

**National Guidelines for Primary
Health Care Physicians**

**Diabetes Mellitus and
Metabolic Syndrome Management**

Iraq

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List of abbreviation

ACEIs	Angiotensin converting enzyme inhibitor
ARB	Angiotensin receptor blocker
BB	Beta blockers
BMI	Body mass index
BP	Blood pressure
CCBs	Calcium channel blockers
CNS	Central nervous system
CVD	Cardiovascular disease
DASH	Dietary approach to stop hypertension
DBP	Diastolic blood pressure
DKA	Diabetes ketoacidosis
DCCT	Diabetes Control and Complications Trial
DM	Diabetes Mellitus
ECG	Electrocardiography
FPG	Fasting plasma glucose
GFR	Glomerular filtration rate
HDL	High density lipoprotein
HF	Heart failure
IFG	Impaired Fasting Plasma Glucose
IFCC	International Federation of Clinical Chemistry
IGT	Impaired Oral Glucose Tolerance Test (2hr PP)
i.m	Intra muscular
i.v	Intra venous
IHD	Ischemic heart disease
ISH	International society for hypertension
JVD	
LDL	Low density lipoprotein
LVH	Left ventricular hypertrophy
MODY	Maturity –onset diabetes of the young
OGTT	Oral glucose tolerance test
2hr PP	Two hours post prandial
s.c	Subcutaneous
SBP	Systolic blood pressure
SMBG	self monitoring blood glucose
TSH	Thyroid stimulating hormone
WHO	World health organization

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Introduction

Diabetes Mellitus with its devastating complications is considered one of the leading causes of morbidity and mortality globally. It is estimated that as many as three out of every four people with diabetes are diagnosed while the remaining one is missed. Diabetes is a chronic disease that requires continuous medical care and education to prevent acute complications and to reduce the risk of long term complication. People with diabetes should receive treatment and care from a physician-coordinated team of health professionals including nurses, nutritionists, and social workers. Iraq is one of the forefronts of the Type II Diabetes Mellitus epidemic and should not be forgotten or neglected. According to the national survey conducted in 2015, it is estimated that 13.9% of the adult Iraqi population (18+years of age), have hyperglycemia, 35.6% have high blood pressure, 33.5% are obese and 37.8% have hypercholesterolemia many will be found to have various lipid abnormalities.

Definition

Diabetes mellitus is a metabolic disorder of multiple etiology characterized by chronic hyperglycemia with disturbances of carbohydrates, fat and protein metabolism resulting from a defect in insulin secretion, insulin resistance, or both. (WHO, 1999). It is almost always associated with multiple other metabolic abnormalities, such as hypertension, dyslipidaemia, and a pro-thrombotic state, which in combination form the Metabolic Syndrome, and greatly increase the morbidity and mortality of the disease.

Classification of Diabetes Mellitus:

Diabetes can be classified into four clinical categories, which include:

1. **Type I Diabetes Mellitus** – is the result of an absolute deficiency of insulin caused by an autoimmune process destroying the β islet cells of the pancreas. This is found most commonly in children and young people. Finding low insulin is nonspecific, because the level may be functionally depressed by marked hyperglycemia, dehydration or lipo toxicity. Approximately 10% of all diabetics have Type I diabetes.
2. **Type II Diabetes Mellitus** – this is characterized by relative resistance of body cells to insulin with progressive loss of β islet cells Insulin secretion, and is strongly associated with obesity, especially abdominal obesity. It is found primarily in older adults, but increasingly found even in obese young adults, youth and even children . Approximately 80% of all diabetics have type II diabetes, and most of these will also develop the metabolic syndrome as they age.
3. **Gestational Diabetes** – This is characterized by a relative glucose intolerance with hyperglycemia during pregnancy (-during second or third trimester), and can lead to significant complications of the pregnancy, such as macrosomia and increased incidence of certain congenital defects. Although it may improve following delivery, it is also associated with an increased risk of diabetes later in life.
4. **(Secondary diabetes)**– these are relatively uncommon, but include various disorders of the pancreas (cystic fibrosis, chronic pancreatitis), genetic defects in pancreatic β -cell function or of insulin action, or diabetes induced by various medications (corticosteroids, anti-neoplastic drugs, anti-retroviral drugs) or monogenic diabetes syndromes (such as neonatal diabetes and maturity-onset diabetes of the young [MODY]).

Clinical Presentation

Diabetes should be suspected with any of the following symptoms:

- Polyuria (frequent urination)
- Polydipsia (thirst and frequent drinking of water or other fluids)
- Polyphagia
- Weight loss
- Intermittent blurring of the vision
- Recurrent skin infection

Diagnosis of Diabetes Mellitus

Diagnosis is established with one of four possible tests, as follows:

- Fasting plasma glucose ≥ 126 mg/dl (7.0 Mmol/L) (venous blood by spectrophotometer), which is confirmed with a second elevated reading on a separate day. Fasting should be for minimum of 8 hours over a night.
- Oral Glucose Tolerance test :2 hour postprandial (ideally 75 gm anhydrous glucose dissolved in water) plasma glucose ≥ 200 mg/dl (11.1 Mmol/L)
- Casual (without regard to the time since the last meal) plasma glucose ≥ 200 mg/dl (11.1 Mmol/L), together with any of the above classic symptoms of hyperglycemia
- HbA1c measurement $\geq 6.5\%$ using a standardized method of testing that is certified by NGSP and standardized to the Diabetes Control and Complications Trial (DCCT) assay calibrated according to International Federation of Clinical Chemistry (IFCC) standardisation

In the absence of equivocal hyperglycemia, diagnosis requires two abnormal test results from the same sample or two different samples

In conditions associated with an altered relationship between A1C and plasma glucose such as hemoglobinopathies, pregnancy (second and third trimesters and the postpartum period), glucose-6-phosphate dehydrogenase deficiency, HIV, hemodialysis, recent blood loss or transfusion, or erythropoietin therapy, only plasma glucose criteria should be used to diagnose diabetes

Pre-diabetes (Impaired fasting glucose and impaired glucose tolerance)

Hyperglycemia that is not sufficient to meet the diagnostic criteria for diabetes is categorized as either impaired fasting glucose or impaired glucose tolerance. (Table 1).

Table 1: Impaired Glucose Tolerance by Type of Test.

Test	Pre-Diabetes Values (Impaired glucose tolerance)
Impaired Fasting Plasma Glucose (IFG)	100- less than 126 mg/dl (5.6-less than 7 Mmol/L)
Impaired Oral Glucose Tolerance Test (2hr PP) (IGT)	140 –less than 200 mg/dl (7.8- less than 11.1 Mmol/L)
HbA1c	5.7% – 6.4%

Complications of Diabetes Mellitus

The potential long-term complications of diabetes can be roughly divided into two categories, the microvascular and the macrovascular.

- **Microvascular complications:** are primarily caused by decreased circulation through the smallest arterioles of the body's organs, and are directly associated with prolonged hyperglycemia resulting in retinopathy (leading to blindness), nephropathy (leading to renal failure), and neuropathy (leading to Charcot foot and peripheral infections). Various studies have shown that the development of these microvascular complications can be significantly delayed by strict and consistent control of the blood glucose, most commonly by maintaining glucose at less than 126 mg/dl. However, the target should be individualized according to age and presence of co-morbidities in order to avoid the risk of hypoglycemia.
- **Macrovascular complications:** are caused by the progressive development of atherosclerosis in the major arteries of the body (aorta, carotid, coronaries and iliac vessels) leading to myocardial infarction, heart failure, stroke, and peripheral vascular disease – These complications appear to be more related to the other metabolic abnormalities that most commonly accompany diabetes, primarily hypertension, lipid abnormalities, and increased thrombogenesis rather than the actual hyperglycemia alone. This combination of metabolic abnormalities has been termed as Metabolic Syndrome. Most studies have found that it is one or more of these macrovascular complications which is the primary cause of death in 75-80% of all diabetics.

Co-morbidities with Diabetes Mellitus

- Autoimmune Diseases (T1D)
- Cancer
- Cognitive Impairment/ Dementia
- Fatty Liver Disease
- Pancreatitis
- Fractures
- Hearing Impairment
- HIV
- Low Testosterone (Men)
- Obstructive Sleep Apnea
- Periodontal Disease
- Psychosocial/Emotional Disorders

TYPE I DIABETES MELLITUS

Etiology:

It is caused by an autoimmune process destroying B-cell determining level of hyperglycemia associated with demonstration of anti-islet antibodies. The patient may be susceptible to other autoimmune disorders, most commonly Celiac disease and other endocrine disorders like Hashimoto's thyroiditis that may occur before or after the onset of type I DM.

It may result from viral destruction of B cells as in congenital rubella, cytomegalovirus and Coxsackie virus infections. Although the etiological roles of viral infections are controversial.

The pubertal peak in onset of type I DM occurs earlier in girls than boys. This sex difference might be mediated, in part, by estrogen or by gene regulated. The pubertal changes may contribute to accelerated onset of type I DM in genetically susceptible females.

Diagnosis

- In the majority of young people, the presenting symptoms are usually the following:
 - Unusual thirst
 - Polyphagia
 - Excessive drinking of water and fluids
 - Frequent urination
 - Weight loss
 - Blurring of the vision
- Occasionally, the initial presentation may be a diabetic ketoacidosis (DKA)
- The above symptoms should be confirmed by tests for:
 - Random plasma glucose ≥ 200 mg/dl (11.1 mmol/l)
 - Heavy glycosuria
 - Possible ketonuria
- Diagnostic criteria are the same for children as for adults
- Plasma glucose rather than A1C should be used to diagnose the acute onset of type I diabetes in individuals with symptoms of hyperglycemia.
- Further investigations may be required at specialized level of care to know the etiology and associated diseases as mentioned above.
- Care should be taken to avoid delay in the diagnosis and initiation of the treatment because of the risk of rapid metabolic deterioration with insulin deficiency.

Diagnostic difficulties at onset

- Young infants with unexplained weight loss and hidden symptoms
- Hyperventilation of ketoacidosis misdiagnosed as pneumonia and asthma
- Abdominal pain or vomiting misdiagnosed as abdominal 'migraine' or appendicitis
- Enuresis or polyuria misdiagnosed as urinary infection
- Polydipsia misdiagnosed as habit or psychogenic drinking

The possibility of DM type II is to be considered among children and young people with suspected diabetes with:

- Strong family history of DM type II
- Obese at presentation
- black or Asian family origin
- low or no insulin requirement of less than 0.5 units/kg body weight/day after the partial remission phase
- Show evidence of insulin resistance (for example, acanthosis nigricans)

Staging of Type I Diabetes:

	Stage 1	Stage 2	Stage 3
Characteristics	<ul style="list-style-type: none"> • Autoimmunity • Normoglycemia • Presymptomatic 	<ul style="list-style-type: none"> • Autoimmunity • Dysglycemia • Presymptomatic 	<ul style="list-style-type: none"> • New-onset hyperglycemia • Symptomatic
Diagnostic criteria	<ul style="list-style-type: none"> • Multiple autoantibodies • No IGT or IFG 	<ul style="list-style-type: none"> • Multiple autoantibodies • Dysglycemia: IFG and/or IGT • FPG 100-125 mg/dL (5.6-6.9mmol/L) • 2-hr PG 140-199 mg/dL (7.8-110 mmol/L) • A1C 5.7-6.4 (39-47 mmol/mol) or ≥10% increase in A1C 	<ul style="list-style-type: none"> • Clinical symptoms • Diabetes by standard criteria

Management of Type I Diabetes Mellitus

All type I diabetic patients should be referred to be treated at specialized care level. It is the specialized team's task to initiate treatment in newly diagnosed patients. The general aims of the diabetes care team should be to provide:

- Multi-disciplinary care
- Recognition of potential complications
- Expert practical guidance and skill training on self monitoring, home care and prevention of complications.
- Psychosocial support for the family

The cornerstones of management of children and adolescents with Type I diabetes mellitus:

1. Insulin therapy (Annex 1)

2. Monitoring of plasma glucose
3. Appropriate nutrition
4. Education of patient and family (Annex 2)
5. Establishment of good physician-patient rapport and regular follow up are essential for achieving good glycemic control.

The goals of contemporary diabetes management in children are:

1. Preventing diabetic ketoacidosis (DKA) and severe hypoglycemia
2. Establishing realistic glycemic targets and regimens adapted to individual circumstances
3. Maintain plasma glucose and HBA1c within the normal range
4. Balancing strict glycemic control, which reduce the risk for long term sequel and avoidance of severe hypoglycemia which is more likely with strict glycemic control
5. Setting realistic goals for each child and family
6. Maintaining normal growth and development, and emotional maturation.

Once stabilized, some of the follow-up can be done at the PHC level with the following consideration:

- Education is provided for the patients and their family members or caregivers on Insulin therapy, plasma blood glucose monitoring, effects of diet, physical activity and intercurrent illness on glycemic control, importance of adherence to management instructions, prevention and detection of hypoglycaemia, hyperglycaemia and ketosis, risk of smoking, regular eye and dental examination.
- Regular visits is associated with optimal glycemic control.
- Wearing or carrying identity of having type I diabetes may be necessary in emergency condition.

Urgent and Emergency Issues

Hypoglycemia

- Hypoglycemia is the most frequent acute complication in type I diabetes
- Clinically, hypoglycemia causes signs and symptoms of:
 - **Autonomic activation** (hunger, trembling of hands or legs, palpitations, anxiety, pallor, sweating)
 - **Neuroglycopenia**(impaired thinking, change of mood, irritability, dizziness, headache, tiredness, confusion and later convulsions and coma). This can occur without the alarming symptoms of autonomic activation, which can result in hypoglycemia of which the patient is not aware (hypoglycemia unawareness).

Grading of severity of Hypoglycemia

Mild (grade 1): Child or adolescent is aware of, responds to and self-treats the hypoglycemia. Children aged below 5–6 years can rarely be classified as grade 1 hypoglycemia because they are usually unable to help themselves.

Moderate (grade 2): Child or adolescent cannot respond to hypoglycemia and requires help from someone else, but oral treatment is successful.

Severe (grade 3): Child or adolescent is semi-conscious or unconscious or in coma with or without convulsions and may require parenteral therapy (i.m or s.c.glucagon and/or i.v glucose).

- Mild hypoglycemia may cause a variety of reversible signs and symptoms characteristic of neurological dysfunction.
- Severe prolonged hypoglycemia with convulsions has the potential, particularly in young children, to cause permanent CNS impairment

Treatment of Hypoglycemia

- Mild or moderate (grade 1 or 2)
 - Immediate oral rapidly absorbed simple carbohydrate e.g.
 - 5–15 g glucose or sucrose (tablets/sugar lumps)
 - 100 ml sweet drink (glucose/sucrose drinks, syrup, juice , etc)
 - Wait 10–15 min. If no response - Repeat oral intake as above
 - As symptoms improve or normoglycemia is restored, the next meal or oral complex carbohydrate should be ingested (e.g. fruit, bread, cereal, milk)
 - Blood glucose measurements are the only way to confirm hypoglycemia if the diagnosis is uncertain. Blood glucose measurements also confirm the return of the blood glucose towards normal after hypoglycemia
- Severe (grade 3) Treatment is urgent, by available means as:
 - Severe hypoglycemia with loss of consciousness with or without convulsions (particularly if there is vomiting) is most safely and rapidly reversed by injection of Glucagon, which is best given IM (or deep SC)
 - 0.5 mg for age <12 years
 - 1.0 mg for age 12+ years (or 0.1–0.2 mg/10 kg body weight)
 - If glucagon is unavailable or recovery is inadequate, IV glucose should be administered slowly by trained personnel over several minutes to reverse the hypoglycemia
With iv glucose 10–30% at a dose of 200–500 mg/kg
 - If hypoglycemia is not associated with vomiting nor severe enough to remove the swallowing, spitting or gag reflexes, it is usually effective to give concentrated sugar as glucose gel/syrup/honey/jam carefully by mouth
 - Referral to hospital for optimal management

Recovery phase after severe hypoglycemia

Close observation and blood glucose monitoring are essential because vomiting is common and recurrent hypoglycemia may occur. The patient will then usually require, additional oral carbohydrate and/or IV infusion of glucose (glucose 10% at 1.2–3.0 ml/kg per hour)

Prevention of Hypoglycemia

The dangerous and damaging effects of hypoglycemic episodes can be prevented primarily by the education of the patients, their parents, and other care givers, with particular attention to:

- Early warning signs and symptoms of hypoglycemia, which may be unique to the individual
- Self monitoring of blood glucose
- Effects of exercise on reduction of plasma glucose, increasing the risk for hypoglycemia
- Encouraging snacks and bedtime meals with high fiber, complex carbohydrates with consideration to glycemic index to prevent hypoglycemic attacks.
- Emergency management of hypoglycemic episodes
- Periodic review of individual insulin management
- Taking special care when routines are altered, such as holidays, travel or changes of season
- Repeated advice that a source of glucose or sucrose must always be immediately available
- Equipment for blood glucose measurement must be available to all young people with diabetes for immediate confirmation and safe management of hypoglycemia
- Ideally Glucagon should be readily accessible to all parents and care givers, especially when there is a high risk of severe hypoglycemia. Training on administration of glucagon is essential
- Children and adolescents with diabetes should wear some form of identification or warning of their disease
- Review of glycemic targets for those at high risk (e.g. young children and those with hypoglycemic unawareness)
- Assessment of hypoglycemic episodes with the goal of learning from each episode, particularly
 - Food intake (daytime and bedtime snacks; pre- and post-exercise carbohydrate intake)
 - Insulin action profiles (e.g. rapid-acting insulin analog to reduce post-meal or nocturnal hypoglycemia; splitting evening short/rapid and bedtime intermediate-acting insulin doses)
 - Nocturnal (2.00–4.00 AM) blood glucose measurements

Diabetic Ketoacidosis (DKA):

- Diabetic ketoacidosis is the commonest cause of diabetes –related deaths in children
- Most deaths in DKA occur as a result of cerebral edema.
- Deaths and neurological morbidity should be avoidable by reducing the incidence of DKA through:
 - Earlier diagnosis at onset.
 - Appropriate management of diabetes during inter-current illness.
 - Recognition that recurrent DKA is often caused by insulin omission.
 - Achievement of good glycemic control.

Emergency assessment to confirm the diagnosis:

- Characteristic history: polydipsia, polyuria, vomiting, anorexia, high fever.
- Clinical assessment of dehydration and acidotic breathing and consciousness level
- Biochemical confirmation of plasma glucose, glycosuria, ketonuria, PH and electrolytes.

- Early presentation of ketoacidosis should be considered keeping in mind unexplained abdominal pain , vomiting and loss of appetite

Treatment of Ketoacidosis:

Ketoacidosis in children need to be managed at hospital. A senior specialist/ consultant physician with experience in managing DKA in children should be consulted for optimal management.

Key points in treatment:

- Fluid-rehydration
- Insulin- increase needs
- Monitor ketones
- Monitor plasma glucose

TYPE II DIABETES MELLITUS

Type II diabetes mellitus frequently goes undiagnosed for years because hyperglycemia develops gradually and at earlier stages is often not severe enough for the patient to notice any of the classic symptoms of diabetes.

Patients with type II diabetes are generally obese, especially with central obesity which is strongly associated with a varying degree of resistance to the effects of insulin. This is usually associated in at least 80% of all patients with diabetes with other significant problems of the Metabolic Syndrome,

Metabolic Syndrome

The definition of metabolic syndrome is the presence of 3 or more of following risk determinants:-

- 1- Waist circumference more than 102 cm in men ,88 cm in women.
- 2- Triglycerides equal or more than 150 mg/dl.
- 3- HDL less than 40mg/dl in men , less than50 mg/dl in women.
- 4- Hypertension with B.P equal to or more than130/85 mmHg.
- 5- Impaired fasting glucose equal or more than 100mg/dl.

These levels may not meet the criteria for diagnosis of diabetes or of hypertension in the normal individual, but are statistically correlated with glucose intolerance, relative insulin resistance, and a progressively higher risk of cardiovascular disease and early mortality, which has also been shown to be reduced if all of these factors are adequately controlled.

Clinical Evaluation of the Diagnosed Diabetes and/or Metabolic Syndrome:

Evaluation should be performed at the initial visit to:

- Confirm the diagnosis and the type
- Assess related risk factors
- Detect diabetes complications and comorbidity
- Develop a management plan with the patient and family

Targeted History

- Symptoms of diabetes
- Current medications and Past medical history
 - Family history of first degree relatives with a focus on diabetes, hypertension, heart and vascular problems, especially early death from cardiac causes, renal failure, autoimmune disease)
- Symptoms of diabetic complications and co-morbidities
 - Retinopathy (Vision loss or blurring)
 - Nephropathy (Peripheral edema)
 - Neuropathy (Paraesthesias or numbness of feet or hands) Cold feet
 - Intermittent cramping pain of calf or foot pain at rest, especially at night
 - Burning, tingling, or crawling sensation in feet
 - Pain and hypersensitivity of feet
 - Weakness (foot drop)

- Skin color changes (redness, cyanosis)
- Peripheral Vascular problems
- Life style factors
 - Level and type of daily exercise
 - dietary history (Daily dietary habits, relative composition of protein, carbohydrates and fat, Type of fat taken)
 - tobacco consumption
 - Alcohol use
- Medication and vaccination history(influenza, hepatitis, pneumococcal)
- History of gestational diabetes or delivery of large babies > 4kg.
- Screening for psychosocial state
- Assessment of cognitive function
- Pregnancy planning

Targeted Physical Examination

- Pulse rate
- Respiratory rate
- Blood pressure (with orthostatic blood pressure measurement)
- Height and weight
 - Calculate the Body Mass Index (BMI) as below:

$$\text{BMI} = \text{Weight (kg)} / \text{Height (m}^2\text{)}$$
 Normal BMI Value (18.5 –less than25)
- Waist circumference
 - Normal for men < 102 cm
 - Normal for women < 88cm
- Ophthalmological exam
 - Visual acuity
 - Fundoscopic exam – refer to ophthalmologist for complete exam
- Mouth and dental condition
 - Dental infections
 - Moniliasis or other mucosal abnormalities
- Thyroid abnormalities
 - Enlarged or nodular thyroid
- Cardiac exam
 - apical heave, (LVH)
 - loud S2 or S4, JVD (evidence of heart failure)
 - arterial disease (carotid, peripheral, renal)
 - Edema
- Pulmonary Exam
 - Basal crackles
 - Evidence of fluid or effusion
- Abdominal exam
 - Palpable kidney (polycystic kidney)
 - Other masses(abdominal aortic aneurysm)
 - Bruit (renal artery stenosis)
- Peripheral pulses and distal microvascular circulation
 - Dorsalis pedis and posterior tibial pulses

- Capillary circulation in fingers and toes
- Skin condition
 - Ischemic skin changes
 - Site of insulin injection, lipodystrophy
 - Signs of other comorbidities
- Neurological exam with a focus on:
 - Extremity deep tendon reflexes
- Foot examination:
 - Inspection of the skin, presence of foot cracks, ulcers, callous or deformities and toenails
 - Warmth and vascular assessment
 - Neurological assessment: (10-g monofilament testing for light touch with at least one other assessment: pinprick, temperature, vibration)

Standard Laboratory Evaluation

Fasting plasma glucose
 Hemoglobin A1C
 Lipid profile (Fasting cholesterol, LDL, HDL, Triglycerides)
 Blood urea
 Serum Creatinine
 Estimated glomerular filtration rate
 Urine albumin, ketones, and glucose (dipstick)
 Urine specimen for quantitative albumin – may calculate Albumin/Creatinine ratio
 Liver function tests

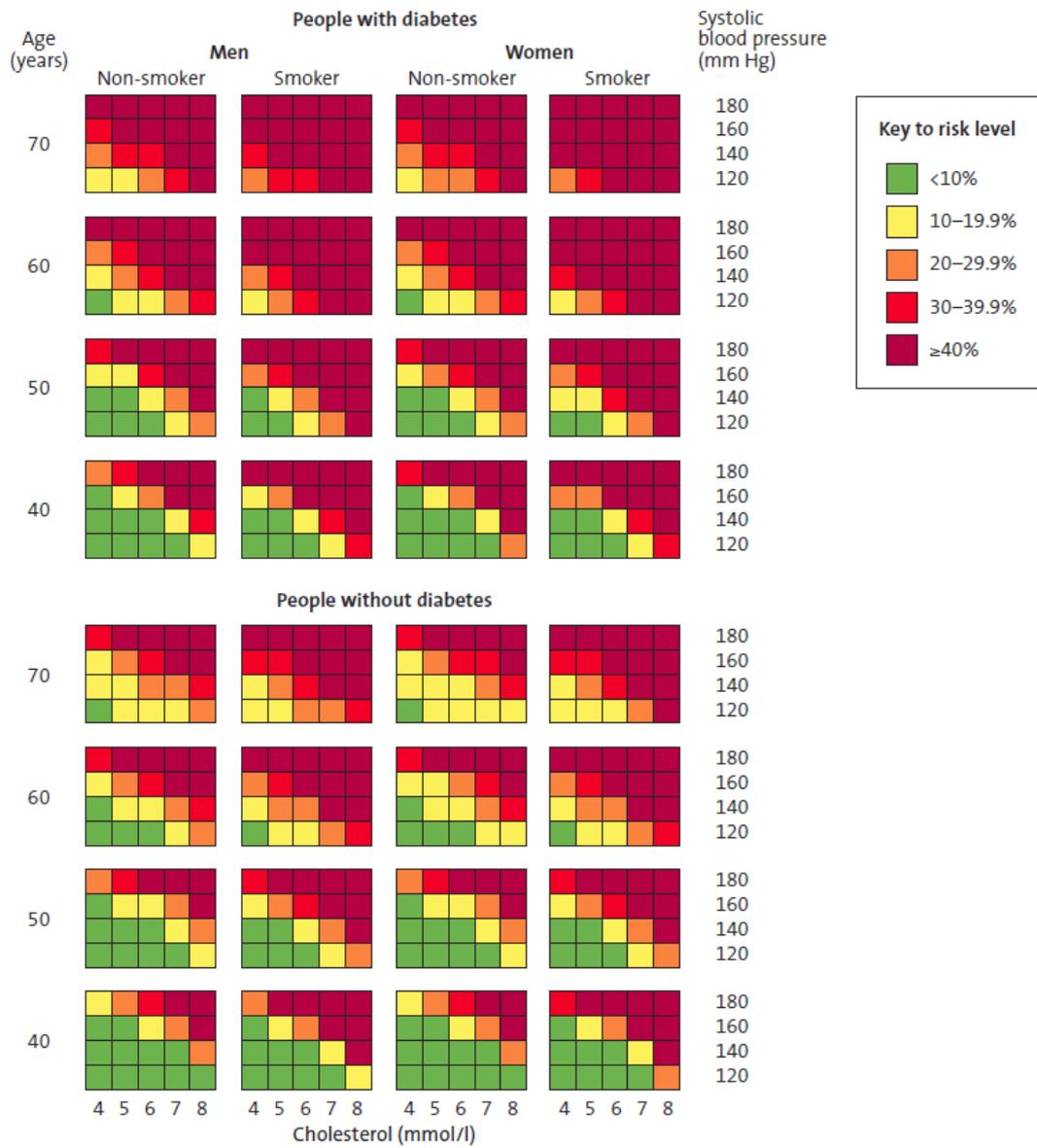
Other condition related investigations:

TSH in type I diabetes
 Vitamin B12 in patients on metformin
 Serum K in patients on ACE inhibitors or ARBs or diuretics.
 ECG in adults

Cardiovascular Risk Classification:

Cardiovascular risk can be expressed as the percentage chance of an individual experiencing a cardiovascular event over a pre-defined period of time, usually the next 10 years. It mainly depends on the presence of CVD risk factors commonly seen with the Metabolic Syndrome such as smoking, average blood pressure, cholesterol levels, age, and presence or absence of diabetes. The WHO-ISH chart can be used to estimate this cardiovascular disease risk over the next 10 years:

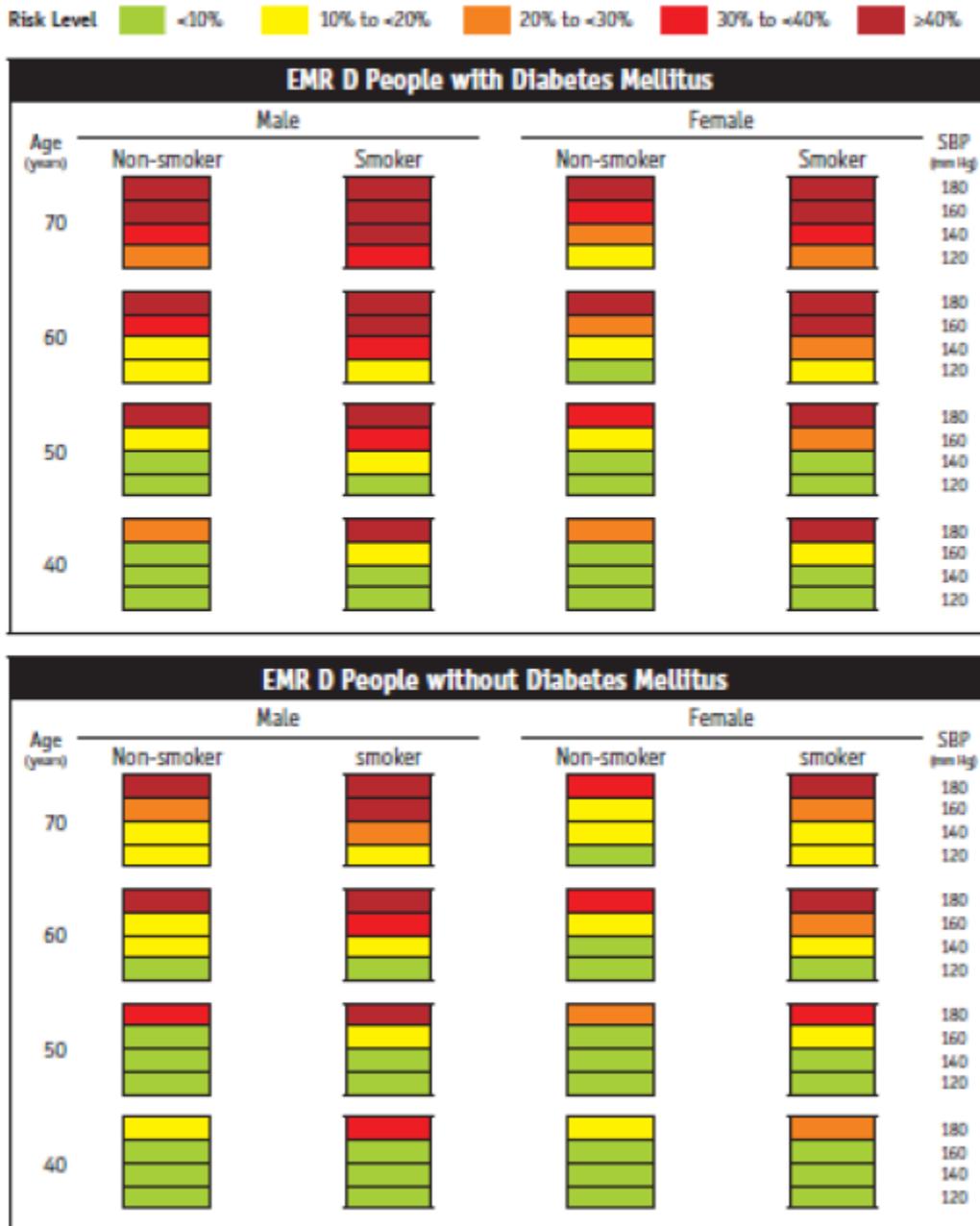
WHO Risk Prediction chart with Cholesterol Measurement



World Health Organization, "Prevention of Cardiovascular Disease", 2007

WHO Risk Prediction chart without Cholesterol Measurement

Figure 14. WHO/ISH risk prediction chart for EMR D. 10-year risk of a fatal or non-fatal cardiovascular event by gender, age, systolic blood pressure, smoking status and presence or absence of diabetes mellitus.



Management of Type II Diabetes and the Metabolic Syndrome

It is important to recognize that each of the problems associated with diabetes, including hypertension, dyslipidemias, a pro-thrombotic tendency, and a pro-inflammatory tendency, must be aggressively and effectively treated simultaneously to reduce the morbidity and mortality of these combined metabolic abnormalities. It should be noted that the metabolic syndrome can be present even in non-obese individuals (with a BMI of < 25), and must be treated in a similar fashion.

There is a wide spectrum in the degree of insulin resistance in patients with glucose intolerance or diabetes, which reflects the severity of the other elements of the metabolic syndrome as well. These differences have resulted in a step-wise approach to the management of diabetes and the metabolic syndrome. In many cases, patients can be controlled with lifestyle changes and Step 2 management drugs. If these measures are not effective in reaching the target goals, referral to a specialist for consultation and management will be necessary.

Aggressive control of the blood glucose alone may not significantly decrease the death rate in diabetics from heart attack or stroke, but simultaneous and rigorous control of the blood pressure in diabetic patients contribute to reduction in death from all causes, and decrease in the associated microvascular problems.

Glycemic control is not the only goal. It has also been found that the simultaneous treatment of co-existing hypertension and dyslipidemia improve the prognosis.

Goals of Diabetes and Metabolic Syndrome Management

The goals for chronic diabetes and the metabolic syndrome may be different from the goals of those who are normal or non-diabetic

Table 2 : Target Goals for Diabetes and Metabolic Syndrome according to WHO Recommendations

Parameter	Goal
Fasting plasma glucose	80- ≤126 mg/dl. (4.4 – ≤7.0 mmol/L)
HbA1C	≤7.0%
Blood pressure	≤130/80 mmHg
Serum total cholesterol	<200 mg/dl. (< 5.2 mmol/L)
LDL cholesterol	<100 mg/dl. (< 2.6 mmol/L)
HDL cholesterol	Men > 40 mg/dl (>1.0 mmol/L) Women > 50 mg/dl. (>1.3 mmol/L)
Triglycerides	< 150 mg/dl. (<1.7 mmol/L)
Stop smoking	No smoking
Daily Exercise	Daily 30-60 min. moderate/ vigorous activity
Preprandial plasma glucose	80-130 mg/dl
Alcohol	Absenteeism

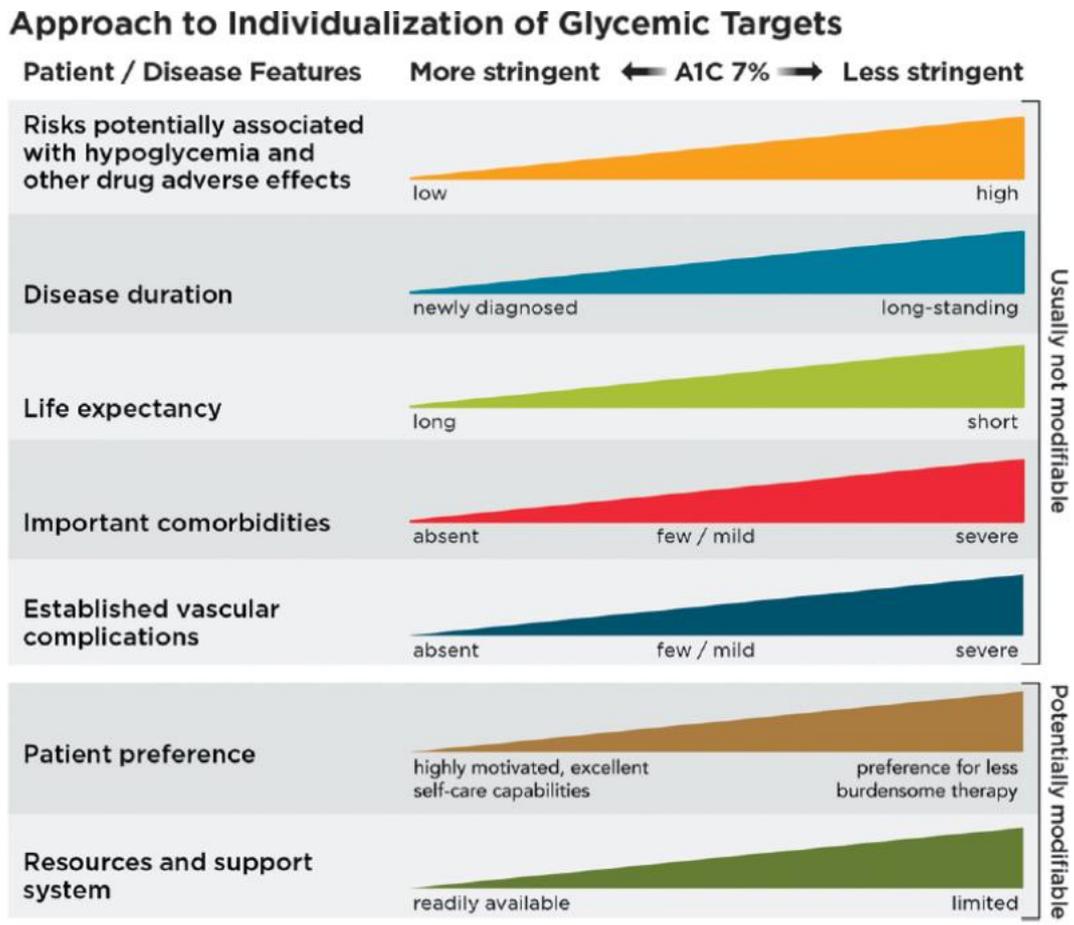
NOTE – MUST WORK SIMULTANEOUSLY TOWARD ACHIEVEMENT OF ALL TARGET GOALS

Stepped Integrated Management of Diabetes and Metabolic Syndrome

Key points:

- Individualized approach should be adopted taking into account risk potential with drugs adverse effects, disease duration, life expectancy, comorbidities, established vascular complications, patient preference, resources and support system.

- Diabetic with co-morbidities and/or diabetes complications should be referred for specialized care
- In the presence of severe osmotic symptoms (severe polyurea, polydipsia and weight loss, the patient should be referred



Source: *Standards of Medical Care in Diabetes - 2019. Diabetes Care 2019;42(Suppl. 1):S61-S70*

Glycemic control

Step1: Life style modification (Annex3) :

To be continued alone for 3 month trial, and throughout ALL steps of management

- **Weight loss**

Weight loss is the cornerstone of management of Type II diabetes and the metabolic syndrome, and is shown to result in increasing insulin sensitivity with reduction of blood pressure and dyslipidemia

- Calories restricted based on BMI and Physical activity practiced. with 50-60% in the form of complex, starchy carbohydrates, 20% fats, and 20% protein.
- Weight loss should be gradual, not more than 1 kg/week
- Weight loss should be at least 5% of body weight (reference)

- **Diet therapy**

Weight loss diet as above, with additional modifications to lower LDL cholesterol and triglycerides and reduce blood pressure

- Incorporate low fat dairy products and lean meat into the diet, replacing most red meat with skinless chicken or with fish (rich in omega-3 fatty acids)
- Vegetable oils are preferred
- Keep sodium level to 2.3 gm/day or less by adding no extra salt to cooking or at the table. Salt substitutes or other spices may be used in moderation
- Add daily fiber in form of beans, oats or other whole grain foods or pasta, or fiber product 10-15gms/day
- Food items with high glycemic index (obviously sweet foods) should be avoided

- **Regular exercise program(Annex 1)**

- Regular aerobic vigorous/moderate exercise 30 minutes/day, 5 days per week is highly recommended and beneficial
- Diabetics medications and diet should be adjusted according to exercise
- Benefits of exercise in diabetes:
 - Improved insulin sensitivity.
 - Improved glycemic control (in type2 diabetes)
 - Improved lipid profile (reduced triglycerides and increased HDL cholesterol)
 - Lowered blood pressure
 - Improved fibrinolysis.
 - Potentiation of weight loss with proper diet
 - Improved quality of life and self-esteem

- **Stop smoking**

- Message to stop smoking must be clear and direct – “cutting down” is not adequate to prevent the added complications of smoking
- Usually requires a focused behavior modification approach
- Assist patient to specify a “stop date”

- Offer advice on how to cope with anxiety and cravings
 - Frequent small snacks
 - May benefit from nicotine patches or chewing gum (Nicorette)
 - Withdrawal symptoms will subside with time
 - Visit to the smoking cessation clinic

Step2:

If not reaching target level with lifestyle modification alone after 3 months trial, add oral glucose lowering medication, beginning with one drug . BEGIN with metformin 500 mg/day, increase as needed to 2000 mg/day in two equally divided doses

If not at target blood glucose in response to this, Continue metformin and add new generations of sulphonylurea. If not available add glibenclamide - begin at 2.5 mg/day, increase as needed to a maximum of 15 mg/day. Glibenclamide should be avoided above the age of 60

If still not at target blood glucose in response to above: refer to specialist for consultation and initiation of Insulin therapy

Step 3:

Begin with insulin therapy, with or without oral medications (Annex1)

Step 4:

Intensive Insulin therapy

Hypertension Management

Refer to MOH Guideline on hypertension” for complete description and protocol.

Step 1: Lifestyle modification trial for 2-4 months, and continue throughout management (Annex3).

If blood pressure > 130 systolic or > 80 diastolic on 2 or more separate occasions in spite of life-style and diet changes:

Step 2:

- Classify the degree of hypertension (with revised norms based on the presence of diabetes)
- Exclude possible secondary causes of hypertension
- Begin management with ACE inhibitor medication. If not controlled add second antihypertensive medication. ACEI or ARB based treatments favorably affect the progression of diabetic nephropathy and reduce albuminuria, and ARBs have been shown to reduce progression to macroalbuminuria., BBs, ACEIs, ARBs,CCBs and Thiazide diuretics have been shown to be beneficial in reducing CVD and stroke incidence in patients with diabetes.

- Blood pressure target should be individualized based on 10 yr cardiovascular risk and medication adverse effects. Individuals with low cardiovascular risk the target blood pressure is < 14/90 mmHg. Those with high risk the target is <130/80 if safely attained.

step 3

If not at target BP in response to this: Refer to specialist for management.

Dyslipidemia management

Step 1: Lifestyle modification trial for 2-4 months, and continue throughout management (Annex3)

If lipid levels not at target levels in spite of life-style changes and appropriate diet and exercise:

Step 2: Begin daily statin medication (with referral to and consultation with specialist) as follows:

High intensity statin for all ages with high cardiovascular risk

Moderate-intensity according to age:

<40 years with additional atherosclerotic cardiovascular disease risk factors

≥40 years without atherosclerotic cardiovascular disease

Statin therapy is contraindicated in pregnancy

Step 3: If lipid levels still not at target levels, refer to specialist for management

Pro-thrombotic state management if indicated

- Use aspirin therapy (75-162 mg/day) as:
 - **Secondary prevention** strategy in those with diabetes and a history of **atherosclerotic cardiovascular disease**
 - **Primary prevention** strategy in those with diabetes who are at **increased cardiovascular risk**, after a discussion with the patient on the benefits versus increased risk of bleeding
 - If not at target levels, **refer for specialized care**

Psychosocial assessment:

All patients with diabetes should have psychosocial assessment to optimize quality of life:

- Assessment for symptoms of diabetes distress, depression, anxiety, disordered eating, and cognitive capacities using patient-appropriate standardized and validated tools at the initial visit, at periodic intervals, and when there is a change in disease, treatment, or life circumstance. Including caregivers and family members in the assessment.
- Screening older adults (aged ≥ 65 years) with diabetes for cognitive impairment and depression.

Management of Special Diabetic Patients:

- **Elderly > 60 years**

Red flags for elderly

- They may have multiple co-morbidities.
- Deterioration of renal function is to be considered
- Poly pharmacy is not preferable so as to avoid drug interaction
- They show increased sensitivity to anti-diabetic medication. Tight glycemic control should be avoided in order not to run the risk of hypoglycemia
- Target HbA1C should be individualized according to patient condition. A level more than 7 mmol/L may be logical
- Special attention is required to control of systolic hypertension

- **Renal disease**

- Monitor serum creatinine and Albumin/Creatinine ratio regularly
- Consider adding an ACE inhibitor if Albumin/Creatinine ratio elevated, in consultation with nephrologist

- **Pregnancy**

- Refer to Obstetrician/Gynecologist for management during pregnancy. May require transfer to insulin therapy during pregnancy

- **Coexisting heart or vascular disease**

- Refer to cardiologist for co-management.

Follow-up Management of Diabetes and Metabolic Syndrome

All patients should be seen and evaluated on a regular basis, preferably monthly, and the following parameters should be evaluated:

Every visit:

- Fasting plasma glucose
- Blood pressure
- Medication dose review
- Patient education – may rotate topics discussed (better in groups)
- Foot examination

Every three months or as indicated:

- Weight
- Waist circumference
- Fasting glucose
- Foot exam
- Neurologic exam
 - o especially lower extremities
 - o Test for light touch, vibration or position sensation, pin prick sensation
 - o May use a standardized monofilament for light touch sensation for reliability
- Medication dose review
- Patient education – may rotate topics discussed (better in groups)
- Refer for A1C (If not controlled or change medication until HbA1C is stable on unchanging therapy)

• **Every 6 months:**

Refer to hospital for specialized tests and specialty consultation:

- Hemoglobin A_{1c} stable on unchanging therapy
- Lipid profile and management of dyslipidemia
- Ophthalmologic evaluation
- Quantitative albumin/creatinine ratio (request single urine specimen for quantitative albumin, and request serum creatinine)
 - o Albumin/creatinine ratio calculated by dividing urine albumin (in mg/l by serum creatinine (in mg/100 ml.) Result is an empiric ratio that correlates with presence or absence of early nephropathy (normal <30, suspected nephropathy >30)
 - o Refer to specialist if Albumin/Creatinine ratio >30 for followup. May consider starting daily dose of captopril or enalapril to preserve renal function, even if blood pressure normal or mildly elevated
- Testing for B12 every patient taking metformin

• **Every year** (especially after 5 years duration of diabetes or age >40)

- Monitor serum cholesterol, HDL, LDL, Triglycerides
- ECG
- Screen for stress, anxiety, and depression

- **Foot monitoring (Annex 4):**

- Patients with symptoms of claudication or decreased or absent pedal pulses should be referred for ankle-brachial index and for further vascular assessment as appropriate.
- Patients who smoke or who have histories of prior lower-extremity complications, loss of protective sensation, structural abnormalities, or peripheral arterial disease should be referred to foot care specialists for ongoing preventive care and lifelong surveillance.
- Provide general preventive foot self-care education to all patients with diabetes.

- **Counseling in family planning if appropriate**

Female diabetic patient at child bearing age should have good glycemic control at least three months before gestation

Referral to a Diabetologist or other Specialists:

1. For persistent hyperglycemia or other parameters (blood pressure, lipids) uncontrolled with above treatment
2. Pregnancy and diabetes (either gestational or pre-existing diabetes) – refer to Diabetic specialist and Obstetrician
3. Initial presentation of Type I Diabetes
4. Diabetic ketoacidosis or hyperglycemic hyperosmolar coma refer to emergency room
Serious acute illness in addition to diabetes
5. Switching from oral hypoglycemic medication to insulin
6. Recognition and management of dyslipidemia
7. Presence of microvascular or macrovascular complications
8. Refer patients who smoke or who have histories of prior lower-extremity complications, loss of protective sensation, structural abnormalities, or peripheral arterial disease to foot care specialists for ongoing preventive care and lifelong surveillance.

Self care and home care:

Diabetes, with or without Metabolic Syndrome, is a chronic, life-long disease. The success of management depends on an effective partnership between the doctor and patient. The patient and his family members and care givers must learn the disease, the medication and management plan, gaining skills in monitoring blood sugar, blood pressure and other elements and provide the doctor with the information to change the management as needed. Advantages include:

- Greater awareness of relationship between activity, exercise, diet, and medication
- Greater collaboration in management of disease
- Improved communication with health care providers

Prevention of Diabetes Mellitus :

• Screening for Type II Diabetes:

- Testing type II diabetes in asymptomatic people should be considered in adults of any age who are overweight or obese ($\text{BMI} \geq 25 \text{ kg/m}^2$) and who have one or more additional risk factors for diabetes.:
 - First degree relative with diabetes
 - History of cardiovascular disease
 - Hypertension or on therapy for hypertension
 - Women with polycystic ovary syndrome
- Individuals with pre-diabetes (impaired plasma glucose should be tested yearly)
- Women with gestational diabetes should have life long testing at least every 3 years. **If high or impaired plasma glucose should be monitored accordingly)**
- For all people, national screening system exists for at age 40 years.
- If tests are normal, repeated testing should be carried out at a minimum of 3-year intervals.

• Screening for gestational diabetes

- Test for undiagnosed diabetes at the first prenatal visit in those with risk factors using standard diagnostic criteria.
- Test for gestational diabetes at 24-28 weeks of gestation in pregnant women not previously known to have diabetes.
- Test women with gestational diabetes for prediabetes or diabetes at 4-12 weeks postpartum, using the 75-g oral glucose tolerance test and clinically appropriate nonpregnancy diagnostic criteria.

• Promotion of healthy life style:

- **Diet** – Encourage low saturated fat, low sodium, high fiber diet with calories restricted to promote weight loss
- **Physical activity:** Perform regular aerobic moderate physical activity at least 30 minutes/day, 5 days per week. Avoid sedentary life style
- **Smoking cessation**
- **Obesity management**
 - Keep $\text{BMI} < 25$ (achieve and maintain more than 5% loss of initial body weight)
 - Waist circumference should be less than target figures

• Pharmacological intervention:

- Metformin therapy for prevention of type 2 diabetes should be considered in those with prediabetes, especially for those with $\text{BMI} \geq 35 \text{ kg/m}^2$, those aged < 60 years, and women with prior gestational diabetes mellitus.
- This may lead to Vit B12 deficiency and periodic assessment is required.

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Diabetes and Metabolic Syndrome Management

ANNEXES

Annex 1

Insulin Therapy, for those PHC Centers with the expertise and availability of the drugs.

Principles of insulin therapy:

- To provide sufficient insulin throughout the 24 hours to cover basal requirements
- To deliver adequate boluses of insulin in an attempt to match the hyperglycemic effect of meals.

Insulin preparations:

- There are many different insulin preparations and delivery systems are available, like syringes ,pens and insulin pumps.
- Short acting insulin (soluble, regular, human. E.g Actarpid, Humilin)
- Rapid acting insulin analogs (e.g. Insulin Lispro, insulin Aspart,glulisine)
- Intermediate acting insulin (e.g. Isophane NPH)
- Long acting insulin (e.g. Ultralente[®], untratard[®] insulin)
- Long acting insulin analogs e.g. (glargine, detemir)
- Premixed human insulin (e.g. Mixtard in ratios of: 10:90, 15:85, 20:80,25:75,30:70,40:60, 50:50)
- Premixed biphasic Insulin (e.g. Biphasic insulin aspart)

Frequently used regimens

- Two injections daily of a mixture of short and intermediate-acting insulins (before breakfast and the main evening meal)
- Three injections daily using a mixture of short and intermediate acting insulins before breakfast; short-acting insulin alone before an afternoon snack or main evening meal; intermediate-acting insulin before bed; or variations of this.
- Basal-bolus regimen of short-acting insulin 20-30 min before main meals (e.g. breakfast, lunch and the main evening meal); intermediate or long-acting insulin at bedtime
- Basal-bolus regimen of rapid-acting insulin analog immediately before main meals (e.g. breakfast, lunch and main evening meal); with intermediate-or long-acting insulin at bedtime
- Insulin pump regimes are regaining popularity with a fixed or variable basal dose and bolus doses with meals
- None of these regimens can be optimized without frequent assessment by blood glucose monitoring

Insulin therapy for children and young people with type I diabetes

While the insulin regimen should be individualized for each patient, there are 3 basic types of insulin regimen.

Multiple daily injection basal–bolus insulin regimens: injections of short-acting insulin or rapid-acting insulin analogue before meals, together with 1 or more separate daily injections of intermediate-acting insulin or long-acting insulin analogue.

Continuous subcutaneous insulin infusion (insulin pump therapy): a programmable pump and insulin storage device that gives a regular or continuous amount of insulin (usually a rapid-acting insulin analogue or short-acting insulin) by a subcutaneous needle or cannula.

One, two or three insulin injections per day: these are usually injections of short-acting insulin or rapid-acting insulin analogue mixed with intermediate-acting insulin

Key points on dosage:

- Daily insulin dosage varies greatly between individuals and changes over time. It therefore requires regular review and reassessment. Dosage depends on many factors such as:
 - Age
 - Weight
 - Duration and phase of diabetes
 - State of injection sites
 - Nutritional intake and distribution
 - Exercise patterns
 - Results of plasma glucose monitoring (and glycated hemoglobin)
 - Inter-current illness
 - number of daily injections
 - the need of flexibility in meal planning and the unique family schedule.
- During the partial remission phase (honeymoon period) the daily insulin dose often gradually declines to <0.5 IU/kg per day
- Prepubertal children (outside the partial remission phase) usually require 0.7-1.0 IU/kg per day
- During puberty, requirements may rise substantially above 1 IU/kg per day

Injection sites

- The usual injection sites are
 - Front of thigh/lateral thigh (the preferred site because of ease of access, administration and for slower absorption of longer acting insulins)
 - Abdomen (the preferred site when faster absorption is required, and it may be less affected by muscle activity on exercise)
 - Buttocks (upper outer quadrant - may be useful in small children)
 - Lateral aspect of arm (in small children with little SC fat, IM injection is more likely and it may cause unsightly bruising)

Problems with injections

- Local hypersensitivity reactions to insulin injections are uncommon but when they do occur, formal identification of the insulin (or more rarely preservative) responsible may be possible with help from the manufacturer, or a trial of an alternative insulin preparation may solve the problem
- Lipohypertrophy with the accumulation of fat and fibrous tissue in lumps underneath the skin is common in children
- Lipoatrophy is now uncommon since the introduction of highly purified insulins
- Painful injections are common problems in children. Check angle and depth of injection to ensure injections are not being given IM

- Leakage of insulin is common and cannot be avoided. Encourage slower withdrawal of the needle from the skin, stretching of the skin after the needle is withdrawn, or pressure with a clean finger over the injection site
- Bruising and bleeding are more common after IM injection or tight squeezing of the skin
- Bubbles in insulin should be removed whenever possible.

Annex 2

Key points in education for type I diabetes:

Continuous education is needed with continuous review of previously learned information and addition of new concepts. It is important to take into consideration the family educational level and cultural practices. The educator must be sensitive to the age and developmental stage of the child and adolescents, and shift educational efforts from caregiver(s) to the adolescent when time is appropriate. Continued parental supervision of adolescent with diabetes is crucial to metabolic control

At initial visit or at diagnosis:

- What is type I diabetes, and how is different from the much commoner type II diabetes in adult population
- Need for lifelong insulin replacement and ensuring good glycemic control
- Targets for fasting and post prandial blood glucose
- Brief discussion of short and long term complications
- Technique of insulin administration (should teach administration by insulin syringes and needle to all, even if pen have been prescribed), injection site rotation, insulin storage, and handling
- Self-monitoring blood glucose and maintenance of records
- Symptoms of hypoglycemia and its management
- Basic dietary advice, with a simple clear individualized diet plan
- Appropriate storage of Insulin
- Information on possible transient honey moon phase (Transient remission) that needs reduction of insulin to avoid hypoglycemia. The duration of this period is variable for weeks, months or rarely years.
- The child can live a healthy life with normal life span if properly managed

At second visit (preferably within a week after discharge or from first visit)

- Review the information given earlier, ask questions to gauge the parents understanding
- Go over the records, and reinforce action to be taken for values outside the acceptable range
- Ensure that insulin being administered is the same as has been prescribed and appropriate insulin syringe is being used (U-50syringe for 50U/ml insulin, U-100 syringe for 100U/mlinsulin and see the detailed increments if it 1U to each increment or 2U to each increment)
- Teach basic modification of the dose of insulin according to plasma glucose values
- Sick day management and school-related issues, checking urinary ketones and action to be taken

At subsequent visits.

- Based on the motivation of the patient and the family,
- Review the information given earlier
- Adherence to treatment and life style practice

Annex 3

Life Style Management

Diet Therapy

A patient with diabetes or the metabolic syndrome should consider the following:

- A healthy diet should organize both the quality and quantity of the diet.
- Should have three main meals (breakfast, lunch and dinner) with snacks in between the meals. The snacks are especially important for children, pregnant women, and the elderly because of their limited food intake and increased needs for nutrition and for those on Insulin therapy.
- Most adults with diabetes and the metabolic syndrome are overweight, and can develop a significant level of control of their diabetes, blood pressure, and abnormal blood lipids by simply losing weight and keeping it off
- A dietician trained in pediatric nutrition and diabetes should help to develop a meal plan that is individualized to the patient's daily schedule, food preferences, cultural influences and physical activity.
- The total number of recommended calories follows the child's growth requirements along with consideration to the need for weight gain or loss.
- Growth velocity, weight gain, and BMI should be monitored at every visit to ensure that the meal plan is sufficient to meet the energy requirement of the patient.
- Unexpected weight loss or poor weight gain should promote consideration of suboptimal metabolic control, as well as eating disorders, thyroid dysfunction or gastrointestinal disease i.e. possibility of associated celiac disease.
- Fasting for long times, and also taking too much food in one meal, because either extreme will negatively affect the level of blood sugar.

Use the following modified Dietary Approaches to Stop Hypertension (DASH) Eating Program as a guide to selection and quantity of foods:

DASH Eating Program

Food	Servings per day	Serving Size
Grains	5-6 daily servings	½ cup cooked rice or pasta; 1 slice whole grain bread
Vegetables	4-5 daily servings	1 cup raw vegetables or fruit ½ cup cooked vegetables or fruit
Fruits	2-3 daily servings	1 cup raw fruit 1 medium banana 1 orange, ½ grapefruit
Low-fat or fat-free dairy products	2-3 daily servings	1 cup of low-fat milk or yoghurt
Lean meat, poultry	2 daily servings	90 grams cooked lean meat

Food	Servings per day	Serving Size
and fish		90 grams cooked chicken
Nuts, seeds, and dry beans/lentils	1-2 servings per day	15 grams of nuts ¼ cup cooked beans, peas, or lentils, humus
Fats and oils	2-3 daily servings.	1 teaspoon olive oil
Sweets - limited	Less than 1 serving per day	1 small piece of pastry or sweet

Note: DASH diet adapted slightly for approximately 1600 Kcal/day, and to control simple sugars. See also Annex 3 – “Diet for Diabetes and Metabolic Syndrome” for general suggestions. http://www.nhlbi.nih.gov/health/public/heart/hbp/dash/new_dash.pdf

- Suggestions for starting the DASH eating program:
 - Add more vegetables, rice, pasta, and dry beans or lentils to your diet.
 - Use fruit with meals or as a snack. Unsweetened canned and dried fruits are easy to use; choose fresh fruits in season.
 - Use whole grains such as brown rice, whole wheat bread, bulghur wheat, or oats as much as possible
 - Use only small amounts of butter, margarine, or salad dressing, and use low-fat or fat-free condiments and olive oil.
- Use healthy oils for cooking and eating:
 - Use olive oil and other unsaturated fat oils such as sunflower oil
 - Eat foods rich in omega-3 fats such as fresh fish
- Take low-fat or no-fat dairy products (yoghurt, cheese or milk) three times a day.
- Use only low fat meats like chicken, fish or lean beef, and limit the quantity to no more than 180 gms/day.
- Instead of typical high fat or sweet snacks (chips, candy, etc.), eat unsalted pretzels or nuts, raisins or dried apricots, plain crackers or biscuits, low-fat and fat-free yogurt and frozen yogurt; unsalted plain popcorn with no butter, fresh fruit or raw vegetables.
- Read food labels carefully to choose products that are lower in sodium. Avoid the following high sodium (salt) items:
 - flavoring cubes (Maggi cubes) and soy sauce
 - canned and/or dried soup
 - canned vegetables
 - processed meats and luncheon meats
 - salted snacks like chips, pretzels, pickles
- Avoid fad (magazine-published) diets;
 - Eat a balanced diet instead
 - Eat small, frequent meals
 - Avoid large and heavy meals
- Check with your doctor about supplementing your diet with B vitamins
- Reduce salt in your diet
 - Avoid cooking with salt
 - Avoid fast food
 - Avoid salty food ,such as pickles, cured meats, salty snacks, and canned soup

- Avoid seasonings that contain sodium , such sauces, ketchup and monosodium glutamate
- Do not add salt to your food after it is prepared
- Read food labels and buy foods that are low in sodium
- When eating out ,ask that your food be prepared without salt
- Take foods rich in fiber every day
 - Dietary fiber is a plant material that humans cannot digest. Fiber increases the amount of stool in your intestine. The most well-known fiber is wheat bran.
 - In addition to lowering cholesterol and blood sugar levels, some studies have shown that people with hypertension who increase fiber in the diet for at least 8 weeks can significantly lower their blood pressure. As an added benefit, high fiber foods usually contain important vitamins and minerals.
 - Fiber comes in 2 forms, based on whether it will dissolve in water: soluble and insoluble. Most experts believe that most fiber intake should be in the form of **insoluble fiber**
 - Water Soluble Fiber sources: fresh fruits, dried fruits, vegetables, green leafy vegetables, oats, barley, legumes
 - Insoluble Fiber sources : vegetables, whole wheat, bran, whole grain brown bread
 - Raw foods tend to have more fiber than cooked, canned or pureed items. Even chopping and peeling skins removes some fiber
 - Fiber can also be taken in common fiber supplements like Metamucil, or whole wheat bran can be purchased very inexpensively from a miller. Use 2-3 teaspoons of bran in many cooked dishes
 - When taking high fiber foods, be sure to take at least 2 liters of water or other fluids every day. Fiber tends to bind water, which leads to softer stools and a more rapid transit of material through the intestines.
- Examples of a high – fiber diet:
 - **Breads and grains** : e.g. : Barley, whole grain breads , whole grain baked pastries and muffins
 - **Fruit** : Apple, orange, banana, dates, peach, pear
 - **Vegetables**: Carrots, spinach, tomato, potatoes, cabbage, zucchini
 - **Substitutes for meats**: Meat has no fiber and contains various amounts of cholesterol and saturated fats. There are many high-fiber foods that can help replace meat protein in the diet, such as almonds, kidney beans, peanuts, sesame seeds, sunflower seeds

Physical activity:

- Children and adolescents with type I or type II diabetes or prediabetes should engage in 60 min/day or more of moderate- or vigorous-intensity aerobic activity, with muscle-strengthening and bone-strengthening activities at least 3 days/week.
- Most adults with type I and type II diabetes should engage in 150 min or more of moderate-to-vigorous intensity aerobic activity per week, spread over at least 3 days/week, with no more than 2 consecutive days without activity. Shorter durations

(minimum 75 min/week) of vigorous intensity or interval training may be sufficient for younger and more physically fit individuals.

- Adults with type I and type II diabetes should engage in 2-3 sessions/week of resistance exercise on nonconsecutive days.
- All adults, and particularly those with type II diabetes, should decrease the amount of time spent in daily sedentary behavior. Prolonged sitting should be interrupted every 30 min for blood glucose benefits, particularly in adults with type II diabetes.
- Flexibility training and balance training are recommended 2-3 times/week for older adults with diabetes

Annex 4

Foot Examination and Patient education

Screening symptoms of diabetic peripheral neuropathy

- Cold feet
- Intermittent cramping pain of calf or foot pain at rest, especially at night
- Burning, tingling, or crawling sensation in feet
- Pain and hypersensitivity of feet
- Weakness (foot drop)
- Skin color changes (redness, cyanosis)

Screening test for high risk of neuropathy

- Use 10 gm. Monofilament to test for light touch
- Apply Monofilament to sole of foot distally sufficient to bend monofilament – ask patient if and where pressure is felt
- Inability to feel 10 gm. pressure is high risk for future skin damage and ulceration

Patient education to prevent foot injury

- Shoes: Should be low heeled, made of soft leather or fabric, neither tight nor loose, with wide toes to avoid pressure, and the arch of shoe filling properly with the arch of the foot. Proper arch inserts should be used. Advise patient to look carefully to the inside of shoes before wearing to avoid pressure points from shoe
- New Shoes: Should be neither tight nor loose. Should be worn only for 2 hours on the first day, then increase daily use by one hour until shoes become comfortable
- Stockings and socks: Better made of cotton, thick, and warm with loose garters
- Bare foot walking: Absolutely prohibited whether indoors or outdoors
- Management of dry skin and cracks:
 - Dry skin without cracks: Soak feet daily in warm tap water for 10 – 15 minutes, dry gently, and rub with mineral oil or thick moisturizing cream to keep moisture.
 - Dry skin with cracks: Rub callus at edges of cracks with file or rough stone. Then soak feet in mild soap water for 10 – 15 minutes. Cover cracks with antiseptic such as neomycin ointment – and rub feet with mineral oil.
- Management of corns and calluses:
 - To remove excess corns or calluses ask patient to soak feet in warm tap water with mild soap for 10 minutes, then rub excess tissues by a file. If not effective consult podiatrist
- Nail care:
 - Clean around nails with a wood stick. If nails are long, file them. Filing should be straight and not shorter than the underlying soft tissues of the toes.
 - Soak brittle nails for 30 minutes each night in warm tap water
 - It is important for each diabetic patient to develop a habit of visually inspecting both feet at least once weekly, or more often if the diabetes is advanced. The elements of this inspection should include the following:
 - Daily washing and inspection

- Keeping walking areas clear of dangerous objects
 - Appropriate footwear (selection, fitting and use)
 - Using slippers indoors-no bare feet allowed at any time!
 - Proper nail and callous care – no bathroom surgery allowed on these areas!
 - Avoid extreme temperatures of either cold or heat on the feet
 - Avoid soaking of the feet for long periods of time, which can lead to burns and excessive softening of the skin
 - Report foot problems promptly to a physician (infections, ulcers, and cuts that do not heal)
-
- Care of abrasions and minor trauma and infection
 - Patient should consult his physician, even in case of minor injuries. If a physician is not easily accessible at all times, patients should consult with a physician in case of redness, blistering or swelling
 - Cover area with sterile gauze fitted by non-adhesive plaster. Advise patient not to use limb excessively and to elevate foot while sitting.
 - Avoid irritant antiseptics
 - Treat infections aggressively

Annex 5

Self monitoring and Home Care of Diabetes and Metabolic Syndrome

The important elements are the following:

- Life style modification (annex 3)
- Know and be alert to danger signs of diabetes and the metabolic syndrome
 - Hypoglycemia symptoms – light-headedness, difficulty walking, confusion, disorientation
 - The treatment for hypoglycemia (15 grams of sugar), which should be carried with most diabetics
 - Actions to take to prevent relapse of hypoglycemia – regular scheduled eating 2-3 times daily, avoid fasting, balance food intake with exercise, confirm with doctor the dosages of medication
 - Possible vaginal yeast infections in women with diabetes
 - Postural dizziness with changes in position, especially for those with metabolic syndrome and several controlling medications
 - Any suggestion of a serious complication:
 - chest pain or pressure
 - weakness on one side of the body
 - vision changes
 - loss of consciousness, even if only for a few minutes
- Self/ home blood glucose monitoring
 - Patients should be encouraged to purchase a home glucose monitor, and taught how to use it effectively. Blood glucose results can then be recorded in a logbook with the date and any pertinent observations, for review by the monitoring physician
 - Home glucose monitoring is especially helpful for those patients who are unstable, whose diet is erratic, and who are on insulin.
 - Ideally monitoring should be performed 4-6times daily: fasting, Before and 2- hours after meals and during night. Also checked during and few hours after vigorous sport or exercise; to confirm presence of hypoglycemia and documentation of recovery. More frequent checking is needed on sick days.
 - Since each glucose monitor requires a unique set of test strips, it is important that the patient purchase a monitor for which the test strips are easily and economically available in his/her region.
 - The doctor or nurse should review the use of the glucose monitor with the patient to be sure that the correct technique is followed for accurate results. The frequency of recommended use of the monitor will depend on the stability of the patient's diabetes, the age, the medications being used (especially if insulin is used), and whether or not the patient is susceptible to episodes of hypoglycemia
- Home blood pressure monitoring
 - Since the majority of those with adult onset diabetes also have increased blood pressure, it is very helpful for the patient to also purchase a blood pressure

apparatus to self-monitor the blood pressure in varying stages of life. This will assist the doctor in deciding on the proper medications and dosage for best control of the blood pressure

- Monitoring of blood lipids
 - Similarly, most adult patients with diabetes also have abnormal blood lipids (fats), which increase the risk of atherosclerosis and problems such as heart attacks and stroke. These should be monitored on a regular basis, at least once or twice each year, to help the doctor decide what treatments should be used to help control the lipids. This is one element of care that must be done by a physician or hospital laboratory.
- Home monitoring and care of the feet
 - It is important for each diabetic patient to develop a habit of visually inspecting both feet at least once weekly, or more often if the diabetes is advanced. The elements of this inspection should include the following:
 - Daily washing and inspection
 - Keeping walking areas clear of dangerous objects
 - Appropriate footwear (selection, fitting and use)
 - Using slippers indoors-no bare feet allowed at any time!
 - Proper nail and callous care – no bathroom surgery allowed on these areas!
 - Avoid extreme temperatures of either cold or heat on the feet
 - Avoid soaking of the feet for long periods of time, which can lead to burns and excessive softening of the skin
 - Report foot problems promptly to a physician (infections, ulcers, and cuts that do not heal)
 - See Annex 4

Annex 5

Home Care of Diabetes and Metabolic Syndrome

Annex 5 Home Care of Diabetes and Metabolic Syndrome

The important elements of the home care of diabetes and the metabolic syndrome are the following:

- Weight loss
 - Critical to the control of diabetes and all of the other metabolic abnormalities that accompany it, especially since excessive weight is one of the primary causes of Type II diabetes
 - Must be approached on a long-term basis; weight must be gradually reduced and remain at the lower level for life
- Nutritional therapy
 - A balanced, calorie restricted diet must be developed that is acceptable to the patient, and able to be maintained for the rest of life.
 - The diet must include critical elements of treatment of some of the other metabolic abnormalities seen with the metabolic syndrome, such as salt restriction to improve hypertension, and decreased saturated fat to improve lipid abnormalities
 - See the below section on Food Choices for Diabetes for more information
- Regular exercise
 - Regular vigorous exercise and physical activity is essential to any weight loss program
 - In addition, there are many added benefits to exercise, such as an improved sense of well-being, improved bone structure, fewer falls later in life, improved balance and coordination, lowered blood pressure, and improved cardiovascular function
 - To be maximally effective, the exercise must be vigorous aerobic activity for at least 30 minutes per day, 5 days per week
- Stop smoking
 - Any inhaled smoke has been shown to have multiple effects on the heart and circulation, including increased atherosclerosis, increased tendency toward a clotting disorder, lung damage, and decreased muscle function.
 - Any patient with diabetes must stop smoking completely and permanently, or risks shortening the life-span by at least 10 years
 - There are multiple behavioral and medication-based treatments available to assist in the difficult task of stopping smoking – ask your doctor about these if you are unable to stop without help.
- Know and be alert to danger signs of diabetes and the metabolic syndrome
 - Hypoglycemia symptoms – light-headedness, difficulty walking, confusion, disorientation

- The treatment for hypoglycemia (15 grams of sugar), which should be carried with most diabetics
- Actions to take to prevent relapse of hypoglycemia – regular scheduled eating 2-3 times daily, avoid fasting, balance food intake with exercise, confirm with doctor the dosages of medication
- Possible vaginal yeast infections in women with diabetes
- Postural dizziness with changes in position, especially for those with metabolic syndrome and several controlling medications
- Any suggestion of a serious complication:
 - chest pain or pressure
 - weakness on one side of the body
 - vision changes
 - loss of consciousness, even if only for a few minutes
- Home blood glucose monitoring
 - Most patients visit the out-patient department, hospital, or physicians office for this monitoring; however it is expensive and impractical to do this with the frequency that is most helpful for good control of diet, exercise, and medications.
 - Patients should be encouraged to purchase a home glucose monitor, and taught how to use it effectively. Blood glucose results can then be recorded in a logbook with the date and any pertinent observations, for review by the monitoring physician
 - Home glucose monitoring is especially helpful for those patients who are unstable, whose diet is erratic, and who are on insulin
 - Since each glucose monitor requires a unique set of test strips, it is important that the patient purchase a monitor for which the test strips are easily and economically available in his/her region.
 - The doctor or nurse should review the use of the glucose monitor with the patient to be sure that the correct technique is followed for accurate results. The frequency of recommended use of the monitor will depend on the stability of the patient's diabetes, the age, the medications being used (especially if insulin is used), and whether or not the patient is susceptible to episodes of hypoglycemia
- Home blood pressure monitoring
 - Since the majority of those with adult onset diabetes also have increased blood pressure, it is very helpful for the patient to also purchase a blood pressure apparatus to self-monitor the blood pressure in varying stages of life. This will assist the doctor in deciding on the proper medications and dosage for best control of the blood pressure
 - Further information on this is available in the handout on “Home Care for Hypertension”
- Monitoring of blood lipids
 - Similarly, most adult patients with diabetes also have abnormal blood lipids (fats), which increase the risk of atherosclerosis and problems such as heart attacks and stroke. These should be monitored on a regular basis, at least once or twice each year, to help the doctor decide what treatments should be used to help control the lipids. This is one element of care that must be done by a physician or hospital laboratory.

- The doctor will recommend various therapies to help reduce the lipids, including changes in the diet (see Annex 3 - “Diet for Diabetes and Metabolic Syndrome”, and below section on “Food Choices...”), increased exercise, and if lipids are severely elevated, medication to reduce the lipids.
- Home monitoring and care of the feet
 - Uncontrolled diabetes and associated blood vessel changes can cause a progressive decrease in both the pain sensation of the foot and the circulation of the foot. These abnormalities increase the chances of injuries, which because of poor circulation may take much longer to heal.
 - Up to 20% of all patients with diabetes have a chronic foot problem noted on examination, and up to 15% of all diabetics will develop an ulceration on the foot during their lifetime, which can lead to an amputation if not promptly recognized and treated
 - It is important for each diabetic patient to develop a habit of visually inspecting both feet at least once weekly, or more often if the diabetes is advanced. The elements of this inspection should include the following:
 - Daily washing and inspection
 - Keeping walking areas clear of dangerous objects
 - Appropriate footwear (selection, fitting and use)
 - Using slippers indoors-no bare feet allowed at any time!
 - Proper nail and callous care – no bathroom surgery allowed on these areas!
 - Avoid extreme temperatures of either cold or heat on the feet
 - Avoid soaking of the feet for long periods of time, which can lead to burns and excessive softening of the skin
 - Report foot problems promptly to a physician (infections, ulcers, and cuts that do not heal)
 - See Annex 4 – “Foot Care – Patient Screening and Education for Diabetes” for more information on this

Annex 6

Performance Checklist: Diabetes Mellitus type II and Metabolic Syndrome

Task	Achieved?		Comments
	Yes	No	
History: patient is asked about:			
Personal, family, and past history			
Symptoms related to diabetes			
Symptoms of coexisting illness(hypertension, liver disease, heart disease, high cholesterol)			
Frequency of acute complications (DKA – hypoglycaemia)			
Full dietary history(times of meals, weight changes)			
Current medications used for coexisting diseases(steroids, thiazides)			
Methods of glucose monitoring			
Physical Examination			
Height & weight and waist circumference			
Heart rate, blood pressure			
Palpate peripheral pulses			
Examine feet for deformities, cracking, infection, ulcers			
Examine mouth, teeth, and gums			
Examine thyroid gland			
Examine skin(infection, site of insulin injection)			
Chest & heart			
Abdomen (liver, spleen & loin)			
Neurological Examination (Vibration sense, peripheral numbness, ankle jerk)			
Patient Education			
Uses simple clear language			
Periodically checks to confirm if patient understands instructions			
Ask patient if he /she has any questions			
Educational messages			
Basic pathophysiology of diabetes and metabolic synd.			
Nutrition(caloric requirement, food types)			
Drugs: all drugs for diabetes/metabolic syndrome			

Task	Achieved?		Comments
	Yes	No	
Exercises: proper methods & timing			
Glucose and blood pressure monitoring			
Hypoglycemia: counsel about symptoms & prevention			
Management of other illnesses			
Long term complications and how can be prevented			
Personal hygiene			
Foot care			
Referral of patients to educational session (nutritionist, nurse specialist for diabetes)			
Monthly Diagnostic tests/procedures: Records the following tests/procedures on a monthly basis			
Fasting plasma glucose(FPG)&/or2H PPPG			
Urine glucose and ketones			
Quarterly Diagnostic tests/procedures: Orders/records following tests every 6 months			
Quantitative Albumin/Creatinine ratio			
Hb A1c			
Annual Diagnostic tests/procedures:			
Serum Cholesterol, HDL, LDL, Triglycerides			
Retinal examination (ophthalmologist referral)			
Serum creatinine			
ECG (patients > 40 years)			
Medication			
Appropriate drug prescription according to guidelines			
Referral			
Appropriate referral for consultation according to guidelines			