successful diabetes management program is being increasingly recognized. Diabetic patients should be educated about the chronic nature of DM and its complications, meal planning, the importance of smoking cessation, weight control, regular exercise as well as the need for periodic assessments on a long-term basis
- Diet and exercise are the cornerstone for treatments of diabetes, but there should be no hesitation to introduce anti-diabetic medications when patients' blood sugar control is not satisfactory

## **5.2 Health education**

- Structured education is an integral part of diabetes care. Offer group-based structured DM education and self-management program to every patient and /or their carer at and around the time of diagnosis, with annual reinforcement and review.
- Offer individual patient education to patients with suboptimal glycaemic control.
- Emphasize the importance of exercise.
- Emphasize group-based structured DM education and self-management program. There is also some evidence that group-based education programs may reduce blood pressure and body weight, and increase self-empowerment, quality of life, self-management skills and treatment satisfaction.

## **5.3 Clinical assessments**

- at least semi-annual visit
- at each visit:
  - ask for symptoms of hypoglycaemia, hyperglycaemia, side effects of medications, change in vision, angina, intermittent claudication
  - measure blood pressure (BP), body weight (BW) and glucose and assess progress in achieving treatment goals (weight goals, glycaemic, blood pressure and lipid goals)
- annual assessment
  - lipid, renal function, albuminuria, microalbuminuria, foot and fundi (through dilated pupils or retinal photography)

## **5.4 Treatment objectives**

- to prevent life-threatening acute complications
- to treat hyperglycaemic symptoms
- to prevent or halt progression of chronic diabetic complications
- to achieve these objectives, it is important not only to treat hyperglycaemia but also the other components of the insulin resistance syndrome, including hypertension, dyslipidaemia, obesity and albuminuria

## **5.5 Treatment target values**

- Microvascular disease prevention:  
The benefits of intensive glycaemic control on microvascular and neuropathic complications are well established for both type 1 and type 2 diabetes. Lowering HbA1c to below or around 7 % has been shown to reduce microvascular and neuropathic complications of type 1 and type 2 diabetes. Therefore, for microvascular disease prevention, the HbA1c goal for non-pregnant adults in general is < 7 %. (Level of evidence: A)
- Macrovascular disease prevention:  
After reviewing the current studies (ACCORD / ADVANCE / VADT), the conclusion is that until more evidence becomes available, the general goal of < 7% appears reasonable for many adults for macrovascular risk reduction. (Level of evidence: B)

**TREATMENT TARGET VALUES**

	<b>Ideal control</b>	<b>unsatisfactory control</b>
<b>Fasting PG (mmol/l)</b>	4-6	≥ 8
<b>HbA1c (x upper limit of normal, %)</b>	<7 (< 110%)	≥ 8 (≥ 130%)
<b>Body mass index (kg/m<sup>2</sup>)</b>	<23	≥ 27
<b>Waist circumference (male)</b>	< 75cm (< 30 inches)	≥ 90cm (≥ 36 inches)
<b>Waist circumference (female)</b>	< 70cm (< 28 inches)	≥ 80cm (≥ 32 inches)
<b>Systolic blood pressure (mmHg)</b>	< 130	≥ 160
<b>Diastolic blood pressure (mmHg)</b>	< 80	≥ 95
<b>Total cholesterol (mmol/l)</b> <b>HDL-cholesterol (mmol/l)</b> <b>HDL-cholesterol (mmol/l)</b> <b>Triglyceride (mmol/l)</b>	Refer to PDQA Guideline on Lipid Management in Primary Prevention of Cardiovascular Disease	

**5.6 Diabetic medications**

- **Diabetic medications can be broadly divided into 3 classes:-**
  - insulin sensitizers (metformin and glitazones)
  - insulin secretagogues (sulphonylureas and meglitinides) or exogenous insulin
  - drugs that modulate food absorption, e.g. acarbose
- **Considerations of starting of oral anti-diabetes drugs**
  - to decide after 3-6 months of life-style modification for mild hyperglycaemia, should consider if HbA1c > 7% unless contraindicated
  - early combination regimens rather than the so-called maximum dose of 1 class
- **Choice of anti-diabetes drugs should be based on**
  - knowledge of the underlying pathophysiology
    - ➔ to initiate therapy with insulin sensitizers for obese patients especially with multiple cardiovascular risk factors
  - degree of hyperglycaemia
    - ➔ metformin and insulin secretagogues are more effective in lowering blood glucose than glitazones and acarbose in general

- risk of hypoglycaemia
  - ➔ high dose sulphonylureas, especially those that have a long duration of action should be avoided in subjects who may run a higher risk of hypoglycaemia, such as elderly patients, alcoholics, liver/renal disease or epileptics
- side-effect profile
  - ➔ metformin is contra-indicated in patients with co-existing conditions that predispose to lactic acidosis, such as renal/liver disease, severe lung disease or heart failure.
  - ➔ acarbose is contra-indicated in those with inflammatory bowel disease

## DRUG TREATMENT FOR TYPE 2 DM

Drug class	effect on HbA1c As monotherapy	major side effects	Precaution
<b>Insulin secretagogues (sulphonylureas, glinides)</b>	1.5 to 2.5%	weight gain, hypoglycaemia	Stop Sulphonylureas when plasma creatinine > 200 µmol/l
<b>Biguanides (Metformin)</b>	1.5 to 2.5%	GI upsets, lactic acidosis	Stop when plasma creatinine > 150 µmol/l in male or 140 µmol/l in female
<b>Thiazolidinediones</b>	0.5 to 1.0%	weight gain, fluid retention, Liver toxicity	
<b>Acarbose</b>	0.5 to 1.0%	flatulence and loose stools	
<b>Insulin</b>	potentially normalized	hypoglycaemia, weight gain	

- Metformin
  - Start metformin treatment in a person who is overweight or obese and whose blood glucose is inadequately controlled by lifestyle intervention alone.
  - Consider metformin as an option for first-line glucose-lowering therapy for a person who is not overweight.
  - Continue metformin if blood glucose control remains or becomes inadequate and add another oral glucose lowering medication (usually a sulfonylurea).
- Thiazolidinediones (glitazones)
  - Rosiglitazone maleate (Avantia) is not recommended according to current evidence. There is an increase chance of developing edema, cardiovascular diseases and broken bones in women after taking rosiglitazone.
- DPP-4 Dipeptidyl peptidase-4 inhibitors (Sitagliptin and vildagliptin)
  - Comparison with other already established blood-glucose lowering drugs, DPP-4 did not reveal any advantage. Long term data especially on cardiovascular outcomes, immune function and safety are needed before widespread use of these new agents. Currently, the drug should be restricted to selected patients.

## 5.7 Dietary intervention

### A-Level evidence

- Foods containing carbohydrate from whole grains, fruits, vegetables, and low-fat milk should be included in a healthy diet.
- With regard to the glycemic effects of carbohydrates, the total amount of carbohydrate in meals or snacks is more important than the source or type.
- Non-nutritive sweeteners are safe when consumed within the acceptable daily intake levels.
- Structured programs that emphasize lifestyle changes, including education, reduced fat (<30% of daily energy) and energy intake, regular physical activity, and regular participant contact, can produce long-term weight loss on the order of 5–7% of starting weight.
- Exercise and behavior modification are most useful as adjuncts to other weight loss strategies. Exercise is helpful in maintenance of weight loss.
- Standard weight reduction diets, when used alone, are unlikely to produce long-term weight loss. Structured intensive lifestyle programs are necessary.
- Less than 10% of energy intake should be derived from saturated fats.
- Dietary cholesterol intake should be <300 mg/day. Some individuals (i.e., persons with LDL cholesterol  $\geq$ 100 mg/dl) may benefit from lowering dietary cholesterol to <200 mg/day.

### B-Level evidence

- Although the use of low-glycemic index foods may reduce postprandial

hyperglycemia, there is not sufficient evidence of long-term benefit to recommend use of low-glycemic index diets as a primary strategy in food/meal planning.

- As with the general public, consumption of dietary fiber is to be encouraged;
- To lower LDL cholesterol, energy derived from saturated fat can be reduced if weight loss is desirable or replaced with either carbohydrate or monounsaturated fat when weight loss is not a goal.
- Intake of *trans* unsaturated fatty acids should be minimized.
- Reduced-fat diets when maintained long-term contribute to modest loss of weight and improvement in dyslipidemia.
- Two to three servings of fish per week provide dietary n-3 polyunsaturated fat and can be recommended.

## 5.8 Diabetic cardiovascular disease

**Hypertension** (blood pressure  $\geq 140/90$  mmHg) is a common co morbidity of diabetes, affecting the majority of people with diabetes, depending on type of diabetes, age, obesity, and ethnicity. Hypertension is also a major risk factor for CVD and microvascular complications such as retinopathy and nephropathy.

### Screening and diagnosis

- Blood pressure should be measured at every routine diabetes visit. Patients found to have systolic blood pressure  $\geq 130$  or diastolic blood pressure  $\geq 80$  mmHg should have blood pressure confirmed on a separate day. (C)

### Goals

- Patients with diabetes should be treated to a systolic blood pressure  $< 130$  mmHg. (B)
- Patients with diabetes should be treated to a diastolic blood pressure  $< 80$  mmHg. (B)

### Treatment

- Patients with hypertension (systolic blood pressure  $\geq 140$  or diastolic blood pressure  $\geq 90$  mmHg) should receive drug therapy in addition to lifestyle and behavioral therapy. (A)
- Multiple drug therapy (two or more agents at proper doses) is generally required to achieve blood pressure targets. (B)
- Initial drug therapy for those with a blood pressure  $> 140/90$  mmHg should be with a drug class demonstrated to reduce CVD events in patients with diabetes (ACE inhibitors, ARBs,  $\beta$ -blockers, diuretics, and calcium channel blockers). (A)
- All patients with diabetes and hypertension should be treated with a regimen that includes either an ACE inhibitor or ARB. If one class is not tolerated, the

- other should be substituted. If needed to achieve blood pressure targets, a thiazide diuretic should be added. (E)
- If ACE inhibitors, ARBs, or diuretics are used, monitor renal function and serum potassium levels. (E)
    - In patients with type 2 diabetes, hypertension, and microalbuminuria, ACE inhibitors and ARBs have been shown to delay the progression to macroalbuminuria. (A)
    - In those with type 2 diabetes, hypertension, macroalbuminuria, and renal insufficiency, ARBs have been shown to delay the progression of nephropathy. (A)
  - In elderly hypertensive patients, blood pressure should be lowered gradually to avoid complications. (E)
  - Patients not achieving target blood pressure despite multiple drug therapy should be referred to a physician experienced in the care of patients with hypertension. (E)
  - Orthostatic measurement of blood pressure should be performed in people with diabetes and hypertension when clinically indicated. (E)

### **Lipid management**

Please refer to PDQA Guideline on Lipid Management in Primary Prevention of Cardiovascular Disease

### **Anti-platelet agents in diabetes**

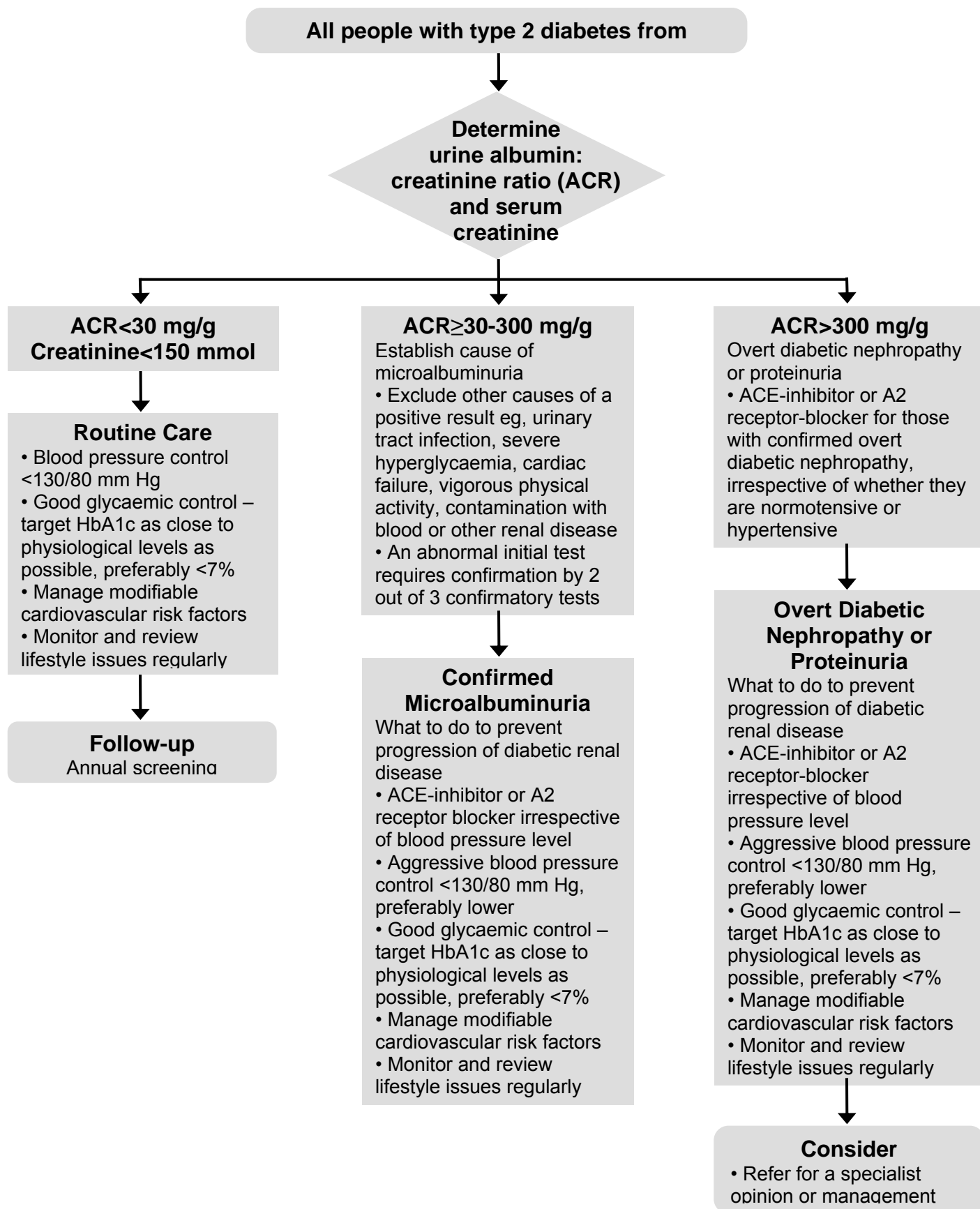
- Use aspirin therapy (75–162 mg/day) as a secondary prevention strategy in those with diabetes with a history of myocardial infarction, vascular bypass procedure, stroke or transient ischemic attack, peripheral vascular disease, claudication, and/or angina. (A)
- Consider use aspirin therapy (75–162 mg/day) as a primary prevention strategy in those with type 2 diabetes at increased cardiovascular risk, including those who are over 40 years of age or who have additional risk factors (family history of CVD, hypertension, smoking, dyslipidemia, albuminuria). (A)

### **Smoking cessation**

The routine and thorough assessment of tobacco use is important as a means of preventing smoking or encouraging cessation. Special considerations should include assessment of level of nicotine dependence, which is associated with difficulty in quitting and relapse.

- Advise all patients not to smoke. (A)
- Include smoking cessation counseling and other forms of treatment as a routine component of diabetes care. (B)

## 5.9 Diabetic renal disease



### General recommendations

- To reduce the risk and/or slow the progression of nephropathy, optimize glucose control. (A)
- To reduce the risk and/or slow the progression of nephropathy, optimize blood pressure control. (A)

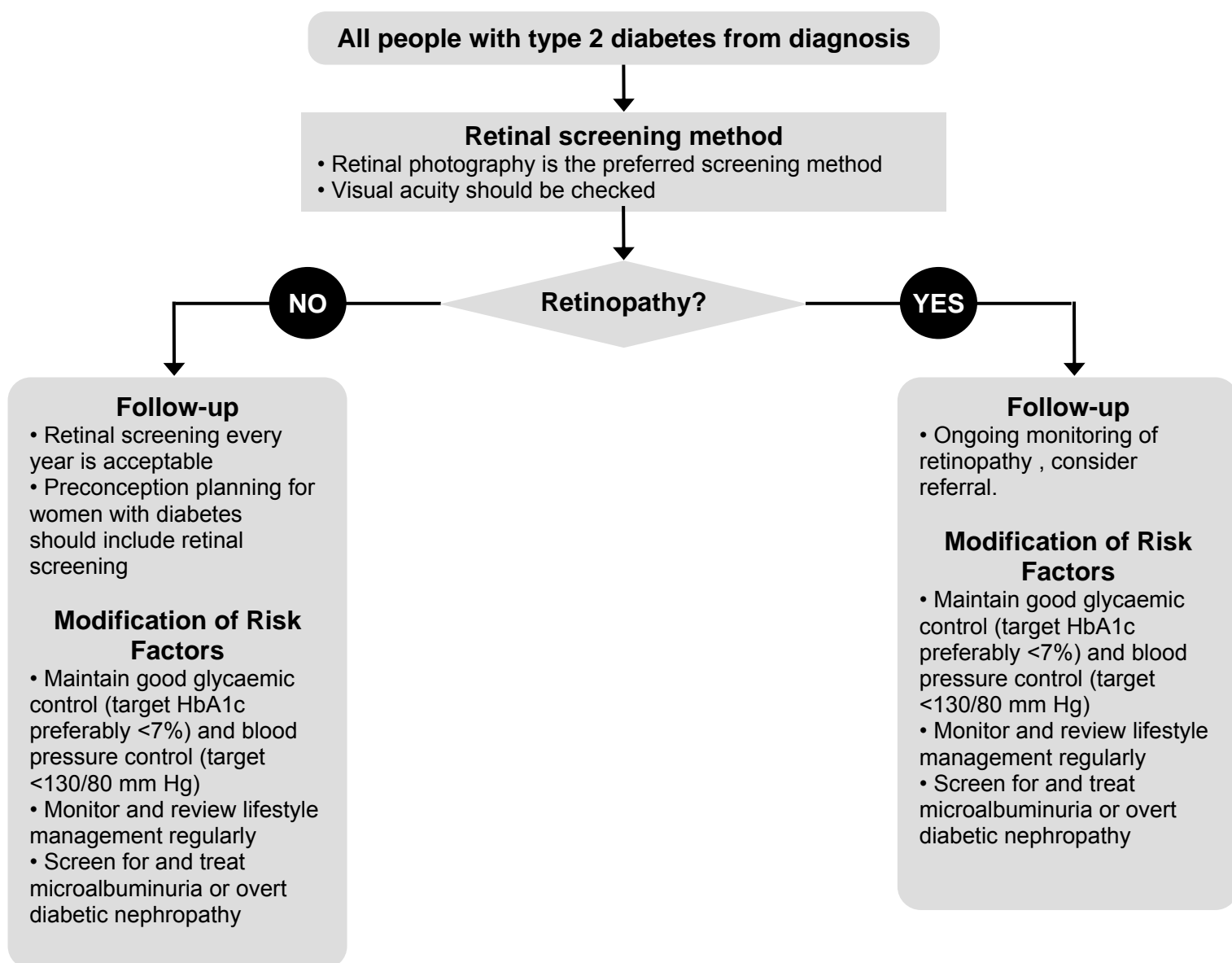
### Screening

- Perform an annual test for the presence of microalbuminuria in all type 2 diabetic patients, starting at diagnosis. (E)

### Treatment

- In the treatment of both micro- and macroalbuminuria, either ACE inhibitors or ARBs should be used. (A)
  - In patients with type 2 diabetes, hypertension, and microalbuminuria, ACE inhibitors and ARBs have been shown to delay the progression to macroalbuminuria. (A)
  - In patients with type 2 diabetes, hypertension, macroalbuminuria, and renal insufficiency (serum creatinine >1.5 mg/dl), ARBs have been shown to delay the progression of nephropathy. (A)
- With regards to slowing the progression of nephropathy, the use of DCCBs as initial therapy is not more effective than placebo. Their use in nephropathy should be restricted to additional therapy to further lower blood pressure in patients already treated with ACE inhibitors or ARBs. (B)
- In the setting of albuminuria or nephropathy, in patients unable to tolerate ACE inhibitors and/or ARBs, consider the use of non-DCCBs,  $\beta$ -blockers, or diuretics for the management of blood pressure. (E)
- If ACE inhibitors, ARBs, or diuretics are used, monitor serum potassium levels for the development of hyperkalemia. (B)

## 5.10 Diabetic eye disease



### General recommendations

- Optimal glycemic control can substantially reduce the risk and progression of diabetic retinopathy. (A)
- Optimal blood pressure control can reduce the risk and progression of diabetic retinopathy. (A)
- Aspirin therapy does not prevent retinopathy or increase the risks of hemorrhage. (A)

## Screening

- Patients with type 2 diabetes should have an initial dilated and comprehensive eye examination shortly after the diagnosis of diabetes. (B)
- Retinal photography carried out by experienced personnel should be used in a programme of systematic screening for diabetic retinopathy. (C)

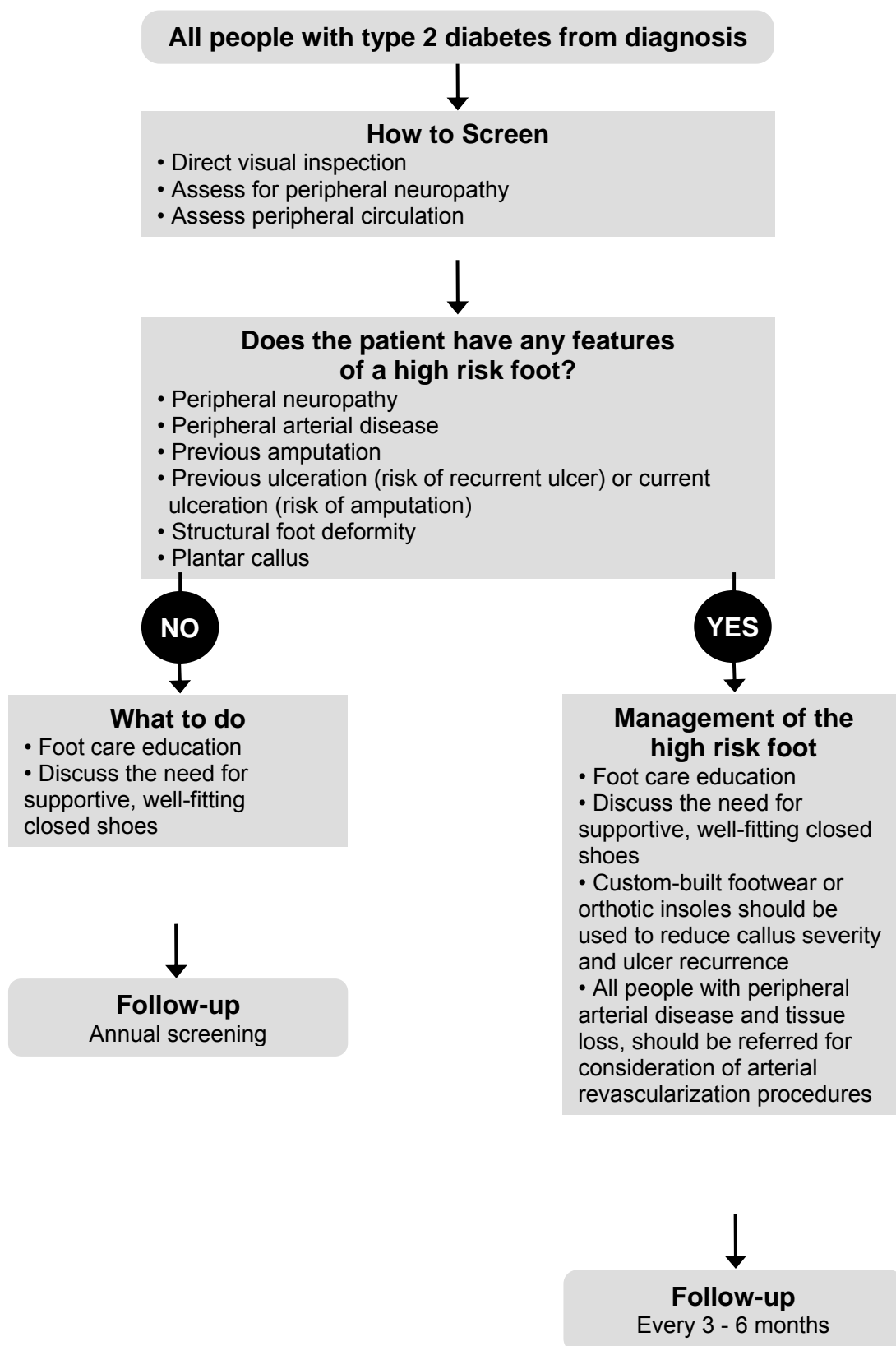
(Retinal photography can achieve a sensitivity of 80% and is a more effective screening method than direct ophthalmoscopy, which only rarely achieves 80% sensitivity even when carried out by properly trained operators.)

- Screening should be repeated annually. Examinations will be required more frequently if retinopathy is progressing. (B)
- When planning pregnancy, women with preexisting diabetes should have a comprehensive eye examination and should be counseled on the risk of development and/or progression of diabetic retinopathy. Women with diabetes who become pregnant should have a comprehensive eye examination in the first trimester and close follow-up throughout pregnancy and for 1 year postpartum. This guideline does not apply to women who develop GDM because such individuals are not at increased risk for diabetic retinopathy. (B)

## Treatment

- Laser therapy can reduce the risk of vision loss in patients with high risk characteristics. (A)
- Promptly refer patients with any level of macular edema, severe NPDR, or any PDR to an ophthalmologist who is knowledgeable and experienced in the management and treatment of diabetic retinopathy. (A)

## 5.11 Diabetic foot disease



## Recommendations

- The foot examination can be accomplished in a primary care setting and should include the use of a Semmes-Weinstein monofilament, tuning fork, palpation, and a visual examination. (B)
- Educate all patients, especially those with risk factors, including smoking, or prior lower-extremity complications, about the risk and prevention of foot problems and reinforce self-care behavior. (B)
- Refer high-risk patients to foot care specialists for ongoing preventive care and life-long surveillance. (C)
- Initial screening for PAD should include a history for claudication and an assessment of the pedal pulses. Consider obtaining an ABI, as many patients with PAD are asymptomatic. (C)
- Refer patients with significant claudication or a positive ABI for further vascular assessment and consider exercise, medications, and surgical options. (C)
- Perform a comprehensive foot examination annually on patients with diabetes to identify risk factors predictive of ulcers and amputations. Perform a visual inspection of patients' feet at each routine visit. (E)

## 5.12 Referral criteria

Below are some suggested referral criteria for reference. Doctors should refer their patients based on their own clinical judgment and resources available.

### Referral to medical:

- Type 1 DM
- Diabetes in pregnancy
- Complicated with co-morbidities: newly diagnosed ischemic heart disease, unstable angina and CVA within 6 months, typical DM nephropathy with low creatinine clearance, suboptimal BP control
- Deterioration of glycaemic control despite reinforcement with optimal treatment available in primary care clinic (HbA1c  $\geq$  8.5 % at least 2 occasions over 6 months)
- Those may benefit from cardiac testing (e.g. those with a history of coronary heart disease with (i) typical or suggestive cardiac symptoms/ECG changes, (ii) CVD risk factors and planning to begin a vigorous exercise program or sildenafil treatment, or (iii) multiple CVD risk factors)
- Those who require insulin

### Referral to ophthalmologist:

- If complications identified, e.g. diabetic retinopathy, cataracts
- Positive pregnancy test
- Proliferative or pre-proliferative retinopathy
- Macular edema

- Non-proliferative retinopathy that is severe, of new onset or progressive
- Unexplained visual impairment +/- long duration of diabetes (e.g. >10 years) especially if glycaemic control has been suboptimal

Referral to orthopaedics or vascular surgery:

- Uncontrolled ischemic rest pain
- Life-threatening foot infection
- Non-healing ulcer

Referral to emergencies department

- Emergency situations (e.g. hyperglycemic come, hypoglycemia with acute metabolic decompensation such as moderate ketonuria, decreased general condition, dehydration or mental impairment)

## APPENDIX – LEVEL OF EVIDENCE

ADA evidence grading system for clinical practice recommendations

Level of evidence	Description
A	<p>Clear evidence from well-conducted, generalizable, randomized controlled trials that are adequately powered including:</p> <ul style="list-style-type: none"> <li>• Evidence from a well-conducted multicenter trial</li> <li>• Evidence from a meta-analysis that incorporated quality ratings in the analysis</li> <li>• Compelling nonexperimental evidence, i.e., "all or none" rule developed by Center for Evidence Based Medicine at Oxford</li> </ul> <p>Supportive evidence from well-conducted randomized controlled trials that are adequately powered including:</p> <ul style="list-style-type: none"> <li>• Evidence from a well-conducted trial at one or more institutions</li> <li>• Evidence from a meta-analysis that incorporated quality ratings in the analysis</li> </ul>

B	Supportive evidence from well-conducted cohort studies <ul style="list-style-type: none"><li>• Evidence from a well-conducted prospective cohort study or registry</li><li>• Evidence from a well-conducted prospective cohort study</li><li>• Evidence from a well-conducted meta-analysis of cohort studies</li></ul>
	Supportive evidence from a well-conducted case-control study
C	Supportive evidence from poorly controlled or uncontrolled studies <ul style="list-style-type: none"><li>• Evidence from randomized clinical trials with one or more major or three or more minor methodological flaws that could invalidate the results</li><li>• Evidence from observational studies with high potential for bias (such as case series with comparison to historical controls)</li><li>• Evidence from case series or case reports</li></ul>
	Conflicting evidence with the weight of evidence supporting the recommendation
E	Expert consensus or clinical experience

## **REFERENCE**

### ***Adapted from***

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**Footnotes**

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- ♦ *Last modified : Aug 2009*
- ♦ *This protocol is scheduled for review at 1 year or earlier as appropriate.*
- ♦ *Comments and suggestions are welcomed and should be addressed to the group coordinators.*

**DISCLAIMER**

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**GUIDELINE AVAILABILITY**

*Additional copies can be obtained by contacting PDQA, Department of Health.*

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