AIIMS Bhopal Certification in Primary Care Management of Chronic Vascular Diseases

2014-2015

Developed by
All India Institute of Medical Sciences Bhopal

with assistance from
Department of Public Health and Family Welfare
Government of Madhya Pradesh

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Government of Madhya Pradesh

Course Director:

Dr Rajnish Joshi
Department of Medicine
AIIMS Bhopal
Email: rajnish.genmed@aiimsbhopal.edu.in

Course Coordinators :

Dr Abhijit P Pakhare
Department of Community and Family Medicine (CFM)
AIIMS Bhopal
Email: abhijit.cfm@aiimsbhopal.edu.in

Dr Sanjeev Kumar
Department of Community and Family Medicine (CFM)
AIIMS Bhopal
Email: sanjeev.cfm@aiimsbhopal.edu.in

Writing team:

Dr Rajnish Joshi
Department of Medicine
AIIMS Bhopal

Dr Sanjeev Kumar
Department of CFM
AIIMS Bhopal

Dr Abhijit Pakhare
Department of CFM
AIIMS Bhopal

Dr Alkesh Khurana
Department of Pulmonary Medicine
AIIMS Bhopal

Dr Arun Kokane
Department of CFM
AIIMS Bhopal

Dr Surya Bali
Department of CFM
AIIMS Bhopal

Dr Tejal Lathia
Department of Endocrinology
TNMC Mumbai

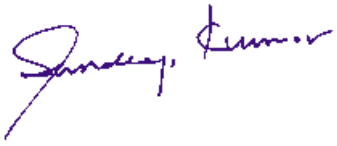
Dr Ameya Joshi
Department of Endocrinology
TNMC Mumbai

Message

Non-communicable diseases are increasingly becoming more prevalent in India, and three main categories include chronic vascular and metabolic diseases, cancer, and injuries. Further non-communicable diseases also include chronic respiratory conditions (such as COPD, Bronchial Asthma), rheumatic conditions (Rheumatoid arthritis, Osteoarthritis), and Chronic Liver, and hematological conditions, which are comparatively less prevalent. It becomes important that these conditions are managed as far as possible at the primary care level, with appropriate referrals to secondary and tertiary care facilities.

In this regard, in 2013, All India Institute of Medical Sciences Bhopal, eagerly responded to a request from Madhya Pradesh Government to upgrade skills of its medical officers. I am happy that this skill up-gradation activity has developed into a certificate course in primary care management of chronic vascular diseases. In this, we have included the four most common conditions chronic vascular and metabolic diseases (hypertension, diabetes, chronic airway diseases). In addition, in-line with the national program, we have also included sessions on early detection of cancers (breast, oral, head-neck, cervix, and ovaries). This training is planned over a period of three days and is aimed to make health-care professionalsmore confident, as well as focused on simple doable actions in primary care.

This partnership between AIIMS Bhopal, and Department of Public health and Family welfare, Government of Madhya Pradesh is an initial effort, in long term goal of improving health care of citizens of India. We hope that similar workshops will enhance care at primary level, and with efficient referral mechanisms will also help in optimal care delivery at tertiary level. Such an efficiency can surely improve health-care delivery in Madhya Pradesh. Similar models of care are needed in other parts of country as well, where tertiary care facilities must work with the State to strengthen primary care. We hope that all participants of these workshops go back with renewed knowledge and skills, and really make a difference in patient-care.



Prof. Sandeep Kumar
Director, AIIMS Bhopal

Message

Non-communicable diseases (NCDs) are now responsible for most deaths in middle aged and older adults in India. Major NCDs include cardiovascular diseases (CVD; coronary artery, cerebro-vascular, and peripheral vascular diseases), and importantly its risk factors (smoking, hypertension, diabetes mellitus, obesity, dyslipidemia, unhealthy diet, and reduced physical activity). These conditions were previously believed to be diseases of affluent, which is no-longer true. Prevalence as well as mortality due to them is higher in the socially disadvantaged. Medical management of NCDs requires unique skill-sets that often need to be learned and re-learned.

Government of India has launched National Program for Prevention & Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS). Currently in its second phase, the program includes 100 of 640 districts (15.6%) in India.In Madhya Pradesh, we envisage toextend skill sets pertaining to these diseases to all the districts, so that citizen who access services in the public sector have access to comprehensive services. . This training is being imparted as an adjunct to facility level strengthening in the state.

In 2013, a total of 87medical officers from 24 districts had benefited from such trainings, and this year we are expanding the same to all districts in 34 training sessions, each of these sessions will have 30 participants including doctors and nurses. This scale-up has been made possible due to the positive feedback we have received from previously trained medical officers. I hope and believe that this training will strengthen services available to citizens of Madhya Pradesh.

Shri Pankaj Agarwal (IAS)
Commissioner Health
Directorate of Health Services
Department of Public Health and Family Welfare
Government of Madhya Pradesh

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CHAPTER 1
CHRONIC DISEASES: PROBLEM STATEMENT

1. How big is hypertension as a problem in India ?

According to recent estimates, about 40% of adults in both urban and rural India have hypertension (blood pressure greater than 140 mm Hg systolic or 90 mm Hg diastolic). Over the past three decades, there has been an increase in proportion of individuals with hypertension in India.

In India, of all individuals with hypertension, less than half are aware about it, of those who are aware only about one-third are on treatment, and among those on treatment, less than one-fifth achieve blood-pressure control.

2. Why should hypertension be treated ?

Presence of hypertension doubles the risk of heart attacks, stroke, heart failure, chronic kidney disease, and peripheral arterial disease. The risk doubles with every subsequent 20mm Hg increase in systolic, and 10mm Hg increase in diastolic blood pressure.

Multiple risk factors (salt-intake, obesity, alcohol, stress, age) lead to increase in blood pressure, which further has its effects on blood-vessels, heart, brain, and kidneys. (See figure 1 below)

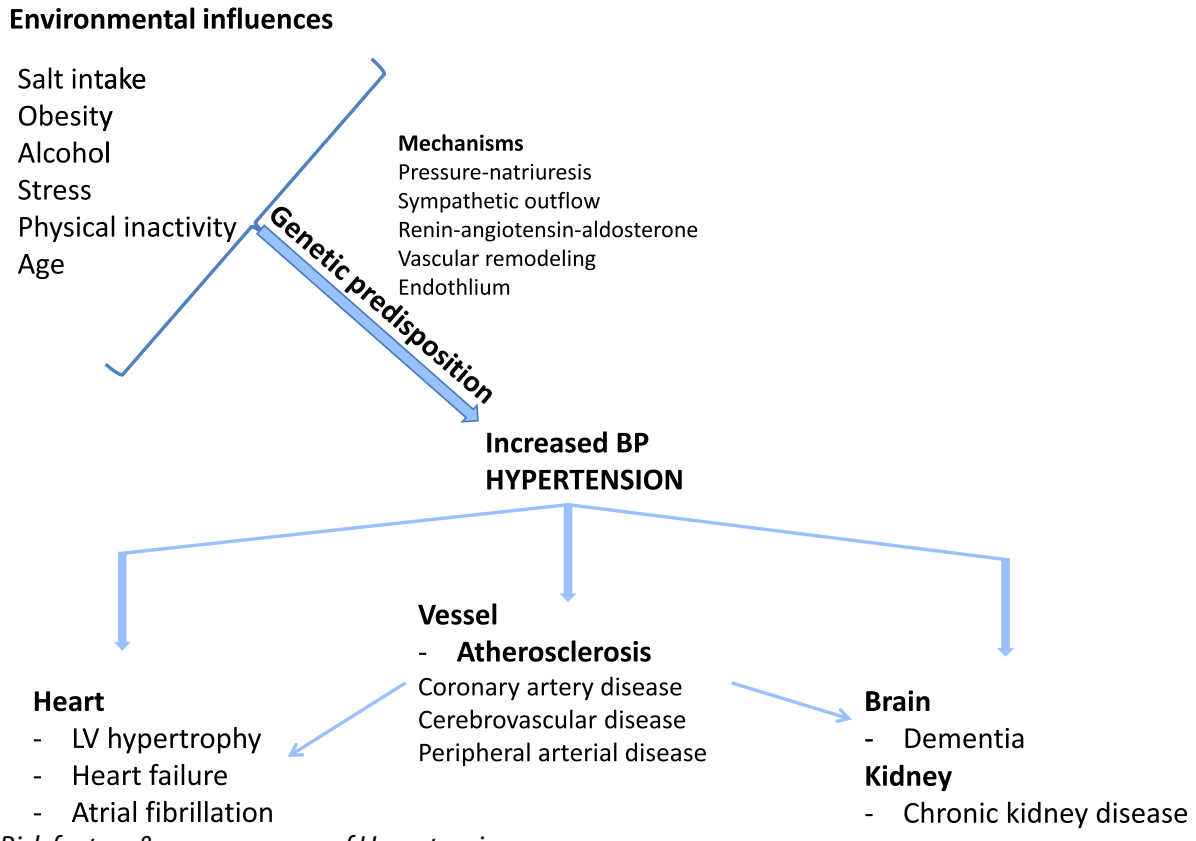


Figure 1 : Risk factors & consequences of Hypertension

Upto 95% of all individuals with hypertension have essential (or primary) hypertension, due to mechanisms as in figure 1. Only 5% individuals (especially young hypertensives, age <20 years) have secondary hypertension.

3. How big is diabetes mellitus as a problem in India?

Diabetes mellitus is a metabolic disease, characterized by chronic elevation in blood glucose levels, and alterations in carbohydrate, fat and protein metabolism due to inadequate synthesis or inadequate action of insulin.

India has seen a rapid rise in prevalence of diabetes mellitus, and today our country has largest number of individuals with diabetes mellitus. There are about 40 million individuals with diabetes mellitus in India, and the number is expected to rise upto 80 million by 2030. Over the past three decades, the prevalence of diabetes has increased and is now estimated to be around 10-15% in urban areas, and 5-10% in rural areas.

4. Why should diabetes mellitus be treated?

It is well established that uncontrolled diabetes mellitus leads to:

1) Direct effects of high blood glucose levels
   (1) Diabetic comas (Ketoacidosis, or hyperosmolar coma)
   (2) Recurrent infections (Dermatological fungal infections, bacterial infections etc)
2) Indirect effects on blood vessels
   (1) Microvascular complications
      (a) Retinopathy (leading to blindness)
      (b) Nephropathy (leading to renal failure)
      (c) Neuropathy (leading to loss of sensation or loss of motor power in limbs)
   (2) Macrovascular complications
      (a) Coronary artery disease (leading to heart attack, and heart failure)
      (b) Cerebrovascular disease (leading to stroke, paralysis and dementias)
      (c) Peripheral vascular disease (leading to gangrene in feet, resulting in amputation)

5. How big is acute coronary syndrome and stroke problem in India

Tobacco use, hypertension and diabetes mellitus are key risk factors which lead to blockages in vessels of heart (coronary artery disease), brain (cerebrovascular disease) and limbs (peripheral vascular disease). These diseases are clinically identified as acute coronary syndrome (ACS), stroke, and limb gangrene.

Acute Coronary Syndrome (ACS) is a term used for any condition brought on by sudden, reduced blood flow to the heart. ACS means that a person is experiencing one of two things: a small or large heart attack or the person is suffering severe chest pain called an unstable angina. India has the highest burden of acute coronary syndromes in the world. The three most common risk factors for ACS in Indians are smoking (40%), high blood pressure (38%), and diabetes (30%).

Care for ACS needs to be improved in India. In a large nationwide registry of ACS in India (CREATE Registry), the median time from symptoms to hospital was 360 min (about 6 hours), which is several times higher than in high income counts. Time from reaching hospital to thromolysis (called door to needle time) was 50 minutes, which is longer than prescribed standard of 30 minutes. Reduction of delays in access to hospital

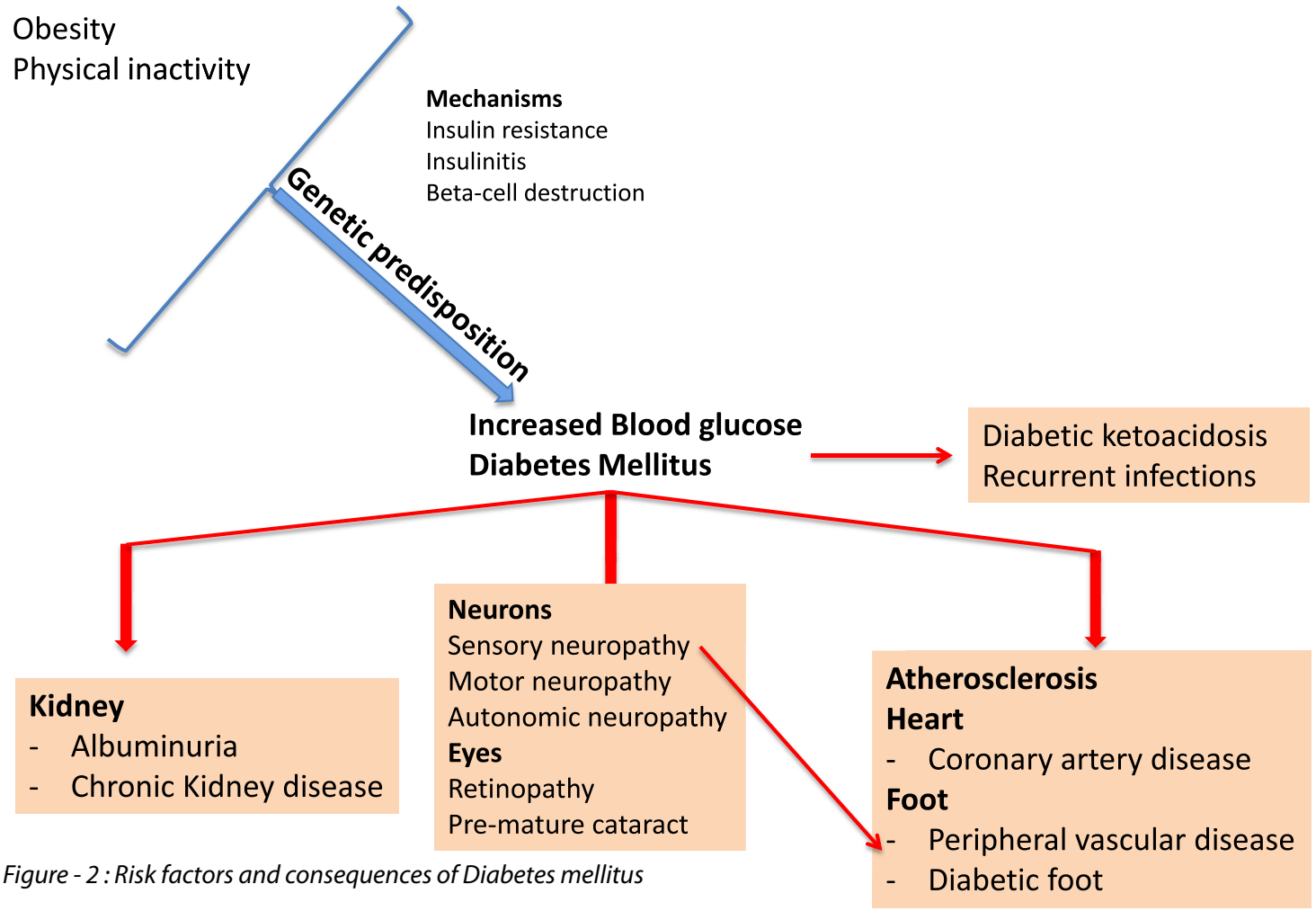


Figure - 2 : Risk factors and consequences of Diabetes mellitus

and provision of affordable treatments could reduce morbidity and mortality from ACS in India.

About one-third of the patients with ACS who have myocardial infarction die before reaching hospital. Of those who reach about 53% are from lower middle class and another 20% were from poor social classes. Hence ACS is no longer a disease of the rich, it is seen more frequently in those who are economically disadvantaged. Poor patients are also less likely to get evidence-based treatments, and had greater 30-day mortality than wealthy patients (8% vs 6%).

Stroke is clinically defined as 'the rapid development of clinical signs and symptoms of a focal neurological disturbance lasting more than 24 hours or leading to death with no apparent cause other than vascular origin. It is a global health problem. It is the second commonest cause of death and fourth leading cause of disability worldwide. Approximately 20 million people each year will suffer from stroke and of these 5 million will not survive. In India, the ICMR estimates in 2004 indicated that stroke contributed 41% of deaths and 72% of disability adjusted life years amongst the non-communicable diseases. Prevalence of stroke in population is estimated to be about 150 to 200 per 100,000 population. Large nationwide stroke registries are currently underway.

In addition to ACS and Stroke, peripheral vascular disease leading to foot gangrene and amputation is another vascular catastrophe, which occurs

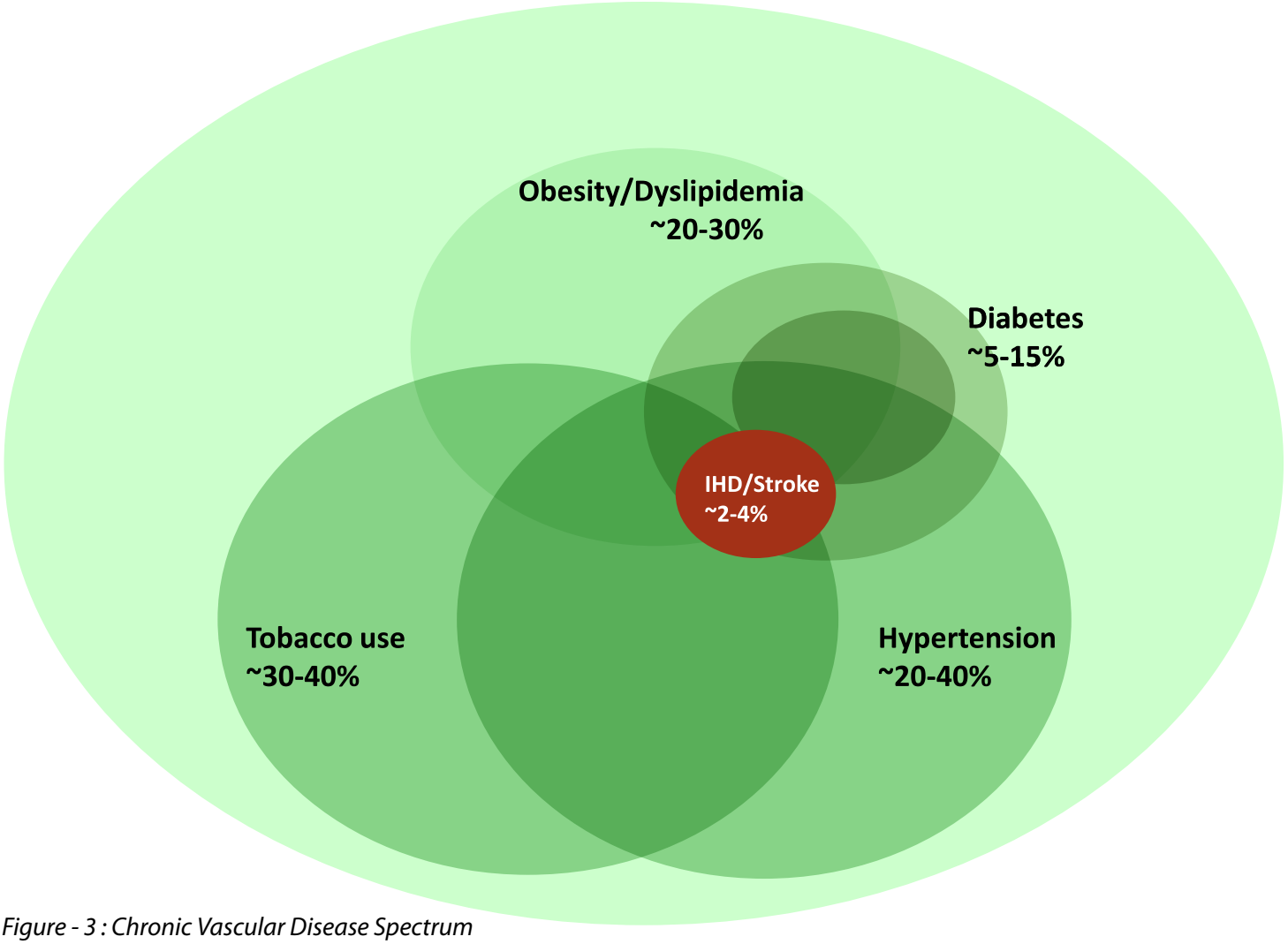


Figure - 3 : Chronic Vascular Disease Spectrum

because of tobacco use, high blood pressure and high blood sugars.

6. Why do we need primary and secondary prevention of acute coronary syndrome and strokes ?

Primary prevention of ACS and Stroke is aimed at risk factor reduction, so that these devastating events do not develop. Primary prevention includes tobacco cessation, control of blood pressure, blood sugars, and lipid levels. These techniques are complex and involve behavioral as well as environmental modification.

Once a person develops ACS or stroke, emphasis is on prevention of a second vascular episode, which could be either another ACS, stroke or peripheral gangrene. Secondary prevention includes risk factor reduction, as well as use of specific medication. Drugs used in secondary prevention include anti-platelets (Aspirin), lipid lowering drugs (statins), betablockers, and ACE inhibitors. We will learn more about these in Chapter 9.

Control of chronic diseases in India needs a multi-level strategy, aimed at management, risk factor control, improving medical education, health-care financing, and working on social determinants of health.

Chapter 9.

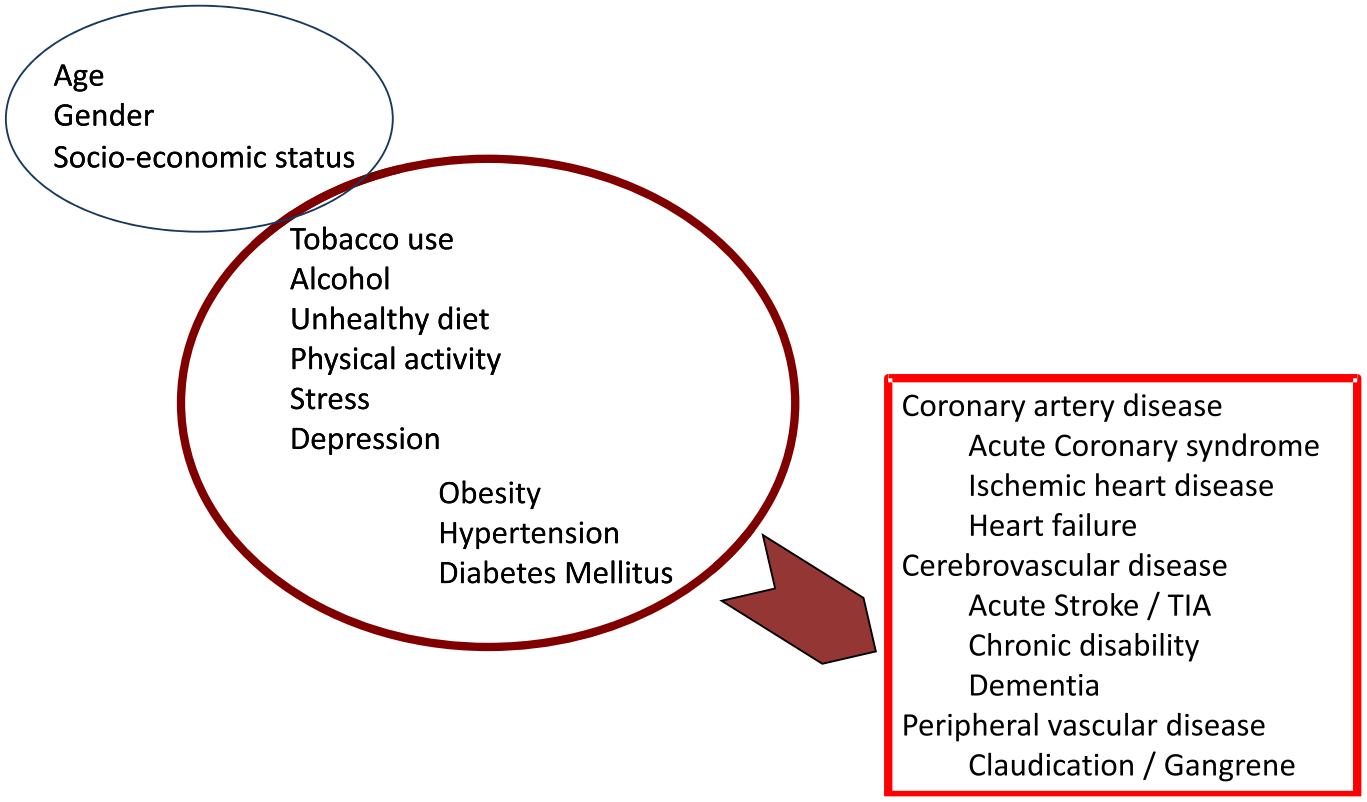


Figure - 4 : Multi-factorial risks and consequences

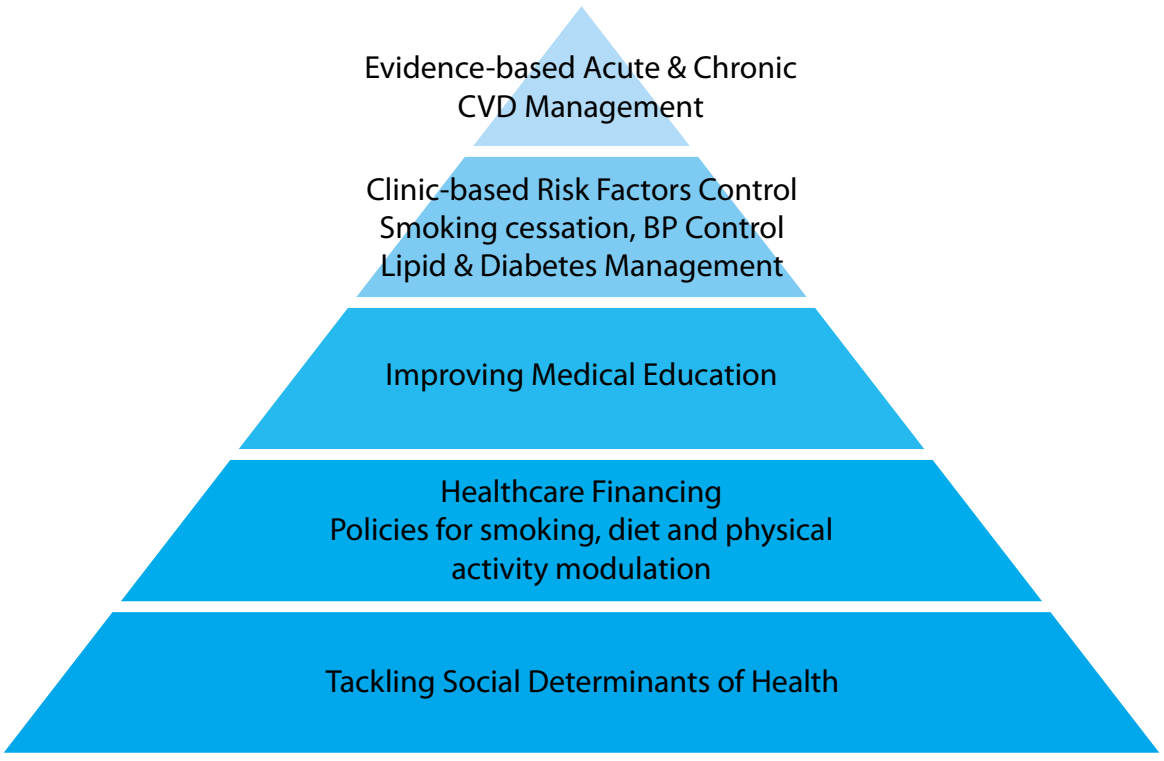


Figure - 5 : CVD Prevention Pyramid

CHAPTER 2
MEASUREMENTS IN CHRONIC DISEASES

Learning objectives

At the end of this module, you will be able to:

- Understand how to accurately measure blood pressure, obesity, and blood sugar
- Know how to decide if a person has hypertension, diabetes mellitus or metabolic syndrome

1) How to accurately measure blood pressure?

Blood pressure measurement is a simple technique. Measure blood pressure in every individual who come to the health-center, regardless of nature of symptoms. For accurate measurement, following step-by-step methods should be used:

Table 1: Blood pressure measurement

Where	**As a matter of convention, measure in right brachial artery** (right arm).* Do not measure blood pressure in paralyzed limb, if limb has arterio-venous fistula, limb with axillary lymph node dissection, or limb with deformity. If neither arm can be used, measure blood pressure in leg.
Equipment	**Sphygmomanometer (BP machine), Stethoscope** Can use either mercury, aneroid or digital apparatus. Digital apparatus does not require stethoscope
Ambience	**Room should be quiet, patient should have rested for about 30 min**, and should not have performed physical activity, consumed tobacco, tea, or coffee in past 30 minutes.
Patient position	**Sitting comfortably, back rested, legs supported on ground, and forearm rested** on a firm surface at the level of heart. Arm should be bare or with a loose non-constricting clothing.
Cuff size	**The bladder of the cuff should cover 2/3 or more of the arm circumference**. Regular BP cuffs are of 12 x 22 cm size, and appropriate for arm length upto 26cm. This is usually adequate for adult BP measurement

Cuff placement	**Cuff should be 2cm above the elbow crease**, and mid-point of the cuff-bladder should be at the midline (over brachial artery). It should be fitted snugly, but allowing two fingers to be inserted between the cuff and the arm.
Palpatory pressure	Inflate the cuff, with mercury / aneroid manometer placed at the level of the arm, and at eye-level. Inflate pressure upto 80mm Hg, and then slowly (10mm Hg in 3 seconds) till pulse obliterates. Note the **pulse-obliteration pressure**, which corresponds to systolic blood pressure.
Auscultatory pressure	Inflate the cuff to 20-25 mm Hg above pulse-obliteration pressure, place bell of the stethoscope over the brachial artery, and slowly deflate at he rate of 2mm Hg per second. Note the blood pressure level at which kortakoff's sounds appear (Systolic blood pressure or SBP). Continue to deflate till the point these sounds disappear (diastolic blood pressure or DBP).

Figure - 1 : Patient position at the time of blood pressure measurement

* Note: If patient has elevated blood pressure (>140/90), and for first diagnosis of hypertension, measure blood pressure in both arms. If difference is more than 20mm Hg in both arms, repeat the measurement, and if difference remains consistent use the higher measurement for decision-making.

Blood pressure measurements obtained by mercury or aneroid or digital apparatus are comparable. If pulse is irregular,digital apparatus will not accurately measure blood pressure. In such a case, only use manual methods.

Remember : Blood pressure measurement normally variesduringthe day.

- It is higher in the mornings, than rest of the day.
- It is also higher during the times of stress, and after meals.
- Blood pressures obtained by doctors in health centers are usually higher, as compared to those obtained by nurses and paramedics.
- Also clinic-based measurements are usually higher (white coat hypertension), as compared to those obtained at home.
- In a person who complains of dizziness, measure sitting/supine blood pressure and

At each occasion, if BP > 140/90, obtain three readings separated by minimum 1-minute interval. Average these three readings to obtain BP at this occasion.

standing blood pressure one minute later. If standing systolic blood pressure is 20mm Hg or more lower, this confirms postural hypotension. Review patients medication and advise referral if necessary.

- In a young hypertensive (age <20 years) also measure leg blood pressure to screen for coarctation of aorta, and to look for conditions with positive Hill's sign.

2) How to decide that a person has hypertension?

Hypertension is defined as SBP more than or equal to 140 mm Hg or DBP more than or equal to 90 mm Hg, measured on at least two or more occasions.

According to hypertension classification, SBP < 120 mm Hg and DBP <80 mm Hg is normal. SBP between 120-139 or DBP between 80-89 is pre-hypertension. Hypertension (SBP>/=140 or DBP>/=90) is further divided into two categories:

Never classify a person as hypertensive based on blood pressure readings obtained on a single occasion.

First visit: If blood pressure values obtained on first occasion are elevated, classify the person as hypertensive only if there are compelling indications which are:

- SBP>/=160 or DBP >/=100 m Hg and
- Features suggesting hypertensive urgency (altered sensorium suggestive of encephalopathy, papilloedema or retinopathy), or
- Features suggesting end organ damage (such as established ischemic heart disease or chest-pain, past history suggesting stroke, or presence of proteinuria), or
- Known diabetes mellitus.
- If the person is pregnant, consider pregnancy-induced hypertension (see chapter on Pregnancy Induced Hypertension)

Table2 : Classification of hypertension

Category	Systolic blood pressure (mm Hg)	Diastolic blood pressure (mm Hg)
Normal	<120	<80
Pre-hypertension	120-139	80-89
Stage I hypertension	140-159	90-99
Stage II hypertension	160 or more	100 or more

If there are no compelling indications, and if SBP >/= 140 or DBP >/=90, arrange to measure blood pressure again, at least after two weeks. Screen for other risk factors (tobacco use, obesity), and advise life-style modification (see section B below).

If SBP <140 and DBP <90, classify the person as **normotensive.** Ask the person to get blood-pressure measured one year later if SBP >/=120 or DBP >/= 80 mm Hg (Pre-hypertension).

Figure - 2 : Blood pressure reading in normal range

Second visit : If SBP >/= 160 mm Hg, and DBP >/= 100 mm Hg, classify the person as having **hypertension.** If SBP is between 140-159 mm Hg, or DBP between 90-99 mm Hg, arrange to obtain a third reading at least two weeks later. Continue to advise for and reinforce life-style modification (see section B below). If SBP <140mm Hg, and DBP <90 mm Hg, person is normotensive.

Third visit : If SBP >/= 140 mm Hg, and DBP >/= 90 mm Hg, classify the person as having **hypertension.**

3) Measurement of obesity (Body Mass Index and Waist Circumference)

a. Body Mass Index

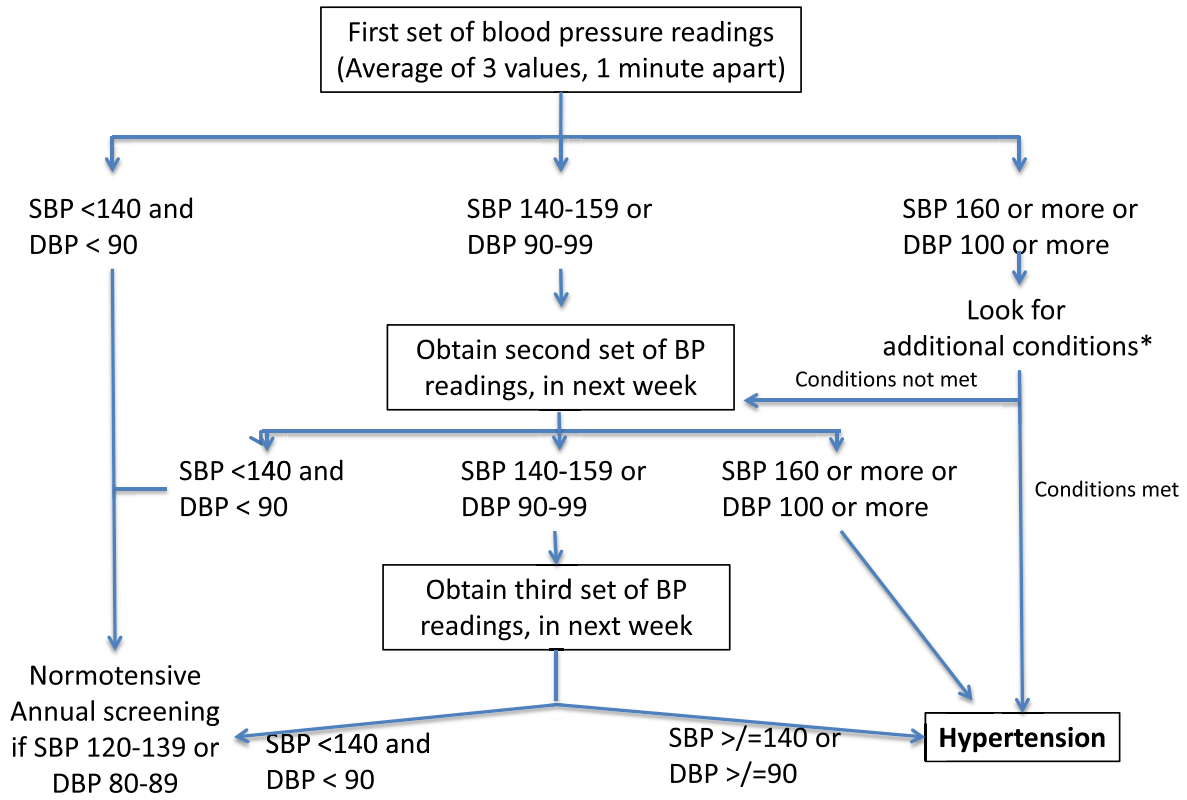
Body mass index is ratio of weight (in Kg) and square of height (in meters). We need two measurements to calculate body mass index – weight and height.

Measuring Weight

Weight is measured using a weighing scale. Weight is measured in kilograms, and rounded off to the nearest 100 grams. For example, a weight of 56.4 kgs means 56 kg and 400 grams.

The following points should be kept in mind while recording the weight:

- The weighing machine should be placed on a flat surface.
- Make sure that the scale reads zero before the person stands on it.
- The person to be weighed should be wearing light clothing.



* Additional conditions include symptoms suggestive of hypertensive urgency (altered sensorium, papilloedema) or clear evidence of end organ damage (heart disease, past stroke, proteinuria) or in presence of pregnancy or established diabetes mellitus)

Figure - 3 : Decision algorithm for diagnosis of hypertension

- The person should stand upright on the weighing scale looking straight ahead.
- The person should not hold a wall or a table for support.

Measuring Height

Height is measured by a stadiometer. It is measured in centimetres. For calculation of body mass index, it is convereted to meters. For example a height of 175 cm means 1.75 meters.

The following points should be kept in mind while recording the height:

a. The stadiometer should be kept on a flat surface (flat floor)

b. Now ask the patient to stand on the black board with feet together and heel touching the back of the board.

c. The back of the heel the buttocks and the head of the person should be in a straight line and should be touching the columns.

d. He/she should be looking straight ahead.

e. Pull the marker down and allow it stand horizontally on the centre of the patient's head as shown in the picture below.

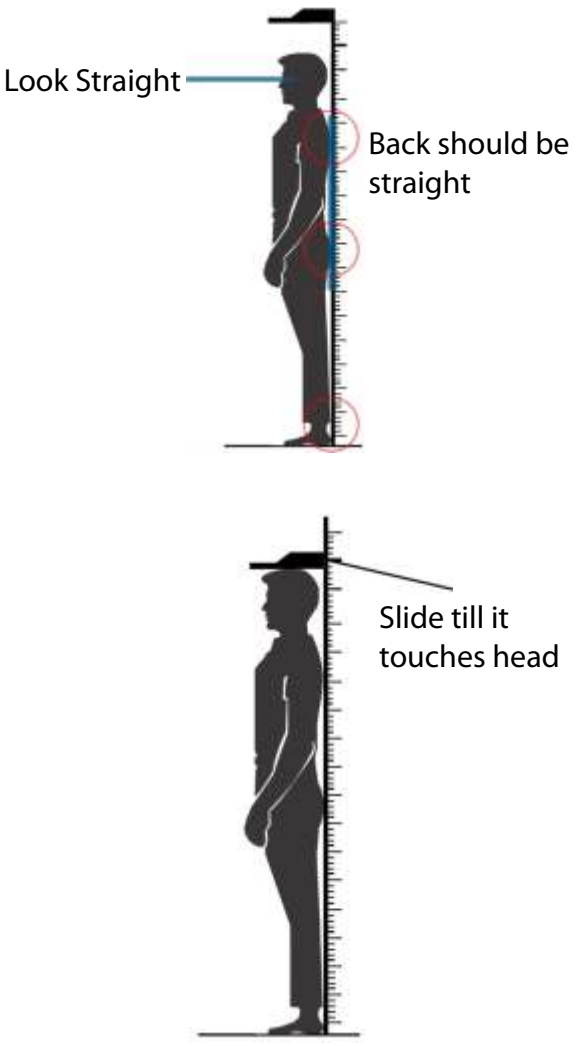


Figure - 4 : Measurement of height

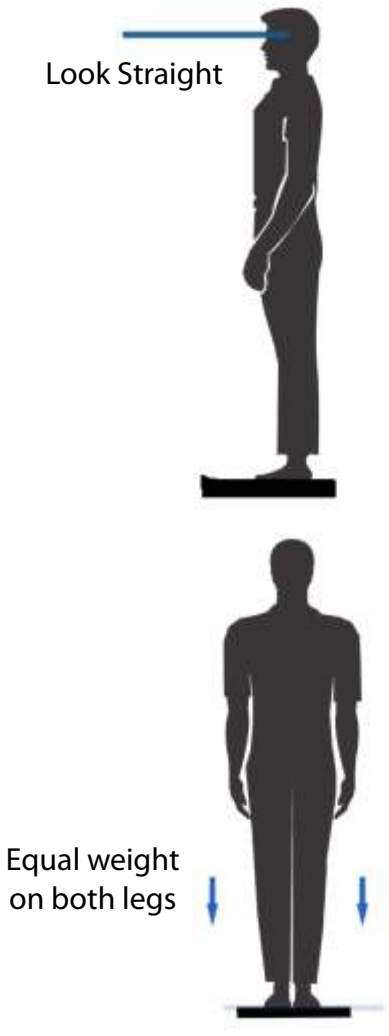


Figure - 5 : Measurement of weight

f. Read the marking in centimetres on the column.

Calculation of BMI

Now that you know how to correctly measure the weight and height of a person, you can calculate the BMI of that person. You also know that based on the person's BMI, you can classify him / her as normal, overweight or obese.

The formula to calculate BMI is as follows:

$$BMI = \frac{\text{Weight in kg}}{(\text{Height in meter})^2}$$

For example:

A person weighs 75 kg and his height is 170 cm.

(100 cm = 1 meter, Therefore, 170 cm = 1.70m)

$$BMI = \frac{\text{Weight in kg}}{(\text{Height in meter})^2}$$

$$\text{Therefore, BMI} = \frac{75}{(1.70)^2}$$

$$= \frac{75}{(1.70 \times 1.70)}$$

$$= \frac{75}{2.89}$$

$$= 25.95$$

Therefore the BMI of this person is 25.95 kg/m^2

Record BMI of every person with hypertension. Normal adults have a BMI between 18 and 25 kg/m^2.

If BMI is between 25.1 and 30 kg/m^2, the person is overweight. If BMI is more than 30 kg/m^2, the person is obese.

Obesity is an important risk factor for hypertension. Reduction in weight will improve blood pressure control. Individuals who are overweight or obese are at risk for metabolic syndrome (see below), and may have additional morbidities such as impaired glucose tolerance, diabetes mellitus, and dyslipidemia.

b. Waist circumference

Waist circumference is measured using a flexible non-elastic measuring tape. It is measured in centimeters and recorded to the nearest millimeter.

If waist circumference is more than 90 cm for men and more than 80 cm for women, it indicates abdominal obesity.

The following points should be kept in mind while measuring the waist circumference:

- Patient should be wearing light clothing.
- He/ she should stand erect.
- Bring the tape all the way around his waist, at the level of the navel.
- Make sure the tape is parallel to the floor and not too tight.
- The person should not hold his breath and pull his belly in.

Figure - 6: Measurement of waist circumference

4) What are normal blood glucose levels ?

Glucose is most important carbohydrate fuel in our body. When we have food, complex carbohydrates in diet are broken down into glucose, which is absorbed in intestines. When we are not having food (fasting state), fats and proteins are broken down to produce glucose. In normal individuals blood glucose levels vary between 70 and 100mg/dL in fasting state and 90 to 140mg/dL after meals.

Venous glucose has slightly lower concentration as compared to capillary glucose. Plasma glucose is lower than blood glucose.

Blood glucose level also varies with meals. After a meal, blood glucose level rises, and falls within 2 hrs after meal. Typically after a 100gm oral glucose, the sugar levels rise upto 180mg/dl in first hour, and fall below 140mg/dl after 2 hours(these are upper cutoffs). When blood glucose exceeds renal threshold (usually 180mg/dl), it is excreted in urine, and urine sugars are positive. However urine sugar levels are not reliable for screening , or diagnosis of diabetes mellitus as excreted urine is stored in bladder for long, and hence it is difficult to time urine collection with respect to meals. Further, other conditions like tubulopathies, interfering substances and renal glycosuria can complicate the picture.

Blood glucose level indicate levels at a give time. **Glycosylated hemoglobin (HbA1C)** is a measure which gives an average value over previous 3 months, and is a better measure of control.

We can estimate capillary blood glucose level using a glucometer. It is a reliable estimate of plasma venous glucose.

5) How to measure blood glucose levels using a glucometer?

Easiest and widely available method of blood glucose estimation is using a glucometer. Follow these steps to check blood glucose with a meter:

Getting Ready

- Wash your hands with warm water and soap for at least 15 seconds, then rinse and towel dry.
- Get supplies:
  a. Meter
  b. Test strips
  c. Lancing device
  d. Needle, often called a lancet
- Open the lancing device and put a needle in. Take the cap off theneedle. Do not touch the needle.
- Put the cover back on the device. Set the spring on the device so that it isready to be used to stick you.

Testing

- Get a test strip out of the bottle or package. Put the cap back on thebottle.
- Put the strip in the meter. This will turn the meter on.
- Match the code on your meter screen with the code for your teststrips.
  a. The code is printed on the test strip bottle or package.
  b. If your meter has the code built into the strips, go to the next step.
- Now, code free glucometer are also available.
- When the test strip symbol (or a drop of blood symbol) flashes on the screen, the meter is ready for a drop of blood.
- Pick up the lancing device and put it against the pulp of finger
- Push the button on the device to release the needle.
- Squeeze finger at its base to get a large drop of blood.

Figure - 7a: Equipment for blood sugar measurement

- Touch the end of the test strip to the drop of blood or based on the device, put the blood drop on the test area of the strip.
- Be sure that the test area on the strip fills completely with blood.
- The meter will time the test and blood glucose value will show on the screen.
- Record blood glucose value on case paper of patient, with date and time.

Cleaning Up the Supplies

- Remove the test strip and throw it away in dustbin

Figure - 7b: Selecting right code for glucometer device

- Remove the needle from the device. Throw the needle into a sharps container.
- Wash your hands again with water and soap.

6) Whom to screen for diabetes mellitus?

- Those who have symptoms indicative of diabetes mellitus
  - Increased thirst
  - Increased urination
  - Increase in appetite

Figure - 7c: Applying a drop of blood for sugar testing

  - Weight loss
  - Non-healing ulceration
  - Tingling or numbness over a limb
  - Visual loss or premature cataract
  - Recurrent infections (especially cutaneous/ genital infections)
  - Urinary tract infection.
- Those who are asymptomatic, but are overweight (BMI greater than25 kg/m2)and have additional risk factors such as:
  - Physical inactivity
  - First-degree relative with diabetes
  - Women who delivered a baby weighing 4kg or more, or had elevated blood glucose during pregnancy.
  - Hypertension (more than 140/90 mmHg or on therapy for hypertension)
  - Dyslipidemia

- Women with polycystic ovary syndrome
- Impaired glucose tolerance (FPG>110mg/dL) on previous testing
- History of CVD
- Tuberculosis

7) How to decide that a person has diabetes mellitus and its subtypes ?

- Obtain capillary blood glucose for initial screening.
- If fasting capillary blood glucose is more than 100mg/dL or 2-hour post meal blood glucose is more than 140mg/dL, advise the person to obtain fasting plasma glucose (FPG) and 2 hour post-meal plasma glucose (2-Hr PPG) from a laboratory
- Meal refers to 75gm of oral glucose, dissolved in 250mL of water.
- Use laboratory based FPG and 2he-PPG values for correct classification of diabetes mellitus.
- Based on FPG and 2he-PPG levels, an individual is classified as having diabetes or impaired glucose tolerance (IGT):

Normal FPG and 2he PPG levels

- If a person has normal blood glucose levels, no further action with regards to diabetes mellitus is required.
- Retesting after 2 years may be advised, if person was at high risk for diabetes mellitus.

Impaired glucose tolerance

- Design management plan
- Screen for associated comorbidities

Diabetes mellitus

- Classification (see on next page)
- Design management plan
- Screen for associated comorbidities

Previously T1DM was called IDDM and T2Dm was called NIDDM. This terminology has been discarded as need for insulin may be there with both sub-types. For routine clinical care, it not necessary to measure autoantibody levels for classification. A clinical differentiation is usually sufficient.

This differentiation is necessary for selection of initial therapeutic modality. Individuals with T1DM will be poorly responsive to oral medication. While those with T2DM will be responsive to insulin, they could have been better managed on oral drugs as well. In case you are unable to decide (example a 40 year old thin person, or a 26 year old obese person with high glucose levels) follow T2DM algorithm and look for therapeutic response.

Glycosylated hemoglobin

Glycosylated hemoglobin (HbA1c) provides an average of blood glucose levels over preceding three months. Its values are expressed in percentage.

Table 1: Diagnostic criteria for diabetes mellitus

	Normal	Impaired glucose tolerance (IGT) or pre-diabetes	Diabetes mellitus
Fasting Plasma Glucose (FPG) (mg/dL)	Less than 100*	100 to 125*	126 or more
2-Hr post-meal plasma glucose (2Hr-PPG) (mg/dL)	Less than 140	140-199	200 or more

* WHO defines normal as less than 110mg/dL and IGT as 110-125mg/dL

**All recent data is about point of care HbA1C testing. Less than 5.7% is normal, 5-7 to 6.4% is impaired glucose tolerance, more than or equal to 6.5% is diabetes mellitus.

Table 2 : Differentiation between type 1 and type 2 diabetes mellitus

	Type 1 Diabetes Mellitus (T1DM)	Type 2 Diabetes Mellitus (T2DM)
Key pathophysiology	Autoimmune process leading to reduce insulin synthesis. Islet cell antibodies present	Insulin resistance. Auto-antibodies absent
Age of presentation	Usually < 30 years. Can occur at any age	Usually > 30 years, can occur at any age
Symptoms	Classical symptoms of polyuria, polydipsia/ Diabetic Ketoacisosis is hallmark	May be asymptomatic
Weight	Usually weight loss or normal	Usually overweight or obese
Ketosis	Develop diabetic ketoacidosis. 25% have DKA on presentation	DKA uncommon, ketones may be present. sometimes with infection.
Treatment	Will need insulin for management	Usually controlled with oral hypoglycemic drugs
C peptide (stimulated)	<0.6	>0.6 usually>1.8

Non-diabetic individuals have HbA1c of less than 5.7% (normal), 5-7 to 6.4% is impaired glucose tolerance, more than or equal to 6.5% is diabetes mellitus. Target for control of diabetes mellitus is HbA1c of <7%.

Young, thin-built diabetic with DKA history usually has T1DM. A middle-aged, Obese diabetic usually has T2DM.

Corresponding percentage and average capillary blood glucose levels are as follows:

Table 3: HbA1c values and average blood glucose (eAG) levels

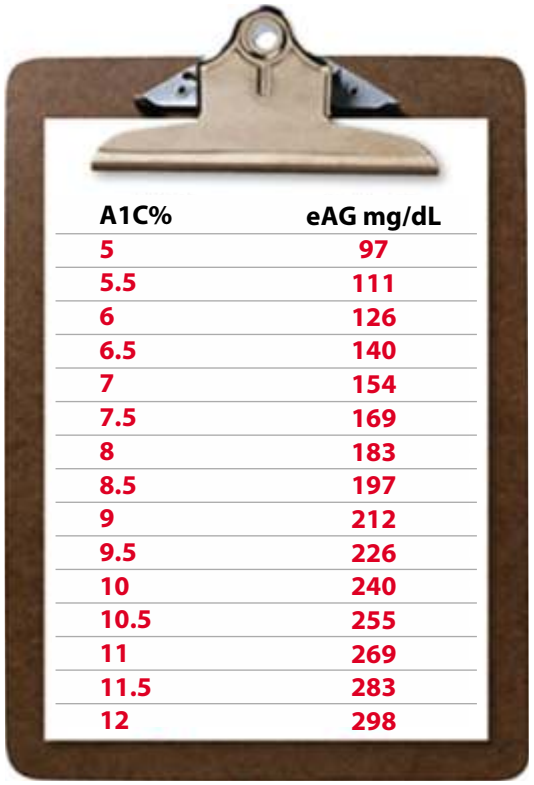
8) What are other necessary measurements to be obtained ?

Additional measurements are obtained for the following reasons:

A) Confirmation

a. Hypertension does not need to be confirmed with further tests

b. Fasting Plasma Glucose (FPG) should be obtained to confirm presence of diabetes mellitus, if initial screening test has been blood glucose test, measured by a glucometer. This is because classification of IGT and DM are based on FPG values. However if blood glucose test is unequivocally high, confirmation may not be required.



A1C%	eAG mg/dL
5	97
5.5	111
6	126
6.5	140
7	154
7.5	169
8	183
8.5	197
9	212
9.5	226
10	240
10.5	255
11	269
11.5	283
12	298

Figure - 8: HbA1c values and estimated average glucose (eAG)

B) Co-morbidities

a. Hypertension and Diabetes may co-exist. Every person with hypertension must be screened for diabetes mellitus using either blood glucose or FPG. Blood pressure values are a must in management of diabetes mellitus.

b. Fasting lipid profile (Serum cholesterol, triglycerides, HDL and LDL) should be obtained in all individuals with Hypertension or diabetes mellitus, especially in those who have obesity (BMI >30kg/m2) or abdominal obesity (Waist circumference >90cm in men or >80cm in women).

C) Complications

a. Nephropathy (Can be either due to diabetes or hypertension)

- Urinary protein (If positive, indicates presence of nephropathy. If negative, evaluate for microalbuminuria to rule out nephropathy).

i. Serum creatinine – Calculate eGFR to determine presence of nephropathy. Broadly if serum creatinine is greater than 1.4mg/dL indicates presence of nephropathy.

b. Neuropathy (Consequence of diabetes)

- Enquire about any sensory symptoms Physical examination for sensory loss (with 10g monofilament) and motor deficit.

c. Macrovascular complications

i. Palpation for peripheral pulsations (to screen for peripheral vascular disease)

ii. Electrocardiography (to screen for overt ischemic heart disease)

d. Retinopathy (Consequence of diabetes)

Fundus examination. Advise referral to ophthalmologist for evaluation.

e. Cardiovascular (Can be either due to diabetes or hypertension)

eGFR calculation

$$eGFR = \frac{(140\text{-Age}) \times \text{Weight (kg)}}{72 \times \text{Serum creatinine}}$$

(Multiply by 0.85 if female)

A 50 year old male, weight 72kg, S Creatinine 1.0	90 ml/min
A 50 year old male, weight 72kg, S Creatinine 1.2	75 ml/min
A 50 year old male, weight 72kg, S Creatinine 1.4	64 ml/min
A 50 year old male, weight 72kg, S Creatinine 1.6	56 ml/min

eGFR interpretation

CKD stages	**eGFR**
Stage 1	>90 ml/min with evidence of kidney damage
Stage 2	<90ml/min
Stage 3	<60ml/min
Stage 4	<30 ml/min
Stage 5	<15 ml/min

CKD is defined as reduced eGFR or evidence of kidney damage, for at least three months.

12 lead ECG for evidence of ischemia (coronary artery disease) or Left ventricular hypertrophy.

f. Ketosis (Consequence of diabetes)

- About 25% of all individuals with T1DM have ketonuria and ketoacidosis on presentation. Urinary ketones can be assessed using a urinary reagent strip, which can measure ketones. If ketones are positive on urinary examination:

o Initiate normal saline infusion

o Urgently refer the patient for specialist management.

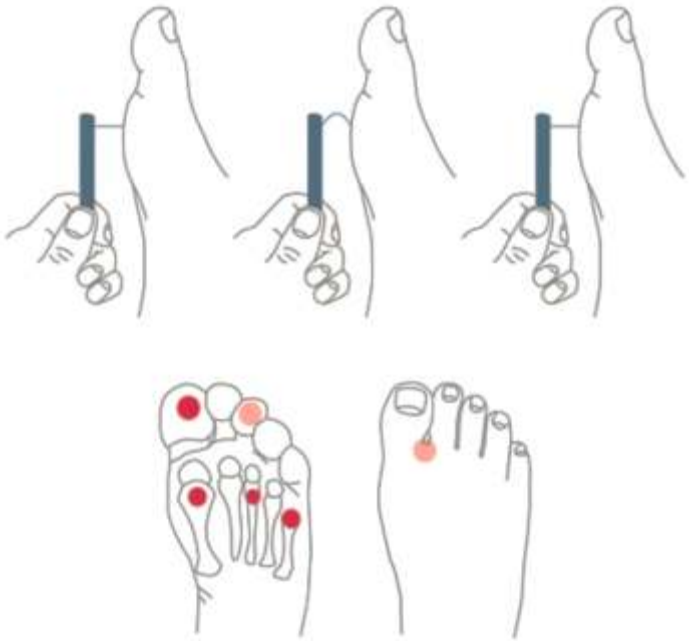


Figure - 9 : Sensory examination in diabetes mellitus

- Continue fluid infusion during transport

Metabolic syndrome

Obesity, Hypertension, Hyperglycemia, and Dyslipidemia occurring together increases risk for cardiovascular events. Metabolic syndrome is defines as :

i. Waist circumference of > 90cm in men, or > 80cm in women

ii. At least two or more of the following features:

1. Blood pressure more than 135/85 mm Hg
2. Fasting plasma glucose level more than 100mg/dL or known diabetes mellitus
3. Fasting triglyceride levels more than 150mg/dL
4. Fasting HDL levels less than 40mg/dL in men, less than 50mg/dL in women.

- A person with metabolic syndrome may need additional drug therapy for lipid lowering or management of impaired glucose tolerance or diabetes mellitus.

Secondary hypertension

Features suggestive of secondary hypertension:

- Young hypertensives (age less than 20 years).
- Episodic hypertension, with extreme diaphoresis (pheochromocytoma).
- Absent peripheral pulsations.
- Lower limb blood pressure lower than upper limb (Coarctation of aorta)
- Presence of abdominal bruit.
- Presence of nephropathy at the time of diagnosis.
- Poor blood pressure control on medication.
- Rise in serum creatinine levels after initiating ACE inhibitors.

Such individuals need to be screened for secondary causes of hypertension. This requires specialist referral.

CHAPTER 3
TOBACCO CESSATION

Chapter plan

- What's in a Cigarette? (4000 chemicals)
- Stages of Change
- Need of Four - W's
- 5 A's for Intervention
- 5 R's for Motivation
- The addiction triangle to assess
- Communicating with Smokers in Four Stages of Readiness for Change
- 5 D's to Quit Smoking
- Physical benefits after quitting
- Methods to Dealing with Withdrawal
- Some De-addiction Centres in India

What's in a Cigarette?

It is generally believed that cigarettes have only tobacco, but it may come as a surprise to many that cigarettes have more than 4000 harmful chemicals known to man. Some of the chemical presents in cigarettes are Butane (lighter fluid), Cadmium (batteries), Acetic Acid (vinegar), Methane (sewer gas), Arsenic (poison), Carbon monoxide, Hexamine (BBQ lighter), Methanol (rocket fuel), Paint, Ammonia (toilet cleaner), Nicotine (insecticide), Toluene , (industrial solvent), Stearic Acid (candle wax).

Various health outcomes like Psoriasis, Cataract, Skin wrinkling, Hearing loss, Cancer, Tooth decay, Emphysema, Osteoporosis, Heart diseases, Stomach ulcers, discolored fingers, Cervical cancer and miscarriage, Deformed sperm, Berger's disease have been associated with smoking

Why should a Medical officer involve in Tobacco Cessation?

- Tobacco users come in contact with the health care system more often than the non-users
- It is to seen as golden opportunity to initiate smoking cessation programs
- Minimal interventions by the health care professional increases overall tobacco abstinence rates

Stages of Change

The stages of change are the stages a person goes through from not willing to change, to modifying and maintaining his/her lifestyle with respect to a particular health outcome. There are 8 stages of change as explained by Prochaska & Diclement's model namely Pre contemplation, Contemplation, Preparation, Action, Maintenance, Established, Change, Relapse.

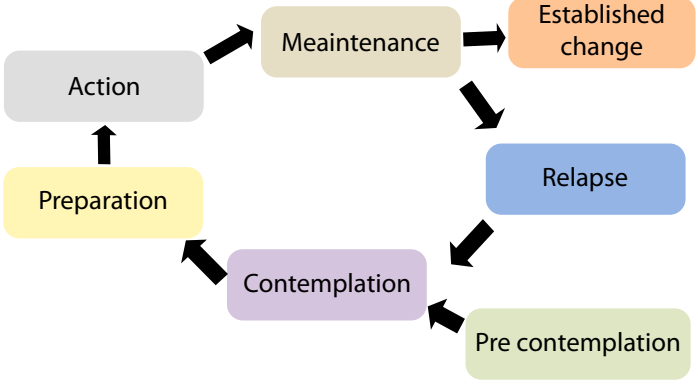


Figure - 1 : Stages of Change

Table 1: Stages of changes with patient response

Stage of Change	Response from patient
Pre contemplation	Not thinking of quitting in the next six months
Contemplation	Ambivalent, but thinking of quitting in the next six months
Preparation	Planning to quit in the next month
Action	Quit in the last six months
Maintenance	Quit for more than six months
Relapse	Has returned from the Action or the Maintenance stage to an earlier stage

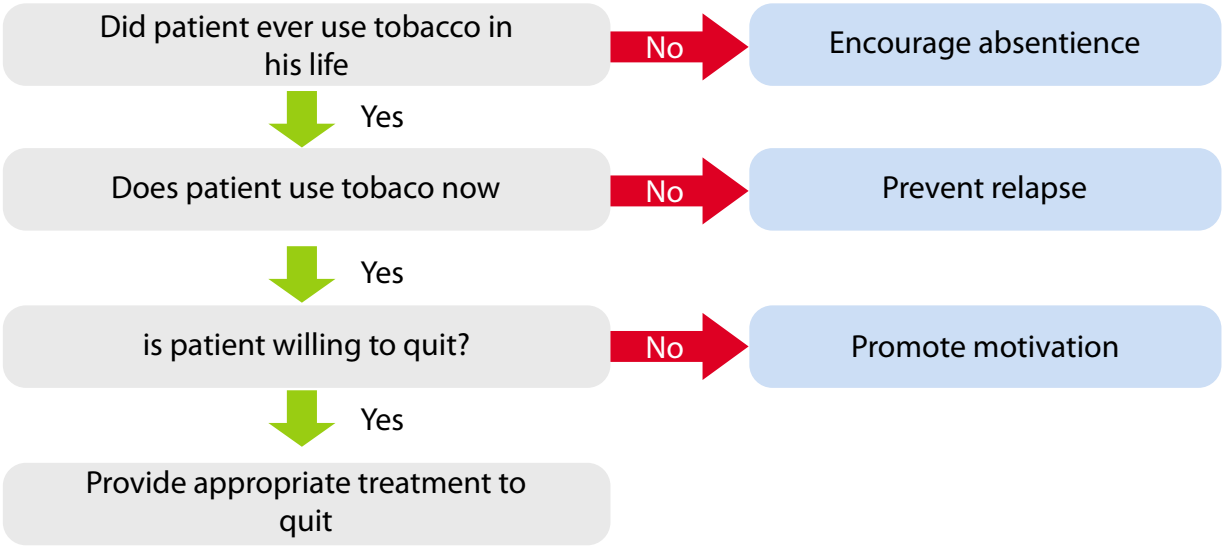


Figure 2 : Approach to Tobacco De-addiction

How can a Medical doctor approach for Tobacco De-addiction?

In Routine Clinical Practice, "Initial, effective smoking cessation counselling can be delivered as part of routine clinical practice in as little as 2 minutes". The general model for tobacco de-addiction is as follows in various situations,

What can be done & said?

Use every opportunity, when you come to contact with the patient, only a 2 to 3 minute message is enough, keep the message short and simple. Personalize the health message.

Make it pertinent to visit if possible. The disadvantage with this model is that it is only 5% effective. It is not possible to who will be impacted. There could be a delayed reaction to the counselling given

Need of Four - W's

Medical practitioners always face the four W's that is whom, when, where, & what. We come across similar questions during cessation counselling sessions. Given below are some possible answers to these queries.

Whom should you ask?

Ask EVERY patient you treat if he/she uses tobacco in any form

When should you ask?

During initial contact or during routine assessment

Where should you ask?

In any setting – hospital/community or any other

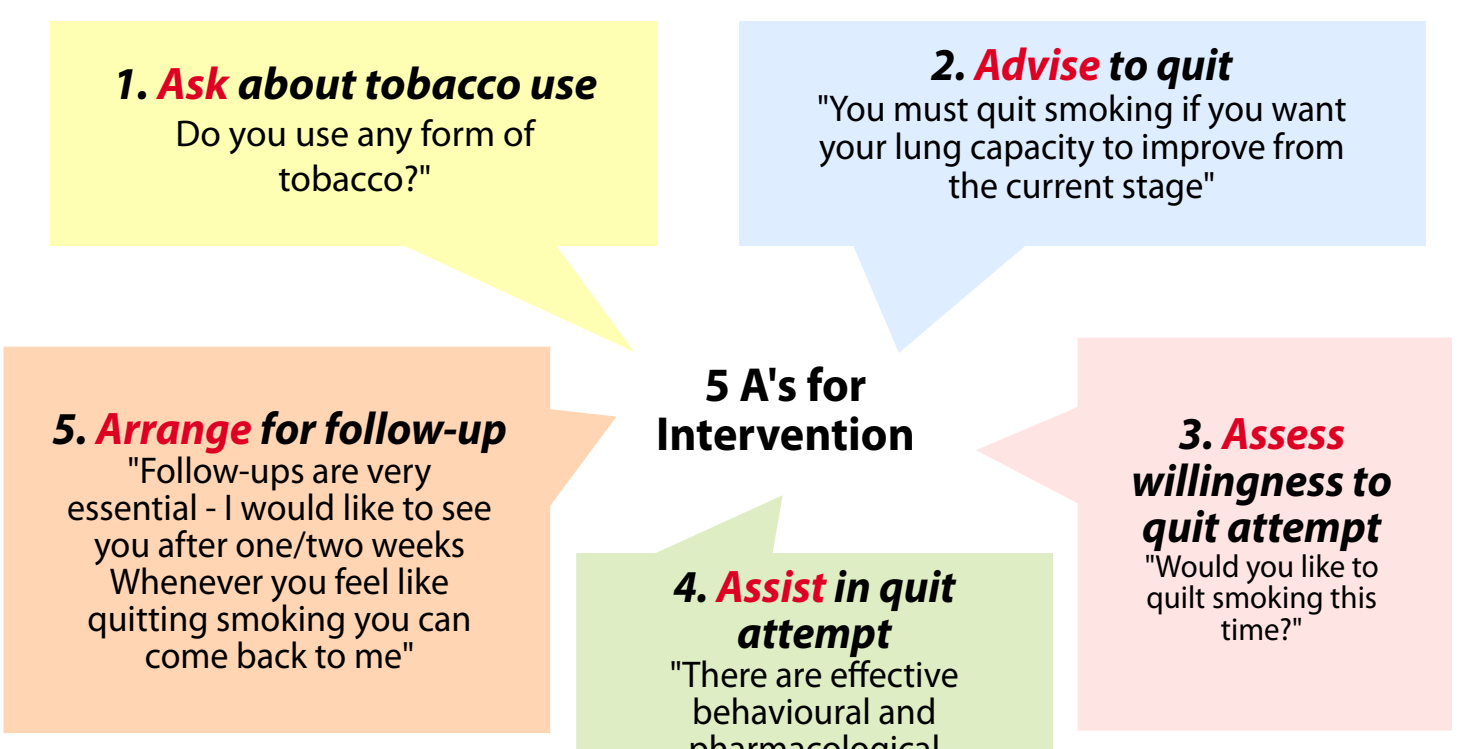


Figure - 3 : 5 A's for Intervention

What should you ask?

Does he/she use tobacco currently?

Eg. If a patient comes with a simple cough, Ask: "Do you smoke?"

5 R's for Motivation

In order to motivate the patient to quit smoking and to maintain abstinence we can use the five R's for motivation. They are Relevance, Risks, Rewards, Roadblocks, and Repetition

Relevance

We can explain to the patient that benefits of quitting tobacco usage like s/he can longer and better quality of life, People you live with will be healthier. We can also explain the decrease chance of heart attack, stroke or cancer

Risks

We should explain the various health risks associated with smoking to the patient. Diseases based on severity and duration like Acute (breathing, asthma, pregnancy), Long-term (heart, lungs, heart)

Rewards

The patient should be educated about the various health rewards like Health (self & others), Food taste, Sense of smell, Feel better, Example to others, Additional years of life

Roadblocks

The important aspects of an effective counselling are the educating the patient regarding the roadblocks or problems they may encounter during the period of abstinence, Withdrawal symptoms, Fear of failure, Weight gain, Lack of support, Depression, Enjoyment of tobacco are a few to be mentioned

Repetition

Motivation of people to quit smoking cannot be achieved in one sitting, so, respectfully repeat and remember the 5 R's during each visit, providing motivation and information.

Physical benefits after Quitting

20 minutes - Blood pressure and pulse rate is back to normal

8 hours - Can breathe easier? Oxygen levels are back to normal. Chance of having a heart attack has gone down

24 hours - Coughing a lot? That's a good sign… Lungs are starting to clear out the mucus

48 hours - You are nicotine-free. Enjoying food more? Your senses of taste and smell are improving

72 hours - You'll have more energy. Lung capacity increases and your bronchial tubes are relaxed, so breathing and exercising is easier

1 year - Risk of heart attack has dropped by 50%

10 years - Risk of dying from lung cancer is cut in half

10-15 years - Risk of dying from a heart attack is the same as a person who has never smoked

The Addiction Triangle to Assess

Physical – Stimulation Tension reduction Craving

Nicotine Replacement Therapy

Exercise

Relaxation therapy

Psychological - Pleasurable relaxation Tension reduction Craving

Relaxation

Exercise

Thought stopping

Stress management

Behavioral - Habit handling

Change routine

Break use patterns

Find substitutes

Communicating with Smokers in Four Stages of Readiness for Change

While communicating with smokers you will come across people in various stages of change. Each stage of readiness for change is unique and requires a different level of information as

Not ready for change

They need information and statistics regarding the various health outcomes of smoking. It is essential to raise their awareness level regarding the same.

Considering change

Need specific targeted communications and resources

Ready for change

Need to know overcome obstacles and focus on being able to quit

Practicing and sustaining change

Need materials that reinforce their positive behavior, Sustain their interest & commitment in maintaining a healthy lifestyle

5 D's to Quit Smoking

The 5 D'S which are helpful for patient who willing quit smoking -

Delay – Advise the patient to delay smoking until the craving to smoke passes (3 -5 min span)

Distract yourself – Asks/he to shift your attention away from thoughts of smoking (like a walk around)

Drink water – Instruct them to have water, drinking large amount of water as it beats cravings to smoke

Deep breaths – Ask them to take deep breaths as it helps you relax and let the stress of early smoking cessation go

Discuss - Feelings with someone close to you or with other ex-smokers - Hearing from those who have navigated smoking cessation successfully

Methods to Dealing with Withdrawal

The following methods may be helpful in dealing with effects associated with cessation of smoking

- Remind yourself that withdrawal will last only a few days
- Remember the urge will stay only for a few minutes, then go away
- Keep something in mouth (cardamom or chewing gum)
- Keep the hands busy (water the plants or squeeze a ball)
- Take each day at a time / Eat a healthy diet
- Get enough exercise / Learn to relax
- Avoid situations that cause temptation / Keep yourself active.

Parmacotherapy

Bupropion

- Initially developed as an antidepressant, but has been shown to be effective as smoking cessation aid.
- Therapy should start one to two weeks before the quit date.
- Dose
  - First three days - 150 mg in the morning.
  - Increase to 150mg twice per day.
- Therapy should continue until 12 weeks to six months after the quit date.
- More effective if administered in combination with nicotine replace therapy.
- Contraindicated in persons with seizure disorder.

Varencline

- Reuduces cravings and withdrawl.
- Therapy should start one week before quit date.
- Dose
  - Day 1 to 3 : 0.5 mg OD Days

    Days 4 to 7 : 0.5 mg BD

    Day 8 to end of : 1 mgBD treatment.
- Therapy should continue for 12 weeks after quit date.

Nicotine Replacement Therapy

- Assess tobacco dependence by using Brief Fagerstrom Nicotine dependence test.
- For oral to tobacco products, replace cigaratte by concerned product.
- If patient has nicotine dependence phormacotherapy has to be added.
- Nicotine replacement therapy is available in form of
  - Chewing gums - Inhaler
  - Patch - Nasal spray
- Dosage & treatment plan is shown in table.

Table 2: Brief Fagerstrom Test for Nicotine Dependence

	PLEASE TICK (✓) ONE BOX FOR EACH QUESTION	
How soon after waking do you smoke your first cigarette?	Within 5 minutes 5-30 minutes 31-60 minutes	☐ 3 ☐ 2 ☐ 1
Do you find it difficult to refrain from smoking in places where it is forbidden? e.g. Library, Railway Station etc.	Yes No	☐ 1 ☐ 0
Which cigarette would you hate to give up?	The first in the morning Any other	☐ 1 ☐ 0
How many cigarettes a day do you smoke?	10 or less 11-20 21-30 31 or more	☐ 0 ☐ 1 ☐ 2 ☐ 3
Do you smoke more frequently in the morning?	Yes No	☐ 1 ☐ 0
Do you smoke even if you are sick in bed most of the day?	Yes No	☐ 1 ☐ 0
	Total Score	
SCORE	1-2 = low dependence 3-4 = low to mod depoendence	5-7 = moderate dependence 8+ = high dependence

Table 3 : Nicotine replacement therapy dose range

Dependence level	**Nicotine Replacement Therapy Dosage**	**Combination Therapy**
High	**Patches :** 21mg/24hr or 15mg/16hr **Inhaler :** 6-12 cartridges per day **Lozenge :** 4mg **Gum :** 4mg	**Patches :** 21mg/24hr or **15mg/16hr** AND **Lozenge or Gum :** 2mg
Moderate	**Patches :** 21mg/24hr or 15mg/16hr **Inhaler :** 6-12 cartridges per day **Lozenge :** 4mg **Gum :** 4mg	**Patches :** 21mg/24hr or **15mg/16hr** AND **Lozenge or Gum :** 2mg
Low to moderate	**Patches :** 14mg/24hr patch or 10mg/16hr **Inhaler :** 6-12 cartridges per day **Lozenge :** 2mg **Gum :** 2mg	**Patches :** 14mg/24hr or **15mg/16hr** AND **Lozenge or Gum :** 2mg
Low	May not need NRT Monitor for withdrawal symptoms **Patches :** 7mg/24hr patch or 5mg/16hr **Lozenge :** 2mg **Gum:** 2mg	

CHAPTER 4
MANAGEMENT OF HYPERTENSION

Learning objectives

At the end of this module, you will be able to:

- Decide on how to initiate treatment of hypertension
- Plan life-long life-style management of an individual with hypertension

1. What are the treatment options available for hypertension?

Once a person is deemed to have hypertension, treatment options include:

a) Lifestyle interventions (NICE)

a. No tobacco

b. Increase physical activity

c. Consume healthy diet

d. Ease stress

Lifestyle advice must be given at initial patient visit, and subsequently reinforced at every visit.

b) Drugs

Lifestyle interventions (NICE)

a. No tobacco

i. Ask every person about tobacco consumption (smoking, chewing, or inhaled tobacco). Tobacco use in any form is harmful.

ii. Advise to quit tobacco use. Ask the person to completely abstain from tobacco use, rather than tapering. Former is more likely to be successful. Strongly suggest that tobacco in all forms and in all doses is harmful.

Figure 1: Different forms of tobacco. All forms are equally harmful

iii. Assist the person in quit attempt. Ask the person to choose a quit date. Let the person mark the quit date on a calendar, and this should be informed to all family

members. Ask the person and family members to destroy any tobacco products which may be present in house. Ask family members to support quit attempt, so that the person does not procure or consume tobacco. Advise that side effects on stopping tobacco use (irritability, headache, constipation) are short lived, and will be over soon. Currently nicotine gum is available to help mitigate some of these side effects.

iv. Enquire about quit attempt on subsequent visits. If quit attempt has failed, reinforce the need to quit smoking, and set next quit date.

b. Increase physical activity

i. Perform at least 30 minutes of moderate physical activity every day, such as brisk walking, games or light sports.

ii. Brisk walking is one of the simplest and effective methods of physical activity.

iii. Preferably schedule walk at a fixed time everyday to ensure consistency. Flat areas such as play ground, or parks are preferable. In the initial stages, walk about 15 minutes and then gradually raise it to 30 minutes. Identifying indoor places to walk when the weather is not good is also useful.

c. Consume healthy diet

What to avoid

i. Reduce salt consumption. Advise to avoid high salt content foods such as pickle, salty snacks, papad, pakodas, chips etc. Salt intake is to be restricted to less than 6gm per person per day.

ii. Reduce oil and fats. Reduce fried foods such as poori, kachori, samosa, pakoda, poha. Reduce junk foods such as fries, or chips. Prefer vegetables to be steamed,

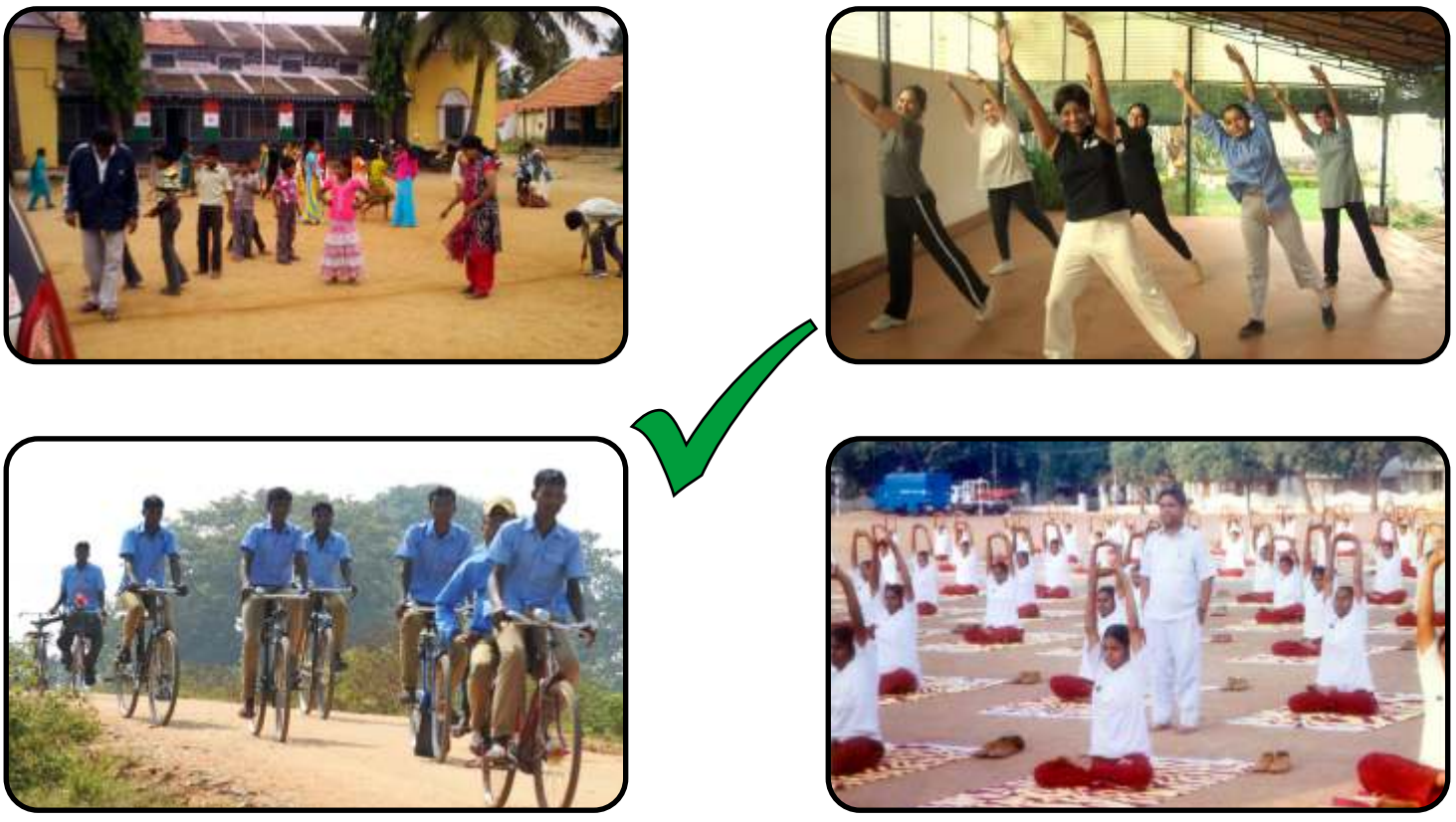


Figure - 2 : Different forms of physical activity

Figure - 3 : Different salty foods which need to be avoided

grilled or boiled instead of fried. Prefer vegetable oils (such as refined oils or mustard oil) over animal fats (such as cream, ghee or butter).

iii. Advise to abstain from alcohol consumption. Excessive consumption of alcohol increases blood pressure.

iv. Advise to reduce consumption of caffeine containing drinks such as tea or coffee. Excessive consumption of caffeine increases blood pressure.

v. Reduce aerated drinks or packaged juices as these increase caloric intake and lead to weight gain.

vi. For those who consume non-vegetarian food, avoid red meat (such as mutton or pork). Fish, chicken, and egg white is preferable.

What to consume more

vii. Diet should be rich in fruits and vegetables. It is recommended that a person should consume 5 servings of fresh fruits or vegetables. (Eg two medium sized whole

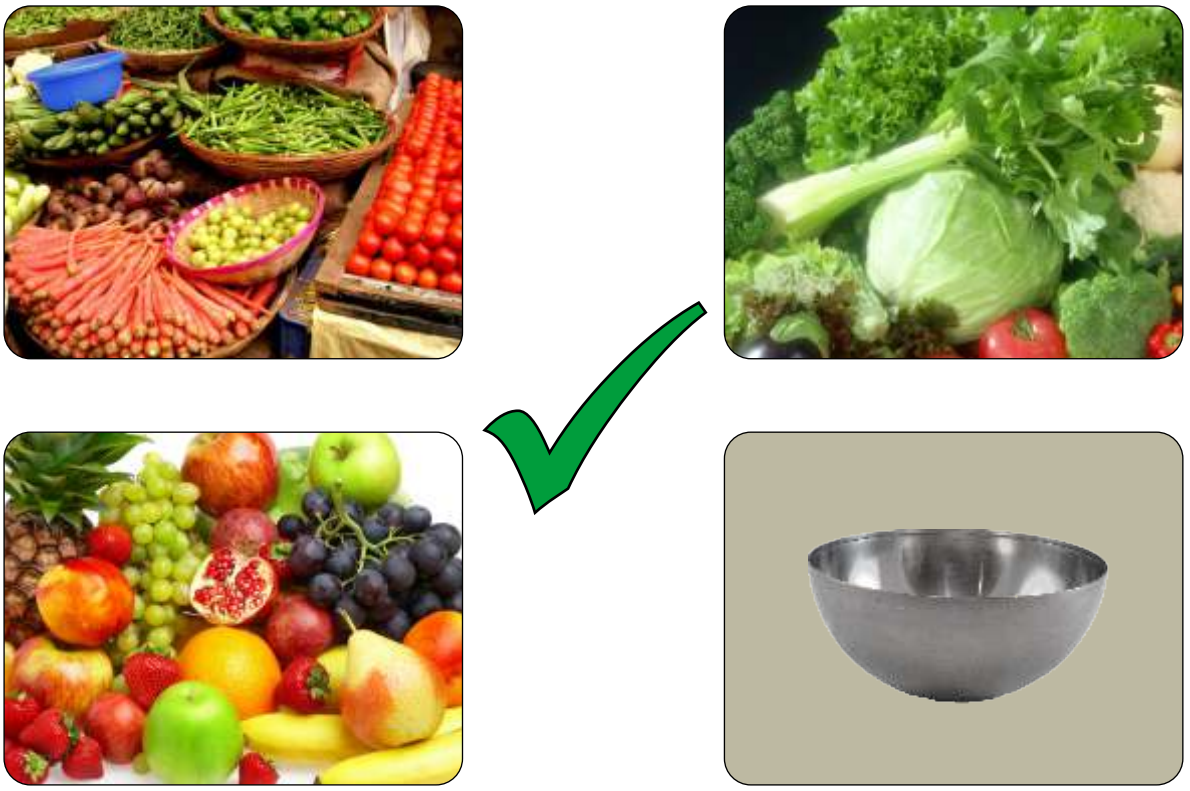


Figure 4 : At least 5 servings of fruits and vegetables need to be consumed. A typical serving size is 1 katori or 50gm

fruits such as banana, apple, orange, or mango, and three servings of salad which has fresh vegetables such as tomato, cucumber, carrot or radish)

viii. Whole wheat and coarse grains are preferred (such as whole-wheat, unpolished rice, millet or ragi) over refined grains. This is because whole grains have more fiber content, which takes longer to digest.

ix. Take time to consume meals (at least 20 minutes), avoid taking second helpings, and choose small plate sizes.

d. Ease stress

Mental Stress in layman terminology is 'tension' or 'pressure'. We have to understand that stress needs to be accepted as a part of life. Everybody has some amount of stress. But the impact of stress on oneself depends on his/her personality. People who are generally nervous tend to be more easily stressed out. People who are calm and take things lightly are less stressed.

Some simple tips to ease stress are as follows:

i. Talking to people around you, share your thoughts and feelings with your relations, friends or collegues.

ii. Be hopeful and have a positive attitude

iii. Blaming oneself or others for any situation should be avoided.

iv. Starting a regular exercise program, including yoga, meditation or other relaxation techniques

v. Take time off to have fun and to enjoy the simple things in life that make one happy is desirable.

vi. Divide time between work and family.

vii. Seeking professional help in case one is unable to cope with stress.

Drugs (ACD)

Four main categories of anti-hypertensive drugs are commonly used in management of hypertension are:

A. Angiotensin converting enzyme inhibitors (ACEI) / Angiotensin II receptor blockers (ARB)

C. Calcium channel blockers (CCB)

D. Diuretics (D)

Beta-Blockers have been removed as an anti-hypertensive drug category in JNC-8 classification

Table 3: Major categories of anti-hypertensive medication

Name of the Drug	Dosage range	Common side effects	Comments
ACE Inhibitors Enalapril Ramipril	Enalapril 5 to 40mg Ramipril 2.5 to 20mg	Dry cough Hyperkalemia Dizziness	· First dose may result in dizziness due to hypotension. While initiating, give the drug in the evening. · Dry cough is a common side effect. Change to alternate if it persists · Do not use in pregnancy · It is the preferred drug for patients who have both diabetes & hypertension · This drug class has benefits beyond blood pressure control, such as atheroma plaque stabilization, prevention of nephropathy and heart failure.
Angiotensin receptor blockers Losartan Telmisartan	Losartan 50 to 100mg Telmisartan 40 to 80mg	Dizziness Headache Hyperkalemia	· Used when ACE inhibitors are not tolerated. · Do not use in pregnancy · Alternate preferred drug (after ACEI) in those with hypertension and diabetes · This drug class has benefits beyond blood pressure control, such as atheroma plaque stabilization, prevention of nephropathy and heart failure.
Calcium Channel Blockers Amlodipine	Amlodipine 2.5 to 10mg	Headache Dizziness Ankle swelling	· If swelling over feet develops, may add additional diuretic · Safe in individuals with renal failure · Calcium channel drugs are used in pregnancy, these is no known teratogenic effect · Amlodipine is a long acting preparation. Nefidepine is short acting, and not ideal for chronic treatments. Verapamil and Diltiazem have predominant cardiac effects, and not preferred for management of hypertension.
Thiazide Diuretics Hydrochlorthaizide (HCTZ)	HCTZ 12.5 to 50mg	Dyspepsia Tiredness Muscle cramps Visual blurring	· Often used along with ACEI/ARB/CCB · Contraindicated in presence of gout · Other diuretics (Frusemide, Toresamide, Amiloride) are not preferred drugs in management of hypertension.

All drugs are initiated at low dosages, and thereafter scaled up to optimal dosages

2. How to initiate drug therapy in hypertension?

Who should be treated

- Must initiate drug therapy in individuals of any age, who have stage 2 hypertension
- Must initiate drug therapy in individuals less than 80 years of age, who have stage 1 hypertension, especially in presence of diabetes mellitus, or end-organ damage (such as left ventricular hypertrophy or ischemic changes on ECG, proteinuria or renal dysfunction as determined by serum creatinine levels).
- Individuals with isolated systolic hypertension are to be treated in same manner as those with systolic or diastolic hypertension.

General principles

- Initiate antihypertensive drugs as once-daily therapies
- Prescribe drug in a low dose, and allow at least 2-4 weeks before escalating close.
- Out of pocket cost to the patient is an important determinant to drug adherence. Calcium channel blockers and thiazide diuretics are least expensive, followed by ACE inhibitors and angiotensin receptor blockers which are more expensive.
- Two (or more) drugs in a low dose have a better effect as compared to a single drug in a high dose.
- If combination therapy is planned:
  - Preferred combinations are ACEI/ARB with a diuretic or ACEI/ARB with a calcium channel blocker or a diuretic with a calcium channel blocker.
  - Unacceptable combinations are beta-blocker alone or ACEI and ARB, or a dual ACEI/ARB or ACEI/ARB with a beta-blocker or beta-blocker with a non-Amlodipine calcium channel blocker (such as diltiazem or verapamil).

Hypertension treatment algorithm

Drug therapy for hypertension can be initiated at a primary care level in the following manner:

Figure 6: Anti-hypertensive drug treatment algorithm

3. How to monitor therapy for hypertension?

Blood pressure control

- Target blood pressure is less than 140/90 in those

Table 4 : Main categories of anti-hypertensive drugs and dosages

		Drug	Starting dose (mg)	Optimal dose (mg)	Maximum dose (mg)
A	Angiotensin converting enzyme inhibitor	Enalapril	5	10	40
		Ramipril	2.5	5	20
	Angiotensin receptor blocker	Losartan	50	50	100
		Telmisartan	40	40	80
C	Calcium channel blocker	Amlodipine	2.5	5	10
D	Thiazide diuretic	Hydrochlorthiazide (HCTZ)	12.5	25	50

If optimal dose of one drug, is not able to achieve blood pressure control target, add a second drug. If two drugs in their optimal dosages are not able to achieve target, add a third drug. It is preferable to use two drugs in optimal or low dosages, as compared to single drug in a high dose.

who are less than 60 years of age, and less than 150/90 in those who are 60 years or more in age. Reinforce blood pressure control target and adherence to drug therapy during every visit.

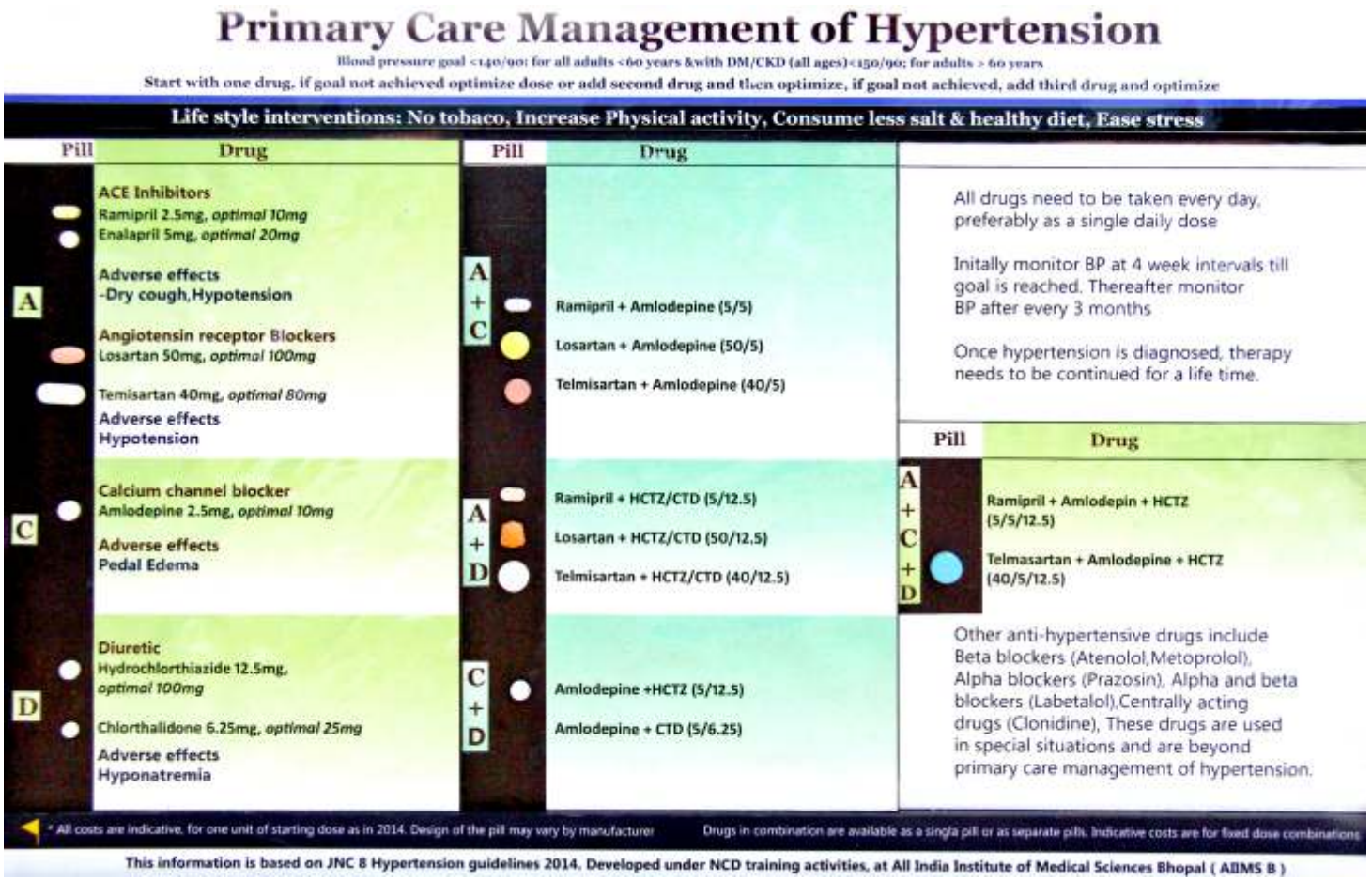
- In individuals with blood pressure and diabetes mellitus, target blood pressure to be less than 140/90 mm Hg.
- Health center based blood pressure readings, are to be obtained in the same fashion as those obtained at time of initial diagnosis.
- Once therapy has been initiated, or altered, allow at least 4 weeks to judgefor blood pressure response.
- If target blood pressure is not reached with starting dose of a drug, and adherence to drugs is good, escalate to optimal dose.
- Use stepwise escalation guide (figure above) to adjust therapy.
- If an individual blood pressure is controlled on a particular drug or combination of drugs, continue to use the same prescription.
- Do ask about common side effects of anti-hypertensive drugs (such as dry cough with ACEI, dizziness with ARB/ACEI, pedal edema with CCB) during every visit. Switch to a different class of drugs if a particular drug causes side effects. In case that side effect persists even 2-4 weeks after drug is withdrawn, investigate for alternate etiologies.

Adherence to medication

- Adherence to blood pressure lowering medication is key to blood pressure control. Emphasize the following:
  - o Take your blood pressure medicines every day
  - o It is better to fix a particular time in the day for taking medicines. It helps to integrate this with a routine activity, such as just before dinner.
  - o Involve family members to promote adherence, ask spouse to give verbal reminders.
  - o Keep your medicines at a place where it is visible, such as near a place where you have food.
  - o Emphasize that raised blood pressure often does not have any symptoms. Usually when

Figure - 5 : Adherence is important for chronic drug therapies

Adherence to medication is key to blood pressure control. Promote adherence at every visit.



the symptoms start, target organ damage (such as cardiac, cerebral, retinal or renal) has already occurred.

- Once daily therapy with low pill burden is important to promote adherence.

Co-morbidities

- Please do advise targets for common co-morbidities such as tobacco use, and obesity.
- Target for tobacco use is complete cessation of tobacco use.
- Target for obesity will include weight to be approximately be equal to height (in cms) – 100 , or BMI less than 25kg/m2, or waist circumference less than 90cm for men and less than 80cm for women. Attempt to achieve 7% weight reduction in a 3 month duration.
- Individuals with metabolic syndrome need specialist referral.

CHAPTER 5
DIABETES MELLITUS: MANAGEMENT

Learning objectives

At the end of this module, you will be able to:

- Decide on how to initiate treatment of diabetes mellitus
- Long term management with drugs and life-style changes
- Recognition of complications of diabetes mellitus

Section A: LIFESTYLE CHANGES IN DIABETES MELLITUS

What are the treatment options available for diabetes mellitus ?

Treatment options for diabetes mellitus are:

- **Lifestyle changes**
- **Oral hypoglycemic drugs**
- **Insulin**

Lifestyle changes

- Compliments NICE as described for hypertension
  - **No Tobacco**
  - **Increase physical activity**
  - **Consume healthy diet**
  - **Ease stress**
- Increasing physical activity, reduction in caloric intake, with setting of achievable goals is essential component of diabetes management. This is known as Medical nutritional therapy (or MNT)
  - These are described in more detail following section.

No tobacco (see section on hypertension)

Increase Physical activity

- Eat from a variety of foods from all the food groups to ensure you get the right nourishment for your body.
- Portion control is key. Aim for moderate and consistent portions of food at each meal.

Figure - 1 : Stay physically active

- If you need a snack or a fruit, space it approximately 2-3 hrs before or after a meal.
- Avoid skipping meals
- Eat when you are hungry, not starving. Stop when you feel full.
- Breakfast is a must; try to have two third of your calories before dinner
- Increase the amount of fiber in your meals
- Drink lots of water through the day
- Go slow on salt and sugar
- Trim the fat

Goal is to achieve physical activity of at least 30-60 minutes per day, at least five days in a week. General principles of physical activity plan are as follows:

- Start slowly, any activity is better than none
- Brisk walk is better than a casual walk.
- Find company for exercise. Group plans work better than alone
- Increase activity in daily routines. Take stairs, get up to turn off / on TV, parking away from door.
- Dancing, swimming, biking are fun based physical activities.
- Wear good footwear before engaging in physical activity.
- Drink adequate water while you exercise.
- In case of significant cardiovascular disease, avoid strenuous / aerobic exercise.
- Don't walk fast if there is neuropathy of cardiac problem
- Examine foot front and back before and after exercise
- Vigorous physical activity is contraindicated in those with proliferative diabetic retinopathy.

Consume healthy diet Medical Nutrition therapy (MNT)

The food that we eat is broken down into glucose. Glucose is the main source of energy to our body. The presence of glucose in the blood causes blood sugar levels to rise and signals the pancreas to release the hormone insulin.

Insulin is like a key which opens the lock of the cells, allowing glucose to enter in and get converted into energy.

In the absence of Insulin, glucose cannot enter the cells resulting in high blood sugar levels. The body is deprived of the energy it needs to carry out its daily functions.

High blood glucose levels over time affects every vital organ in the body (Kidney, eyes, heart, nerves etc) and can cause life threatening complications.

In patients with **Type 1 diabetes,** body produces little or no insulin at all. Meal timings become very important for patients on insulin.

In patients with **Type 2 diabetes,** body does make insulin - but there may be a problem. Pancreas might not make enough of it, or there may be a defect preventing it from helping glucose enter the cells. People with Type 2 diabetes may be managed on diet and exercise alone, or put on oral medication or started with insulin.

In patients who are overweight, a meal plan must be advised which helps them to lose weight. Weight loss makes it easier to control blood sugar, and so does a regular eating schedule.

- A sedentary person aged 30 to 60 years needs about 2000 calories per day (2200 to 2400 kcal in men, 1600-1800 kcal in women). Add 200 kcal if a person is moderately active, and another 200 kcal for those who are very active / engage in strenuous work. This caloric intake will allow for weight maintenance.
- If weight reduction is planned, restrict to 500calories less than required (about 1500 calories for a sedentary person, aged 30-60 years. About 1800 kcal in men, 1200 kcal in women).

Table 1 : Types of carbohydrates

GOOD CARBOHYDRATES	BAD CARBOHYDRATES	
Complex Carbohydrates (Good Carbohydrates)	**Simple Carbohydrates**	**Refined Carbohydrates**
They are packed with fiber, vitamins and minerals. The body takes longer and has to work harder to break down these foods into energy. Include foods rich in complex carbohydrates as they give you sustained energy and keep you full longer and active throughout the day. **Sources :** Whole grain cereals – unpolished rice, whole wheat, oats, broken wheat (daliya), barley, millets, whole pulses and sprouts – soybeans, root vegetables, etc.	They are digested quickly by the body. When taken in small amounts, they give your body an immediate energy boost. Best to correct a hypoglycemic event. If you have a fruit juice, it will take only about fifteen minutes for the sugar to enter your blood and cause a spike in blood glucose levels. **Sources :** Fruit juice, honey and some vegetables.	The body processes refined carbohydrates quickly making your blood sugar rise and fall rapidly. The higher the food is in refined sugar, the worse it is for you as it offers very little nutriditonal value to your body. **Source :** Polished rice, white bread, white pasta, maida / refined flour and its products, aerated drinks, candy, artificial syrups, sugar. Junk food : Burger, pizza, samosa, vada etc, pastries and desserts. Bakery items : Biscuits, breads, cookies, puffs etc.

Figure - 2 : Consume fresh fruits and vegetables

Knowing your Food Groups

Foods contain nutrients that are needed by your body for good health. There are three main nutrients that make up food and contribute calories- Carbo, Protein, and Fat.

Carbohydrates

- They are the preferred and main source of energy for body functions
- Carbohydrates are of three types : **complex, simple and refined**

Foods having no or negligible carbs (0-5 g). They have very little impact on blood glucose levels.

No or negligible Carbohydrates (0-5 g carbohydrates)

- All vegetables
- Green leafy vegetables
- Nuts

As a rule of thumb, opt for whole foods rather than refined and processed foods.

- Spices
- Eggs
- Seafood
- Meat and poultry
- Fats (Oil, butter and ghee)

Impact of Carbohydrates on blood glucose :

Carbohydrates by far have the greatest short-term impact on your blood glucose levels more than protein or fat.

Blood glucose levels begin to rise after fifteen minutes of eating and most of the carbohydrate is broken down into blood glucose within the first two hourse of eating.

The rise in blood glucose levels will depend on the amount (g) and the type of carbohydrate (complex, simole, refined) you eat.

Fiber

Fiber cannot be digested by the body and hence does not provide any calories. It keeps you full longer, aids in weight loss and helps prevent constipation.

Impact of Fiber on Blood Glucose :

Though considered a carbohydrate like starch or sugar, fiber does not raise blood glucose levels. In fact the presence of fiber can slow down the impact of other carbohydrates in a meal.

Recommended intake (25 – 35 g/day)

Ideas for increasing fiber intake include :

Choose whole fruits over fruit juices

- Opt for brown rice and whole-grain/multigrain product instead of white rice and refined flour
- Choose whole-grain, high fiber cereals for breakfast
- Much on raw vegetables like cucumber, carrot, radish and tomatoes
- Include sprouts and unstrained soup in your diet

Sources :

Whole wheat, brown rice, jowar, bajra, bran, barley, bulgar wheat (daliya), rolled or whole oatmeal, whole grain, corn, vegetables, sprouts, peas, soyabean, guar, fenugreek, beans, carrots, apples, guava, citrus fruits, strawberries, figs, prunes, pear, etc.

- o Fruit consumption is encouraged. Prefer fruits with low glycemic index (apples, guava, orange, watermelon, papaya). Avoid banana, chickoo grapes , Mango) Any fruit intake is better than none.

Choose low fat protein sources like lean meat, sprouts, egg whites, low fat milk, yoghurt and defatted soya to meet your protein requirements.

Table 2 : Types of fats

Saturated Fat	Trans Fats	Dietary Cholesterol
Restrict foods with too much saturated fat as they raise 'bad chlesterol' levels in your blood. **Sources :** Butter, cheese, whole milk and cream, egg yolks, lard and skin of poultry, red meat and processed meat like sausages, ham and bacon, coconut oil, cocoa butter and palm kernel oils.	Eat foods with as litle trans fat as possible (less than 2% of total fat intake). **Source :** Bakery products, margarine, vanaspati / dalda, ready to eat (processed) foods, deep fried foods like samosas, bhajias, french fries, chips, sweets like jalebis, gulab jamuns, etc.	Restrict the dietary cholesterol intake to less than 200 mg/day. **Source :** Milk and milk products, butter, ghee, egg yolks, liver, brain and other organ meats, red meat and poultry.

Proteins

Proteins are the building materials of the body responsible for growth, maintenance and energy. On an average an individual needs 0.8-1.0 of protein/kg body weight. This may vary depending on several factors.

Sources of protein include milk and milk products, dals, sprouted pulses (chana, moong, matki, rajma), soyabean, egg, meat, fish, chicken and nuts.

For those of you vegetarians, who find it difficult to meet you protein intake, milk, yoghurt, buttermilk, whey water, hung curd, low fat paner, cheese, soyabean and tofu are an excellent source of high quality protein and must be included in your meal plan.

Effect of protein on blood glucose levels :

Protein eaten in small portions has little effect on blood glucose levels.

But if you eat large amounts of protein in a meal (3 servings of protein = 3 x 7 g of protein / serving = 21 g of protein)*, it may delay the absorption of carbohydrate and cause the sugars to increase for up to a few hours after the meal.

Fats and Oils

Although fats have earned the bad reputation of causing weight gain and other ill effets, some fat is essential for survival. Out of the total calories, 20-30% should come from fat.

Look for words such as "shortening", "partially hydrogenated vegetable oil," or "hydrogenated vegetable oil" in the ingredients. These words are clues that the food contains trans fat.

Facts about Fats & Oils

- The biggest problem with food is high amount of fat used in cooking.
- No fat or oil is "totally safe" and can be consumed in unlimited quantities. Any fat or oil you eat (healthy or unhealthy) is a dense source of calories.
- All vegetable and seed oils are "cholesterol free". Cholesterol is present only in animal foods.

It is advisable not to reheat oils. The oil once used for frying can be used for cooking; for example to give tadka to the dal

Table 3 : Healthy fats

HEALTHY FATS		
Unsaturated fats found in many vegetable oils and seeds do not raise blood cholesterol levels and have a protective effect on the heart. Even though considered healthy, healthy fats are still high in calories. They can be made part of a healthy diet, as long as you do not exceed you total fat allowance.		
Monounsaturated Fats (MUFA) :	**Polyunsaturated Fats (PUFA) : Omega-6**	**Polyunsaturated Fats (PUFA): Omega-3**
Decreases LDL (bad) cholesterol **Sources :** Avocado, Olive oil, Groundnut oil, Canola oil, Rice Bran Oil, Nuts, Olives, Nuts, Sesame sees.	Decreases LDL (bad) cholesterol and improves insulin action. **Sources :** Safflower, Sunflower, Cottonseed, Corn, Soyabean oil, Groundnut, Ricebran and Sesame oil.	Reduces Triglycerides and Stickiness in blood **Sources :** Soyabean, Canola/Rapeseed and mustard oils, pulses like Black Gram (kala chana), Kidney beans (rajmah) & Cowpea (lobia), Mustard and Fenugreek seeds and green leafy vegetables, fish like Mackerel, Sardines, Tuna and Salmon.

Table 4 : Unhealthy fats

UNHEALTHY FATS		
They raise blood cholesterol levels and put you at an increased risk for Obeisty, Diabetes, Heart Disease and Cancer.		
Saturated Fat	**Trans Fats**	**Dietary Cholesterol**
Restrict foods with too much saturated fat as they raise 'bad chlesterol' levels in your blood. **Sources :** Butter, cheese, whole milk and cream, egg yolks, lard and skin of poultry, red meat and processed meat like sausages, ham and bacon, coconut oil, cocoa butter and palm kernel oils.	Eat foods with as litle trans fat as possible (less than 2% of total fat intake). **Source :** Bakery products, margarine, vanaspati / dalda, ready to eat (processed) foods, deep fried foods like samosas, bhajias, french fries, chips, sweets like jalebis, gulab jamuns, etc.	Restrict the dietary cholesterol intake to less than 200 mg/day. **Source :** Milk and milk products, butter, ghee, egg yolks, liver, brain and other organ meats, red meat and poultry.

Figure-3 : Oil and Salt Ration for Family of four

- A blend of two or more vegetable oils should be used in daily cooking.
- Deep or shallow fried foods should be avoided.
- If you have a sedentary lifestyle, you should restrict total fat intake to about 25g (5tsp*) of visible fat / day & if you are involved in hard physical work, you should restrict total fat intake to 35_40 g (7-8tsp) of visible fat/day

Frying and Reheating of Oils

For frying, use oils which have more stability and a high smoke point. The common practice of repeatedly using the same oil for frying is hazardous to health.

Effect of fat on blood glucose levels :

Fat has a minimal effect on blood glucose levels similar to protein. However, if fat is present in high amounts; it can slow down the breakdown of carbohydrate from the meal causing you blood glucose to rise much later.

The best example is of ice-cream. If you eat an ice-cream and test blood glucose after two hours, chances are that you will not see a spike in blood glucose levels, however if you test after a few hours, blood glucose levels may be higher.

Hence monitoring in case of a high fat meal is recommended for up to 4-6 hours after consuming the meal.

Sugar Substitutes

i. Artificial Sweeteners

Artificial Sweeteners are similar to sugar in taste but do not provide any calories. They do not have any effect on blood glucose levels.

Eamples are saccharin, asparatame, sucralose, acesulfame-k, stevia and cyclamate. They are generally considered to be safe to use if consumed in moderation.

ii. Sugar Alcohols

Sugar alcohols are like sugar in some ways, but they are not completely absorbed by the body and hence provide fewer calories. Because of this, the blood

glucose impact of sugar alcohols is lesser than that of sugar.

Sugar alcohols should be taken with caution as studies have shown that consumption of foods high in sugar alcohols can cause diarrhea in people with diabetes

Examples are mannitol, sorbitol and xylitol which are used as sweeteners in a variety of products like bakery goods, chewing gum, ice cream and candy.

Alcohol

- Alcohol provides empty calories (7 cals/g) and should be avoided.

If a product contains a Sweetener, it does not mean it is carbohydrate free. Check the food label on foods marked "diet", "light" or "sugar free" to check which sweetener is used and the total carbohydrate content.

- If you choose to drink alcohol, do so in moderation (not more than one or two drinks).
- Choose low carbohydrate drinks. Avoid Beers, Sweet Wines, Liquers and cocktails
- Make sure you eat something to prevent your blood glucose levels from going low.
- Additional blood glucose testing (espically at night) is recommended when consuming alcohol.

How many calories do the Nutrients Contain ?

1 gram of carbohydrate = 4 calories

1 gram of protein = 4 calories

1 gram of fat = 9 calories

A balanced diet should provide around 50-60% of total calories from carbohydrates, preferably from complex carbohydrates, about 15-20% from proteins and 20-30% from both visible and invisible fat.

Provide a diet prescription

- Based on common food items consumed device a diet prescription for your patient.

Table 5: Caloric content of common Indian foods (Source National Institute of Nutrition, Hyderabad)

Approximate Calorific Value of Some Cooked Preparatioins

	Preparation	Quantity for one serving	Calories (K cal)
1.	**Cereal**		
	Rice	1 cup	170
	Phulko	1 No.	80
	Paratha	1 No.	150
	Puri	1 No.	80
	Bread	2 slices	170
	Poha	1 cup	270
	Upma	1 cup	270
	Idli	2 Nos.	150
	Dosa	1 No.	125
	Kichidi	1 cup	200
	Wheat porridge	1 cup	220
	Semolina porridge	1 cup	220
	Cereal flakes with milk		
	(corn/wheat/rice)	1 cup	220
2.	**Pulse**		
	Plain dhal	½ cup	100
	Sambar	1 cup	110
3.	**Vegetable**		
	With gravy	1 cup	170
	Dry	1 cup	150
4.	**Non-Vegetarian**		
	Boiled egg	1 No	90
	Ommelette	1 No.	160
	Fried egg	1 No.	60
	Mutton curry	¾ cup	260
	Chicken curry	¾ Aicup	240
	Fish fried	2 big pieces	190
	Fish cutlet	2 Nos.	1 9o
	Prawn curry	¾ cup	220
	Keema kofta curry	¾ cup (6 small koftas)	240
5.	**Savoury snacks**		
	Bajji or pakora	8 Nos.	280
	Besan ka pura	1 No.	220
	Chat (Dah pakori)	5 pieces	220
	Cheese balls	2 Nos.	250

	Preparation	Quantity for one serving	Calories (K cal)
	Dahi vada	2 Nos.	180
	Vada	2 Nos.	140
	Mosala vada	2 Nos.	150
	Masala dosa	1 No.	200
	Pea-kochori	2 Nos.	380
	Potato bonda	2 Nos.	200
	Sago vada	2 Nos.	210
	Samosa	1 No.	200
	Sandwiches {butter- 2tbsp)	2 Nos.	200
	Vegetable puff	1 No.	200
	Pizza {Cheese and tomato)	1 slice	200
6.	**Chutneys**		
	Coconut/groundnuts/til	2 tbsp	120
	Tomato	1 tbsp	10
	Tamarind {with joggery)	1 tbsp	60
7.	**Sweets and Desserts**		
	Besan barfi	2 small pieces	400
	Chikki	2 pieces	290
	Fruit cake	1 piece	270
	Rice puttu	½ cup	280
	Sandesh	2 Nos.	140
	Double ka meetha	½ cup	280
	Halwa (kesari)	½ cup	320
	Jelly/Jam	1 tbsp	20
	Custard {caramel)	½ cup	160
	Srikhand	½ cup	380
	Milk chocolate	25 g	140
	Ice-creom	½ cup	200
8.	**Beverages**		
	Tea (2 tsp sugar + 50 ml toned milk)	1 cup	75
	Coffee (2 tsp sugar + 100 ml)	1 cup	110
	Cow's milk (2 tsp sugar)	1 cup	180
	Buffalo's milk (2 tsp sugar)	1 cup	320
	Lassi (2 tsp sugar)	1 cup/glass (200 ml)	110
	Squash	1 cup/glass	75
	Syrups (Sharabats)	1 cup/glass	200
	Cold drinks	1 bottle (200 ml)	150
	Fresh lime juice	1 glass	60

	Portion	Calories
Nuts		
Almonds	10 Nos.	85
Cashewnuts	10 Nos.	95
Coconut (fresh)	100 g	444
Coconut (dry)	100 9	662
Peanuts	50Nos.	90
Fresh fruits		
Apple	1 medium	65
Banana	1 medium	90
Grapes	30 Nos.	70
Guava	1 medium	50
Jackfruit	4 pieces	90
Mango	1 medium	180
Mosambi/Organge	1 medium	40
Papaya	1 piece	80
Pineapple	1 piece	50
Sapota	1 medium	80
Custard apple	1 medium	130
Watermelon / muskmelon	1 slice	15
Salad		
Beetroot	1 medium	30
Carrot	1 medium	70
Cucumber	1 medium	12
Onion	1 medium	25
Radish	1 medium	10
Tomato	1 medium	10

Figure - 4 : Ingredients in diet

दैनिक भोजन को व्यवस्थित करें

सुबह का नाश्ता

	मात्रा	खाद्य पदार्थ का विवरण	कैलोरी
1	रोजाना कोई भी एक कप	चाय (बिना शक्कर)	36
		दूध (टोनड दूध हो तो बेहतर)	90
2	रोजा कोई भी एक पदार्थ	अंडा (बॉईल) (1)	90
		वडा (2)	140
		भजिया /पकोड़ी (4)	140
		पोहा (एक कटोरी)	145
		मूली का पराठा (कम तेल)	145
		गोभी प्याज का पराठा (कम तेल) एक	147
		इडली (2)	150
		आमलेट (1)	160
		बेसन का चीला (एक से डेढ़)	164
		दही बड़ा (2)	180
		छोले-कचौरी (1)	190
		सैंडविच-2 स्लाइस	200
		समोसा (1)	200
		मसाला डोसा (1)	200
		साबूदाना वडा (2)	210
		उपमा (एक कटोरी)	270
		टोमेटो सॉस (1 चम्मच)	13
3	रोजाना कोई भी एक पदार्थ एक कटोरी	हरी चटनी	15
		छाछ	60
		नारियल चटनी (1 बड़ा चम्मच)	60
		दही	75
		तरबूज (2-3 स्लाइस 200 ग्राम)	32
4	फल रोजाना कोई भी एक	खरबूज (2-3 स्लाइस 200 ग्राम)	34
		सन्तरा/ऑरेंज (मध्यम आकार वाला)	40
		मौसंबी	40
		अमरूद (मध्यम आकार वाला)	50
		सेब (एप्पल) (मध्यम आकार वाला)	65
		अंगूर (एक छोटी कटोरी)	70
		पपीता (2 छोटे स्लाइस)	90
		केला (मध्यम आकार वाला)	90

रोजाना सबेरे के नाश्ते में ऊपर दिये गये हर नम्बर के बाक्स में से कोई भी एक पदार्थ का सेवन किया जा सकता है

रोजाना कुल कैलोरी

दोपहर का भोजन

	मात्रा	खाद्य पदार्थ का विवरण	कैलोरी
1	सलाद–रोजाना एक मध्यम आकार वाला	खीरा	12
		टोमेटो (2)	20
		प्याज	25
		बीट/चुकंदर	30
		गाजर	70
2	रोजाना कोई भी एक पदार्थ	पराठा (मध्यम आकार) (1)	150
		फुलका (मध्यम आकार) (2)	160
		तंदूरी नान (मध्यम आकार) (1)	200
3	सब्जी रोजाना एक कटोरी	भरवा भिंडी	70
		फल्ली और गाजर	65
		पत्ता गोभी	100
		कोला फ्राई (2)	104
		गोभी	120
		मैथी टोमेटो	122
		गोभी मटर	122
		कोफ्ता करी	136
		दाल पालक	140
		बैंगन भरता	147
		पालक मशरूम	160
		कड़ी	147
		मच्छी/फिश फ्राई (2 पीस)	190
		राजमा	200
		चिकन मसाला (3/4 कटोरी)	240
		मटन मसाला (3/4 कटोरी)	260
		नुट्रीला (सोयाबीन)	260
4	दही/रायता रोजाना एक कटोरी	दही	75
		प्याज टमाटर रायता	60
		बूंदी रायता	100
5	रोजाना	चावल (एक कटोरी)	170
6	दाल रोजाना कोई भी एक	मूंग दाल	100
		चना दाल	118
		मसूर दाल	127
		उरद दाल	170

रोजाना दोपहर के खाने में ऊपर दिये गये हर नम्बर के बाक्स में से कोई भी एक पदार्थ का सेवन किया जा सकता है

रोजाना कुल कैलोरी

शाम का नाश्ता

	मात्रा	खाद्य पदार्थ का विवरण	कैलोरी
1	रोजाना कोई भी एक ग्लास 	जलजीरा	30
		चाय (बिना शक्कर)	36
		नीबू शरबत	60
		वेज सूप (बिना क्रीम वाला) (1 कटोरी)	70
		दूध (टोनड दूध हो तो बेहतर)	90
		कॉफी (2 चम्मच शक्कर)	110
		लस्सी (2 चम्मच शक्कर)	115
		कोल्ड्रिंक (छोटी बोतल 200 मिली)	150
2	रोजाना कोई भी एक कटोरी  	मुरमुरा	66
		मारी बिस्किट (2 बिस्किट)	70
		फल्ली	80
		सैंडविच-1 स्लाइस	100
		मूंग दाल (अंकुरित)	100
		काला चना चाट	100
		आलू बोंडा (1 पीस)	100
		मठरी	110
		भजिया/पकोड़ी (4)	140
		समोसा (1)	200
		साबूदाना वडा (2)	210
		दही पकोड़ा चाट (5 पीस)	220
3	फल रोजाना कोई भी एक 	तरबूज (2-3 स्लास 200 ग्राम)	32
		खरबूजा (2-3 स्लाइस 200 ग्राम)	34
		सन्तरा/ओरेंज (मध्यम आकार वाला)	40
		मौसंबी	40
		नाशपाती	50
		फ्रूट चाट (सेब पपीता)	50
		अमरूद (मध्यम आकार वाला)	50
		सेब (एप्पल) (मध्यम आकार वाला)	65
		पपीता (2 छोटे स्लाइस)	70
		केला (मध्यम आकार वाला)	90
		सीताफल	90
		आम (मध्यम आकार वाला)	130

रोजाना शाम के नाश्ते में ऊपर दिये गये हर नम्बर के बाक्स में से कोई भी एक पदार्थ का सेवन किया जा सकता है

रोजाना कुल कैलोरी

रात का भोजन

	मात्रा	खाद्य पदार्थ का विवरण	कैलोरी
1	सलाद रोजाना कोई भी एक कटोरी	दही	75
		प्याज, टमाटर, रायता	60
		बूंदी रायता	100
		बथुआ रायता	100
2	रोजाना कोई भी एक पदार्थ	पराठा (मध्यम आकार) (1)	150
		फुलका (मध्यम आकार) (2)	160
		तंदूरी नान (मध्यम आकार) (1)	200
3	सब्जी रोजाना कोई भी एक कटोरी	भरवा भिंडी	70
		करेला फ्राई (2)	104
		गोभी	120
		मेथी टोमेटो	122
		गोभी मटर	122
		कोफ्ता	136
		दाल पालक	140
		बैंगन भरता	147
		कड़ी	147
		मछली/फिश फ्राई (2 पीस)	190
		राजमा	200
		चिकन मसाला (3/4 कटोरी)	240
		मटन मसाला (3/4 कटोरी)	260
		नुट्रीला (सोयाबीन)	260
4	दाल रोजाना कोई भी एक कटोरी	मूंग दाल	100
		चना दाल	116
		मसूर दाल	127
		उरद दाल	170
5	रोजाना	चावल (एक कटोरी)	170
6	मिठाई हफ्ते में एक बार सिर्फ एक पीस	सन्देश	70
		चिक्की	145
		बेसन बर्फी/लड्डू	200
		आइसक्रीम (आधी कटोरी)	200
		हलवा (आधी कटोरी)	320
		श्रीखंड (आधी कटोरी)	360

रोजाना रात में खाने में ऊपर दिये गये हर नम्बर के बाक्स में से कोई भी एक पदार्थ का सेवन किया जा सकता है

रोजाना कुल कैलोरी

अखिल भारतीय आयुर्विज्ञान संस्थान, भोपाल

Section B : ORAL DRUGS IN MANAGEMENT OF TYPE 2 DIABETES MELLITUS

Oral hypoglycemic drugs

- Main oral hypoglycemic drugs, which are most useful in management of diabetes mellitus are detailed in following table:

Table 6 : Main categories oral hypoglycemic drugs

Drug class	Drug and dose range	Advantages	Precautions
Biguanide	Metformin 500mg to 2gm	- Reduces insulin resistance - Drug of choice for insulin resistance and T2DM - Causes weight maintenance - Low potential for hypoglycemia	- Not suitable in patients with renal failure (S creatinine >1.4mg/dL)or eGFR less than 60ml/min. - Not yet recommended by ADA but increasingly used in pregnancy and in women who are lactating. - Risk of lactic acidosis in patients with hepatic dysfunction, alcohol abusers, heart failure and acute coronary syndrome, and elderly (age >80 years of age) - Dyspepsia, and metallic taste in mouth are common side effects - Protects beta cells
Sulphonylru eas	Glibenclamide 2.5 to 10mg Glimeperide 1 to 8mg Glipizide 5 to 20mg	- Improves insulin secretion - Good for lean individuals. Causes some gain in weight Good for post-meal hyperglycemia	- Hypoglycemia is an important side effectwhich is prolonged, recurrent and lasts for few days - Rare hypersensitivity to drug - Contraindicated in pregnancy - Exhausts Beta Cells

Note: Other oral dugs such as Nateglinide, Repaglinide, acarbose, Volibose, and incretin analogs (exenatide, Liraglutide) and DPP IV inhibitors (Sitagliptin, Vildagliptin, Linagliptin)are also available. These drugs are outside the scope of current module due to their cost, availability at primary care level, and less common usage.

Pioglitazone was banned in India in June 2013. This ban was subsequently revoked, however this drug is kept outside the perview of this course

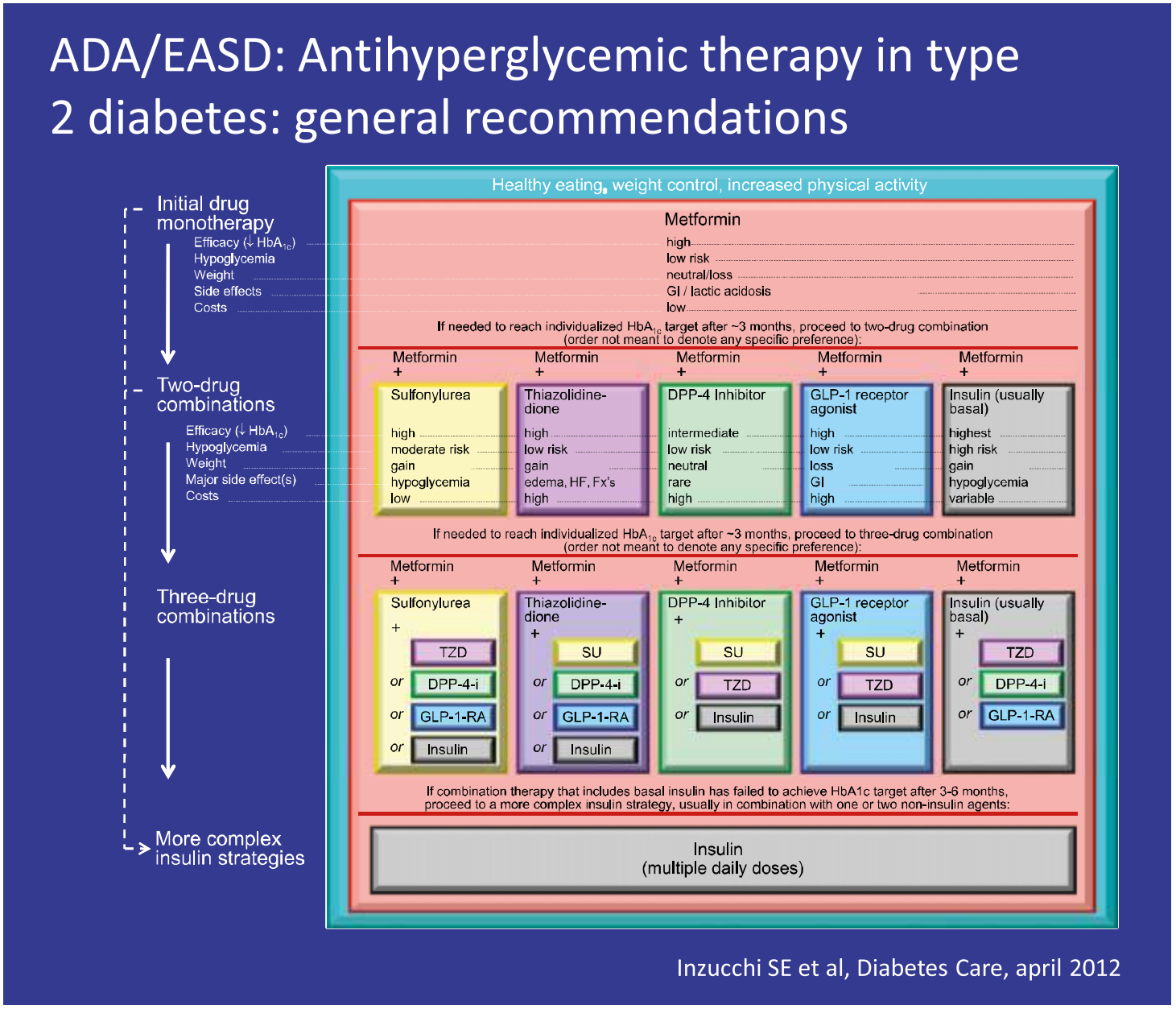


Figure - 5 : Initiation and escalation of drug therapy in T2DM

How to initiate drug therapy and monitor in type 2 diabetes mellitus ?

Therapy is to be initiated based on following principles:

In this module, we will learn about metformin as first line agent, addition of sulphonylurea as second line therapy. DPP IV inhibitors and GLP-1 receptor agonists are more expensive alternatives, and are outside the scope of current training.

Target to be achieved is glucometer measured capillary glucose, fasting 70-140 mg/dL; Post-meal 100-160/180 mg/dL; HbA1c <7%.

BP <140/90 mm Hg

Table 7 : Management practice for first time detected diabetic

First Time Detected DM		
FPG Level	**HbA1C Level**	**Action**
196-250	**8-9%**	**Single ora drug + MNT** Metformin is a preferred drug (unless contraindicated). Check capillary blood glucose after 1-2 weeks to see if target achieved. Escalate dose to maximum, and move to next stage if target not achieved.
251-300	**9-10%**	**Combination oral drugs+ MNT** Use combinations of metformin + sulphonylurea +/- pioglitazone. Check for targets after 1-2 weeks. Escalate dose to maximum if targets not achieved.
>300	**>10%**	**Insulin +/-Oral drugs** Prefer long acting l combination insulin prepration.

Medical nutrition therapy stage (FPG <200)

- If FPG on presentation is below 200mg/dL, initiate lifestyle modifications and medical nutrition therapy (MNT) (See details below)
- Key components of MNT include
  - Food plan
    - Adjust carbohydrate intake
    - Reduce fat intake
    - Adjust portion size and meal spacing
  - Regular exercise plan
  - Follow up weekly to ensure that plan is on track
- Allow MNT trial for three months. Goals of MNT are:
  - Capillary blood glucose (Fasting) between70-140mg/dL
  - LDL less than 70 mg/dL
  - BP less than 140/90 mm Hg
  - Weight loss 7% from previous
- If after 3 months assess if blood glucose goal is reached
- If goal is not reached, need to initiate single drug therapy for control
- If goal is reached, consider metformin therapy to prevent progression to diabetes mellitus.
- Not in everyone, take decision a/c to patient, remember DM prev prog and merits of metformin in prevent DM

Single oral drug stage (FPG 200-250)

- Serum creatinine is an important test, useful for initiation of drug therapy.
- If serum creatinine is less than 1.4mg/dL, and in absence of any chronic liver disease initiate with metformin.
- If serum creatinine is between 1.4 and 2.0 mg/dL initiate with a sulphonylurea
- If serum creatinine is above 2.0 mg/ dL, will need to initiate with insulin therapy.

Metformin therapy

- Expected clinical benefit with metformin is reduction in about 1-2% of HbAic
- Initiate with **500mg once daily** (regular or a sustained release preparation)
- Follow up after 2 weeks to see if target fasting

capillary blood glucose (< 140mg/dL) is achieved.

- If target is not achieved escalate metformin in the following fashion:

Table 8 : Dose escalation for metformin

Metformin type	Start dose (PM)	Next dose (AM / PM)	Next dose (AM/PM)	Next dose (AM/Mid/ PM)
Metformin 500mg tablet	500	500 / 500	500 / 1000	1000/ 500 / 1000
Metformin sustained release 500mg tablet	500	- / 1000	- / 1500	- / - / 2000 or 1000 / - / 1000

Each dose escalation if done after checking fasting capillary glucose, allowing at least 2 weeks after previous dose escalation.

Sulphonylurea therapy

- Expected clinical benefit with sulphonylurea is reduction in about 1-2% of HbA1c
- It may be an initial oral agent of choice, if serum creatinine is 1.4 – 2.0mg/dL, or in a non-obese type 2 diabetes mellitus.
- Check target and consider dose escalation after 2 week intervals.
- Initiating, and escalating plan for sulphonylure as is as follows:

Table 9 : Dost escalation for sulphoryl uses

	Start dose (AM)	Next dose (AM)	Next dose (AM/PM)	Next dose (AM/ PM)
Glibenclamide 2.5mg (Daonil)	2.5	5	5 /5	10 / 5
Glipizide 5mg	5	10	15 / -	10 / 10
Glimiperide 1mg	1	2	3/-	4/- or 2 / 2

Combination oral drug stage (FPG 250-300)

- Unless contraindicated, initial drug of choice in type 2 diabetes mellitus is **metformin**
- If daily metformin dose of 2gm along with medical nutrition therapy is not able to achieve targets, add a second drug.
- Common combination therapy is **Metformin + Sulphonylurea.**
- Add second drug (sulphonylurea) at starting dose
- Monitor for target after every 2 weeks.
- If target is not achieved, escalate dose of sulphonylurea to maximum.
- If maximum **Metformin + Sulphonylurea** (eg 2gm metformin and 4mg og glimiperide) is not able to achieve target, consider insulin or adding a third agent.
- All combinations are contraindicated in pregnancy, during lactation, in presence of renal disease, hepatic dysfunction and in individuals who abuse alcohol or engage in binge drinking.

If target is achieved, and blood sugars are in target range for two consecutive times, can monitor targets at monthly or three monthly intervals.

If targets are not achieved with two drugs in their maximum tolerable dosages, following options exist:

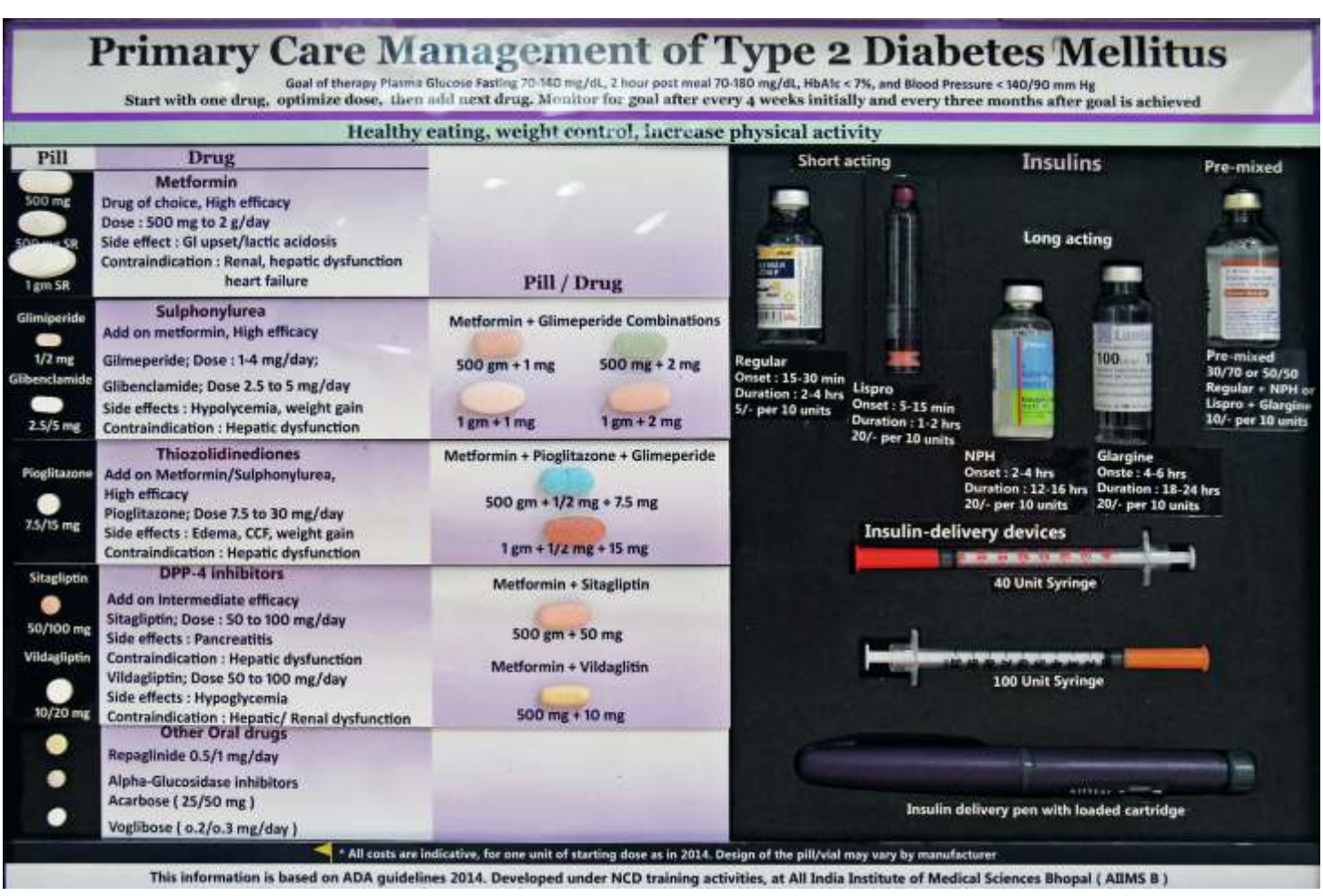


Figure - 6 : Primary care management of type 2 diabetes mellitus

a) Use of a third oral drug (please consult a specialist) Options for a third oral drug include:

   (1) Thiozolidinedione derivatives such as pioglitazone (15-30mg/day)

   (2) Gliptins such as Sitagliptin (50-100mg/day), Vildagliptin (50-100mg/day) or Linagliptin (5-10mg/day)

   (3) Glinides such as repaglinide

   (4) Alpha-glucosidase inhibitors such as acarbose (25-50mg/day) or voglibose (0.4-0.6mg/day)

b) Use of Insulin therapy (please see next section)

   i) In type 2 diabetes mellitus a single basal dose may suffice if there is adequate insulin reserve. In indivduals who do-not have an adequate insulin reserve, multiple insulin injections may be needed.

If at any stage capillary blood glucose is less than 70mg/dL consider and treat hypoglycemia, and de-escalate therapy.

Section C: INSULIN IN MANAGEMENT OF DIABETES MELLITUS

Insulin

Insulin is an injectable drug, which can achieve best control of diabetes mellitus. Situations where use of insulin is indicated are:

- Type 1 diabetes mellitus
- Gestational diabetes mellitus
- Type 2 diabetes mellitus if:
  - Uncontrolled with multiple oral agents (Beta cell failure FPG>110 or pp>180 with max dose of OHA, earlier if patient wishes)
  - If patient develops chronic kidney disease
  - Patient with severe hepatic disease
  - Short term use in critically ill individuals
  - Post Myocardial Infarction for first 3 months

Insulin use in Type 2 Diabetes Mellitus

If combination oral therapy in T2DM is not able to achieve targets, or if FPG on presentation is greater than 300mg/dL consider insulin therapy.

In type 2 diabetes mellitus follow the following principles regarding combination oral and insulin therapy:

- Continue dietary modifications and physical exercise regimen as previous.
- Reinforce that insulin therapy is in-addition to drugs, and is necessary for control.
- Continue Metformin in its maximal dose, if there are no contraindications to its use.

Table 10 : Main subtypes of Insulin

Insulin type	Properties
Regular or short acting insulin	- Human regular insulin (HR) - Onset of action in about 30 minutes, Peak action in 2 hrs, duration 4 hours. - Used 30minutes before meals - Usually given subcutaneously. - Can be given IV in case of diabetic ketoacidosis.
Intermediate acting insulin	- NPH insulin - Onset in about 2 hours, peak action after 6 hours and duration upto 12 hours - Pre-breakfast dose will provide adequate insulin levels over lunch. - Not suitable for IV use. Used subcutaneouly
Long acting insulin (Basal analogues)	- Insulin glargine / detemir - Onset in 4 hours, no peak effect, plateau effect lasting for about 20-24 hours. - Suitable for once daily therapy.
Insulin mixtures	- HR + NPH (30/70) combination Most widely used combination. Suitable for twice daily therapy (before breakfast and before dinner). - HR + NPH (50/50) combination Individuals who have post-prandial hyperglycemia may be switched to this combination, which a higher proportion of regular insulin.

- Sulphonylureas have a high potential for hypoglycemia. Avoid using them with Insulin.
- Estimate insulin requirement. In Type 2 diabetes mellitus requirement is usually low
- Initiate at 0.25 U/kg/day basal insulin (20 units per day for a person weighing 80Kg).
- This daily requirement can be initiated as
  - Basal insulin once daily regimen
    - Insulin glargine or NPH insulin
    - Single (preferably evening) daily dose of total Insulin requirement
    - Eg Insulin Glargine 20U once daily preferably at bedtime, or Insulin NPH 10U twice daily (in morning and at evening)
    - Monitor using Pre-breakfast FBG levels.
    - Monitor using Pre-breakfast FBG, pre-dinner PPBG levels.
  - In type 2 Diabetes mellitus, blood sugar levels take time to normalize. Allow at least three days of therapy before dose modification. Adjust insulin dose based on the following table:
  - Mixtures are inferior to basal insulin, and use of basal and pre-meal insulin is better than pre-mixed regimens.
  - All individuals with diabetes mellitus, especially those who remain uncontrolled despite Insulin dose of 0.5U/kg (eg greater than 40 U/day for a 80 kg person) will need a specialist referral. This referral is required to screen for complications and for dose adjustment.

Table 11 : Dose adjustment for insulin in type 2 diabetes mellitus

Insulin regimen	Blood Glucose	Value mg/dL	Action
Basal insulin	Fasting	<70	Reduce evening dose by 2 Units
		70-140	Continue same dose
		140-250	Increase evening dose by 2 Units
		>250	Increase evening dose by 4 units
Mixed insulin	Fasting	<70	Reduce evening dose by 2 Units
		70-140	Continue same dose
		140-250	Increase evening dose by 2 Units
		>250	Increase evening dose by 4 units
	Pre-dinner	<70	Reduce morning dose by 2 units
		70-140	Continue same dose
		140-250	Increase morning dose by 2 Units
		>250	Increase morning dose by 4 units

  - Mixed insulin twice daily regimen
    - Premixed Regular/NPH insulin (30/70)
    - Give two-half of total dose as pre-breakfast, and other half as pre-dinner.
    - Eg Insulin 30/70 8 U before break-fast and 8U before dinner (if total requirement is 16 U).

Insulin use in Type 1 Diabetes Mellitus

Things to explain a patient before starting Insulin

Patients with Type 1 diabetes mellitus have severe insulin deficiency, may have ketones in urine (even without diabetic ketoacidosis) and have a higher insulin requirement.

Life-style management, and diet planning is essential in patients with type 1 diabetes mellitus.

Insulin therapy is mainstay of management, and insulin is needed from the very outset. Before initiating insulin explain the following to the patient:

- Insulin supplementation is necessary for survival
- Oral medicines to reduce blood sugar levels are not of benefit with type 1 diabetes
- Insulin is required on a daily basis, and two or more injections in a day will be needed.
- Patient must learn to take their own dose
- Insulin is administered as subcutaneous injection
- While injections can be administered at any part of the body, but it is advisable to use abdomen or thigh as preferred sites. These are also the most convenient sites for self administration of insulin
- Insulin vials need to be stored at less than 30 degrees. In summer store insulin in refrigerator or on ice packs. Do not freeze insulin.
- Have a regular meal schedule. Donot skip meals or fast. In case you have to, will need to skip previous insulin dosage.
- Always keep some sugar or glucose powder or sweet biscuits with you. In case symptoms of hypoglycemia develop (sudden ghabrahat, sweating, uneasiness) immediately take some sugar. In case symptoms persist contact a doctor.
- Pre-meal regular insulin (pre-breakfast, pre-lunch, or pre-dinner) must be given half an hour prior to meals.

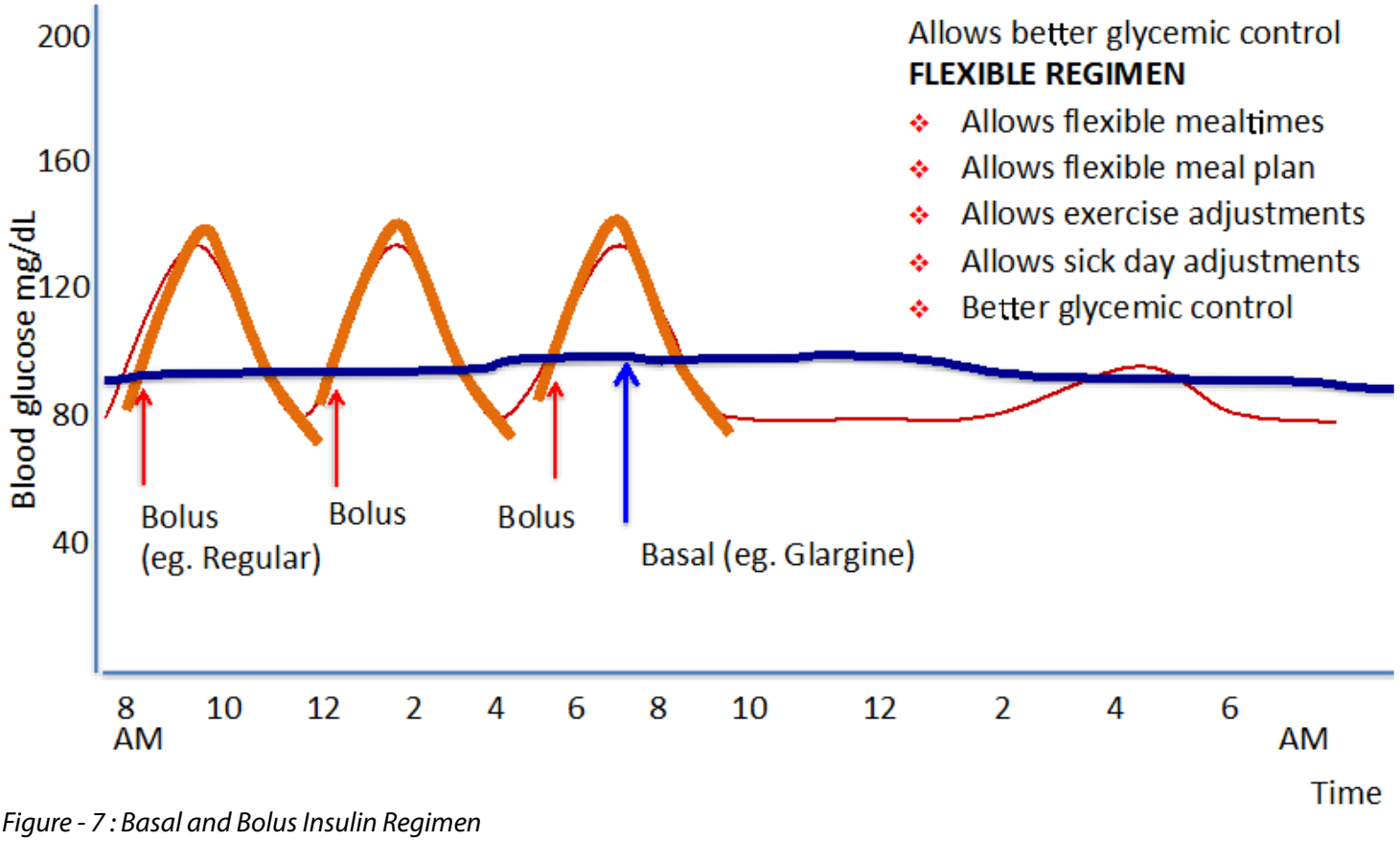


Figure - 7 : Basal and Bolus Insulin Regimen

Estimate daily insulin dose

Starting insulin requirement varies between 0.5 to 0.7 U/kg/day. Example for a 60kg person, initiate therapy with 30 Units of daily insulin requirement. This requirement is divided based on insulin regimen selected for the patient.

Insulin administration regimens

There are two basic regimens:

a) Basal-Bolus regimen

a. Basal bolus regimen physiologically mimics insulin release.

b. Regular insulin is used in pre-meal dose, half an hour before breakfast, lunch and dinner.

c. Long acting insulin is used as a single dose (Glargine) or NPH (two doses).

d. If Regular (3 doses) and Glargine (1 dose) is used, consider total insulin requirement of 0.5 to 0.7 U/kg. Eg 30 Units in a 60 kg person. Use 40% as basal (eg 12 Units), and 60% regular insulin in three divided pre-meal doses. Pre-meal doses are decided based on individuals meal frequency and size (eg 18 Units as either 6-6 -6, or depending on meal size as 4-6-8 if breakfast is light, and dinner is heavier than lunch).

e. If regular (3 doses) and NPH (2 doses) are used, use 40% of total dose as NPH eg. 12 Units in a 60 kg person, with daily requirement of 30 units. Divide NPH into two doses, roughly as 8U in morning, and 4 in evening), and 60% as regular insulin. Divide regular insulin in three pre-meal doses (eg. 4-6-8).

f. Monitor and adjust dose, based on four blood glucose estimations – pre-breakfast, pre-lunch, pre-dinner, and post-dinner. Dose can is adjusted based on following schedule:

b) Mixed insulin

a. While mixed regimens are commonly available and used, this does not mimic physiology and less likely to control sugars well.

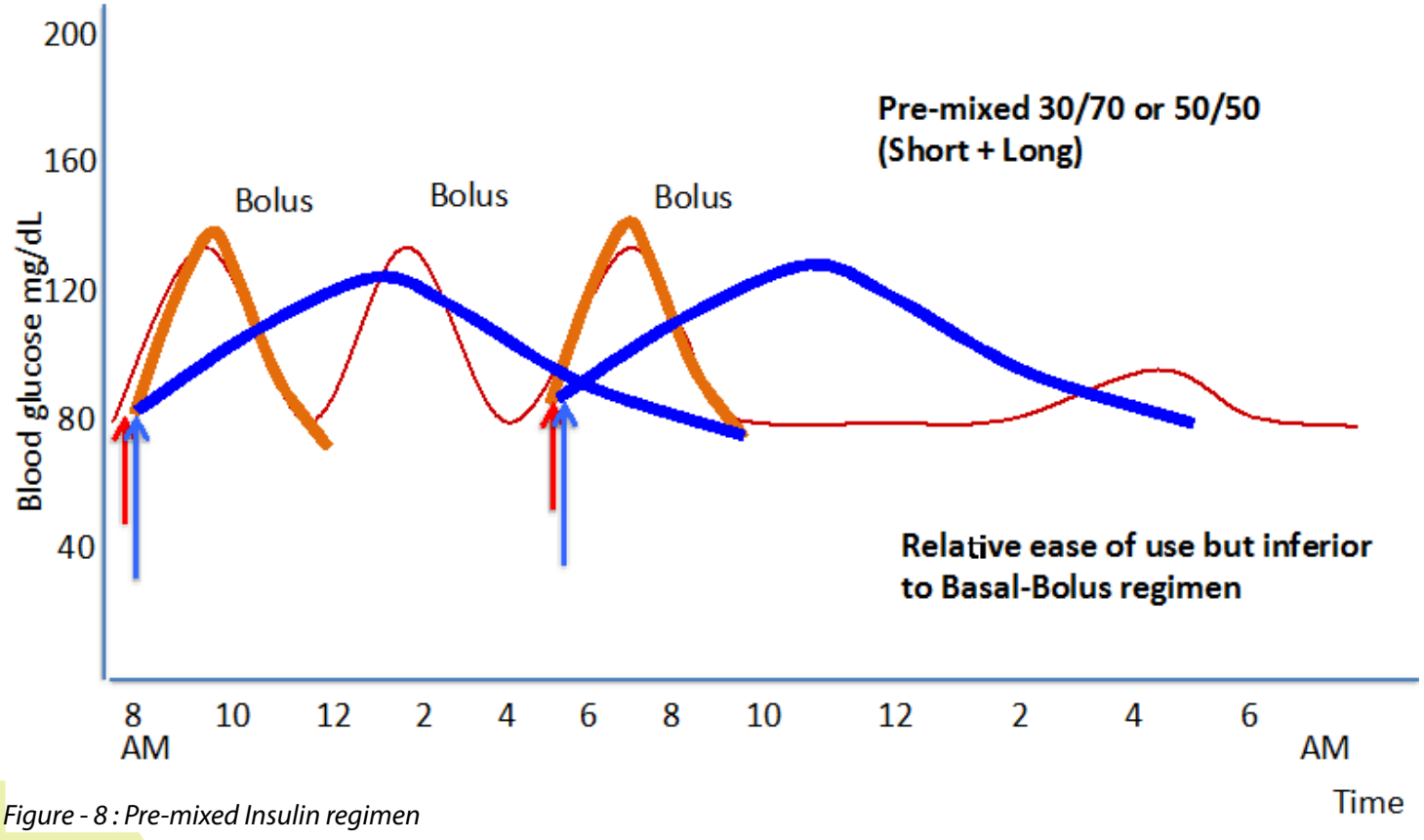


Figure - 8 : Pre-mixed Insulin regimen

Table 12: Dose adjustment for insulin in type 1 diabetes mellitus

Blood Glucose	Value mg/dL	Action
Fasting	<70	Reduce evening basal dose by 2 Units
	70-140	Continue same dose
	>140	Increase evening basal dose by 2 Units
Pre-lunch	<70	Reduce morning bolus dose by 2 units
	70-140	Continue same dose
	>140	Increase morning bolus dose by 2 Units
Pre-dinner	<70	Reduce pre-lunch bolus dose by 2 units
	70-140	Continue same dose
	>140	Increase pre-lunch bolus dose by 2 Units
Post-dinner	<100	Reduce pre-dinner bolus dose by 2 units
	100-140	Continue same dose
	>140	Increase pre-dinner bolus dose by 2 Units

b. Usually 2/3 of total requirement is given as pre-breakfast, and 1/3 as a pre-dinner dose

Insulin administration and storage

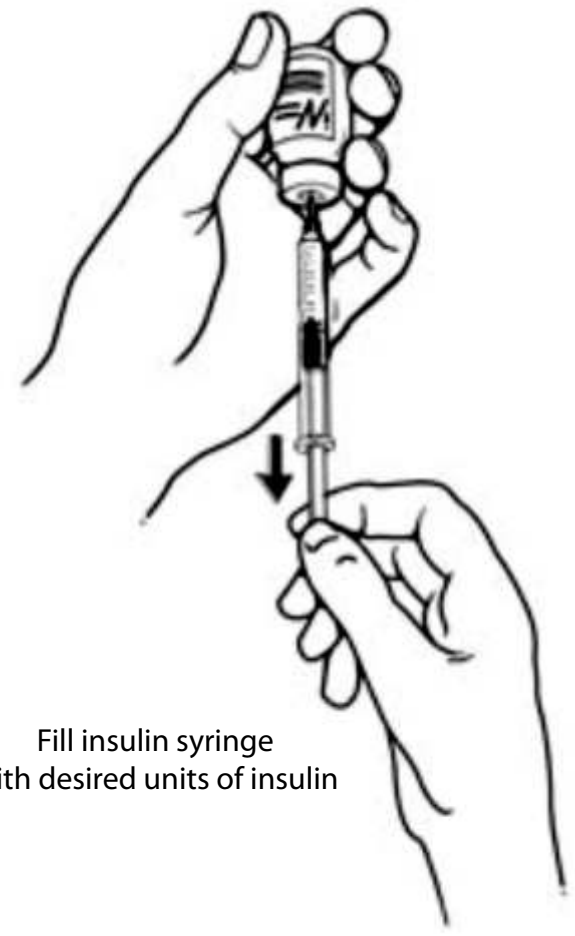
Insulin administration should be taught to the patient. It must be self administered by the patient.

Self administration is most conveniently done over the abdomen. Other sites of administration include Thigh, buttock or over the arm.

Patient is asked to administer insulin about one palm breadth away from the umbilicus. The site needs to be rotated with every injection.

A disposable insulin syringe can be used by the same person for upto two days (till the needle is blunt). The needle should be stored in a sterile manner.

- Unopened (i.e., insulin not currently in use) insulin should be stored in the refrigerator at 2°C-8°C
- Insulin should never be frozen or stored in an ambient temperature greater than 30°C
- An insulin vial in use may be kept at room temperature (28-32 degrees) for ~1 month.



Fill insulin syringe
with desired units of insulin

Figure - 9 : How to fill insulin in syringe

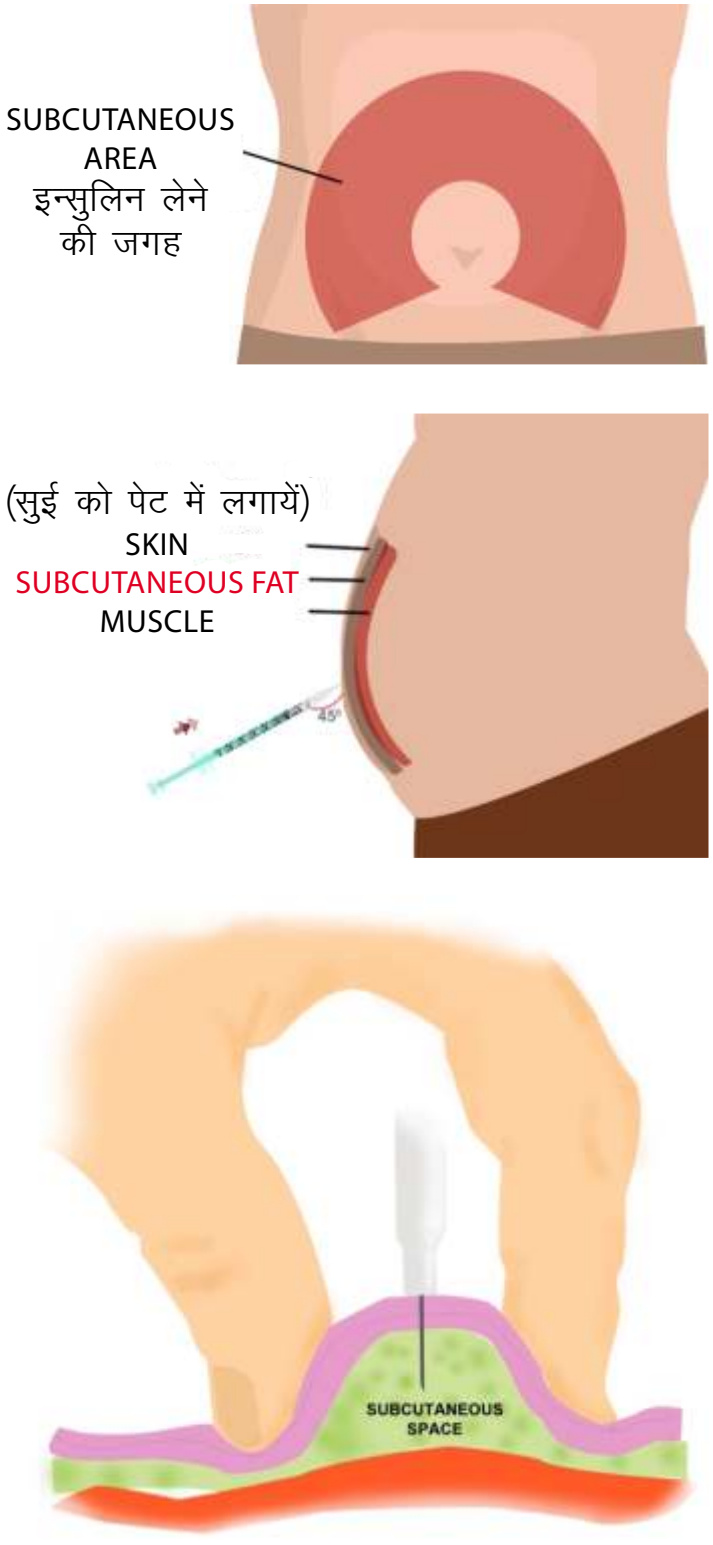


Figure - 10 : Steps for insulin administrationi

Hypoglycemia recognition

Common symptoms of Hypoglycemia include:

- Headache
- Irritability
- Hunger
- Fatigue, Tiredness
- Excessive sweating, shaking

Usually these symptoms appear when blood sugar levels fall below 40-50mg/dL. Individual hypoglycemia awareness levels differ. Advise all individuals on Insulin to keep sweet biscuits / sugar / toffees with them, to be consumed immediately if symptoms occur. This needs to be followed by a meal within 15-20 minutes.

If symptoms of hypoglycemia occur or if Blood glucose levels are less than70mg/dL, insulin therapy needs to be deescalated.

CHAPTER 6
DIABETES MELLITUS: SCREENING AND PREVENTION OF COMPLICATIONS

Complications of Diabetes Mellitus are of the following types:

a) Macrovascular complications
   i) Coronary artery Disease
   ii) Cerebrovascular disease
   iii) Peripheral vascular disease
b) Microvascular complications
   i) Diabetic Retinopathy
   ii) Diabetic Nephropathy
   iii) Diabetic neuropathy

Macrovascular Complications of Diabetes

The central pathological mechanism in macro-vascular disease is the process of atherosclerosis, which leads to narrowing of arterial walls throughout the body. Atherosclerosis is thought to result from chronic inflammation and injury to the arterial wall in the peripheral or coronary vascular system. In

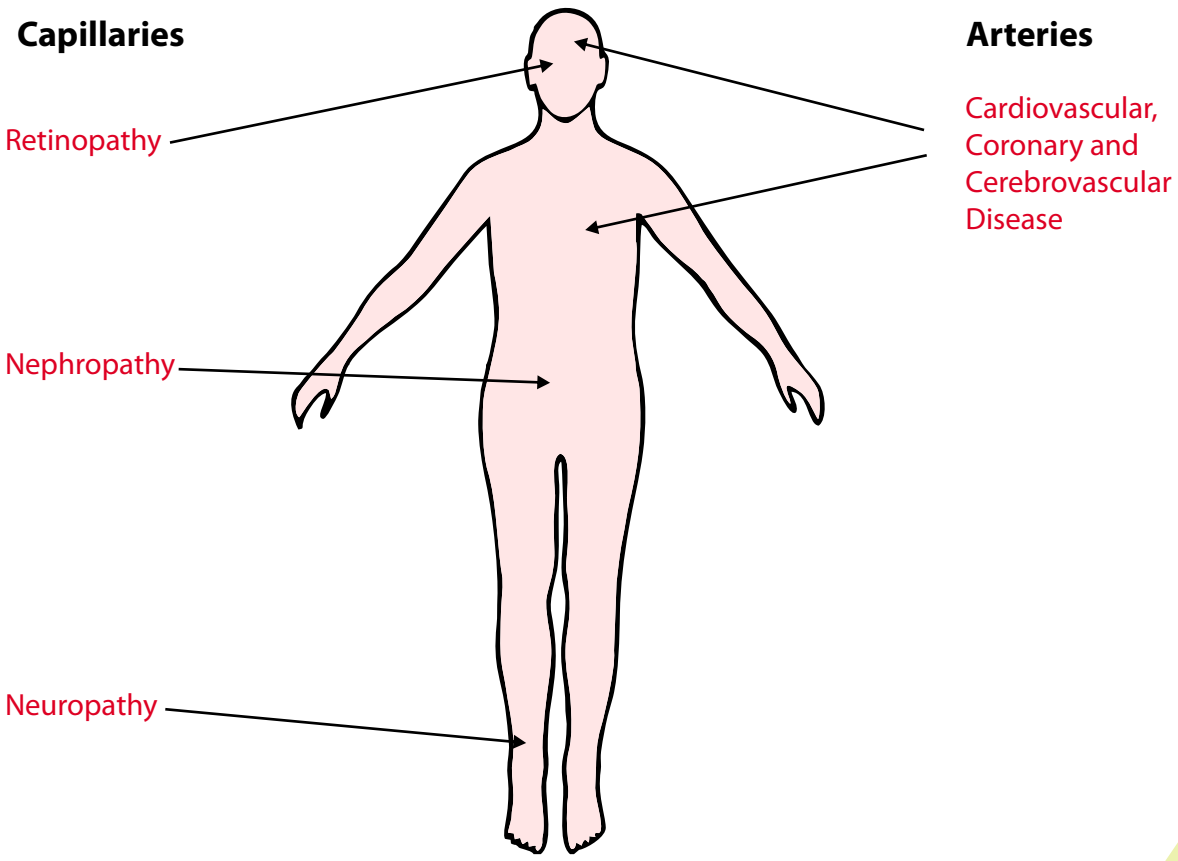


Figure - 1 : Chronic Complications of Diabetes Mellitus

addition to atheroma formation, there is strong evidence of increased platelet adhesion and hypercoagulability in type 2 diabetes. The combination of increased coagulability and impaired fibrinolysis likely further increases the risk of vascular occlusion and cardiovascular events in type 2 diabetes.

Diabetes increases the risk that an individual will develop cardiovascular disease (CVD). CVD is the primary cause of death in people with either type 1 or type 2 diabetes. Moreover, Type 2 diabetes typically occurs in the setting of the metabolic syndrome, which also includes abdominal obesity, hypertension, hyperlipidemia, and increased coagulability. These other factors can also act to promote CVD. Diabetes is also a strong independent predictor of risk of stroke and cerebrovascular disease.

The increased risk of CVD has led to more aggressive treatment of these conditions to achieve primary or secondary prevention of coronary heart disease before it occurs. There is additional benefit to lowering blood pressure with ACE inhibitors or ARBs. Blockade of the renin-angiotensin system using either an ACE inhibitor or an ARB reduced cardiovascular endpoints more than other antihypertensive agents.Another target of therapy is blood lipid concentration. There is a decreased risk in macrovascular disease in patients with diabetes who are treated with lipid-lowering agents, especially statins. These drugs are effective for both primary and secondary prevention of CVD.

Prevention of macrovascular complications

a. Smoking cessation and cessation of tobacco use

b. Blood pressure control

   i. Measure blood pressure at every visit

   ii. Target blood pressure <140/90 mm Hg

   iii. Optimize life-style management with salt restriction

   iv. Use anti-hypertensive drug therapy in all patients where blood pressure is elevated above target

   v. Preferred drug ACEI (Enalapril / Ramipril) or ARB (Losartan / telmisartan)

   vi. Additional drugs (calcium channel blockers, thiazide diuretics) as required for blood pressure control.

   vii. Beta-blockers (especially metoprolol, carvedilol, and nebivilol) can be used with diabetes mellitus.

c. Dyslipidemia management

   i. Target Cholesterol <150mg/dL, LDL <100mg/dL, Triglycerides <150 mg/dL, and HDL >40mg/dL.

   ii. Target BMI <25kg/m2

   iii. Optimize life-style management

   iv. Lipid lowering therapy in all patients with lipid levels above target.

   v. Drugs to be used include statins (Atorvastatin) and Fibrates (Fenofibrate).

   vi. Clinically effective dose of Atorvaststin is 10-80mg/day or Rosuvastatin 5-20mg/day or Fenofibrate 54-160mg/day.

   vii. Use lipid lowering drugs in all patients who have had a prior vascular event (ACS/Stroke). Use in all patients with dyslipidemia who have an additional risk factor (Tobacco use, hypertension, obesity, nephropathy), or above 40 years of age.

   viii. Measure lipids after three months of initiation to see if target is achieved.

d. Antiplatelet drugs

   i. Use Aspirin 75 or 150mg per day.

   ii. If aspirin is not tolerated, or contraindicated, use oral clopidogrel 75mg per day.

   iii. Use antiplatelet drugs in all patients who have had a prior vascular event (ACS/Stroke). Use in all patients who have an additional risk factor (Tobacco use,

hypertension, obesity, dyslipidemia, nephropathy), or above 50 years of age.

Microvascular Complications of Diabetes

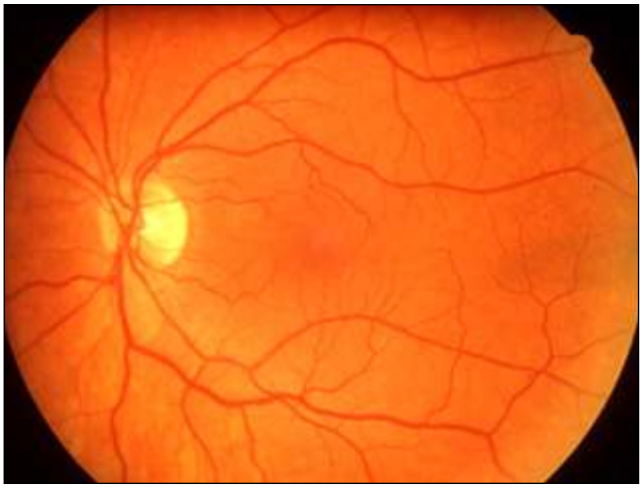
Diabetic retinopathy

Diabetic retinopathy is the most common microvascular complication of diabetes. The risk of developing diabetic retinopathy or other microvascular complications of diabetes depends on both the duration and the severity of hyperglycemia. There are several proposed pathological mechanisms by which diabetes may lead to development of retinopathy. These include osmotic stress from sorbitol accumulation, direct injury due to advanced glycosylated end products, oxidative stress, and due to activation of vascular endothelial growth factors in diabetes mellitus.

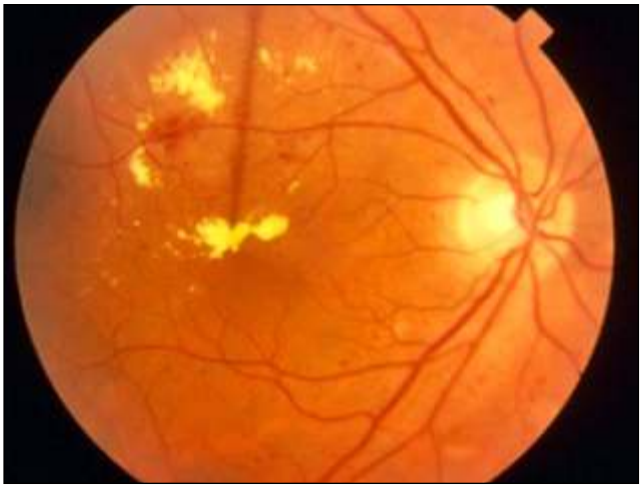
Diabetic retinopathy is classified as either background or proliferative. Background retinopathy includes following such features:

a) Small hemorrhages in the middle layers of the retina. They clinically appear as "dots" and therefore are frequently referred to as "dot hemorrhages."

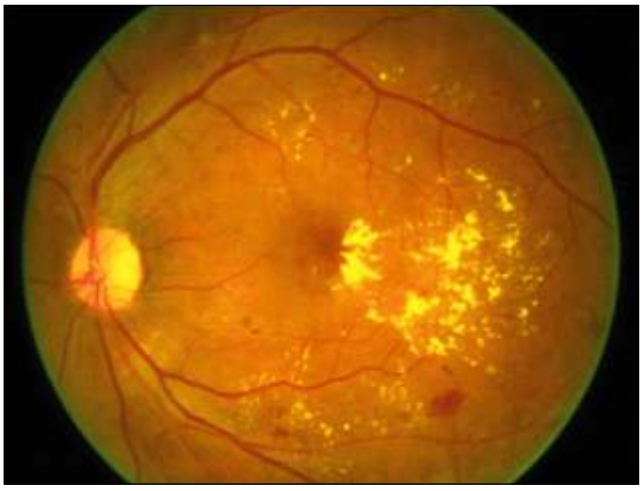
b) Hard exudates are caused by lipid deposition that typically occurs at the margins of hemorrhages.



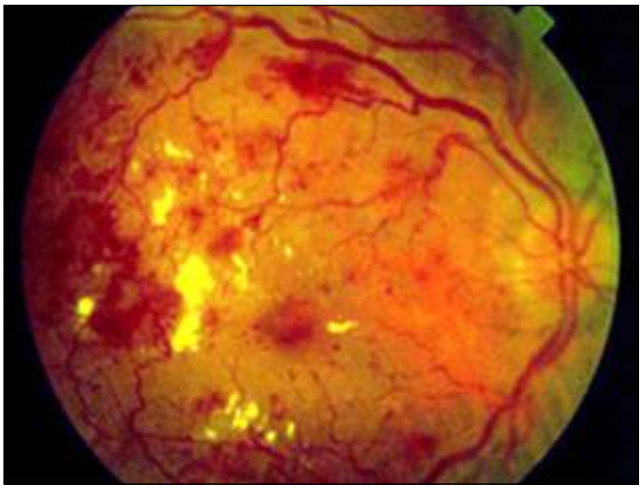
Normal Fundus examination



Hard exudates and dot hemorrhages



Hard exudates, Hemorrhage and Macular edema



Advanced retinopathy with proliferative changes, large Hemorrhages and edema

Figure - 2 : Stages in diabetic retinopathy

c) Microaneurysms are small vascular dilatations that occur in the retina, often as the first sign of retinopathy. They clinically appear as red dots during retinal examination.

d) Retinal edema may result from microvascular leakage and is indicative of compromise of the blood-retinal barrier. The appearance is one of grayish retinal areas. Retinal edema may require intervention because it is sometimes associated with visual deterioration.

Proliferative retinopathy is characterized by:

a) Formation of new blood vessels on the surface of the retina and can lead to vitreous hemorrhage.

b) White areas on the retina ("cotton wool spots") can be a sign of impending proliferative retinopathy.

If proliferation continues, blindness can occur through vitreous hemorrhage and traction retinal detachment. With no intervention, visual loss may occur. Laser photocoagulation can often prevent proliferative retinopathy from progressing to blindness.

Prevention of Diabetic Retinopathy

i) Screen for retinopathy at time of diagnosis and thereafter annually. Less frequent screening (every 2-3 years) is recommended if two or more exams are normal.

ii) Advise referral to ophthalmologist for detection and management.

iii) Control of blood sugars, blood pressure, and lipids prevents retinopathy

Diabetic nephropathy

Diabetic nephropathy is the leading cause of renal failure. It is defined by proteinuria > 500 mg in 24 hours in the setting of diabetes, but this is preceded by lower degrees of proteinuria, or "microalbuminuria." Microalbuminuria is defined as albumin excretion of 30-299 mg/24 hours. Without intervention, diabetic patients with microalbuminuria typically progress to proteinuria and overt diabetic nephropathy. This progression occurs in both type 1 and type 2 diabetes.

The pathological changes to the kidney include increased glomerular basement membrane thickness, microaneurysm formation, mesangial nodule formation (Kimmelsteil-Wilson bodies), and other changes. The underlying mechanism of injury may also involve some or all of the same mechanisms as diabetic retinopathy.

Initial treatment of diabetic nephropathy, as of other complications of diabetes, is prevention. Patients should be treated to the lowest safe glucose level that can be obtained to prevent or control diabetic nephropathy. Treatment with angiotensin-converting enzyme (ACE) inhibitors and angiotensin receptor blockers (ARBs)has been shown to decrease the risk of developing nephropathy and cardiovascular events in patients with type 2 diabetes.In addition to aggressive treatment of elevated blood glucose, patients with diabetic nephropathy benefit from treatment with antihypertensive drugs. Similarly, patients with macroalbuminuria also benefit from control of hypertension.

Prevention of Diabetic Nephropathy

i) Screen for nephropathy at time of diagnosis and thereafter annuallyusing urinary albumin and serum creatinine measures.

ii) Nephropathy is present in presence of proteinuria, or in presence of microalbuminuria (urine albumin 30 to 300 mg per gm creatinine)

iii) Nephropathy progress to CKD and ESRD if eGFR less than 60ml/min calculated using serum creatinine values.

iv) Advise ACEI/ARB to prevent ESRD in all patients, especially in presence of proteinuria.

v) Refer to specialist if eGFR is less than 60ml/min

vi) ACEI/ARB can be safely continued till serum creatinine < 3mg/dL.

Diabetic neuropathy

Diabetic neuropathy is defined as "the presence of symptoms and/or signs of peripheral nerve dysfunction in people with diabetes after the exclusion of other causes." As with other microvascular complications, risk of developing diabetic neuropathy is proportional to both the magnitude and duration of hyperglycemia. The mechanisms of nerve injury in diabetes mellitus include polyol accumulation, injury from AGEs, and oxidative stress. Peripheral neuropathy in diabetes may manifest in several different forms, including sensory, focal/multifocal, and autonomic neuropathies. More than 80% of amputations occur after foot ulceration or injury, which can result from diabetic neuropathy.

1. Chronic sensorimotor distal symmetric polyneuropathy (DSP) is the most common form of neuropathy in diabetes. Typically, patients experience burning, tingling, and "electrical" pain, but sometimes they may experience simple numbness. In patients who experience pain, it may be worse at night. Patients with simple numbness can present with a painless foot ulceration, so it is important to realize that lack of symptoms does not rule out presence of neuropathy. Physical examination reveals sensory loss to light touch, vibration, and temperature. Patients who have lost 10-g monofilament sensation are at considerably elevated risk for developing foot ulceration.
2. Pure sensory neuropathy is relatively rare and associated with periods of poor glycemic control or considerable fluctuation in diabetes control. It is characterized by isolated sensory findings without signs of motor neuropathy. Symptoms are typically most prominent at night.
3. Radiculopathy in Diabetes mellitus occurs due to reduced blood flow to spinal nerves. It causes cause pain, numbness, tingling, or weakness along the course of the nerve. Radiculopathy can occur in any part of the spine, but it is most common in the lower back (lumbar radiculopathy) and in the neck (cervical radiculopathy). It is less commonly found in the middle portion of the spine (thoracic radiculopathy).

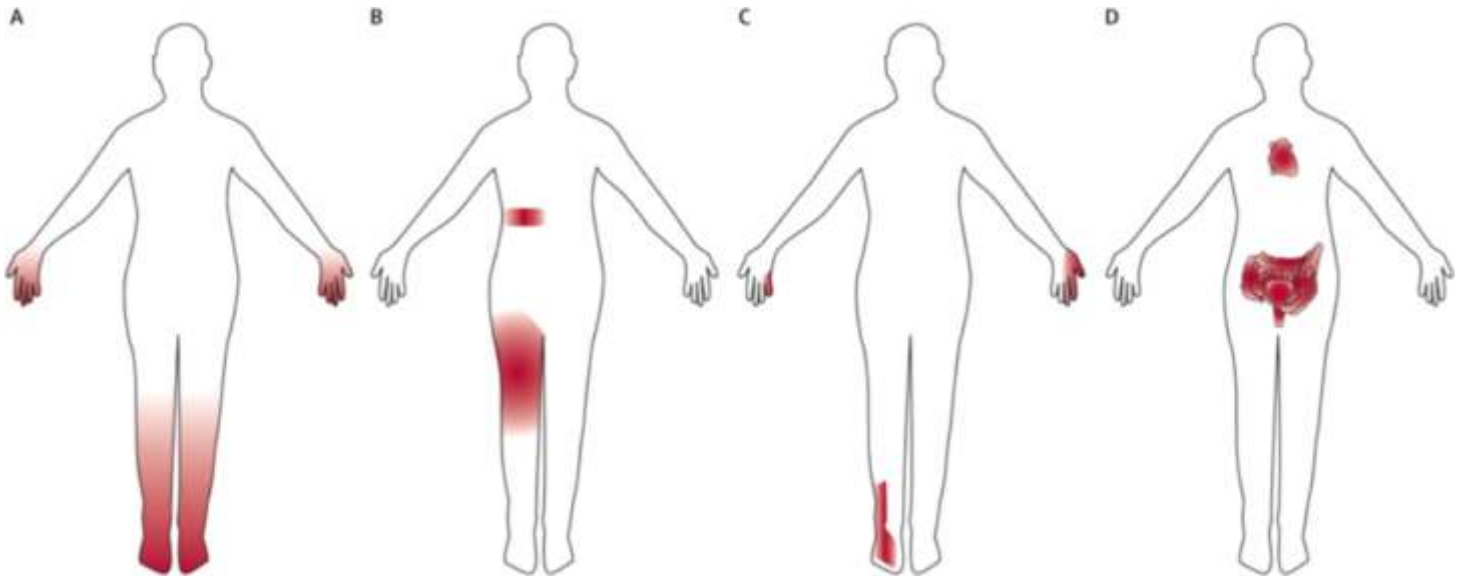


Figure - 3 : Patterns of nerve injury A) Distal symmetric polyneuropathy; B)Radiculoplexopathy and radiculopathy; C) Mononeuropathy; D) Autonomic neuropathy

4. Mononeuropathies and mononeuritis multiplex typically have a more sudden onset and involve virtually any nerve, but most commonly the median, ulnar, and radial nerves are affected. Cranial neuropathies are rare. Diabetic amyotrophy may be a manifestation of diabetic mononeuropathy and is characterized by severe pain and muscle weakness and atrophy, usually in large thigh muscles.
5. Diabetic autonomic neuropathy can manifest by gastroparesis, constipation, diarrhea, anhidrosis, bladder dysfunction, erectile dysfunction, exercise intolerance, resting tachycardia, silent ischemia, and even sudden cardiac death.

There is no specific treatment of diabetic neuropathy, although many drugs are available to treat its symptoms. The primary goal of therapy is to control symptoms and prevent worsening of neuropathy through improved glycemic control. Amitriptyline, imiprimine, paroxetine, citalopram, gabapentin, pregablin, carbamazepine, topiramate, duloxetine, tramadol, and oxycodone have all been used to treat painful symptoms, but only duloxetine and pregablin possess official indications for the treatment of painful peripheral diabetic neuropathy.

Diabetic foot

Foot problems are common in people with diabetes because of their increased risk of peripheral neuropathy, peripheral vascular disease, abnormal pressure on the foot, and impaired resistance to infection

Figure - 4 : Examine your feet daily

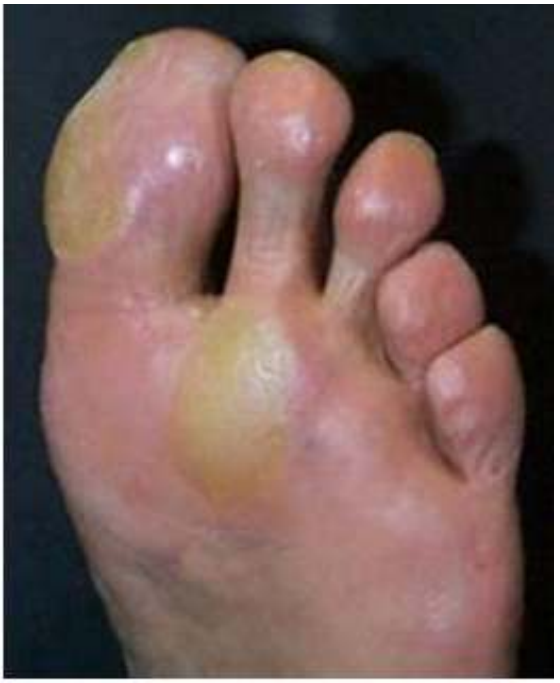


Figure - 5 : Callosities on foot

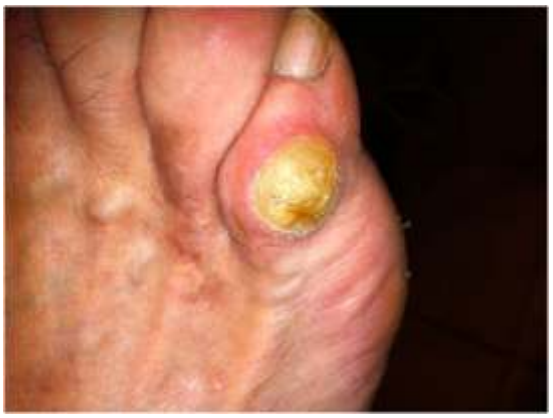


Figure - 6 : Corn over little toe

These factors frequently combine and result in ulceration and infection, progression to gangrene, and subsequent lower limb amputation

Prevention of ulceration is extremely important and should involve regular foot inspection, identification of the foot at risk, rapid treatment of all foot problems, education of patients and healthcare professionals, and instruction concerning appropriate footwear

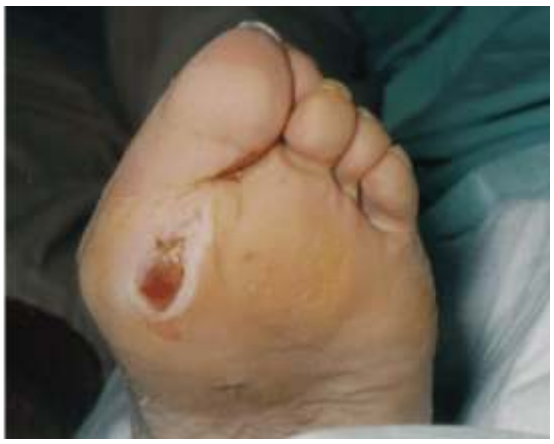


Figure - 7 : Ulceration over foot

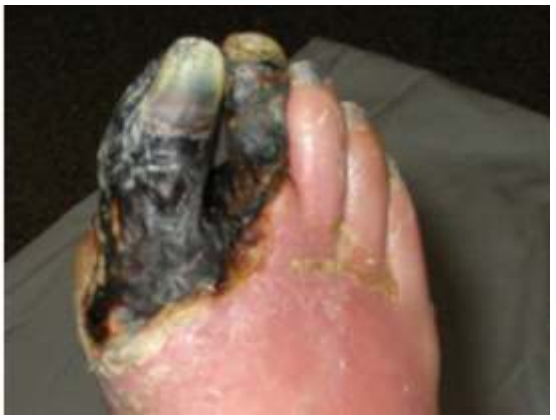


Figure - 8 : Gangrene

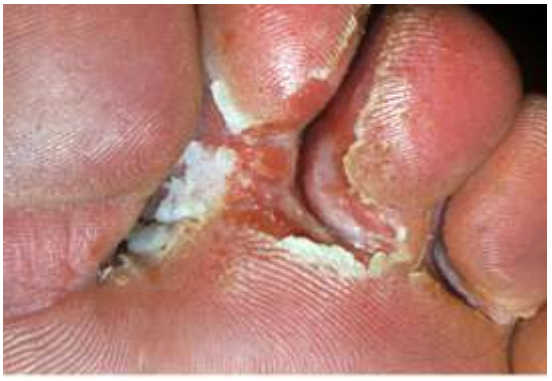


Figure - 9 : Fungal infections

Prevention of Diabetic foot

i. Examine feet of all diabetics

ii. Low risk foot – Normal foot, sensations intact, no ulceration, no infection, pulsations intact

iii. Advise diabetic foot-care (see appendix)

iv. High risk foot – Sensory loss, presence of ulceration, corn or callosities, presence of infection., absent pulsations

v. Treat simple ulcers (less than 2cm diameter, and less than 0.5cm deep) using dressings, local antibacterials

vi. Treat fungal infections with local antifungal ointments

vii. Refer to specialist if ulcer does not heal in 2 weeks, or if extensive ulcer (>2cm diameter, >0.5cm deep) or in presence of gangrene, or if one of the feet are cold, or if peripheral pulsations are absent.

CHAPTER 7
HYPERTENSION AND DIABETES IN PREGNANCY

Hypertension in Pregnancy

Definitions

Chronic hypertension is hypertension that is present at the first ANC visit or before20 weeks or if the woman is already taking antihypertensive medication when detected to be pregnant.

Gestational hypertension is new hypertension presenting after 20 weeks with outsignificant proteinuria.

Pre-eclampsiais new hypertension presenting after 20 weeks with significant proteinuria.

Eclampsiais a convulsive condition associated with pre-eclampsia.

Mild hypertensiondiastolic blood pressure 90–99 mmHg, systolic blood pressure 140–149 mmHg

Moderate hypertensiondiastolic blood pressure 100–109 mmHg, systolic blood pressure 150–159 mmHg

Severe hypertension diastolic blood pressure 110 mmHg or greater, systolic blood pressure 160 mmHg or greater

Pre-Pregnancy advice

- All women who are known to have HTN before pregnancy should be told that ACE/ARBs and Diuretics are contraindicated during pregnancy, as these are teratogenic.
- These drugs need to be discontinued as soon as pregnancy is detected, and alternatives initiated.
- Continue Salt reduction before and during pregnancy.

Ante-partum advice

- Check Blood pressure at every ANC visit.
- If HTN is detected (BP >140/90) before 20 weeks, it may be due to chronic HTN. Typically in Pregnancy induced hypertension (PIH) blood pressure rises after 20 weeks of gestation.
- Measure for Urinary Proteins at each ANC visit. If Proteinuria is present in presence of hypertension during pregnancy, it is classified as Pre-eclampsia.
- Patients with chronic Hypertension, Pregnancy induced hypertension, or Pre-eclampsia need to be cared for by specialists.

- If a previous pregnancy was complicated by Pregnancy induced hypertension, advise to initiate Oral Aspirin, 75 mg from 12 weeks to term.
- Blood pressure reduction medications in pregnancy are advised if BP >150/100 (without any end organ damage) or >140/90 (in presence of end organ damage).
- Antihypertensive drugs which are safe in Pregnancy are:
    - o Alpha-methyl dopa (Initiated at 250 mg twice daily. Maximum dose is upto 3 gms in two divided doses)
    - o Labetalol (initiated at 100mg twice daily. Maximum dose is 1200mg per day in 2-3 divided dosages)
    - o Nifedipine (initiated as 30mg of sustained release preparation. Maximum daily dose is 120mg of sustained release preparation per day).
- Other antihypertensive drugs (Amlodepin, and beta-blockers) do-not have known teratogenic effects, but are usually avoided in pregnancy.
- ACEI / ARBs have known teratogenic effects and are contraindicated. Diuretics are not given as they may adversely affect pregnancy outcomes.
- Target blood pressure for control is <150/100 mm Hg (or <140/90 mm Hg in case of previous end organ damage).
- Please ensure that diastolic blood pressure does not fall below 80 mm Hg. If this happens we may need to deescalate drug therapy.
- **Pre-eclampsia needs hospitalization and specialist management**
- **Obstetric management in case of Chronic HTN or PIH needs to be done by specialists.**

Management after delivery

- Blood pressure needs to be monitored after delivery. At least four times on day 1, and daily between 2-5 days.
- Requirement for anti hypertensive drugs falls after delivery in hypertensive states during pregnancy.
- If woman was started on alpha-methyl-dopa, this drug needs to be discontinued within 2 days of delivery (as it is secreted in breast milk).
- Women with chronic HTN can be shifted back to their previous drug therapies at this.
- In case of PIH / Pre-eclampsia evaluate if blood pressures remain high and drug therapy will be needed.
- Follow up at 6 weeks post-delivery for a repeat BP measurement and need for long-term anti-hypertensive drug therapy.

Diabetes in Pregnancy

Diabetes may exist before conception or may be detected first time during conception.

Definitions

- **Diabetes Mellitusis** defined as Fasting Plasma Glucose (FPG) of 126mg/dl or above or 2 hour Post-prandial plasma glucose of 200 mg/dL or more at any time during pregnancy.
- **If it is detected in early pregnancy, it is more likely to indicate a pre-existing diabetes mellitus.**

Gestational diabetes is defined as Fasting plasma glucose of 92-125 mg/dL or One hour post 75gm plasma glucose of >180mg/dL or two hour post 75gm glucose to be between 153 and 199 mg/dL. (WHO 2013 guidelines)

Blood sugars should be tested for in early pregnancy (as soon after pregnancy is detected). If this blood sugar level is normal (for diabetes and for gestational diabetes) blood sugars should be retested at 28 weeks. This is because gestational diabetes may manifest later in pregnancy.

In normal course, blood sugar levels fall in pregnant stage. Hence cut-offs for gestational diabetes are lower as compared to impaired glucose tolerance in the non-pregnant stage.

Pre-Pregnancy advice

All women with pre-existing diabetes must control their blood sugars prior to conception. They must optimize diet, physical activity, and achieve weight control, if previously obese.

Ante-partum management

If FPG is between 95 and 105 mg/dL, gestational diabetes can be managed by medical nutritional therapy. If sugars are higher than this level or if 1 hour PPG is >180 mg/dL, or 2 hr PPG is > 160 mg/dL, additional drug therapy is indicated.

Drug therapy of Diabetes during pregnancy is by using regular insulin. **Long acting insulins, and insulin analogues such as Insulin Glargine are contraindicated. Use of Oral drugs such as Metformin or Glyburide may be done, but safety is not established. All other oral drugs are contraindicated.**

Regular insulin is advised in three pre-meal divided dosages. Regular monitoring using glucometer sugar levels is advised.

Post-partum management

Insulin requirement falls immediately after delivery. Hence sugar levels need to be monitored in initial 5 days after delivery, and thereafter at 6 weeks. If blood sugar levels remain abnormal patient will need long term therapy.

- **Obstetric management in case of diabetes or gestational diabetes needs to be done by specialists. Medical management also needs to be planned under specialist care.**

(Source : http://www.almostallthetruth.com)

CHAPTER 8
CHRONIC AIRWAY DISORDERS

DEFINITIONS

- **Global Initiative for Asthma(GINA) definition:**

  In a chronic inflammatory disorder of the airways, many cells and cellular elements play a role.Chronic inflammation is associated with airway hyper responsiveness that leads to recurrent episodes of wheezing, breathlessness, chest tightness, and coughing. It is associated with widespread, variable, and often reversible airflow limitation

- **Global Initiative for Chronic obstructive lung Disease (GOLD) definition:**

  A disease state characterized by airflow limitation that is not fully reversible, the airflow limitation is usually both progressive and associated with an abnormal inflammatory response of the lungs to noxious particles or gases"

PATHOPHYSIOLOGY/RISK FACTORS

ASTHMA :

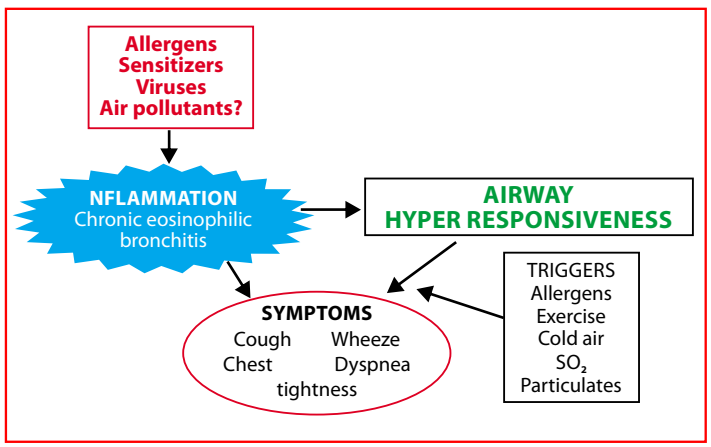


Figure - 1 : Pathogenesis of Asthma

COPD :

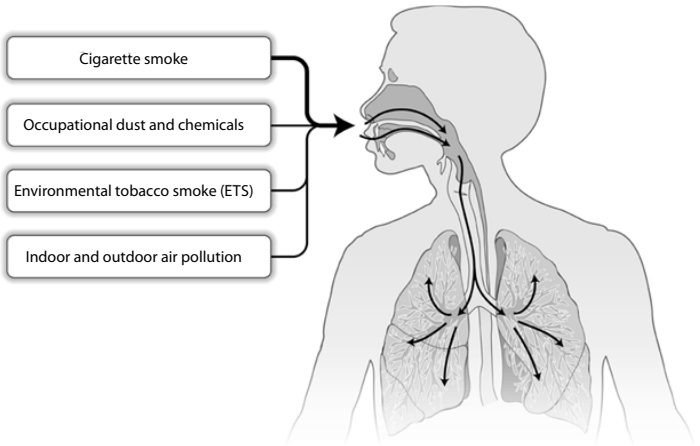


Figure - 2 : Causative factors for COPD

Both Asthma and COPD are clubbed together as they both lead to narrowing of the airways. But the differentiation between the two is important as treatment,course of illness and prognostication vary significantly in both the disease processes.

CLINICAL DIAGNOSIS AND DIFFERENTIATION

Asthma:

History:

- Recurrent episodes of wheezing
- Troublesome cough at night
- Cough or wheeze after exercise
- Cough, wheeze or chest tightness after exposure to airborne allergens or pollutants
- Colds "go to the chest" or take more than 10 days to clear

Investigations:

(i) Pulmonary Function Tests/Spirometry with Bronchodilator reversibility

Ideally, each asthma patient should undergo PFTs .This is not mandatory for diagnosis because a lot of asthma patients especially in milder severity grades, have normal PFTs because of episodic nature of the disease. However,for severity classification, PFTs are a must as treatment varies accordingly.

- **Mild Intermittent**

  Symptoms less than once a week,Brief exacerbations,Nocturnal symptoms not more than twice a month,FEV1 or PEF ≥80% predicted,FEV1 or PEF variability < 20%

- **Mild Persistent**

  Symptoms more than once a week but less than once a day,Exacerbations may affect activity and sleep,Nocturnal symptoms more than twice a month,FEV1 or PEF ≥80% predicted,FEV1 or PEF variability < 20-30%

- **Moderate Persistent**

  Symptoms daily,Exacerbations may affect activity and sleep,Nocturnal symptoms more than once a week,Daily use of SABA,FEV1 or PEF 60-80% predicted,FEV1 or PEF variability > 30%

- **Severe Persistent**

  Symptoms daily, Frequent exacerbations, Frequent nocturnal asthma symptoms, Limitations on physical activities,FEV1 or PEF ≤60% predicted,FEV1 or PEF variability > 30%

(ii) Chest X ray : Though Chest X ray is normal in most of the asthmatics yet it is suggested to get it done for at least once in the initial visit. A lot of asthmatics have only cough as the presenting symptom and X ray helps to rule out other obvious causes of cough e.g.Tuberculosis,Pneumonia e.t.c In smokers,where COPD is a likely presumptive diagnosis on history, it is not unusual to find a mass lesion /malignancy at the initial visit on a Chest X ray.

(iii) Sputum AFB : Routine RNTCP guidelines should be followed as always. Tuberculosis is still a rampant disease and hence sputum AFB needs to be done with cough of more than two weeks duration.

COPD

History:

- A clinical diagnosis of COPD should be considered in any patient who has dyspnea, chronic cough or sputum production, and a history of exposure to risk factors,mainly long history of smoking for the disease.

Investigations:

(i)Pulmonary Spirometry is required to make the diagnosis; the presence of a post-bronchodilator FEV1/FVC < 0.70 confirms the presence of persistent airflow limitation and thus of COPD

In patients with FEV1/FVC < 0.70:

GOLD 1: Mild	FEV1 > 80% predicted
GOLD 2: Moderate	50% < FEV1 < 80% predicted
GOLD 3: Severe	30% < FEV1 < 50% predicted
GOLD 4: Very Severe	FEV1 < 30% predicted

*Based on Post-Bronchodilator FEV1

(ii) Chest X ray : Unlike asthma, COPD patients usually have some findings on a chest x ray. There may be hyperinflated lung fields in an emphysematous patient or bilateral bronchovascula prominence in patients of chronic bronchitis. More importantly, pneumothorax and bullous disorders may be the actual cause of Dyspnea in OPD patients and need to be ruled out before starting the treatment.

(iii) Sputum AFB : As in asthma patients, sputum AFB needs to be done for any cough of more than two weeks duration.

Hence, the main differentiating feature between asthma and COPD is the episodic nature of the disease in former whereas COPD follows a downhill progressive course. Though COPD predominantly occurs in smokers but it is not uncommon to find asthmatics with a smoking history. In some cases, where the differentiation between the two diseases

remains a dilemma despite investigations and thorough history , such patients may be labeled as Asthma-COPD Overlap Syndrome(ACOS)

TREATMENT

CONTROLLERS	RELEIVERS
· Inhaled glucocorticosteroids · Leukotriene modifiers · Long-acting inhaled β_2-agonists in combination with inhaled glucocorticosteroids · Systemic glucocorticosteroids · Theophylline · Cromones · Anti-IgE	· Rapid-acting inhaled β_2-agonists · Systemic glucocorticosteroids · Anticholinergics · Theophylline · Short-acting oral β_2-agonists

OPD ASTHMA TREATMENT:

1. Develop Patient/Doctor Partnership
2. Identify and Reduce Exposure to Risk Factors
3. Assess, Treat and Monitor Asthma
4. Manage Asthma Exacerbations
5. Special Considerations

The above flowchart sums up the Outpatient management of asthma patients. Steps 1,2, 3 and 4 suggest treatment medication for mild intermittent, mild persistent, moderate persistent and severe persistent asthma patients respectively. Step 5 suggests treatment for patients for patients of bronchial asthma in exacerbation or patients with severe allergic asthma needing anti IgE treatment.

REDUCE ← **TREATMENT STEPS** → INCREASE

	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5
	asthma education				
	environmental control				
	as needed rapid-acting B_2-agonist	as needed rapid-acting B_2-agonist			
CONTROLLER OPTIONS		SELECT ONE	SELECT ONE	ADD ONE OR MORE	ADD ONE OR MORE
		low-dose ICS*	low-dose ICS plus long-acting B_2-agonist	medium-or high-dose ICS plus long-acting B_2-agonist	oral glucocorticosteroid (lowest dose)
		leukotriene modifier**	medium-or high-dose ICS	leukotriene modifier	anti-IgE treatment
			low-dose ICS plus leukotriene modifier	sustained-release theophylline	
			low-dose ICS plus sustained-release theophylline		

*inhaled glucocorticosterioids
**receptor antagonist or synthesis inhibitors

Figure - 3 : 'Step up' and 'Step down' treatment approach in Asthma

OPD COPD TREATMENT:

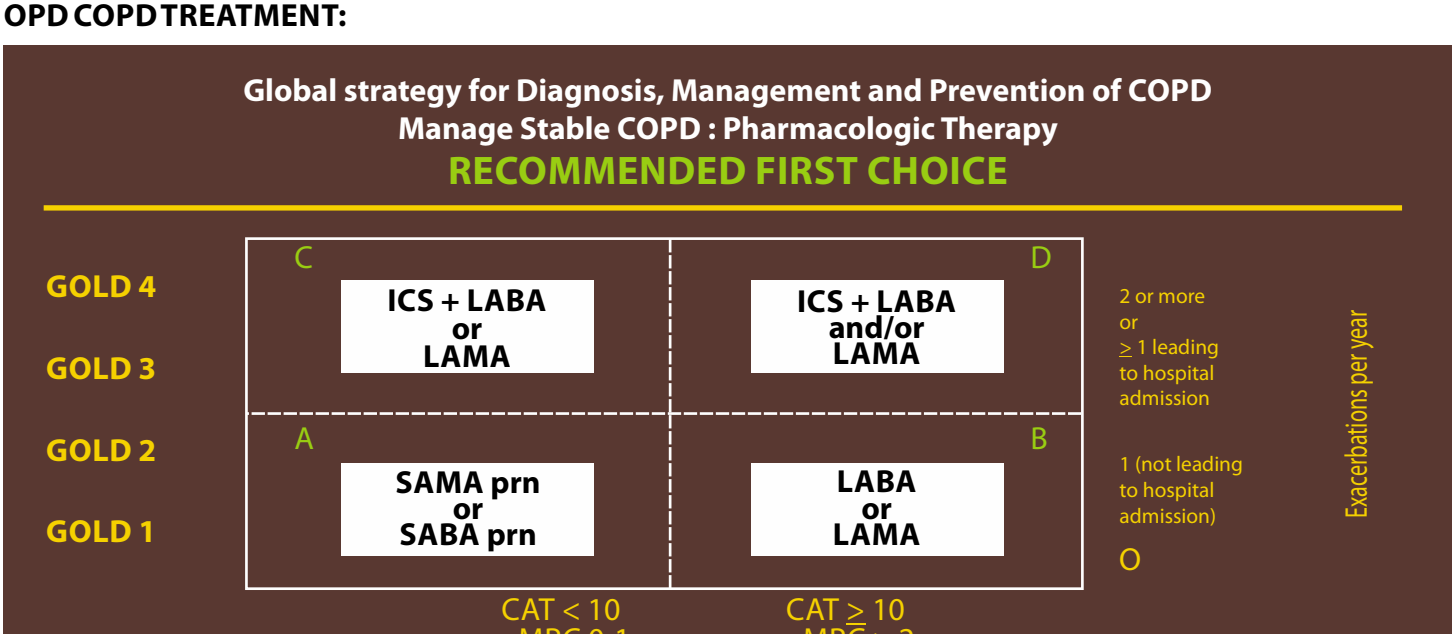


Figure - 4 : Choice of therapy as per severity of COPD

ICS	:	*Inhaled corticosteroids*	*LABA*	:	*Long Acting Beta 2 agonist*
LAMA	:	*Long Acting Muscarinic Antagonist*	*SABA*	:	*Short Acting Beta 2 Agonist*
SAMA	:	*Short Acting Muscarinic Antagonist*	*CAT*	:	*Combined Assessment Test Score*
MMRC	:	*Modified MRC Scale*			

The above diagram sums up the outpatient management of COPD patients. Earlier classification of GOLD 1,2,3,4 stages is now further classified into A, B ,C and D categories considering their symptomatic severity as well. This newer detailed classification is more accurate for prognostication of COPD patients. Patients with more symptomatic presentation have a poorer prognosis apart from considering PFT values only.

MANAGEMENT OF EXACERBATIONS:

Primary therapies for exacerbations:

- Repetitive administration of rapid-acting inhaled β2-agonist,Can give 3 nebulisations/ MDI 2 puffs each every 20 minutes for 1 hour
- Early introduction of systemic glucocortico steroids
- Oxygen supplementation

Closely monitor response to treatment with serial measures of lung function

Do not use injectable Theophylline

REFERRAL TO TERTIARY CARE:

- No response with 1 hour/3 nebulisations
- Less than 3 hours sustained response
- No/Minimal effect within 4-6 hours of starting steroids
- HR>120,SpO2<90% despite supplementation
- Comorbidities

CHOICE OF DEVICE

Dry Powder Inhalers (DPI):

young patient who can generate good inspiratory flow rate

Avoid prescribing DPI in children and Old Age

Breath Holding for 10 seconds/best feasible

Metered dose inhalers (MDI):

- Should never be prescribed without a spacer
- Drug Deposition increases from 10%(without spacer) to 50%(with the spacer)
- Spacer also minimizes the problem of hand mouth incordination
- Spacer should always be shaken before use.

BREATH ACTUATED INHALERS:

- Minimal inspiratory flow rate opens the gateway for drug delivery.
- Advantage: patient is aware of generation of minimal inspiratory flow rate.
- Hence, better than DPIs
- Some elderly patients still can't generate minimal flow rate, for them MDIs are still a better choice.
- Costlier than DPIs

FOLLOW UP

IN ASTHMA

- Patient on follow up is categorized as controlled, partly controlled or uncontrolled based on the frequency of daytime and night-time symptoms.
- The treatment is accordingly stepped up or stepped down.

IN COPD

- Maximum 3 monthly follow up for ICS/IBD
- Smoking cessation strategies
- Treat osteoporosis
- Clubbing in COPD: High suspicion of Ca lung
- Pulmonary Rehabilitation programmes

Notes

Notes

Notes

अखिल भारतीय आयुर्विज्ञान संस्थान भोपाल
All India Institute of Medical Sciences Bhopal
Saket Nagar, Bhopal
www.aiimsbhopal.edu.in

Anupam Mudran # 9425025574