

Diabetes Management

The background features a blue-tinted illustration of a human torso with internal organs visible. A large circular inset on the right side shows a detailed view of the pancreas, which is a yellowish, elongated organ with a bumpy texture. The overall theme is medical and related to diabetes management.

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Lec: 9

1st course

CONTENTS



Diabetes
Mellitus

- **INTRODUCTION**
- **Classification**
- **RISK FACTORS**
- **Diagnosis**
- **Treatment**



INTRODUCTION

INTRODUCTION



➤ **Definition:**

- chronic metabolic disorder of multiple etiology in which the body can't metabolize carbohydrate, fats and proteins
 - because of defects in insulin secretion and/or action.
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CLASSIFICATION

Classification of DM



I. Type 1 DM

- It is due to insulin deficiency and is formerly known as:
 - Type I
 - Insulin Dependent DM (IDDM)
 - Juvenile onset DM

II. Type 2 DM

- It is a combined insulin resistance and relative deficiency in insulin secretion and is frequently known as:
 - Type II
 - Noninsulin Dependent DM (NIDDM)
 - Adult onset DM
-

Classification of DM



III. Gestational Diabetes Mellitus (GDM):

- Gestational Diabetes Mellitus (GDM) developing during some cases of pregnancy but usually disappears after pregnancy.

IV. Secondary DM:

- Results from another medical condition or due to the treatment of a medical condition that causes abnormal blood glucose levels
 - Cushing syndrome (e.g. steroid administration)
 - Hyperthyroidism



Epidemiology

□ Type 1 DM:

- It is due to pancreatic islet β -cell destruction predominantly by an autoimmune process.
- Usually develops in childhood or early adulthood
- accounts for upto 10% of all DM cases
- Develops as a result of the exposure of a genetically susceptible individual to an environmental agent

Epidemiology

□ Type 2 DM:

- It results from insulin resistance with a defect in compensatory insulin secretion.
 - Insulin may be low, normal or high!
 - About 30% of the Type 2 DM patients are undiagnosed (they do not know that they have the disease) because symptoms are mild.
 - accounts for up to 90% of all DM cases
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Etiology



□ Etiology of Type 1 Diabetes:

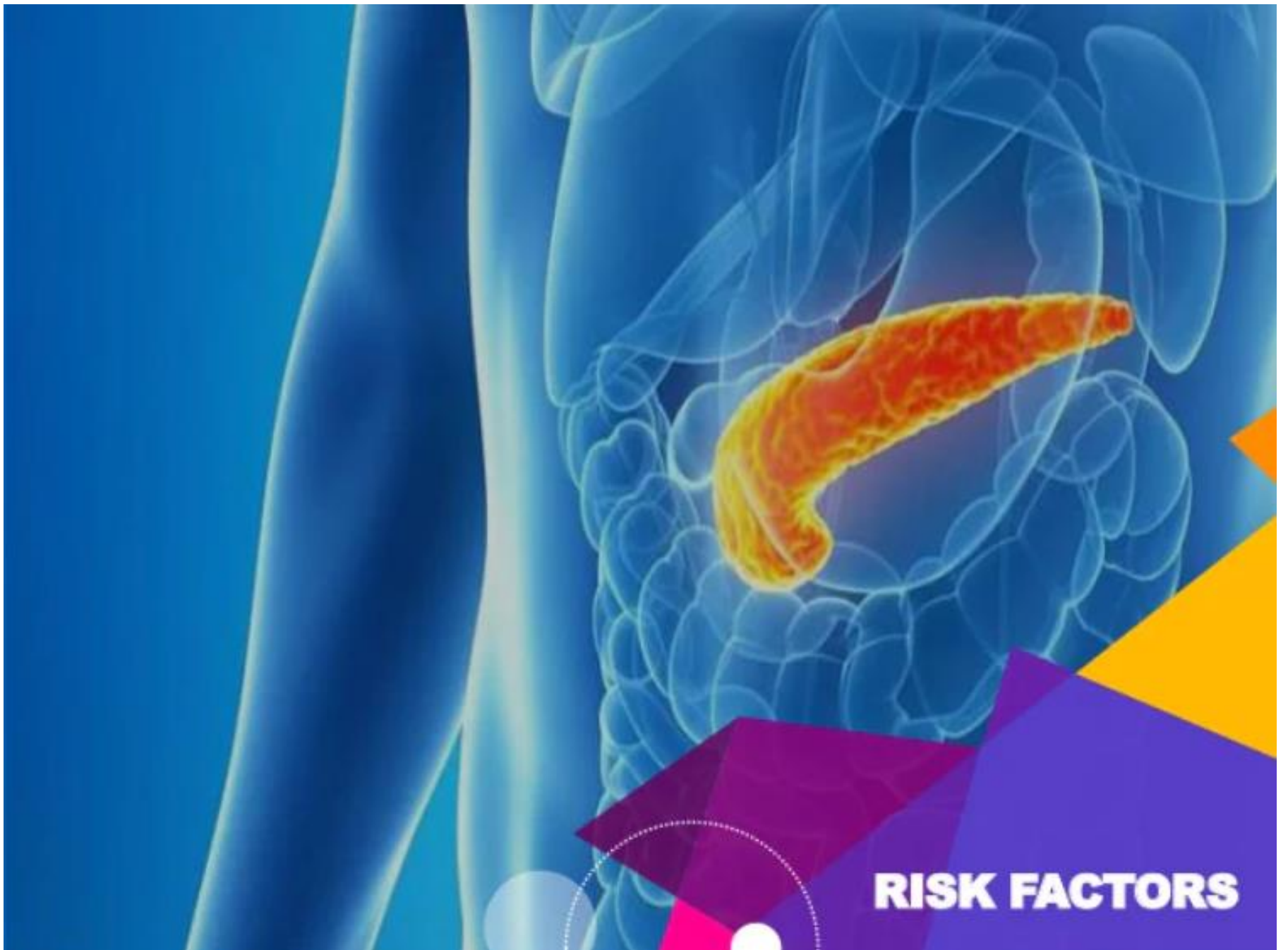
- Autoimmune disease
- Selective destruction of cells by T cells
- Several circulating antibodies against cells
- Cause of autoimmune attack: unknown
- Both genetic & environmental factors are important



Etiology

□ Etiology of Type 2 Diabetes:

- Response to insulin is decreased
 - ↓ glucose uptake (muscle, fat)
 - ↑ glucose production (liver)
 - The mechanism of insulin resistance is unclear
 - Both genetic & environmental factors are involved
 - Post insulin receptor defects
-



RISK FACTORS

Risk Factors

□ For Type 1 DM

- Genetic predisposition
- In an individual with a genetic predisposition, an event such as virus or toxin triggers autoimmune destruction of β -cells probably over a period of several years.

Risk Factors



□ For Type 2 DM

- Family History
- Obesity
- Habitual physical inactivity
- Previously identified impaired glucose tolerance (IGT) or impaired fasting glucose (IFG)
- Hypertension
- Hyperlipidemia



DIAGNOSIS

Clinical manifestations

□ Type 1 DM:

- Polyuria
 - Polydipsia
 - Polyphagia
 - Weight loss
 - Weakness
 - Dry skin
 - Ketoacidosis
-

Clinical manifestations

□ Type 2 DM:

- Patients can be asymptomatic
- Polyuria
- Polydipsia
- Polyphagia
- Fatigue
- Weight loss
- Most patients are discovered while performing urine glucose screening

Clinical manifestations





DIAGNOSIS



Laboratory examination

- **Fasting blood glucose(FBG)**
 - Glucose blood concentration in samples obtained after at least 8 hours of the last meal
 - **Random Blood glucose**
 - Glucose blood concentration in samples obtained at any time regardless the time of the last meal
-

Laboratory examination

- **Glucose tolerance test(OGTT)**
 - 75 gm of glucose are given to the patient with 300 ml of water after an overnight fast
 - Blood samples are drawn 1, 2, and 3 hours after taking the glucose
 - This is a more accurate test for glucose utilization if the fasting glucose is borderline
-

Laboratory examination

- **Glycosylated hemoglobin (HbA1C)**
 - Normally it comprises 4-6% of the total hemoglobin.
 - Increase in the glucose blood concentration increases the glycated hemoglobin fraction.
 - HbA1C reflects the glycemic state during the preceding 8-12 weeks
-

Laboratory examination

➤ Glucosuria

- To detect glucose in urine by a paper strip
- Semi-quantitative
- Normal kidney threshold for glucose is essential

➤ Ketonuria

- To detect ketonbodies in urine by a paper strip
- Semi-quantitative

Diagnostic criteria

	HbA1C	FBG (mg/dl)	OGTT (mg/dl)
Diabetes	≥ 6.5	≥ 126	≥ 200
Prediabetes	5.6-6.4	100-125	140-199
Normal	< 5.6	≤ 99	≤ 139

A close-up photograph of medical supplies. A silver stethoscope is positioned in the upper center. To its left are several blue capsules. To its right and in the foreground are numerous yellow capsules. The items are resting on a white document with the word "Diabetes" printed in a large, black, serif font. The background is slightly blurred, showing more of the same items.

Diabetes

TREATMENT

DM - management

□ Goals of therapy:

- Reduce symptoms
 - Promote well-being
 - Prevent acute complications
 - Delay onset and progression of long-term complications
-

DM - management

□ Lines of therapy:

- Non-pharmacological treatment
 - Pharmacological treatment
-

Non-pharmacological treatment

- Nutritional therapy:
 - Diet
 - Exercise
 - Stop smoking
 - Avoid precipitating factors
-

Nutritional Therapy

- Overall goal of nutritional therapy
 - Assist people to make changes in nutrition and exercise habits that will lead to improved metabolic control
-

Nutritional Therapy

- **Type 1 DM**
 - Diet based on usual food intake, balanced with insulin and exercise patterns
 - In most cases, high carbohydrate, low fat, and low cholesterol diet taken
 - **Type 2 DM**
 - Calorie reduction
-

Nutritional Therapy

- **Food composition**
 - Meal plan developed with dietitian
 - Nutritionally balanced
 - Does not prohibit the consumption of any one type of food
-

Nutritional Therapy

➤ Exercise

- Essential part of diabetes management
- Increases insulin sensitivity
- Lowers blood glucose levels
- Decreases insulin resistance
- Take small carbohydrate snacks during exercise to prevent hypoglycemia
- Exercise after meals
- Monitor blood glucose levels before, during, and after exercise

Pharmacological treatment



- Insulin (Type 1 and Type 2 DM)
 - Sulfonylurea (Type 2 DM)
 - Biguanides (Type 2 DM)
 - Meglitinides (Type 2 DM)
 - Thiazolidinediones Glitazones (Type 2 DM)
 - α -Glucosidase inhibitors (Type 2 DM)
 - Incretin mimetic (Type 2 DM)
 - DPP4 inhibitors (Type 2 DM)
 - Amylin analogs (Type 1 and Type 2 DM)
 - SGLT2 Inhibitors (Type 2 DM)
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Drug Therapy: Insulin

- **Exogenous insulin:**
 - Required for all patient with type 1 DM
 - Prescribed for the patient with type 2 DM who cannot control blood glucose by other means
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Drug Therapy: Insulin

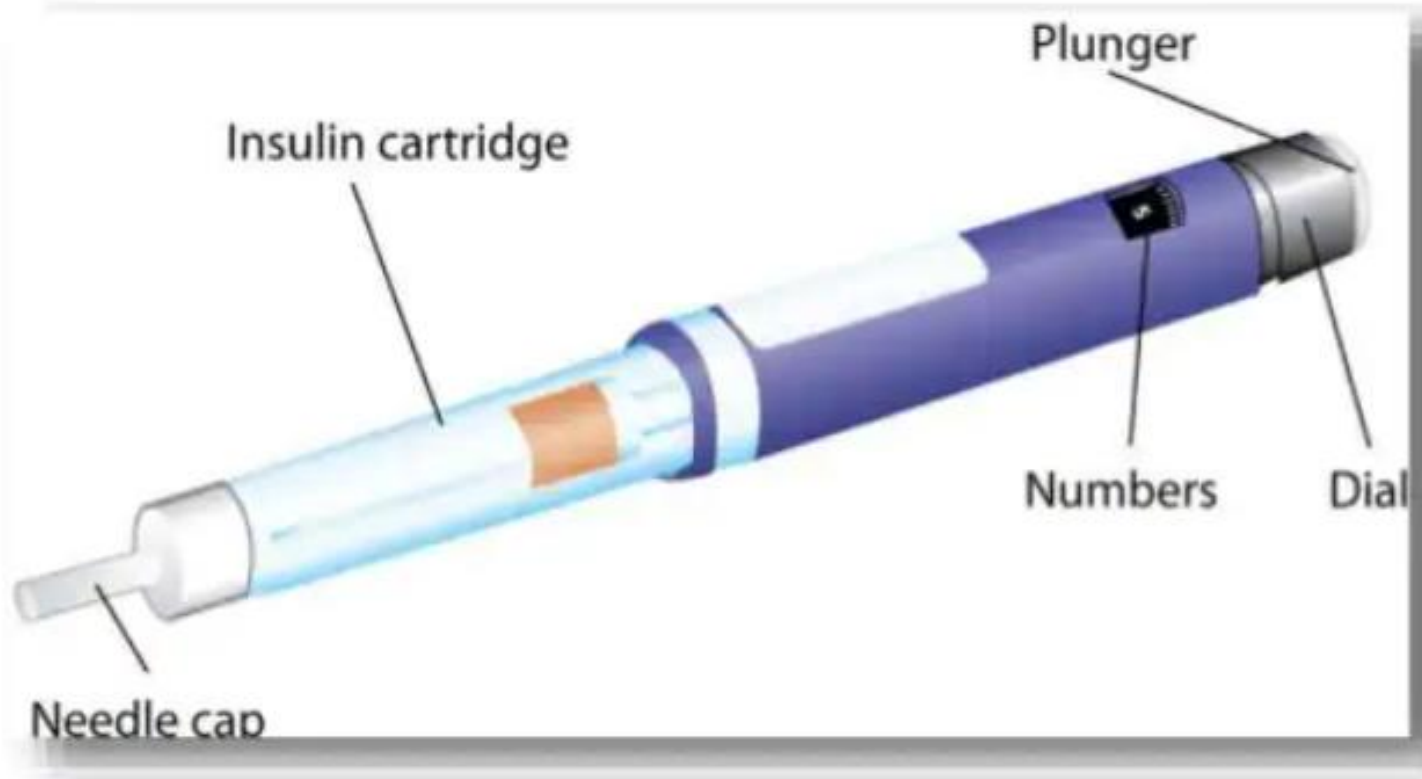
➤ **Methods of Insulin Administration**

- Cannot be taken orally
 - Insulin delivery methods
 - Ordinary SQ injection with syringes
 - Insulin pen
 - Insulin pump
-

Drug Therapy: Insulin

- **Administration of insulin**
 - Fastest absorption from abdomen, followed by arm, thigh, buttock
 - Rotate injections within one particular site
 - Do not inject in site to be exercised
-

Drug Therapy: Insulin



Drug Therapy: Insulin

➤ Problems with insulin therapy

- Hypoglycemia :
 - Due to too much insulin in relation to glucose availability
- Allergic reactions
- Local inflammatory reaction
- Lipodystrophy
- Hypertrophy or atrophy of SQ tissue due to frequent use of same injection site.

Drug Therapy: Insulin

- **Drugs interfering with glucose tolerance**
 - Diazoxide
 - Thiazide diuretics
 - Corticosteroids
 - Oral contraceptives
 - Streptazocine
 - Phenytoin
 - All these drugs increase the blood glucose concentration.
-

Drug Therapy: Oral Agents

- Increase insulin production by pancreas
 - Reduce glucose production by liver
 - Enhance insulin sensitivity and glucose transport into cell
 - Slow absorption of carbohydrate in intestine
-

Pharmacotherapy :Type 2 DM

General considerations:

- Consider therapeutic life style changes (TLC) for all patients with Type 2 DM
 - Initiation of therapy may depend on the level of HbA1C
 - HbA1C < 7% may benefit from TLC
 - HbA1C 8-9% may require one oral agent
 - HbA1C > 9-10% my require more than one oral agent
-

Pharmacotherapy :Type 2 DM

□ Obese Patients :

- Metformin or glitazone then if inadequate
 - Add SU or short-acting insulin secretagogue then if inadequate
 - Add Insulin or glitazone
-

Pharmacotherapy :Type 2 DM

□ Non-Obese Patients :

- Add SU or short-acting insulin secretagogue then if inadequate
 - Add Metformin or glitazone then if inadequate
 - Add Insulin
-

Pharmacotherapy :Type 2 DM



□ Early insulin resistance :

- Metformin or glitazone then if inadequate
 - Add glitazone or metformin then if inadequate
 - Add SU or short-acting insulin secretagogue or insulin
-

Pharmacotherapy :Type 1 DM



- The choice of therapy is simple
 - All patients need Insulin
 - The goal is:
 - To balance the caloric intake with the glucose lowering processes (insulin and exercise), and allowing the patient to live as normal a life as possible
-

Pharmacotherapy :Type 1 DM

- The insulin regimen has to mimic the physiological secretion of insulin
 - With the availability of the SMBG and HbA1C tests adequacy of the insulin regimen can be assessed
 - More intense insulin regimen require more intense monitoring
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Pharmacotherapy :Type 1 DM

- Example:
 - 1) Morning dose (before breakfast):
Regular + NPH or Lente
 - 2) Before evening meal:
Regular + NPH or Lente

 - Require strict adherence to the timing of meal and injections
-

Pharmacotherapy :Type 1 DM

➤ Modification

- NPH evening dose can be moved to bedtime
 - Three injections of regular or rapid acting insulin before each meal + long acting insulin at bedtime (4 injections)
 - The choice of the regimen will depend on the patient
-

Pharmacotherapy :Type 1 DM

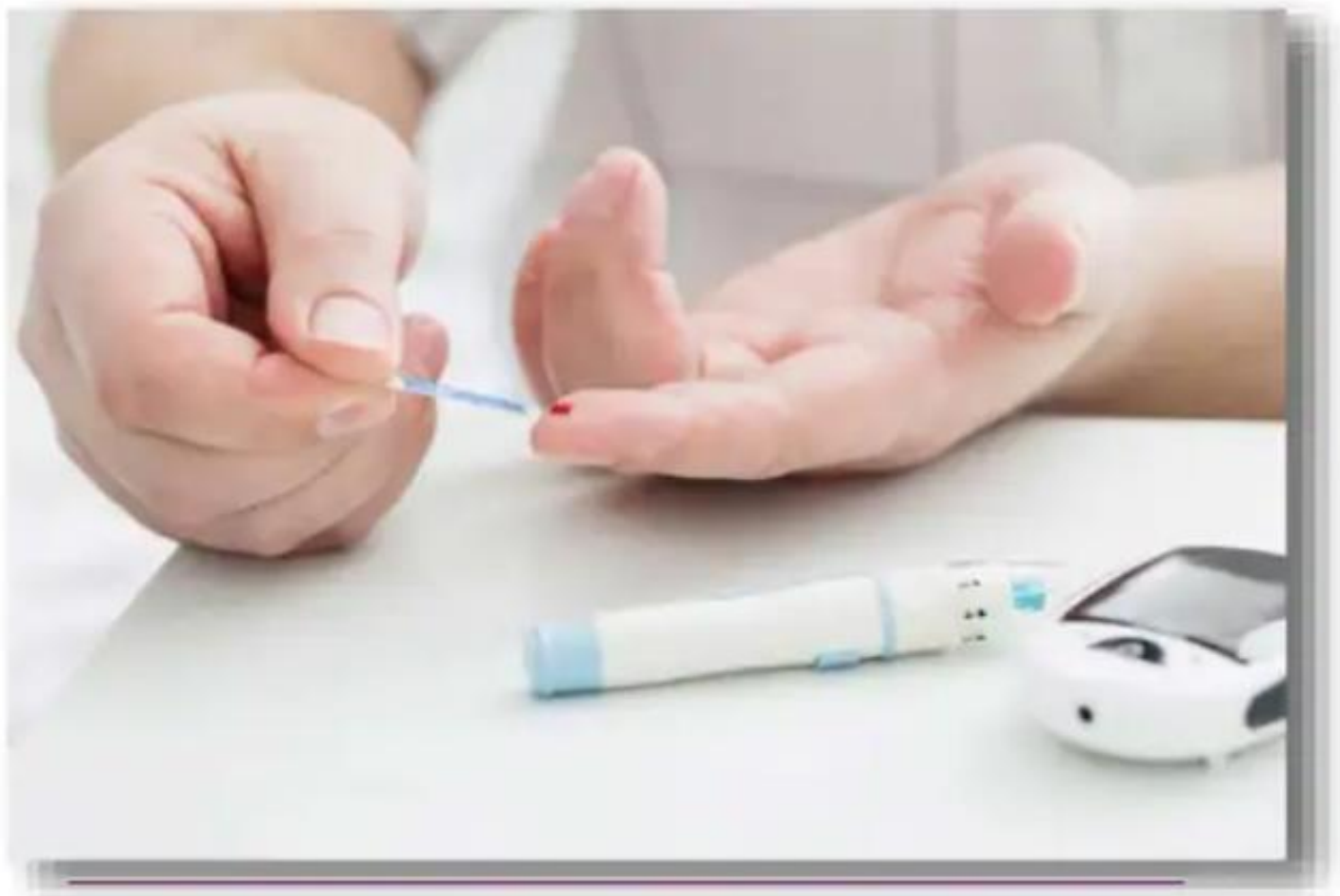
➤ How much insulin ?

- A good starting dose is 0.6 U/kg/day
 - The total dose should be divided to:
 - 45% for basal insulin
 - 55% for prandial insulin
-

Pharmacotherapy :Type 1 DM

- ❑ **Self-monitoring of blood glucose(SMBG)**
 - Extremely useful for outpatient monitoring specially for patients who need tight control for their glycemic state.
 - A portable battery operated device that measures the color intensity produced from adding a drop of blood to a glucose oxidase paper strip.
 - e.g. One Touch, Accu-Chek, DEX, Prestige and Precision.
-

Self Monitoring Test

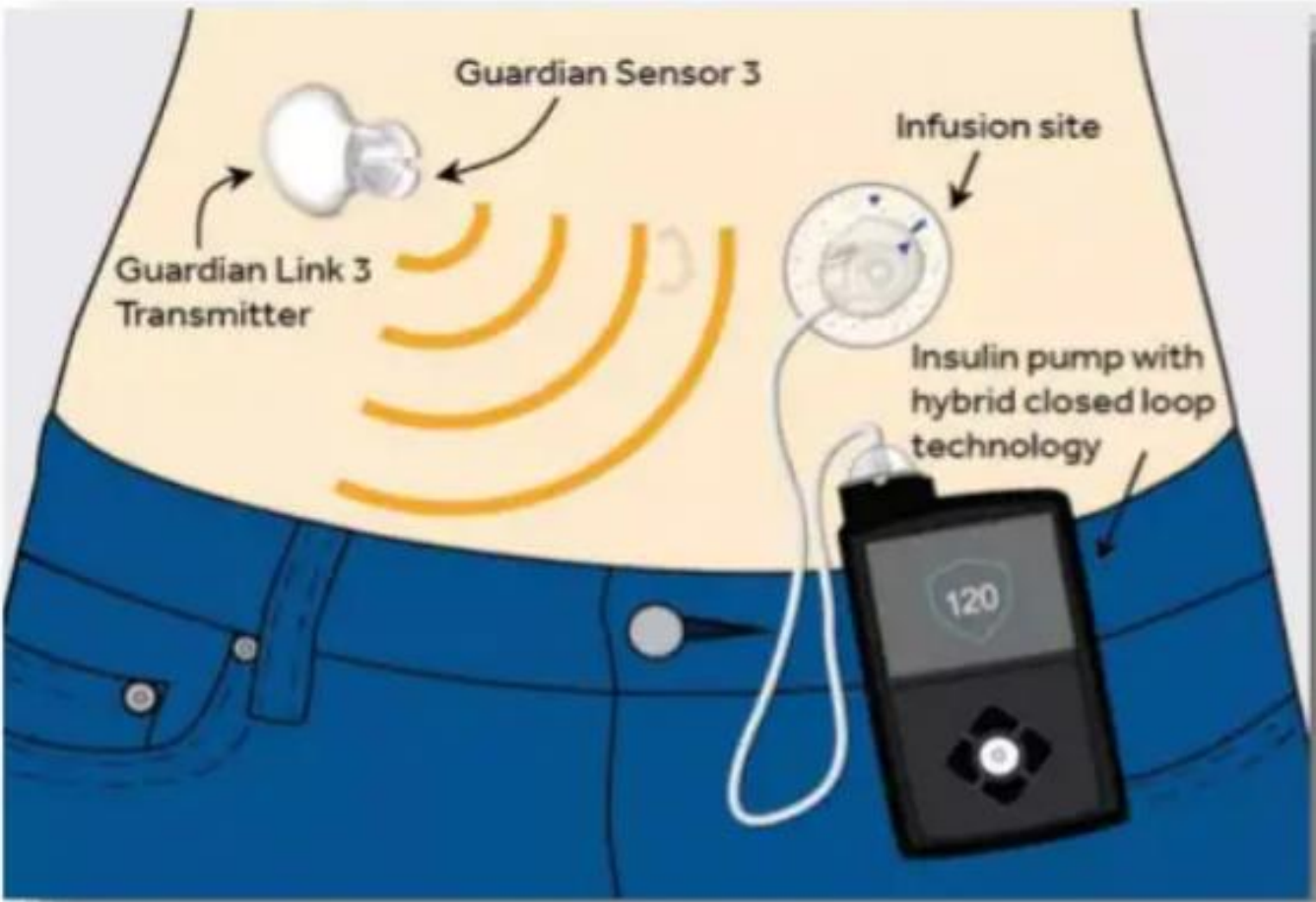


Pharmacotherapy :Type 1 DM

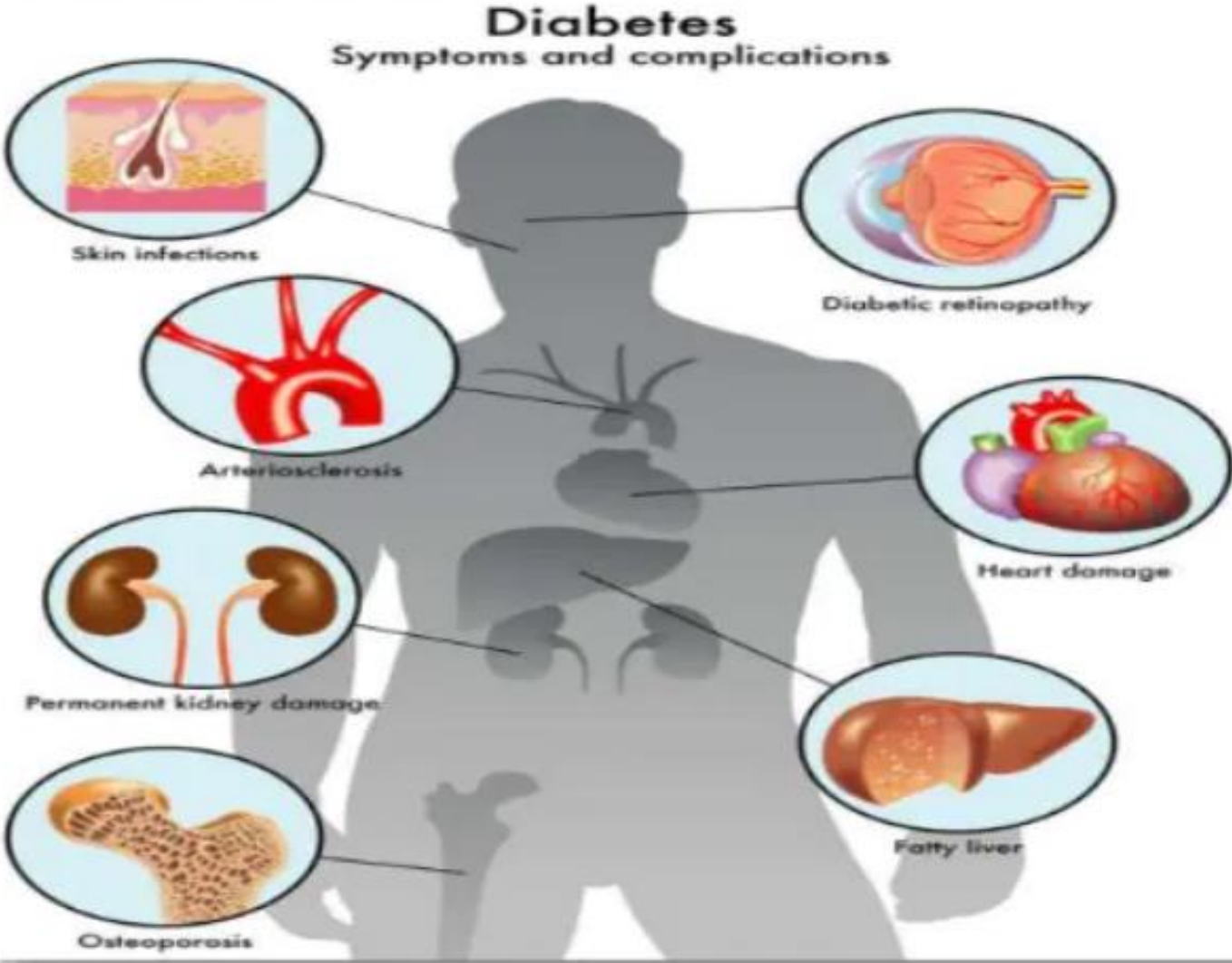
➤ Insulin Pump Therapy

- This involves continuous SC administration of short-acting insulin using a small pump
- The pump can be programmed to deliver basal insulin and spikes of insulin at the time of the meals
- Requires intense SMBG
- Requires highly motivated patients because failure to deliver insulin will have serious consequences

Pharmacotherapy :Type 1 DM



Complications



Complications

➤ Acute Complications

- Hypoglycemia
 - Diabetic ketoacidosis
 - Hyperosmolar hyperglycemic nonketotic syndrome
-

Complications

➤ Chronic Complications

□ Macrovascular complications:

- Coronary heart disease, stroke and peripheral vascular disease

□ Microvascular Complications:

- Retinopathy, nephropathy and neuropathy
-

Acute Complication: Hypoglycemia

- Hypoglycemia occurs due to too much insulin (or oral agents) in relation to glucose availability
 - Brain requires constant glucose supply thus hypoglycemia affects mental function
-

Acute Complication: Hypoglycemia

- **Clinical manifestations:**
 - Confusion, irritability
 - anxiety, tachycardia, tremors
 - Diaphoresis, tremor, hunger, weakness, visual disturbances
 - If untreated → loss of consciousness, seizures, coma, death
-

Acute Complication: Hypoglycemia

➤ Treatment for hypoglycemia

- Ingest simple CHO (fruit juice, soft drink), or commercial gel or tablet
- Avoid sweets with fat (slows sugar absorption)
- Then eat usual meal snack or meal and recheck
- if not alert enough to swallow
 - Glucagon 1m IM or SQ (glycogen → glucose)
 - Then complex CHO when alert

Acute Complication: Diabetic Ketoacidosis (DKA)

- Usually in Type 1 diabetes; can occur in Type 2
 - Causes:
 - Infection
 - Stressors (physiological, psychological)
 - Stopping insulin
 - Undiagnosed diabetes
-

Acute Complication: Diabetic Ketoacidosis (DKA)

- **Clinical manifestations:**
 - Dehydration
 - Deep difficult breathing (d/t metabolic acidosis)
 - Fruity breath (d/t acetone)
 - Abdominal pain, N & V, cardiac dysrhythmias
-

Acute Complication: Diabetic Ketoacidosis (DKA)

➤ Treatment

- Replace fluid and electrolytes
 - Insulin (First IV bolus, then infusion)
 - correct precipitating cause (e.g., infection, etc.)
-



thanks
For Watching

