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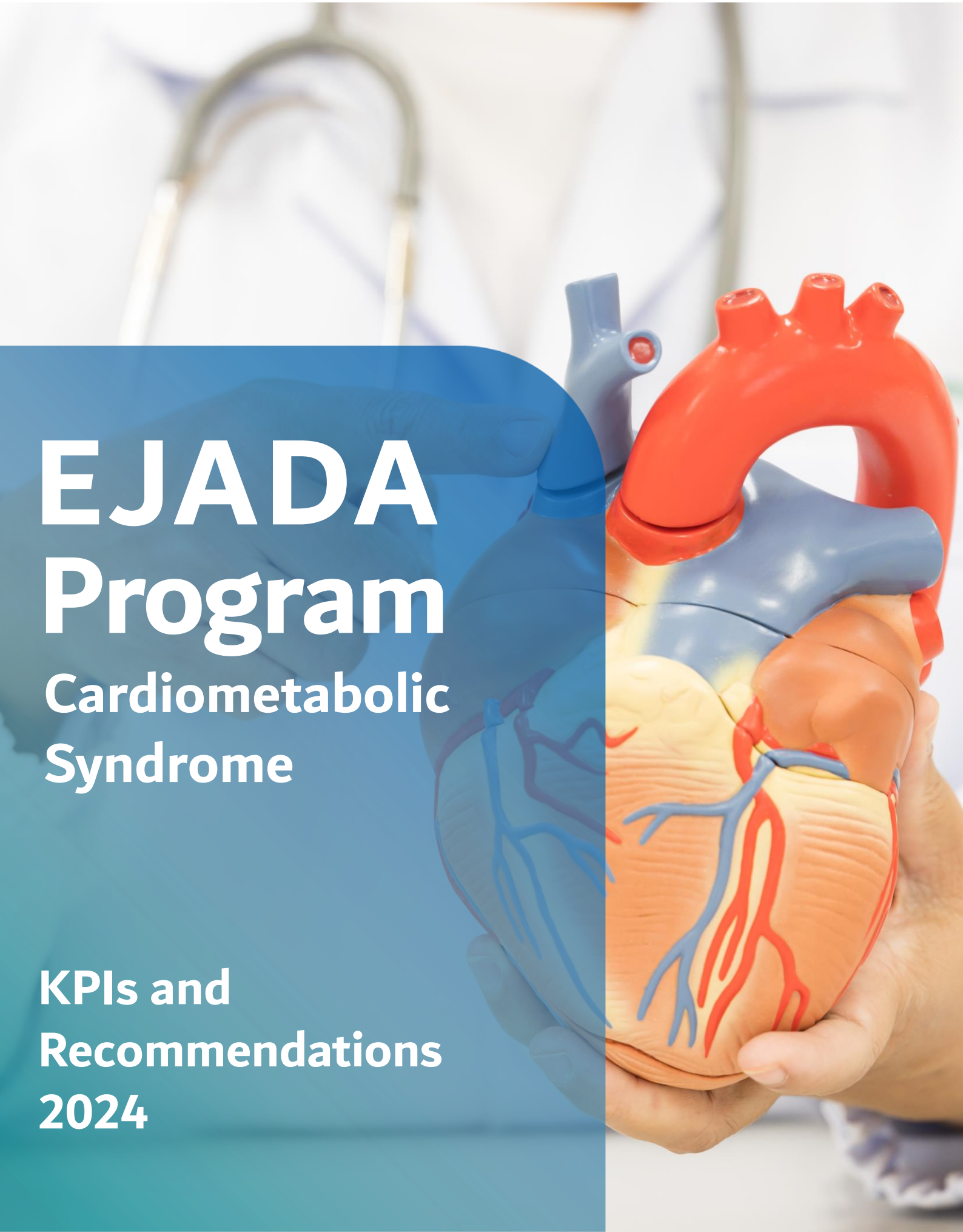

EJADA Program

Cardiometabolic Syndrome

KPIs and Recommendations 2024

Cardiometabolic Risks
KPIs and Recommendations

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Content

Introduction

Diabetes mellitus (DM) remains one of the most prevalent chronic diseases globally. Cardiovascular disease (CVD) is the most prevalent cause of morbidity and mortality in people with DM. The increased risk of major cardiovascular (CV) events in patients with T2DM causes an estimated 12-year reduction in life expectancy. DM frequently coexists with other cardiovascular (CV) risk factors such as hypertension, obesity, and dyslipidemia, sometimes known as the metabolic or cardiometabolic syndrome. Several investigators have reported that molecular mechanisms linked to DM raise the risk of CVD on their own. As a result, reducing CV risk factors in patients with DM is crucial for reducing the long-term untoward CV outcomes.

Despite their heightened CV risks, most T2DM patients do not meet treatment targets for multiple CV risk factors. Moreover, in the UAE, the incidence of cardiometabolic diseases is exceedingly high, impacting young patients and leading to a high burden of premature CV events. This can be partially attributed to the fact that, currently, primary care professionals treat 90% of people with type 2 diabetes mellitus (T2DM). The average visit is too short to comprehensively discuss CV risk factors with patients who are at high risk for CVD and DM. If these risk factors are not timely addressed, they may lead to ischemic heart disease, isch- emic stroke, peripheral artery disease, and congestive heart failure, which are the common causes of long-term morbidity and mortality in patients with DM.

Meanwhile, globally there is a paradigm from a focus on the control of HbA1c (only) to an organ-protective approach with greater emphasis on cardio-renal risk protection based on the data showing significantly improved cardio-renal out- comes with sodium-glucose cotransporter-2 (SGLT-2) inhibitors and glucagon-like peptide-1 (GLP-1) receptor agonists along with tight control of traditional CV risk factors.

Based on the above, this protocol was developed to provide a comprehensive cardiometabolic evaluation to reduce CV events and CV hospitalization in the UAE population by addressing:

1. Glycemic control
2. Early diagnosis of CV complications (i.e. early identification of CV risk factors) in pa- tients with prediabetes and diabetes
3. Early implementation of multifactorial intensive therapies that are evidence and guide- line based.

These guidelines are aimed not just at primary care physicians but also specialists, perhaps leading to a more collaborative and multidisciplinary approach to the prevention, diagnosis, and treatment of patients with diabetes and CVD.

Scope

The Ejada KPIs are quality indicators and ratings for physicians, facilities and insurance companies based on information collected by DHA systems from providers, payers and patients.

The "Cardiometabolic Risks (cardiovascular risk assessment and management in diabetes mellitus patients)" KPIs and Recommendations are based on regional and International guidelines on assessment and management of cardiometabolic risks in diabetes mellitus patients. The KPIs are designed for healthcare practitioners and providers to follow international best practices in the assessment and management of cardiovascular risks in diabetes mellitus patients

The " Cardiometabolic Risks" KPIs cover the following aspects;

- Screening for cardiovascular risks in patients with diabetes mellitus.
- Management of CV diseases such as heart failure, arrhythmia and stroke in diabetes mellitus patients
- Referrals to appropriate experts for management of cardiovascular or renal complications in patients with diabetes mellitus

The KPIs and recommendations have been reviewed by leading experts in the UAE.

List of Abbreviations

S.No	Abbreviation	Full term
1	ABI	Ankle brachial index
2	ACEi	Angiotensin converting enzyme inhibitor
3	ACR	Albumin creatinine ratio (urine)
4	Afib	Atrial fibrillation
5	ARNI	Angiotensin receptor neprilysin inhibitor
6	ASCVD	Atherosclerotic cardiovascular disease
7	BMI	Body mass index
8	BP	Blood pressure
9	CAC	Coronary artery calcium
10	CHD	Coronary heart disease
11	CKD	Chronic kidney disease
12	CKM	Cardiovascular-kidney-metabolic syndrome
13	CT	Computerized tomography
14	CVD	Cardiovascular disease
15	DKD	Diabetic kidney disease
16	DP	Dorsalis pedis
17	ECG	Electrocardiography
18	eGFR	Estimated glomerular filtration rate
19	GLP-1 RA	Glucagon-like peptide 1 receptor agonist
20	HDL	High-density lipoprotein
21	HF	Heart failure
22	HFPEF	Heart failure with preserved ejection fraction
23	hs-CRP	High sensitivity C reactive protein
24	hs-TNI	High sensitivity Troponin I
25	hs-TNT	High sensitivity Troponin T
26	KDIGO	Kidney disease improving global outcomes
27	LDL	Low-density lipoprotein

List of Abbreviations

S.No	Abbreviation	Full term
28	LOPS	Loss of protective sensations
29	LVH	Left ventricular hypertrophy
30	MetS	Metabolic syndrome
31	MRA	Mineralocorticosteroid receptor agonist
32	NAFL	Non-alcoholic fatty liver
33	NASH	Non-alcoholic steatohepatitis
34	NT-proBNP	N-terminal pro B type natriuretic peptide
35	OSA	Obstructive sleep apnoea
36	PAD	Peripheral artery disease
37	PCSK9	Protein convertase subtilisin kexin type 9
38	PT	Posterior tibial
39	RAAS	Renin-angiotensin-aldosterone system
40	SDOH	Social determinants of health
41	SGLT-2i	Sodium-glucose transport protein 2 inhibitor

KPIs and their Measuring Parameters

Data collection frequency: Monthly

S.No.	KPIs	Measuring Parameters
1	Screening for High Risk of Cardiometabolic Events	BP, BMI, Peripheral pulse including AB, Retinal examination ECG & NT-ProBNP, Serum creatinine, eGFR, UACR, Lipids profile, CBC, HbA1c, HsCRP , HsTroponin , Lipoprotein(a) for risk stratification
2	Coronary Artery Calcium (CAC) Score with Non-contrast Computed Tomography (CT) for assessment of Cardiovascular Risk in Asymptomatic Patients with Diabetes Mellitus (DM) at Moderate Risk	Coronary Artery Calcium (CAC) Score with Non-contrast Computed Tomography (CT)
3	Assessment of Microalbuminuria in Patients with Diabetes Mellitus to Identify Risk of Developing Renal Dysfunction or Cardiovascular Disease (CVD)	Microalbumin test
4	Annual B-type natriuretic peptide (NT-ProBNP) and Echocardiogram (ECHO) for Assessment of Heart Failure in Patients with Diabetes Mellitus (DM)	NT-ProBNP/Echocardiogram(ECHO)
5	Appropriate pharmacological treatment in T2DM Patients at High-Risk for Cardiovascular (CV) Events	DDC List of drugs
6	Appropriate pharmacological treatment in patients with T2DM and Chronic Kidney Disease (CKD) to Reduce risk of cardiovascular (CV) Events	DDC List of drugs
7	The use of ACEi or ARBs and SGLT2i and Finerenone in the treatment of diabetic albuminuria/diabetic nephropathy	DDC List of drugs
8	Prescribing high-intensity statin up to the highest tolerated dose as first line therapy for dyslipidemia in T2DM patients	DDC List of drugs
9	Prescription of Direct Oral Anti-coagulants for Stroke Prevention in Diabetic Patients with Atrial Fibrillation	DDC List of drugs
10	Timely addition of PCSK9 targeted therapy in patients not achieving the LDL target (on maximally tolerated statin therapy) or patients with “statin intolerance.”	DDC List of drugs
11	Appropriate pharmacological treatment for Stroke Prevention in Diabetic Patients with Atrial Fibrillation	DDC List of drugs
12	Appropriate pharmacological treatment for patients with Diabetes Mellites Diagnosed with Heart Failure	DDC List of drugs

KPIs and their Measuring Parameters

Data collection frequency: Monthly

S.No.	KPIs	Measuring Parameters
11	Referral of Patients with Diabetes Mellitus (DM) to Cardiologist	Cardiologist referral
12	Referral of Patients with Diabetes Mellitus(DM) to Nephrologist	Nephrologist referral
13	Avoidable Hospitalization in Patients with Diabetes Mellitus (DM) and Cardiovascular (CV) Event	Hospital Admission
14	Cost of Hospitalization in Patients with Diabetes Mellitus(DM) Due to Cardiovascular (CV) Event	Cost of hospitalization
15	Percentage Cost Decrease for Managing Patients with Diabetes Mellitus (DM) with Cardiovascular (CV) Event	CVD treatment cost

Cardiometabolic Syndrome

The global burden of noncommunicable diseases (NCDs) is increasing rapidly, and CVD remains the leading cause of death and disability. It is estimated that 85% of CVD deaths are caused by ischemic heart disease and stroke. The risks of CVDs are multifactorial and largely modifiable; the most common are obesity, central obesity/abdominal obesity, hyperglycemia, dyslipidemia, and hypertension. According to the World Health Organization (WHO) predictions and projections, these risk factors are rapidly increasing in the United Arab Emirates (UAE).

Diabetes and prediabetes: According to the International Diabetes Federation (IDF), more than 73 million adults have been diagnosed with diabetes in the Middle East and North African (MENA) region, which has the highest diabetes prevalence rate (16.2%) in all the IDF regions. An alarming situation is that 40.7% of the diabetic population in the UAE is undiagnosed with diabetes.

Obesity: The obesity epidemic was predicted by WHO in 1997, and it has now become a true pandemic, affecting young people. Obesity and overweight are major health problems since they increase the risk of developing diabetes, CVD, hypertension, chronic kidney diseases (CKD), and other complications. In the UAE, the prevalence has doubled from 1989 to 2017, and the current prevalence rate is 31.7%. In the UAE and Gulf Cooperation Council (GCC) nations, an increase in per-capita income and economic growth, coupled with increasing life expectancy, has resulted in increasing rates of obesity and associated NCDs.

Hypertension: Hypertension is also one of the major NCDs and a public health challenge that increases the risk of developing CVD. Among the UAE population, a cross-sectional study found that 22.4% were hypertensive, and men had higher blood pressure than women. The Weqaya Program in Abu Dhabi showed an overall prevalence of hypertension of 23.1%. According to the Dubai Household Survey (2019) (n = 2,530), 32.5% of adults reported being diagnosed with hypertension (38.37% of males and 16.66% of females).

Metabolic Syndrome: Metabolic syndrome is a multifactorial condition that is characterized by a combination of three or more of the following risk factors: increased waist circumference, high triglycerides, low high-density lipoprotein cholesterol (HDL-C), high blood pressure, and high fasting blood glucose. Metabolic syndrome alone increases CVDs by twofold even without the presence of DM. According to a cross-sectional population-based study conducted in the UAE, metabolic syndrome prevalence was 37.4% (32.7% in women and 39% in men). The prevalence was 33.6% in the Emirati population, 34.5% in the Arab non-Emirati population, and 40.7% in the Asian population. The young adult population in the UAE has a high prevalence of metabolic syndrome compared to global estimates in the same age group.

Cardiometabolic Syndrome

Dyslipidemia: A study examining the lipid control over 5 years in patients with diabetes across primary and tertiary government health sectors in Dubai found that 60.5% of patients achieved LDL levels <100 mg/dL. Non-HDL-C levels <130 mg/dL were achieved in 67.9% of patients in tertiary care in 2012 compared to 60.9% in primary care. UAE nationals had better lipid control across the study duration compared to expatriates. The Weqaya program in Abu Dhabi reported dyslipidemia rates to be high (44.2%), with newly diagnosed individuals having high LDL and low HDL levels. The low HDL levels were reported to be a greater contributor to dyslipidemia than the high LDL levels. In the DYSIS-2 ME study 88% of patients post MI and ACS were not at target in the UAE & region in spite of the available combination lipid lowering therapy

Dietary Practices, Physical Activity, and Smoking: A cross-sectional study conducted in 628 randomly selected households in all seven Emirates reported that across all gender- age groups, 43% of girls and 38% of boys (6–10 years) consumed more calories than their estimated energy requirements. Snacking represents a major source of Emirati caloric intake (>20%) of total calories. In addition, caloric beverages account for 8–14% of total calories, emphasizing to pay more attention to educating the public on nutrition. A high prevalence of physical inactivity was observed among the sampled population of Dubai (85.1%), 95.4% of which did not engage in vigorous-intensity activities. According to the UAE Ministry of Health and Prevention 2010 report, the prevalence of smoking any tobacco product was 21.6% among men and 1.9% among women.

Obstructive Sleep Apnea: The linkage between obstructive sleep apnea (OSA), obesity, metabolic syndrome, hypertension, left ventricular hypertrophy, and atrial fibrillation is well established. The major barriers to diagnosis and treatment are that many people do not recognize the symptoms and severity of the condition, and HCPs do not regularly ask about the duration and quality of sleep or screen patients for OSA.

Screening and diagnosis for cardiometabolic complications

The ability to accurately identify people at high risk of cardiometabolic events allows for more extensive risk factor treatment to lower the chance of an incident of heart failure (HF) or atherosclerotic cardiovascular disease (ASCVD). Risk variables are used in a variety of ways to assess a person's both cardiometabolic and CVD risk. (Fig. 1, 2).

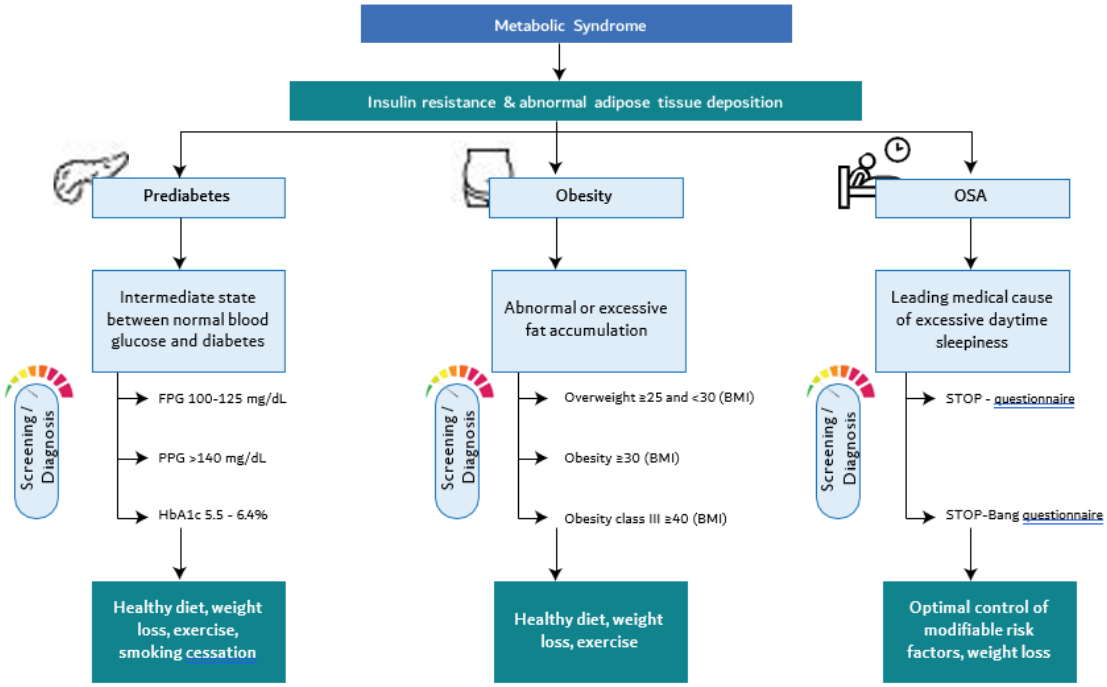
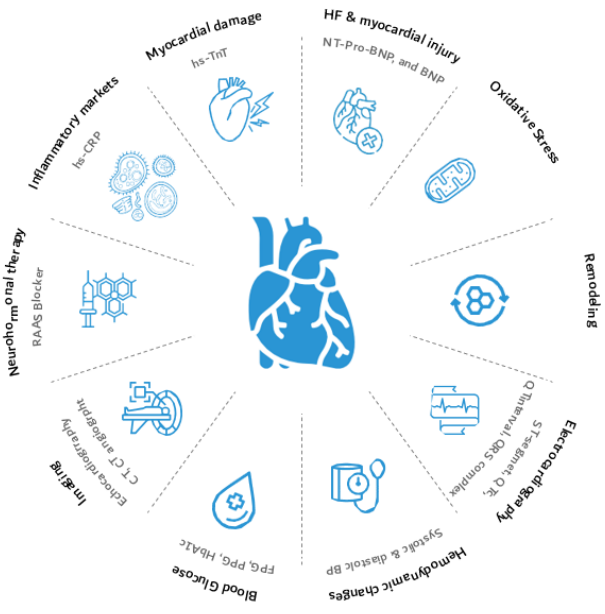


Figure 1: Metabolic syndrome – dysglycemia/prediabetes/OSA – screening and diagnosis



Biomarkers, electrocardiography, and imaging for clinical assessment of CV damage. hsTnT, High Sensitivity Troponin; NT-ProBNP, N-terminal prohormone BNP; FPG, fasting plasma glucose; PPG, post- prandial plasma glucose; CT, computed tomography; CRP, C-reactive protein

Figure 2: Biomarkers, electrocardiography, and imaging for clinical assessment of CV damage. hsTnT, High Sensitivity Troponin; NT-ProBNP, N-terminal prohormone BNP; FPG, fasting plasma glucose; PPG, post- prandial plasma glucose; CT, computed tomography; CRP, C-reactive protein.

Recommendations for screening and diagnosis

WHO TO SCREEN

- Prediabetes can be screened every 2-3 years
- Type 2 Diabetes mellitus annually
- Type 1 Diabetes mellitus of ≥10 years duration annually

HOW TO SCREEN

MEDICAL HISTORY

Check for symptoms or signs of CVD or PAD or CHF: chest pain, peripheral edema, dizziness, palpitations, fatigue, effort intolerance, syncope, intermittent claudication

MEDICAL EXAMINATION

- Full medical examination
- BP
- BMI
- Peripheral pulse including ABI
- Retinal examination
- Foot examination

ASSESSMENT OF CV DAMAGE

- Annual resting ECG
- Annual NT-proBNP (>125) and High Sensitivity Troponin. If NT-proBNP is not available, then BNP may be used (>30).
- Coronary artery calcium (CAC) score with non- contrast CT in asymptomatic patients with DM at moderate risk every 5 years.

ADDITIONAL RISK ASSESSMENT TOOLS

- Serum creatinine
- eGFR
- Urine for ACR (Urine microalbumin)
- Echo
- Lp(a)
- CBC, lipid profile
- HbA1c
- CTCA or functional imaging in patients with abnormal ECG.
- Assessment of carotid and/or femoral plaque burden with arterial US
- Assessment of femoral arteries by CT or MRI in symptomatic patients at moderate or high-risk (PAD)/CVD.

WHO IS POSITIVE

- Those with abnormal physical examination
- Those with abnormal investigations

→

- Early referral to a specialist for further management according to the individual diagnosis and address all healthy lifestyles measures
- Treat all cardiometabolic parameters as very-high risk group (see treatment recommendations) and screen annually

WHO IS NEGATIVE

APPLY THE RISK SCORING CRITERIA

CV risk score in preple with diabetes or prediabetes	Score
Age ≥40 yrs	1
Age <40 yrs	0
Duration of DM >10yrs	1
Duration of DM <10 yrs	0
No CV risk factors	0
One CV risk factor	1
Multiple CV risk factors	2

→

Score	CV Risk category	Screening
Score of 4	Very high CV risk	Annually
Score of 3	High CV risk	Annually
Score of 2	Moderate CV risk	Annually
Score of 1	Low CV risk	Annually, every 2 years in prediabetes

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Recommendations for lifestyle modifications

R2.1 Lifestyle modification is applicable at all stages of CKM and needs to be continually reinforced as it impacts all of the risk factors simultaneously

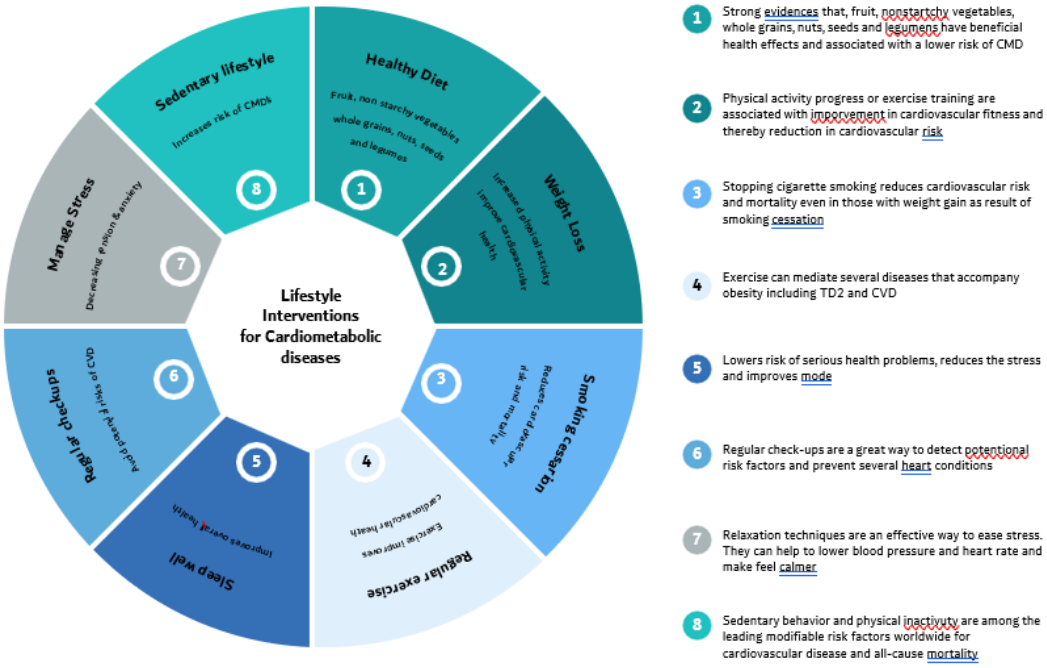

Figure 3: Lifestyle modification for cardiometabolic disorders

Management of Obesity

Obesity is defined as an abnormal or excessive fat accumulation that may impair health. Classification of obesity as per BMI is given below:

Obesity classification	BMI
Severely underweight	<16.5 Kg/m^2
Underweight	< 18.5 Kg/m^2
Normal weight	≥ 18.5-24.9 Kg/m^2 (18.5 -22.9 Kg/m^2 in Asian population)
Overweight	≥ 25-29.9 Kg/m^2 (23 -24.9 Kg/m^2 in Asian population)
Obesity	≥ 30 Kg/m^2 (≥25 Kg/m^2 in Asian population)
Class I	30 – 34.9 Kg/m^2 (25-29.9 Kg/m^2 in Asian population)
Class II	35 – 39.9 Kg/m^2 (≥30 Kg/m^2 in Asian population)
Class III	≥ 40 Kg/m^2 (also referred to as severe, extreme, or massive obesity)

Table 1: Classification of obesity (BMI Classification Percentile And Cut Off Points - StatPearls - NCBI Bookshelf (nih.gov))

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Recommendations for the management of obesity

R2.2: Pharmacotherapy is indicated in:

1. Patients with BMI ≥27 with comorbidities
2. Patients with BMI ≥30 without comorbidities
3. Long term maintenance of weight loss

R2.3: Bariatric surgery is indicated in patients with BMI ≥40

R2.4: Drugs approved for the management of obesity include Orlistat, Liraglutide, Naltrexone, and Bupropion. New medications and emerging therapies for obesity management include

1. Tirzepatide (Mounjaro): GIP/GLP-1 agonist approved by FDA and registered for obesity pharmacotherapy in UAE (no CVOT data nor evidence in obesity with ASCVD or CHF)
2. Simeglutide (Wegovy): Contains semaglutide and should not be used with other semaglutide-containing products or other GLP-1 receptor agonist medicine. Itis approved by FDA reduce risk of MACE and registered for obesity pharmacotherapy in adults and adolescents in UAE. Highly significant Safety and CV efficacy in obesity with high risk ASCVD in SELECT CVOT . In the STEPF-HF randomized clinical studies of HFPEF & obesity (with & without DM) simegludtide demonstrated reduction in hospitalization for HF and improved quality of life .

Smoking cessation

Smoking is an important modifiable risk factor for CVD. The number of smokers worldwide has increased to 1.1 billion in 2019, with tobacco smoking causing 7.7 million deaths annually including 1 in 5 deaths in males worldwide.

Recommendations for smoking cessation

R2..5 All patients with CVD should be screened for tobacco or electronic cigarette smoking

R2.6 Minimal counseling on the importance of smoking cessation should be granted to all patients with CVD risk factors to reduce the rate of smoking and subsequent CVD events

R2.7 The following should be accessible for adults who smoke

1. Behavioral interventions: behavioral support and very brief advice on quit- ting smoking
2. Medicinally licensed products: nicotine replacement therapy, bupropion, and varenicline

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Obstructive sleep apnea

The linkage between obstructive sleep apnea (OSA), obesity, metabolic syndrome, hypertension, left ventricular hypertrophy, and atrial fibrillation is well established . Both OSA and obesity / metabolic syndrome are key drivers of sympathetic overdrive and increased resting heart rate . The major barriers to diagnosis and treatment are that many people do not recognize the symptoms and severity of the condition, and HCPs do not regularly ask about the duration and quality of sleep or screen patients for OSA. Weight loss in the DM pt with sleep apnea also results in significant positive impact on control of hypertension and atrial fibrillation .Diabetes therapies that prioritize weight loss would be of greater benefit if patients have comorbidities including sleep apnea , AF , hypertension and LVH

Recommendations for the management of sleep apnea

R2.8: HCP should ask about symptoms and there should be ≥1 of the following:

1. Daytime sleepiness, unintentional sleep episodes, un- refreshing sleep, fatigue, or difficulty staying asleep
2. Awakening with breath-holding, gasping, or choking • Reports by a bed partner of loud snoring, breathing interruptions, or both in the patient's sleep
3. The patient and any bed partners, roommates, or housemates are all sources for clinical risk assessment
4. Patients with poorly controlled hypertension (which may be caused or exacerbated by OSA), atrial fibrillation or other arrhythmias, heart failure (which may cause OSA), stroke, or diabetes
5. STOP-BANG score

R2.9: Once OSA is suspected, referral to an expert is needed

1. Polysomnography for oxygen desaturation, apnea, and hypopnea events
2. ENT examination for upper airway obstruction

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Nonalcoholic Fatty Liver Disease and NASH

The presence of NAFLD has been associated with microvascular diabetic complications, especially CKD. Women with polycystic ovary syndrome (PCOS) are at increased risk of T2DM and NAFLD. Based on pathophysiology persons with NAFLD will be at risk of other CMD manifestations, and individuals who have one or more CMD manifestations will be at increased risk of NAFLD. ASCVD is the principal cause of death in patients with NAFLD. NAFLD can be considered a risk enhancer when ASCVD risk is assessed in patients..

Recommendations for NAFLD and NASH

R2.10 Clinicians should recommend lifestyle changes in persons with excess adiposity and NAFLD with a goal of at least 5%, preferably 10% weight loss, as more weight loss is often associated with greater liver histologic and cardiometabolic benefit, depending on individualized risk assessments.

R2.11 To offer cardiometabolic benefit in persons with T2DM and NAFLD, clinicians must consider treatment with GLP-1RAs, pioglitazone, or SGLT-2 inhibitors; however, there is no evidence of benefit for treatment of steatohepatitis with SGLT-2 inhibitors.

R2.12 Treatment with specific GLP-1RAs with CV benefit (semgalutide , liraglutide and dulaglutide) or bariatric surgery that induces sustained weight loss leads to improvement of common comorbidities in NAFLD, such as hypertension, sleep apnea, atherogenic dyslipidemia, hyperglycemia with frequent resolution of diabetes, and amelioration of the risk of CVD and HCC. Bariatric surgery is considered in patients with NASH and BMI >35 with remission of T2DM, improved dyslipidemias, and risk of ASCVD events.

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Diabetic foot and peripheral artery disease (PAD)

The presence of diabetic foot and severe peripheral neuropathy both indicate advanced target organ damage, which itself classifies diabetic patients at very high risk for CV events. Simultaneous referral to the specialty for surgical management and limb salvage as well as to cardiology for detailed assessment of associated CVD is recommended.

Recommendations for diabetic foot and PAD

R2.13 DM patients should have annual ABI screening even if asymptomatic.

R2.14 If ABI is abnormal (<0.9 in DM) then the multifactorial management will include reclassification to very high risk and need for:

1. Antiplatelets and,
2. Lipid-lowering targeting to LDL of 1.4 mol/L/55 mg/dL Intensive glycemic control with the addition of GLP1-RA, which has been shown to reduce amputation
3. Intensive glycemic control with the addition of specific GLP1-RA with CV benefit (Liraglutide , Semaglutide) which have been shown to reduce both MACE and amputation in PAD
4. Low Dose (vascular dose)rivaroxaban (2.5 Mg bid) reduced both MACE events and PAD (limb events) in PAD and DM

R2.15 All diabetic patients should be referred to podiatry for risk stratification for the development of ulceration and other diabetic-related pathologies such as Charcot neuroarthropathy. [Table 2,3]

R2.16 **Musculoskeletal evaluation :** All patients should be asked to stand in order to identify any pedal deformities such as bunions, flatfeet, or hammertoes and any asymmetry between foot, ankle, and leg position

R2.17 **Vascular evaluation**

1. Assessment:
    a. Skin temperature from tibial tuberosity
    b. Color return to digits, and, most importantly
    c. The absence or presence of pedal pulses (posterior tibial and dorsalis pedis).
2. In the absence of palpable pedal pulses, an ABI is often utilized to evaluate PAD.
3. With more advanced disease and increasing vessel calcification seen in diabetes and end-stage renal disease, a simple ABI is not sensitive to diagnose. If the patient does not have an urgent problem (Table 2), therefore, more detailed noninvasive tests such as pulse volume recordings, toe pressure, or toe brachial indices should be considered with a referral to vascular surgeon and/or vascular medicine specialist, particularly if skin changes are noted.

Comprehensive multimodality cardiometabolic therapies

R2.18 Neurologic evaluation

1. Assessment of loss of protective sensation (LOPS). This is most commonly done by evaluating the response of a 10 g monofilament wire to the plantar aspect of multiple digits, metatarsal heads, and heel.
2. If this is not available, an Ipswich test is a reasonable substitute.

R2.19 Dermatologic evaluation

1. The entire skin surface of the foot and ankle should be visualized for any dry skin, hyperkeratosis, fissuring of skin, or ulceration; this includes all of the interdigital areas.
2. Lack of sweating, which can lead to anhidrosis, is a sign of possible auto- nomic neuropathy. This in conjunction with a patient who says their feet feel “cold” or “warm” (loss of autonomic vascular tone to veins and arteries, respectively) is a strong suggestion of autonomic neuropathy.

R2.20 In patients with advanced vascular disease, i.e., ABI <0.5, SGLT-2 inhibitor can be used with caution after consultation with a CV specialist

Category	Ulcer Risk	Characteristics	Frequency
0	Very low	No LOPS and No PAD	Once a year
1	Low	LOPS and PAD	Once every 6–12 months
2	Moderate	LOPS + PAD, or LOPS + foot deformity or PAD + foot deformity	Once every 3-6 months
3	High	LOPS or PAD, and one or more of the following• History of a foot ulcer• A low- er-extremity amputation (minor or ma- jor)• End-stage renal disease	Once every 1–3 months

Table 2: The IWGDF risk stratification system and corresponding foot screening frequency. LOPS, loss of protective sensation, PAD, peripheral artery disease. Screening frequency is based on expert opinion since no evidence is available to support these intervals. When the screening interval is close to a regular diabetes check-up, consider screening the foot at that check-up.

Comprehensive multimodality cardiometabolic therapies

Priority	Indications	Timeline	Suggested follow up
Urgent (active pathology)	Open wound or ulcerative area, with or without signs of in- fection. New neuropathic pain or pain at rest. Signs of active Charcot deformity (red, hot, swollen midfoot or ankle)• Vas- cular compromise (sudden absent DP/PT pulses or gangrene)	Immediate referral/ consultation	As determined by specialist
High (ADA risk category 3: the diabetic foot in remission)	Presence of diabetes with a previous history of ulcer or low- er-extremity amputation. Chronic venous insufficiency (skin color change or temperature difference)	Immediate or "next available" outpatient referral	Every 1-2 months
Moderate (ADA category 2)	PAD ± LOPS• DP/PT pulses diminished. Presence of swelling or edema	Referral within 1–3 weeks (if not already receiving regular care)	Every 2-3 months
Low (ADA risk category 1)	LOPS ± longstanding, nonchanging deformity. Patient re- quires prescriptive or accommodative footwear	Referral within1 month	Every 4-6 months
Very low (ADA risk category 0)	No LOPS or PAD• Patient seeks education on topics such as routine foot care, athletic training, appropriate footwear, or injury prevention	Referral within 1-3 months	At least annually

Table 3: Modified ADA diabetic foot risk classification. DP, dorsalis pedis; LOPS, loss of protective sensation; PT, posterior tibial

Glycemic Control

Recommendations for glycemic control in DM with HF

R2.21 Lifestyle intervention particularly weight loss and cardiac rehabilitation

R2.22 Metformin can be used at any stage or level of risk. SGLT2-I or GLP1-RA are highly recommended regardless of glycemic control

Dyslipidemia

Dyslipidemia in T2DM and metabolic syndrome is typically represented by elevation of both fasting and postprandial TG, Apo-B, small dense LDL, and low HDL-C and Apo-A1 levels. (Fig3, 4)

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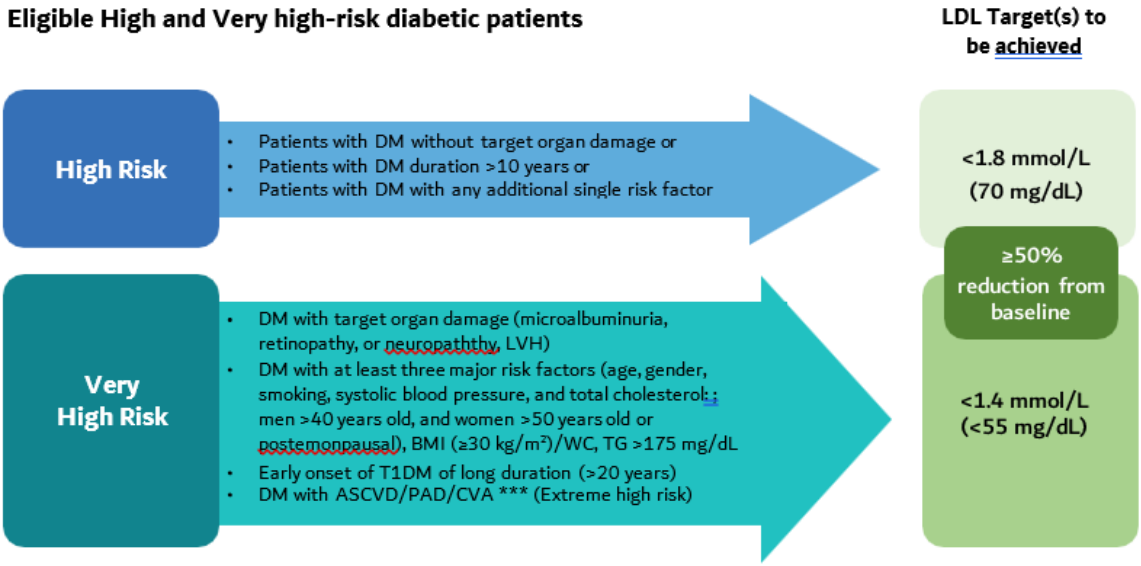

Figure 4: Eligible high- and very high-risk diabetic patients

Recommendations for dyslipidemia

R2.23 A diet with low saturated fat, high in fiber and fish is recommended

R2.24 The targets are:

1. Body mass index of 20–25 kg/m2
2. Waist <37 inches in men and 31.4 inches in women

R2.25 ESC/EASD-2019 guidelines recommend achieving a minimum 50% reduction from baseline LDL and also achieve the below risk-specific targets:

- LDL-C <100 mg/dL – patients with T2DM at moderate CV risk
- LDL-C <70 mg/dL – patients with T2DM at high CV risk
- LDL-C <55 mg/dL – patients with T2DM at very high CV risk

R2.26 3.5–7.0 h of moderate physical activity per week or 30–60 min most days.

R2.27 In addition to lifestyle modification, it is recommended initially:

1. A high-intensity statin up to the highest tolerated dose to reach target goals for specific levels of risk.
2. Reassessing the LDL at 4–6 weeks and, if the goal is not reached, switching to Statins in combination with ezetimibe.
3. The addition of Proprotein Convertase Subtilisin/Kexin type 9 (PCSK9) tar- geted therapies inhibitors (including the PCSK9 siRNA (RNAi) inhibitors such as inclisiran or PCSK9 Mononclonal Antibodies evolocumab and aliro- cumab) should be considered in patients not achieving the LDL target (on maximally tolerated statin therapy) or patients with “statin intolerance.”

Comprehensive multimodality cardiometabolic therapies

R2.27 In addition to lifestyle modification, it is recommended initially:

4. Combination of maximum tolerated statin, ezetimibe, and PCSK9-targeted therapies in very high-risk patients (in particular DM with established AS- CVD/PAD) to achieve 85% reductions of LDL and target LDL of less than 1.4 achieves a linear reduction in CV events.
5. Utilization of fixed-dose combination of statin and ezetimibe maximizes ad- herence. In addition, the PCSK9 siRNA inclisiran has shown a long term reduction of LDL and predicted proportionate reduction of CV events using a 6-month injection, a strategy that maximizes adherence to lipid lowering.
6. In patients with ASCVD or other CV risk factors on a statin with controlled LDL cholesterol but persistently elevated triglycerides (135–499 mg/dL), the addition of icosapent ethyl is recommended to reduce residual CV risk.

R2.28 It is recommended to obtain a lipid profile at the initiation of statins or other lipid-lowering therapy, 4–6 weeks after initiation or a change in dose, and annually thereafter, as it may help to monitor the response to therapy and inform medication adherence.

Hypertension

High blood pressure is the main risk factor for CVD and all-cause mortality. There is ample evidence that blood pressure lowering leads to reduced CVD and total mortality. Hypertension is defined as a sustained blood pressure ≥130/80 mm Hg.. While blood pressure should be confirmed using multiple readings, patients with BP ≥180/110 mm Hg and CVD could be diagnosed with hypertension at a single visit. Home BP monitoring is recommended to confirm treatment effectiveness.

Recommendations for hypertension

R2.29 A healthy lifestyle with weight loss when indicated, reducing dietary sodium, increasing dietary potassium intake, and increasing physical activity, preferably as recommended in the Dietary Approaches to Stop Hypertension (DASH)-style eating pattern.

R2.30 Pharmacologic therapy should be started when BP is ≥130/80 mm Hg, aiming for a target BP of <130/ 80 mm Hg. However, target BP can be individualized, taking into consideration CV risk, potential drug side effects, and patient preference.

R2.31 Patients with BP ≥160/100 mm Hg should be started on two drugs, preferably in a single pill to aid adherence. Angiotensin-converting enzyme (ACE) inhibitors or angiotensin receptor blockers (ARBs) are the recommended first-line therapy for the treatment of hypertension in people with diabetes and CAD and/or albuminuria. Regular testing for serum creatinine/eGFR and potassium levels should be assured. Other classes of BP medications with evidence-based CV mortality benefits include calcium channel blockers and thiazide-like diuretics.

Comprehensive multimodality cardiometabolic therapies

R2.32 For those not meeting BP targets on three classes of antihypertensive medications (including a diuretic), a mineralocorticoid receptor antagonist (MRA) should be considered.

R2.33 In diabetic hypertensive patients with sympathetic overdrive manifested by a heart rate >80 associated with metabolic syndrome and obesity, the use of glycemically neutral and highly selective beta-blockers is recommended as elevated heart rate doubles the risk of CV events. In some of these patients, investigations for secondary causes of hypertension may be warranted. Selective Beta blockers are recommended in hypertensive patients with OSA due to its association with sympathetic over drive and paroxysmal Atrial Fibrillation and resistant hypertension

Antiplatelet and thrombolytic therapy

Antiplatelet therapy is recommended for secondary prevention of CV events in patients with diabetes . Historically, antiplatelet therapy with aspirin or clopidogrel in aspirin- allergic patients was used.

Recommendations for antiplatelet and thrombolytic therapy

R2.34 Adults who are being evaluated for CVD prevention should undergo a thorough risk assessment as delineated previously (particularly high and very high risk) and have a clinician-patient risk discussion before starting on aspirin. In addition, assessing for other risk-enhancing factors can help guide decisions about preventive interventions in selected individuals, as can CAC scanning.

R2.35 The CV outcomes for people using anti-coagulation strategies (COMPASS) study established the evidence-based role of the addition of aspirin to a “CV” dose of rivaroxaban 2.5 mg in CV residual risk reduction in diabetics (chronic CAD and PAD) as well as diabetics with CKD

Hypoglycemia

Hypoglycemia, usually caused by insulin or sulphonylureas therapy, is limiting a key factor in achieving tight glycemic control in patients with diabetes. Severe hypoglycemia causes QT prolongation, which is a strong risk factor for severe ventricular arrhythmias and sudden death. Severe hypoglycemia is one of the predictors of ASCVD in those with T2DM. However, recent CVOTs did not show a link between hypoglycemia and increased CV morbidity or mortality.

Comprehensive multimodality cardiometabolic therapies

Recommendations for hypoglycemia

R2.36 Educating patients and their caregivers on the prevention, recognition, and prompt treatment of hypoglycemia is important. Use of diabetes technology that detects and warns patients of hypoglycemia (CGM) should be considered in patients with recurrent hypoglycemia and tailoring glycemic control regimens to reduce risk (particularly sulphonylureas and insulin)

Heart diseases and vascular diseases

Prevention and treatment of heart failure in patients with impaired glucose metabolism includes the following:

Recommendations for heart diseases and vascular diseases

R2.37 Lifestyle intervention particularly weight loss and cardiac rehabilitation

R2.38 Pharmacotherapies combining SGLT-2 inhibitor with ARNI or ACE inhibitor, MRA, and ß blockers for HFREF

R2.39 Treatment of atrial fibrillation in patients with impaired glucose metabolism for stroke prevention and rate versus rhythm control, where SGLT-2 inhibitor has been shown to decrease atrial fibrillation incidence and progression . Specific GLp1 RA reduce the incidence of stroke (liraglutide , dulaglutide and semaglutide)

R2.40 Use of specific GLP1-RA with CV benefit (liraglutide , semaglitide , dulaglutide) and metabolic surgery in diabetic patients with obesity and heart failure (in particular HFPEF) has been shown to improve hypertension, sleep apnea, atrial fibrillation burden as well as functional capacity and MRI/ECHO parameters of diastolic dysfunction. Metabolic surgery is associated with a 62% reduced risk of developing heart failure

Comprehensive multimodality cardiometabolic therapies

Coronary artery disease and coronary syndrome

R2.41 A stable chronic coronary syndrome is managed by both disease-modifying agents and symptomatic antianginal therapy;

1. Disease-modifying agents include dual antiplatelet (aspirin plus clopidogrel), statins, and ACE inhibitors.
2. Symptomatic therapy for angina includes β-blockers, nitrates, non-dihydro- pyridine calcium channel blockers, trimetazidine, ivabradine, and ranolazine.

R2.42 Dysglycemia adds more risk to cardiac conditions; in this respect, T2DM increases the percentage of small dense LDL, which is more readily deposited in the blood vessels, and according to the recent evidence, using specific GLP1 receptor agonist with CV benefit (liraglutide , semaglutide and dulaglutide) is recommended for the high-risk patients to reduce CV events, especially MI and stroke.

Atrial fibrillation

In diabetic patients with atrial fibrillation (non-valvular), the risk of embolic stroke is markedly elevated.

Recommendations for atrial fibrillation

R2.43 For stroke prevention, direct oral anti-coagulants (apixaban 5 mg bid, dabigatran 150 mg bid, edoxaban 60 QD, and rivaroxaban 20 QD) are superior to warfarin with 60% reduced risk of intracranial hemorrhage. However, unlike the other direct oral anti-coagulants, DM patients treated with apixaban bled more (3.0%/year) than did subjects without diabetes (1.9%/year). Standard dosing is recommended except with significant CKD.

R2.44 Aspirin is not recommended as it is inferior and does not reduce the risk of bleeding.

R2.45 Atrial fibrillation is managed through:

1. Rate or rhythm control, which can be accomplished through medication or pulmonary vein isolation
2. Upstream management, which addresses the underlying disease and precipitating factors, especially sleep apnea and obesity, which are major triggers of atrial fibrillation recurrence.

Comprehensive multimodality cardiometabolic therapies

Chronic heart failure and diabetic cardiomyopathy

Chronic heart failure is the third most common cardiac condition in dysglycemia patients, and it is the least well-recognized and poorly diagnosed, commonly presenting as heart failure with preserved ejection fraction. The symptoms of heart failure in outpatient diabetics are often vague and contribute to the misdiagnosis

Recommendations for chronic heart failure and diabetic cardiomyopathy

R2.46 Key symptoms that should be asked about during every visit include exertional fatigue, inability to go one flight upstairs (NYHA functional class-II), lower limb edema, and exertional palpitation. NT-proBNP and an ECG should be obtained with a fast-track referral to a cardiologist, and a detailed Echo should be obtained

R2.47 For an asymptomatic diabetic patient, an annual screening with NT-ProBNP is recommended to diagnose the early stages of HF, initiate the guideline-directed therapy for heart failure, and obtain an Echo

R2.48 The biomarker thresholds for clinical use in the out- patient diabetic setting include a BNP >50 pg/mL and NT-proBNP >125 pg/mL.

1. Advanced age, more advanced CKD or atrial fibrillation, anemia, OSA, pulmonary hypertension, critical illness, and sepsis, may lead to higher concentrations of prognostic biomarkers.

2. Obesity may lower natriuretic peptide concentrations even in the presence of significant HF risk

R2.49 If a patient has an abnormal NT-proBNP or BNP above the cutoff point, this confirms the presence of heart failure; thus, referral for Echo and cardiology evaluation is recommended; however, it is recommended to immediately initiate SGLT2-inhibitor therapy even prior to ECHO and RAAS inhibitor (ARNI is preferred over ACE inhibitors and ARBs in addition to MRA). In HFPEF addition of GLp1 RA semaglutide reduced HF hospitalization and improved QOL

Comprehensive multimodality cardiometabolic therapies

Chronic Kidney Disease

The clinical importance of screening and treating patients with diabetes and CKD / DKD to preserve kidney function and reduce CV risk is highlighted. Proteinuria indicates abnormal excretion of protein by the kidneys, whereas albuminuria refers to an abnormal excretion rate of the specific protein albumin. It is a marker of endothelial dysfunction and increased risk for CV morbidity and mortality, especially, but not exclusively, in high-risk populations such as diabetics and hypertensives.

CKD is classified based on: Cause (c) GFR (G) Albuminuria (A)				Albuminuria categories Description and range		
				A1	**A2**	**A3**
				Normal to mildly increased	Moderately increased	Severely increased
				<30mg/g <3 mg/mmol	30-299 mg/g 3-29 mg/mmol	Severely increased
GFR categories (mL/min per 1.73 m²) Description and range	**G1**	Normal or high	≥90	Screen 1	Treat 1	Treat & refer 1
	G2	Mildly decreased	60-98	Screen 1	Treat 1	Treat & refer 3
	G3a	Mild to moderately decr.	45-59	Treat 1	Treat 2	Treat & refer 3
	G3b	Moderately to severely decr.	30-44	Treat 2	Treat & refer 3	Treat & refer 3
	G4	Severely decreased	15-29	Treat & refer 3	Treat & refer 3	Treat & refer 4+
	G5	Kidney failure	<15	Treat & refer 4+	Treat & refer 4+	Treat & refer 4+

Table 4: KDIGO 2022, clinical practice guideline for diabetes management in CKD

Patients with progressive diabetic kidney disease are twice more likely to have CVD events and die of CVD than patients with renal complications. It reflects the urgent need for intensification of multiple protective therapies and increased frequency of testing and referral.

Comprehensive multimodality cardiometabolic therapies

Recommendations for chronic kidney disease

The clinical importance of screening and treating patients with diabetes and CKD / DKD to preserve kidney function and reduce CV risk is highlighted. Proteinuria indicates abnormal excretion of protein by the kidneys, whereas albuminuria refers to an abnormal excretion rate of the specific protein albumin. It is a marker of endothelial dysfunction and increased risk for CV morbidity and mortality, especially, but not exclusively, in high-risk populations such as diabetics and hypertensives.

R2.50 People with diabetes and moderately elevated ACR and/ or eGFR <60 should be referred to the relevant specialists.

R2.51 ACE inhibitors and ARBs are not recommended for the primary prevention of CKD in patients with diabetes who have normal blood pressure, normal urine albumin- creatinine ratio, and normal eGFR.

R2.52 In the treatment of albuminuria/nephropathy, both ACE inhibitors and ARBs can be used.

R2.53 In T1DM with or without hypertension, with microalbuminuria or clinical albuminuria, ACE inhibitors are the initial agents of choice.

R2.54 In hypertensive T2DM with microalbuminuria or clinical albuminuria, ACE inhibitors or ARBs are the initial agents of choice. If one class is not tolerated, the other should be substituted.

R2.55 Besides optimum blood glucose control, in patients with T2DM and CKD, both SGLT2 and a selective nonsteroidal mineralocorticoid receptor agonist, finerenone, can be used, alone or in combination, early in a wide range of DKD to reduce cardiac events and renal worsening.

R2.56 The use of an SGLT2-inhibitor in patients with an eGFR <60 and ≥20 mL/ min/1.73 m2 or urinary albumin ≥30 mg/g creatinine is recommended to reduce CKD progression and CV events.

R2.57 In patients with a broad range of diabetic CKD stage, 1–4 with GFR 90-25 mL/min or urine albumin-creatinine ratio 30–300 mg/gm are at significantly increased risk of both CV events and CKD progression or are unable to use an SGLT2-inhibitor, finerenone is recommended to reduce CKD progression and CV events.

R2.58 Both SGLT2-inhibitors and finerenone can be safely used together in DKD. Both SGLT2-inhibitors and finerenone can be safely used together in DKD. Metformin is recommended for use in most patients with T2D and CKD who have eGFR >30 ml/min/1.73 m2 in combination with other agents

Initiation of metformin with dose titration based on eGFR

- eGFR ≥60 or between 45–59 ml/min/1.73m²
  - Immediate release (IR): initial 500 mg or 850mg once daily with uptitra- tion by 500 or 850mg/day every 7 days until maximum dose
  - Extended release: if GI side effects from IR; initial dose 500mg/day to be uptitrated by 500mg/day every 7 days until maximum dose
- eGFR 30-44 ml/min/1.73m²
  - initiate at half of the dose and uptitrate to half of maximum_recom- mended dose

Multidisciplinary Referral to Address the Comorbidities

URGENT referral of symptomatic patients is essential. This would include the following:

- Hypertension has difficulty in achieving the target blood pressure
- ECG changes or chest symptoms suspicious of CAD
- Palpitations
- Atrial fibrillation (including asymptomatic) or another arrhythmia
- Heart failure symptoms such as dyspnea and pedal edema, pulmonary congestion on chest X-ray, or elevated BNP or NT-proBNP
- Syncope and loss of consciousness
- Chest pain and dyspnea
- Claudication symptoms

People with CVD disease or end-organ damage or those who are screen positive should be treated as a very high-risk group as detailed below
Please refer to RISK TABLE: ANY ABNORMAL SCREENING TEST = VERY HIGH RISK , IF NEGATIVE SCORE = USE SCORING TABLE

Risk Category	SGLT2-I* or GLP1RA* Rx regardless of glycemic control , target or metformin	Glycemic control	BP target and Rx choice	LDL targets and Rx choice	Antiplatelets
Very high CV risk	Start in people with T2D & prediabetes	If above target combines SGLT2-I* with GLP1-RA* in people with T2D	<130/80 Use ACE-I or AII-A(ARB)	LDL <55 mg/dl Use high-intensity lipid-lowering therapy**	Indicated
High CV risk	Not routinely indicated	If above target use either SGLT2* or GLP1-RA* in people with T2D	<130/80 Use ACE-I or AII-A(ARB)	LDL <70 mg/dL Use high-intensity lipid-lowering therapy**	Consider
Moderate CV risk	Not routinely indicated	Use any glycemic agent according to EDES guidelines and type of diabetes	<130/80 Use any antihypertensive agent	LDL <100 mg/dL Use moderate-intensity statin**	Not indicated
Low CV risk	Not routinely indicated	Use any glycemic agent according to EDES guidelines and type of diabetes	<130/80 Use any antihypertensive agent	LDL <120 mg/dL Consider moderate-intensity statin	Not indicated

Table 5: Management of cardiometabolic parameters . *Choose an agent with CVOT evidence of benefit. SGLT2-I is the preferred choice in HF and/or CKD, while specific GLP1-RA (liraglutide, semaglutide , dulaglutide) is the preferred choice in atherosclerotic conditions. **If LDL target is not achieved with a statin, then add other lipid-lowering agents with evidence of benefit (see lipid section). Consider TG and non-HDL-C and APO-B as additional therapeutic targets as per guidelines .

Management Algorithm

Diabetic hypertension & LVH	ACEi or ARBs
	SGLT-2 inhibitor
	GLP-1A
	High intensity lipid lowering therapy
Diabetic ASCVD / MI	ACEi preferred over ARBs
	SGLT-2 inhibitor
	GLP-1A
	High intensity lipid lowering therapy
	Aspirin low dose Rivaroxaban
Erectile dysfunction	SGLT-2 inhibitor
	GLP-1A
	ARBs / ACEi
	Antiplatelets
	High intensity lipid loweing therapy
	Avoid beta blockers
Diabetic renal failure / CKD	SGLT-2 inhibitor
	GLP-1A
	Finerenone
	High intensity lipid lowering therapy

Diabetic foot	GLP-1
	Aspirin
	ACEi
	Low dose Rivaroxaban
	High intensity lipid lowering therapy
Atrial fibrillation / abnormal ECG	Anti-coagulants
	SGLT-2 inhibitor
	GLP-1A
	ARBs / ACEi
	Beta blocker
	High intensity lipid lowering therapy
Diabetes with obesity & NAFLD	Lifestyle modification
	Weight management
	GLP-1RA
	SGLT-2 inhibitor
	Metabolic surgery
	Sleep apnea evaluation
	Lipid lowering therapy based on risk

Diabetic Heart Failure	SGLT-2 inhibitor
	GLP-1A
	ARNI > ACEi or ARBs
	Avoid pioglitezone and Saxogliptin
	High intensity lipid lowering therapy
	Beta blocker + MRA

Diabetic Heart Failure	ACEi or ARBs
	SGLT-2 inhibitor
	GLP-1
	High intensity lipid lowering therapy + Fibrates
	Aspirin

KPIs and Recommendations

Screening for High Risk of Cardiometabolic Events

Description Title	Screening of prediabetic and diabetic patients for risk of cardiometabolic events
Definition	Percentage of patients with prediabetes and diabetes who underwent BP, BMI, Retinal examination, ECG & NT-ProBNP, Serum Creatinine, GFR, UACR, Lipids profile, CBC, HbA1c, Additional biomarkers HsCRP , HsTroponin , Lipoprotein(a) for risk stratification for cardiometabolic events
Numerator	Number of patients with prediabetes and diabetes who underwent BP, BMI, Retinal examination, ECG & NT-ProBNP, Serum Creatinine, GFR, UACR, Lipids profile, CBC, HbA1c, Additional biomarkers HsCRP , HsTroponin , Lipoprotein(a) for risk stratification for cardiometabolic events in a measurement year
Denominator	Patients diagnosed with prediabetes, type 2 diabetes mellitus,
Exclusion criteria	Patients not diagnosed with prediabetes and diabetes
Unit of measure	Percentage (Numerator/Denominator x 100)
Measure Target and/or Threshold	Higher is better
Rationale	In clinical practice, it is important to precisely recognize individuals at elevated risk for cardiometabolic events, as this enables the implementation of more comprehensive risk factor management and helps to reduce the likelihood of a heart failure (HF) event or atherosclerotic cardiovascular disease (ASCVD).

Coronary Artery Calcium (CAC) Score for assessment of Cardiovascular Risk

Description Title	Coronary Artery Calcium (CAC) Score with Non-contrast Computed Tomography (CT) for assessment of Cardiovascular Risk in Asymptomatic Patients with Diabetes Mellitus (DM) at Moderate Risk
Definition	Percentage of patients with a diagnosis of DM with moderate risk (CV risk score of 2) , in whom CAC with non-contrast CT was done during the measurement year.
Numerator	Percentage of patients with a diagnosis of DM with moderate risk(CV risk score of 2) , in whom CAC with non-contrast CT was done during the measurement year.
Denominator	Patients diagnosed with Prediabetes, Type 2 DM
Exclusion criteria	Patients not diagnosed with DM
Unit of measure	Percentage (Numerator/Denominator x 100)
Measure Target and/or Threshold	Higher is better
Rationale	Measurement of CAC score by non-contrast cardiac CT is an inexpensive, low-radiation imaging method to detect and quantify coronary artery atherosclerotic plaque burden. Measurement of CAC score is an effective marker to refine cardiovascular risk stratification in an asymptomatic population. Studies have shown that across age groups, asymptomatic adults with diabetes have higher median CAC scores than individuals without diabetes.; however, CAC scoring does not allow for differentiation between non-obstructive and obstructive CAD.

Assessment of Microalbuminuria in Patients with Diabetes Mellitus to Identify Risk of Developing Renal Dysfunction or Cardiovascular Disease (CVD)

Description Title	Assessment of Microalbuminuria in Patients with Diabetes Mellitus to Identify Risk of Developing Renal Dysfunction or Cardiovascular Disease (CVD)
Definition	Percentage of patients with a diagnosis of DM in whom urine microalbumin test was done during the measurement year.
Numerator	Number of patients with a diagnosis of DM in whom urine microalbumin test was done during the measurement year.
Denominator	Patients diagnosed with Prediabetes, Type 2 DM
Exclusion criteria	Patients not diagnosed with DM
Unit of measure	Percentage (Numerator/Denominator x 100)
Measure Target and/or Threshold	Higher is better
Rationale	Microalbumin is a marker of endothelial dysfunction and increased risk of cardiovascular morbidity and mortality, particularly in high-risk patients such as patients with DM and hypertension. DM Patients with progressive diabetic kidney disease are twice more likely to develop CV events and death compared to patients without renal complications.

Annual B-type natriuretic peptide (NT-ProBNP) and Echocardiogram (ECHO) for Assessment of Heart Failure in Patients with Diabetes Mellitus (DM)

Description Title	Annual B-type natriuretic peptide (NT-ProBNP) and Echocardiogram (ECHO) for Assessment of Heart Failure in Patients with Diabetes Mellitus (DM)
Definition	Percentage of patients with DM, who underwent NT-ProBNP test and ECHO, during mesurement year.
Numerator	Number of patients with DM, who underwent NT-ProBNP test and ECHO, during mesurement year.
Denominator	Patients diagnosed with DM
Exclusion criteria	Patients not diagnosed with DM
Unit of measure	Percentage (Numerator/Denominator x 100)
Measure Target and/or Threshold	Higher is better
Rationale	In diabetic patients receiving outpatient care, the signs of heart failure can be subtle, leading to incorrect diagnoses. It is essential to inquire about specific symptoms at each appointment, such as fatigue when exerting oneself, difficulty climbing a single flight of stairs (reflecting NYHA functional class-II), swelling in the lower extremities, and palpitations during physical activity. In these cases, it is advisable to measure NT-proBNP levels and perform an ECG, followed by a prompt referral to a cardiology specialist. A comprehensive echocardiogram should also be conducted. For diabetic patients without symptoms, the American Diabetes Association recommends yearly NT-proBNP screening to detect heart failure in its initial stages, to start treatment in accordance with established guidelines, and to carry out an echocardiogram.

Appropriate pharmacological treatment in T2DM Patients at High-Risk for Cardiovascular (CV) Events

Description Title	Prescription of Glucagon-Like Peptide-1 Receptor Agonists/Sodium-Glucose Cotransporter -2 inhibitors(GLP-1 RA/SGLT-2i) in DM Patients at High-Risk for CV Events
Definition	Percentage of patients with a diagnosis of DM and high-risk for CV events(diabetes duration ≥10 years without target organ damage plus any other additional risk factor) who received treatment with GLP-1 RA/SGLT-2i during the measurement year.
Numerator	Number of patients with a diagnosis of DM and high-risk for CV events(diabetes duration ≥10 years without target organ damage plus any other additional risk factor)who received treatment with GLP1 Agonists during the measurement year.
Denominator	Patients diagnosed with DM with high-risk for CV events
Exclusion criteria	Patients not diagnosed with DM
Unit of measure	Percentage (Numerator/Denominator x 100)
Measure Target and/or Threshold	Higher is better
Rationale	Multiple large cardiovascular outcome trials have shown that GLP1 agonists/SGLT-2 inhibitors reduces major adverse cardiovascular events and additional cardiovascular outcomes, such as hospitalization for heart failure. Therefore, diabetes and cardiology guidelines and professional societies recommend GLP-1 RA/SGLT-2 inhibitors to reduce cardiovascular risk in high-risk individuals with DM, regardless of glycemic control.

Appropriate pharmacological treatment in patients with T2DM and Chronic Kidney Disease (CKD) to Reduce Cardiovascular (CV) Events

Description Title	Prescription of Sodium-Glucose Cotransporter -2 inhibitors (SGLT-2i) in Patients with Diabetes Mellitus and Chronic Kidney Disease (CKD) to Reduce Cardiovascular (CV) Events
Definition	Percentage of DM patients with CKD, in whom SGLT2-inhibitors was prescribed, during the measurement year.
Numerator	Number of DM patients with CKD, in whom SGLT2-inhibitors was prescribed, during the measurement year.
Denominator	Patients diagnosed with DM and CKD
Exclusion criteria	DM Patients without CKD
Unit of measure	Percentage (Numerator/Denominator x 100)
Measure Target and/or Threshold	Higher is better
Rationale	SGLT2-inhibitor in patients with an eGFR <60 and ≥20 mL/min/1.73 m2 or urinary albumin ≥30 mg/g creatinine is recommended to reduce CKD progression and CV events.

The use of ACEi or ARBs and SGLT2i and Finerenone in the treatment of diabetic albuminuria/diabetic nephropathy

Description Title	The use of ACEi or ARBs and SGLT2i and Finerenone in the treatment of diabetic albuminuria/diabetic nephropathy
Definition	Percentage of patients with a diagnosis of DM and high-risk for CV events(diabetes duration ≥10 years without target organ damage plus any other additional risk factor) who received treatment with GLP-1 RA/SGLT-2i during the measurement year.
Numerator	Number of patients with a diagnosis of DM and high-risk for CV events(diabetes duration ≥10 years without target organ damage plus any other additional risk factor)who received treatment with GLP1 Agonists during the measurement year.
Denominator	Patients diagnosed with DM with high-risk for CV events
Exclusion criteria	Patients not diagnosed with DM
Unit of measure	Percentage (Numerator/Denominator x 100)
Measure Target and/or Threshold	Higher is better
Rationale	Multiple large cardiovascular outcome trials have shown that GLP1 agonists/SGLT-2 inhibitors reduces major adverse cardiovascular events and additional cardiovascular outcomes, such as hospitalization for heart failure. Therefore, diabetes and cardiology guidelines and professional societies recommend GLP-1 RA/SGLT-2 inhibitors to reduce cardiovascular risk in high-risk individuals with DM, regardless of glycemic control.

Prescribing high-intensity statin up to the highest tolerated dose as first line therapy for dyslipidemia in T2DM patients

Description Title	Prescribing high-intensity statin up to the highest tolerated dose as first line therapy for dyslipidemia in T2DM patients
Definition	Percentage of patients with a diagnosis of T2DM and dyslipidemia who are receiving high intensity statins as first line of treatment
Numerator	Number of patients with a diagnosis of T2DM and dyslipidemia who are receiving high intensity statins as first line of treatment
Denominator	Patients diagnosed with T2DM and dyslipidemia
Exclusion criteria	Patients not diagnosed with DM
Unit of measure	Percentage (Numerator/Denominator x 100)
Measure Target and/or Threshold	Higher is better
Rationale	American Diabetes Association (ADA): Recommends high-intensity statin therapy for most adults with diabe- tes aged 40-75 years with LDL-C levels of 70-189 mg/dL, regardless of their baseline cholesterol levels, due to the high cardiovascular risk associated with diabetes. American College of Cardiology (ACC) and American Heart Association (AHA): These guidelines also support the use of high-intensity statins in patients with diabetes aged 40-75 years, particularly if they have multiple risk factors or a higher estimated 10-year atherosclerotic cardiovascular disease (ASCVD) risk.

Timely addition of PCSK9 targeted therapy in patients not achieving the LDL target (on maximally tolerated statin therapy) or patients with “statin intolerance.”

Description Title	Timely addition of PCSK9 targeted therapy in patients not achieving the LDL target (on maximally tolerated statin therapy) or patients with “statin intolerance.”
Definition	Percentage of T2DM patients on maximally tolerated statin therapy and ezetimibe or with statin intolerance who are prescribed PCSK9 targeted therapy.
Numerator	Number of patients with dyslipidemia and T2DM on maximally tolerated statin therapy and ezetimibe or with statin intolerance who are prescribed PCSK9 targeted therapy.
Denominator	Patients diagnosed with T2DM and Dyslipidemia who did not achieve LDL target
Exclusion criteria	Patients without T2DM
Unit of measure	Percentage (Numerator/Denominator x 100)
Measure Target and/or Threshold	Higher is better
Rationale	ADA Guidelines: Recommend considering PCSK9 inhibitors for patients with T2DM and atherosclerotic cardio- vascular disease (ASCVD) or those at very high risk for ASCVD who do not achieve LDL-C targets with statins and ezetimibe. ACC/AHA Guidelines: Suggest the use of PCSK9 inhib- itors for high-risk patients, including those with T2DM, who have not reached LDL-C goals despite maximally tolerated statin and ezetimibe therapy.

Appropriate pharmacological treatment for Stroke Prevention in Diabetic Patients with Atrial Fibrillation

Description Title	Prescription of Direct Oral Anti-coagulants for Stroke Prevention in Diabetic Patients with Atrial Fibrillation
Definition	Percentage of DM patients diagnosed with atrial fibrillation, in whom direct oral anti-coagulants (apixaban 5mg, dabigatran 150mg, edoxaban 60mg, rivaroxaban 20mg)was prescribed, during the measurement year.
Numerator	Percentage of DM patients diagnosed with atrial fibrillation, in whom direct oral anti-coagulants (apixaban 5mg, dabigatran 150mg, edoxaban 60mg, rivaroxaban 20mg)was prescribed, during the measurement year.
Denominator	DM Patients diagnosed with atrial fibrillation
Exclusion criteria	DM Patients without diagnosis of atrial fibrillation
Unit of measure	Percentage (Numerator/Denominator x 100)
Measure Target and/or Threshold	Higher is better
Rationale	In patients with diabetes diagnosed with atrial fibrillation, risk for development of embolic stroke is markedly high. Therefore, for stroke prevention, direct oral anti-coagulants are recommended. Direct oral-anticoagulants are considered more effective compared to warfarin and reduce the risk of intracranial hemorrhage by 60%.

Appropriate pharmacological treatment for patients with Diabetes Mellites Diagnosed with Heart Failure

Description Title	Combining SGLT-2 inhibitor with ARNI or ACE /ARB inhibitor, MRA, and ß blockers as a first choice in DM with CHF
Definition	Percentage of DM patients diagnosed with heart failure, in whom SGLT-2I, ARNI,MRA, was prescribed, during the measurement year.
Numerator	Percentage of DM patients diagnosed with heart failure, in whom SGLT-2I, ARNI,MRA, was prescribed, during the measurement year.
Denominator	DM Patients diagnosed with heart failure
Exclusion criteria	Patients without diagnosis of DM
Unit of measure	Percentage (Numerator/Denominator x 100)
Measure Target and/or Threshold	Higher is better
Rationale	In treatment of patients with diabetes diagnosed with heart failure, combination of SGLT-2i, ARNI and MRA, is recommended. These drugs exhibit synergistic benefits in reduction of cardiovascular morbidity and mortality, in DM patients diagnosed with heart failure.

Referral of Patients with Diabetes Mellitus (DM) at high risk of cardiovascular events to Cardiologist

Description Title	Referral of Patients with Diabetes Mellitus(DM) to Cardiologist
Definition	Percentage of patients with diagnosis of DM who were referred to a cardiologist during the measurement year.
Numerator	Number of patients with diagnosis of DM who were referred to a cardiologist during the measurement year.
Denominator	Total number of adults with DM during the measurement year
Exclusion criteria	Members who do not have a diagnosis of DM during the measurement year
Unit of measure	Percentage (Numerator/Denominator x 100)
Measure Target and/or Threshold	Higher is better
Rationale	The assessment of cardiometabolic risks in patients with DM is likely to be done by a primary physician or diabetologist; early referral of the DM patients with high risk for CV events, to a cardiologist, is critically to reduce the CV events and improve clinical outcomes.

Referral of Patients with Diabetes Mellitus(DM) to Nephrologist

Description Title	Referral of Patients with Diabetes Mellitus(DM) to Nephrologist
Definition	Percentage of patients with diagnosis of DM and eGFR<30ml/min/1.73m^2 referred to Nephrologist during the measurement year.
Numerator	Number of patients with diagnosis of DM and eGFR<30ml/min/1.73m^2 referred to Nephrologist during the measurement year. .
Denominator	Total number of adults with DM during the measurement year
Exclusion criteria	Members who do not have a diagnosis of DM during the measurement year
Unit of measure	Percentage (Numerator/Denominator x 100)
Measure Target and/or Threshold	Higher is better
Rationale	The early detection of diabetic kidney disease (DKD) is a key to reduce complications, morbidity and mortality. Consensus documents and clinical practice guidelines recommend referral of DM patients to nephrology when the estimated glomerular filtration rate falls below 30 mL/min/1.73 m^2 or when albuminuria exceeds 300 mg/g urinary creatinine.

Referral of Patients with diabetic foot and PAD to appropriate specialists

Description Title	Referral of Patients with diabetic foot and PAD to appropriate specialists
Definition	Percentage of patients with diagnosis of DM who were referred to an appropriate specialist for diabetic foot/PAD during the measurement year.
Numerator	Number of patients with diagnosis of DM who were referred to an appropriate specialist during the measurement year.
Denominator	Total number of adults with DM during the measurement year
Exclusion criteria	Members who do not have a diagnosis of DM during the measurement year
Unit of measure	Percentage (Numerator/Denominator x 100)
Measure Target and/or Threshold	Higher is better
Rationale	The presence of diabetic foot and severe peripheral neuropathy both indicate advanced target organ damage, which itself classifies diabetic patients at very high risk for CV events. Simultaneous referral to the specialty for surgical management and limb salvage as well as to cardiology for detailed assessment of associated CVD is recommended.

Referral of Patients with Diabetes Mellitus(DM) to Nephrologist

Description Title	Referral of Patients with Diabetes Mellitus(DM) to Nephrologist
Definition	Percentage of patients with diagnosis of DM and eGFR<30ml/min/1.73m^2 referred to Nephrologist during the measurement year.
Numerator	Number of patients with diagnosis of DM and eGFR<30ml/min/1.73m^2 referred to Nephrologist during the measurement year. .
Denominator	Total number of adults with DM during the measurement year
Exclusion criteria	Members who do not have a diagnosis of DM during the measurement year
Unit of measure	Percentage (Numerator/Denominator x 100)
Measure Target and/or Threshold	Higher is better
Rationale	The early detection of diabetic kidney disease (DKD) is a key to reduce complications, morbidity and mortality. Consensus documents and clinical practice guidelines recommend referral of DM patients to nephrology when the estimated glomerular filtration rate falls below 30 mL/min/1.73 m^2 or when albuminuria exceeds 300 mg/g urinary creatinine.

Avoidable Hospitalization in Patients with Diabetes Mellitus (DM) and Cardiovascular (CV) Event

Description Title	Avoidable Hospitalization in Patients with Diabetes Mellitus (DM) and Cardiovascular (CV) Event
Definition	Percentage of patients with DM who were hospitalized during the measurement year, due to some cardiovascular event (CAD/heart failure/atrial fibrillation)
Numerator	Number of patients with DM who were hospitalized during the measurement year, due to some cardiovascular event (CAD/heart failure/atrial fibrillation)
Denominator	Total number of patients with DM in the measurement year
Exclusion criteria	Members who do not have a diagnosis of DM during the measurement year
Unit of measure	Percentage (Numerator/Denominator x 100)
Measure Target and/or Threshold	Lower is better
Rationale	In patients with DM, prevalence of cardiovascular events, particularly heart failure, coronary artery disease and stroke, is very high and associated with significant morbidity, hospitalization and mortality. Early detection of CV risk factors, referral to cardiologist and initiation of effective therapy and appropriate preventive strategies to prevent recurrence of CV events are crucial to reduce hospitalization due to CV diseases.

Cost of Hospitalization in Patients with Diabetes Mellitus(DM) Due to Cardiovascular (CV) Event

Description Title	Avoidable Hospitalization in Patients with Diabetes Mellitus (DM) and Cardiovascular (CV) Event
Definition	Percentage of patients with DM who were hospitalized during the measurement year, due to some cardiovascular event (CAD/heart failure/atrial fibrillation)
Numerator	Number of patients with DM who were hospitalized during the measurement year, due to some cardiovascular event (CAD/heart failure/atrial fibrillation)
Denominator	Total number of patients with DM in the measurement year
Exclusion criteria	Members who do not have a diagnosis of DM during the measurement year
Unit of measure	Percentage (Numerator/Denominator x 100)
Measure Target and/or Threshold	Lower is better
Rationale	In patients with DM, prevalence of cardiovascular events, particularly heart failure, coronary artery disease and stroke, is very high and associated with significant morbidity, hospitalization and mortality. Early detection of CV risk factors, referral to cardiologist and initiation of effective therapy and appropriate preventive strategies to prevent recurrence of CV events are crucial to reduce hospitalization due to CV diseases.

Percentage Cost Decrease for Managing Patients with Diabetes Mellitus (DM) with Cardiovascular (CV) Event

Description Title	Percentage Cost Decrease for Managing Patients with Diabetes Mellitus (DM) with Cardiovascular (CV) Event
Definition	Percentage decrease in cost incurred (in AED) for managing patients with DM with CV event (Coronary artery disease/heart failure/stroke) during the measurement year when compared to previous year
Numerator	Difference of total cost (AED) incurred for managing DM with CV event (Coronary artery disease/heart failure/stroke) previous measurement year (A) from current measurement year (B)
Denominator	Total cost incurred for managing patients with DM and CV event (Coronary artery disease/heart failure/stroke)during the previous measurement year (A)
Exclusion criteria	Members who do not have a diagnosis of DM, in any setting, during the measurement year
Unit of measure	A-B/A X 100
Measure Target and/or Threshold	Higher Percentage is better
Rationale	The disease and economic burden of CV events in patients with DM is substantial. Improved clinical outcomes and reduction in associated healthcare costs can be achieved by addressing multiple factors including; greater focus on prevention, early diagnosis, appropriate medical management, implementation of comprehensive lifestyle changes.

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