Technology to Promote and Increase Physical Activity in Heart Failure

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KEYWORDS

• Heart failure • Self-management • Physical activity • Exercise adherence • Internet technology • Social media • Telemedicine • Exercise promotion

KEY POINTS

- Heart failure is an important cause of cardiovascular disease–related morbidity and mortality and is closely linked to physical inactivity, obesity, and other unhealthy lifestyle behaviors.
- Habitual physical activity is firmly recommended for heart failure self-management but current levels among patients remain low, independent of age, ethnicity and race, gender, and socioeconomic status.
- Technology-based interventions are accessible, affordable, and have been proved effective in increasing physical activity levels but specific benefits among individuals with heart failure are undetermined.
- Health education, improved health literacy, and social support networks are associated with higher levels of self-efficacy, treatment adherence, and self-care engagement in heart failure patients.
- Technology-driven physical activity promotion tactics may foster greater patient engagement, adherence, and self-efficacy by enhancing health education, improving health literacy, and building social support systems.

INTRODUCTION

Cardiovascular disease (CVD) is the leading cause of death in the United States and abroad with severe heart-related morbidities affecting men and women across all ages and ethnic and racial groups.[1] Among the different CVDs, heart failure (HF) is a primary health concern, with a current US incidence, prevalence, and total cost of more than $800,000, $5 million, and $30 billion, respectively.[2] The development of HF is closely linked to common comorbidities of CVD, such as hyperlipidemia, hypertension, and diabetes.[3] In addition, controllable factors (ie, obesity and unhealthy lifestyle behaviors) also contribute greatly to HF risk, among which includes a sedentary lifestyle characterized by physical inactivity.[2,3] Among some populations, physical inactivity may increase the risk of HF by more than 50%.[4]

Habitual physical activity in the forms of structured exercise training and spontaneous physical activity (ie, walking, stair climbing, and performing household chores) is commonly recommended for the management of HF.[5,6] However, patients are less likely to engage in such activities often because of dyspnea, function-limiting comorbidities, and/or an utter lack of motivation.[7,8] Social networks and social support can enhance intrinsic and extrinsic motivation,[9] thereby fostering greater treatment adherence and self-care activities among HF patients, which influence disease

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outcomes.[10,11] Furthermore, the widespread use of information and communication technology tools and resources (ie, computer networks, mobile applications, and wearable activity trackers) offers a potentially beneficial avenue for increasing physical activity levels and positive self-management behaviors primarily through improvements in intrinsic motivation.[12–14] In light of these facts, an effective strategy for encouraging exercise and other forms of physical activity in HF patients is one that capitalizes on the integral role of social support systems and the potential role of information and communication technology in facilitating self-management of HF.

Recent advances in social media and other Internet- and mobile-based information and communication technologies offer a unique approach to health promotion, disease prevention, and disease management. According to a recent report published by the Pew Research Center's Internet and American Life Project, nearly 90% of Americans use the Internet by way of a computer and/or mobile technology.[15] Among Internet users, social networking and health-specific Web sites are the most popular, used by approximately 70% of men and women including whites, African Americans, and Hispanics.[16,17] Moreover, the Deloitte 2010 Survey of Healthcare Consumers reports that people with chronic conditions are among the most likely to participate in online wellness programs and other World Wide Web–based interventions.[18] In addition, many interventions incorporate the use of wearable devices, such as pedometers, accelerometers, and heart rate monitors, allowing individuals to track their progress, set goals, and even share their activities and successes with people within their social networks,[17,19] which can further boost motivation and improve adherence.[20,21]

Given that approximately half of people with HF are expected to die within 5 years of being diagnosed,[2] innovative approaches to promoting exercise and physical activity in this population is of major clinical importance. Although engaging in such behaviors does not necessarily reverse HF, such practices can significantly improve the overall quality of life of patients by supporting healthy weight management, attenuating associated breathlessness, and improving other signs and general manifestations of the disease.[7,22,23] This article presents the ways in which technological advances in Internet- and mobile-based communication, social media, and self-monitoring devices can serve as a means to broadly promote increasing levels of physical activity to improve health outcomes in the HF population.

EXERCISE INTOLERANCE AND NONCOMPLIANCE IN HEART FAILURE

Regular physical activity in the form of exercise training is firmly recommended as a lifestyle measure for HF.[7,23] Unfortunately, although studies show that nearly 80% of people with HF admit to understanding the importance of exercise, only a mere 39% have actually adhered to a structured training regimen.[24] Exercise generally involves the performance of dynamic contractions of large muscle groups, which is usually not well tolerated by HF patients because of breathlessness, weakness, and extreme fatigue.[7,8]

Although such exercise intolerance is a classic symptom of HF, those patients who initiate and consistently adhere to an exercise training regimen are known to reap substantially beneficial results. The benefits of exercise training in HF include improved myocardial function, functional capacity, and peak oxygen consumption (V_{O_2}); reduced hospitalization rates; and ultimately increased probability of survival.[7,8,25] In light of such benefits, noncompliance of HF patients to exercise presents a major barrier to sound treatment.

Ineffective exercise promotion tactics may greatly contribute to a lack of compliance among HF patients. According to the World Health Organization, patient adherence in general is a multifactorial issue largely influenced by the health care team, specific disease characteristics, and patient-related factors including one's economical and environmental circumstances.[26] Adherence also largely depends on social influence; numerous studies show that social support is by far one of the most important factors affecting health behaviors and outcomes within the context of chronic conditions.[8,26,27] Given the critical role of social influences in health behaviors in the presence of disease, strategies that foster opportunities for social networking and participation may serve as a means to educate, empower, and motivate individuals to engage in healthier lifestyle choices.

Internet-based communication, coined under Web 2.0, has been shown to significantly enable unique social interactions among individuals with various chronic conditions, their supporters (ie, friends and family), and health care providers.[28,29] In addition, increasingly sophisticated mobile technologies have taken social computing beyond Web 2.0, as the widespread adoption and use of smartphones, tablet computers, and applications have introduced new and innovative ways to improve health and health care delivery.[30,31] Within the context of HF, such technologies