

Cardiovascular-Kidney- Metabolic Health:

A 2023 Presidential Advisory From the AHA



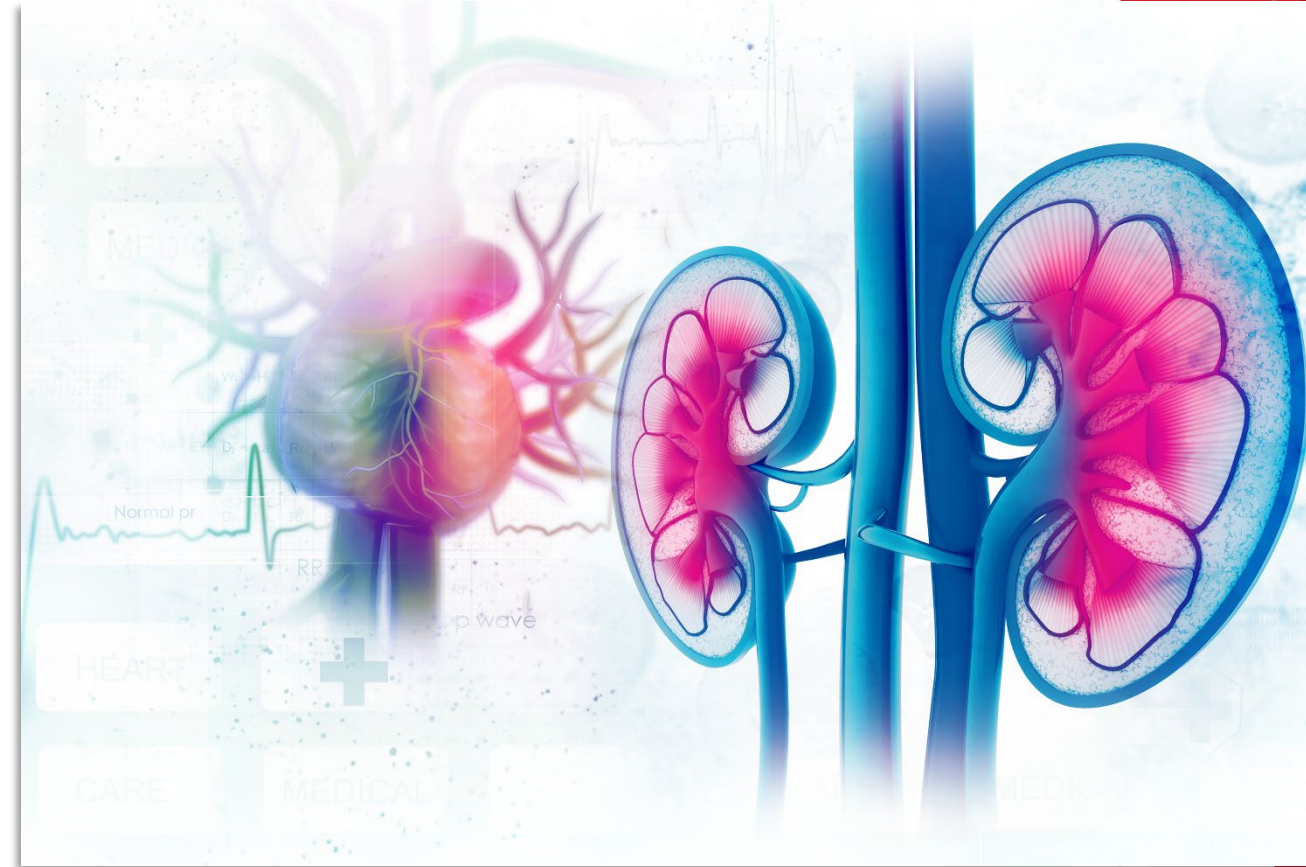
American
Heart
Association.

Definition of Cardiovascular-Kidney-Metabolic Syndrome (CKM)

- » A systemic disorder characterized by pathophysiologic interactions among metabolic risk factors, chronic kidney disease, and the cardiovascular system, leading to multi-organ dysfunction and a high rate of adverse cardiovascular outcomes.
- » CKM syndrome includes both individuals at risk for cardiovascular disease due to the presence of metabolic risk factors and/or chronic kidney disease, and individuals with existing cardiovascular disease that is potentially related to or complicates metabolic risk factors and/or chronic kidney disease.
- » The increased likelihood of CKM syndrome and its adverse outcomes is further influenced by unfavorable conditions for lifestyle and self-care resulting from policies, economics, and the environment.

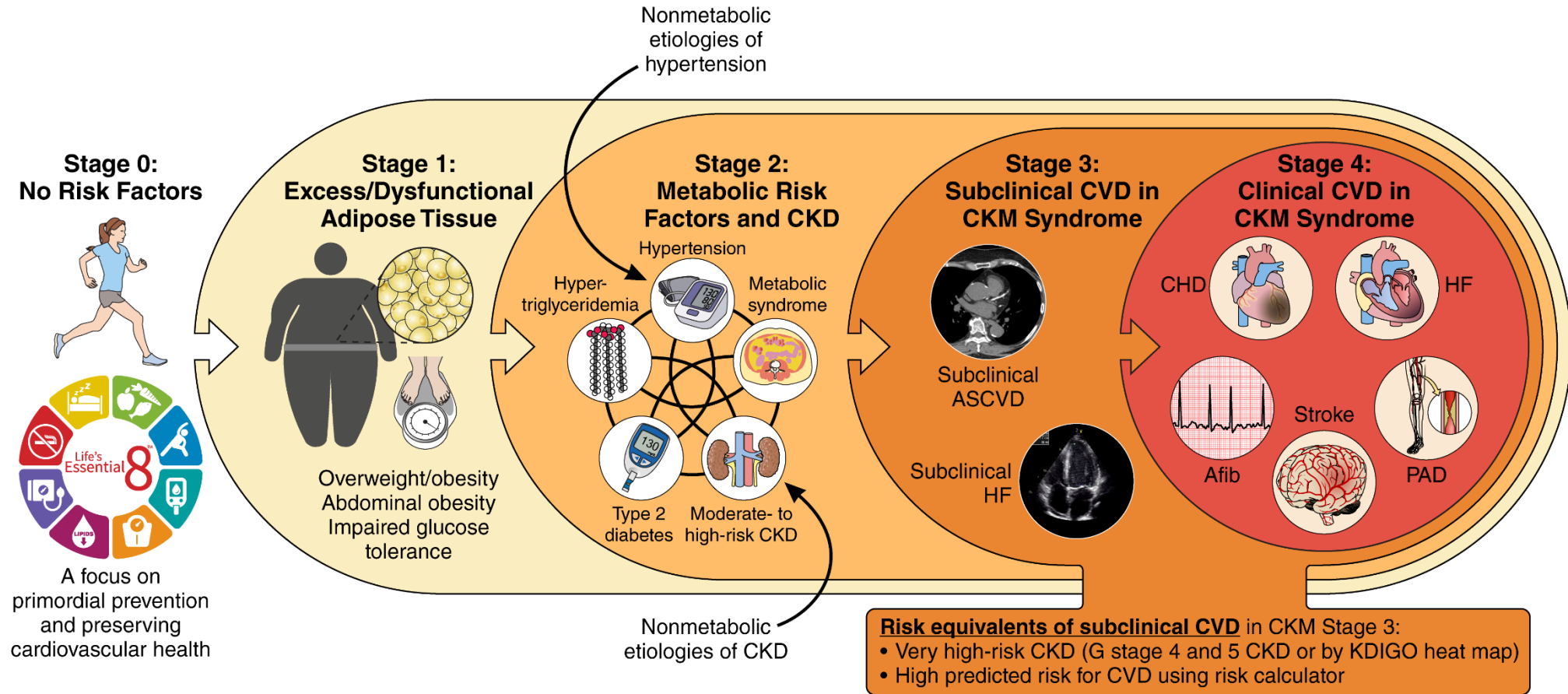
Definition of CKM Syndrome Simplified

Cardiovascular-kidney-metabolic (CKM) syndrome is a health disorder due to connections among heart disease, kidney disease, diabetes, and obesity leading to poor health outcomes.



Abbreviations: CKM indicates Cardiovascular-Kidney-Metabolic.

Stages of Cardiovascular-Kidney-Metabolic Syndrome



Abbreviations: Afib indicates atrial fibrillation; ASCVD, atherosclerotic cardiovascular disease; CHD, coronary heart disease; CKD, chronic kidney disease; CKM, cardiovascular-kidney-metabolic; CVD, cardiovascular disease; HF, heart failure; KDIGO, Kidney Disease Improving Global Outcomes; and PAD, peripheral artery disease.

Rationale for CKM Syndrome Staging

Reflects the pathophysiology of underlying CKM progression

Importance of early detection of under-recognized clinical conditions

Each stage to represent a higher level of absolute clinical risk

Principal focus on cardiovascular disease

The primary cause of premature mortality in relation to poor CKMH is CVD.

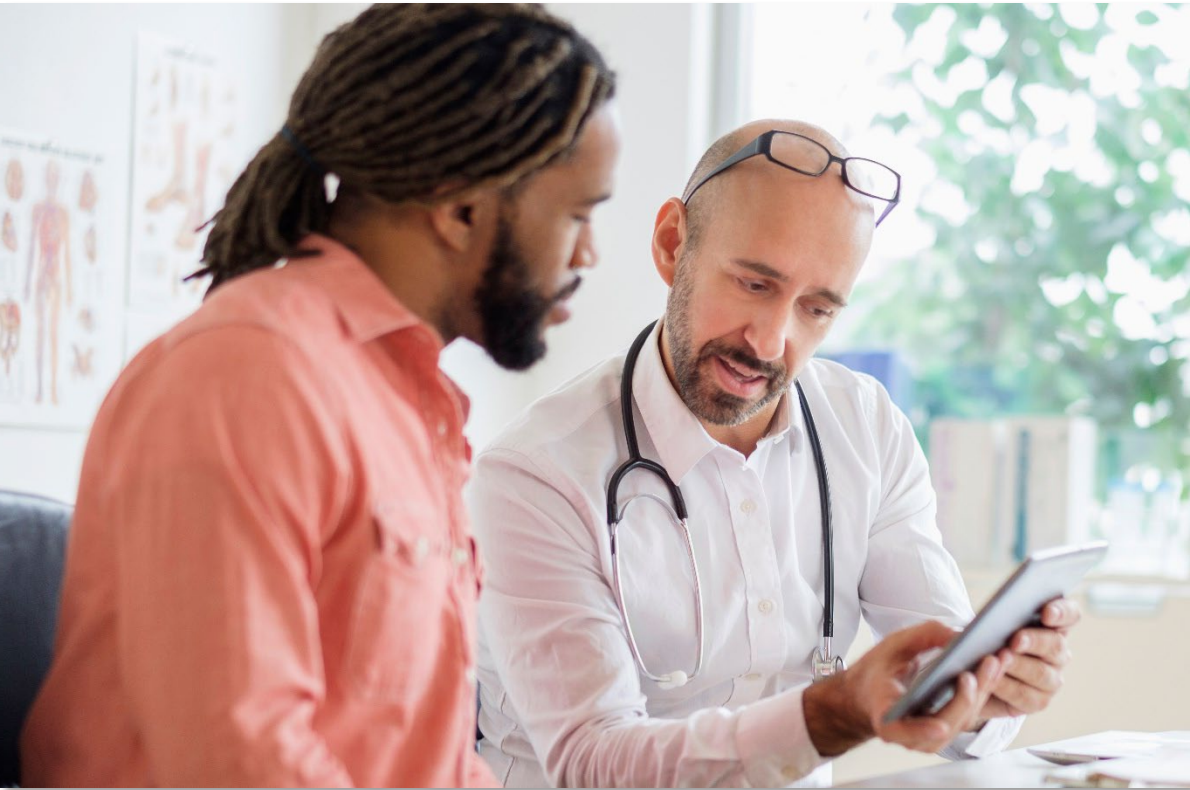
Additional focus on kidney failure

Each stage represents an opportunity for preventive intervention

The goal is to prevent the progression to the next stage

Staging Rationale

Stage 0: No CKM Syndrome Risk Factors



- » Individuals without overweight/obesity, metabolic risk factors, and CKD or subclinical/clinical CVD
- » Primarily encountered in children, adolescents and young adults in the population
- » Focus on primordial prevention

Abbreviations: CKD indicates chronic kidney disease; CKM, Cardiovascular-Kidney-Metabolic; and CVD, cardiovascular disease.

Staging Rationale

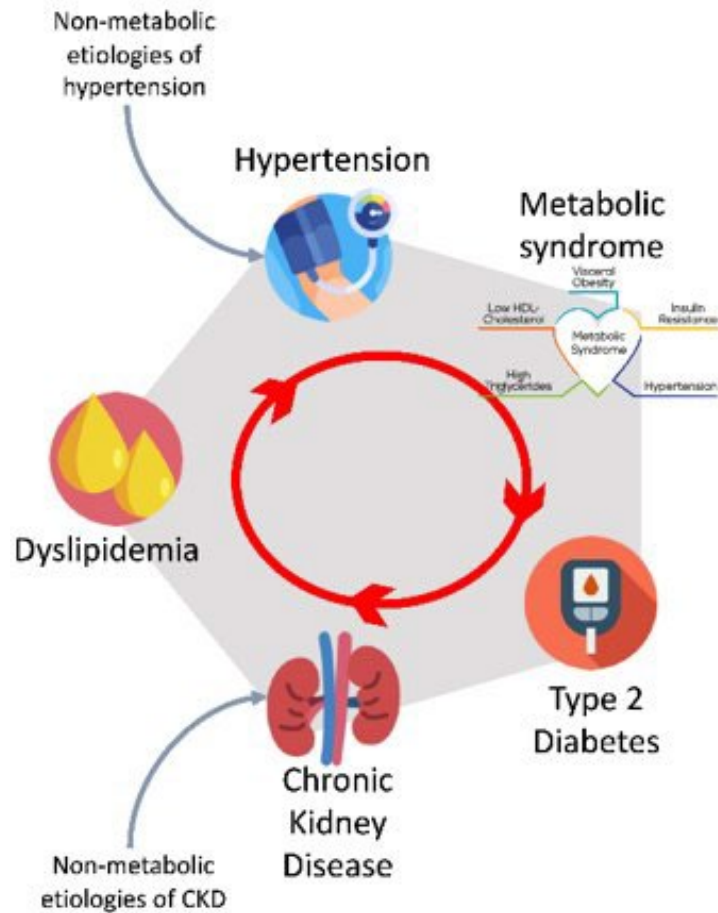
Stage 1: Excess and/or Dysfunctional Adiposity



- » Overweight/obesity, abdominal obesity and/or dysfunctional adipose tissue, without the presence of other metabolic risk factors or CKD
- » Adiposity at root of most metabolic risk factors and CKD but markedly under-addressed
- » Several processes involved in the development of dysfunctional adipose tissue
- » Impaired glucose tolerance is a clinical manifestation
- » History of gestational diabetes increases risk of developing type 2 diabetes

Staging Rationale

Stage 2: Metabolic Risk Factors and CKD

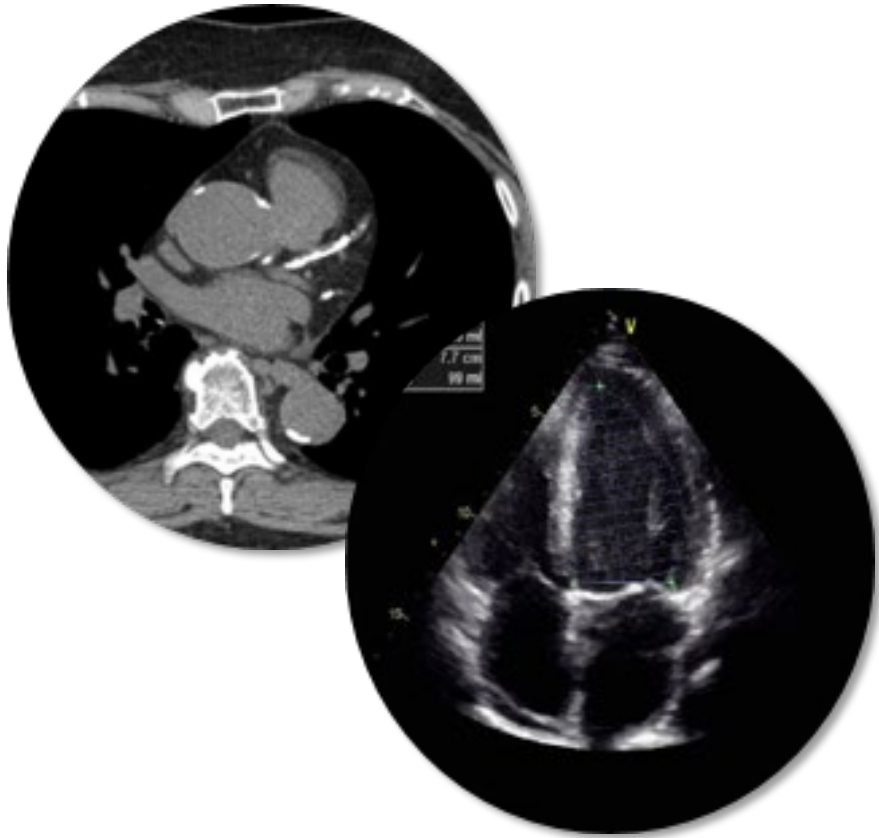


- » The presence of metabolic risk factors and/or CKD
- » Considerable pathophysiologic interactions among conditions
- » Metabolic syndrome emphasizes inter-relatedness of stage 2 conditions
- » Hypertension
- » CKD
- » Emphasis on unique considerations for CVD prevention in the context of CKM conditions

Abbreviations: CKD indicates chronic kidney disease; CKM, Cardiovascular-Kidney-Metabolic; and CVD, cardiovascular disease.

Staging Rationale

Stage 3: Subclinical CVD in CKM



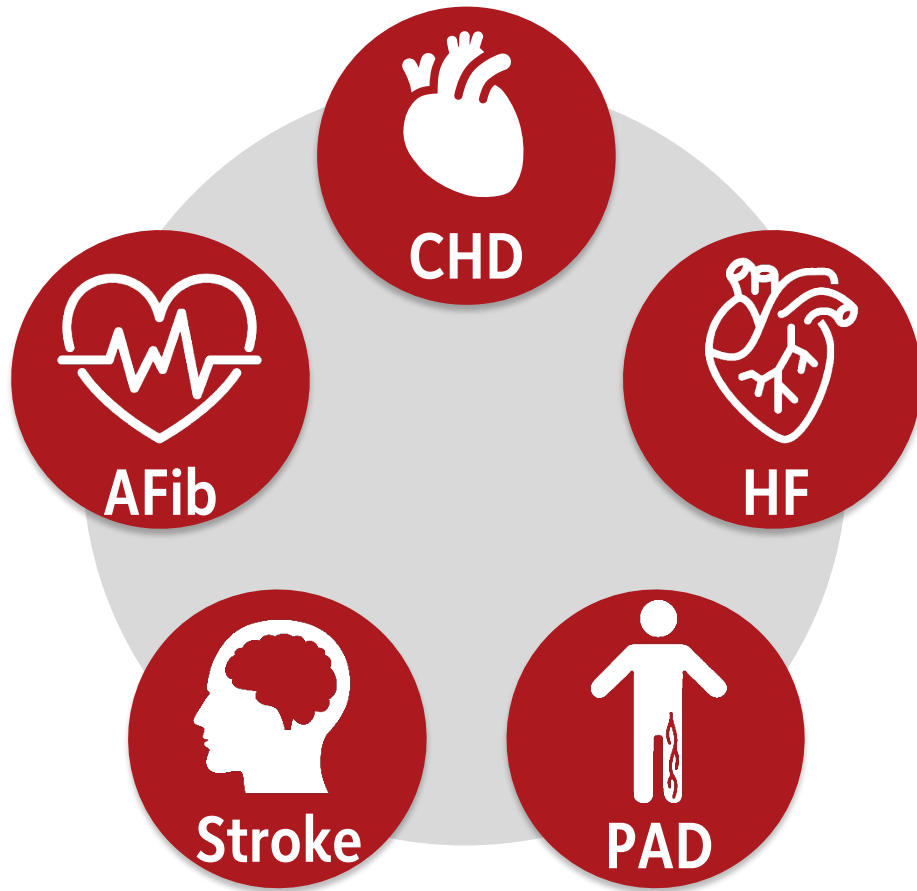
- » Subclinical ASCVD or subclinical HF with excess/dysfunctional adiposity, other metabolic risk factors or CKD
- » Additionally includes risk equivalents of people with high predicted CVD risk and very-high risk CKD
- » Indicates high absolute CVD risk
- » Prompt preventive therapy warranted

Abbreviations: ASCVD indicates atherosclerotic cardiovascular disease; CKD, chronic kidney disease; CKM, Cardiovascular-Kidney-Metabolic; and CVD, cardiovascular disease.

Ndumele, C.E. et al., Cardiovascular-Kidney-Metabolic Health: A Presidential Advisory From the American Heart Association. 2023. *Circulation*.

Staging Rationale

Stage 4: Clinical CVD in CKM



- » Clinical CVD with excess/dysfunctional adiposity, other metabolic risk factors and/or CKD
- » **Stage 4a:** no kidney failure
- » **Stage 4b:** kidney failure present
- » Management for CVD influenced by other CKM Syndrome conditions present

Risk Enhancing Factors in CKMH



- » Chronic inflammatory conditions
- » High-risk demographic groups
- » High burden of adverse SDOH
- » Mental health disorders
- » Sleep disorders
- » History of premature menopause
- » History of adverse pregnancy outcomes
- » Polycystic ovarian syndrome
- » Erectile dysfunction
- » Elevated high-sensitivity C-reactive protein
- » Family history of kidney failure, diabetes

Abbreviations: CKMH indicates Cardiovascular-Kidney-Metabolic Health; and SDOH, social determinants of health.

Screening

Rationale for CKM Syndrome Screening

Detect asymptomatic individuals early for effective prevention

Screening test criteria

Accurate and reproducible

Accessible at the population level and/or routine clinical practice

Targeting where needed to “high yield” populations

Ongoing screening for biological markers

Screening for SDOH

Allows for stage regression

Screening for CKM Syndrome

Early Life Screening Age <21 years



- » Annual screening for overweight and obesity using sex- and age-specific CDC growth charts
- » Mental and behavioral health screening
- » Blood pressure assessment at least annually, and at every visit starting at age 3
- » Fasting lipid panel between ages 9-11 and again between ages 17-21
- » Positive family history of dyslipidemia- begin screening at age 2
- » Screen for glucose intolerance and monitor alanine aminotransferase
- » Assign appropriate CKM Syndrome stage and begin recommended prevention

Screening for CKM Syndrome

Adult Screening Age ≥ 21 years



- » BMI and waist circumference annually
- » Blood pressure, HbA1c and lipid panel at stage-determined intervals
- » Microalbumin and creatinine measurements at stage-determined intervals
- » Screening for MASLD every 1-2 years as directed by guidelines
- » CAC measurements as directed by guidelines

Abbreviations: BMI indicates body mass index; CAC, coronary artery calcium; CKM, Cardiovascular-Kidney-Metabolic; Hb A1C, hemoglobin a1c; and MASLD, metabolic dysfunction-associated steatotic liver disease.

Ndumele, C.E. et al., Cardiovascular-Kidney-Metabolic Health: A Presidential Advisory From the American Heart Association. 2023. *Circulation*.

Screening for CKM Syndrome

SDOH Screening



Use established screening tools



Financial strain



Education/literacy



Personal safety



Mental health



Screening tools can also assess for health behaviors impacted by SDOH



Incorporate an existing screening tool into the clinical care workflow and EHR

CKM Syndrome Prevention and Management

Interdisciplinary Care Models

Value-based care

- » Involvement of interdisciplinary care team when any two of the following are present: CKD, diabetes, and subclinical/clinical CVD
- » Interdisciplinary team
 - Primary care
 - Nursing
 - Subspecialists
 - CKM coordinator
 - Pharmacy
- » Development of clinical protocols based on guidelines.
- » Interdisciplinary team meets at regular intervals to discuss plan of care

Volume-based care

- » Targeted referrals to subspecialists.
 - Nephrology
 - Endocrinology
 - Cardiology
- » CKM coordinator assistance with patient navigation across multiple subspecialists
- » Utilization of telemedicine to see subspecialists as needed

CKM Syndrome Prevention and Management

Addressing SDOH in Care Model



Systematic screening for SDOH using validated tools



Integration of SDOH assessments into clinical care workflow and EHR

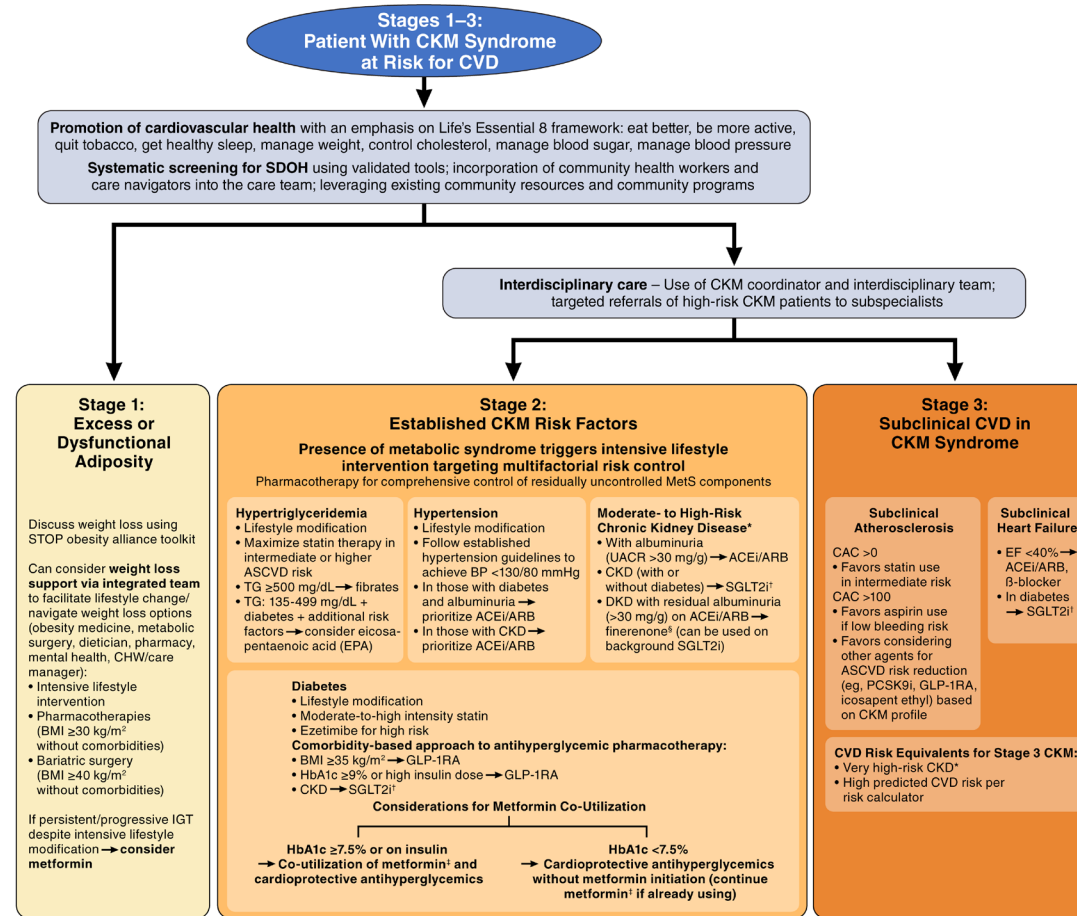


Incorporation of **community health workers** into integrated care team for patient support and navigation



Leveraging existing **community resources and community programs**

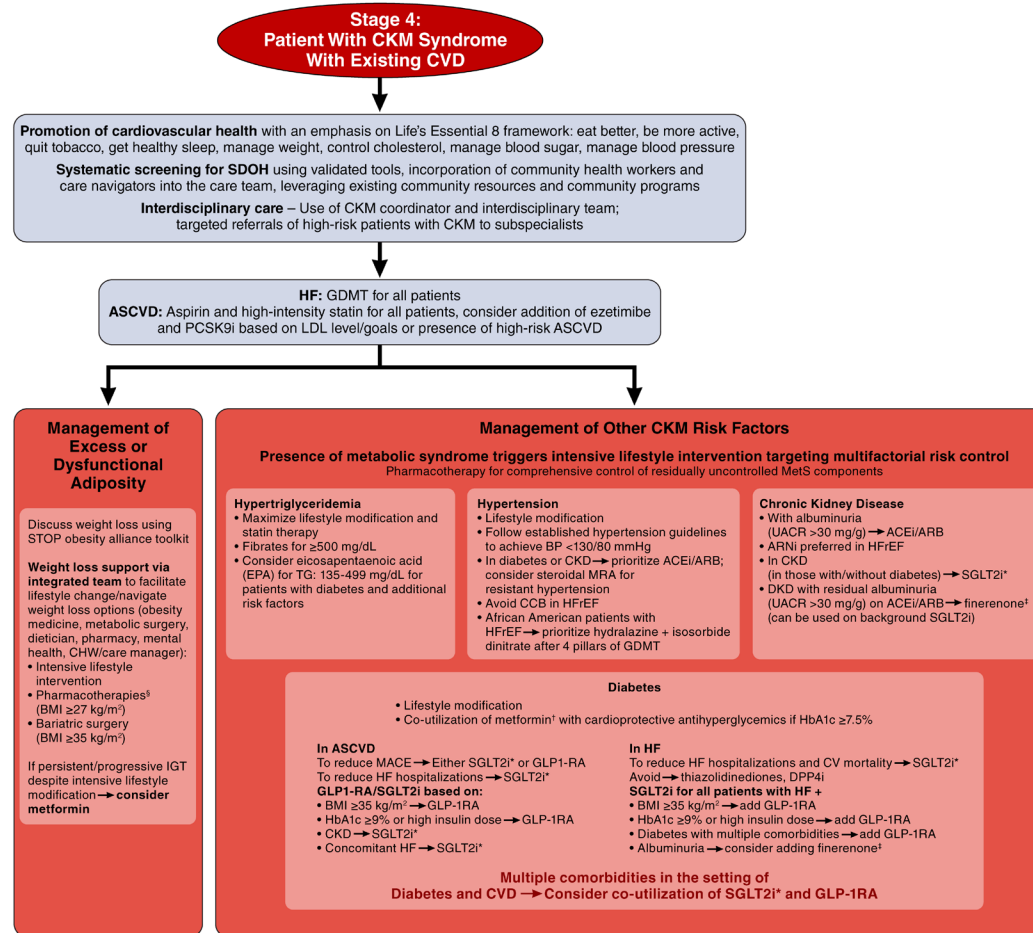
CKM Syndrome Management Stages 1-3



*per KDIGO heat map
[†]SGLT2i can be safely initiated for patients with eGFR ≥ 20 mL/min/1.73 m²
[‡]Metformin can be co-utilized for patients with eGFR ≥ 30 mL/min/1.73 m²
[§]Finerenone can likely be initiated on background SGLT2i for those with eGFR > 25 mL/min/1.73 m² and potassium < 5 mEq/L

Abbreviations: ACEi indicates angiotensin-converting-enzyme inhibitors; ARB, angiotensin II receptor blockers; ARNi, angiotensin receptor/neprilysin inhibitors; ASCVD, atherosclerotic cardiovascular disease; BP, blood pressure; BMI, body mass index; CHD, coronary heart disease; CHW, community health worker; CKD, chronic kidney disease; CKM, cardiovascular-kidney-metabolic; CVD, cardiovascular disease; DKD, diabetic kidney disease; DM, diabetes mellitus; EF, ejection fraction; GLP-1RA, GLP-1 receptor agonist; HbA1c, hemoglobin A1c; HF, heart failure; IGT, impaired glucose tolerance; MetS, metabolic syndrome; P2Y12i, P2Y12 inhibitors; SDOH, social determinants of health; SGLT2i, sodium-glucose transport protein 2 inhibitors; STOP, Strategies to Overcome and Prevent; and UACR, urine albumin-creatinine ratio.

CKM Syndrome Management Stage 4



*SGLT2i can be safely initiated for patients with eGFR ≥20 mL/min/1.73 m²

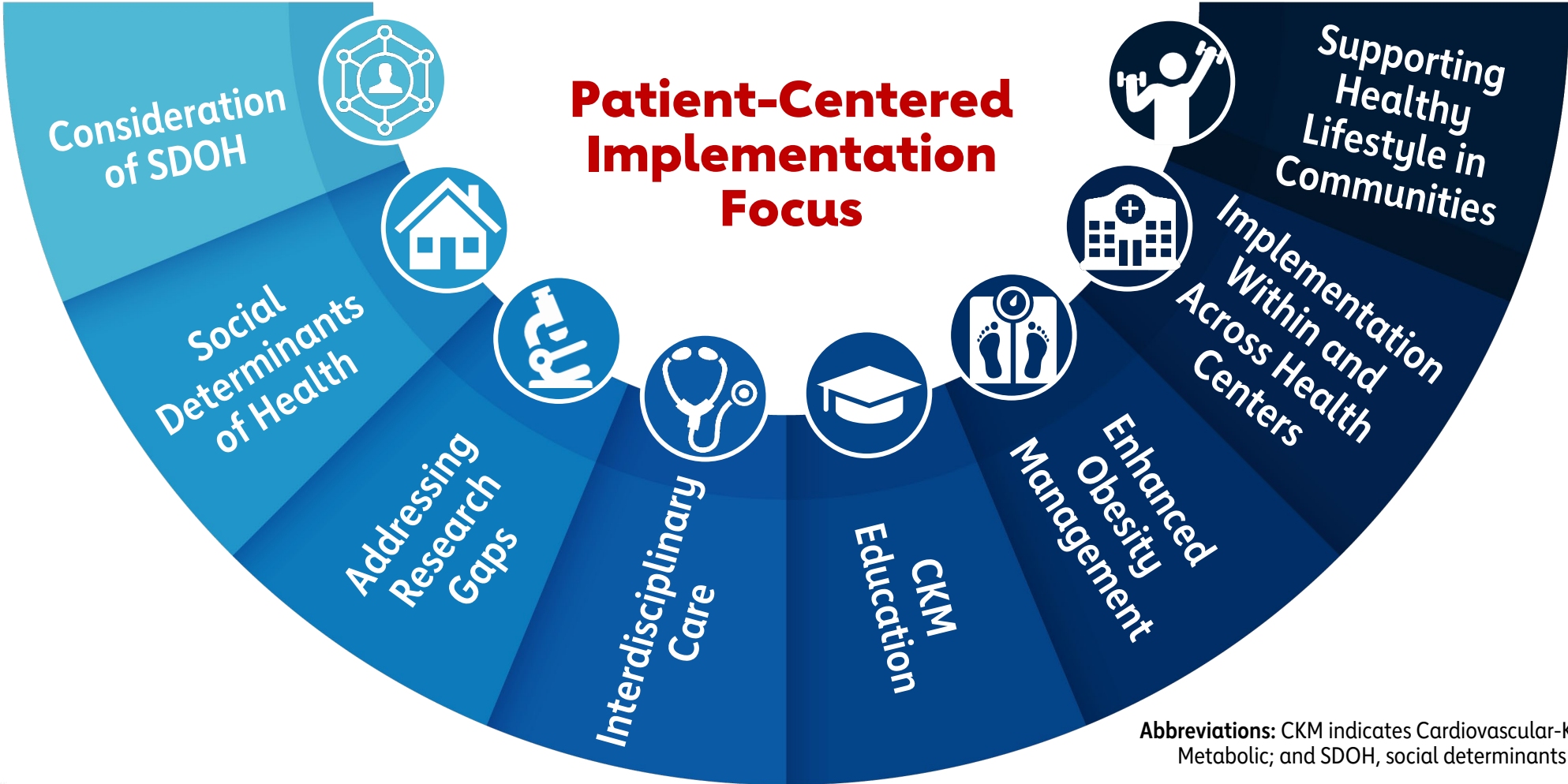
†Metformin can be co-utilized for patients with eGFR ≥30 mL/min/1.73 m² and without unstable or decompensated HF

‡Finerenone can likely be initiated on background SGLT2i for those with eGFR >25 mL/min/1.73 m² and potassium <5 mEq/L

§Pending the full results of the SELECT trial, high dose GLP-1RA may become frontline therapy in patients with obesity and established CVD

Abbreviations: ACEi indicates angiotensin-converting-enzyme inhibitors; ARB, angiotensin II receptor blockers; ARNi, angiotensin receptor/neprilysin inhibitors; ASCVD, atherosclerotic cardiovascular disease; BP, blood pressure; BMI, body mass index; CHD, coronary heart disease; CHW, community health worker; CKD, chronic kidney disease; CKM, cardiovascular-kidney-metabolic; CVD, cardiovascular disease; DKD, diabetic kidney disease; DM, diabetes mellitus; EF, ejection fraction; GDMT, guideline-directed medical therapy; GLP-1RA, GLP-1 receptor agonist; HbA1c, hemoglobin A1c; HF, heart failure; IGT, impaired glucose tolerance; LDL, low-density lipoprotein; MetS, metabolic syndrome; P2Y12i, P2Y12 inhibitors; SDOH, social determinants of health; SGLT2i, sodium-glucose transport protein 2 inhibitors; STOP, Strategies to Overcome and Prevent; and UACR, urine albumin-creatinine ratio.

Cardiovascular-Kidney-Metabolic Syndrome Call to Action



Abbreviations: CKM indicates Cardiovascular-Kidney-Metabolic; and SDOH, social determinants of health.

Cardiovascular-Kidney-Metabolic Syndrome Call to Action

Consideration of SDOH



- » Upfront priority for screening of SDOH to guide approaches to care
- » Integration of SDOH assessments into clinical workflow and electronic health records
- » Incorporation of individuals into the care team to address access, navigation, and social barriers
- » Leveraging community resources for needs based on SDOH screening
- » Need for more data on the impact of SDOH screening and addressing social needs on CKM risk factors and outcomes

Cardiovascular-Kidney-Metabolic Syndrome Call to Action

Interdisciplinary Care



- » Interdisciplinary care for individuals with a confluence of CKM factors. Two complementary approaches:
 - Value-based care model: Use of CKM coordinator and interdisciplinary team to provide remote guidance regarding CKM care
 - Volume-based care model: targeted referrals of high-risk patients to Cardiology, Endocrinology, Nephrology
- » May rely more on value-based care model in health centers/regions with a low density of subspecialists
- » Appropriate reimbursement models and infrastructure needed

Cardiovascular-Kidney-Metabolic Syndrome Call to Action

Access to Pharmacotherapies



Utilization of pharmacists and social workers on the interdisciplinary CKM team to facilitate access



Advocacy for policy level changes to ensure access



Incorporate representation of health systems, payors, patients, and caregivers into policy change advocacy measures

Cardiovascular-Kidney-Metabolic Syndrome Call to Action

Addressing Research Gaps



Need to address key gaps in CKM knowledge, screening, prevention, management and implementation of care models through intensified research efforts



Emphasis on interdisciplinary and cross-specialty investigative approaches that reflect the interconnectedness inherent to CKMH



Envision the possibility for research investments related to CKMH, in addition to research fellowships for trainees

Cardiovascular-Kidney-Metabolic Syndrome Call to Action

CKM Education



- » Prioritize education for health care professionals and community members regarding CKMH
 - Underlying science and inter-connectedness of CKMH
 - Definition of CKM syndrome
 - CKMH staging
 - Prediction of outcomes in CKM
 - Approaches to CKM prevention and management

Cardiovascular-Kidney-Metabolic Syndrome Call to Action

Enhanced Obesity Management



- » Enhance education about approaches to obesity
- » Providing toolkit for addressing obesity in clinical encounters
- » Emphasis on integrated teams to support a patient-centered approach to weight loss:
 - Obesity medicine, metabolic surgery, dietician, pharmacy, mental health, community health workers/care manager
- » Need to advocate for better access to obesity pharmacotherapies and better reimbursement for obesity management in health centers

Cardiovascular-Kidney-Metabolic Syndrome Call to Action

Implementation within and across Health Centers



- » Informed by the AHA's CKMH initiative, validated CKMH measures and center-specific performance across registry-based data
- » Patient-centric AHA CKMH certification program, allowing for the designation of an AHA Center for CKMH Excellence for institutions that meet criteria for optimal implementation of specified CKMH metrics.
- » CKMH certification could activate implementation of key CKMH quality improvement metrics and hospital certification programs not only across GWTG hospitals in the US, but also in 13 other countries globally where the AHA is currently engaged, allowing for a scaled up global impact.

Abbreviations: AHA indicates American Heart Association; and CKMH, Cardiovascular-Kidney-Metabolic health.

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Cardiovascular-Kidney-Metabolic Syndrome Call to Action

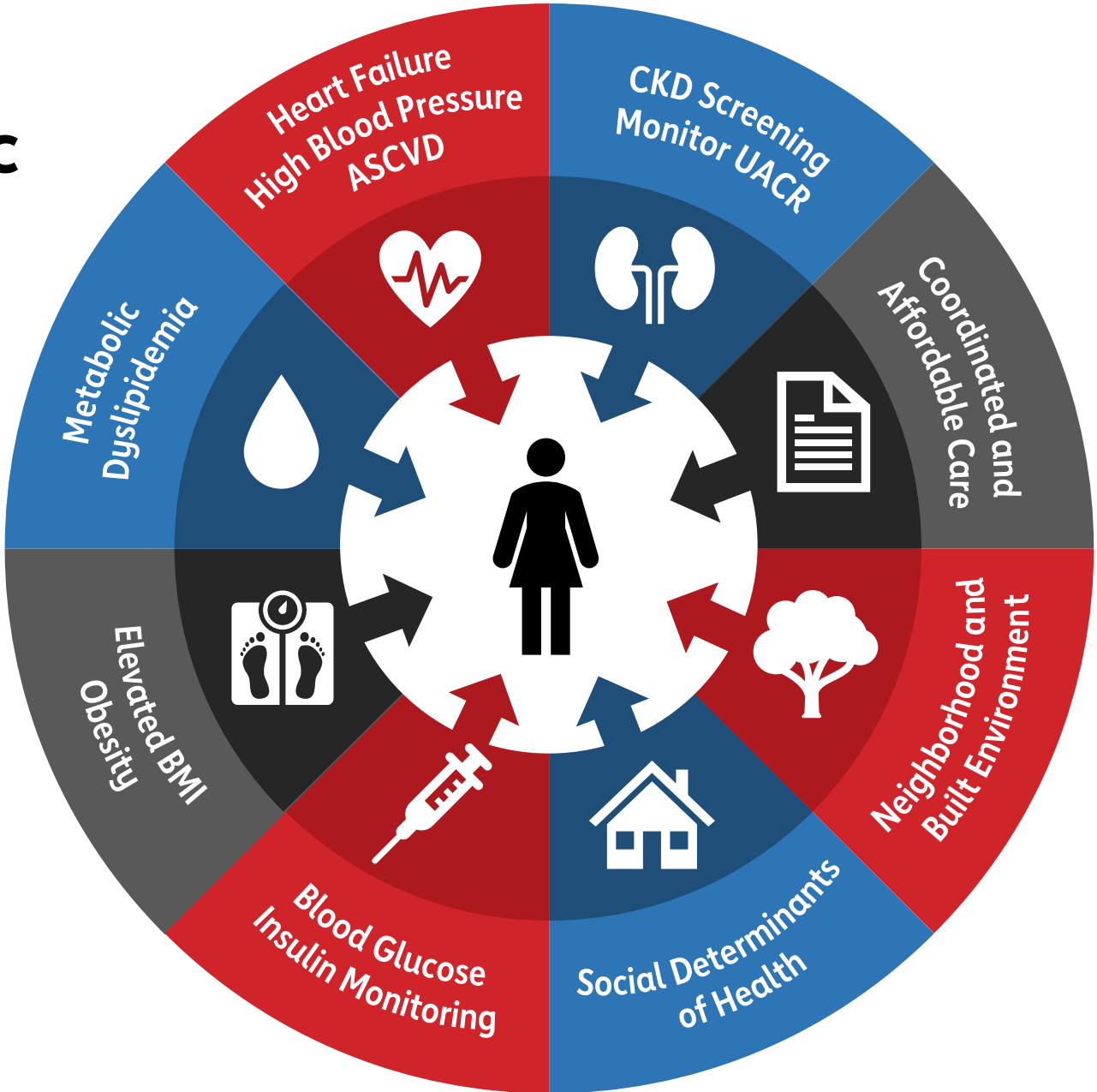
Supporting Healthy Lifestyle in Communities



- » Critical need to support the achievement of ideal cardiovascular health, particularly healthy lifestyle, in community settings
- » Will involve multi-level partnerships between AHA and outside stakeholders
- » Emphasis on strategies to enhance cardiovascular health across the life course and across diverse communities

Cardiovascular-Kidney-Metabolic Syndrome

Patient-Centered Implementation Focus



Abbreviations: ASCVD indicates atherosclerotic cardiovascular disease; BMI, body mass index; CKD, chronic kidney disease; and UACR, urine albumin-creatinine ratio.

