



Disparities in the Use of Cardiac Rehabilitation in African Americans

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Abstract

Purpose of review Cardiac rehabilitation (CR) is a comprehensive outpatient program that reduces the risk of mortality and recurrent events and improves functional status and quality of life for patients recovering from acute cardiovascular disease (CVD) events. Among individuals with established CVD, African Americans have a higher risk of major cardiac events, which underscores the importance of CR use among African Americans. However, despite their high likelihood of adverse outcomes, CR is poorly utilized in African Americans with CVD. We review data on CR utilization among African Americans, barriers to participation, and the implications for policy and practice.

Recent findings Although established as a highly effective secondary prevention strategy, CR is underutilized in general, but especially by African Americans. Notwithstanding efforts to increase CR participation among all groups, participation rates remain low for African Americans and other minorities compared to Non-Hispanic Whites. The low CR participation rates by African Americans can be attributed to an array of factors including differential referral patterns, access to care, and socioeconomic factors. There are several promising strategies to improve CR participation which include promoting evidence-based guidelines, reducing barriers to access, novel CR delivery modalities, including more African Americans in CR clinical research, and increasing diversity in the CR workforce.

Summary African Americans with CVD events are less likely to be referred to, enroll in, and complete CR than Non-Hispanic Whites. There are many factors that impact CR participation by African Americans. Initiatives at the health policy, health system, individual, and community level will be needed to reduce these disparities in CR use.

Keywords Cardiovascular disease · Race · Disparities · Cardiac rehabilitation · Utilization

Abbreviations

CABG Coronary artery bypass graft surgery
CHD Coronary heart disease

CMS Center for Medicare and Medicaid Services
CR Cardiac rehabilitation
CVD Cardiovascular disease
CHW Community health worker
HF Heart failure
MI Myocardial infarction
NCDR National Cardiovascular Data Registry
NHW Non-Hispanic White
PCI Percutaneous coronary intervention
SES Socioeconomic status
USA United States of America

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Introduction

More than 3 million Americans per year experience cardiovascular disease (CVD) events including myocardial infarction (MI) and acute decompensated heart failure (HF), or undergo cardiac procedures such as percutaneous coronary intervention (PCI), coronary artery bypass graft surgery

(CABG) or heart valve repair or replacement [1, 2]. Minority groups, particularly African Americans, bear a disproportionate burden of CVD. African Americans have a higher prevalence of coronary heart disease (CHD) and are more likely to have fatal presentations of CHD than non-Hispanic Whites (NHWs) [3].

Compared to NHWs, more African Americans develop HF from modifiable risk factors such as hypertension and diabetes [4–6]. African Americans experience incident HF at younger ages, with men having the highest incidence of HF compared to other race and sex groups [4, 7]. Furthermore, middle-aged African American men and women with HF (ages 35–64 years) have higher mortality rates compared to NHW men and women, and these disparities have been widening [8]. Patients with pre-existing CVD are at high risk for both short and long-term morbidity, mortality, and costs associated with readmissions and repeat procedures [9, 10].

Cardiac rehabilitation (CR) is a highly effective outpatient program for reducing recurrent CVD events and mortality, improving quality of life and functional status for patients recovering from CVD events [11]. Nonetheless, CR is significantly underutilized by eligible patients. Additionally, disparities in the use of CR by African Americans and other racial and ethnic minorities exist due to unique and sometimes addressable barriers. This review summarizes the epidemiology of CR utilization among African Americans, reasons for these existing disparities, and efforts to address them [12].

Background

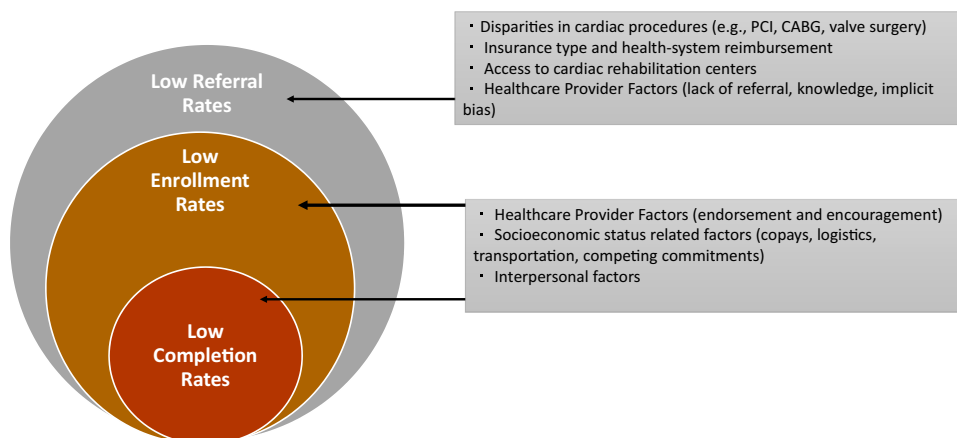
CR is a central component of secondary prevention strategies for those with recent CVD events [11]. Administered over 12 weeks and 36 sessions, the core elements of CR include: functional status assessments; supervised exercise training; comprehensive management of risk factors (e.g., tobacco cessation, nutrition, and physical activity); disease

self-management education; and counseling on psychosocial risk factors [13•]. CVD care in the early twentieth century was characterized by restrictions on mobility after CVD events, which led to deconditioning and poor outcomes [14]. Over the last 30 years, however, exercise training and the formal program of CR have become key to preventing recurrent CVD events [15]. Exercise training has favorable effects on the cardiovascular system, skeletal muscle, lipids, weight loss/maintenance, and blood pressure [16].

In a meta-analysis of randomized clinical trials of CR among patients with MI, Lawler et al. showed a 47% lower risk of recurrent MI, 36% lower risk of cardiac mortality, and 26% lower risk of all-cause mortality [17]. Multiple other studies have confirmed that CR is associated with a nearly 50% reduction in long-term mortality rates after MI of up to 10 years [18–20]. Clinical benefits in patients with HF and heart valve surgery have also been described [21–23]. Thus, clinical practice guidelines give a Class IA recommendation for CR for all patients with a qualifying CVD event, which includes MI, CABG, PCI, stable angina pectoris, heart valve surgery, symptomatic peripheral arterial disease, stable HF with reduced ejection fraction, and heart transplantation [11, 13•]. Furthermore, the Center for Medicare and Medicaid Services (CMS) and other private insurers reimburse up to 36 sessions of CR for eligible patients [24].

Despite established benefits, CR is underutilized with nationwide participation rates of approximately 20–30% [25, 26•]. Women, racial and ethnic minorities, the elderly, and patients with low socioeconomic status (SES) are less likely to participate, and therefore do not reap the substantial short and long-term benefits of CR [12, 25, 26•, 27•, 28–31, 32••, 33••, 34–37]. At the root of the disparities in the use of CR are multi-level barriers at the health system, individual provider and patient level that will be highlighted in this review [38, 39] (Fig. 1).

Fig. 1 Barriers to cardiac rehabilitation utilization among African Americans



Disparities in Referrals

Referral to CR involves a physician order for CR for a qualifying condition, a documented discussion with the patient about the program, and CR program receipt of the associated order [40••]. However, referral rates to CR differ significantly between African Americans, other minorities, and NHWs. Gregory et al. demonstrated that among patients with CVD eligible for CR, discharged from community hospitals in Maryland, NHW patients were twice as likely to be referred to CR compared to African American patients, even after adjusting for demographics and insurance characteristics [41]. And in an observational study of 253 women discharged after acute MI or coronary revascularization from an urban academic center, Allen et al. showed that African American women were 55% less likely to be referred to CR within 6 months of discharge compared to White women [42].

More recently in the AHA *Get with the Guidelines*, a large inpatient quality improvement registry of 365 hospitals across the USA including nearly 50,000 patients with CHD, African Americans patients were 20% less likely to be referred to CR compared to NHWs [33••]. In the *National Cardiovascular Data Registry (NCDR)* of over 1.5 million individuals undergoing PCI, Aragam et al. showed that among nearly 200,000 patients on Medicare, compared with NHWs, African Americans were less likely to be referred to CR [43].

Overall, single-center, multi-center, and Medicare data confirm racial disparities in CR referrals. There are a number of potential reasons why African Americans and other minorities are less likely to be referred to CR than NHW, including differences in the indication for CR, insurance coverage, health care access, provider awareness about CR benefits and implicit bias. We describe each factor in more detail subsequently.

Disparities in Cardiac Procedures

Patients who undergo cardiac procedures during their hospitalization such as PCI or CABG for MI or angina, or heart valve surgery for symptomatic valvular heart disease, are more likely to be referred to CR compared to patients with MI or HF who are treated with medical management alone [26•]. Importantly, African Americans with symptomatic CVD are less likely to undergo advanced cardiac procedures. For example, among individuals undergoing coronary angiography for symptomatic CHD, African Americans are less likely to undergo CABG or PCI [44, 45]. Additionally, African Americans with symptomatic aortic stenosis are less likely to undergo both surgical and

percutaneous trans-catheter aortic valve replacements [46, 47]. Since individuals who undergo cardiac procedures are more likely to be referred to CR, racial differences in procedures may contribute to systematically lower CR referrals for African American patients.

Insurance and Reimbursement

There are several studies, both single center and nationwide, that show that patients with private insurance are more likely to be referred to CR when compared to patients with government sponsored insurance such as Medicaid that is designed to support those with limited financial resources. Aragam et al. showed that among patients who underwent PCI, having Medicaid was associated with lower CR referral compared to those with Medicare or private insurance [43]. Mead et al. showed that insurance status played a significant role in individual physicians' likelihood of CR referrals [48••]. Since African Americans are more likely to have Medicaid or be uninsured compared to their NHW counterparts, disparities in insurance coverage also likely contributes to lower CR referrals [49, 50].

Access to Cardiac Rehabilitation Centers

Lack of facilities is another hindrance to referrals, particularly when the discharging hospital is not affiliated with a CR center. Geographic variations in access to facilities may explain variations in CR use. In a nationwide study of Medicare beneficiaries after MI or CABG, large variations in participation by state of residence were uncovered [25]. The highest participation rates were found in the midwestern states, which had nearly four times more CR enrollment compared to southern states [25]. The highest participation rate was in Nebraska (53.5%), but many of the southern states had participation rates of <5% [25]. These extreme variations in participation may be attributable to differential access to CR facilities, with less availability in regions with higher African American populations [48••]. For example, in large urban cities such as New York City, there is only one program available per 728,000 residents [51]. There is also a scarcity of CR centers in both urban and rural areas in the USA to accommodate all patients requiring CR. In a survey of 812 CR program directors in the USA about the CR center capacity, most were operating at full capacity and had insufficient resources to increase capacity to accommodate more new patients [52]. Health systems with a lack of CR facilities may be more concentrated in areas where African Americans live, such as urban settings. Moreover, healthcare providers may be more hesitant to refer patients outside their health system for fear of losing their patient base [48••]. Therefore, discharging physicians may be influenced by

lack of facilities or inadequate CR capacity when deciding whether to refer patients to CR.

Healthcare Provider Factors

Healthcare Provider Knowledge

A lack of awareness about CR, its benefits, insurance coverage, and health-system reimbursement are key factors influencing the decision for physician referrals to CR [53]. Dahan et al. identified lack of knowledge about the indications and benefit of CR as a significant factor leading to lower referral rates by physicians [54]. Mead et al. showed that skepticism about the benefits of CR and clinician emphasis on advanced therapies and interventional procedures played a role in lower referrals among physicians working in minority-predominant hospital systems [48••].

Healthcare providers in urban health systems, predominantly serving minority patients with an indication for CR, described a lack of a formal referral process, including when and how referrals should occur. This was especially salient with providers who were overburdened and had time pressures, such as those in safety-net urban hospitals, with high Medicaid utilization rates, that served more African American and other minorities [48••, 55].

Implicit Bias

Another factor that likely affects CR referrals is implicit bias, which influences the care of patients and is associated with poor patient–physician communication and lower levels of satisfaction with care [56]. Even well-intentioned clinicians when under conditions of stress (e.g., time pressure, fatigue, information overload) may unintentionally contribute to disparities [57]. In work by van Ryn and Burke, surveys of physicians caring for both African American and NHW patients with symptomatic CHD undergoing coronary angiography believed that their African American patients were less likely to adhere to treatment recommendations and instead engage in unhealthier behaviors [58]. Specifically, for CR, Ghisi et al. developed and administered a 19-item *Physician Attitudes toward Cardiac Rehabilitation and Referral Scale* that was quite revealing [59].

Some of the most salient factors noted in the survey that predicted attitudes to CR were physicians' perceptions of patient motivation, patient characteristics, and perception of benefit. These responses were not specific to African American patients. While there are no large studies specifically examining race-related implicit bias in CR referrals, important insights about disparities in CR referrals can be gained from a qualitative study with in-depth interviews of physicians by Mead et al. [48••]. In this study, clinicians perceived that less positive attitudes toward exercise and

healthy diet by African Americans and other minorities resulted in their lower likelihood of participation and adherence to CR [48••]. Such preconceived notions about African Americans' willingness to engage in healthy lifestyle practices could influence the likelihood of CR recommendation and referral [49]. Clinician perceptions about their patients may unintentionally contribute to differences in referrals and endorsement of CR [57, 60].

Disparities in CR Enrollment and Completion

Even after referral, African Americans and other minorities are less likely to enroll in or complete the full 36-sessions of CR. In a single-center retrospective study in an urban academic center, Prince et al. showed that racial and ethnic minorities were 77% less likely to enroll in CR despite having a referral [61]. Similarly, Suaya et al. in 1997 examined over 260,000 Medicare beneficiaries with acute MI or CABG, with an indication for CR, and found that NHWs were 33% more likely to enroll in CR compared to racial and ethnic minorities [25]. Similarly, in 2016, Ritchey et al. examined over 360,000 Medicare beneficiaries with an indication for CR and found that African Americans were 30% less likely to enroll in CR despite having an indication. Additionally, Patel et al. showed that among nearly 50,000 Medicare beneficiaries undergoing heart valve surgery, only 24% of African Americans enrolled in CR compared to 45% of NHW patients [23].

Within an analysis of *Behavioral Risk Factor Surveillance System* data of 11,773 people (8% African-American) recently discharged after MI, African Americans participated in CR 30% less than NHW patients [29]. Fewer studies have examined CR completion by race. Prince et al. showed that among patients who initiated CR, racial and ethnic minority patients were less likely to successfully complete all CR sessions [61]. There are a number of potential reasons for lower CR participation among African Americans after referral, as summarized below.

Patient Knowledge and Attitudes Toward CR

Patient knowledge and awareness of the importance of CR in their recovery is a critical component to enrollment and completion. Knowledge and awareness requires effective education. And in fact, healthcare provider discussion and endorsement of CR with patients have been among the most important and powerful motivators for CR participation by patients [48••, 53]. However, the educational needs of patients recovering from CVD events are complex [62]. Many patients referred to CR were unaware of the role of CR in their recovery because discussions about the benefits of CR did not occur [63]. Mead et al. also showed

that even when African Americans are referred to CR, they consistently reported not receiving adequate information about CR and its benefits to guide their decisions about whether to participate in CR [48••].

Factors Related to Socioeconomic Status

Another source of disparities in CR participation by African Americans may relate to SES. According to an analysis of federal government statistics by the Pew Research Center, compared to NHWs, African Americans were more likely to have lower household incomes, live in lower-income neighborhoods, have lower net wealth, and less likely to graduate from college than their NHW counterparts [64]. People with low SES face significant barriers to CR participation [12, 48••].

Bachmann et al. analyzed data from the *Southern Community Cohort Study*, a prospective cohort study in the southeastern USA, and found that among 4,096 patients with symptomatic CHD, individuals with a household income > \$25,000 were 68% more likely to initiate CR than individuals with incomes < \$15,000 [31]. Additionally, individuals who had completed college were 61% more likely to participate in CR compared with those with less than high school education. Those who lived in the most deprived neighborhoods were 58% less likely to participate in CR compared to those living in the least deprived neighborhoods.

Mead et al. identified barriers to attending CR related to low SES, including a lack of transportation, competing priorities such as work, and responsibility as a care giver [48••]. Work responsibility was an especially important barrier for younger working-age participants. Valencia et al. highlighted work inflexibility as a key barrier for CR participation, especially in low-income occupations with few healthcare benefits such as sick leave [37].

Mead et al. explored, with in-depth interviews and focus groups, reasons why African American patients did not participate in CR. The top barriers were lack of insurance coverage, constraints by insurance coverage on participation, prohibitive out-of-pocket costs, and transportation difficulties. Furthermore, many of these patients cited difficulties navigating the health system as being the primary reason for non-participation, and patients frequently gave up trying to enroll in CR when the process became confusing or burdensome [48••]. There have been some combined associations described for SES and race with CR participation, for example, compared to only 6% of NHW women, 23% of African American women were more likely to withdraw prior to CR completion due to work conflicts [65].

Interpersonal Factors

Interpersonal factors in the clinical setting may also play a role in lower CR participation rates among African American patients. The quality of the interactions between patients and physicians has consistently been lower for minority patients [66]. Among African American patients, perceptions of health care discrimination and rapport with their physician influences their decision-making related to their cardiovascular health [67]. Valencia et al. proposed that perceived discrimination and dissatisfaction with healthcare providers were potential reasons for low CR enrollment among racial and ethnic minorities [37].

Implications for Policy and Practice

In recognition of the importance of CR, and particularly its underutilization by vulnerable groups, the Center for Disease Control and Prevention and CMS, in 2017, launched an initiative called the “Million Hearts Cardiac Rehabilitation Collaborative” to increase CR participation from 20 to 70% by 2022 [68••]. They estimated that “increasing enrollment into CR to 70% would result in 25,000 fewer lives lost, and 180,000 less hospital admissions.” Their roadmap to increasing CR participation centered on strategies to increase referral to, enrollment in, and completion of CR that have been proven in clinical trials among all patients. However, there have not been specific clinical trials examining ways to engage African American patients in CR, largely because they have been underrepresented in CR clinical research [69].

The groundbreaking report by the Institute of Medicine in 2003, *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care*, outlined interventions to eliminate racial and ethnic disparities in healthcare. The lessons from this report can be translated to strategies to increase the utilization of CR among African Americans and other minorities [55]. However, these strategies will require efforts at the health policy, health system, healthcare provider, community, and individual levels (Fig. 2).

Promote Evidence-Based Guidelines

CR is a Class IA recommendation for patients with eligible CVD events. Furthermore, CR referral both from the inpatient and outpatient setting is an American Heart Association/American College of Cardiology (AHA/ACC) Performance Measure and is an important facet of the discharge process [13•]. Therefore, institutions should adopt automated systematic referral in the electronic health record for all patients eligible for CR. One of the most important

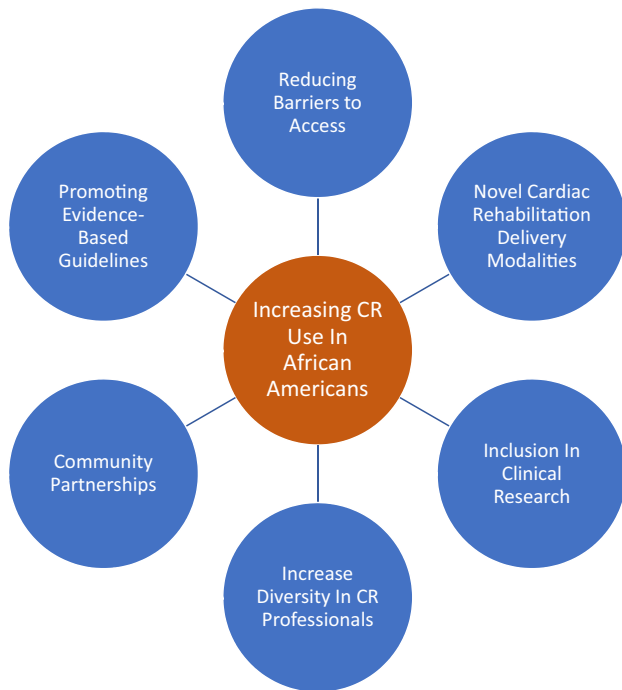


Fig. 2 Strategies for increasing cardiac rehabilitation use in African Americans

variables associated with CR participation is an actual referral order either at hospital discharge or soon after discharge [32••, 70]. Discussion, endorsement, and encouragement by healthcare providers are also important.

Grace et. al. showed that systematic referrals and a discussion prior to hospital discharge by either provider or liaison boosted referrals, resulting in 45% higher enrollment [70]. Systematic referrals promote consistency and equity in care [68••]. Additionally, knowledge of the benefits of CR, and awareness of reimbursement by healthcare providers are significantly associated with referral and endorsement of the program [71]. Health systems could better educate clinicians on the evidence regarding CR indications and effectiveness. They can also encourage clinicians to comply with guideline recommendations for CR referrals to promote consistency and equity in care.

Reduce Barriers to Access

Healthcare Financing and Delivery

African Americans are more likely to be uninsured, enrolled in government-sponsored healthcare plans such as Medicaid, or insured by lower-tier health plans [50]. These plans may place limits on services like CR, may not provide coverage for CR, or may require prohibitive co-pays. Health insurance reform such as the Affordable Care Act in 2014 was

associated with greater gains in health insurance coverage for African Americans and Hispanics compared to NHWs [72]. Efforts at reforming healthcare financing and delivery to allow higher enrollment in high-quality health insurance plans that allow coverage for CR with minimal or no co-pays would further reduce disparities in access to CR.

Eliminate Out-of-Pocket Costs

Eliminating co-pays and other out-of-pocket expenses improves adherence to CVD therapies after MI and this approach may also work for improving CR enrollment [73]. Programs that assist patients with co-pays and out-of-pocket costs, including transportation vouchers, are vital and may be cost-effective if they result in higher CR participation rates.

Health System Navigation

Health system navigation, particularly in the post-discharge time period, is a formidable barrier for many patients attempting to participate in CR, particularly those with low SES [74]. Patient navigators and inpatient liaisons improve the uptake of CR after discharge [75]. Among African Americans, health system navigation with the assistance of trained community health workers (CHWs) can potentially improve engagement with the health system [76].

CHWs are public health personnel who promote health within the community and often reflect the communities they serve. The use of CHWs has been shown to improve CVD risk factor control and to favorably impact the post-discharge transition among patient with low SES [76]. Integration of CHWs into a multidisciplinary CR team could help increase CR uptake among African American patients [77].

Novel CR Delivery Modalities

African Americans are more likely to live in areas with lower access to CR or to have difficulties with access due to logistical challenges or transportation costs [25, 48••]. Alternatives to center-based CR that can be delivered in a variety of settings, such as at home or in community centers, are promising avenues for increasing access. These alternatives are promising because they can potentially help overcome barriers often faced by African Americans such as geographical distance, logistics, time conflicts, and costs associated with transportation. Home-based CR can be delivered by a variety of modalities including websites, text-messages, phone calls and by emerging avenues through virtual and mobile applications [78, 79].

A recent Cochrane review comparing randomized clinical trials of home-based vs. center-based CR showed that they

were similarly associated with improved quality of life and reductions in recurrent CVD [80]. Importantly, home-based CR is a safe and reasonable alternative to center-based CR for select low- to moderate-risk patients [80, 81•]. One barrier to home-based CR is lack of reimbursement by insurance. However, the COVID-19 pandemic has led to CR center closures and reduced CR capacity, which has resulted in CMS approving reimbursement for home-based CR [82].

Another potential strategy for improving CR uptake among African Americans is equitable access to mobile technology. Among 724 veterans with CHD with access to mobile technologies, enrolled in a home-based virtual CR program, there were no differences in CR participation and completion by race [83]. Additionally, a mobile application that was tailored to African American patient preferences was successful in improving cardiovascular health behaviors [84]. Future research is needed to refine home-based CR to include technology that is accessible and tailored to African Americans and other minority patients.

Community Partnerships

Community-based CR approaches, with CR sessions housed within community organizations such as churches or community centers, can potentially increase CR participation among African Americans by enhancing trust with the healthcare team [85, 86]. Brewer et al. described a cardiovascular health promotion intervention that was culturally tailored, community-based, and linked to local churches to promote cardiovascular health among African Americans as a potential way to improve CVD outcomes [87]. There has also been prior work showing community-based programs such as local YMCAs can improve access and allow more patients to participate [85].

Inclusion into Clinical Research

African Americans have been traditionally underrepresented in CR clinical research. Among 63 trials on the efficacy of CR in CHD, only 5 reported race or ethnicity in the participant characteristics, and the overwhelming majority of participants were NHWs [88]. Only one study, *Heart Failure: A Controlled Trial Investigating Outcomes of Exercise Training (HF-ACTION)*, which examined the benefits of CR for patients with HF with reduced ejection fraction, included a substantial subset of African Americans (32%) [89]. Among several clinical trials of innovative ways to increase CR participation, few have described the racial and ethnic composition of the participant characteristics, and among them, the majority of participants were NWHs [69].

Including African Americans and other minorities in clinical trials on novel CR delivery methods is important for developing interventions that are widely effective for individuals from diverse backgrounds. Furthermore, active engagement of community stakeholders in research using community-based participatory research approaches will enhance efforts to improve equity in CR use [90, 91].

Increase Diversity among CR Health Professionals and Enhance Health Equity Education

Research has shown that concordance by race or ethnicity between patients and providers results in higher rates of health-service utilization, patient satisfaction, and adherence to treatment [92]. However, racial and ethnic diversity among CR health professionals is quite low. A survey performed by the *American Association of Cardiac and Pulmonary Rehabilitation (AACVPR)* in 2010 found that out of the nearly 1,000 respondents, only 1% were African American [60]. Thus, one way to increase trust, patient satisfaction, and higher participation in CR is through increasing diversity among CR health professionals [37, 60]. Additionally, instruction for healthcare providers that integrates a focus on health equity, cultural competency, and sensitivity training could contribute to better patient-provider relationships, increased patient satisfaction, higher quality of care and help to reduce disparities in CR participation [93].

Conclusion

Significant disparities in the use of CR by African Americans exist and result from a complex array of factors that lead to lower CR referrals, enrollment and completion compared to NHWs. Disparities in referrals have consistently been described across single center studies, national registries, and Medicare claims data. African Americans are less likely to undergo cardiac procedures that are associated with higher rates of CR referrals, and more likely to have insurance with more restrictions or greater copays or to lack adequate insurance coverage for CR. African Americans are also more likely to inhabit regions that lack access to CR centers. Additionally, healthcare provider factors such as knowledge of CR, skepticism about its benefits, and implicit bias can play a role in lower referrals among African Americans patients. CR enrollment and completion are also influenced by barriers related to socioeconomic status such as costs and time constraints, as well as interpersonal factors such as trust. African Americans have been underrepresented in research on CR benefits and interventional studies testing strategies to increase CR participation. Efforts such

as systematic and automatic referrals using the electronic health record, healthcare provider education about CR, cultural competency, sensitivity training, novel CR delivery modalities, and enhanced community partnerships are needed to reduce racial disparities in CR utilization.

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Compliance with Ethical Standards

Conflict of Interest The authors have no conflicts of interest to disclose.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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