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AHA SCIENTIFIC STATEMENT

Equity in Cardio-Oncology Care and Research: A Scientific Statement From the American Heart Association

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ABSTRACT: Advances in cancer therapeutics have revolutionized survival outcomes in patients with cancer. However, cardiovascular toxicities associated with specific cancer therapeutics adversely affect the outcomes of patients with cancer. Recent studies have uncovered excess risks of these cardiotoxic events, especially in traditionally underrepresented populations. Despite advances in strategies to limit the risks of cardiovascular events among cancer survivors, relatively limited guidance is available to address the rapidly growing problem of disparate cardiotoxic risks among women and underrepresented patient populations. Previously decentralized and sporadic evaluations have led to a lack of consensus on the definitions, investigation, and potential optimal strategies to address disparate cardiotoxicity in contemporary cancer care (eg, with immunotherapy, biologic, or cytotoxic therapies) settings. This scientific statement aims to define the current state of evidence for disparate cardiotoxicity while proposing uniform and novel methodological approaches to inform the identification and mitigation of disparate cardio-oncology outcomes in future clinical trials, registries, and daily clinical care settings. We also propose an evidence-based integrated approach to identify and mitigate disparities in the routine clinical setting. This consensus scientific statement summarizes and clarifies available evidence while providing guidance on addressing inequities in the era of emerging anticancer therapies.

Key Words: AHA Scientific Statements ■ antineoplastic protocols ■ cardiotoxicity ■ health equity ■ healthcare disparities ■ immunotherapy ■ sex ■ socioeconomic disparities in health

In the United States, nearly 20 million people are considered cancer survivors.[1] Over the past 2 decades, there has been notable improvement in cancer survival.[1] Much of this increase has been driven by a surge in effective novel anticancer therapies. However, cardiovascular disease (CVD) has emerged as a leading cause of nonmalignant morbidity and mortality risk in patients with cancer.[2] To meet this challenge, the burgeoning field of cardio-oncology is dedicated to increasing the awareness and management of cardiovascular sequelae associated with anticancer therapies.[3]

Concurrently, a growing body of evidence suggests that the risk of significant cardiotoxicity with anticancer therapy may be increased among women and underrepresented populations.[4–7] This is supported by disparately high mortality risk after a cancer diagnosis, particularly among women and individuals from underrepresented ethnic and racial groups, even after accounting for socioeconomic and behavioral patterns. Given the broad ramifications of these gaps in a rapidly growing population, undertaking this pressing public health issue is critical. Considering the clear need to understand and address the drivers of disparities in cardio-oncology, we provide a multidisciplinary, evidence-based consensus statement from leading experts in the fields to move toward equity.

In this expert consensus document, we define the current state of evidence surrounding disparities in

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cardio-oncology. We also specifically provide context and suggestions for the following:

- Sex differences in cardiotoxic risk
- Population-specific differences in cardiotoxic risk
- Diversity in cancer or cardiotoxicity clinical trial (and registry) participation
- Strategies for reducing inequity in cardio-oncology

We also aim to provide consensus practical strategies for the equitable application and management of increasingly common clinical cardio-oncology scenarios.

DEFINING INEQUITY IN CARDIO-ONCOLOGY

The American Heart Association has outlined a general definition of health disparities and inequities. Health disparities are health differences among groups of people closely linked with social, economic, and environmental disadvantages.[8] Notably, health care inequity in cardio-oncology encompasses medical and societal issues and intrinsic cultural barriers (Figure 1). In the United States, these groups are typically affiliated with members of the same race, ethnicity, or socioeconomic status, as well as sexual and gender minority groups. These groups are defined as underrepresented and are considered as such in this scientific statement. These affiliations are hierarchical and determine access to privileged living and health. Health equity is defined as the right to equitable health care for all, regardless of societal disadvantages, based on group orientation.[9] Within cardio-oncology, cancer treatment can lead to a wide variety of cardiovascular manifestations and complications. The International Cardio-Oncology Society consensus statement[10] provides a summary of available criteria to diagnose and define CVD toxicities across cardiology and oncology clinical documents. These associated CVD toxicities include heart failure, myocarditis, arrhythmias, ischemic disease, pericarditis, and hypertension. Here, we define cardio-oncology inequities primarily as differences in the optimal allocation of cardioprotective medications, surveillance, and development of adverse outcomes related to cancer therapy–related cardiac disease or outcomes between different ethnic, racial, socioeconomic status and sexual and gender minority groups. Given the evolving nature of available data, we should also globally consider any disparate manifestations of cardiac disease after cancer treatment.

POPULATION-SPECIFIC CONSIDERATIONS

Sex Differences in Cardiotoxicity Risk

Emerging data suggest potential differences in the toxicity profile risk of a growing number of immune and targeted anticancer therapies.[11–13] In an evaluation of 202 phase 2 and 3 clinical trials, women saw a 34% increased risk of severe adverse events with anticancer therapy, including a 66% higher risk of immune checkpoint inhibitor (ICI)–associated toxicities.[13] Preclinical studies also demonstrate sex differences related to ICI-associated cardiac toxicity. In a genetic mouse model that recapitulates the findings of ICI-associated myocarditis (*Pdcd1-/-; Ctla4 +/-* haploinsufficiency), female mice have increased mortality rates.[14] This is consistent with clinical data that some female patients may be more prone to developing ICI-associated myocarditis for unclear reasons, possibly related to estradiol-dependent pathway attenuation.[15,16] The mechanisms of sex-dependent differences and immune-related adverse effects require more investigation at the preclinical and patient levels to determine biological differences in cardiotoxicity outcomes.

Among women treated with more traditional chemotherapies (eg, anthracyclines), differences in cardiac risk factors have been identified to contribute to cardiotoxic risk.[17] Obesity increases breast cancer and CVD risk, particularly in postmenopausal women.[1,8] Breast cancer therapies such as anthracyclines and trastuzumab are known to increase the risk of cardiac dysfunction, with up to a 10% to 14% incidence.[18] However, breast cancer survivors see even higher rates of heart failure with preserved ejection fraction, which contributes to poor outcomes but is often underrecognized.[19] Similarly, antiestrogen therapy in some women with breast cancer and postmenopausal women has been associated with CVD and stroke.[17] Women with breast cancer are also more likely to receive left-sided radiation therapy, which carries an increased risk of CVD events.[20] Together, these data support sex-based differences as a critical frontier in understanding and management of cardiotoxic risk.

Cardiotoxicity in Black Populations

Clinical and population-level data have established that African American/Black patients face a substantially increased risk for severe cardiotoxicity.[5,10,21–27] Most available research has focused on women with breast cancer.[10] Black patients have consistently demonstrated a 3-fold increased risk of cardiotoxicity after anthracyclines therapies.[5,21] Similarly, human epidermal growth factor receptor 2 inhibitor treatments are associated with a >2-fold increase in cancer therapy–related cardiac disease among Black patients with breast cancer.[22,23] In a study of patients treated with ICI therapy, Black women saw a 3.4-fold increased risk of cardiotoxic events compared with White women.[24] The reasons for these disparities are unclear but may be related to Black women presenting with later stages of cancers, which often require a higher intensity of anticancer therapies.[25,26] Despite these observations, available Surveillance, Epidemiology,

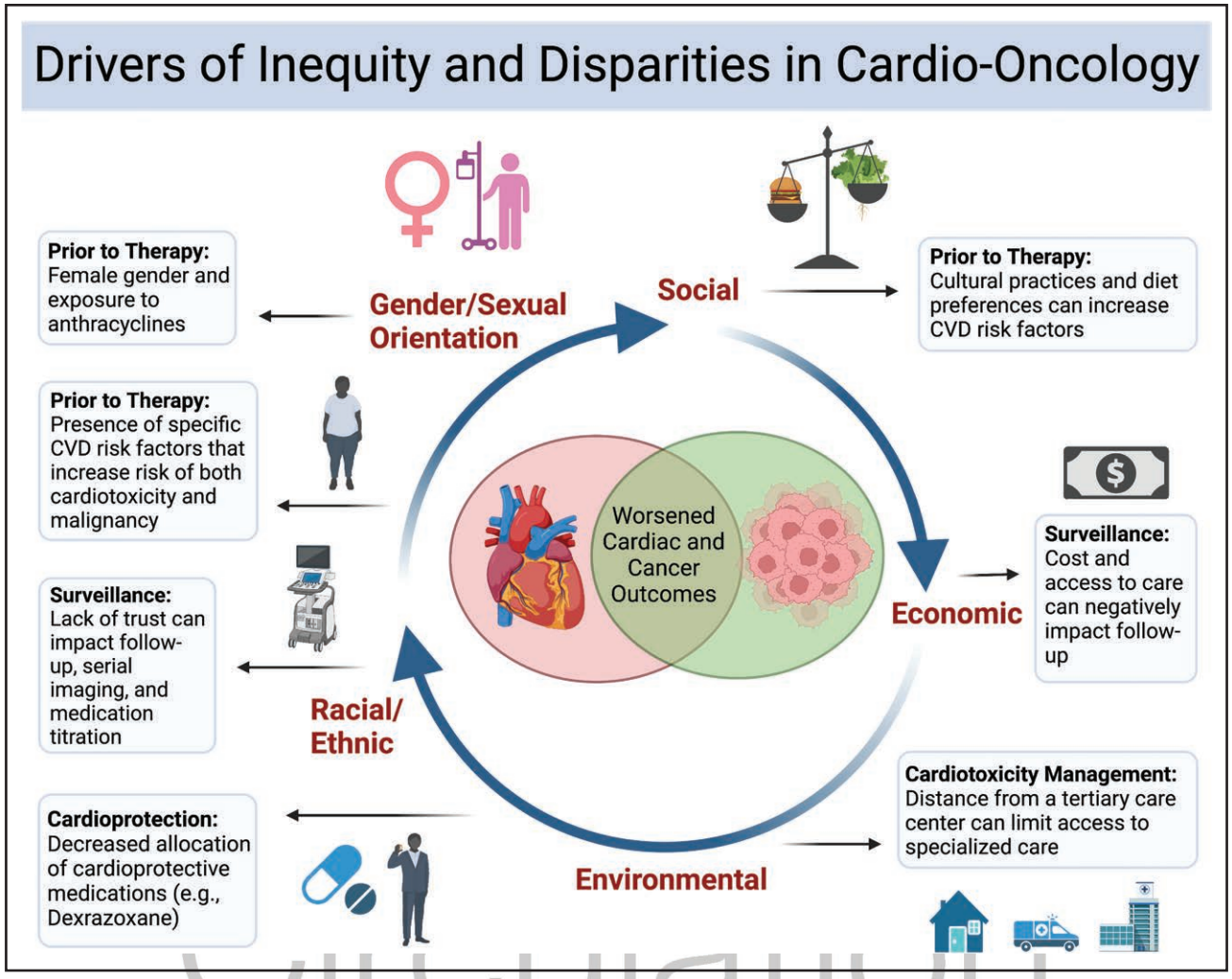

Figure 1. Inequity in cardio-oncology encompasses medical, genetic, and societal issues and intrinsic cultural barriers that ultimately lead to disparate outcomes.
CVD indicates cardiovascular disease. Created with BioRender.com.

and End Results–based data suggest that Black patients still see increased CVD and mortality risk after a cancer diagnosis, even after accounting for socioeconomic, cancer stage, and treatment-related factors (Table 1).[27–29] This suggests an independent risk not explained by increased rates of hypertension or other traditional cardiac factors alone. However, traditional risk factor burden has been identified to partially contribute to global cancer therapy–related cardiac disease risk in all populations. In the NHANES (National Health and Nutrition Examination Survey) community cohort, Black men and women had up to a 40% prevalence of hypertension compared with <30% among White individuals.[30] In several cancer survivor studies, there are disproportionately higher rates of hypertension in Black populations, which may increase the risk of cancer therapy–related cardiac disease especially related to heart failure.[8,29] In a large registry-based analysis, Black patients with breast cancer had a >2-fold increased risk for hypertension-related hospitalizations after a cancer diagnosis.[31] Although there are limited data, this risk of hypertension may likely be accentuated in patients requiring stem cell transplantation and tyrosine kinase inhibitors, treatments linked to incident hypertension.[3,32,33] Culturally, diets rooted in historic practices (eg, "soul food") and limited access to healthy foods due to socioeconomic factors may play a role.[8] These foods are high in saturated fats and salt, which can contribute to higher rates of hypertension. The factors and mechanistic drivers behind these differences still remain poorly elucidated, and additional prospective data are needed.[5] However, taken together, these observations affirm significant knowledge gaps in cardiotoxic risk and outcomes, which may limit survival among Black cancer survivors.

Cardiotoxicity in Hispanic Populations

In the United States, the Hispanic/Latin population represents 19% of the total population.[34] It is the country's fastest-growing racial and ethnic group, reaching 62.1

Table 1. Summary of Evidence of Disparate Risk of Cardiovascular Toxicity After Cancer Therapy by Specific Populations[5,10–16,21–28]

Cancer therapy type	Common toxicity	Populations at reported increased risk	Relative risk of cardiotoxicity	Mortality
Anthracyclines	Heart failure	Black	≈2.5–2.9	↑ Black
HER2-targeted therapies	Heart failure	Black	2.0–3.0	↑ Black
ICIs	Myocarditis, arrhythmia, ASCVD	Women, Black	1.0–3.4	NA
TKIs	Hypertension, arrhythmia, heart failure	Black	>2.0	NA
CHIP mutations (treatment induced or de novo)	ASCVD	Black	1.0–2.4	…
Pretreatment*	CVD risk factors	Black, American Indian,† Hispanic, Asian	>1.0	…

ASCVD indicates atherosclerotic cardiovascular disease; CHIP, clonal hematopoiesis of indeterminate potential; CVD, cardiovascular disease; HER2, human epidermal growth factor receptor 2; ICI, immune checkpoint inhibitor; NA, not available; and TKI, tyrosine kinase inhibitor.

*Precancer treatment cardiac risk factors.

†Increased CVD mortality rate also reported in American Indian individuals with any prior cancer treatment.[28]

million in 2020 despite an estimated undercount of 5% in the national census. Hispanic people in the United States are diverse in race, origin, heritage, socioeconomic characteristics, patterns of immigration, and degree of acculturation, with >33 million Hispanic people reporting their ancestry as mixed from ≥2 races. Cardio-oncology care inequalities stem from long-standing individual disparities in cardiovascular and cancer care.[35] CVD and cancer are the top 2 leading causes of death in the Hispanic population in the United States, sharing risk factors and often coexisting in the same individual along with other complex comorbidities.[36] Hispanic patients are less likely to be diagnosed with cancer early than non-Hispanic White patients.[1] With reduced screening and delayed preventive measures, Hispanic patients have more complex CVD, cancer diagnosis at later stages, and restriction to more cardiotoxic regimens because of a lack of eligibility for novel treatments.[7] Ultimately, this contributes to a higher incidence of treatment complications, cardiac dysfunction, and adverse patient outcomes. However, as seen with Black populations, whether factors beyond differences in cancer treatment intensity influence outcomes is an active area of investigation.

Cardiotoxicity in Asian and Pacific Islander Populations

There are similarities between Hispanic and Asian and Pacific Islander (API) populations. Cancer and CVD are also top causes of mortality risk in API people, and at least 19% of API people are without any source of medical care in the United States.[37] Like Hispanic populations, heterogeneity among people of API descent is masked by data collection in the aggregate. This does not reflect national origin, immigration status, and acculturation, which have been associated with increased cardiovascular risk factors and rates of cancer in API populations.[36,38] A recent study demonstrated that age-adjusted mortality rates in cardio-oncology patients were higher in counties with greater social vulnerability, particularly in Hispanic and API patients.[4] These data support the role of social factors in contributing to cancer therapy–related cardiac disease risk among various populations. To address these inequities, we must routinely work to consider the potential vulnerability data on our patients (Supplemental Figure 1).

Cardiotoxicity in the LGBTQIA+ Community

Sexual and gender minority groups include individuals who identify as a sexual orientation other than heterosexual (eg, gay, lesbian, bisexual, asexual, pansexual) or a gender different from their sex assigned at birth. The acronym LGBTQIA (lesbian/gay/bisexual/transgender/queer/intersex/asexual plus) is used to encompass all sexual and gender minority groups. In the United States, at least 7% of adults identify as LGBTQIA.[34] Nevertheless, LGBTQIA individuals experience health care inequality resulting from stressors (including self-stigma, family rejection, poor mental health, bias-motivated violence, and poverty) and structural discrimination, which can result in health care professionals' biases. These issues are likely amplified among individuals who identify with multiple minority groups. The National Institutes of Health identified sexual and gender minority groups as a health care disparity population for research.[39] In particular, LGBTQIA populations are at increased risk for CVD and cancer. LGBTQIA adults are more likely to report tobacco use and obesity (particularly among sexual minority women) than their cisgender heterosexual counterparts.[40] Moreover, HIV infection disproportionately affects transgender women and sexual minority men, which can lead to increased CVD risk factors and disease. Similarly, these behaviors and conditions can lead to increased cancer incidence and disparities at every stage of cancer care, from screening to end-of-life planning. Although no studies have specifically addressed cardio-oncology disparities

in this population, their presence can be inferred from the known CVD and oncology disparities.

To address these issues, it is suggested that sexual and gender data be routinely gathered in cardio-oncology patients because data demonstrate that asking these questions helps ease anxiety for patients on this topic.[40] Health care professionals should work to avoid gendered language as much as possible, and there should be increased visibility of LGBTQIA health care professionals and allies.

Cardiotoxicity in Pediatric Populations

Survival outcomes for pediatric cancers have improved over the past 2 decades. However, this has been accompanied by higher rates of long-term (>5 years) morbidity and mortality risk.[41] Several large cohort studies across different countries demonstrated improved survival outcomes after a primary cancer diagnosis but worse long-term survival compared with the general population.[41–44] Long-term survivors have a 7 to 9 times higher risk of death resulting from cardiac-related events compared with the general US population. Increased adverse cardiac events included heart failure (hazard ratio, 9.7), valvular disease (hazard ratio, 9.7), and coronary artery disease (hazard ratio, 3.4).[42,43] Cardiac studies in survivors have demonstrated frequent functional abnormalities by echocardiogram, including abnormal myocardial strain both early after therapy and over longer-term follow-up, even in the absence of symptoms.[45,46] Exercise stress testing has also shown progressive decline in measured exercise capacity (peak Vo_2).[47,48] Survivors also have an increased rates of hypertension, dyslipidemia, and vascular disease compared with the general population that may be exacerbated by environmental exposures and behaviors such as exercise, diet, and tobacco use.[42–48] Because of the inherent challenges faced by many childhood cancer survivors, who often are faced with strong desires to minimize medical care and to reflect peers without cancer histories, we suggest that an enhanced focus on the need for consistent care should be delivered to both patients and facilities.

Limited access to high-quality linguistically and culturally appropriate care, lower health literacy, structural racism, and perceived discrimination further drive disparities within cardio-oncology care. As research to develop novel therapies and precision cardio-oncology care progresses, it is essential to understand the unique biological characteristics of patients with cancer and survivors of diverse backgrounds.

NONBIOLOGICAL DRIVERS OF DISPARITIES IN CARDIO-ONCOLOGY

Social Determinants of Health

Social determinants of health such as poverty, neighborhood disadvantage, racial discrimination, lack of social support, and social isolation play an essential role in cardiovascular and cancer risk in individuals from underrepresented racial and ethnic groups.[49,50] Overall health (including cancer and cardiovascular) outcomes are heavily affected by disparities in access to and availability of health care services, nutritious foods, and education and employment opportunities and geographic location. In turn, all these factors affect rates of chronic disease and possibly the development of cardiotoxicities from cancer therapies. This is supported by emerging social vulnerability index– and area deprivation index–based studies demonstrating a graded increase in adverse outcomes based on social adversities.[4] Considering all these factors as they relate to health care is crucial for developing impactful policy solutions for all patients with cancer.

Limited Insurance and Access to Follow-Up

In a Surveillance, Epidemiology, and End Results–based investigation of long-term outcomes after anticancer treatment, insurance status was identified as a key determinant of subsequent cardiovascular risk.[27] Populations with multiple potential toxic exposures likely require more consistent and focused monitoring over time to minimize the risks of adverse outcomes. Historically, individuals from underserved groups were significantly more likely to be underinsured or to lack access to consistent care.[51] These factors have been established to contribute to other cardiovascular conditions, wherein the mortality risk is elevated in the absence of regular care.[52,53] This is compounded by increased financial burdens faced by those with comorbid cancer and CVD.[54] Furthermore, these challenges may be exacerbated in more rural settings, where cardio-oncology may not be readily available.[1,4,37] In less developed nations, limited access to cardio-oncology services may limit outcomes.[55] Data suggest that for other conditions (eg, hypertension screening) in which access to care for underrepresented populations is improved, poorer outcomes may be reduced.

Environment and Structural Racism

Environmental and psychosocial stressors have been recognized to contribute to disparate CVD.[55–57] Structural racism[58] limits opportunities for social, economic, and financial advancement and was recently identified in a presidential advisory from the American Heart Association as having a significant influence on health and health disparities. This advisory called for a multipronged approach to combating structural racism and environmental challenges that includes restructuring workplace, neighborhood, and school systems to improve conditions that affect health; improving the quality of housing and dismantling residential segregation; eliminating inequities that reduce access to health care; educating, understanding, and transforming

attitudes on racism; and researching racism and its effects on health and health disparities. Such recognition and strong statements from leading medical societies should improve education of physicians and lead to the adoption of policies that influence health care on a societal level.

Workforce Representation

Data indicate that some patients may experience more favorable outcomes when there is gender or racial concordance with their health care professional.[59] Similarly, population data show that patients of underrepresented backgrounds may be more likely to adhere to visits and care when a clinician of an even somewhat similar background is involved in their care.[60] These patients report lower likelihood of perceived bias and potentially greater adherence to care. Parallel to these observations has been the increasingly appreciated contribution of the conspicuous underrepresentation of key groups within the physician and biomedical research workforce, within the fields of both cardiovascular medicine and hematology/oncology.[61,62] Cross-sectional studies by the Association of American Medical Colleges, American Medical Association, and American Board of Internal Medicine assessed US cardiology physician workforce demographics and trends within the cardiology field. They found that although racially diverse groups make up more than one-third of the US demographic, <8% of adult and pediatric cardiologists[61] and <8% of practicing oncologists come from these groups.[62,63]

In a 2019 survey of Cardiovascular Diseases Program Directors, 86% felt that diversity in cardiovascular medicine needed to improve, and 70% of those polled felt that training programs could enhance diversity. The 2 most significant barriers were a lack of "perceived" qualified candidates and the overall culture of cardiology to achieve this objective.[64] However, in a similar focused survey of 110 CVD program director respondents, 63% of those polled felt that their program was already diverse and that efforts to increase diversity were not needed, and only 6% listed diversity as a top 3 priority when creating a fellowship rank list.[65] Moreover, a top reason for limited recruitment was a perceived lower "ability to fit in" or be a "team player." From 2006 to 2016, there was an increase in the percentage of female adult cardiologists from 8.9% to 12.6%. However, underrepresented minority groups in adult and pediatric cardiology fellowships increased only from 11.1% to 12.4%.[61] Although Asian individuals are not considered underrepresented in medicine because they make up 22% of annual US medical school graduates and >50% of current adult cardiology fellows, the broad term Asian covers many ethnic groups from Southeast Asia and the Pacific Islands, which may contain underrepresented groups.[66] This calls for more detailed analysis and classification to not aggregate such groups into a group not classically perceived to be underrepresented. Concurrently, implicit bias in the selection process, promotion, and support of underrepresented faculty and community practitioners has affected the observed gaps in the workforce.[67–69] For example, the 2022 annual Association of American Medical Colleges faculty report of full-time medical school faculty identified that of ≈191 512 faculty, 3.8% identified as Black/African American (2.2% of this group holding full professor rank) and 3.4% identified as Hispanic, Latino, or of Spanish origin (2.6% holding full professor rank).[70]

These findings indicate that much work remains to be done in establishing effective strategies for diversifying the cardiology and cancer workforce, from the trainee to the faculty level. Such efforts may result in improved access to care and overall quality of care of underrepresented populations.[49,71]

CLINICAL TRIAL DIVERSITY

Growing data suggest that the absence of diversity (eg, biological, socioeconomic, sexual identity) in cancer and CVD therapeutic assessment drives poor treatment response and adverse clinical outcomes. Available cardiotoxicity trials have focused primarily on more homogeneous White populations. This was historically driven in part by perceptions of likelihood to adhere to visits. However, with the establishment of cardio-oncology as an accepted discipline, enhanced focus on the equitable distribution of patients within registries and trials is needed to facilitate improved the translation of results into clinical care. In a review of cancer clinical trials from 2003 to 2016, only 31% of cancer clinical trials reported race and ethnicity. Non-Hispanic White people are more likely to enroll in clinical trials than Black/African American and Hispanic people, with enrollment fractions for Hispanic people being the lowest of all racial and ethnic groups in most cancer types.[72] The National Institutes of Health and other societies have called for research stakeholders to invest in programs and policies that increase diversity in clinical trials and the research workforce. Practically, this would include collecting and publishing data on racial and ethnic diversity among trial participants to better inform the understanding and application of study data.[73]

STRATEGIES TO IMPROVE EQUITY

Investigating Biological Mechanisms

Although social factors may influence much of the disparities observed, mounting data suggest that the interaction of anticancer therapeutics may differ between groups. For example, women show differing expression of key pathways involved in the development of ICI myocarditis compared with men.[16] Because of this and the

historical underrepresentation of women and racial and ethnic groups in many key trials used to inform clinical care and interpretation of risk, we suggest strong effort be made toward exploring potential biological pathways and factors (eg, gene variants) related to differences in cardiotoxic risk and disease severity.[5–7] These efforts will allow the tailoring of care in an era of increasing focus on precision medicine.

Intentionally Diversifying Clinical Trials

It is essential to promote increased diversity in general and cardio-oncology clinical trials. Specifically, the incidence of cardiovascular risk factors disproportionately affects marginalized populations, which are also associated with the development of cancer treatment–associated cardiotoxicities. The lack of adequate representation of a diverse population can lead to outcome disparities. Several strategies should be considered to achieve a more diverse population in cardio-oncology clinical trials. Clinical trial eligibility should be broadened to prevent the exclusion of patients with preexisting CVD or risk factors, advanced cancer stage, or chronic conditions such as HIV. Screening of study participants should rely on standardized processes to reduce the introduction of bias, and study sites should use the Diversity Site Assessment Tool of the Society for Clinical Research Sites to promote diversity, equity, and inclusion.[74] Clinical trial sites should develop a process to assess clinical trial diversity regularly and to reduce unconscious bias through cultural humility. Last, the intentional diversification of clinical trial leadership and support staff can help to promote health equity and to reduce disparities. We expect to better understand the risk of cardiotoxicity with increased diversity, equity, and inclusion of marginalized populations in cardio-oncology studies.

Integrating Social Determinants of Health Into Clinical Care Delivery

Beyond the need for additional mechanistic studies focused on potential mediators of disparate cardiotoxicity, raising awareness of the social and financial inequities in cardio-oncology care is crucial. Furthermore, local and public advocacy for treatment pathways that provide

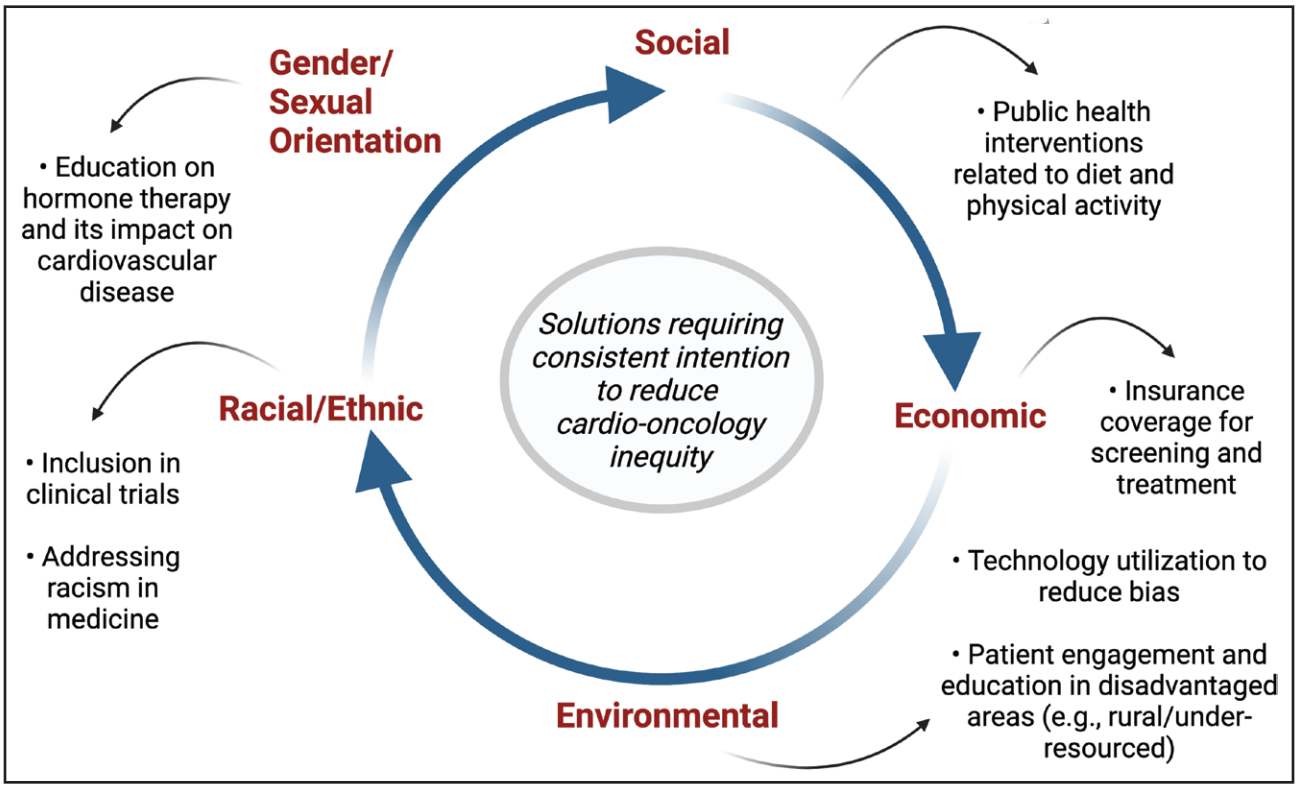

Figure 2. Potential practical strategies to reduce inequity in cardio-oncology.
Despite the high burden of disease faced by many patients, multilevel considerations may serve to reduce the differences in outcomes. To achieve these goals, we suggest identifying barriers to care and introducing solutions to improve patient outcomes (lifestyle changes; community education and outreach; availability for oncological clinical trials and cardio-oncology; cardio-oncology education for oncology and cardiology clinicians; inclusion in clinical trials; diversity of workforce; standardization of research protocols; leveraged technology platforms to improve clinician implementation of strategies to reduce cardio-oncology disparities; removal of barriers to oncology and cardiology care). Created with BioRender.com.

fiscally conscious optimal care can help address these inequities, improve patient outcomes, and further equitable participation in scientific progress in cardio-oncology[75] (Figure 2). This may improve cardiovascular and cancer outcomes across all populations.

Improving Access to Care

It is postulated that telehealth may help address disparities in access to health care services and health outcomes.[7] Although challenges in consistent access to telehealth remain, remote access is an increasingly feasible and effective avenue for cardio-oncological care when travel may be limited.[76] Other proposed solutions to telehealth disparities, including using technology designed with equity in mind, making materials in various languages accessible, creating patient intake forms that ask about accessibility to technology, asking patients if they need help with technology, and allowing extra time in virtual visit appointments, will require intentional training and leveraging to optimize the delivery and outcomes of care.[77]

Reducing Bias

Because of the serious toll of bias on patient outcomes, strategic reduction is needed. Proposed strategies to reduce bias in academic search committees have included (1) programmed pretraining of members in identifying implicit bias and self-awareness; (2) designing an outcome framework of ideal key characteristics that would be insulated against individual or group bias; (3) selecting committee members who are not solely politically powerful or influential faculty members; (4) using an impartial scribe to document meetings and interviews objectively; and (5) having a target goal of underrepresented applicants to interview.[69]

Additional Strategies

Other strategies for improvement include purposefully designing trials and interventions that define, screen for, and mitigate the financial consequences of cardio-oncology care through financial navigation plans.[5] Patient navigators, including former cancer or cardiotoxicity survivors, have been increasingly incorporated into oncological care.[78] These engaged patients provide a significant avenue to meaningfully reduce barriers to routine and investigation care while increasing the likelihood of consistent patient adherence. We suggest reliable availability of interpretation services for non-English speakers who require assistance to fully understand the complex medical and financial issues in accessing cardio-oncology care. Furthermore, we suggest integration of electronic health record data to help supplement clinical trial data with more diverse population insights into potentially cardiotoxic risks. Promoting a diversified physician workforce and engaging community health workers with language and cultural experience can help bridge the existing gap and provide guidance to culturally specific resources available to these communities.

FUTURE DIRECTIONS

The future of cardio-oncological health equity is contingent on our intentions. However, evidence to support and guide the management of these challenges is largely unavailable (Table 2). Trials intentionally focused on high-quality, representative data are essential. To reduce inequitable care among different groups, studies should aim (1) to increase the representation of female patients and patients from underrepresented racial and ethnic groups in proportion to prevalence by cancer type disease presentations within clinical trials; (2) to optimize preexisting conditions of historically

Table 2. Summary Take-Home Points and Select Common Issues That Remain to Be Addressed to Reduce Disparities in Cardio-Oncology

Key take-home points
Women appear to have higher risks of ICI-related toxicities, with some unique cardiotoxic mechanisms in women.
Black patients face up to a 3-fold higher risk of cardiotoxicity and cardiovascular death with anticancer (targeted, immune, hormone) therapies.
Other racial and ethnic minority groups may also see increased cardiotoxic risk.
Hypertension and other CVD risk factors are disproportionately increased with chemotherapy (eg, anthracycline treatment) among Black patients.
Caution should be used in the interpretation of clinical trial data for cardiotoxic risk assessment because many trials do not well represent diverse populations.
Social determinants of health (eg, insurance status, rural vs urban residence) influence long-term cardiovascular risk and survival in cancer survivors.
Evidence gaps and future research directions for addressing cardio-oncology disparities
Specific predictive factors of long-term cardiotoxic risk with targeted and immune-based cancer therapies in women and those from underrepresented ethnic and racial groups
Mechanisms underlying disparate cardiotoxic risk beyond socioeconomic factors
Further investigation of sex-specific differences in cardiac toxicities (eg, ICI therapies)
Role of perceived stress (eg, discrimination) in cardiotoxicity susceptibility
Population-specific studies of cardiotoxic profiles in other understudied groups (eg, API, Native American)
Optimal strategy for improving (population reflective) representation in cancer clinical trials
Role of technology (eg, artificial intelligence) in improving cardiotoxicity disparities
Personalized cardioprotection strategies (eg, integrating biological, genetic, and social determinant markers)

API indicates Asian and Pacific Islander; CVD, cardiovascular disease; and ICI, immune checkpoint inhibitor.

increased prevalence in those from underrepresented racial and ethnic groups such as hypertension and obesity; and (3) to understand barriers to prevention, early detection, and appropriate clinical management of cancer and CVD in historically underrepresented groups. Concurrently, artificial intelligence and other emerging technologies should aim to reduce bias to improve outcomes. Conscientiously leveraging technology and designing trials with outcomes related to these issues in practice (considering feasibility and cost) will critically accelerate the field of cardio-oncology in the 21st century. With tangible goals, we can improve health inequities in cardio-oncology.

ARTICLE INFORMATION

The American Heart Association makes every effort to avoid any actual or potential conflicts of interest that may arise as a result of an outside relationship or a personal, professional, or business interest of a member of the writing panel. Specifically, all members of the writing group are required to complete and submit a Disclosure Questionnaire showing all such relationships that might be perceived as real or potential conflicts of interest.

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Kerryn W. Reding	University of Washington	None	None	None	None	None	None	None
Kathleen E. Simpson	Childrens of Colorado Pediatrics	None	None	None	None	None	None	None
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Writing Group Disclosures Continued

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Eric H. Yang	University of California at Los Angeles, UCLA Cardiovascular Center	CSL Behring (research funding, site PI for AEGIS 2 clinical trial)†; Boehringer Ingelheim and Eli and Lilly (research funding, site PI for EMPACT MI)†; Bristol Meyers Squibb (research funding, site PI for ATRIUM trial)*	None	None	None	None	Pfizer*; Edwards Lifesciences*	None

This table represents the relationships of writing group members that may be perceived as actual or reasonably perceived conflicts of interest as reported on the Disclosure Questionnaire, which all members of the writing group are required to complete and submit. A relationship is considered to be "significant" if (a) the person receives $5000 or more during any 12-month period, or 5% or more of the person's gross income; or (b) the person owns 5% or more of the voting stock or share of the entity, or owns $5000 or more of the fair market value of the entity. A relationship is considered to be "modest" if it is less than "significant" under the preceding definition.

*Modest.

†Significant.

Reviewer Disclosures

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