

# 02

## STANDARDS OF MEDICAL CARE IN DIABETES

In this chapter, guidelines for the standards of medical care in patients with diabetes are summarized. Each topic involved in the medical evaluation is defined separately. Physical examination details as well as laboratory tests, and their frequency of use are briefed. The current evidence-based recommendations for medical treatment of hypertension and lipid disorders are provided. In the complications chapter, we are focused particularly on atherosclerosis, and its prevention, smoking cessation, and self monitoring and education.

Figure 2.1 shows the algorithm for the standards of medical care in adults with diabetes.

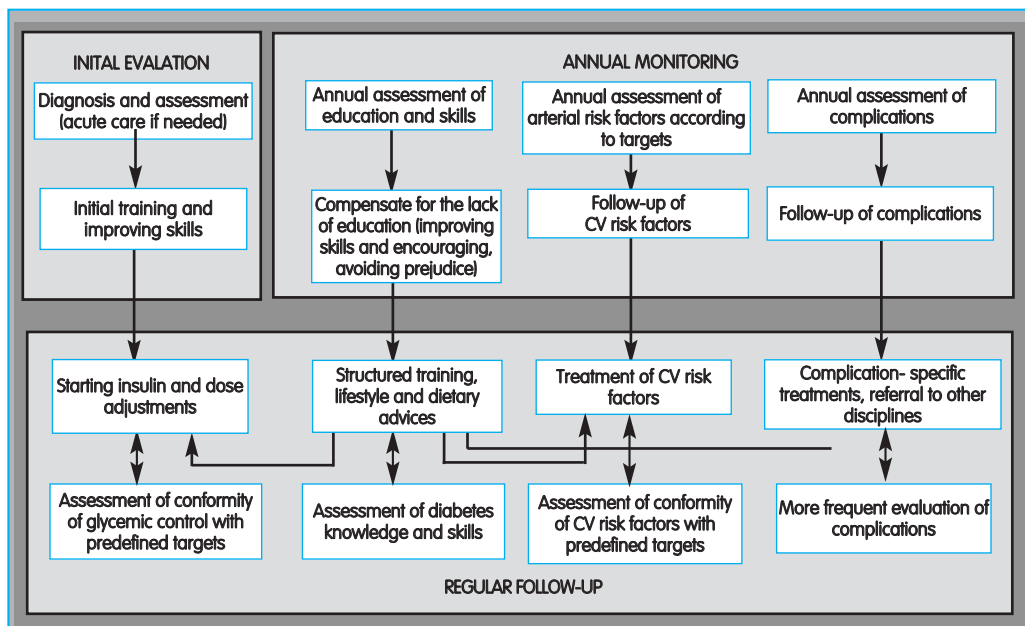


Figure 2.1 Diabetes care for adult with type 1 diabetes

CV; Cardiovascular

## 2.1 ANAMNESIS

The following issues should be questioned when taking anamnesis in a patient with diabetes mellitus.

- The symptoms of diabetes, physical examination findings and laboratory results
- Previous A1C values
- Eating habits, nutritional status, weight history, growth and development of children and adolescents
- Details of previous treatment programs (nutrition, self monitoring 'SMBG', habits and health-related beliefs)
- Current diabetes treatment (medicines, meal plan, SMBG results)
- Work out details
- The frequency, degree and causes of acute complications (DKA, hypoglycemia)
- Previous and current infections (skin, feet, teeth, genitourinary)
- The symptoms associated with chronic complications (ocular, renal, nervous system, gastrointestinal, cardiovascular, diabetic foot, cerebrovascular accident) and treatment details
- Other drugs that may affect blood glucose levels
- Risk factors of atherosclerosis (smoking, hypertension, obesity, dyslipidemia, family history)
- Other diseases related to endocrine disruption and eating behaviors
- Family history of diabetes and other endocrine disorders
- Factors that may affect treatment and follow up of diabetes (lifestyle, cultural, psychosocial, educational and economical factors)
- Smoking and alcohol consumption, substance abuse
- Contraception, reproductive life, sexual life

## 2.2 PHYSICAL EXAMINATION

The following items should be checked when examining patient with diabetes mellitus.

- Height and weight measurement (comparison of growth charts in children and adolescents)
- Measurement of waist circumference (in all diabetic patients)
- Puberty stage, sexual developmental level
- Blood pressure (orthostatic measurement if needed, comparison with normal values for age)
- Fundus examination
- Oral examination
- Thyroid palpation
- Cardiac examination
- Abdominal examination (liver palpation)
- Pulse examination (palpation and auscultation)
- Hand and finger examination (for sclerodactyly and Dupuytren's contracture)
- Foot examination (those at risk for diabetic foot)
- Skin examination (acanthosis nigricans, reactions in insulin injection sites)
- Neurological examination
- Findings related to certain forms of secondary diabetes (hemochromatosis, pancreatic diseases, endocrinopathies, genetic syndromes)

## 2.3 CONSULTATIONS

- Medical nutrition therapy, 'MNT' (if possible, patient should be referred to a dietitian)
- Fundus examination (in accordance with a follow up protocol)
- Family planning for reproductive age women
- Diabetes educator (if a diabetes educator is not available, then the physician should assume education)
- Psychologist (if behavior therapy is necessary)
- Because of the lack of podiatrist in our country, diabetes nurses, dermatologists and physiotherapists should replace them.
- If necessary, other disciplines and other areas of expertise (neurology, nephrology, cardiology, gynecology) should be consulted

## 2.4 LABORATORY EXAMINATIONS

- A1C (every 3 to 6 months)
- Fasting lipid profile (total cholesterol, HDL cholesterol, LDL cholesterol, triglycerides): Every year
- Microalbuminuria (urinary albumin excretion rate, 'UAE'): Screening for microalbuminuria should be performed annually, starting 5 years after diagnosis of type 1 diabetes or earlier in the presence of puberty, and then annually. In all patients with type 2 diabetes screening for microalbuminuria should start at the time of diagnosis and then annually. Albuminuria is measured in an early morning spot urine sample and calculated as 'urinary albumin/creatinine' ratio. UAE is interpreted according to the principles showed in Table 2.1.
- Creatinine in adults (proteinuria in children): Every year
- TSH measurement (in all subjects with type 1 diabetes, and if necessary in type 2 diabetes): If TSH is abnormal, free T4 should be measured. Patients with type 1 diabetes mellitus should be screened for autoimmune thyroiditis by anti-thyroid peroxidase and anti-thyroglobulin autoantibodies at initial diagnosis. TSH should also be monitored after metabolic control has been established, if the test is normal it should be repeated every 1 or 2 years or when symptoms of thyroid disease occur.
- ECG in adults: Annually
- A urine sample should be obtained at each visit for complete urine analysis (ketones, protein, sediment, etc.).
- Additionally autoantibodies (anti-tissue transglutaminase and anti-endomysium IgA, if serum IgA level is in normal range) related to gluten enteropathy should be tested in children and adolescents with type 1 diabetes. All antibody positive or symptomatic cases should be referred to gastroenterologist for endoscopic evaluation for definitive diagnosis.

**Table 2-1. Evaluation of urinary albumin excretion rate (UAE)**

	First morning spot urine	24 hour urine	
	Albumin/creatinine (mg/g)	UAE (mg/day)	UAE rate (µg/min)
Normoalbuminuria	<30	<30	<20
Microalbuminuria <sup>†</sup>	30-300	30-300	20-200
Macroalbuminuria (Clinical albuminuria)	>300	>300	>200

<sup>†</sup>Microalbuminuria is defined as at least 2 of 3 measurements are higher than normal within the last 3 to 6 months.  
Excessive urinary albumin excretion levels may be associated with intensive exercise within the last 24 hours, infection, high fever, congestive heart failure, prominent hyperglycemia and hypertension.

### Glomerular filtration rate

Glomerular filtration rate (GFR) is estimated by determining creatinine clearance. The calculated estimate of glomerular filtration rate (eGFR) is based on two widespread adapted formulas in the lack of clinical renal failure.

#### Cockcroft – Gault formula<sup>(1)</sup>

$$eGFR = [(140 - \text{age}) \times \text{weight (kg)}] / [\text{serum creatinine (mg/dL)} \times 88.6]$$

<sup>(1)</sup>The resulting value is multiplied by a constant of 0.85 if the patient is female.

Some sources have suggested this formula as follow;

$$eGFR = [(140 - \text{age}) \times \text{weight (kg)}] / [\text{serum creatinine (mg/dL)} \times 72]$$

#### MDRD formula

Alternatively, eGFR is calculated using MDRD (Modification of Diet and Renal Disease) study equation. MDRD has been proposed to give more accurate results than Cockcroft-Gault, especially in elderly diabetic patients. The following web site can be used to calculate eGFR with MDRD formula ([http://www.kidney.org/professionals/kdoqi/gfr\\_calculator.cfm](http://www.kidney.org/professionals/kdoqi/gfr_calculator.cfm)).

## 2.4.1 Glycemic Control

### Self-monitoring of blood glucose (SMBG)

- SMBG frequency should be determined according to patient characteristics (3-4 times daily in type 1 diabetics treated with insulin with basal-bolus regimen, pregnant women and diabetics treated with insulin pump; 3-4 times weekly in type 2 diabetics).
- Postprandial glycemia (PPG): It is measured in diabetics whose A1C target is not reached although their fasting and preprandial

glucose levels are under control, and in those on nutrition and anti-hyperglycemic agents to control postprandial glycemia levels. Postprandial glucose measurements should be made 2 hours after the beginning of a main meal, from the time of the first bite. One hour postprandial glucose level is used in pregnant women.

- Patients should be taught how to make MNT and insulin/OAD dose adjustments according to the SMBG results.
- SMBG technique should be reviewed regularly.

#### Long term glucose control (A1C)

- A1C is measured periodically every 3 months in patients with type 1 diabetes and in those with type 2 diabetes using insulin, and every 3 to 6 months in other type 2 diabetic patients.

### 2.4.2 Blood Pressure (BP) Control

- A1C should be evaluated together with SMBG results.

#### Target BP

- The optimal BP target is  $\leq 130/80$  mmHg. BP follow-up should be recommended to patients under appropriate conditions at home.
- The cardiovascular (CV) risk factors should be taken into account together with BP levels.
- The lowest tolerated BP levels without any risk of severe hypotension ( $\leq 120/ <70$  mmHg), should be targeted.

### 2.4.3 Lipid Profile

#### Target levels

- LDL-cholesterol  $<100$  mg /dL ( $<70$  mg/dL in diabetic patients with primary CV event)
- Triglycerides  $<150$  mg/dL
- HDL-cholesterol  $>40$  mg /dL ( $>50$  mg/dL in women)

#### Frequency of measurement

- Once a year (it may vary depending on the patient; once every 2 years in children)

## 2.5 COMPLICATIONS

### 2.5.1 Prevention of Coronary Artery Disease

Especially patients with type 2 diabetes are associated with a greater risk and mortality of coronary artery disease (CAD). The routes to prevent coronary artery disease are summarized below:

Anti-thrombocyte (antiaggregant) therapy

- Acetyl salicylic acid (80-150 mg/day) should be used in all adults with diabetes and macrovascular events for secondary prevention.
- Acetyl salicylic acid should be used in all diabetic patients with a high risk of CV events for primary prevention (see Chapter 13.1)
- Aspirin therapy should not be recommended for patients under the age of 21 years because of the increased risk of Reye's syndrome associated with aspirin.
- The preventive role of aspirin has never been studied in patients under the age of 30 years.

#### Smoking cessation

Epidemiological case-control studies revealed the cause-effect relationship between smoking and health risks. Statistics of developed countries show that smoking is responsible for 1 in 5 deaths.

- Cigarette smoking is the most changeable risk factor for CV disease (CVD).
  - The risk of CVD morbidity and early mortality rates are significantly increased in smoking diabetic patients compared with the general population.
  - Smoking is found to be associated with the earlier development and progression of microvascular complications.
  - Some forward-looking studies have shown that smoking increases the risk of development of type 2 diabetes.
  - All members of the diabetes team (physician, nurse, dietitian and psychologist) should advise diabetic patients on stopping smoking at every opportunity.
  - The amount and duration of smoking should be ascertained.
  - The patients with a risk of starting smoking again should be supported.
  - Proven methods for smoking cessation should be included in routine diabetes care/education programs.
- Consequently smoking cessation is an efficient and cost-effective approach in reducing above-mentioned risks.

### 2.5.2 Diabetic Nephropathy

#### Screening for CVD

1. Patients with high risk for CVD should undergo exercise stress testing.
2. Patients should be referred to cardiologists as needed.

#### General recommendations

- Optimal glycemia and BP control should be provided.

#### Screening for nephropathy

1. Microalbuminuria (UAE) should be measured
  - In patients with type 1 diabetes of  $\geq 5$  years' duration
  - In all patients with type 2 diabetes.
2. eGFR should be calculated by measuring serum creatinine annually

### 2.5.3 Diabetic Retinopathy

#### General recommendations

- Optimal glycemia and BP control should be provided.

#### Screening for retinopathy

- Fundus examination should be performed yearly, starting at puberty or 5 years after diagnosis in type 1 diabetes, and annually in all patients with type 2 diabetes starting at time of diagnosis.

#### Follow up

- Annual fundus examination after the diagnosis
- Fundus examination and other necessary control should be performed in diabetic women who plan pregnancy, then in the first trimester and then as often as needed.
- Patients with macular edema, advanced non-proliferative retinopathy and proliferative retinopathy should be referred to ophthalmologists.

### 2.5.4 Diabetic Foot

#### Patients at high risk for amputation

Patients with following conditions are at high risk for amputation:

- Sensory neuropathy
- Altered foot biomechanics
- Evidence of increased pressure (erythema, hemorrhage under a callus)
- Bone deformities
- Peripheral artery disease (weak or absent pulses in the limb)
- History of ulceration or amputation
- Severe nail pathology

#### Approach

Multidisciplinary approach is essential. Detailed examination of the feet and vascular assessment should be performed, and patients must be educated about foot care and diabetic foot protection.

## 2.6 EDUCATION

Education constitutes the backbone of treatment both in type 1 and type 2 diabetes. Following the diagnosis of diabetes, patients should be referred to a diabetes center. After establishing glycemic control, they should be included in the education program conducted by a physician, a nurse and a dietitian. Education should be repeated at regular intervals. Diabetic patients should gain the following skills with education.

#### Patients with type 1 diabetes must know

- What and when to eat
- What to do during and after exercise
- How to make glucose measurements 3-4 times (more frequent if needed) a day at home (SMBG)
- How to inject insulin 2-5 times daily
- Symptoms and treatment of hypoglycemia

- How to inject glucagon when needed
- How to cope with anxiety due to fear of hypoglycemia and hyperglycemia
- How to overcome with anxiety caused by the risk of development of microvascular complications
- How to protect from microvascular complications
- Foot care
- How to regulate diabetes in case of comorbidity or during intercurrent illnesses, and when to communicate with health care team
- The application of contraceptive methods and the importance of glycemic control during pregnancy.

#### Patients with type 2 diabetes must know

- The importance of healthy and balanced diet to ensure weight loss
- How to perform SMBG in number and time appropriate to treatment
- When and which OADs will be used
- The other accompanied disorders that may affect diabetes
- How to inject insulin when needed
- Symptoms and treatment of hypoglycemia
- How to protect microvascular complications
- Foot care
- How to regulate diabetes in case of comorbidity and exceptions, and when to communicate with health team
- The application of contraceptive methods and the importance of glycemic control during pregnancy

In addition to the above matters, all patients with type 1 and type 2 diabetes should be informed about the teeth and gum diseases, and recommended to visit a dentist once a year. Also, they should be given information about the application and timing of the vaccines (see Chapter 15.7)

#### SEMT RECOMMENDATIONS FOR PATIENT EDUCATION

1. *Education should be provided to all patients with diabetes and their family members in the appropriate time to improve their knowledge and skills in self-management of diabetes [Class A, Level 1A evidence (1,2)].*
2. *All diabetic patients and their family members should learn how to evaluate SMBG at home, and to change the treatment according to self-monitoring glucose results [Class A, Level 1A evidence (1)].*

#### REFERENCES

1. Norris SL, Engelgau MM, Narayan KMV. Effectiveness of self management training in type 2 diabetes: a systematic review of randomized controlled trials. *Diabetes Care* 2001;24:561-7.
2. Ellis S, Speroff T, Dittus R, et al. Diabetes patient education: a meta-analysis and meta-regression. *Patient Educ Couns* 2004;52:97-105.