Gender, Race and Cardiac Rehabilitation in the United States: Is There a Difference in Care?

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Abstract: Coronary heart disease is the leading cause of death within the United States, involving both genders and among all races and ethnic populations. Cardiac rehabilitation (CR) has been shown to significantly improve morbidity and mortality, and these benefits extend to individuals of both genders and all ages with coronary heart disease. Despite this, referral and participation rates remain surprisingly low. Furthermore, women and minorities have even lower referral rates than do their male and white counterparts. Over the course of this article, we will review CR referral and participation among women, as well as racial and ethnic minorities in the United States. We will also examine barriers to CR participation among these subgroups.

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Coronary heart disease (CHD) is the leading cause of death worldwide. Approximately, 2200 Americans die of cardiovascular disease (CVD) each day, which accounts for 32.8% of all deaths in the United States.[1]

Cardiac rehabilitation (CR) programs are medically supervised exercise programs that have been shown to improve physical function, exercise capacity, quality of life, psychosocial well-being, as well as morbidity and mortality.[2] These benefits have been shown to extend to both genders and to all age groups.[3] Yet, despite the beneficial effects of CR programs on outcomes among patients with CHD,[4] participation rates in the United States are dismally low, with probably well less than 30% of eligible patients participating in these programs.[5]

The leading cause of death among women in the United States is CVD. Despite this, there is compelling evidence to suggest that female patients with CVD are under-referred to CR programs when compared with male patients. Furthermore, there is evidence to suggest that even after referral, the CR participation rates and the completion rates are lower among female patients.[6]

Currently, racial and ethnic minorities constitute approximately 28% of the U.S. population, with this number projected to increase to 40% in the next 15 years.[7] Fifteen percent of the Hispanic Americans population are currently the fastest growing group in the United States, followed by blacks/African Americans at 12% and Asian Americans, American Indian and Alaska Natives representing approximately 7%.[8] According to the 2011 Heart Disease and Stroke Statistics update, 44.8% of black men and 47.3% of black women older than 20 years have CVD compared with 37.4% of white men and 33.8% of white women in the same age group, whereas 30.7% of Mexican American men and 30.9% of Mexican American women older than 20 years have CVD.[9]

Over the last 4 decades, there has been an overall decrease in the mortality rates from CHD and acute myocardial infarction (MI) in the United States.[10,11] However, there is evidence to suggest that there has been steeper decline in CHD mortality among whites compared with blacks,[12] as well as decreased hospitalization among whites for acute MI's when compared with their black counterparts.[13] In fact, this increased risk of fatal incident CHD among blacks is almost twice the age-standardized rate compared with white men and white women. This increased risk has been attributed to racial differences in CHD risk factors, which were more prevalent among blacks compared with white men and women.[14] This can be explained by the fact that racial minorities tend to receive lower quality health care,[15] fewer referrals[16] or less accessibility to health care[17] when compared with nonminorities. In addition to this, CR utilization and participation rates among racial and ethnic minorities are also low in the United States.[18]

Over the course of this review, we will access the CR referral and participation among women, as well as racial minorities in the United States. We will also examine barriers to CR participation in these subgroup populations.

BENEFITS OF CR

Over the years, CR has been shown to provide a multitude of physiological, psychological and cognitive benefits (Table 1). One of the fundamental merits of CR is the mortality benefit even among those individuals who have undergone revascularization therapy and/or medical and device therapy. Suaya et al[20] demonstrated marked reductions in mortality among those who attended CR (21%–34%) compared with those who did not. This benefit was observed among both men and women. Furthermore, a dose effect of CR was demonstrated with better outcomes among those who attended more sessions. This dose effect of CR was seen in another study by Hammill et al.[21] Here, patients who attended all 36 CR sessions had a 14% lower risk of mortality and 12% lower risk of MI compared with those who attended just 24 sessions, a 22% lower risk of mortality and 23% lower risk of MI compared with those who attended just 12 sessions, and a 47% lower risk of mortality and 31% lower risk of MI compared with those who attended just 1 session.

Because of the beneficial effects of estrogen, younger women tend to have an extra level of protection from CVD than men partly due to higher levels of high-density lipoprotein cholesterol (HDL-C)[22] and through the reduction of atherogenic lipoproteins such as low-density lipoprotein levels (LDL-C) and lipoprotein A.[23,24] However, this benefit disappears with menopause, and the risk of CV events rises in postmenopausal women to eventually equal to that of men.[25] In addition to its benefit on mortality, CR may provide improvements in HDL-C and/or triglycerides (TGs), which may average +6% and −15%

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TABLE 1. Benefits of cardiac rehabilitation

Improvements in exercise capacity
Estimated METs
Maximal oxygen consumption (peak $\dot{V}O_2$)
Improvements in lipids
Total cholesterol
HDL-C
LDL-C
Triglycerides
Total cholesterol/HDL-C
LDL-C/HDL-C
Reduction in obesity indices
Weight
% Body fat
Body mass index
Major morbidity and mortality
Reduction in overall mortality
Reduction in congestive heart failure
Reduction in hospital costs
Reduction in nonfatal myocardial infarction
Improvement in psychological factors
Depression score
Anxiety score

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METs, metabolic equivalent of tasks; HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol.

for HDL-C and TGs, respectively.[6] In fact, there is evidence to suggest that with CR, women may experience greater improvements in HDL-C, despite similar changes in fitness and body composition after these outpatient programs.[26] Furthermore, these improvements in lipid profile have been observed in both younger and older female patients.[27] In general, most CHD patients with elevated LDL-C are already on statin therapy, which provides effective LDL-C reduction. As a result, in clinical practice, smaller demonstrable benefits regarding isolated LDL-C are seen with CR.[28,29] Regardless, women seem to demonstrate greater decreases in LDL-C compared with men after CR programs.[30]

The rates of obesity and metabolic syndrome are increasing rapidly in the United States.[31] Numerous studies have demonstrated that obese individuals are more likely to be predisposed to hypertension, insulin resistance and dyslipidemia in addition to other medical conditions.[19] A potential benefit of formal CR is weight reduction among the large number of patients with CHD who are overweight or obese.[32] Furthermore, among the 45 obese patients in a small study from the Ochsner CR program who achieved 5% or greater weight loss, greater improvements in exercise capacity and plasma lipids were observed when compared with the 81 obese individuals who did not lose weight.[33] In addition to improvements in plasma lipid profiles, a more recent study demonstrated that overweight/obese individuals who lost weight showed significantly greater improvements in many of their CHD risk factors including insulin resistance, blood pressure, clotting profiles, peak exercise capacity and inflammation.[34–36] There also seems to be a mortality benefit present with successful weight loss after CR.[37]

Inflammation is regarded as a possible mechanism in both initiation and progression of atherosclerosis, which in turn propagates CV events.[38,39] Inflammatory markers such as high sensitivity C-reactive protein have been associated as a CHD risk factor and are a potent independent predictor of CHD events. CR has been shown to reduce levels of high sensitivity C-reactive protein in patients regardless of the percutaneous intervention status.[40–42]

In addition to the physiological benefits of CR, nonmortality benefits have been observed as well. CR improves the quality of life for patients with CHD, which has been translated to increased physical activity and vocational status.[43] There is also evidence to suggest that CR participation significantly enhances the older patients' ability to live independently by improving their ability to perform common household tasks.[44]

Psychological stress (PS) is generally underemphasized in medical practice and has been demonstrated among the 9 major modifiable CVD risk factors. PS was ranked only below lipids and smoking in overall pathogenicity of CVD and is comparable in risk with hypertension and abdominal obesity.[45] Recent data demonstrates a high prevalence of PS among patients with CHD, which is markedly improved after CR programs.[46,47] In fact, although PS makes completion of CR difficult, those individuals who completed CR programs had statistically significant improvements in depression and anxiety compared with dropouts.[48] Finally, this improvement in PS has been observed among men and women.[49]

Among the patients who did not participate in any formal CR program (n = 522), there was a 30% mortality in depressed subjects during follow-up compared with only 8% in those who chose to participate in CR.[50] However, among those patients who remained depressed after CR, there was a 4-fold increase in mortality during 3-year follow-up (22% versus 5%; $P < 0.001$) compared with those who were not depressed after CR. Furthermore, those patients who did not improve their exercise capacity after CR (assessed by peak oxygen consumption [$\dot{V}O_2$]) maintained a high prevalence of depression and high mortality risk, whereas those who achieved either mild ($<10\%$) or marked ($>10\%$) improvement in peak $\dot{V}O_2$ after CR significantly reduced both prevalence of depression and mortality risk. This suggests that only small improvements in exercise capacity are needed to gain dramatic improvements in depression-related increased mortality risk. These findings were also seen among heart failure (HF) patients, where depressed patients who completed CR had 59% lower mortality compared with HF-depressed patients who did not complete CR.[51] More importantly, those HF patients who remained depressed after CR had a nearly 4-fold higher mortality compared with patients whose depression resolved after CR ($P = 0.005$). Furthermore, among 269 patients with acute MI or after elective percutaneous coronary intervention, participants who underwent CR were less anxious and depressed and were found to be more relaxed and content.[52]

Lavie et al[53] demonstrated that younger patients (<50 years) had hostility scores that were 2.5 times higher than the older patients (≥ 65 years), and these patients with hostility symptoms had more adverse CHD risk profiles, including higher levels of total cholesterol, TG, total cholesterol/HDL-C, fasting glucose and glycosylated hemoglobin compared with younger patients with low hostility scores. Furthermore, after CR, there was a significant improvement in behavioral characteristics (including hostility) and CHD risk factors, especially among this younger population.