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Cardiovascular Care in Women Veterans

A Call to Action

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ABSTRACT: Cardiovascular disease is the number one cause of death for women in the United States. Of the 1.3 million active duty service members, 16.3% are currently women, and the number of women veterans is expected to increase. Women veterans have higher rates of cardiovascular disease than civilian women and present a unique population. We focus on 5 key areas regarding cardiovascular disease care for women veterans: (1) the rapidly changing demographic; (2) prevalence of traditional risk factors; (3) prevalence of less traditional risk factors (eg, homelessness, military sexual trauma, and mental health disorders); (4) treatment and outcomes of cardiovascular disease; and (5) the current state and future directions of research in this area. This review is a call to action for continued improvements in the cardiovascular care and research for this rapidly growing, at-risk, and under-represented population.

VISUAL OVERVIEW: A visual overview is available for this article.

Women have served in the US military since its inception, with the first formal action when the Army Nurses' Corps was formed (1901). Today, women serve in all branches of the military as 16.3% of 1.3 million active duty service members. While the population of 19.6 million living veterans is projected to decline over time, the number of women veterans (WVs) is projected to increase from 1.9 million to over 2.2 million over the next 25 years.[1] WVs' use of the Veterans Health Administration (VA) has also doubled over the last 15 years, increasing attention to provision of high-quality cardiovascular care to meet their needs, as they have particularly high rates of cardiovascular disease (CVD) risk factors and high rates of diagnosed CVD.[2,3]

ABOUT FACE: WVs' CHANGING SOCIODEMOGRAPHICS

WVs' sociodemographics have changed dramatically over the past decade.[4] The largest group of WVs is between the ages of 44 to 65, but a second group in their 20s-30s has quickly grown as a result of the recent Iraq and Afghanistan conflicts. WVs are more ethnically diverse than both male veteran (MV) and female civilian counterparts: nearly 30% of younger WVs are black and 10% are Hispanic, with younger minority WVs found to have a high rates of delayed care or unmet medical needs.[5] While quality of care has improved within the VA system, racial disparities persist for important outcome measures that impact CVD and life expectancy, such as diabetes mellitus, hypertension, and lipid control.[6]

Key Words: cardiovascular disease ■ risk factors ■ socioeconomic factors ■ veterans ■ women

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Even though WVs have higher educational attainment than MVs, a significantly higher percentage of WVs have no personal income or live below the poverty line.[4] They also have significantly higher interpersonal stressors than MVs and significantly less social support, with 20% reporting they have no one to depend on.[2,7]

GATHERING INTELLIGENCE: TRADITIONAL CARDIOVASCULAR RISK FACTORS IN WVs

For the past 70 years, CVD has remained the number one killer of women in the United States, affecting 36% of the female population and claiming 1 life every 1 minute and 19 seconds.[8] Overall, 11% of WVs have been diagnosed with CVD; over the age of 65, 32% of WVs are affected. 60% of younger WVs have at least 1 major cardiovascular risk factor; this increases to 75% in the 44 to 65 age group and to 80% in the over 65 age group.[9]

Veteran status alone may contribute to the risk of developing CVD. Veterans have been found to be at increased risk for developing new-onset heart disease, even after controlling for traditional cardiovascular risk factors, sociodemographics, chronic illnesses, poor health habits, body mass index, and depression.[10]

Obesity

Veterans have higher rates of obesity than the general population: 78% of veterans are either overweight or obese, compared to 68% in the overall US population.[11] WVs have an even higher prevalence of obesity. More WVs (44%) than MV (41%) meet criteria for obesity. Black WVs (51%) have higher obesity rates than black MVs (43%) and are twice as likely to be obese as white WVs. WVs with mental health disorders are more likely to be obese than MVs with the same mental health disorders.[12,13]

Diabetes Mellitus

Between 2005 to 2014, the prevalence of diabetes mellitus in veterans increased from 15.6% to 20.5% versus approximately 9.1% of the general population.[14,15] 11% of WVs have diabetes mellitus compared with 9% of civilian women. WVs outpace the general population for diabetes mellitus prevalence in every age category. Among WVs 44 to 65 years old, 16% are diabetic; this rate increases to almost 25% in those over 65. In one study of 900 Vietnam-era WVs who used both VA and non-VA care, diabetes mellitus prevalence was 32%.[16] Hispanic and black WVs have been shown to have an over 4-fold and 2.5-fold higher risk, respectively, for diabetes mellitus when compared with white WVs. This is an even higher risk than when comparing minority and white civilian women.[13] Nearly 25% of WVs with diabetes mellitus have a HbA1c level greater than 9%.[17]

Gestational diabetes mellitus also presents a specific risk to women and particularly WVs. Gestational diabetes mellitus occurs in 2 to 10% of pregnancies and has been shown to be associated with future increased risk of cardiovascular morbidity and mortality.[8,18] Compared to civilian women, WVs have been found to have a 40% higher risk of gestational diabetes mellitus.[19]

Hypertension

Nearly 40% of WVs between the ages of 45 to 65 have hypertension. After age 85, more WVs than MVs have hypertension.[9] Like black civilian women (46.3%), black WVs have the highest prevalence compared with all veterans of any race or age, except for Pacific Islander males in the 44 to 65 age range, and black MVs who have the highest prevalence overall.[4,9] In one of the first studies to look at racial differences in CVD risk factors in WVs, black WVs were found to have 2.3 times higher odds of having hypertension than white WVs.[13] Hypertension control in WVs has also been found to be significantly worse.[6]

Hypertensive disorders of pregnancy deserve a special mention, as they have been shown to be a woman-specific risk factor associated with a 2-8-fold risk for development of future CVD.[18] Compared with civilian women, WVs have a 32% higher risk of developing hypertensive disorders of pregnancy.[19]

Lipids

Half of all veterans have a diagnosis of dyslipidemia.[9] WVs (27%) have lower prevalence of dyslipidemia than MVs (47%), but this difference narrows with age. After the age of 65, over 50% of WVs are affected compared with 56% of older MVs. Pacific Islander and Hispanic WVs over 65 years old have a prevalence of approximately 60%. Prevalence of dyslipidemia in WVs is also higher in those with mental illness and substance use disorders, affecting 40% of those with depression and up to 45% of those enrolled in tobacco cessation treatment.[20]

WVs are less likely than MVs to be on any lipid lowering therapy for both primary and secondary prevention of CVD.[21] This gender gap was not eliminated after accounting for proper clinical action and worsened with age, especially when looking at older WVs with ischemic heart disease. Even when electronic reminders were used, 25% of WVs were still less likely than MVs to have lipid-lowering medications adjusted or ordered.[22] A more recent study corroborated this, showing that WVs were 32% less likely to receive any statin therapy and 24% less likely to be on a high-intensity statin, despite a diagnosis of CVD.[23] Since the release of the 2013 American College of Cardiology/American Heart Association cholesterol treatment guidelines,

WVs are still 12% and 20% less likely to receive any statin therapy or be on a high-intensity statin for primary prevention than MVs, and significantly fewer WVs (28.7%) than MVs (35%) are prescribed high-intensity statins for secondary prevention.[24–26]

Tobacco

Veterans (29.2%) have higher rates of tobacco use than the general population (15.5%).[27] In the veteran population, more WVs (28.9%) smoke cigarettes than MVs (21.1%).[27] A higher number WVs (29.7%) use tobacco compared with civilian women (13.5%).[27,28] Hispanic WVs use tobacco nearly 3.5 times more than white WVs.[13] WVs are less likely to be successful at quitting smoking than MVs with low enrollment rates into smoking cessation programs, despite efforts at tailoring these programs to WVs needs by providing multiple choices of programs, tools, and support based on WVs' input.[29]

Why Do WVs Have Poorer Control of Traditional CVD Risk Factors?

Reasons for higher rates and poorer control of traditional CVD risk factors in WVs are not fully understood but likely multifactorial. WVs have been found to have suboptimal CVD health literacy.[30] WVs do not exercise regularly, and because of high rates of military sexual trauma (MST), may be less willing to join VA-based group-format weight loss programs comprised mostly of MVs.[31] Even when enrolled in weight management programs, WVs lose less weight than MVs. These barriers may perpetuate obesity-related morbidities including diabetes mellitus, hypertension, and dyslipidemia. WVs are less willing to take lipid-lowering medications and may be less willing to seek care at VA in general due to sexual harassment from MVs.[32] WVs have less social support to help track their medications, are less likely to have someone accompany them to medical visits, and are also more likely to be homeless.[33] Coexistent high rates of mental health disorders including anxiety, depression, and posttraumatic stress disorder (PTSD) may also play a role.[2]

STEALTHY ASSASSINS: HOMELESSNESS, MST, AND MENTAL HEALTH DISORDERS AS POSSIBLE NONTRADITIONAL CVD RISK FACTORS IN WVs

Homelessness

Homeless women have a significantly higher risk of premature death and chronic medical conditions than homeless men, with significantly elevated 30-year CVD risk scores.[34,35] Compared to civilian women, WVs have a 4-fold increased risk of homelessness.[36] Risk factors for homelessness in WVs include abuse or violence prior to, during, or after military service; postmilitary physical or mental illness, or substance abuse; unemployment; criminal justice involvement; and, particularly, MST. These risk factors lead to a sense of isolation and lack of support that also increase poor overall health outcomes.[37] While homeless WVs have a lower rate of substance abuse than homeless MVs, they have a higher rate of mental health disorders, particularly PTSD.[38] 30% of homeless WVs live >40 miles from a VA medical center. Rural homeless WVs live an average of 107 miles from a VA specialty center, further increasing their barrier to subspecialty care.[39]

MST

WVs experience more sexual assault than civilian women. 40% of WVs report having been sexually assaulted while in the military compared with 17% rate of sexual assault in civilian women.[40–42] Homeless WVs have a 40 to 53.3% rate of MST compared with 26.8% of housed WVs.[41] 25% of WVs experience stranger harassment in VHA care environments, with a 3 times higher rate in WV with a history of MST, increasing their risk for delayed or missed healthcare.[43] WVs with MST have an increased risk of diabetes mellitus, hypertension, and obesity, as well as high resting heart rates and decreased heart rate variability.[42,44–47] WVs with MST also have at least a 2-fold greater risk of depression and a 6 to 9-fold increased risk of PTSD, both of which have been linked to CVD.[41,44]

Depression and PTSD

Veterans overall have higher rates of mental illnesses, particularly depression and PTSD, than the general US population. In one of the earliest studies of Vietnam-era veterans, the estimated lifetime prevalence of PTSD was approximately 30%.[48] More recently, 45% of post-9/11 veterans have been diagnosed with depression and 56% with PTSD.[49] WVs are much more likely to have a diagnosis of depression or PTSD than MVs (31.6% versus 11.8%).[9] WVs are much more likely to have been diagnosed depression than civilian women (8.5%).[50] More WVs (17.0%) have PTSD than MVs (12.3%) and higher rates of PTSD than civilian women (5.2%).[9,50] Notably, PTSD and depression in WVs stems not only from experiencing violence in combat but also significant MST exposure, as previously mentioned.[40]

The link between depression and CVD has been well described in the literature, and young women with depression, in particular, have been shown to have significantly increased risk of coronary artery disease (CAD), death, or major adverse cardiovascular events.[51] A re-

cent study of 157 195 WVs showed that those with depression had a 60% increased CAD risk, similar to that of smoking. The odds of having of CAD increased by another 44% with every additional mental health diagnosis.[52] Links between PTSD and CVD are also being established. MVs with PTSD and no baseline CVD have a significantly increased risk of nonfatal myocardial infarction, fatal CAD, as well as all coronary heart disease outcomes combined, including early mortality, even after adjustment for possible confounders.[53] In the Millennium Cohort Study, veterans with combat experience had nearly twice the risk of self-reported heart disease and new-onset heart disease when compared with those who did not see combat.[54] WVs with PTSD, depression, and MST have been shown to have an increased burden of chronic medical illnesses, including obesity, hypertension, and heart attack.[45,55] They also have higher resting heart rates than those without PTSD, which may put them at higher risk for CVD morbidity and mortality.[46] Studies of civilian women with PTSD also show a 1.5- to 3-fold increased likelihood of CVD.[56] Research is also exploring whether PTSD increases CVD risk via dysregulation of the inflammatory system, autonomic function, and the hypothalamic-pituitary-adrenal axis. Possible shared genes common to both PTSD and CVD are being investigated.[57] PTSD treatment itself may play a role in decreasing CVD risk.[56,57]

While the American Heart Association has released a scientific statement recommending that depression be recognized as a risk factor for poor outcomes in acute coronary syndromes, neither depression nor PTSD has yet been added to the guideline list of accepted traditional risk factors for the development of CVD.[58]

INTO THE BREACH: TREATMENT OF CVD IN WVS

Gender disparities in the diagnosis and treatment of CVD have been well documented. Women have differences in CVD presentation, receive fewer diagnostic tests and less aggressive medical and interventional therapies, and have been shown to have worse morbidity and mortality.[59] While both the American Heart Association and the federal government have instituted initiatives to increase awareness of these gender disparities in an effort to both improve the care of and research on women with CVD, resulting impacts on women's CVD outcomes have not yet been realized.[18,59]

This gender gap is apparent in diagnostic testing and cardiac procedures for WVs. WVs are up to half as likely to receive coronary angiography despite having more chest pain or angina diagnoses than MVs and are more likely to receive noninvasive cardiac testing. They are less likely to receive other interventional procedures such as cardioversions, pacemakers, defibrillators, or electrophysiological ablation. This trend has not changed since publication of the VA's State of Cardiovascular Health in Women Veterans in 2013 or 2017.[9,60] Reasons for continued disparities are unclear.[9]

Two recently published studies looked at the characteristics, treatment, and outcomes of WVs undergoing percutaneous intervention or cardiac catheterization.[61,62] WVs and MVs had similar outcomes for morbidity and mortality at 1 year. However, WVs continued to have higher prevalence of depression or PTSD and received less appropriate medical therapy despite diagnosis of acute coronary syndrome. WVs also had less macrovascular obstructive coronary disease overall. Differences in endothelial dysfunction and microvascular disease have not been explored as causes for acute coronary syndrome in WVs.

FORGING AHEAD: A MULTIPRONGED ATTACK

WVs are a unique population in the CVD world. They have higher prevalence of traditional CVD risk factors that are more poorly controlled than the general population of women. They also suffer from less traditional CVD risk factors of MST, PTSD, and depression at a higher rate than their MV colleagues. These issues may place WVs at higher risk for CVD-related morbidity and mortality. Overall, studies regarding veterans' CVD and CVD risk factors have included very few WVs, MVs only, or did not stratify results by gender. We face a paucity of prospective, randomized, interventional clinical trials specifically studying CVD treatment or outcomes in WVs.[63–65] To overcome these issues, we recommend a multipronged approach via education, outreach, and continued research expansion.

The VA has made great strides in the past several decades to ensure proper, comprehensive and gender-specific healthcare for WVs. The VA Women's Health Services national program office was created in the early 1990s to provide policy and programmatic support to address WVs' healthcare needs.[66] Regional comprehensive women's healthcare clinics, as well as local women's health clinics, were developed and deployed in the VA.[67] This resulted in dramatic improvements in women's primary care, often outperforming private sector quality metrics (eg, cervical and breast cancer screening rates), while later work reduced many VA gender disparities in care. However, gaps still remain, specifically in the areas of diabetes mellitus and lipid control as well as ischemic heart disease.[17] Health literacy among WVs has also been shown to be suboptimal with knowledge gaps about CVD, CVD risk factors, and their consequences.[30]

Improving patient awareness of CVD should continue to be one of the first steps in battling CVD in WVs. Since 2012, the VA has officially partnered

with the American Heart Association's "Go Red for Women" campaign to raise WVs awareness of CVD, providing online resources for education, nutrition, and fitness programs, as well as connection with other women experiencing CVD.[68] These efforts in educating WVs about the importance of CVD should be continued and further emphasized, encouraging WVs to take ownership of their cardiovascular health. The same holds true for VA providers who need additional support for gender-tailored CVD risk screening and treatment.

The VA has had policies delineating the inclusion of WV in research since the late 1980s, but it was not until 2004 that the VA pursued a formal women's health research agenda and conducted its first systematic review of WVs' research.[63,66,69] None of the 182 identified research articles studied WVs and CVD. The VA Women's Health Research Network was subsequently formed to systematically build research capacity, which contributed to more WV studies being published in the next 5 years than the previous 25 years combined.[69] The most current review (2017) further identified twice the number of research articles since the original review (over 440 articles). Yet, only 11 were specifically about WVs and CVD.[65]

Recruitment of WVs into studies has not been easy. WVs remain a numeric minority in the VA and need to be oversampled to attain sufficient sample sizes and properly analyze findings by gender.[66] WVs may be less able to participate in VA research during business hours due to work or family care obligations, further lowering recruitment. The Women's Health Research Network has established a Practice Based Research Network to facilitate investigator access to sites needed to recruit WVs into multisite studies, enlisting local managers, providers and researchers and providing infrastructure support.[69]

The studies that have been performed in the past several decades on CVD risk factors and CVD in WVs have been integral to the advancement of their cardiovascular care. They have highlighted the fact that WVs are affected by more than just the public perception of typical women's diseases or typical veterans' diseases of PTSD and depression. They have illustrated that the gender gap continues to exist for cardiovascular care even within the veteran population where care is standardized, measured, and reported. These studies have shown that research must continue to be actively conducted in this field to tackle persistent gender disparities and ensure that those who rely on the VA do so with the best possible CVD-related outcomes. We must continue to better understand multilevel determinants of gender disparities in CVD, screening, treatment, and outcomes, and use that information to design more prospective, randomized clinical trials of interventions for WVs' CVD as well as data-driven strategies capable of system improvements, especially as they age.[64,65,69] These trials must also focus on understanding, improving, and implementing CVD prevention in the rapidly growing younger WVs population, remembering to be cognizant and inclusive of the comorbidities specific to these populations as previously described. Doing this will benefit not only WVs but the female population as a whole.

The first steps are already being taken into this new era. The Facilitating Cardiovascular Risk Screening and Risk Reduction in WVs arm of the EMPOWER (Enhancing Mental and Physical Health of Women Through Engagement and Retention) Quality Enhancement Research Initiative is currently recruiting participants. This is a nonrandomized stepped-wedge trial to evaluate the implementation of a gender-tailored CVD prevention toolkit to help providers identify cardiovascular risks in WVs with a primary outcome of referrals to health promotion and disease prevention services (URL: http://www.clinicaltrials.gov; Unique identifier: NCT02991534). The WARRIOR trial (Women's Ischemia Trial to Reduce Events in Non-Obstructive CAD) is also currently underway. This Department of Defense funded trial, is a multicenter, prospective, randomized, blinded outcomes evaluation comparing intensive medical therapy to usual care in nonobstructive coronary disease primarily in veteran and active duty women with a primary outcome of major adverse cardiovascular events (URL: http://www.clinicaltrials.gov; Unique identifier: NCT03417388). Another newly-funded Department of Defense project will examine the intersection of PTSD and CVD in WVs (CDMRP award number W81XWH-18-1-0725).

CONCLUSIONS

The rapidly growing WV population represents a specific at-risk population with characteristics that set them apart from their male counterparts as well as their civilian sisters, in regard to CVD risk factors and CVD recognition, diagnosis, treatment, and possibly even outcomes. Significant advancements have been made over the past decade in better characterizing CVD in WVs, but there remains a large gender gap and paucity of prospective, randomized, interventional clinical trials. The time is now to continue to push to the forefront the cardiovascular care of WVs—to help save the hearts and lives of the women who have bravely served our country.

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Disclosures

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