CME

Managing patients with sex-, race-, or ethnicity-based cardiovascular health inequities

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ABSTRACT

Cardiovascular health inequities are experienced among cisgender women, gender minorities, Black and Indigenous people, and people with lower socioeconomic status. Early identification and treatment of patients at risk for disparate and adverse cardiac health outcomes are essential.

Keywords: cardiovascular, health inequities, sex, gender, race, acute coronary syndrome

Learning objectives

- Identify differences in diagnosis and treatment of CVD among cisgender women compared with cisgender men.
- Recognize cardiovascular risk factors among transgender and gender-diverse patients.
- Recognize the occurrence and prevention of racial differences in outcomes of CVD.
- Develop awareness of the relationships among depression, anxiety, and ACS.

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Cardiovascular disease (CVD) encompasses conditions affecting the heart and blood vessels, and commonly recognized CVDs arise from coronary artery disease, cerebrovascular disease, peripheral artery disease (PAD), rheumatic and congenital heart diseases, and venous thromboembolism (VTE).[1,2] The National Center for Health Statistics reported that heart disease was the leading cause of death in the United States in 2021, and social determinants of health can exacerbate morbidity and mortality associated with CVD.[3,4] Mortality primarily is caused by ischemic heart disease and cerebrovascular accidents.[2] Coronary artery disease (CAD) is the most common form of heart disease, accounting for about 13% of deaths in the United States.[5,6] Because of the high prevalence of CVD in the United States and globally, steps to recognize patients with CVD risk factors and mitigate modifiable risks are essential. Modifiable risk factors include smoking, elevated body mass index, physical inactivity, and excessive alcohol intake. Socioeconomic and structural factors, such as low income, limited access to care, and food insecurity, although systemic in nature, also may exacerbate risk factors.[4]

Health inequities are informed by gender as well as sex.[7] Sex and gender are multidimensional constructs. Sex is informed by anatomical and physiological traits that form the basis for labeling infants at birth as either male, female, or intersex.[8] Sex most often is assigned based on the phenotypic appearance of external genitalia. Gender has behavioral, psychological, and social dimensions, which include gender identity and expression.

Cisgender and *transgender* are descriptive terms that refer to concordance and a lack of concordance, respectively, between sex and gender. The public health community uses the term *gender minorities* to describe any degree of incomplete concordance between gender characteristics and sex traits, regardless of self-identification. In this article, *cisgender women* and *cisgender men* are

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Key points

- Clinical presentation, diagnostic tests, treatment, and outcomes in cardiovascular care may be informed by socially defined factors including race, ethnicity, sex, and gender.
- Research has identified clinical care gaps relating to the equitable use of high-sensitivity troponin tests, cardiac catheterization protocols, postcatheterization care, and cardiovascular pharmaceuticals.
- Treatment protocols are evolving to address health disparities in cardiovascular health.

used to refer to participants in studies that lacked or did not indicate inclusion of transgender patients, or the terms are used to refer to participants in studies whose gender identity was reported to correspond with the sex registered for them at birth.

After a diagnosis of acute coronary syndrome (ACS), cisgender women experience delays in recognition of elevated cardiovascular risk profiles compared with cisgender men, resulting in delays in access to cardiac interventions such as perfusion studies and preventive drugs.[9] Published research on management and outcomes of CVD has historically failed to represent cisgender women or gender minorities. The National Institutes of Health (NIH) issued regulations in 1993, known as the NIH Revitalization Act, in an attempt to encourage the inclusion of cisgender women in clinical trials.[10] This regulatory guidance has contributed to an increase in enrollment of cisgender women to 33% of study participants in 2011-2015 from 21% in 1986-1990.[10] However, enrollment of cisgender women remains below 50%, which is the estimated prevalence of cisgender women and girls in the US population.[10]

CLINICAL PRESENTATION

Clinical practice guidelines recognize that the clinical presentation of ACS varies by sex traits.[11] Although chest pain is a prominent symptom across all patients, cisgender women are more likely to present with additional complaints such as nausea, fatigue, shortness of breath, dizziness, upper back pain, and anxiety.[11-13] As representation of cisgender women increases in studies, researchers have been actively seeking to identify the cause of the observed variation in ACS presentation between cisgender women and cisgender men. Traits that have been associated with sex include differences in myocardial mass, coronary artery diameter, sex steroids, microvascular dysfunction, and internalizing disorders (characterized by anxiety, depressive, and somatic symptoms).[9,14,15]

DIAGNOSIS

Cisgender women presenting with ACS are at increased risk for misdiagnosis or delayed diagnosis, resulting in increased mortality within 12 months.[16] Compared with cisgender men, cisgender women presenting with ACS are 37% more likely to receive an initial misdiagnosis of an ST-segment elevation myocardial infarction (STEMI) and 29% more likely to receive a misdiagnosis of a non-ST-segment elevation myocardial infarction (NSTEMI).[16] This may be partly due to lower suspicion of ACS by both the affected cisgender women and their clinicians; it also could be due to the lower sensitivity of common diagnostic tests in cisgender women.[13,17-21]

Time from symptom onset to hospital arrival The first step in reducing disparities in the diagnosis of ACS for cisgender women is to educate patients on specific symptoms most commonly associated with sex traits and the importance of seeking care promptly at symptom onset. In a study across 41 hospitals of patients presenting with ACS, cisgender men were found to present to the hospital, on average, 30 minutes closer to the time of symptom onset than cisgender women.[22] Studies have shown that patients with accurate knowledge of ACS are more likely to seek care sooner.[23] Primary care providers should educate patients at risk for ACS about their specific risks and when to seek medical care.

ECG The use and interpretation of ECGs are contributing factors to sex- and gender-based disparities in ACS recognition and treatment. A 2020 study investigating disparities in ECG use studied 714 patients presenting to the ED with suspected ACS.[19] The median wait time for the first ECG was longer for cisgender women (25 minutes) than cisgender men (18 minutes).[19] Studies also suggest a greater incidence of electrode misplacement in patients with breast tissue, regardless of sex or gender.[24-26]

Recommendations vary on the proper placement of chest leads on patients with breast tissue. Guidelines recommend placement of the electrodes under breast tissue until research evaluating the placement of electrodes above breast tissue is available.[27] Research also has shown evidence of further inaccuracy in ECG interpretation in patients after breast augmentation with implanted silicone breast prostheses compared with unaugmented breast tissue. In a blinded study, experienced electrophysiologists analyzed the ECGs of participants with and without silicone breast implants.[28] Of participants with breast implants, 42% to 46% were inaccurately interpreted as abnormal.[28] This reduced accuracy can be explained by distortion of electric vectors, which cannot pass through the silicone shell of the implants (**Figure 1**).[28]

Sex-based wave amplitude differences have informed guidelines on threshold values for ST-segment elevation and depression (**Table 1**).[29] Failure to meet these thresholds, however, does not exclude ACS.

Assessment tools The HEART score, entailing assessment of patient history, ECG findings, age, risk factors,

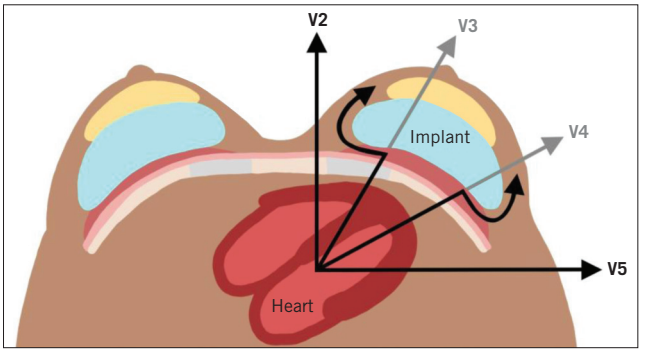

FIGURE 1. Silicone and saline breast implants use a silicone shell, which is unexcitable in nature. This results in altered electrical propagation of vectors reaching the ECG electrodes. The V_3 and V_4 vectors depicted in gray display the expected pathway of signals reaching the ECG leads. The vectors in black have been distorted by the breast implants.

and troponins, is a commonly used, standardized decision-making tool for evaluation and risk stratification of patients with suspected ACS.[30] The patient history category is prone to interclinician variability because it relies on clinical judgment to risk-stratify patient history into low, medium, or high risk. The subjective nature of this component may leave room for bias between cisgender men and women because cisgender women often present with greater variation in symptoms. Therefore, ACS identification in cisgender women may require thoughtful consideration of the variability and breadth of symptoms, rather than simply the absence of symptoms such as chest pain or equivocal anginal symptoms.[18] Use of the HEART score guideline was associated with more equitable outcomes among study participants with suspected ACS.[31] Therefore, despite subjective criteria, the HEART score may be beneficial in reducing inequities in risk stratification by sex-associated traits and may help to guide clinical pathways to appropriate patient management.

TABLE 1. AHA/ACCF/HRS recommendations for the threshold values for ST-segment changes[29]

Lead(s)	Threshold values for abnormal J-point elevation or depression
Men age 40 years and older	
V_2 and V_3	Elevation of 0.2 mV (2 mm)
All other leads	Elevation of 0.1 mV (1 mm)
Men under age 40 years	
V_2 and V_3	Elevation of 0.25 mV (2.5 mm)
Women of all ages	
V_2 and V_3	Elevation of 0.15 mV (1.5 mm)
All other leads	Elevation of greater than 0.1 mV (1 mm)
Men and women of all ages	
V_3R and V_4R	Elevation of 0.05 mV (0.5 mm) *except for males under age 30 years, for whom 0.1 mV (1 mm) is more appropriate*
V_7 through V_9	Elevation of 0.05 mV (0.5 mm)
V_2 and V_3	Depression of -0.05 mV (-0.5 mm)
All other leads	Depression of -0.1 mV (-1 mm)

Cardiac troponin assays Cardiac troponins are regulatory proteins found in the cytoplasm of the myocardium. When the myocardium is damaged, cell membranes rupture and release extracellular contents, including troponins, into the extracellular space and eventually into the bloodstream. These mechanisms make troponin T and troponin I effective biomarkers for myocardial injury. In patients with myocardial infarction (MI), serum troponin levels rise within 2 to 3 hours of cardiac ischemia.[32,33]

The use of high-sensitivity troponin (hs-cTn) assays, approved by the FDA in early 2017, has become increasingly common in recent years because of their earlier detection ability and increased accuracy compared with conventional troponin assays.[11,34] However, interpretation of hs-cTn is limited by baseline troponin level variability from patient to patient. This suggests that patients with a lower baseline troponin level may fail to be identified when hs-cTn is used as a diagnostic tool.[35] The 99th percentile of cardiac troponin levels has traditionally been considered a key parameter to define normal and abnormal cardiac troponin levels, in accordance with the 2000 European Society of Cardiology/American College of Cardiology (ACC) guidelines.[36] Studies have found significant differences in the normal distributions of hs-cTn by sex traits.[37] In a study exploring baseline hs-cTn levels, investigators measured hs-cTn levels in 2,077 healthy young adults ages 25 to 41 years who did not have CVD.[36] Results demonstrated upper reference limits that were three times higher in cisgender men (15.79 ng/L) than in cisgender women (5.11 ng/L).[36] These data remained significant following a multivariable adjustment, which accounted for factors including age, family history, and physical activity.[36] Similar studies have yielded consistent results.[38]

Given this knowledge of baseline differences in hs-cTn levels across sex traits, studies have investigated the use of sex-specific thresholds in clinical practice.[37,39] Results have demonstrated improvement in ACS recognition in cisgender women with the use of sex-specific thresholds compared with rates of recognition using a singular sex-nonspecific threshold.[37,39] These findings were reflected in 2021 American Heart Association (AHA)/ACC/American Society of Echocardiography/American College of Chest Physicians/Society for Academic Emergency Medicine/Society of Cardiovascular Computed Tomography/Society for Cardiovascular Magnetic Resonance guidelines, which highlight the

importance of laboratory parameters that take sex traits into consideration to minimize disparities in diagnosis of acute MI.[40] Studies are needed to establish recommendations for appropriate hs-cTn levels for transgender patients undergoing hormone therapy.

TREATMENT AND OUTCOMES

Despite equivalent clinical protocols, research has consistently shown differences in clinical care for cisgender men and women presenting with acute MI and cardiac arrest. A review of 11,622,528 acute MI admissions associated with 584,216 cardiac arrests showed disparities in cardiac care, despite similar guideline recommendations for cisgender women and men.[41] Cisgender women with ACS were less likely to receive cardiac intervention and had a higher in-hospital mortality than men (52.6% versus 40.6%, adjusted OR 1.13 [95% CI 1.11-1.14]; $P < .001$).[41] This may suggest a disparate application of evidence-based medicine that puts cisgender women at a disadvantage.

Studies exploring the causes of sex-based discrepancies in cardiac intervention have generated inconsistent conclusions. Some studies concluded that invasive interventions are underused in cisgender women; others have suggested that these interventions are overused in cisgender men.[41,42] This discrepancy also may be, in part, caused by clinician hesitance resulting from the persistent disparity in outcomes between cisgender women and men even after receiving the indicated intervention. Studies have found an increased incidence of adverse outcomes, including new-onset heart failure, following percutaneous coronary intervention (PCI) in cisgender women compared with cisgender men.[43] This may be explained by differences in the pathogenesis of ACS, involving the contribution of coronary microvascular dysfunction more frequently in cisgender women than cisgender men, or by differences in the timeliness of PCI initiation.[44,45]

In addition to differences in morbidity following PCI based on sex, sex-specific discrepancies in outcomes have remained evident across treatment modalities. Matetic and colleagues analyzed differences in the outcomes of 7 million patients in a retrospective analysis of NIS data of US patients hospitalized for AMI between 2004 and 2015.[45] Participants were managed with differing interventions such as coronary angiography, PCI, coronary artery bypass grafting, fibrinolysis, intra-aortic balloon pump, and medical therapy. In this temporal analysis of AMI hospitalizations, the authors showed lower receipt of invasive therapies in cisgender women compared with cisgender men. Cisgender women were less likely to receive coronary angiography (aOR, 0.92; 95% CI, 0.91-0.93) and PCI (aOR, 0.82; 95% CI, 0.81-0.83) versus cisgender men. Odds of all-cause mortality were higher in cisgender women (aOR, 1.03; 95% CI, 1.02-1.04; $P = .001$) than in cisgender men.

PSYCHOSOCIAL CONSIDERATIONS

An estimated 1.3 million adults in the United States are transgender or nonbinary.[46] These communities have been found to have an increased risk for CVD.[47] This may be attributed to healthcare inequalities, including expectations of rejection, bias-motivated violence, stigma, and discrimination. Lack of social support and psychosocial and physiologic stressors are associated with vascular dysfunction, a precursor for adverse cardiovascular health.[47] A growing body of research shows that adverse cardiovascular health is associated with the negative effects of stress related to racial, ethnic, or lower socioeconomic status.[47] The Minority Stress Theory (MST) elucidates the relationship between health status and stress associated with antitransgender stigma, marginalized identity, bias, and discrimination.[47] MST emphasizes the value of support structures to promote resilience for better health outcomes. A lack of standardized data collection on gender identity and assigned sex at birth across sources limits understanding of disparities in cardiovascular disease prevalence and incidence among transgender and nonbinary adults, and much of the existing research relies on self-report of cardiovascular outcomes rather than clinical factors and biomarkers.[47]

According to the Behavioral Risk Factor Surveillance System (comprising self-reported data), transgender and nonbinary adults who were assigned female at birth and whose gender identity is something other than female carry a greater than twofold and fourfold increase in the prevalence of MI compared with cisgender men and cisgender women, respectively.[48] Conversely, transgender and nonbinary adults who were assigned male at birth and whose gender identity is something other than male had a greater than twofold increase in the prevalence of MI compared with cisgender women but did not have a significant increase compared with cisgender men.[8]

Cisgender women have a well-established increased risk of VTE if they use postmenopausal hormone replacement therapy or combined estrogen and progestin oral contraceptives. Before the early 2000s, ethinylestradiol was a common component of gender-affirming feminizing hormone therapy.[49] Because of ethinylestradiol's increased prothrombotic potential, estradiol valerate and estradiol cypionate are now preferred for feminizing hormone therapy.[49] VTE risk has been further minimized with optimization of medication selection and routes of administration for gender-affirming feminizing hormone therapy. Longitudinal data on mortality among transgender and nonbinary adults between 1972 and 2018 notes that adults who were assigned male at birth and whose gender identity is something other than male died more frequently because of CVD than all men (standard mortality ratio [SMR] 1.4, 95% CI 1.1·8) and all women (SMR 2.6, 95% CI 1.9–3.4), with mortality because of MI a notable SMR

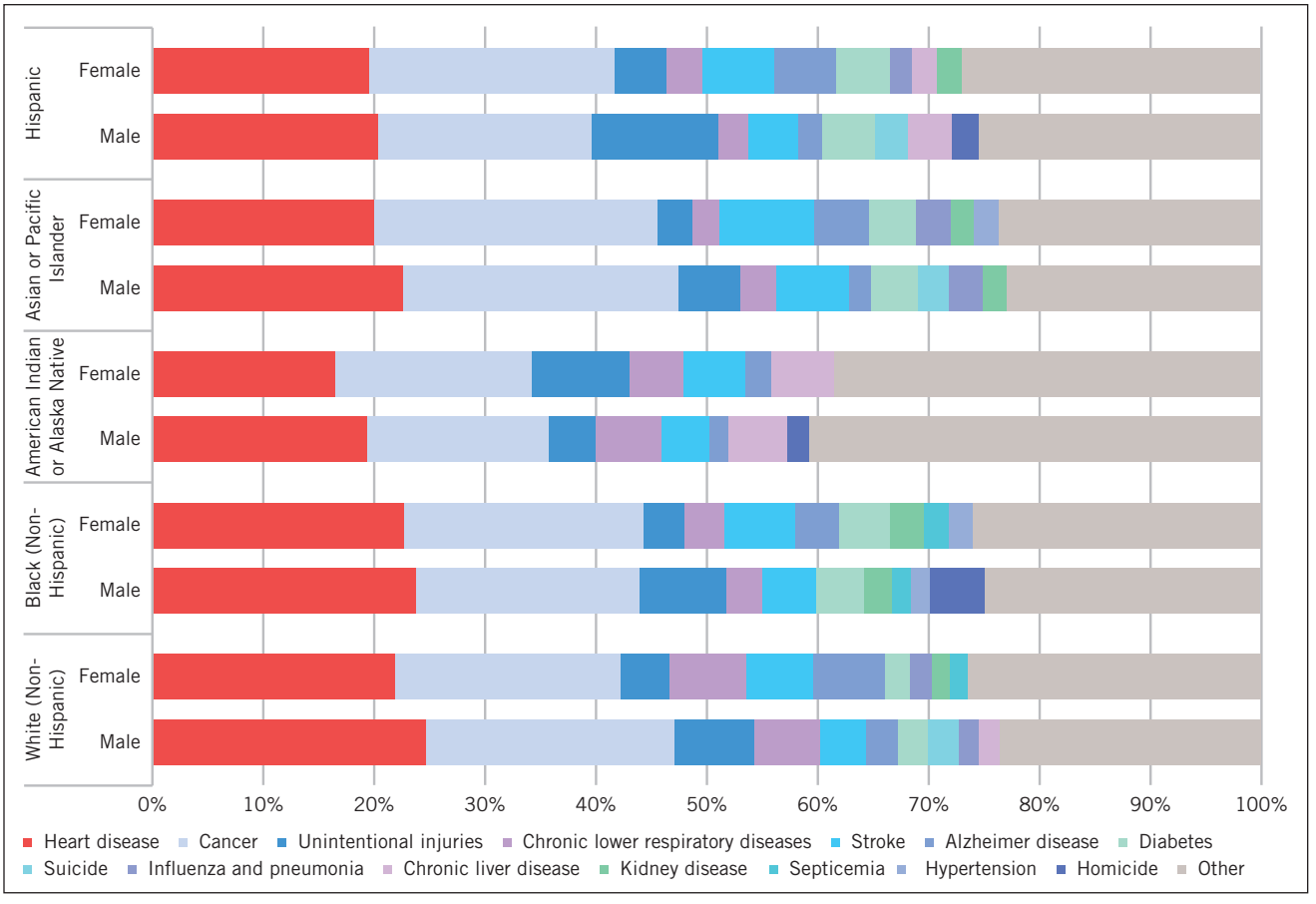

FIGURE 2. Leading causes of death in the United States based on 2017 CDC data

of 3 (95% CI 1.7–4.5).[50] Longitudinal data on the morbidity of the modern feminizing hormone therapy regimen are limited.

GROUPS SOCIALLY AND ECONOMICALLY MARGINALIZED

Data collected by the CDC analyzed the 10 leading causes of death by race, ethnicity, and sex (**Figures 2** and **3**).[51] Further analysis showed statistically significant differences in heart disease-related mortality in all three domains. Consistent with these findings, recent studies have shown a disproportionately high incidence of adverse cardiovascular outcomes following AMI in non-Hispanic Black patients compared with non-Hispanic White patients.[52,53] A 2021 study followed, for 5 years, 313 patients (65% non-Hispanic Black) who were under age 61 years and were hospitalized for confirmed type 1 MI.[53] Results showed a twofold higher risk of adverse outcomes among the Black patients throughout the study that was reduced to 1.3 when adjusted for social determinants of health other than Black racial identity; adverse outcomes included cardiovascular death, recurrent type 1 MI, cerebrovascular accident, and heart failure hospitalization.[53]

A retrospective data analysis of 689,238 hospitalizations for ACS in California, Florida, New York, and New Jersey from the Healthcare Cost and Utilization Project (HCUP) family of databases was published by Yong and colleagues in 2018.[54] They found that Black patients had the lowest in-hospital mortality (5% compared with 6% to 7% for other races, P =.0001, OR 1.02, 95% CI 0.97-1.07) despite low rates of timely angiography in STEMI and NSTEMI and lower use of drug-eluting stents (30% compared with 38% to 40% for other races, P =.0001).[54] Although the most rapid rates of intervention were in Asian patients, these patients also had significant inpatient mortality following STEMI or NSTEMI compared with Black, Hispanic, and Native American patients (7% compared with 5% to 7% for other races, P = .0001, OR 1.13, 95% CI 1.08-1.2), despite Asian patients having high rates of timely angiography in STEMI and NSTEMI and the highest use of drug-eluting stents.[54]

Reducing the mortality and morbidity associated with the most common causes of adverse cardiovascular outcomes in the United States is paramount. To treat hypertension, diabetes, heart failure, stroke, or chronic kidney disease effectively, clinicians must work with patients and their families to analyze the reasons for disparities in

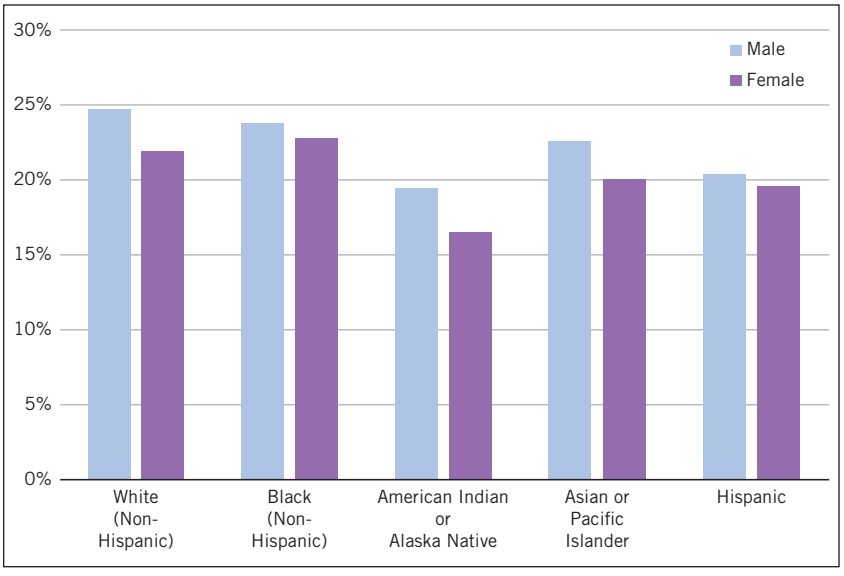

FIGURE 3. Percentage of 2017 deaths attributed to cardiovascular disease by race, ethnicity, and sex

outcomes. One potential factor is the use of race as a risk factor in clinical calculators and algorithms to guide clinical decisions. This is problematic because race is a subjective social construct without a genetic basis.[55]

Race also is a flawed proxy for genetics in that it relies on self-reported information and may lack validity and consistency. A study found discrepancies in the race/ethnicity recorded in patients' electronic health records (EHRs) compared with patients' self-reported race/ethnicity obtained via questionnaire.[56] This may be because some patients may not feel that they belong in the predefined categories provided by the EHR systems.[56] Hispanic patients in particular had higher rates of discrepancies.[56] Patients may be uncertain about how to self-identify their race when race and ethnicity are separated as two different entities.

For years, researchers have sought to discover a genetic basis for race. However, human genome analysis seeking to discover similarities between members of a common race has shown the opposite. In 1999, the Human Genome Project emphasized that race is nonbiologic and has no genetic basis.[57] Genomes may vary more among members of a given race than across members of different racial groups.[58] Without a genuine biologic connection between members of a racial group, racial differences found in large-scale data sets may be explained by the effects of racism.[59] Based on this theory, clinical guidelines using race as a factor in clinical decision-making may further exacerbate healthcare disparities.[59]

TABLE 2. Factors contributing to nonadherence to treatment[70-72]

Patient factors
• Lack of understanding of current condition
• Poor health literacy
• Psychiatric factors such as depression or anxiety
• Social or cultural barriers such as stigma, religious restrictions, or lack of social support
Medication factors
• Complex dosing regimens
• Adverse reactions
• Medication shortages
Healthcare provider and system factors
• Poor access to healthcare
• Poor patient-provider communication
• Patient education related to condition and medication (including benefits and adverse reactions)
Socioeconomic factors
• Poor access to affordable healthful foods
• Poor access to affordable exercise programs
• Insufficient access to pharmacies
• Cost of transportation to medical appointments and pharmacy
• Copays or cost of medication

MINIMIZING RISK FACTORS IN VULNERABLE POPULATIONS

Primary prevention of CVD through the minimization of modifiable risk factors is essential to limit the effect of ACS. Risk factor prevalence varies across race/ethnicity and socioeconomic classes.

Although progress is being made toward greater inclusion of historically underrepresented racial and ethnic groups in other research areas, they remain underrepresented in cardiovascular clinical trials, though these groups often have increased rates of preventable CVD risk factors such as hypertension, hypercholesterolemia, and diabetes. Compounding the issue, clinical trials often do not report data specific to racial/ethnic populations.[58,60]This may be a contributing factor to the underuse of antihypertensives, statins, nutritional referrals, and subspecialty referrals in these groups. Increased emphasis is warranted on screening, treating, and minimizing preventable CVD risk factors in disproportionately affected populations, such as Black, Latino, and Southeast Asian patients.

The renal-protective properties of ACE inhibitors and ARBs have been consistently confirmed by research. The African American Study of Kidneys and Hypertension looked at BP control using amlodipine and ramipril.[58] Participants in the ramipril arm showed a smaller decline in kidney function; those in the amlodipine arm showed greater BP control. Therefore, the presence of comorbid conditions, such as diabetes, chronic kidney disease, or

heart failure, should be considered before excluding the use of an ACE inhibitor or ARB in Black patients.[58]

Several studies have explored the utility of phenotyping for levels of plasma renin activity and aldosterone in Black patients to provide the most effective antihypertensive therapy.[61] Data have suggested that mutations in plasma renin production, known as the Liddle phenotype, can be traced back to specific African ancestries and therefore are not generalizable to all Black patients.[61]

Disproportionately elevated levels of stress among transgender and nonbinary patients and patients of lower socioeconomic status account for increased risk for developing mental disorders.[47,62,63] Research has found that patients with mental health disorders such as depression, anxiety, schizophrenia, and post-traumatic stress disorder are at an increased risk for developing CAD.[64] The mechanisms for this association are multifactorial but are thought to include increased sympathetic nervous system activation leading to increased risk of dysrhythmias, intermittent elevations in heart rate and BP facilitating the development of atherosclerosis, and abnormal platelet activation and endothelial damage resulting from elevations in inflammatory biomarkers and cytokines.[65,66] Excess proinflammatory biomarker and cytokine release results from the hyperreactivity of neuroimmunologic and endocrinologic pathways stimulated in response to repeated exposures to negative stressors.[63]

Along with an increased prevalence of CAD among transgender and nonbinary communities, patients who were persistently anxious were at 5 times higher risk for developing complications at 2 years following an ACS event (OR = 5, 95% CI 1.27-38.8; $P = .05$).[67]

Depression also can commonly develop as one complication of ACS, and may last for months and result in poorer health outcomes.[49] Patients with untreated post-ACS depressive symptoms have been found to have an increased 1-year mortality compared with patients without depression (10.8% versus 6.1%, adjusted hazard ratio, 1.91; 95% CI 1.39-2.62).[68] Screening and treatment of depression is imperative in all patients as primary prevention of CAD and CAD-related morbidity and secondary prevention of CAD and CAD-related mortality.

The AHA recommends screening all patients with CAD using the two-item Patient Health Questionnaire (PHQ)-2; if this screening is positive, follow it with the 9-item PHQ-9.[69] Start patients with depression on psychotherapy and evidence-based pharmacotherapy.[69]

Careful consideration of factors that contribute to nonadherence is an essential step toward optimizing outcomes and providing person-centered care. These may include person-specific, medication, healthcare provider, healthcare system, and socioeconomic factors (**Table 2**).[70–72]

Consider cultural factors (such as diet) that influence cardiovascular health and therapy nonadherence, and discuss these concerns with patients. All primary care providers should be educated about cultural humility as an approach to identifying person-centered and culturally appropriate recommendations to optimize adherence to heart-healthy dietary and lifestyle modifications.

Active listening, counseling, education, and goal setting are crucial steps in optimizing treatment adherence. Tailor patient education to patient level of medical literacy, use patient-friendly terminology, and use the teach-back method, which involves asking patients to restate the information back to you in their own words to ensure adequate understanding.[73] To ensure quality patient communication, use interpretation services for all patients with a preferred language different from that of the clinician. In addition to improving patient adherence to treatment, appropriate communication can lead to lower postdischarge readmission rates and improved patient satisfaction.

Also consider other person-specific factors, such as lifestyle and cognitive ability, when developing treatment plans. Regimens with high pill burdens and different dosing intervals may be difficult to follow and maintain. Communicate with patients and make adjustments that are informed by their goals and preferences, when possible, to develop an effective, evidence-based, and sustainable regimen.[71]

Always consider socioeconomic barriers, including whether patients have access to affordable fresh fruits and vegetables, exercise programs, transportation, and pharmacies; whether they can afford their medications; and if they have disproportionate access to fast-food restaurants.[74]

CONCLUSION

Treatment guidelines and public education require additional modification to more effectively reduce healthcare disparities based on sex, gender, race, and socioeconomic status. Nonadherence is similarly informed by multiple social factors.

Researchers are exploring social factors related to use of hs-cTn in various populations; cardiac interventions; and data correlations with glycemic status, diet, alcohol consumption, and lipid profile. Possible solutions are to include more cisgender women and gender minorities in clinical trials, explore the effects of medications among diverse study participants, incorporate genetics-based medicine, and evaluate medical devices in these populations. Revision to facility-based operational policies and procedures is needed to ensure implicit bias does not affect clinical decision-making and services provided, even when there may be implicit preferences by clinicians.[75,76] As medicine evolves, a more nuanced understanding of social factors should more accurately reflect the complexities of individualized care. **JAAPA**

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