HEARTS IN THE AMERICAS
Regional Workshop

WHO DIABETES Guidelines and Diabetes Module in PEN

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Switzerland

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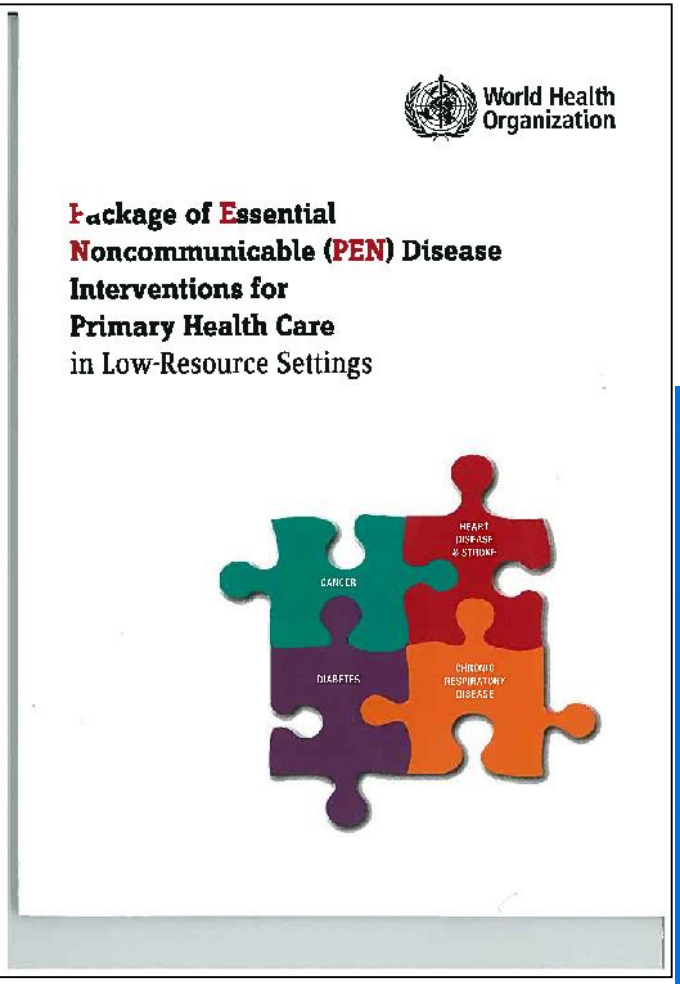
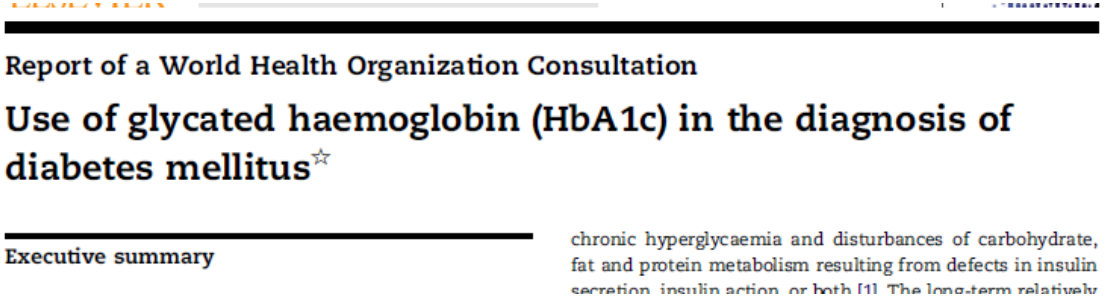
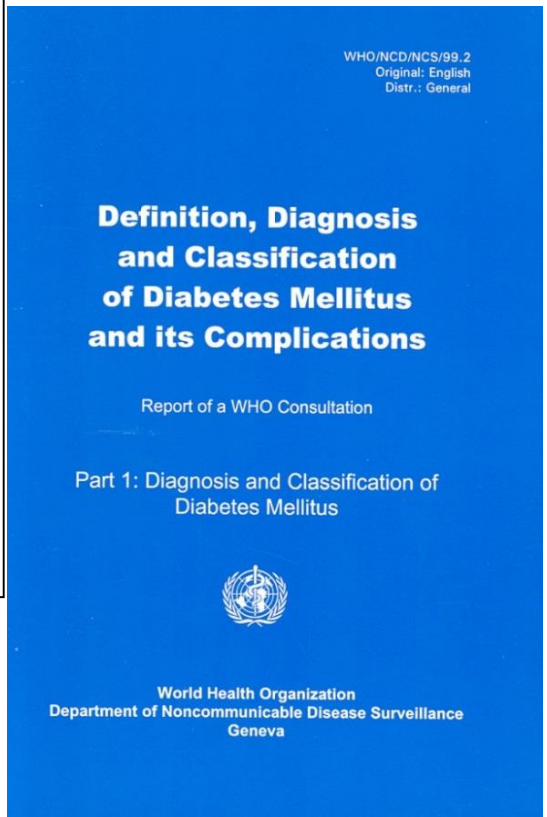
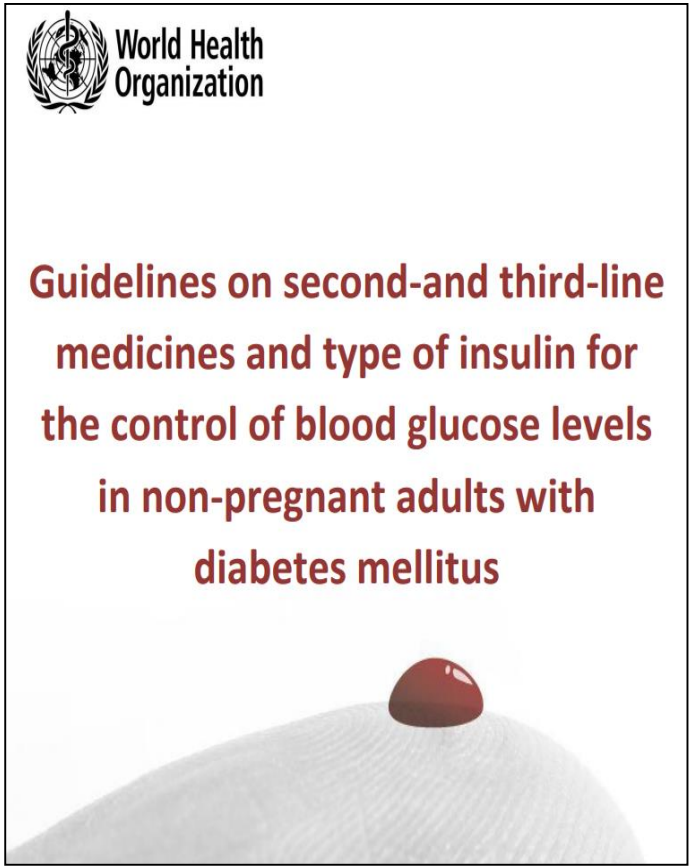
WHO guidance on diabetes diagnosis and management









Training Manual

WHO Package of Essential NCD Interventions (PEN)

Part-II - Protocols

DRAFT FOR FIELD TRIAL

World Health Organization

What is diabetes ?

- Diabetes is a group of metabolic disorders characterized by the presence of hyperglycaemia in the absence of treatment.

- Diabetes occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces

- The long-term specific complications of diabetes include retinopathy, nephropathy and neuropathy

Main types of diabetes

- Type 1 diabetes
  - characterized by deficient insulin production
  - requires daily administration of insulin for survival
- Type 2 diabetes
  - The most common type of diabetes (>90%)
  - Combination of resistance to insulin action and an inadequate insulin secretory response due to β-cell dysfunction
  - Insulin is not required for survival, but often needed it for controlling blood glucose levels
- Gestational diabetes
  - Gestational diabetes is hyperglycaemia with blood glucose values above normal but below those diagnostic of diabetes, occurring during pregnancy

Steps of management of diabetes in a primary care setting

Assess

Risk factors/markers for diabetes

- Overweight/obesity
- Physical inactivity
- Diabetes in first degree relatives
- History of gestational diabetes
- Cardiovascular disease, hypertension

Symptoms

- Polyuria (excessive passing of urine)
- Polydipsia (excessive thirst)
- Unexplained weight loss
- Polyphagia (excessive hunger)
- Vision changes
- Fatigue

Majority of cases have no clinical symptoms and can present with complications

Diagnostic criteria for diabetes

Measurement	Diagnostic cut-off	Comments
Fasting* venous or capillary plasma glucose**	**≥7.0 mmol/l (126 mg/dl)**	Least costly but difficulties with ensuring a fasting state
2-hour post-load venous plasma glucose	≥11.1 mmol/l (200 mg/dl)	Standard method, but cumbersome and costly
2-hour post-load capillary plasma glucose**	≥12.2 mmol/l (220 mg/dl)	Cumbersome and costly, difficulties with ensuring a fasting state
Random plasma glucose	≥11.1 mmol/l (200 mg/dl)	*Least sensitive* test, to be used in the presence of symptoms
HbA1c***	6.5% (48 mmol/l)	Does not require the fasting state but more costly

overnight fast of 8-14 hours;* *****if laboratory measurement is not available, point of care devices can be used* *(they report glucose values in capillary plasma); *** plasma glucose is preferred in people with symptoms who are suspected of having type 1 diabetes*

Treatment principles

Non-pharmacological

A healthy diet , maintaining **normal body weight** and regular **physical activity** are the **mainstay** of diabetes management

Pharmacological

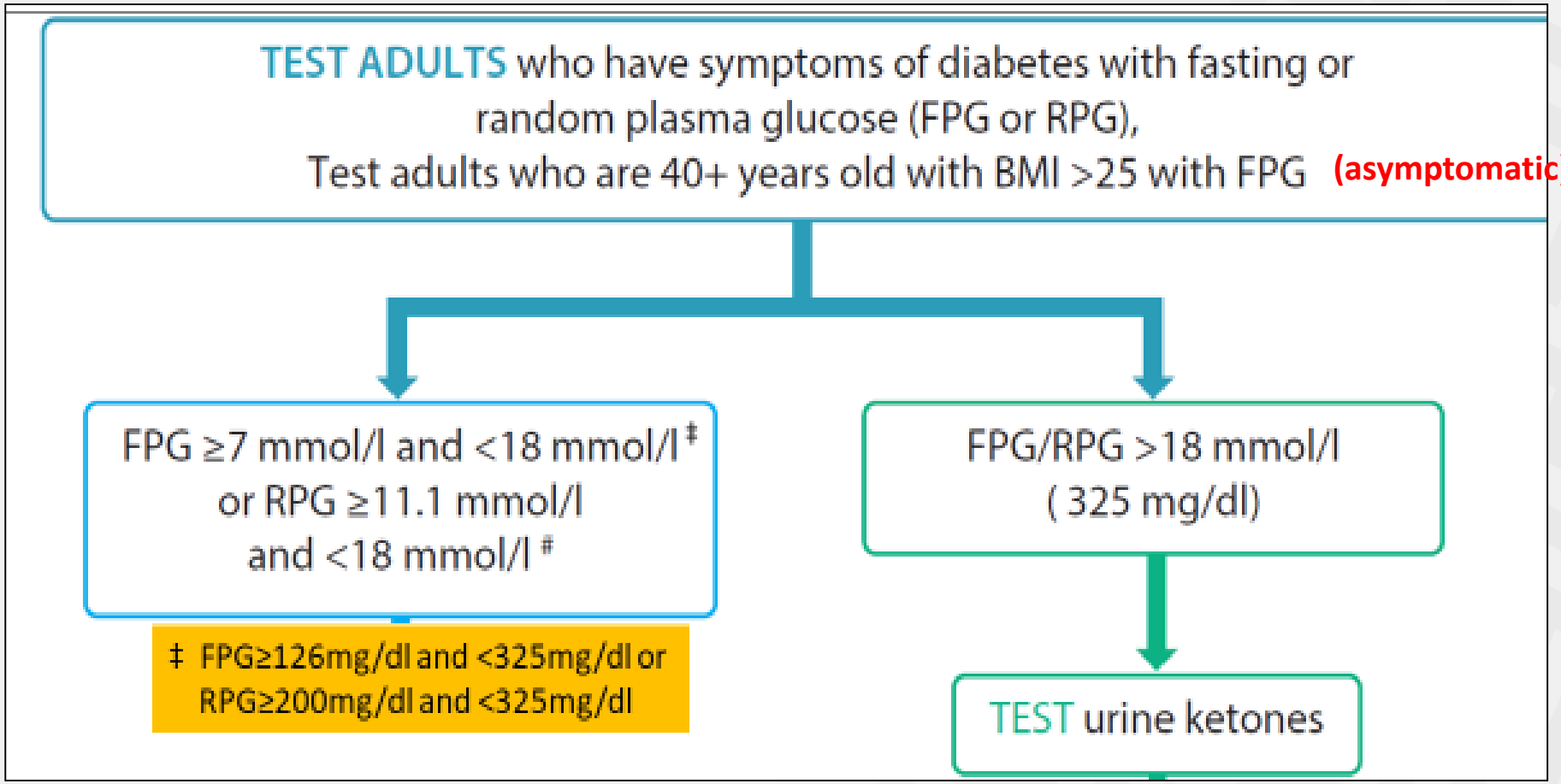
- **Metformin** is the recommended **initial treatment** for people who do not achieve the desired glycaemic control with diet and physical activity.
- **Sulfonylurea** can be used as initial (first-line) treatment **when metformin is contraindicated or not tolerated**
- **Add sulfonylurea** when metformin fails
- **Add human insulin** if treatment with metformin and sulfonylurea fails

Indications for referral

If control is not achieved even after 3 months despite adherence to medication, healthy diet and physical activity

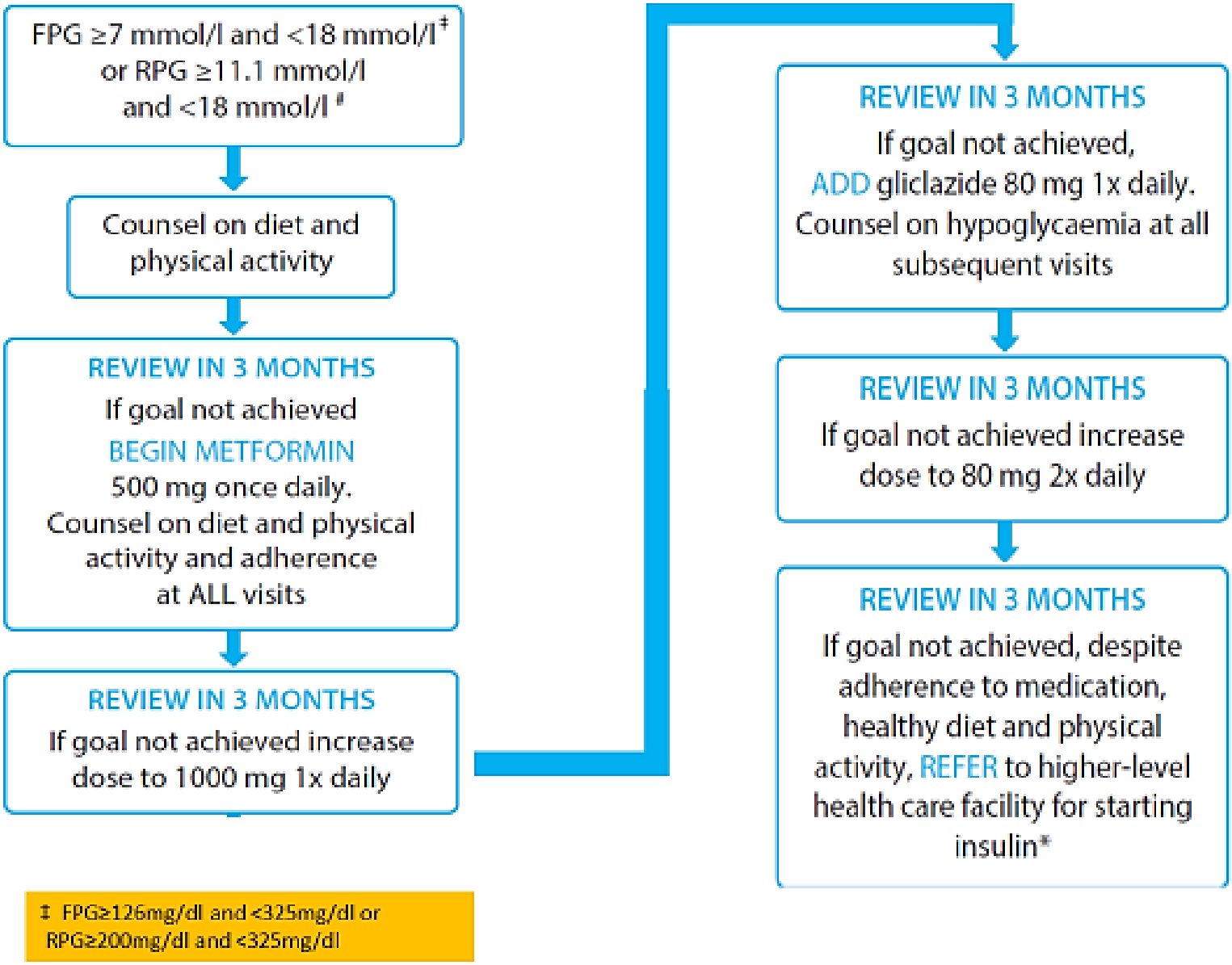
Whom to test ?

(WHO Diabetes protocol 2018)



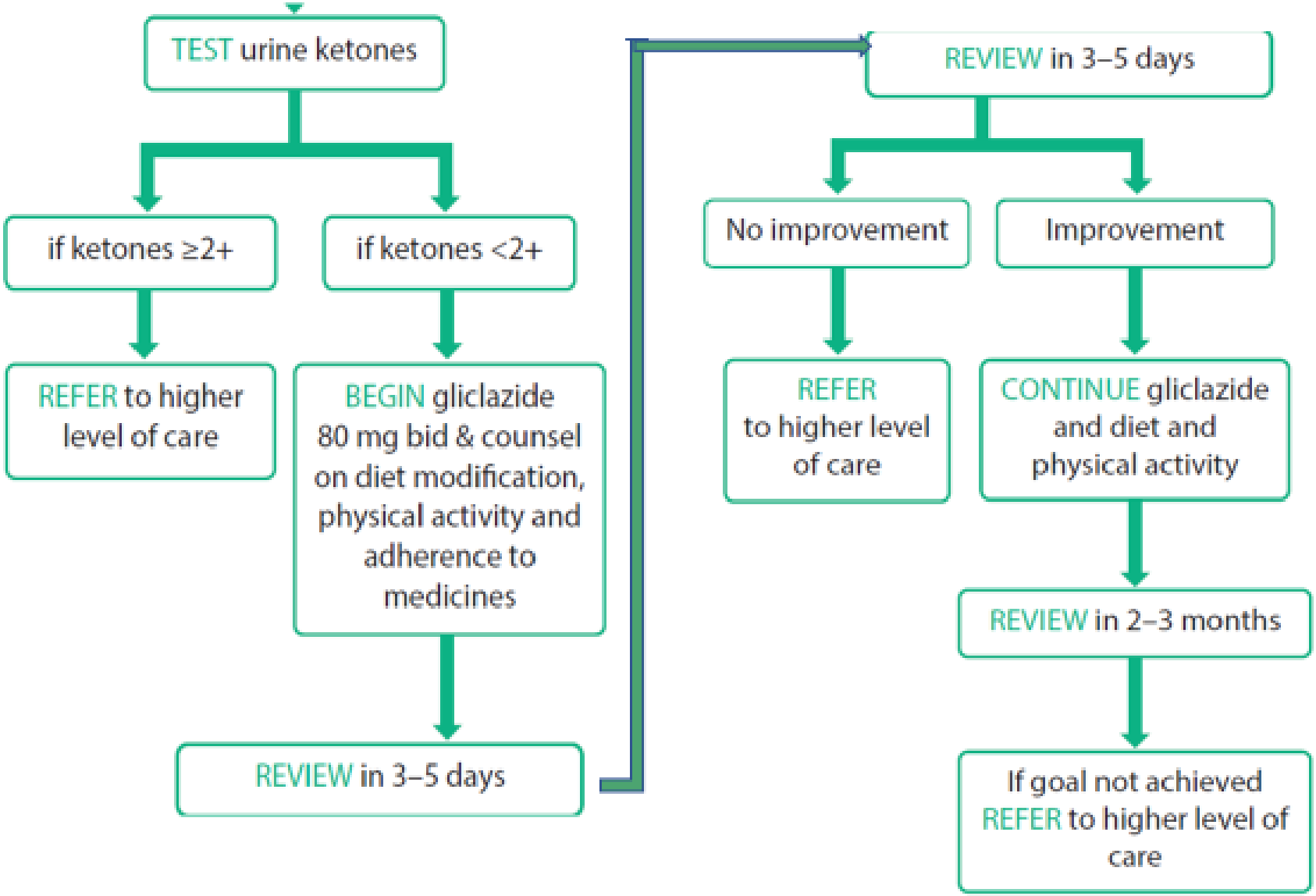
In **asymptomatic** people, it is recommended to **repeat** testing to confirm the diagnosis, preferably with the same test, as soon as practicable on a subsequent day

Control of blood glucose



‡ FPG≥126mg/dl and <325mg/dl or RPG≥200mg/dl and <325mg/dl

Management in presence of ketonuria



TREATMENT GOAL IN DIABETES

HbA1c of 7.0%

OR

Fasting PG value of 7.0 mmol/l (126mg/dl)

AND (if measurement feasible)

Postprandial PG value of 9.0 mmol/l (160 mg/dl)

TREATMENT GOAL IN DIABETES

HbA1c of 7.0%

OR

Consider less stringent glycaemic control in patients with frequent severe hypoglycaemia, advanced complications, serious comorbidities and/or limited life expectancy.

Postprandial PG value of 9.0 mmol/l (160 mg/dl)

Follow-up

Check for complications

- Measure **blood pressure** at every visit
- REFER for dilated-pupil **retinal exam** upon diagnosis, and every two years thereafter
- Examine **feet for ulcers** at every visit. REFER to higher level of care if ulcer present
- Assess risk of **lower limb** amputation annually. REFER to higher level of care if ulcer present or pulse absent
- Test for **proteinuria** annually. REFER to higher level of care if positive.

Precautions with antidiabetic drugs

Metformin is contraindicated in

- people with chronic kidney disease (estimated glomerular filtration rate (eGFR) <45 ml/minute/1.73m2)
- liver disease
- cardiac/respiratory insufficiency
- alcohol abuse
- history of lactic acidosis

Glibenclamide is not recommended in

- people aged 60 years or older
- In patients for whom hypoglycaemia is a concern (people who are at risk of falls, people who have impaired awareness of hypoglycaemia, people who live alone)
- people who drive or operate machinery as part of their job

Macrovascular complications

Patients with diabetes are at a higher risk of:

- Coronary heart disease
- Heart failure
- Cerebrovascular disease
- Peripheral vascular diseases

Management of CVD risk factors in diabetes (hypertension)

Blood pressure control

- Blood pressure lowering in people with diabetes reduces the risk of microvascular and macrovascular complications
- **Thiazide diuretics** and **angiotensin-converting enzyme** (ACE) inhibitors are **recommended**
- Target should be to achieve a target blood pressure < 130/80 mmHg.
- If this is not achievable, refer to a higher level of care.

Management of CVD risk factors in diabetes (lipid control)

Lipid control

- Some lipid profile improvement can be achieved with a healthy diet and physical activity.
- *Statins* can reduce the risk of CVD events in people with diabetes.

Antiplatelet treatment

- Use antiplatelet treatment only for secondary prevention of CVD events.
- 75-100 mg of acetylsalicylic acid daily is recommended to all people with diabetes who have survived a CVD event and have no history of major bleeding

Acute complications of diabetes

Hypoglycaemia

Hyperglycaemia

Hypoglycaemia

- Hypoglycaemia (abnormally low blood glucose) is a frequent complication in patients receiving sulfonylurea or insulin.
- There is no universally agreed plasma glucose cut-off point for hypoglycaemia as symptoms and signs can occur at different thresholds.
- It is most frequently defined at **plasma glucose of <3.9 mmol/l (70 mg/dl)** when it **should be managed even if there are no symptoms and signs**.
- **Severe hypoglycaemia** (plasma glucose <50 mg/dl or 2.8 mmol/l) or appearance of signs
- It can cause loss of consciousness and coma and is potentially life-threatening

Assess for hypoglycaemia

Risk factors

- Skipping meals
- Physical activity more intense than usual
- Alcohol ingestion
- Medicine dosage too high

Symptoms and signs

- Hunger, anxiety, confusion, trembling
- Sweating, headache, seizures
- Palpitations
- Pallor, stupor, ataxia, paraesthesia
- Coma

Management of hypoglycaemia – conscious patient

If the patient is able to eat and drink:

- Give oral carbohydrate that contains 15-20 g of rapidly absorbing forms of glucose (sugar-sweetened soft drink, 1-2 teaspoons of sugar, 5-6 hard candy, cup of milk)
- Repeat the treatment if hypoglycaemia persists after 15 minutes
- If rapidly absorbing glucose is not available, any foods containing carbohydrate can be given (e.g. bread, rice, potato)
- Follow by a small meal

Management of hypoglycaemia- unconscious patient

If patient is Unconscious,

- If plasma glucose <=2.8mmol/l (50mg/dl) and in those unable to eat or ingest drink – give hypertonic glucose (dextrose) intravenously (20 – 50 ml of 50% glucose over 1-3 minutes).
- If this concentration is not available, substitute with any hypertonic glucose solution
- Food should be provided as soon as the patient is able to ingest food safely.
- Adjust medication if necessary.
- Educate the patient about conditions leading to hypoglycaemia.

Hyperglycaemic emergencies

- **Diabetic ketoacidosis (DKA) and hyperosmolar hyperglycaemic state (HHS) are life-threatening conditions**
- **Severe hyperglycaemia-**
  - Plasma glucose >18 mmol/l (325 mg/dl) and
  - Urine ketone 2+ or signs and
  - Symptoms of severe hyperglycaemia

Symptoms and signs of severe hyperglycaemia (DKA and HHS)

- Nausea, vomiting and abdominal pain
- Severe cases of DKA can present with Kussmaul's breathing*
- Changes in sensorium range from alertness to stupor or coma, depending on the severity
- Patients with **HHS typically present in stupor or coma**

**Kussmaul breathing: Air hunger, or rapid, deep, and laboured breathing characteristic of patients with acidosis*

Management of hyperglycaemic emergencies

- DKA or HHS should be suspected in every ill patient with hyperglycaemia
- Refer to hospital all patients with plasma glucose levels >= 18 mmol/l (325 mg/dl) and all patients with suspected DKA or HHS
- **Infuse isotonic saline (0.9% NaCl) at a rate of 1000 ml in the first 2 hours, continue with 1000ml every 4 hours until reaching hospital.**
- Hyperglycaemia slows gastric emptying and oral rehydration might not be effective, even in patients who are not vomiting

Correction of dehydration is the critical first step for transport.

Specific Long term Complications of Diabetes

- Diabetic retinopathy
- Diabetic nephropathy
- Diabetic neuropathy
- Diabetic foot

Diabetic retinopathy

Definition

Diabetic retinopathy is a highly specific vascular complication of diabetes and among the leading causes of blindness

Risk factors for diabetic eye changes

- duration of diabetes
- glycaemic control
- hypertension
- diabetic kidney disease
- dyslipidaemia

Signs and symptoms of diabetic eye changes

- Vision-threatening retinopathy and macular changes may be *asymptomatic*
- Vision loss occurs at advanced stages.

Diagnosis

- Presence of specific retinal lesions and macular edema on fundus examination after pupil dilation

Recommendations for early detection of diabetic retinopathy

- People with type 2 diabetes should be screened for retinopathy by a trained person ***upon diagnosis and every 2 years thereafter***
  - Visual acuity
  - Direct or indirect ophthalmoscopy or retinal fundus photography, after dilating the pupils
- Patients reporting vision loss at any visit and those who have not had a retinal exam in more than 2 years should be referred to an ophthalmologist.
- Referral to an ophthalmologist is recommended if screening by a trained person is not available in primary care.

Diabetic nephropathy

Definition

Diabetic nephropathy is a a clinical syndrome defined by persistent albuminuria* characterized by a relentless decline in glomerular filtration rate (GFR), raised arterial blood pressure and high risk of CVD & death

Risk factors for kidney changes

- genetic susceptibility
- poor glycaemic control
- elevated blood pressure

Signs and symptoms of diabetic nephropathy

- The first symptom of diabetic nephropathy is usually **peripheral edema,** but this occurs at a very late stage
- The first clinical sign is moderately increased **urine albumin** excretion (albuminuria: 30–300 mg/24 h, or an albumin/creatinine ratio 30–300 mg/g, or dipstick trace/1+).
- Severe albuminuria is albumin/creatinin ratio >300mg/g (dipstick 1+/2+)
- Glomerular filtration rate (GFR) <60ml/min/1.73m^2

**albuminuria in at least 2 of 3 consecutive samples >=3 months apart*

Recommendations for early detection of diabetic nephropathy

- ***Once a year monitor*** the albumin/creatinine ratio in a spot urine sample and serum creatinine for estimating glomerular filtration rate (eGFR)
- If measurement of urine albumin/creatinine ratio is not available, test for proteinuria (preferably with strips that specifically measure lower concentrations of albumin).
- Refer to higher level: patients with moderate or severe albuminuria, patients with GFR< 60ml/min/1.73m^2
- Maintain blood pressure levels at <130/80 mmHg with a thiazide diuretic and an ACE-inhibitor
- Modify other major CVD risk factors (dyslipidaemia, smoking)

Diabetic neuropathy

Definition

- Nerve damage or degeneration in diabetes is a group of disorders with diverse clinical manifestations like sensory and disorders of autonomic nervous system.

Risk factors

- Duration of diabetes, Poor glycaemic control
- Age, Hypertension , Obesity

Signs and symptoms of diabetic neuropathy

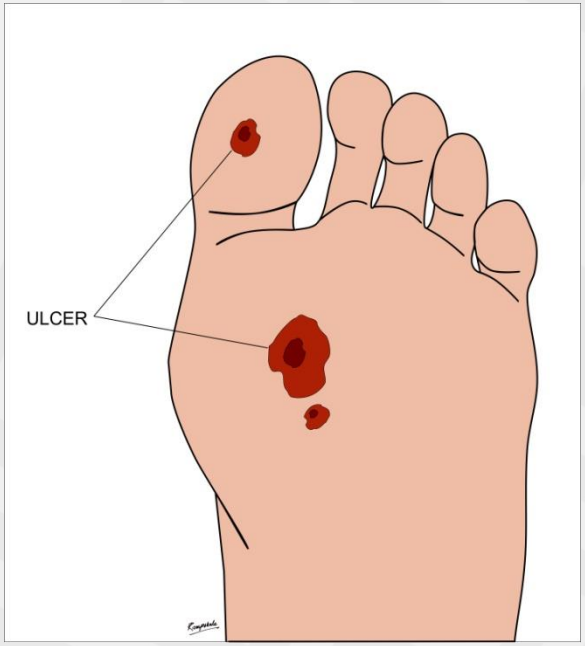
Peripheral neuropathy	Autonomic neuropathy
• Sensory loss • Unpleasant sensation of burning, pain • Tingling or numbness	• Hypoglycaemia • Orthostatic hypotension • Resting tachycardia • Diarrhoea, constipation and fecal incontinence • Erectile dysfunction • Urinary incontinence and bladder dysfunction

Recommendations for management of diabetic neuropathy

- Specific treatment for the underlying nerve damage is not available
- If possible, exclude causes of peripheral neuropathy other than diabetes (alcohol, chemotherapy, vitamin B12 deficiency, hypothyroidism, renal disease, malignancies, HIV infection)
- Refer patients with painful peripheral neuropathy to specialized care for pharmacological management of pain
- Refer patients with suspected autonomic neuropathy to specialized care
- **Improve glycaemic and blood pressure control**

Foot problems in diabetes

- **Diabetic foot** is one of the most common, costly and severe complications of diabetes
- A diabetic foot ulcer is a localised injury to the skin and/or underlying tissue below the ankle.
- Most diabetic foot ulcers are caused by *trauma* from inappropriate footwear and/or *walking barefoot with insensitive feet.*
- Combined with reduced blood flow, neuropathy in the feet increases the chance of foot ulcers, infection and eventual need for limb amputation.



Symptoms of diabetic foot

- Patients can present with symptoms and signs of peripheral neuropathy and/or peripheral artery occlusion and other risk factors for amputation
- Symptoms are :
  - Intermittent claudication - pain in calves when walking, usually disappears in rest (occlusion in peripheral arteries)
  - symptoms of neuropathy

The absence of symptoms does not exclude diabetic foot problems.

Assessment and management of risk of active foot problems

Examination of the feet

- Remove the patient's shoes, socks, dressings and bandages
- *Check for Peripheral neuropathy -*
  - ***Pressure perception*** *testing with 10g Semmes-Weinstein monofilament and*
  - *At least one other test of* ***sensation*** *(128Hz tuning fork vibration / cotton wisp /pin prick – see images) and*
  - *Achilles* ***tendon reflexes***

Monofilament test

Sensory examination should be carried out in a quiet and relaxed setting.

- First apply the monofilament on the patient's hands (or elbow or forehead) so that she or he knows what to expect.
- The patient must not be able to see whether or where the examiner applies the filament .
- The three sites to be tested on both feet are indicated in Figure
- The total duration– skin contact and removal of the filament should be approx. 2 secs.
- Apply the filament along the perimeter of, **not on an ulcer site callus or necrotic tissue.**
- Do not allow the filament to slide across the skin or make repetitive contact at the test site.

Figure a: Sites for monofilament test

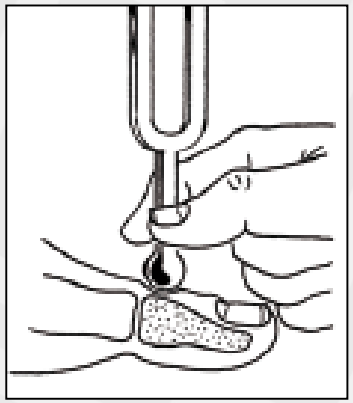
Monofilament test (contd)

- Apply the monofilament perpendicular to the skin surface. Apply sufficient force to cause the filament to bend or buckle.
- Press the filament to the skin and ask the patient whether they feel the pressure applied (Yes/No)
- Next, ask where they feel the pressure (right foot / left foot)
- Repeat this application twice at the same site but alternate this with one “mock” application in which no filament is applied
- So, in total **three questions per site** should be asked

Tuning fork test

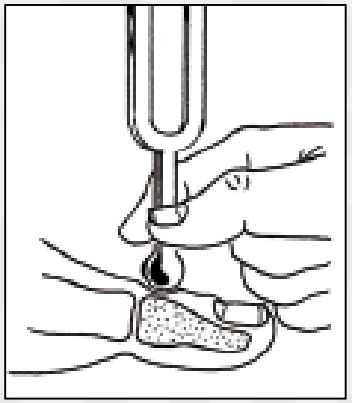
- Sensory examination should be carried out in a quiet and relaxed setting.
- First, apply the tuning fork on the patient's wrist (or elbow or clavicle) so that he or she knows what to expect
- The patient must not be able to see whether or where the examiner applies the tuning fork.
- The tuning fork is applied on a bony part on the dorsal side of the distal phalynx of the first toe
- The tuning fork should be applied perpendicularly with constant pressure (fig d)
- Repeat this application twice but alternate this with at least one "mock" application in which the tuning fork is not vibrating.

Figure d :
Site for tuning fork test



Interpretation of Tuning fork test

- The test is **positive** if the patient correctly answers at least two out of three applications
- The test is **negative** with two out of three incorrect answers, i.e patient is "**at risk for ulceration**"
- If the patient is unable to sense the vibrations on the big toe the test is repeated more proximally (malleolus)



Palpation of arteries

Palpation of dorsal pedis:

- Feel in the middle of the dorsum of the foot just lateral to the tendon of extensor halluces longus (extensor tendon of the great toe)

Posterior tibial artery:

•Midway between medial malleolus and calcaneal tendon

Signs for classifying a patient's risk for developing diabetic foot problems

- Palpation of tibial posterior and dorsal pedal artery pulse
- Presence of current or previous (healed) ulcer
- Previous amputation
- Presence of callus
- Presence of deformity: claw toes, hammer toes, bony prominences; limited joint mobility
- Presence of Charcot arthropathy : redness, warmth, swelling or deformity, particularly if skin is intact
- Signs of infection or inflammation: at least two of redness, warmth, induration, tenderness, purulent secretion
- Signs of gangrene

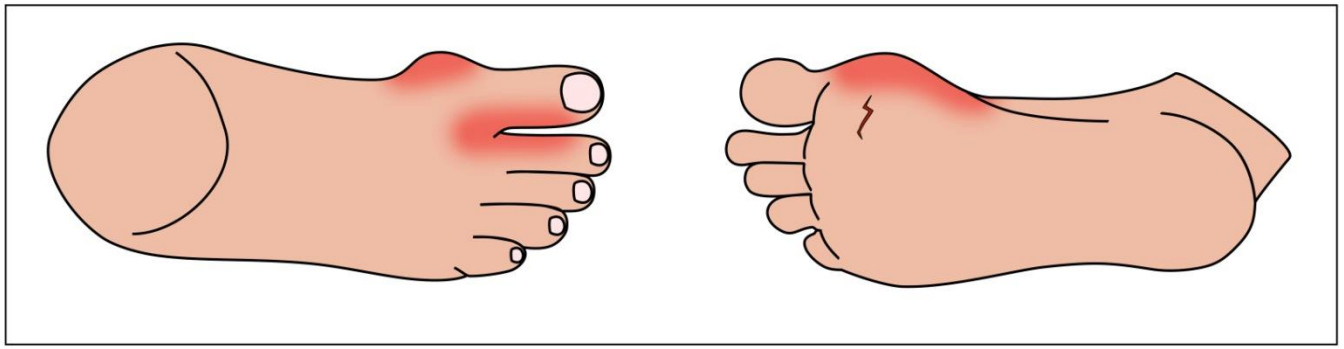
Stratification of risk for developing diabetic foot problems

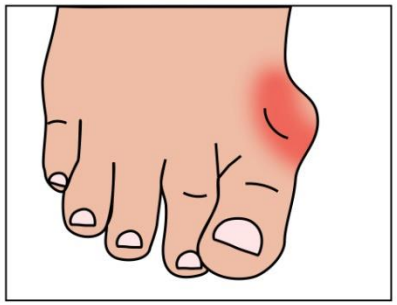
Risk level	Low risk	Moderate risk	High risk	Active foot problem
Features	No risk factor except *callus alone*	*Any of:* •deformity •neuropathy •non-critical limb ischaemia	*Any of:* •previous ulcer •previous amputation •neuropathy with non-critical limb ischaemia •neuropathy with callus and/or deformity •non-critical limb ischaemia with callus and/or deformity	*Any of:* •Ulcer •Spreading infection •Critical limb ischaemia •Gangrene •Suspicion of acute Charcot arthropathy •Unexplained red swollen foot
Action	Assess Annually	Assess every 3-6 months	Assess every 1-3 months	Urgent referral

Recommended actions for foot deformities

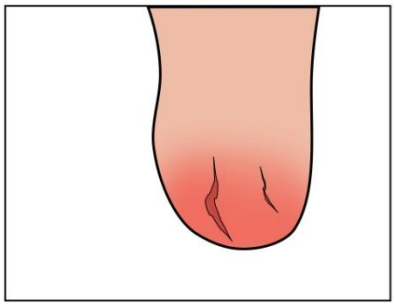
- Removal of callus (or refer if not feasible)
- Protecting or draining blisters
- Treatment of ingrown and thickened nails(or refer if not feasible)
- Antifungal treatment for fungal infections
- Patients with **gross foot deformities** and/or absent peripheral pulses should be referred for further evaluation.

COMMON DIABETIC FOOT PROBLEMS

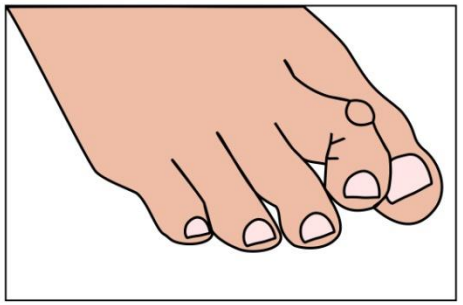




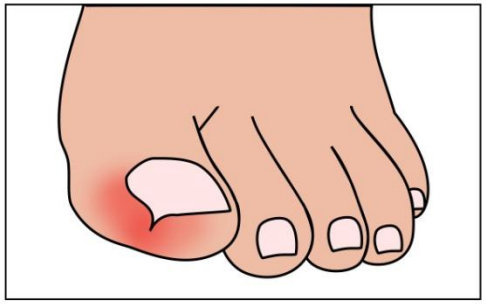
BUNION



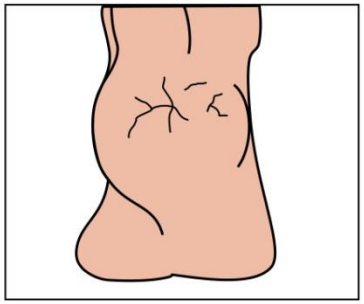
CALLUS



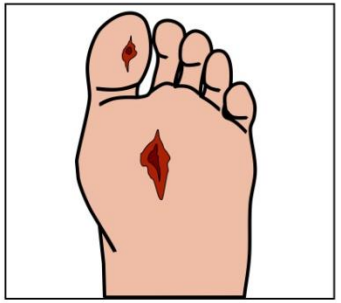
CORN (HAMMER TOE)



TOENAILS



DRY SKIN



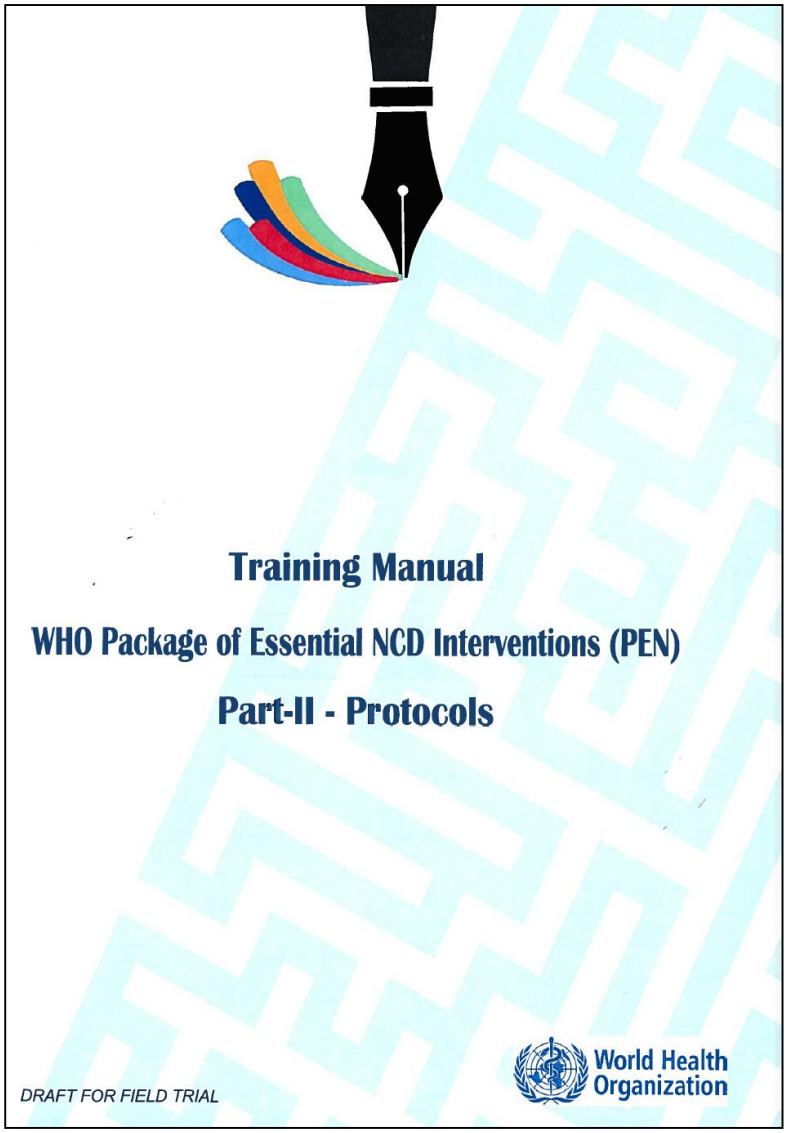
ULCER

Counselling on foot care

- ✓ Examine the feet daily, including between the toes
- ✓ Avoid walking barefoot, in thin-soled footwear or in socks only, both at home and outside
- ✓ Wash feet daily with water temperature below 37°C and dry them well, especially between the toes
- ✓ Lubricate skin with emollients, but not between the toes
- ✓ Cut toenails straight across.
- ✓ Wear socks without seams, not wear tight or knee-high sock and change socks daily
- ✓ Do not wear shoes that are too tight, have rough edges or uneven seams; the inside should be 1-2 cm longer than the foot
- ✓ Inspect shoes inside before putting them on
- ✓ Do not remove corns and calluses, including with chemical agents or plasters

https://www.who.int/diabetes/en/

- Includes Activities and Case studies



Thank you

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