RSSDI Clinical Practice Recommendations 2022

Summary Document For Training

PURPOSE

This slide deck contains content created, reviewed, and approved by the RSSDI. This document is intended to help members learn and train practitioners on the RSSDI guidelines for the treatment of Type 2 Diabetes. Intended to provide clinicians, patients, researchers, and other interested individuals with the components of diabetes care, general treatment goals, and tools to evaluate the quality of care.

DISCLAIMER

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CHAPTER 1 DIAGNOSIS AND CLASSIFICATION

KEY POINTERS

- Criteria for diagnosis of diabetes and prediabetes
- Accepted classifications
- Limited Care

DIAGNOSIS AND CLASSIFICATION

The decision to set diagnostic threshold values was based on the cost-effective strategies for diagnosing diabetes that was reviewed in the Indian context.

Criteria for diagnosis of Prediabetes/ intermediate hyperglycemia:

- Impaired fasting glucose (IFG): FPG 110 mg/dL to 125 mg/dL
- Impaired glucose tolerance (IGT): 2-h plasma glucose (2-h PG) during 75-g OGTT 140 mg/dL to 199 mg/dL
- HbA1c ⩾5.7%-6.4%

DIAGNOSIS AND CLASSIFICATION

Diabetes can be diagnosed with any of the following criteria:

- FPG ⩾126 mg/dL*
- FPG ⩾126 mg/dL and/or 2-h PG ⩾200 mg/dL using 75-g OGTT
- HbA1c⩾6.5% **

Asymptomatic individuals with a single abnormal test should have the test repeated to confirm the diagnosis unless the result is unequivocally abnormal.

DIAGNOSIS AND CLASSIFICATION

Limited Care

- Diabetes can be diagnosed with any of the following criteria:
- FPG ⩾126 mg/dL* or
- FPG ⩾126 mg/dL and/or 2-h plasma glucose ⩾200 mg/dL using 75-g OGTT or
- Random plasma glucose ⩾200 mg/dL in the presence of classic diabetes symptoms

Asymptomatic individuals with a single abnormal test should have the test repeated to confirm the diagnosis unless the result is unequivocally abnormal

DIAGNOSIS AND CLASSIFICATION

Individuals diagnosed with diabetes should be classified according to the World Health Organisation classification system.

S.No	Category
1	Type 1 diabetes (T1DM)
2	Type 2 diabetes (T2DM)
3	Hybrid forms of diabetes: - Slowly evolving immune-mediated diabetes in adults (previously termed LADA-latent autoimmune diabetes of adults) - Ketosis-prone T2DM (previously termed Flatbush diabetes)
4	Other specific types - Monogenic diabetes (defects of beta-cell function or insulin action) - Diseases of the exocrine pancreas - Endocrinopathies - Drug- or chemical-induced diabetes - Infection-related diabetes - Uncommon forms of immune-mediated diabetes - Other genetic syndromes sometimes associated with diabetes
5	Unclassified diabetes - A temporary category used when diabetes does not fit into any of the other categories
6	Hyperglycemia first detected during pregnancy - Diabetes mellitus in pregnancy - Gestational diabetes mellitus Hyperglycaemia first detected during pregnancy

CHAPTER 2 PREVENTION AND REMISSION

KEY POINTERS

- Primary & Secondary Prevention
- Screening & Early Detection
- Prediabetes
- Remission & Surgical Remission
- Limited Care

PREVENTION AND REMISSION

Screening and Early detection:

Opportunistic screening for undiagnosed diabetes and prediabetes is recommended as follows:

- Individuals presenting to healthcare settings for an unrelated illness
- Family members of patients with diabetes
- Antenatal care and Dental care
- Overweight children and adolescents at the onset of puberty

PREVENTION AND REMISSION

Detection programs are usually based on a two-step approach:

- Step 1: Identify high-risk individuals using a non-invasive risk assessment questionnaire
- Step 2: Glycemic measure in high-risk individuals here random capillary glucose between 140 mg/dL and <200 mg/dL is detected, and OGTT should be performed.

PREVENTION AND REMISSION

Prediabetes

- Intervention with appropriate lifestyle modification.
- Linking screening strategies to the healthcare system.
- People with prediabetes should modify their lifestyle, including:

- To lose 5%-10% of body weight if overweight or obese
  - Participate in physical activity for at least 1-h (for obese) or 30 min (for normal weight) daily
  - 6-8 hrs of sleep.

PREVENTION AND REMISSION

People with prediabetes failing to achieve any benefit on lifestyle modifications after six months may be initiated on oral antidiabetic agents (OADs):

- Metformin: In younger individuals with one or more additional risk factors for diabetes, if overweight/obese and having IFG + IGT or IFG + HbA1c >5.7%, the addition of metformin (500 mg, twice daily) is recommended.
- Alternatively, if metformin is not tolerated, alpha-glucosidase inhibitors (AGIs) such as acarbose or voglibose may be initiated.

PREVENTION AND REMISSION

People with prediabetes should be educated on:

- Weight management through optimal diet and physical activity
- Stress management
- Avoidance of alcohol and tobacco

PREVENTION AND REMISSION

Remission : Remission should be defined as

- A return of HbA1c to <6.5% that occurs spontaneously or
- Following an intervention and persists for at least three months without usual glucose-lowering pharmacotherapy.

PREVENTION AND REMISSION

- The patient's remission of diabetes can be documented if this is not due to complications, comorbid conditions, or concomitant therapy.
- Testing of HbA1c to document a remission should be performed just before intervention and at least three months after initiation of the intervention and withdrawal of any glucose-lowering pharmacotherapy.
- In the case of continued use of glucose-lowering drugs for other non-glycemic indications, diabetes remission cannot be defined.

PREVENTION AND REMISSION

- Testing to determine long-term remission maintenance should be done yearly or more frequently if indicated.
- Remission of diabetes should be defined in the context of type-2 diabetes only.

The surgical approach may be considered as a non-primary alternative to treat inadequately controlled T2DM.

PREVENTION AND REMISSION

Surgical Remission

- Bariatric surgery produces significantly more consistent long-term remission than lifestyle modifications and diet, therefore it is considered as the best option for remission of diabetes.
- Quantum weight loss correlates with long-term remission.
- RYG is the gold standard surgical procedure.

PREVENTION AND REMISSION

Limited care:

- The principles for screening are recommended care.
- Diagnosis should be based on FPG or capillary plasma glucose if only point-of-care testing is available.
- Using FPG alone for diagnosis has limitations as it is less sensitive than 2-h OGTT in Indians.

CHAPTER 3

MEDICAL NUTRITION THERAPY (MNT) AND LIFESTYLE MODIFICATION

KEY POINTERS

- Medical Nutritional Therapy & Recommendations
- Food groups & patterns
- Lifestyle Modifications
- Behavioural Counseling
- Limited Care

MEDICAL NUTRITION THERAPY (MNT) AND LIFESTYLE MODIFICATION

MNT

- The nutrition chart and support should be made by a trained nutritionist and a physician/diabetologist.
- It should be based on TAF- Type, Amount, and Frequency

MEDICAL NUTRITION THERAPY (MNT) AND LIFESTYLE MODIFICATION

Carbohydrates

- Carbohydrate content should be limited to 50%-60% of total calorie intake.
- Complex carbohydrates should be preferred over refined products.
- The low glycaemic index (GI) and low glycaemic load (GL) foods should be chosen.
- The quantity of rice (GI: 73) should be limited as it has high GI; Brown rice (GI: 68) should be preferred over white rice. (Millets are another alternative)
- Fiber intake: 25-40 gm per day.

MEDICAL NUTRITION THERAPY (MNT) AND LIFESTYLE MODIFICATION

Proteins

- Protein intake should be maintained at about 15% of the total calories. The quantities of protein intake depend on age, sarcopenia, and renal dysfunction.
- Non-vegetarian foods are sources of high-quality protein. However, intake of red meat should be avoided.

MEDICAL NUTRITION THERAPY (MNT) AND LIFESTYLE MODIFICATION

Fats

- Fat intake should be limited (<30% of total calorie intake), with most sources being from nuts and seeds.
- Oils with high monounsaturated fatty acid (MUFA) and polyunsaturated fatty acid (PUFA) should be used.
- Use of 2 or more vegetable oils is recommended in rotation.

MEDICAL NUTRITION THERAPY (MNT) AND LIFESTYLE MODIFICATION

- For non-vegetarians, 100-200 g of fish/week is advised as a good source of PUFA, and for vegetarians, vegetable oils (soybean/ safflower/sunflower), walnuts, and flaxseeds are recommended. (Peanut oil and mustard oils are suitable based on their fatty acid composition)
- Avoid consuming foods high in saturated fat (butter, coconut oil, margarine, and ghee).

MEDICAL NUTRITION THERAPY (MNT) AND LIFESTYLE MODIFICATION

- Saturated fatty acids (SFAs) intake should be less than 10% of total calories/day (<7% for individuals having high triglycerides).
- Use of partially hydrogenated vegetable oils (Vanaspati) as the cooking medium should be avoided.
- Reheating and refrying of cooking oils should be avoided.

MEDICAL NUTRITION THERAPY (MNT) AND LIFESTYLE MODIFICATION

Food groups and patterns

- A diet rich in fruits, leafy vegetables, nuts, fiber, whole grains, and unsaturated fat is preferred. The plate should include pulses, legumes, unprocessed vegetables, and low-fat dairy.
- Portion size
- Food plate should have vegetables and fruits as the main constituent (50%), both raw and cooked with a variety of vegetables over the week, adding diversity of vegetarian foods to increase intake of phytonutrients

MEDICAL NUTRITION THERAPY (MNT) AND LIFESTYLE MODIFICATION

Food groups and patterns

- Extreme diets, including low-carbohydrate ketogenic, must be planned and executed following consultation with a physician and nutritionist and for a short period.
- Overall salt consumption should be <5 g/day (with sodium consumption <2300 mg/day).
- Avoid or decrease alcohol intake.

MEDICAL NUTRITION THERAPY (MNT) AND LIFESTYLE MODIFICATION

- Smoking cessation should be advised to all. Smoking cessation therapies may be provided under observation for patients who wish to quit in a stepwise manner.
- Sugar-sweetened beverages are best avoided.
- Artificial sweeteners should be avoided as they alter the diversity of the gut microbiome and can increase insulin resistance.

MEDICAL NUTRITION THERAPY (MNT) AND LIFESTYLE MODIFICATION

- Meal plans with strategic meal replacements (partial or complete) may be an option under supervision when feasible.
- Indian fast foods-Street foods like kachori and samosa should be avoided.
- The advocation of fiber-rich fermented food.

MEDICAL NUTRITION THERAPY (MNT) AND LIFESTYLE MODIFICATION

Lifestyle modifications:

- Physicians and diabetes educators could impart recommended care.
- Careful instructions should be given for initiating the exercise program. Help from a trained exercise therapist can be taken.
- Lifestyle advice should be given to all people with T2DM at diagnosis. It should be an effective option for controlling diabetes and increasing CV fitness at all ages and stages of diabetes.

MEDICAL NUTRITION THERAPY (MNT) AND LIFESTYLE MODIFICATION

Lifestyle modifications:

- Lifestyle intervention is a cost-effective approach to the prevention of T2DM.
- Lifestyle interventions should be reviewed yearly or at the time of any treatment or every visit.
- Advise people with T2DM that lifestyle modification, by changing eating patterns like early dinners and physical activity patterns, can effectively manage several adverse risk factors related to T2DM.

MEDICAL NUTRITION THERAPY (MNT) AND LIFESTYLE MODIFICATION

- Physical activity should be introduced gradually, based on the patient's willingness and ability, and the intensity of the training should be individualized to the specific goals.
- The advocation of FITTE- Frequency, Intensity, time, training, Enjoyment
- A minimum of 150 min/week of physical activity is recommended for healthy Indians, given the high predisposition to develop T2DM and CAD, with the advocation of 60 mins of exercise would be beneficial. ⩾30 min of moderate-intensity aerobic activity each day, including swimming, cycling, walking, or rowing.

MEDICAL NUTRITION THERAPY (MNT) AND LIFESTYLE MODIFICATION

- 15-30 min of work-related activity 15 min of muscle-strengthening exercises (at least three times/week), which can include lifting weights, working with resistance bands, inclined walking, sitting ups, or squats.
- STEPS- At least 5000 steps per day. Use of apps or Talk tests for assessment of the intensity of exercise.

MEDICAL NUTRITION THERAPY (MNT) AND LIFESTYLE MODIFICATION

- While the effect of yogic practices is encouraging, it should not replace aerobic exercise.
- Exercise advice should be modified in case of complications like neuropathy, retinopathy, and peripheral vascular disease. However, some appropriate exercise should be encouraged in these patients.
- Use of monitoring tools like accelerometers, GPS units, pedometers, mobile-based apps, or devices to measure the intensity and duration of physical activity may be encouraged.

MEDICAL NUTRITION THERAPY (MNT) AND LIFESTYLE MODIFICATION

Behavioral lifestyle intervention (BLI) / Behavioral Counseling:

- BLI involves patient counseling for strategies such as tailoring goals, self-monitoring, and stimulus control. It's approach have been shown to improve adherence to lifestyle changes and achieve more sustained effects.
- Diabetes self-management support is essential and could be done with a physician or educator in small groups or face-to-face discussions in chat rooms.

MEDICAL NUTRITION THERAPY (MNT) AND LIFESTYLE MODIFICATION

Best Avoided

- Tobacco, Smoking, Alcohol
- Deep-fried, salted street foods
- Night munching and Late dinners
- Stress and unhealthy lifestyle

MEDICAL NUTRITION THERAPY (MNT) AND LIFESTYLE MODIFICATION

Limited Care:

- Nutritional counseling can also be done by health care providers (HCPs) trained in nutrition therapy.
- Reduced consumption of simple carbohydrates, sugar, and fried foods.
- Higher consumption of complex carbohydrates with high protein intake.
- Salt intake should be in moderation.
- Encourage increased duration and frequency of physical activity.
- Mass awareness campaigns for a healthy diet and lifestyle should be conducted.

CHAPTER 4
ORAL HYPOGLYCEMIC AGENTS

KEY POINTERS

- First line recommendations
- Dual therapy
- Quadruple therapy
- Limited Care

ORAL HYPOGLYCEMIC AGENTS

- Metformin can be initiated in combination with lifestyle interventions at the time of diagnosis.if it is contraindicated then sulfonylurea (or glinides), TZD, dipeptidyl peptidase-4 (DPP-4) inhibitors, SGLT2 inhibitors, AGIs or oral GLP 1-RA.

ORAL HYPOGLYCEMIC AGENTS

Dual therapy: Patient-centric approach.

- If glucose control targets are not achieved: Add (SGLT2) inhibitor, or DPP-4 inhibitor or sulfonylurea or thiazolidinediones (TZDs) or sodium-glucose cotransporter 2 inhibitors, AGI or oral GLP 1-RA.

Triple/Quadruple therapy: Patient-centric approach

- If glucose targets are not achieved with two agents: start third oral agent-AGI, DPP 4 inhibitor, SGLT2 inhibitor, or TZDs or oral GLP 1 RA (depending on the second line agent used).

ORAL HYPOGLYCEMIC AGENTS

- Individualized patient care based on comorbidities.
- For patients with established or having high risk for atherosclerotic cardiovascular disease (ASCVD), heart failure, diabetic kidney disease (DKD) or in need of weight reduction consider using SGLT2 inhibitors or oral GLP 1 Agonists.

ORAL HYPOGLYCEMIC AGENTS

- For postprandial hyperglycemia, AGI, glinides or SGLT2 inhibitors may be considered if not contraindicated.
- In elderly patients with increased risk of hypoglycemia, use a DPP-4 inhibitor as an alternative to sulfonylurea.

ORAL HYPOGLYCEMIC AGENTS

Limited care:

- The principles are same as for recommended care along with considerations for cost and availability of generic therapies. In resource constrained situations, sulfonylurea or metformin or TZDs may be used.
- Newer sulfonylureas have benefit of low cost and reduced hypoglycemia (than older OADs); comparable CV safety with DPP4i may be considered. TZDs have established CV safety and may be considered as add on to metformin.

ORAL HYPOGLYCEMIC AGENTS

	Biguanides	SGLT-2 Inhibitors	Oral GLP-1 Analogues (Semaglutide)	Sulphonylureas	Meglitinides	Thiazolidinediones (Pioglitazone)	DPP-4 Inhibitors	α-glucosidase inhibitors
Expected ↓HbA1c	1.0-2.0	0.8-1.2	1.0-1.5	1.0-2.5	0.5-1.0	0.5-1.0	0.5-0.8	0.5-0.8
Conserve β cell function	No	No	Yes	No	No	Yes	No	No
Hypoglycaemia risk	Very low	Very low	Low	High	Moderate	Very low	Low	Very low
Effects on body weight	Neutral	Weight loss	Weight loss	Weight gain	Weight gain	Weight gain	Neutral	Neutral
Other side effects	GI symptoms	UTI, Genital Fungal Infections	Nausea, Higher rates of retinopathy	HYPOGLYCEMIA	HYPOGLYCEMIA	Oedema	None	GI SYMPTOMS
Other safety issues	Lactic acidosis	Increased lower extremity amputation with canagliflozin; ketoacidosis	GI side effects	None	None	Heart failure, fractures	Skin, immune disorders? ARTHRITIS	None

ORAL HYPOGLYCEMIC AGENTS

	Biguanides	SGLT-2 Inhibitors	Oral GLP-1 Analogues (Semaglutide)	Sulphonylureas	Meglitinides	Thiazolidinediones (Pioglitazone)	DPP-4 Inhibitors	α-glucosidase inhibitors
Major cardiovascular event/death	↓CV events	↓CV events	↓CV events	Neutral	Neutral	Neutral CV events	No data (↑ed HF hospitalisation for saxagliptin)	↓CV events
Heart failure risk	↓ed	↓ed	Neutral	Neutral	Neutral	↑ed	↑ed for saxagliptin, alogliptin; neutral for others	Neutral
Renal benefits	None	+++	++	None	None	None	None	None
Benefit on NAFLD	None		Not enough data			+++	None	None
Cost	Low	Upper low	Very high	Low	Low	Low	Low/High	Medium
Overall	++++	+++	+++	++ (depends on salt)	++	++	++	++

CHAPTER 5
INJECTABLES

KEY POINTERS

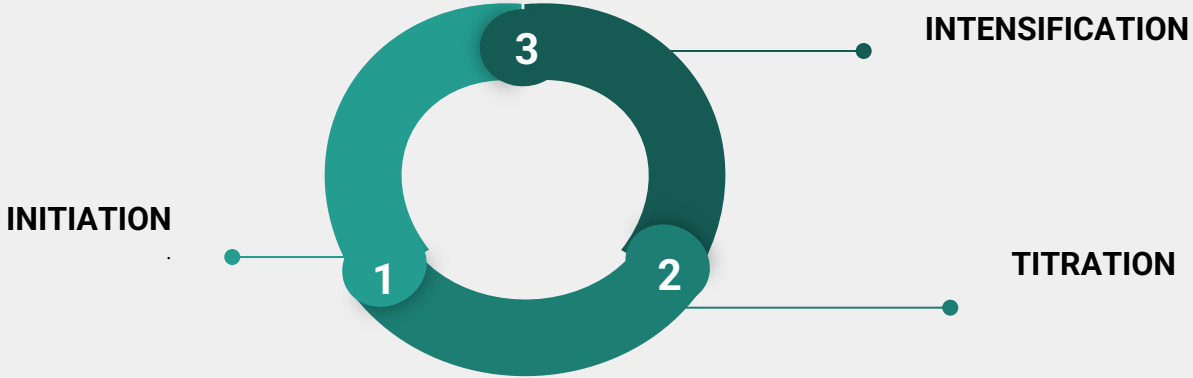
- Recommended care
- Three step protocol : Initiation, Titration, Intensification
- GLP-1 Analogs

INJECTABLES

- Insulin therapy should be considered in all patients failing to achieve glycemic targets on three oral agents.
- For HbA1c 1% to 1.5% & above, additional agents can be considered.
- Consider the limitations of individual oral agents or their combinations in terms of the quantum of HbA1c reduction.
- Consider initiating Insulin in type-2 diabetes patients with severe symptomatic hyperglycemia or unstable state.

INJECTABLES

A three-step protocol involving initiation, titration, and intensification is recommended for all patients requiring insulin.



INJECTABLES

I. **Initiation**:

- Therapeutic choice of regimen, preparation, and the delivery
- Initiating once-daily basal insulin, once-daily premixed/co-formulation insulin, or twice-daily premixed insulin, either alone or in combination .
- Meal timing should match with insulin dose.
- Counselling/education about SMBG, hypoglycemia prevention/recognition.
- Dose adjustments, administration, storage, and other practical aspects should be made available.

INJECTABLES

II. Titration :

- Self-titration regimen (dose increases of 2–4 Units (U) weekly or biweekly).
- Pre-meal glucose optimum levels of <115 mg/dL and PPG levels of <160 mg/dL.
- Subjects with an increased risk of hypoglycemia should be <130 mg/dl and <180 mg/dl.
- Titration should be done to control FBG first, followed by prandial control.

INJECTABLES

II. **Intensification :**

- Recommended when patients fail to achieve glycemic goals even after optimal dose titration.
- Several options can be considered during intensification.

- Switch to premix insulin twice-daily or premix analogs twice or thrice-daily.
- Switch to insulin co-formulation-based regimen.
- Add prandial insulin (basal plus or basal-bolus) with the largest meal of the day.
- Add GLP-1 analogs.

INJECTABLES

- Basal plus regimen can be used as a stepwise approach to insulin intensification, leading to basal-bolus prescription.
- Both premix insulin therapy and co-formulation insulins are acceptable methods of intensification.
- Co-formulation insulin offers the advantage of lower risk of hypoglycemia and nocturnal hypoglycemia.
- Follow insulin intensification as recommended in the algorithm.

INJECTABLES

GLP-1 analogs

- GLP-1 analogs with proven CV benefits should be considered to reduce the risk.
- Viable second-line or third-line options for managing patients with uncontrolled hyperglycemia.
- Can be considered in overweight/obese patients as second-line therapy in patients with metformin inadequacy and first-line therapy in patients with metformin intolerance.

CHAPTER 6 INDIVIDUALIZING THERAPIES AND PRECISION DIABETOLOGY

KEY POINTERS

- ABCD(EFGHI) Approach
- RSSDI Therapeutic Wheel

INDIVIDUALIZING THERAPIES AND PRECISION DIABETOLOGY

- ABCD (EFGH) approach for diabetes management

- Consider combinations of
- Metformin
- One of the treatment as per patient's demographics

INDIVIDUALIZING THERAPIES AND PRECISION DIABETOLOGY

- Drug choice should be based on
- Age
- Body Mass Index
- (CKD) In patients with diabetic kidney diseases
- Duration of Diabetes
- Established cardiovascular diseases
- Financial Concern
- Glycemic status
- Hypoglycemia concern
- Implementations

INDIVIDUALIZING THERAPIES AND PRECISION DIABETOLOGY

The RSSDI Therapeutic Wheel :

From innermost to outermost:

A - Age = Advancing age

B - BMI = Increasing BMI

C - CKD = Advancing CKD

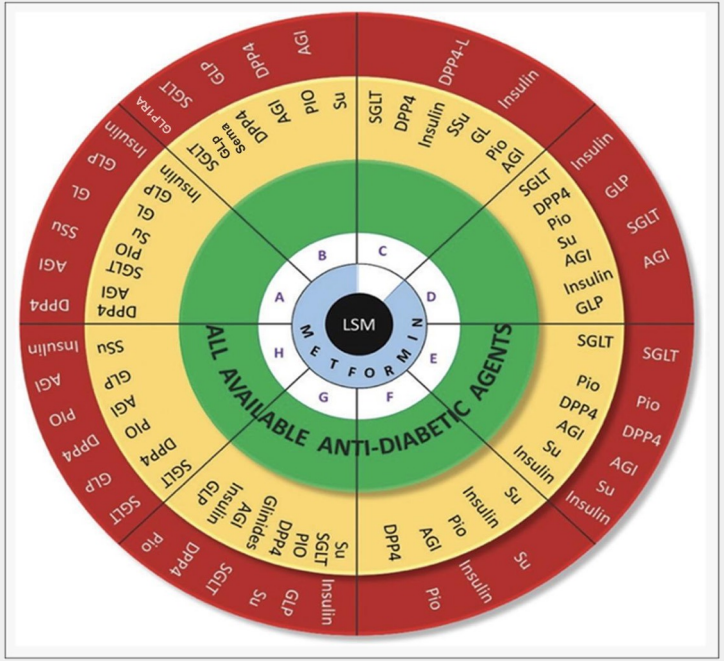
D - Duration of Diabetes = Increasing duration

E - Established CVD = Low CVD risk to Established CVD risk

F - Finance = Adequate to Limited

G - Glycaemic Status = Worsening glycemia control

H - Hypoglycemia = Hypoglycemia concern



Note: Hierarchy of therapy is depicted in clock-wise manner GLPs must be used based on costs. Any of the drugs can be used in the green. For other zones, drugs must be used in the given order.

AGI, Alpha-glucosidase inhibitor; DPP4, Dipeptidyl Peptidase-4 (DPP 4) Inhibitors; DPP4-L, Dipeptidyl Peptidase-4 Inhibitors-Linagliptin; GL, Glinides; GLP, Glucagon-like peptide-1 receptor agonist; PIO, Pioglitazone; SGLT, Sodium-glucose Cotransporter 2 Inhibitors; SSu, short acting sulphonylureas; Su, Sulphonylurea; LSM, lifestyle modification

CHAPTER 7
POSTPRANDIAL HYPERGLYCEMIA

KEY POINTERS

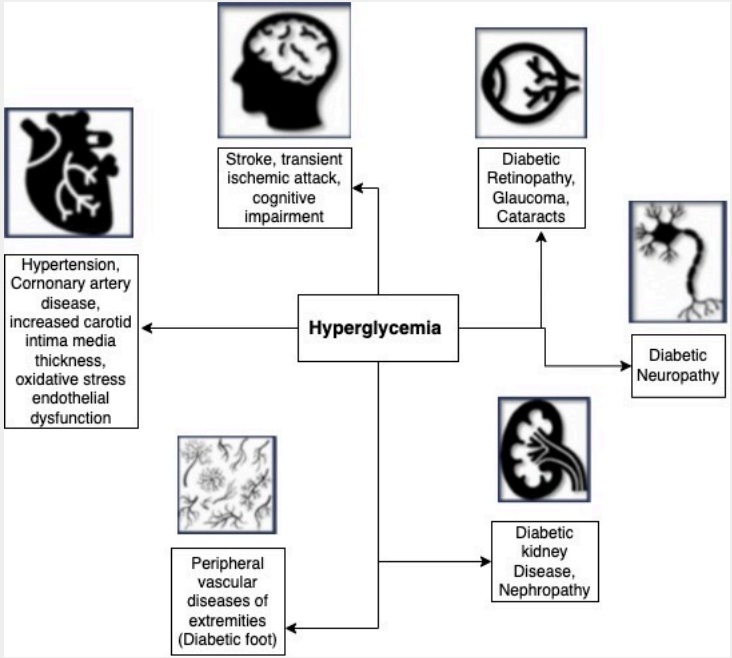
- Definition
- Target Value
- Risk Factors
- Management strategies

POSTPRANDIAL HYPERGLYCEMIA

- Defined as having postprandial glucose level higher than the target after a usual meal and on medications
- Measured 2-h after the start of a usual meal and medications
- Target PPG: 160 mg/dL as long as hypoglycemia is avoided.
- Both nonpharmacologic and pharmacologic therapies should be considered

POSTPRANDIAL HYPERGLYCEMIA

- More prominent in Indians due to traditional diets with the high glycemic index.
- Can lead to the following:



POSTPRANDIAL HYPERGLYCEMIA

MNT for postprandial hyperglycemia	Exercise for postprandial hyperglycemia
• Carbohydrates: 45-65% • Fats: <30% (Saturated fats <7%, Cholesterol <300mg/day) • Proteins: 10-15% • Low glycemic index foods • Increase soluble and insoluble fibers • Replace refined carbohydrates with fruits & vegetables.	• Moderate-intensity aerobic physical activity at least 150 minute per week • Resistance training three times per week

POSTPRANDIAL HYPERGLYCEMIA

Pharmacological Management

- GLP-1 analogues
- GLP-1 agonists (exenatide and lixisenatide) (in case of isolated Postprandial Hyperglycemia)
- insulin analogues
- DPP-4 inhibitors
- Glinides (only if sulfonylureas are contraindicated, or economic consideration pro-
- hibits the use of newer and expensive agents)
- AGIs (acarbose, miglitol, and voglibose)

CHAPTER 8
ACUTE METABOLIC COMPLICATIONS

KEY POINTERS

- Hyperglycemic Crisis
- Algorithm for management
- Fluid replacement therapy
- Insulin therapy
- Bicarbonate therapy
- Transition to subcutaneous insulin

ACUTE METABOLIC COMPLICATIONS

Hyperglycemic Crisis (Diabetic Ketoacidosis and Hyperosmolar Hyperglycemic State)

- Diabetic ketoacidosis and hyperosmolar hyperglycemic state represents the most common and severe acute Metabolic complications of diabetes.
- Treatment individualization is based on careful clinical and laboratory assessment.
- Monitoring the clinical and biochemical responses under hour-by-hour observation, medications and laboratory results.

ACUTE METABOLIC COMPLICATIONS

- In unconscious or severely obtunded patient; secure the airway and empty the stomach by continuous nasogastric suction
- In critically ill and mentally obtunded patients - continuous intravenous insulin is the standard of care.
- If neurologic status deteriorates acutely, hyperosmolar therapy should be given immediately.
- Antibiotics for febrile patients after obtaining blood fluid cultures.

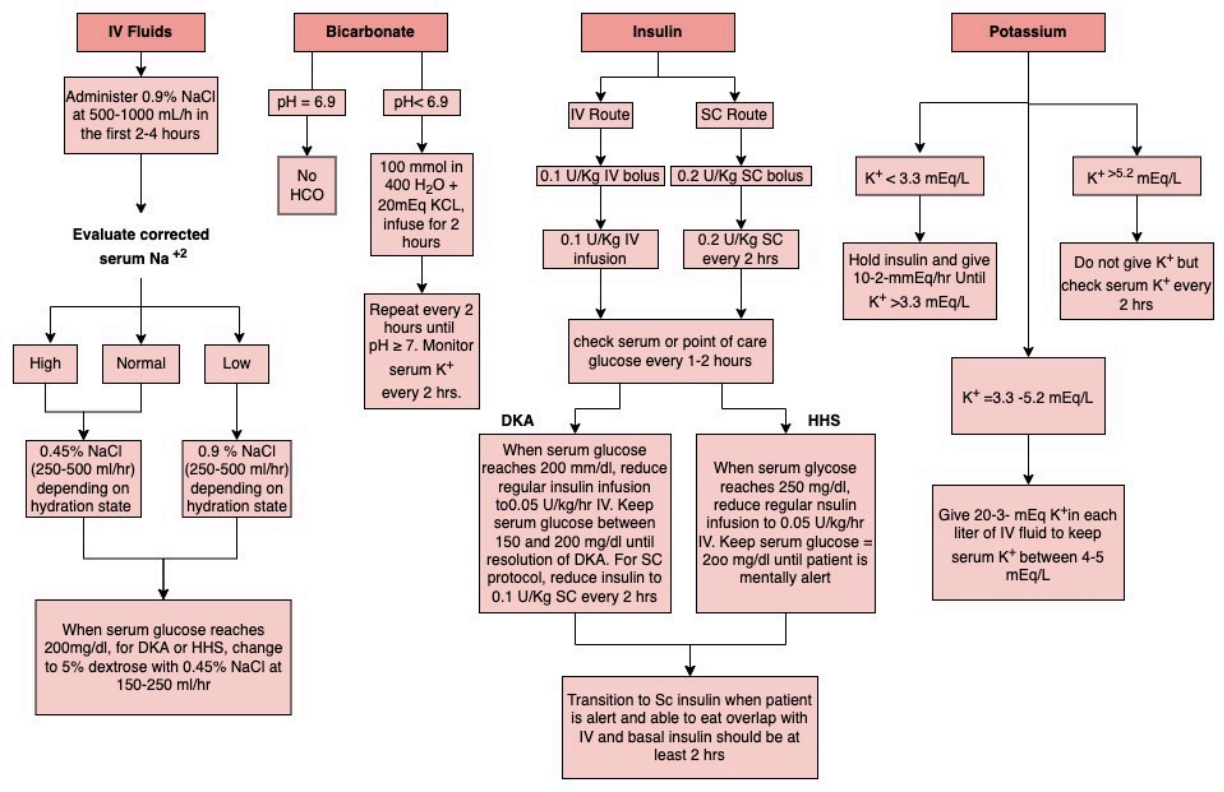
ACUTE METABOLIC COMPLICATIONS

- Diagnostic criteria for diabetic ketoacidosis and hyperglycemic hyperosmolar state

Measure	DKA	HHS
Plasma glucose level (mg/dL)	>250	>600
Arterial or venous pH	<7.30	>7.30
Serum bicarbonate level (mmol/L)	<15	>15
Urine or blood ketones	Positive	Negative or low
Urine or blood βhydroxybutyrate (mmol/L)	≥3	<3
Effective serum osmolality (mOsm/kg)	Variable	>320
Anion gap (mmol/L)	>12	<12
nitroprusside reaction method, defined as 2[measured Na+ (mEq/L)] + glucose (mg/dL)/18, Canion gap: (Na+) - [(Cl− + HCO - (mEq/L)].		

ACUTE METABOLIC COMPLICATIONS

Algorithm for the management of acute metabolic complications (DKA and HHS).



ACUTE METABOLIC COMPLICATIONS

Management of acute metabolic complications

- **Fluid replacement therapy:**

01	Absence of Cardiac Compromise	Isotonic saline (0.9% NaCl) is infused at a rate of 15-20 mL/kg/h or 1-2 l over 1-2 h for prompt recovery of hypotension and/or hypoperfusion.
02	Hyponatremic patients	Continue with 0.9% NaCl at a similar rate or switch to 0.45% NaCl infused at 250-500 mL/h if the corrected serum sodium is normal or elevated.
03	Plasma Glucose is <200 mg/dL	When plasma glucose level is <200 mg/dL, change to 5% dextrose in saline as long as the insulin infusion continues.

ACUTE METABOLIC COMPLICATIONS (Insulin Therapy)

Start insulin infusion 1-2 h after starting fluid replacement therapy, and serum potassium restored to>3.3 mEq/l

A regular human insulin IV bolus of 0.1-0.15 U/kg followed by continuous insulin infusion at 0.1 U/kg/h.

When glucose level reaches 200 mg/dL in DKA or 300 mg/dl in HHS, reduce insulin rate to 0.02-0.05 U/kg/h.

After that, adjust the rate to maintain a glucose level of 150-200 mg/dL in DKA and 250-300 mg/dL in HHS.

Continue insulin infusion until resolution of ketoacidosis

Subcutaneous rapid-acting insulin analogs every 1-2 h. might be an alternative to IV insulin in patients with mild to moderate DKA

Initial dose subcutaneous: 0.3 U/Kg, followed one h later at 0.1 U/Kg every one h, or 0.15-0.2 U/kg every two hour.

IV bolus is avoided in children as it may increase the risk of cerebral edema and can exacerbate hypokalemia.

Subcutaneous rapid-acting insulin analogs like lispro and aspart.

ACUTE METABOLIC COMPLICATIONS

- **Potassium Replacement**

If the patient is hypokalemic, start potassium replacement at the initial volume expansion and before starting insulin therapy. Otherwise, begin after initial volume expansion and concurrent with insulin therapy.

With initial rapid volume expansion, a concentration of 20 mmol/l should be used.

The maximum recommended rate is 0.5 mmol/kg/h.

The goal is to maintain serum potassium levels of 4-5 mEq/l.

ACUTE METABOLIC COMPLICATIONS

- **Bicarbonate therapy** (Not routinely recommended; only indicated in adults with severe acidosis with pH <6.9)

If pH <6.9, consider 100 mmol (2 ampules) in 400 ml sterile water with 20 mEq KCL administered at a rate of 200 ml/h for two h.until pH is ⩾7.0.

If the pH is still <7.0 after this is infused, we recommend repeating the infusion every two hours until pH reaches >7.0.

ACUTE METABOLIC COMPLICATIONS

- **Transition to subcutaneous insulin**

- To prevent recurrence of ketoacidosis or rebound hyperglycemia, consider the overlap of IV insulin for 15-30 min (with rapid-acting insulin) or 1-2 h (with regular insulin) or longer (with intermediate or long-acting insulin) after subcutaneous insulin is given.

ACUTE METABOLIC COMPLICATIONS

- **Transition to subcutaneous insulin**

The most convenient time to change to subcutaneous insulin is just before mealtime.	For patients treated with insulin before admission, restart previous insulin.	Regimen and adjust dosage as needed.	For patients with newly diagnosed DM, start the total daily insulin dose at 0.5-0.8 U/kg/day.	Consider multi-dose insulin given as a basal and prandial regimen.

CHAPTER 9
HYPOGLYCEMIA

KEY POINTERS

- Definition
- Risk factors
- Management & therapy
- Limited Factors

HYPOGLYCEMIA

Hypoglycemia: (glucose alert value of <70 mg/dL)

- Hypoglycemia is a significant cause of concern with some antidiabetic drugs during glycemic management in patients with T2DM.
- The risk of hypoglycemia should be assessed using questionnaires.
- The patient should be well educated regarding the causes, symptoms and risks related to hypoglycemic.

HYPOGLYCEMIA

- Strict monitoring of hypoglycemic episodes is recommended for patients taking insulin, sulfonylureas, or meglitinides alone or in combination.
- Oral glucose (15-20 g) is preferred in conscious hypoglycemic patients Repeat the treatment if SMBG shows persistent hypoglycemia after 15 min. The patient should consume a meal or snack once SMBG returns to normal to prevent the recurrence of hypoglycemia

HYPOGLYCEMIA

- Modern insulins or sulfonylureas should be used instead of traditional drugs in patients with a high risk of hypoglycemia.
- Intramuscular glucagon or intravenous glucose is preferred for unconscious patients or patients with clinically significant hypoglycemia (glucose alert value <54 mg/dL).
- Repeating the intramuscular or subcutaneous glucagon dose of 0.5 mg if there is no symptomatic improvement.

HYPOGLYCEMIA

- Treatment should be modified in the event of hypoglycemia repeatedly occurring at a particular time of the day or in the event of hypoglycemia unawareness.
- Hypoglycemia occurring in the setting of advanced kidney disease (CKD stage 4 or 5) requires relatively longer observation.
- Glucagon is to be avoided in patients with sulfonylurea-induced hypoglycemia.

HYPOGLYCEMIA

Limited Factors:

- All patients with risk of hypoglycemia should be enquired about symptomatic and asymptomatic hypoglycemia at each visit.
- Patients and their family members should be well educated about the identification and management of hypoglycemia, especially night-time hypoglycemia.
- Hypoglycemia should be strictly managed and monitored in special situations such as the elderly, pregnancy, fasting, and metabolic disorders.

CHAPTER 10 CHRONIC COMPLICATIONS 1: RETINOPATHY, NEUROPATHY, DIABETIC KIDNEY DISEASE

KEY POINTERS

- Retinopathy : Examination, Screening and Recommendations
- Neuropathy : Targets & management
- DKD : Management & Recommendations

CHRONIC COMPLICATIONS 1: RETINOPATHY

- Documentation of the formal history of vision and visual acuity
- Examination of the eyes of people with T2DM is performed around the time of diagnosis and then routinely every 1-2 years
- Counselling and follow-up should be routinely
- Stepped approach should be adapted to manage hyperglycemia.
- GLP-1 agonist should be used with caution.

CHRONIC COMPLICATIONS 1: RETINOPATHY

Recommendations for the examination of the eye:

- Classify the findings of eye examination as required: routine review, earlier review or referral to an ophthalmologist (if not making the examination).
- The following frequency of screening is suggested:
  - 1-2 years, if no retinopathy, depending on clinical situation
  - 12 months, if minimal unchanged retinopathy
  - 2-4 months, after any active ophthalmic intervention
  - 3-6 months, if worsening since last examination
  - More often during pregnancy

CHRONIC COMPLICATIONS 1: NEUROPATHY

- Assessment of all T2DM patients
- Diagnose sensorimotor nerve damage by history and examination
- Resources for diagnosis: Diabetic Neuropathy Symptom Score (NSS) and Neuropathy Disability Score (NDS)
- Resting heart rate and heart rate response can be used to diagnose CV autonomic neuropathy
- Discourage the use of alternative medicines as they can cause further complications.

CHRONIC COMPLICATIONS 1: NEUROPATHY

- Diagnose gastroparesis by history, trial of a prokinetic drug (metoclopramide, domperidone), and if troublesome, by gastric emptying studies.
- Diagnose CV autonomic neuropathy by resting heart rate and heart rate response to provocation tests (lying-standing, Valsalva, deep breathing), and by lying and standing BP. Inform anaesthetists, when relevant, where this is present.
- Every patient must undergo a simple assessment e. g. questionnaire-based assessment for depression.

CHRONIC COMPLICATIONS 1: NEUROPATHY

- Diagnose gastroparesis by history, trial of a prokinetic drug (metoclopramide, domperidone), and if troublesome, by gastric emptying studies.
- Diagnose CV autonomic neuropathy by resting heart rate and heart rate response to provocation tests (lying-standing, Valsalva, deep breathing), and by lying and standing BP. Inform anaesthetists, when relevant, where this is present.
- Every patient must undergo a simple assessment e. g. questionnaire-based assessment for depression.

CHRONIC COMPLICATIONS 1: DIABETIC KIDNEY DISEASE

- Kidney function should be assessed at diagnosis and annually by:
- Urine test for albuminuria
- Measurement of serum creatinine and calculation of eGFR

- Urinary albumin to creatinine ratio (ACR) measurement in an early morning first void (mid-stream) spot specimen is the preferred method for assessment of microalbuminuria/proteinuria. Where a first void specimen is not possible or practical, a random spot urine specimen is acceptable. ACR can be measured in the laboratory or at site-of-care.

CHRONIC COMPLICATIONS 1: DIABETIC KIDNEY DISEASE

- Control hyperglycemia, exclude urinary or systemic infections, or pyrexia and avoid strenuous exercise before testing for albuminuria.
- If ACR is raised (microalbuminuria) i.e. ACR >30 mg/g creatinine, repeat ACR twice over the following four months:

  » Microalbuminuria is confirmed if ACR is elevated in two out of three tests, in the absence of infection or overt proteinuria
  » If both repeat tests are not raised, check again annually
  » An ACR >300 mg/g indicates macroalbuminuria

CHRONIC COMPLICATIONS 1: DIABETIC KIDNEY DISEASE

- DKD is diagnosed on the basis of a raised urine albumin/protein or a reduced eGFR (<60 mL/min/1.73 m2) calculated from the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equation. CKD-EPI is the preferred formula.
- The Modification of Diet in Renal Disease (MDRD) formula for calculation of eGFR is not validated above 70 years of age and in Indian patients.
- For patients <18 years of age (including infants, toddlers, children, and teens), the Bedside Schwartz equation should be used.

CHRONIC COMPLICATIONS 1: DIABETIC KIDNEY DISEASE

Management:

- Identified high-risk individuals must get preference for SGLT2 inhibitors for glycemic management if feasible and accepted by patients
- Use angiotensin converting enzyme (ACE)-inhibitors or angiotensin receptor blockers (ARBs) in individuals with micro-or macro-albuminuria, titrated to the maximum tolerated dose
- Intensify management of BP using BP lowering medications and dietary modification
- Intensify management of blood glucose
- Monitor ACR, eGFR and serum potassium

CHRONIC COMPLICATIONS 1: DIABETIC KIDNEY DISEASE

Management:

- Advise daily limiting protein. In those with advancing CKD, restrict to 0.8 g/kg daily with advice for caution for a non-vegetarian diet
- Intensify other renal and CV protection measures
- Assessment and management of anemia and bone disease and appropriate vaccination
- Patients must be counselled to quit smoking
- Consider referral to nephrologists in case of uncertainty about the etiology of kidney disease and complex management issues

CHRONIC COMPLICATIONS 1: DIABETIC KIDNEY DISEASE

Management:

- Agree to a referral criterion for specialist renal care between local diabetes specialists and nephrologists.
- Referral criteria might include
  - eGFR<30 mL/min/1.73 m2, progressive deterioration of kidney function, persistent proteinuria, biochemical or fluid retention problems or difficult diagnosis.
- Rule out non-diabetic kidney disease in patients with early onset of nephropathy (<5 years), absence of retinopathy, heavy proteinuria, presence of active urinary sediments or unexplained rapid decline in eGFR.

CHAPTER 11 CHRONIC COMPLICATIONS 2: DIABETIC FOOT & PERIPHERAL ARTERY DISEASE

KEY POINTERS

- History and assessment
- Risk classification
- Management
- Amputation & recommendations
- COVID-19 & its impact

CHRONIC COMPLICATIONS 2: DIABETIC FOOT & PERIPHERAL ARTERY DISEASE

Assess feet of patients with diabetes at every visit for lesions requiring active treatment and for risk factors for ulcer and amputation:

History of previous foot ulceration or amputation, symptoms of peripheral arterial disease (PAD), physical or visual difficulty in self-foot-care	Foot deformity (hammer or clawed toes, bone prominences), visual evidence of neuropathy (dry skin, dilated veins) or incipient ischemia, callus, nail deformity, or damage. Patient footwear should also be assessed	Detection of neuropathy by 10 g Semmes Weinstein monofilament (or 128 Hztuning fork); a biothesiometer (to assess vibration perception threshold) is anoption for quantitative assessment (cut-off point for ulcer risk >25 volts) andnon-traumatic pin-prick.	Michigan Neuropathy screening instrument is a useful, easy-to-use epidemiological tool to assess neuropathy in a patient with diabetes.	Palpation of foot pulses (dorsalis pedis and posterior tibial). Doppler ultrasound examination or ankle: brachial pressure (ABI) ratio (<0.9 for occlusive vascular disease) may be used where pulses are diminished to quantify the abnormality.

CHRONIC COMPLICATIONS 2: DIABETIC FOOT & PERIPHERAL ARTERY DISEASE

- Discuss the reasons for foot review with each patient with diabetes, as part of the foot-care educational process.
- Must completely refrain from walking barefoot.
- Timely screening and early detection is helpful.
- Agree upon a foot-care plan based on the findings of an annual foot review for patients.
- Assess and provide necessary foot-care education
- F18 PET/CT (labeled WBC) may be considered (if available) to confirm osteomyelitis in the complicated diabetic foot; if MRI is contraindicated because of CKD.

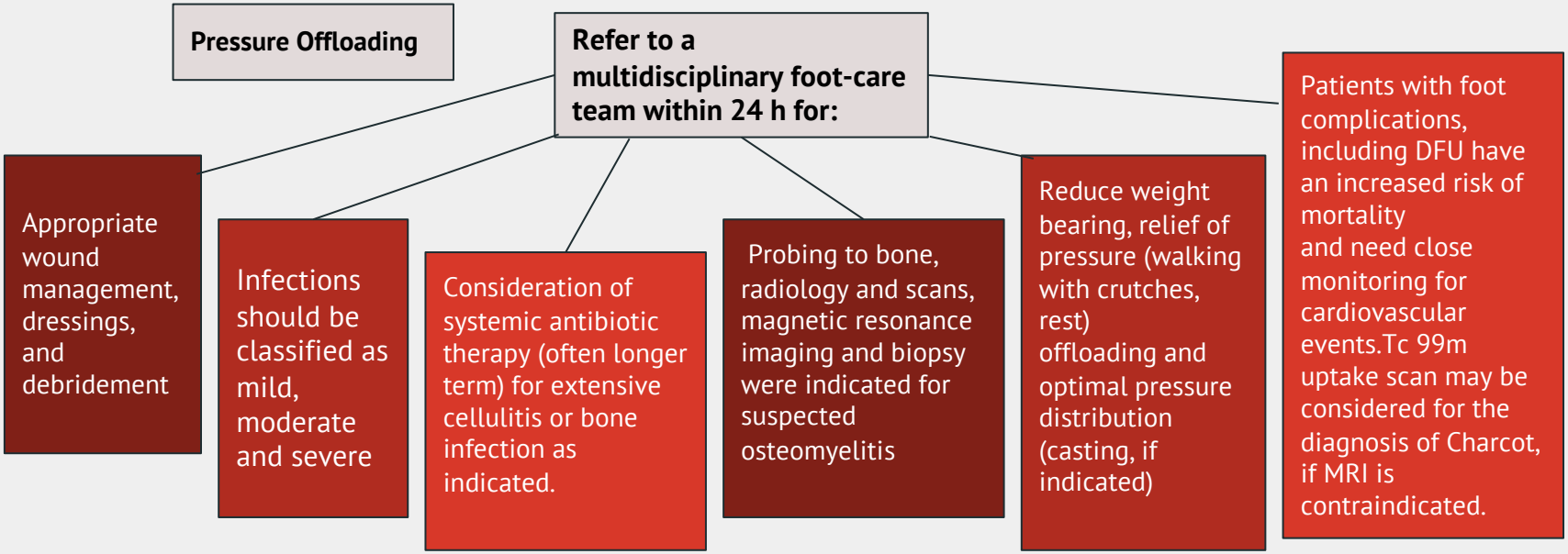
CHRONIC COMPLICATIONS 2: DIABETIC FOOT & PERIPHERAL ARTERY DISEASE

- Classify and manage according to risk classification level based on findings of foot Assessment.

Risk classification level	Management
No added risk: No risk factors; no previous history of foot ulcer or amputation	Provide structured foot-care education and annual review.
At risk: One risk factor; no previous history of foot ulcer or amputation	• Foot-care team to regularly review every 6 months. • At each review: - Inspect both feet - ensure provision of local management as indicated - Educate patient to wash feet daily (with careful drying, particularly between the toes), use emollients to lubricate dry skin, cut toe nails straight across, and avoid using chemical agents or plasters or any other technique to remove callus or corns - Evaluate footwear - provide appropriate advice - Enhance foot-care education
High risk: ≥2 risk factors; previous ulcer or amputation (very high risk)	• Foot-care team to frequently review every 3-6 months. • Educate patient to self-monitor foot skin temperatures once per day to identify any early signs of foot inflammation to prevent a first or recurrent plantar foot ulcer. • At each review: - Inspect both feet - ensure the provision of local management as indicated - Evaluate footwear - provide advice and specialist insoles and shoes if indicated - Consider the need for vascular assessment or referral, if indicated - Evaluate and ensure appropriate provision of intensified foot-care education

CHRONIC COMPLICATIONS 2: DIABETIC FOOT & PERIPHERAL ARTERY DISEASE

People with foot ulceration or infection require the following management:



CHRONIC COMPLICATIONS 2: DIABETIC FOOT & PERIPHERAL ARTERY DISEASE

- Amputation should not be considered unless:

  - A detailed vascular evaluation has been performed by the vascular team
  - Ischemic rest pain cannot be managed by analgesia or revascularization
  - A life-threatening foot infection cannot be treated by other measures
  - A non-healing ulcer is accompanied by a higher burden of disease that would result in amputation.

CHRONIC COMPLICATIONS 2: DIABETIC FOOT & PERIPHERAL ARTERY DISEASE

Management of Charcot's foot will include

- Non-surgical treatment: offloading (casting), walking in a walking boot, use of Charcot Restraint Orthotic Walker (CROW)
- Surgical treatment: Surgery is recommended for those patients who have severe ankle and foot deformities that are unstable and at high risk of developing a foot ulcer. In addition, if the deformity makes braces and orthotics challenging to use, surgery may be indicated. After surgery, the patient will have to avoid putting full weight on the Charcot's foot for an extended period.
- Danosumab may be considered along with TCC to reduce the risk of fractures in acute Charcot Foot. However, Teriparatide has not been shown to reduce time to remission or fracture risk.

CHRONIC COMPLICATIONS 2: DIABETIC FOOT & PERIPHERAL ARTERY DISEASE

COVID-19 and its impact

- COVID-19 is associated with an increased risk of thrombotic complications including the peripheral ischemic foot. It needs heightened screening with ABI in patients with a history of COVID-19.
- Diabetic patients with the risk or history of stroke:
- Pioglitazone may be effective for secondary prevention in patients with stroke/transient ischemic attack.

CHAPTER 12
DIABETES AND HEART

KEY POINTERS

- Cardiovascular risk factors
- Risk Assessment
- Management
- Pharmacological recommendations

DIABETES AND HEART

Cardiovascular risk factors that should be assessed in all patients at diagnosis and annually including

- Hypertension
- Dyslipidemia
- Screening for heart failure on the basis of 2022 AHA/ACC/HFSA Guideline for the Management of Heart Failure.
- Body mass index (BMI) ⩾25
- Family history of premature coronary disease
- Sleep duration has also been added as a new parameter for CVD risk
- Presence of retinopathy as it doubles the risk of CVD
- Presence of hyperuricemia
- Duration of diabetes
- Smoking Status
- Presence of albuminuria including micro-albuminuria >30 mg.

DIABETES AND HEART

- Current or previous CVD events, age, body weight, BP and pulse, of patients should be recorded during their first and subsequent visits.
- UKPDS risk engine and QRISK3 are simple and effective tools for identifying and predicting CVD risks in patients with T2DM and should be recommended for identifying high risk individuals

DIABETES AND HEART

- Current or previous CVD events, age, body weight, BP and pulse, of patients should be recorded during their first and subsequent visits.

- UKPDS risk engine and QRISK3 are simple and effective tools for identifying and predicting CVD risks in patients with T2DM and should be recommended for identifying high risk individuals

- Patients with diabetes and CVD risk should follow the ABC treatment goals**
  - A (HbA1c): <7%
  - B (BP): <130/80 mmHg
  - C (Cholesterol -LDL): <100 mg/dL

DIABETES AND HEART

- Primary prevention is important for those at risk of Heart failure (stage A) or pre HF(stage B)
- All patients should be managed with lifestyle intervention including physical exercise and medical nutrition therapy
- In high-risk patients, low dose aspirin therapy should be administered along with lifestyle intervention
- Statins should be added to lifestyle intervention in all patients with CVD risk, if not contraindicated. The intensity can be modified or titrated according to patient's CVD risk, age, side-effects, tolerability, LDL-C levels etc.

DIABETES AND HEART

- Glycemic control with glucose lowering drugs that are proven to be CV safe and beneficial should be recommended to reduce CVD risk and complications in patients with T2DM. SGLT2 inhibitors and GLP-1 receptor agonists are approved by various regulatory authorities for CV risk reductions, apart from their glucose lowering ability.
- Weight control should be an important consideration, while choosing glucose lowering therapy in overweight/obese persons
- Pharmacological antihypertensive therapy with subsequent titration in addition to lifestyle therapy should be initiated in patients with confirmed office-based BP of >140/90 mmHg

DIABETES AND HEART

- Pharmacological therapy for patients with diabetes and hypertension should comprise a regimen that includes ACE inhibitor/ARB, thiazide diuretics, calcium channel blockers, and selective β blockers. If one class is not tolerated, it should be substituted with molecules from other classes; however, FDCs of different drug classes may be preferred in patients with diabetes to reduce CVD risks and complications and increase compliance.

CHAPTER 13 OTHER COMPLICATIONS- BONE, SKIN AND HEPATOMEGALY

KEY POINTERS

- Diabetes & Osteoporosis (Therapy recommendations under special conditions)
- ADA guidelines for Skin Care
- Recommendations for NAFLD

OTHER COMPLICATIONS- BONE, SKIN AND HEPATOMEGALY

Type 2 Diabetes Mellitus And Osteoporosis

- Screening for osteoporosis by ordering a DXA test should perhaps be more liberal in patient with diabetes (PWD). All over 60 should be screened, and those between 50 and 60 with at least 10 years diabetes duration should be screened.
- Treatment for osteoporosis in people with type 2 should be considered at a T score of -2 rather than -2.5

OTHER COMPLICATIONS- BONE, SKIN AND HEPATOMEGALY

Initial first-line therapy for individuals with prevalent vertebral fractures	• Teriparatide • Intravenous zoledronic acid • Denosumab • Oral bisphosphonates
Initial first line therapy for individuals with prevalent hip fracture	• Intravenous zoledronic acid • Denosumab (only after denosumab) • Teriparatide (not enough literature to confirm)
Initial first-line therapy for high-risk individuals without prevalent fractures	• Bisphosphonates • Zoledronic acid • Denosumab (chances of fracture can increase if not administered on time • Teriparatide (under special conditions)
Recommendations for initial first-line therapies for low and moderate- risk cases for vertebral, non-vertebral, and hip fractures	• Alendronate • Risedronate • zoledronic acid • Denosumab, • Bisphosphonates
Recommendations for the management of osteoporosis in chronic kidney disease (CKD) patients and those on dialysis	• Denosumab (but with Ca & vit-D intake) • Undecalcified iliac biopsy is recommended to make good prognosis • Bisphosphonates & HRT are contraindicated • Testosterone therapy (as applicable)

OTHER COMPLICATIONS- BONE, SKIN AND HEPATOMEGALY

Recommendations for intranasal calcitonin in the management of osteoporosis	• Bisphosphonates • Denosumab • Teriparatide • raloxifene • Intranasal calcitonin(for temporary relief in women, who cannot tolerate above therapies)
Recommendations for combination therapies	• With very high or imminent fracture risk • Teriparatide and Denosumab
Recommendations for sequential therapies	• Teriparatide with antiresorptive agents • Teriparatide and antiresorptives (if unresponsive to anti-resorptive therapy alone) • Denosumab (if discontinued), followed by bisphosphonate, either zoledronate or alendronate in patients with adequate renal function

OTHER COMPLICATIONS- BONE, SKIN AND HEPATOMEGALY

ADA Recommendation for Skin Care

- Keep good glycemic control.
- Keep skin clean and dry.
- Avoid very hot baths and showers. Prevent dry skin.
- Treat cuts right away.
- During cold, dry months, keep your home more humid.
- Use mild shampoos.
- Do not use feminine hygiene sprays.
- See a dermatologist (skin doctor) about skin problems if you are not able
- to solve them yourself.
- Take good care of your feet.

OTHER COMPLICATIONS- BONE, SKIN AND HEPATOMEGALY

Non-Alcoholic Fatty Liver Disease

- Recommend evaluation for NAFLD by measuring baseline and yearly liver enzymes
- Use of noninvasive measures of fibrosis, such as the NAFLD fibrosis score, fibrosis-4 index (FIB-4), or vibration-controlled transient elastography (VCTE) to identify those at low or high risk for advanced fibrosis.
- Patients with a FIB-4 score ⩾1.3 should undergo further evaluation by a liver specialist.

CHAPTER 14
OBESITY AND TYPE 2 DIABETES MELLITUS

KEY POINTERS

- Diagnosis criteria
- Risk Factors
- Management
- Physical therapy recommendations
- Summary of prognosis

OBESITY AND TYPE 2 DIABETES MELLITUS

The cut-off points for overweight and obesity in Indian patients with T2DM patients are as follows:

BMI 18-22.9 kg/m^2	**Normal**
BMI 23-24.9 kg/m^2:	**Overweight**
BMI ⩾25kg/m^2:	**Generalized obesity**
Waist circumference (WC) ⩾90 cm for men and ⩾80 cm for women	**Abdominal obesity**

OBESITY AND TYPE 2 DIABETES MELLITUS

Criteria for metabolic syndrome are as follows:

- Abdominal or central obesity (WC ⩾90 cm for men and ⩾80 cm for women) plus
- Any 2 of the following four factors:

Increased triglycerides (⩾150 mg/dL or specific treatment)

Reduced HDL cholesterol (men: <40 mg/dL; Women: <50 mg/dL or specific treatment)

Increased blood pressure (systolic BP ⩾130 or diastolic BP ⩾85 mm Hg or treatment of previously diagnosed hypertension)

Increased fasting plasma glucose (FPG ⩾100 mg/dL or previously diagnosed T2DM)

OBESITY AND TYPE 2 DIABETES MELLITUS

Management strategies :

- Healthy lifestyle
- Moderate calorie restriction
- At least 150 mins/week of physical activity
- Low-calorie diet
- Change in behavioral pattern
- Pharmacotherapy for those with BMI $\geq$25 kg/m^2
- GLP-1 analogs and SGLT2 inhibitors should be preferred as add-ons to metformin in obese patients with T2DM

OBESITY AND TYPE 2 DIABETES MELLITUS

Management strategies :

- Lipase inhibitors (orlistat) may be used for inducing weight loss with OADs.
- Surgical treatment (bariatric surgery)
  - Restrictive procedures
  - Malabsorptive procedures
  - Combined procedures
  - Experimental procedures

OBESITY AND TYPE 2 DIABETES MELLITUS

Physical therapy recommendation for aerobic and muscle strengthening exercise.

Type of physical activity	Moderate intensity modality	Duration	Frequency/ days per week	Vigorous intensity modality repetitions	Duration	Frequency/ days per week
Aerobic physical acitivity	Brisk walking, stair	30 min	7	Football, badminton,	20 min	3
	climbing, jogging (4-7			basketball, running, rope		
	m/s), cycling, treadmill and swimming			jumping, dancing		
Muscle strengthening activity	Resistance weight training,	1-3 sets of 8-12	2-3	Resistance weight training,	>3 groups of >12	2-3
	curls, presses, anti-gravity exercise, isometric	repetitions targeting major		curls, presses, anti-gravity exercise, isometric	repetitions targeting major	
	exercise, children-body	muscle groups		exercise, children-body	muscle groups	
	weight activity (pull-ups)			weight activity (pull-ups)		

OBESITY AND TYPE 2 DIABETES MELLITUS

Treatment for Overweight and Obesity in Patients with Type 2 DM:

Treatment Options	BMI≥23-24.9 kg/m^2	BMI ≥ 25-32.5 kg/m^2	BMI ≥32.5-37.4 kg/m^2	BMI≥37.5 kg/m^2
Diet and Lifestyle	*	*	*	*
Medications	*	*	*	*
Surgery			††	€€

CHAPTER 15
VACCINATIONS IN PEOPLE WITH DIABETES

KEY POINTERS

- Recommendation of vaccines
- Contraindications
- Miscellaneous vaccines

VACCINATIONS IN PEOPLE WITH DIABETES

- Education about administering at least pneumococcal and influenza vaccines.
- Vaccination against pneumococcal disease, including pneumococcal pneumonia, with the 13-valent pneumococcal conjugate vaccine (PCV13) for children before the age of 2 years.
- People with diabetes aged 2 through 64 should receive a 23-valent pneumococcal
- polysaccharide vaccine (PPSV23). At age ⩾65 years, regardless of vaccination history, additional PPSV23 vaccination is necessary.

VACCINATIONS IN PEOPLE WITH DIABETES

- Annual vaccination against influenza is recommended for all people ⩾6 months of age, especially those with diabetes. Quadrivalent influenza vaccine should be preferred to bivalent.

- Vaccination is contraindicated/postponed in patients with:

- Hypersensitivity to the active substances or any of the excipients of the vaccine
- History of chicken egg allergy, particularly when considering a flu shot
- Recent history of Guillain-Barre syndrome within six weeks of previous influenza vaccination in the case of a flu shot
- Postponed in patients with febrile illness or any acute infection.

VACCINATIONS IN PEOPLE WITH DIABETES

- Depending on the risk and need, other available vaccinations can be considered for diabetes.
- Hepatitis
- Herpes
- HPV
- COVID-19

CHAPTER 16
SEXUAL DYSFUNCTIONS

KEY POINTERS

- Introduction
- Specific to Men
- Specific to Women

SEXUAL DYSFUNCTIONS

- A detailed history and examination should be conducted in an unintimidating private setting with structured interviews by encouraging discussion regarding sexual concerns in both men and women with diabetes.
- Consider appropriate language for patient's age and culture
- Psychological and social disturbances, if any, should be discussed in an empathetic manner.
- Promotion of lifestyle changes to reduce the associated risk factors should be encouraged in patients with diabetes of both sexes.

SEXUAL DYSFUNCTIONS (For Men)

- Prolactin and TFT levels should be considered before measuring testosterone.
- Testosterone levels should ideally be recorded in a good NABL lab, and should be done before 11 am, repeated if it is low. CBC PSA should be monitored thoroughly.
- Patients should be made to understand the difference between erectile dysfunction and premature ejaculation.
- Adult men with diabetes should be screened with a detailed sexual function history for ED as early as they are diagnosed with diabetes. Sexual history has to be taken during the first visit, along with the study of the frequency of sexual dynamics.

SEXUAL DYSFUNCTIONS

- Detection of ED and evaluation of the response to treatment should be performed by validated questionnaires such as IIEF or Sexual Health Inventory for men.
- PDE-5 inhibitors should be given based on the sexual frequency of the patient and may be offered as first-line therapy for the treatment of ED in men with diabetes.
- Symptoms of hypogonadism, including lack of interest in sex and ED should be investigated further with screening for serum testosterone concentration in the morning.
- Since psychogenic and organic components are also broadly responsible for ED, counselling should be recommended.

SEXUAL DYSFUNCTIONS (For Women)

- To identify whether a woman with diabetes has sexual dysfunction, eliciting a detailed history in a compassionate manner and examination is the first step.
- Several self-reported validated questionnaires such as Female Sexual Function Index, the Female Sexual Distress (FSD) Scale, the Brief Index of Sexual Functioning for Women, and the Derogates Interview for Sexual Function have been developed to assess FSD.
- Post-menopausal women with diabetes are prone to have a low desire or depression and, mental health check-ups are recommended to rule out or manage the symptoms.

SEXUAL DYSFUNCTIONS (For Women)

- Postmenopausal women, particularly those in the middle-age range, should be assessed for CV risk factors and FSD, so that both CVDs and sexual problems do not persist unnoticed.
- Currently, the therapeutic recommendations for FSD include maintaining a healthy lifestyle, achieving an optimal glycemic control, genitourinary infection control, and resolving psychosocial issues., And of course, Genitourinary hygiene.
- Treatment with water-based vaginal lubricants, hormone replacement therapy, clitoral therapy device, and genital infection control therapy is recommended.

SEXUAL DYSFUNCTIONS (For Women)

- Treatment strategies with dehydroepiandrosterone supplementation, estrogen or androgen replacement, flibanserin (serotonin 1A receptor agonist and a serotonin 2A receptor antagonist), and PDE-5 inhibitors are investigated; however, currently there is limited evidence for their use.

CHAPTER 17
CLINICAL MONITORING

KEY POINTERS

- SMBG
- Cut- off values
- Special cases management

CLINICAL MONITORING

- Monitor blood glucose control by measuring HbA1c using high-precision methods standardized and aligned to the international reference values.
- Self- Monitoring Blood Glucose (SMBG) enables patients to confirm symptomatic hypoglycemia and detect asymptomatic hypoglycemia and glucose variability. It facilitates making appropriate adjustments in treatment medications and nutrition therapy to achieve HbA1c targets and prevent hypoglycemia.
- In patients on insulin, a combination of HbA1c and SMBG helps achieve glycemic control.

CLINICAL MONITORING

- Measure HbA1c every three to six months depending on level, stability of blood glucose control, and changes in therapy and report HbA1c results in percentages.
- Advise individuals with diabetes that maintaining an HbA1c <7.0% minimizes the risk of developing complications.
- A lower value of the HbA1c target may be considered if it is quickly and safely achieved without hypoglycemia.

CLINICAL MONITORING

- A higher value of the HbA1c target may be considered for individuals where previous attempts to optimize control were associated with unacceptable hypoglycemia or in those individuals who are at a higher risk for hypoglycemia.
- Treatment should be reviewed and modified if the HbA1c level exceeds the agreed target on two consecutive occasions.
- Advise those who target HbA1c levels cannot be reached that any improvement is beneficial.
- Anemia must be excluded before a proper diagnosis based on HbA1c values is made.

CLINICAL MONITORING

In individuals with hemoglobinopathies, fructosamine may be used as a surrogate.

- Point-of-care capillary blood glucose meters should be used to measure blood glucose when patients are hospitalized. Blood glucose meters conforming to the latest ISO standards should be used.
- When prescribing continuous glucose monitoring or ambulatory glucose profile (CGM/AGP), robust diabetes education, training, and support are required for optimal continuous glucose monitor implementation and ongoing use.

CHAPTER 18
TECHNOLOGIES

KEY POINTERS

- CGM
- CSII
- Clinical decision support tools

TECHNOLOGIES

Continuous glucose monitoring (CGM)

- CGM should be considered in conjunction with SMBG and HbA1C for glycemic status assessment in those T2DM individuals treated with intensive insulin therapy and who are not achieving glucose targets.

- Two types of CGMs are available.
  - The professional or retrospective (blinded) CGM which records the data that can be downloaded later in a physician's office
  - The personal or prospective (Real-time) CGM which displays the interstitial glucose values with continuous basis.

TECHNOLOGIES

Continuous glucose monitoring (CGM)

- CGMs can be a helpful tool in diabetes education by facilitating effective communication between clinicians and patients. All users should get trained on how to interpret and respond to their glucose data.
- In well-controlled T2DM, professional CGM once in 6 months could be sufficient irrespective of the treatment regimen.
- CGM may be considered in women with GDM or pregnant women with T2DM and as a supplemental tool to SMBG in individuals with hypoglycemia unawareness and/or frequent hypoglycemic episodes.

TECHNOLOGIES

Continuous subcutaneous insulin infusion (CSII) or insulin pump therapy

CSII or insulin pump therapy may be considered in pediatric patients or in adults on ⩾4 insulin injections per day (intensively managed insulin-dependent T2DM).

TECHNOLOGIES

Common indications for CSII are:

- High HbA1C levels despite MDI
- Recurrent episodes of hypoglycemia or hypoglycemia unawareness
- High doses of insulin or poor glycemic control despite intensive therapy
- Dawn phenomenon
- Unpredictable food or meal intake patterns
- Presence of or future risk of diabetes-related complications, or recurrent DKA/recurrent hospitalizations
- Body mass index (BMI) ⩾25
- Patient can manage the use of the device himself or has trained assistance for the same.
- Glycemic variability causing challenges in diabetes management
- Only compliant patients
- Insulin pump therapy seems to be safe and effective for maintaining glycemic control and for better outcomes in pregnancies complicated by GDM/ T2DM and requiring large insulin doses.
- Sleep duration has also been added as a new parameter for CVD risk
- Patient seeking improvement in quality of life
- During hospital admissions, CSII is not recommended in critically ill patients if the hospital/ICU staff is not familiar with the device
- CSII should only be initiated at a well-equipped center

TECHNOLOGIES

Clinical decision support tools and diabetes management platforms

- Technologies that aid patients and/or healthcare providers in the diagnosis and management of diabetes can improve both the short-term and long-term disease outcomes.
- Adequate training needs to be provided to the healthcare professionals in using the clinical decision support tools and diabetes management platforms.

TECHNOLOGIES

- From among the various diabetes self-management tools and platforms available, patients must be encouraged to adopt the most appropriate tool that would best suit their disease needs and lifestyle.
- Patients must be encouraged to seek timely guidance and frequent reassessment from a trained healthcare team and must be made aware that the adoption of various diabetes self-management tools does not diminish the importance of the former.

CHAPTER 19
SPECIAL SITUATIONS

KEY POINTERS

- **Post-Transplant Diabetes**
- Diabetes and COVID-19
- Travel & Diabetes
- Steroid & Hyperglycemia
- COVID-19, Steroid & Hyperglycemia
- Diabetes & Surgery

Post-Transplant Diabetes (PTDM)

Detection of PTDM:

- Pretransplant

History of diabetes, family history of diabetes, symptoms of microvascular and macrovascular complications, physical assessment including BMI, HBA1c, blood glucose monitoring as a part of pre-operative evaluation

- After Transplant

Patients with early post-transplant hyperglycemia should not be diagnosed as PTDM

Post-Transplant Diabetes (PTDM)

Strategies For Prevention And Treatment Beyond Modification Of Immunosuppressive Regimens:

Pharmacotherapy:

- Insulin is the only safe and effective agent in the context of high glucocorticoid doses and acute illness early post-transplant.

Modification Of Immunosuppression:

- Modification of immunosuppression to alleviate the incidence of PTDM

Deterrence And Patient Education:

- Pre-transplant patients should receive counseling regarding the risk factors of developing PTDM and how to prevent it.

Post-Transplant Diabetes (PTDM)

Recommended care:

- For patients with hyperglycemia in the immediate post-operative period, regular monitoring of blood glucose on follow-up.
- Individuals with pre-operative IGT or hyperglycemia in the perioperative period are at greater risk of PTDM and need close follow up.
- Screening of modifiable and non-modifiable risk factors of PTDM.
- Assessment for PTDM to be done not earlier than six weeks after transplantation.
- For patients diagnosed to have PTDM, dietary advice and individualization of therapy (OADs or insulin).

Assessment for PTDM As per ADA criteria for DM (FBS, OGTT, HBA1c)

Post-Transplant Diabetes (PTDM)

Limited care:

- Preoperative screening for diabetes/ IGT
- Perioperative blood glucose monitoring
- Reassessment at six weeks for PTDM
- Individualized treatment

CHAPTER 19

SPECIAL SITUATIONS

KEY POINTERS

- Post-Transplant Diabetes
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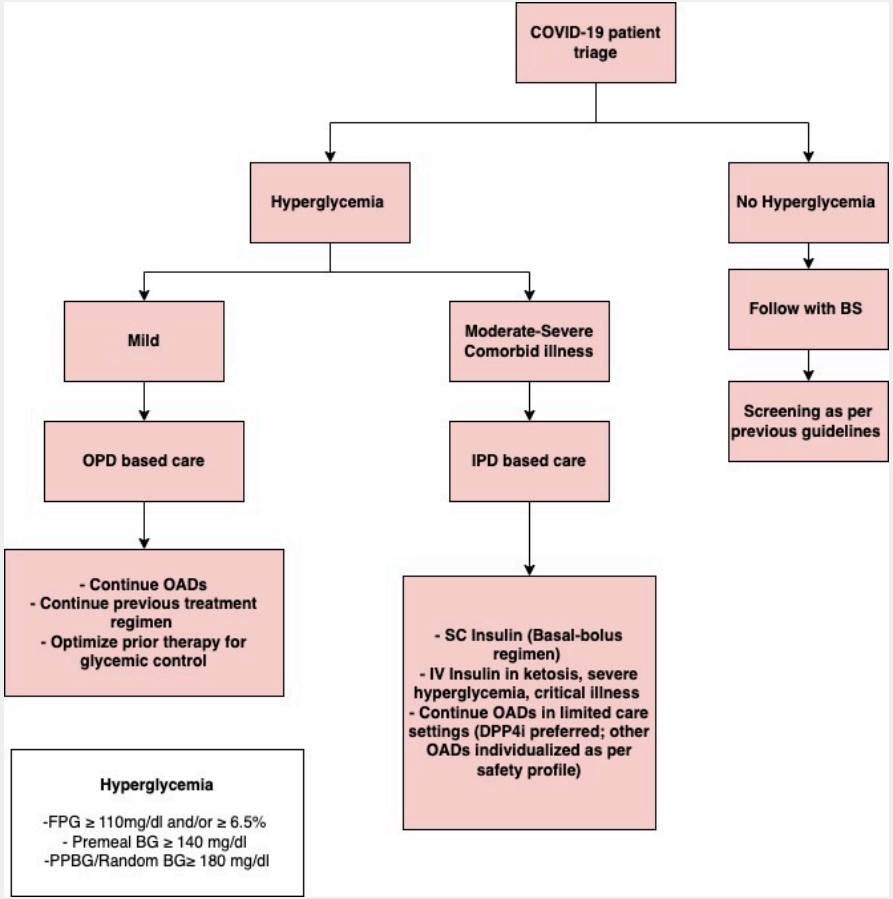
DIABETES AND COVID-19

Approach to management of hyperglycemia in patient with Covid19



DIABETES AND COVID-19

Considerations:

Timely diagnosis of hyperglycemia in Covid19 patients with or without diabetes and appropriate monitoring and management during hospital stay has important implications for morbidity and mortality.

DIABETES AND COVID-19

Monitoring For Dysglycemia After The Acute Illness Rationale and evidence:

Primary prevention of infection in diabetic individuals:

- Remote consultations, and all attempts should be made to adopt telemedicine practices in outpatient care
- Outpatient visits and consultations must be used to emphasize updated vaccination status, including booster/precaution doses as per the national guideline

DIABETES AND COVID-19

Screening for hyperglycemia at presentation:

- Venous samples for HbA1c should be sent on admission to laboratory.

Patients can be categorized as-

- Pre existing DM-if known as diabetic or on anti-diabetic agents.
- Undiagnosed DM-if HbA1c ⩾6.5%
- Stress induced hyperglycemia- if HbA1c <6.5%

DIABETES AND COVID-19

<u>Continued monitoring for hyperglycemia during the hospital stay (Daily):</u>

This would include patients with-

- Fasting plasma glucose ⩾110 mg/dl and/or HbA1c ⩾6.5%
- Pre-meal capillary BG ⩾140 mg/dl
- Post-meal/ Random capillary BG ⩾180 mg/dl

DIABETES AND COVID-19

Recommended care:

- All patients admitted with COVID-19 should be screened for hyperglycemia at admission
- Screening for hyperglycemia at admission can be done with random capillary glucose obtained with a “reliable” glucometer, with values > 180 mg/dl inviting suspicion of hyperglycemia.

*Suggestive of hyperglycemia for pre and post: >140 mg/dl and >180, mg/dl.
#severe hyperglycemia: pre-meal glucose values of >300 mg/dl and/or post-meal values of >400 mg/dl

DIABETES AND COVID-19

Recommended care:

- Documentation of glucometer-derived pre-meal and post-meal glucose values after the first significant meal during a hospital stay, with values suggestive of hyperglycemia.
- Glucose monitoring should not be done once but continued during the course of the Covid19 illness.

*Suggestive of hyperglycemia for pre and post: >140 mg/dl and >180, mg/dl.
#severe hyperglycemia: pre-meal glucose values of >300 mg/dl and/or post-meal values of >400 mg/dl

DIABETES AND COVID-19

- Outpatient contact should emphasize the importance of COVID-19 vaccination, including boosters, as per the national guidelines.
- Post-covid reassessment of glycaemic status mandatory
- Stress hyperglycemia subjects to be educated regarding diabetes prevention strategies and re-evaluated on a regular basis to detect new-onset diabetes
- Initiating continuous intravenous insulin infusion in individuals with severe hyperglycemia with simultaneous evaluation for ketosis.

DIABETES AND COVID-19

Limited care:

- Cost and availability of generic therapies are same as recommended care.
- Venous samples for fasting plasma glucose and HbA1c should be sent after admission if laboratory facilities are available.

***Contraindications: Renal/liver dysfunction, severe Covid19, ketoacidosis, severe hyperglycemia.**

DIABETES AND COVID-19

Limited care:

- In the absence of compelling indications for the use of insulin, oral glucose-lowering agents can be continued in patients without any contraindications for oral antidiabetic drugs (OADs).
- Sulfonylurea, metformin, or TZDs can be used if there are no contraindications.
- Considering their relative safety, dipeptidyl peptidase- 4 (DPP-4) inhibitors can be continued.

***Contraindications: Renal/liver dysfunction, severe Covid19, ketoacidosis, severe hyperglycemia.**

CHAPTER 19: SPECIAL SITUATIONS

KEY POINTERS

- Post-Transplant Diabetes
- Diabetes and COVID-19
- **Travel & Diabetes**
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- COVID-19, Steroid & Hyperglycemia
- Diabetes & Surgery

TRAVEL AND DIABETES

People with chronic illnesses, like diabetes, may be vulnerable to the emotional and physical stresses associated with traveling. However, when unfamiliar foods, unaccustomed climate, different time zones, and social conditions are considered during times of travel, patients may face challenges in managing their diabetes.

TRAVEL AND DIABETES

Recommended care:

- Preparation of pre-travel arrangements and specialized guidance for the vacation under the treating physician is appropriate to start at least a month prior to the date of journey.
- Individuals must carry a physician's advice along with a list of all medications with a generic name and their dosages in a separate, easily accessible container.
- Travel Health insurance is a must, and patients should be immunized with vaccine-preventable diseases concerning the destination.

TRAVEL AND DIABETES

- Airport security requiring patients going through body scanners should be careful as pumps and CGM may undergo radiation-induced malfunction.
- In air travel, patients should carry medicines and carbohydrate-rich snacks.
- In air travel, patients should not inject insulin or use a pump at take-off or landing due to pressure differences which may lead to irregular in insulin administration.

TRAVEL AND DIABETES

- Traveling across more than five time zones requires insulin dose and frequency adjustment.

- In air travel, there is an increased risk of developing deep venous thrombosis (DVT), which can be easily prevented by simple recommended maneuvers and hydration.

TRAVEL AND DIABETES

Limited care:

- It is essential to procure a prescription/ recommendation letter from the physician describing the patient's medical condition, and their current diabetes medication regimen.
- It is prudent to advise the patients to plan for travel delays and lost luggage, so taking twice as many diabetes supplies and medications is recommended, preferably distributed in different luggage bags.

TRAVEL AND DIABETES

Limited care:

- Food options for diabetics may be limited during travel and travel planning should offer greater flexibility in dietary choices.
- Use of the correct syringes with specific insulin concentrations is essential as insulin formulation varies in different countries.

CHAPTER 19:

SPECIAL SITUATIONS

KEY POINTERS

- Post-Transplant Diabetes
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- **Steroid & Hyperglycemia**
- COVID-19, Steroid & Hyperglycemia
- Diabetes & Surgery

STEROID AND HYPERGLYCEMIA

Recommended care

- Consider screening for glucocorticoid-induced diabetes should be in all those treated with medium to high doses of glucocorticoids

If there is no previous diagnosis of diabetes:

- Once steroid initiated, recommend capillary blood glucose (CBG) once daily. It should be done pre or post-lunch or evening meal, in those at high risk or with symptoms suggestive of “hyperglycemia”.

STEROID AND HYPERGLYCEMIA

- If CBG is below 216 mg/dl, we consider it at low risk and then record the capillary blood glucose daily post breakfast or post-lunch
- Increase the testing frequency to four times a day if the value of capillary blood is found more than 216 mg/dl.
- There is no need for capillary blood testing if the value is consistently less than 180 mg/dl.

STEROID AND HYPERGLYCEMIA

If the patient is a known diagnosis of diabetes:

- Review glucose control and current therapy.
- We must set a target of blood glucose in the range of 106-180 mg/dl.
- Start checking capillary blood glucose four times a day and accordingly adjust diabetes medications

***Acceptable range-106-216 mg/dl)**

STEROID AND HYPERGLYCEMIA

Limited Care:

- If blood glucose remains stable for over 24 hours, monitoring can be reduced to 3-4 hourly intervals in appropriate cases.
- If the patient is on parenteral feed, glucose monitoring every 4 to 6 hours is recommended.
- If the patient is receiving intravenous insulin, blood glucose monitoring should be from 30 minutes to every 2 hours.

CHAPTER 19:

SPECIAL SITUATIONS

KEY POINTERS

- Post-Transplant Diabetes
- Diabetes and COVID-19
- Travel & Diabetes
- Steroid & Hyperglycemia
- **COVID-19, Steroid & Hyperglycemia**
- Diabetes & Surgery

Covid-19, STEROID AND HYPERGLYCEMIA

In insulin-native patients:

- Start insulin when glucose exceeds a threshold of 216 mg/dl in a dose of 0.3 IU/KG/day while ⅔ should be administered in the morning and the remaining third in the evening.
- A dose reduction to 0.15 IU/kg in case of age >70 years or eGFR below 30 mL/min has been proposed

Covid-19, STEROID AND HYPERGLYCEMIA

In insulin-native patients:

- Titrate according to morning or evening glucose values in a manner of a reduction of 20% if the glucose falls below 70 mg/dl or decreased by 10% in case of glucose between 70-110 mg/dL
- Insulin dose should be up-titrated by 20% if glucose values exceed 320 mg/dL and by 10% if glucose values are between 220-320 mg/dL

Covid-19, STEROID AND HYPERGLYCEMIA

After charge:

- Tapering is not required if steroids have been used for short duration
- After steroid therapy, monitoring of blood sugar is continuously warranted as we anticipate pre-steroid blood glucose level after stopping antihyperglycemic medications.
- Test Hb1Ac after 3 months post steroid therapy

CHAPTER 19:

SPECIAL SITUATIONS

KEY POINTERS

- Post-Transplant Diabetes
- Diabetes and COVID-19
- Travel & Diabetes
- Steroid & Hyperglycemia
- COVID-19, Steroid & Hyperglycemia
- **Diabetes & Surgery**

Diabetes and Surgery

Different corticosteroids and their equivalent doses,
Steroidal kinetics and potential to trigger hyperglycemia

Glucocorticoids	Peak concentration (minutes)	Equivalent dose (Approx.)	Half-Life (Hrs.)	Duration of action (Hrs.)	Hyperglycemic Effects (Hours)		
					Onset	Peak	Resolution
Hydrocortisone (Short Acting)	20	10	2	8-12	1	3	6
Prednisolone Methylprednisolone (Intermediate acting)	5 4	60-180 60	2.5 2.5	12-36 12-36	4 4	8 8	12-16 12-36
Dexamethasone (Long Acting)	0.75	60-120	4	36-72	8	Variable	24-36

Diabetes and Surgery

Steroid administration in pregnancy may cause transient hyperglycemia or result in increased levels of hyperglycemia in those with gestational diabetes mellitus or pre-extents diabetes.

POA: Baseline history of diabetes, assessment of microvascular and macrovascular complications, HbA1c, serum electrolytes and creatinine level, and current treatment regimen.

Diabetes and Surgery

Recommended care:

- Conduct preoperative assessments
- Maintain serum glucose of 140-180 mg/dL for all in-hospital patients.
- Sulfonylureas, meglitinides, TZDs, GLP-1 agonists must be discontinued on the day of surgery and metformin should be discontinued a night before surgery.
- In patients undergoing surgery, insulin basal-bolus regimen should be preferred.

POA: Baseline history of diabetes, assessment of microvascular and macrovascular complications, HbA1c, serum electrolytes and creatinine level, and current treatment regimen.

Diabetes and Surgery

- Monitor blood glucose more frequently ranging from 0.5-2h
- On the day of surgery, avoid alterations in long-acting basal insulin unless there is a tendency of hypoglycemia or if the patient is on diet restriction preoperatively.

Basal insulin- NPH, glargine, detemir, degludec

Diabetes and Surgery

Basal insulin only:

Once-daily dosing:

- Patients with type 2 diabetes who take only once-daily basal insulin may continue it without any change to their usual regimen.
- We often reduce the dose by 10 to 25 percent to lower the risk of perioperative hypoglycemia.

Basal insulin- NPH, glargine, detemir, degludec

Diabetes and Surgery

Twice-daily dosing

- Patients with type 2 diabetes who take twice-daily basal insulin may also be able to continue their usual regimen. If there is concern about preoperative hypoglycemia, we reduce both doses (morning and prior evening) by 10 to 25 percent.

Basal and prandial insulin

- Omit any prandial insulin (regular, lispro, aspart, glulisine) after fasting begins, typically on the morning of surgery.

Diabetes and Surgery

Pre-mixed insulin:

- The dose on the evening prior to surgery should be reduced by approximately 20 percent and the dose on the morning of surgery by 50 percent.
- Resume regular OAD medications only after the patient is medically stable and retaining oral meals regularly.
- Do not resume metformin in a patient with renal dysfunction.
- Non-emergency procedures should be cancelled if patients have metabolic abnormalities
- Multidisciplinary care team within an institution should formulate appropriate protocol to be followed.

Diabetes and Surgery

Limited Care

- Delay surgery until fluid volume status (BUN, creatinine, and urine output) is stable and metabolic (pH, plasma glucose, creatinine, BUN, electrolytes) control is achieved.
- Tailor the postprandial insulin requirements according to the nutritional mode of patient.
- Avoid consecutive doses of subcutaneous insulin to prevent “stacking” of insulin.

CHAPTER 20
FASTING AND DIABETES

KEY POINTERS

- Indications to avoid fasting
- Recommendations when fasting
- Management of hypoglycemia while fasting

FASTING AND DIABETES

- Fasting to be avoided in individuals with T2DM especially if they also have:
  - Uncontrolled or unstable glycaemia history of recurrent diabetic ketoacidosis (DKA), significant macrovascular/microvascular complications or hypoglycemic unawareness
  - On intensive insulin therapy or experience frequent hypoglycemic episodes
  - Non adherent to medical nutrition therapy, physical activity and /or pharmacotherapy .
- People living with diabetes who wish to fast must:
  - Consult a physician prior to fasting
  - Should be encouraged to participate in pre-fast counseling and assessment to optimize monitoring and therapeutic strategies

FASTING AND DIABETES

During fasting, patients living with diabetes should always:

- Carry glucose tablets, some sweets or candy to be used in case of hypoglycemia, 15-20 grams of rapid acting carbohydrates can also be useful.
- Carry an identification card displaying diabetic status and current medication
- Test blood glucose levels regularly and frequently (especially, if unwell during fasting). Self-monitoring blood glucose (SMBG) as prescribed by HCP can also be performed.

FASTING AND DIABETES

During fasting, patients living with diabetes should always:

- Treat promptly if glucose levels are deranged
- End the fasting immediately in case of dehydration or hypoglycemia and seeks for doctor's help as soon as possible.
- Discuss with the physician regarding the change in dose, and timing of insulin injections

FASTING AND DIABETES

- Hypoglycemia may be prevented in four levels including primordial, primary, secondary, and tertiary, using the ASAP (Anticipate, Suspect, Act to treat, Prevent) strategy
- Metformin, incretin-based therapies (sitagliptin, vildagliptin, and liraglutide) and pioglitazone, glinides, Alpha Glucosidase Inhibitors (AGIs), second generation sulfonylureas like gliclazide MR and glimepiride are the preferable agents to be used during fasting that is spread over a number of days or weeks. In patients on insulin therapy, insulin analogues may be preferred over conventional insulins to minimize the risk of hypoglycemia

FASTING AND DIABETES

- Since prolonged fasting may involve significant reduction in fluid intake so SGLT-2 Inhibitors may be avoided.
- To minimize T2DM-related AEs during fasting, patient centered diabetes education, modified nutrition plan designed for fasting with regular glucose monitoring and adjustment of treatment regimens is recommended.

CHAPTER 21
EDUCATION

KEY POINTERS

- DSMES
- Certified diabetes education
- Social strata for educating
- Techniques
- Recommendations

EDUCATION

- A patient-centered, structured diabetes self-management education (DSME)
- The diabetes self-management education and support (DSMES) program should be conducted at least at four critical times:
  - at diagnosis
  - annually
  - when complicating factors arise
  - when transitions in care occur, and as considered appropriate.

EDUCATION

- Medical professionals can conduct education programs, and certified diabetes educators who are quality assured can provide education (Certified Diabetes Educators) in groups or individual settings. A family member, friend, or caregiver may be involved as needed.

EDUCATION

- The education program should focus on people with diabetes from all backgrounds, mainly rural or poorly educated patients, as they may have less knowledge or awareness regarding diabetes.
- Education material should be customized for those with diabetes from different backgrounds. Every primary care unit should facilitate the training of at least one of their health professionals to become a diabetes educator.
- Diabetes education should be focused on assessing changes in patient behaviors and promoting self-management in patients with T2DM.

EDUCATION

- Diabetes education initiatives should be in simple, understandable, and local languages as far as possible.
- The healthcare provider should ensure that DSME programs are accessible to all patients and designed based on considerations of cultural needs, ethnicity, psychosocial status, medical history, family support, literacy, disability issues, and financial situation.

EDUCATION

- Use techniques of active learning (engagement in the process of learning and with content related to personal experiences), adapted to personal choices and learning styles.
- Use modern communication technologies to advance methods of diabetes education delivery and channels for intervention such as one-on-one or group sessions and effective use of social media platforms by creating credible source(s) of information for those living with diabetes and their caregivers.

EDUCATION

- RSSDI recommends the use of diabetes-related information that is made accessible on the official website of RSSDI and associated social media channels, for improving knowledge and offering an empowering tool to bring positive behavior changes and management skills in those living with diabetes and their caregivers.
- Provide ongoing diabetes self-management support and the creation of self-help groups. Preventive education for diabetes and metabolic disorders should start at the school level.

CHAPTER 22
PSYCHOSOCIAL ISSUES

KEY POINTERS

- Approach to care
- General recommendations
- Specific recommendations for special situations

PSYCHOSOCIAL ISSUES

Approach to care

- Diabetes management should be carried out within a framework of informed and shared decision-making, following the philosophy of responsible patient-centered care.
- Psychosocial care should be provided to all individuals with T2DM using a collaborative, patient-centered care approach with referral to mental health care professionals where needed.
- Family members and other close ones in the management of diabetes must be involved

PSYCHOSOCIAL ISSUES

Approach to care

- Self-disclosure of diabetes, as opposed to maintenance of confidentiality, should be decided on a case-to-case basis, keeping the sociocultural environment in mind
- HCPs should take care of their own psychosocial health, as compassion fatigue is a common professional hazard.

Assessment

- Periodic assessment of psychosocial well-being should be done using questionnaires or validated tools (e.g. WHO-5, PAID, Whooley's 2-item questionnaire)

PSYCHOSOCIAL ISSUES

- Physicians should consider screening tools for diagnosis of diabetes-related anxiety.
- A careful assessment of depression
- Eating disorders, sexual dysfunction and substance abuse must be screened in patients at risk
- The socioeconomic status and education profile of the patient.
- Listening to a patient can be a good way to look into this aspect.

PSYCHOSOCIAL ISSUES

Specific interventions:

- The psychosocial needs of specific groups, e. g., children, adolescents, and youth of marriageable age, adults of reproductive age group, antenatal women, the elderly, the marginalized, and members of ethnic/religious minorities must be kept in mind.
- Coping skills training to prevent and manage diabetes distress should be an integral part of diabetes management. Individuals should be taught to integrate positive coping skills and unlearn negative coping.

PSYCHOSOCIAL ISSUES

Specific interventions:

- Nonpharmacological psychological therapy such as behavioral therapy and cognitive behavioral therapy must be offered when appropriate.
- People with hypoglycemia unawareness should be warned of this problem and the treating physician should relax tight glycemic control in order to restore hypoglycemia awareness.
- Gluco-vigilance must be maintained while prescribing psychotropic drugs that are known to influence carbohydrate metabolism.
- The use of CGM can help to allay the fear of hypoglycemia and help in the improvement of psychosocial well being

PSYCHOSOCIAL ISSUES

Specific interventions

- Personalized self-management support programs and the use of social media in patient education, and e-health-based psychological interventions are useful.
- Digital mental health intervention in the form of the peer support element, diabetes-relevant content and examples, and check-in on their mental health and diabetes self-management regularly can ease the overall implementation.
- Group home telemedicine for young adults with T1D will positively affect diabetes distress, self-efficacy, and diabetes-specific communication
- Use of cognitive behavioral therapy help in addressing psychosocial issues.

CHAPTER 23
TYPE 2 DIABETES MELLITUS IN YOUNG AND ADOLESCENTS

KEY POINTERS

- Risk based screening
- Therapies
- Prognosis

TYPE 2 DIABETES MELLITUS IN YOUNG AND ADOLESCENTS

- Risk-based screening for prediabetes and/or T2DM should be considered in asymptomatic children and adolescents, performed after puberty or after ten years of age, whichever occurs earlier.
- If tests are normal, repeat testing at a minimum of 3-year intervals or more frequently if BMI increases.

TYPE 2 DIABETES MELLITUS IN YOUNG AND ADOLESCENTS

- Fasting plasma glucose, 2-h plasma glucose during a 75-g oral glucose tolerance test, and HbA1c can be used to test for prediabetes or diabetes in children and adolescents.
- Panel of pancreatic autoantibodies should be tested to exclude the possibility of autoimmune T1DM.
- The patient should be evaluated for monogenic forms of diabetes or pancreatic diabetes if clinically indicated.

TYPE 2 DIABETES MELLITUS IN YOUNG AND ADOLESCENTS

- Treatment of youth-onset T2DM should include lifestyle management (long-term weight management, vigorous physical activity, healthy eating patterns), diabetes self-management education, self-monitoring of blood glucose, and pharmacologic treatment.
- A family-centered approach to nutrition and lifestyle modification is essential, and nutrition recommendations should be culturally appropriate and sensitive to family resources.
- Bariatric surgery may be considered in adolescents with marked obesity (BMI: >35 kg/m^2 or 120% of 95th percentile) and uncontrolled glycemia and/or severe comorbidities despite lifestyle and pharmacologic intervention.

TYPE 2 DIABETES MELLITUS IN YOUNG AND ADOLESCENTS

- Blood pressure should be measured and optimized to reduce risk and/or slow the progression of diabetic kidney disease.
- Youth with T2DM should be screened for the symptoms of other comorbidities, including laboratory studies when indicated for neuropathy, retinopathy, non-alcoholic fatty liver disease, obstructive sleep apnoea, and polycystic ovary syndrome (in female adolescents), cardiovascular disease, and dyslipidemia.
- Starting at puberty, preconception counseling should be incorporated into routine diabetes clinic visits for all females of childbearing potential.
- Patients should be screened for smoking and alcohol at diagnosis and regularly thereafter.

CHAPTER 24 HYPERGLYCEMIA IN PREGNANCY - PRE GDM & GDM

KEY POINTERS

- Preconception Care
- Antepartum Care
- Intrapartum Care
- Postpartum Care

HYPERGLYCEMIA IN PREGNANCY - PRE GDM & GDM

Preconception Care:

- Preconception care and planning should be introduced in all women with diabetes or a history of Gestational Diabetes before planning pregnancy.
- Educate about the risks of unplanned pregnancy, its consequences, and the importance of achieving strict preconception glycemic control.
- Counsel on contraceptives and family planning in all women with diabetes in the reproductive age group.
- Insulin is the first line of therapy to treat hyperglycemia in pregnant women with pre-existing diabetes as it does not cross the placenta

HYPERGLYCEMIA IN PREGNANCY - PRE GDM & GDM

Preconception Care:

- General assessment of overall health, including a comprehensive assessment of metabolic status and screening for complications and comorbidities of diabetes.
- Review all concomitant medications for their appropriateness during pregnancy.
- A dose of 400 µg/day of folic acid starting at preconception and continued till 12 weeks of pregnancy should be recommended to avoid neural tube defects.
- Comprehensive nutritional and lifestyle assessment, advice, and weight loss assistance should be provided.

HYPERGLYCEMIA IN PREGNANCY - PRE GDM & GDM

Antepartum care:

- During the first 10 weeks of pregnancy, offer retinal and renal assessment if not evaluated preconception.
- Aim for tight glycemic control with HbA1C 6%, FBS 70-90 mg/dl & 2 hr. PPBS 100-120 mg/dl if these can be achieved without significant hypoglycemia in women with pre-gestational diabetes on intensive insulin therapy.

HYPERGLYCEMIA IN PREGNANCY - PRE GDM & GDM

Antepartum care:

- Insulin is the first-line treatment recommended in all pregnant women with pre-GDM. Basal bolus therapy is most effective in helping achieve these tight glycemic targets.
- All human insulins (Regular/NPH) are safe in pregnancy.
- Insulin Aspart and Lispro are approved for use in pregnancy although we have insufficient data on glulisine. Insulin detemir has been approved for use in pregnancy, glargine use has been found safe in pregnancy, and Degludec is still not supported for use in pregnancy.

HYPERGLYCEMIA IN PREGNANCY - PRE GDM & GDM

Antepartum care:

- Offer ultrasound monitoring as per protocol to monitor fetal growth and timely detection of any structural abnormalities.
- Low-dose aspirin 100–150 mg/day starting at 12 to 16 weeks of gestation may be prescribed to lower the risk of preeclampsia.

HYPERGLYCEMIA IN PREGNANCY - PRE GDM & GDM

Intrapartum care:

- Diabetes is not an indication of preterm or cesarean delivery. Pregnancy may be continued to term if maternal metabolic parameters are satisfactory and there are no indications of adverse fetal growth or complications.
- Capillary blood glucose should be within the optimum level of 70-110 mg/dL during labor.
- Appropriate dose of regular insulin with dextrose infusion must be preferred to achieve target glycemic levels during labor.

HYPERGLYCEMIA IN PREGNANCY - PRE GDM & GDM

Postpartum care:

- Monitor blood glucose levels and consider insulin dose reduction to avoid hypoglycemia in women with pre-GDM.
- Most women with GDM may return to normoglycemia, and insulin may be stopped post-delivery.

HYPERGLYCEMIA IN PREGNANCY - PRE GDM & GDM

- Change glycemic targets to non-pregnant targets as per standard recommendations.
- Reassessment of glycemic status at 6-12 weeks postpartum with a 75 gm OGTT in women with GDM. Educate them on the risk of progression to Prediabetes or eventually T2DM and strategies to prevent it.
- Recommend breastfeeding
- Reminder about the importance of contraception and pre-conception care and planning for pregnancies in the future.

CHAPTER 25
DIABETES AND HYPERTENSION

KEY POINTERS

- Types of hypertension
- Measuring BP in diabetes
- BP Targets
- Therapies
- Diet

DIABETES AND HYPERTENSION

Types of Hypertension:

- Systolic Hypertension
- Non-Dipping Hypertension
- Nocturnal,
- B.P Variability

DIABETES AND HYPERTENSION

- Measuring BP in diabetes patients

- Major goals for the treatment of diabetes are to prevent or delay complications and optimize the quality of life. The pathogenic relationship between T2D and hypertension is assumed to be bidirectional.
- Elevated BP levels are supposed to reflect at least partially the impact of the underlying insulin resistance on the vasculature and kidneys, while there is clinical evidence suggesting that disturbances in carbohydrate metabolism are more common in individuals with hypertension.
- Ideal management of chronic conditions, such as T2D and hypertension, often includes monitoring lifestyle changes and pharmacological interventions to improve metabolic health.

DIABETES AND HYPERTENSION

- Measuring BP in diabetes patients

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- Elevated BP levels are supposed to reflect at least partially the impact of the underlying insulin resistance on the vasculature and kidneys, while there is clinical evidence suggesting that disturbances in carbohydrate metabolism are more common in individuals with hypertension.

DIABETES AND HYPERTENSION

- Measuring BP in diabetes patients
- Ideal management of chronic conditions, such as T2D and hypertension, often includes monitoring lifestyle changes and pharmacological interventions to improve metabolic health.
- Home BP measurement has been recommended by many hypertension guidelines and addresses several limitations of traditional office-based care, including reducing misclassification because of white-coat or masked hypertension and an ability to take more suitable action and a course of corrective therapy.

DIABETES AND HYPERTENSION

- The recommended BP targets for individuals with diabetes should be <130/80 mm Hg and <140/80 in elderly patients. BP should be performed at every clinical visit.
- Use of risk calculator to estimate the 10-year risk of a first ASCVD event (available online at tools.acc.org/ASCVD-Risk-Estimator-Plus) is recommended for assessment of better stratify ASCVD risk and help guide therapy.

DIABETES AND HYPERTENSION

- First-line therapy for hypertensive individuals and individuals with urine albumin-to-creatinine ratio $300 mg/g creatinine (A) or 30–299 mg/g creatinine (B). If one class is not tolerated, the other should be substituted. B should include a drug class
  - ACEI and ARB
  - CCB and/or thiazide-like diuretic
  - The treatment should include a statin in primary prevention if LDL-C >70 mg/dL (1.8 mmol/L) (diabetes with target organ damage) or >100 mg/dL (2.6 mmol/L) (uncomplicated diabetes)

DIABETES AND HYPERTENSION

Dietary recommendations:

- No more than 1500 mg of sodium/day
- Use alternatives for seasoning.
- In rice and other cereal preparations like roti, and poori, do not mix salt.
- Avoid packaged mixes, canned soups, or broths
- Use fresh vegetables.
- Avoid salted snack foods, pickles, pickled vegetables.
- Use little or no sauces.
- Use fresh poultry, fish, and lean meat rather than the canned, smoked, or processed types.

CHAPTER 26 DIABETES AND ELDERLY

KEY POINTERS

- General
- Geriatric Syndromes-detection and management
- Lifestyle management
- OADs
- Injectables

DIABETES AND ELDERLY

- India's population of older adults, including those with diabetes, is increasing by enormous proportions.
- Strong emphasis on cost-effectiveness and simplification of management strategies
- Motivational counseling, cognition enhancement, and social support should be essential.
- Treatment should be tailored according to individual needs to achieve desired glycemic goals.
- Improving subjective well-being and quality of life is an essential care component.

DIABETES AND ELDERLY

- Many geriatric syndromes like dementia and frailty compromise the abilities of older diabetics to self-manage their disease and they begin depending on a caregiver.
- Older diabetics should undergo screening for early detection of neurocognitive impairment and dementia.
- Older diabetics should undergo screening for early detection of frailty, preferably even before the pre-frail stage.

DIABETES AND ELDERLY

- Physical activity and exercise lower blood glucose, promote cardiac function, improve muscle mass, prevent frailty, strengthen bone mass, and elevate mood.
- Stress management and promoting good sleep in older diabetics can be achieved by de-stressing mechanisms like meditation, music, social networking, befriending grandchildren, etc.
- Sleep hygiene includes going to bed at least 1-2 hours after dinner, avoiding daytime naps, keeping the room free from noise and bright light, avoiding TV, coffee, tea, and alcohol, and drinking excess water before sleep.
- Miscellaneous steps include avoiding excess alcohol, self-medication, exposure to pollution, smoke, dust, and weather extremes.

DIABETES AND ELDERLY

Recommendations for the use of OADs in elderly diabetic patients are listed below.

- Metformin- First line of drug, especially in obese diabetics.
- Sulfonylureas- First/Second line of drug.
- Meglitinides- May be given.
- Alpha-Glucosidase Inhibitors- May be given.
- Pioglitazone- May be used in low doses.
- DPP4 inhibitors- Good drug, weight neutral, renal & cardiac friendly except vildagliptin in CLD.
- Oral GLP- 1 Receptor Agonist- in obese Diabetics
- SGLT2 inhibitors- Recommended for up to 70 years of average weight/obese elderly, helpful in patients with diastolic dysfunction.

DIABETES AND ELDERLY

- Injectable therapies like insulin and GLP1RA offer reasonable glycaemic control in elderly diabetics if used with caution, and the appropriate patient selection is made judiciously.
- Starting low and going slow should be the mantra to avoid adverse effects.
- Patient and caregiver education, monitoring, and regular follow-ups are the key to the success of injectable therapies in elderly diabetics.

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GUIDELINES

RSSDI Clinical Practice Recommendations for the Management of Type 2 Diabetes Mellitus 2022

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DIAGNOSIS AND CLASSIFICATION OF DIABETES

Recommendations

Recommended Care

Prediabetes/ intermediate hyperglycemia can be diagnosed with any of the following criteria:
- Impaired fasting glucose (IFG): FPG 110 mg/dL to 125 mg/dL or
- Impaired glucose tolerance (IGT): 2-h plasma glucose (2-h PG) during 75-g OGTT 140 mg/dL to 199 mg/dL or
- HbA1c ≥5.7%-6.4%

Diabetes can be diagnosed with any of the following criteria:
- FPG ≥126 mg/dL* or
- FPG ≥126 mg/dL and/or 2-h PG ≥200 mg/dL using 75-g OGTT
- HbA1c≥6.5% ** or
- Random plasma glucose ≥200 mg/dL in the presence of classic diabetes symptoms

Asymptomatic individuals with a single abnormal test should have the test repeated to confirm the diagnosis unless the result is unequivocally abnormal.
Individuals diagnosed with diabetes should be classified according to the World Health Organisation classification system.

Limited Care

Diabetes can be diagnosed with any of the following criteria:
- FPG ≥126 mg/dL* or
- FPG ≥126 mg/dL and/or 2-h plasma glucose ≥200 mg/dL using 75-g OGTT or
- Random plasma glucose ≥200 mg/dL in the presence of classic diabetes symptoms

Asymptomatic individuals with a single abnormal test should have the test repeated to confirm the diagnosis unless the result is unequivocally abnormal

The diagnosis of diabetes in pregnancy is dealt with in the **Chapter on Hyperglycaemia in Pregnancy**.

NOTE:
- Estimation of HbA1c should be performed using NGSP standardized method.
- Venous plasma is used for the estimation of glucose
- Plasma must be separated soon after collection because the blood glucose levels drop by 5%–8% hourly if whole blood is stored at room temperature.
- Capillary glucose estimation methods are not routinely recommended for diagnosis of diabetes/prediabetes/ intermediate hyperglycemia in the clinic setting; however, they may be used in epidemiological settings for assessing the population prevalence of diabetes and for individual diagnosis in resource-constrained environments where facilities for venous plasma glucose estimation are not immediately available. However, individuals detected to have dysglycemia using capillary blood glucose should have their diagnosis confirmed at the earliest by one of the methods mentioned above.[1]

For more details on glucose estimation, refer [2]

*FPG is defined as glucose estimated after no caloric intake for at least 8–12 hours.
**Using a method that is National Glycohemoglobin Standardization Program (NGSP) certified. For more on HbA1c and NGSP, please visit http://www.ngsp.org.