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CV Edge

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Current Issues & Trends in Cardiovascular Disease Prevention & Rehabilitation

Heart Failure and Cardiac Rehabiliation

The Development and Implementation of a Web-based Program Supporting Heart Failure Patients

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Heart failure, in which the heart cannot pump blood sufficiently forward, is a leading cause of hospitalizations in Canada and in many developed countries in the world. Many of these hospitalizations are a result of readmissions of the same patient.[1, 2] A common cause of hospitalization in patients with heart failure is retention of fluid which leads to edema and shortness of breath. Facilitated patient self-management (such as self-weighing, monitoring of fluid intake and symptoms, and the interpretation of changes in weight and symptoms) provided through specialized clinics has demonstrated improved outcomes including decreased hospital readmission.[3] Indeed, up to 50% of hospitalizations for heart failure could be prevented due to improved patient self-management.[4] However, as these clinics are commonly located in hospitals in large urban areas, many patients living in small urban and rural areas have no access to these supports.

In recent years, the advancement of technology has made it possible to connect patients in outlying areas to health care providers and clinics in urban areas. A number of methods to connect with patients include the use of specialized telemonitoring devices and Internet-based solutions. Early studies have demonstrated that these devices, where patients enter their signs and symptoms, which are monitored by nurses or physicians, have shown improved outcomes such as decreased hospitalization and increased quality of life.[5] However, more recent studies have been equivocal.[6, 7]

In 2004, the Heart Function Clinic at St. Paul's Hospital in Vancouver was investigating solutions to connect with their patients who lived outside of the Greater Vancouver area. The use of telemonitoring devices was not feasible due to the upfront cost of the devices ($5-$15K each) and the accompanying central monitoring software (upwards of $100K or more). The telemonitoring systems are often cumbersome to install, maintain and return to the monitoring centre, which have made the use of telemonitoring systems prohibitive for widespread use. While telephone interventions may be cheaper, they require nurse initiated phone calls to patients regardless of their clinical status. These phone calls can be time consuming even in patients who are stable. This inefficiency decreases the number of patients one nurse can monitor and therefore, may result in resources being diverted away from patients who have the greatest needs.

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Additionally, telephone interventions do not offer the opportunity for interactive displays of patient data.

In contrast, the Internet as a means for health care delivery has numerous advantages: 1) it is widespread and increasing in all age groups, 2) it is inexpensive, 3) it facilitates both patient data transfer and patient feedback, thereby supporting patient self-management, 4) it is scalable to larger patient volumes, 5) it delivers health care directly to the patient (predominantly in their home) and 6) it requires minimal set-up for patients with current Internet access. While older adults tend to have lower levels of Internet access than their younger counterparts, Internet access is growing the fastest in people over 65 years.8 We had previously demonstrated that 66% of cardiac inpatients had home Internet access and that more than 70% of these patients used the Internet more than three times per week.9 As a result, the Heart Function Clinic decided to develop and evaluated an Internet-based 'virtual' Heart Function Clinic (vHFC) that could be used to support the Clinic's patients.

The vHFC was developed in 2006 and consisted of a password protected website that patients could access from their home computer. After logging in, patients were directed to enter their morning weight and answer the following yes/no questions pertaining to their heart failure symptoms daily as compared to how they felt the day before:

1. Do you feel your breathing is more difficult?
2. Are your ankles more swollen, or do you feel bloated?
3. Did you wake up feeling more short of breath?
4. Have you felt your heart racing, fluttering or missing beats more than normal?
5. Do you have less energy or feel more tired or dizzy?

The website generated an alert if the patient's weight changed significantly – usually two kilograms or more in two days, five kilograms or more in seven days – however could be individualized, if they answered 'Yes" to any one of the five questions, or if data entry was missed for three consecutive days. If an alert was generated, patients were directed to a webpage that contained a message reiterating their responses and indicating that the vHFC nurse will contact them on the next working day for follow-up. When the nurse logged onto the website, she saw all patient alerts in the nurse's inbox. Alerts were resolved through telephone consultation between the nurse and patient. The nurse reinforced self-monitoring skills but if the symptoms required medical management the nurse directs the patient to appropriate action, which may be follow-up by their physician or heart failure clinic. If the patient's weight did not change and if they answered 'No' to the five questions, then no alert was generated and the subsequent webpage contained a message stating that they are doing well according to their responses, but that they should seek medical assistance if they feel unwell. Patients could also view their progress page which included a chart of their weight over time along with highlighting the days on which they generated alerts. Using the principles of self-management, participants were able to visually see the connection between changes in their weight and their symptoms, thus reinforcing the need for maintaining their weight through medication adherence, and salt and fluid restriction.

The vHFC underwent a pilot evaluation in 20 patients newly referred to the St. Paul's Hospital Heart Function Clinic.[10] After six months, there were 456 alerts generated of which 295 (64.7%) were for lack of data entry. We observed an improvement in maintenance of the subscale of the Self-Care of Heart Failure Index[11] (p=0.039). There was also non-significant improvements in the subscale of the Self-Care of Heart Failure Index (p=0.069), Minnesota Living With Heart Failure Questionnaire[12] (p=0.337), 6-minute walk test (p=0.124), and NTproBNP (p=0.210). From our study exit interviews, participants stated that the website was easy to use and that it made them feel connected to their healthcare professional. Sample comments included:

> "I enjoyed it, I found it useful and I thought somebody out there is looking at it you know and giving me a call [if] something is wrong... you wouldn't normally phone a doctor and say my foot is swelling a bit." (male, 73 years)
>
> "It made me understand to look for any of the symptoms I used to shrug off as just something else. Now I'm more concerned with what my body is actually doing. So that I'm more aware of whether my heart is really bothering me or whether it's something else" (male, 48 years)

From this pilot study we also received feedback that informed the subsequent iteration of the vHFC. Patients indicated they found that answering just yes/no to the questions was too restrictive and that they wanted to include a free-text box to qualify their responses. As a result, the questions were modified so that patients can answer questions based on a five-point Likert scale and a free-text field was added. If patients answered a five (indicating their symptoms were 'much worse') to any single question or answered a four (indicating their symptoms were 'a little worse') to more than three questions or entered text in the free-text field, an alert would be generated. The system will also allow patients to enter data at intervals other than daily for those who were more stable and patients could enter in a vacation stop. These changes were done to reduce the number of alerts for no data entry. Lastly, patients can now enter in blood pressure and heart rate data, both of which have alert thresholds.

With the above changes and success of the vHFC, the vHFC has been implemented into the heart function clinics of St. Paul's Hospital and Vancouver General Hospital. To date, over 130 patients have used the vHFC to help manage their care and there are 40 patients currently using it. Over this time we have found that the vHFC can be a valuable support to patients with heart failure without requiring costly infrastructure.

References

1. Tsuyuki, R.T., M.C. Shibata, C. Nilsson, and M. Hervas-Malo, Contemporary burden of illness of congestive heart failure in Canada. Can J Cardiol, 2003. 19(4): p. 436-8.
2. Canadian Institute for Health Information. Health Indicators, 2008, in Health Indicators. 2008, Canadian Institute for Health Information: Ottawa.
3. Arnold, J.M., P. Liu, C. Demers, et al., Canadian Cardiovascular Society consensus conference recommendations on heart failure 2006: diagnosis and management. Can J Cardiol, 2006. 22(1): p. 23-45.
4. Jovicic, A., J.M. Holroyd-Leduc, and S.E. Straus, Effects of self-management intervention on health outcomes of patients with heart failure: a systematic review of randomized controlled trials. BMC Cardiovasc Disord, 2006. 6: p. 43.
5. Clark, R.A., S.C. Inglis, F.A. McAlister, et al., Telemonitoring or structured telephone support programmes for patients with chronic heart failure: systematic review and meta-analysis. BMJ, 2007. 334(7600): p. 942.
6. Chaudhry, S.I., J.A. Mattera, J.P. Curtis, et al., Telemonitoring in patients with heart failure. N Engl J Med, 2010. 363(24): p. 2301-9.
7. Koehler, F., S. Winkler, M. Schieber, et al., Impact of remote telemedical management on mortality and hospitalizations in ambulatory patients with chronic heart failure: the telemedical interventional monitoring in heart failure study. Circulation, 2011. 123(17): p. 1873-80.
8. Statistics Canada, Canadian Internet Use Survey. The Daily, 2013: p. 5-7.
9. Lear, S.A., Y. Araki, B. Maric, et al., Prevalence and characteristics of home Internet access in patients with cardiovascular disease from diverse geographical locations. Can J Cardiol, 2009. 25(10): p. 589-93.
10. Maric, B., A. Kaan, Y. Araki, et al., The use of the Internet to remotely monitor patients with heart failure. Telemed E Health, 2010. 16(26-33).
11. Riegel, B., B. Carlson, D.K. Moser, et al., Psychometric testing of the self-care of heart failure index. J Card Fail, 2004. 10(4): p. 350-60.
12. Rector, R.S., S.H. Kubo, and J.N. Cohn, Patients' self-assessment of their congestive heart failure. II. Content, reliability, and validity of a new measure— the Minnesota Living with Heart Failure questionnaire. Heart Fail, 1987. 3: p. 198-209.

Exercise Training in Patients with Heart Failure: Clinical Outcomes

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INTRODUCTION

Heart failure (HF) is a common syndrome that is the final common pathway for a number of cardiac conditions but most commonly is related to ischemic heart disease or hypertension.[1] Although the focus is often on abnormalities of the heart, it is well known that peripheral abnormalities, especially involving the skeletal muscles, significantly contribute to the functional impairment found in HF patients.[2,3] The findings of skeletal muscle abnormalities have provided substantial support for the skeletal muscle hypothesis (Figure 1) as an explanation for the exercise intolerance in HF patients.[2] Left ventricular (LV) dysfunction reduces blood flow and activates a catabolic state causing skeletal muscle myopathy, which contributes to fatigue and dyspnea. This, in turn, stimulates ergoreceptors in the skeletal muscles leading to increased ventilation and sympathoexcitation with vagal withdrawal. The resultant vasoconstriction and increased afterload cause further deterioration of LV function, forming a

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From the Editor

Dear Friends,

I wish you had a good time with your family and friends. We present here a brief bulletin for the end of this summer.

Recent studies have demonstrated that Cardiac rehabilitation is an important tool in the therapeutic armamentarium of heart failure.

The first article by Scott Lear and Annemarie Kann speaks about the importance of adapted internet program to better serve patients with heart failure.

We republished the second article because of the favorable repercussion after its first publication in 2011. The article is about one of the fundamental aspects of cardiac rehabilitation : physical retraining. In this article, Dr. Robert S. McKelvie assesses the effects of physical exercise on the clinical evolution of patients suffering from heart failure. This article encourages the prescription of physical exercise in these patients.

In the References and Reviews section, Kelly Angevaare summarizes two recently published articles. The first article by Spaling MA et al. is a systematic review about the opinions of patients with heart failure on self-care. This article highlights the elements which could improve the support that we, the professionals, can bring to these patients. The second article by JA Stone vicious cycle. Ultimately this results in further worsening of exercise tolerance, skeletal muscle myopathy, and may eventually lead to a progressive adverse effect on LV remodeling.

This theory would support the use of prescribing exercise training for HF patients. The present paper reviews the effects of exercise training on clinical outcomes in patients with HF.

EFFECTS OF EXERCISE TRAINING ON CLINICAL OUTCOMES

Effects of Exercise Training on Exercise Performance

There have been a number of studies assessing the effects of exercise training on exercise performance.[4,5] In general, the studies have demonstrated improvements in peak exercise performance although most of them only recruited a relatively small number of patients.[4,5] The three larger randomized studies have found variable improvement in peak exercise performance.[6-8] Belardinelli et al[6],in 99 HF patients, found the exercise group had an 18% improvement in peak oxygen uptake (peak VO_2). McKelvie et al[7] , in 181 HF patients, found the exercise group had a 14% improvement in peak VO_2. The much larger study by O'Connor et al[8] in 2331 HF patients, found the exercise group had a 4% increase in peak VO_2.

Potential Mechanisms for Exercise Training Improving Outcomes

Table 1 outlines the various potential mechanisms by which exercise training may improve clinical outcomes in HF patients. Exercise training has been demonstrated to improve cardiac output and regional blood flow, which is associated with an increase in peak VO_2.[5] Alterations in the autonomic nervous system that decrease sympathetic tone and increase vagal tone would also potentially improve survival and possibly decrease the hospitalization rate.[9,10] Exercise training has a direct effect on the skeletal muscle including causing an increase in aerobic enzymes, improving mitochondrial function, and increasing the relative amount of type 1 muscle fibres.[5] Effects on the peripheral vasculature include potential improvement of coronary blood flow, which may lead to a reduction in myocardial ischemia and myocardial infarction.[5] Therefore, given the overall effects of exercise training, there potentially could be an improvement in quality of life (QOL), reduction of hospitalizations, and improvement in survival.

Effects of Exercise Training on Quality of Life, Mortality, and Morbidity

Effects of Exercise Training on Quality of Life

Quality of life has been examined in a number of studies examining the effectiveness of exercise training in HF patients.[1,11] The QOL measures have varied and often the studies consisted of relatively small sample sizes.[1,11]

A recent meta-analysis has examined the effects of exercise training on QOL in HF patients.[11] In this

Table I

Potential Mechanisms by Which Exercise Training Improves Outcomes

Organ System/Tissue	Response to Exercise Training	Effect on Mortality and Morbidity
Improve Central Transport and Regional Blood Flow	↑ in cardiac output; ↑ in peak $V0_2$; reverse chronotropic incompetence; ↑ regional blood flow	↑ peak $V0_2$ → { ↑ survival; ↓ hospitalization
Autonomic Nervous System	↑ HRV; ↓ plasma NE (rest)	↑ HRV →↓arrhythmia → { ↑ survival ↓ hospitalization ↓ plasma NE → ↑survival
Skeletal Muscle	↑ aerobic enzymes; ↑ mitochondria size/density; ↑ capillary density; ↑ relative type I fibers	Change in muscle composition → { ↑ QOL ↓ hospitalization
Peripheral vasculature	↑ vasculature reactivity	↑ coronary blood flow →↓ Ischemia and MI → { ↑ survival ↓ hospitalization

HRV heart rate variability; NE norepinephrine; ↑ = increase; peak VO_2 = peak oxygen uptake

offers a 100% Canadian perspective on using physical exercise as therapy for patients with heart failure.

Finally, in the Professional Profile section, we present a case report on retraining of patients waiting for cardiac transplant. We republished the article by M. Keast and S. Black of Ottawa University because this is a reality that many of us are more and more being faced with in our practice. In this article, the authors discuss a exercise training program for patients waiting for cardiac transplant who have both a ventricular assist device and a defibrillator implanted.

To finish, I would like to invite all of you to share with us your ideas on the pertinence to continue this publication and the changes needed to improve our communications.

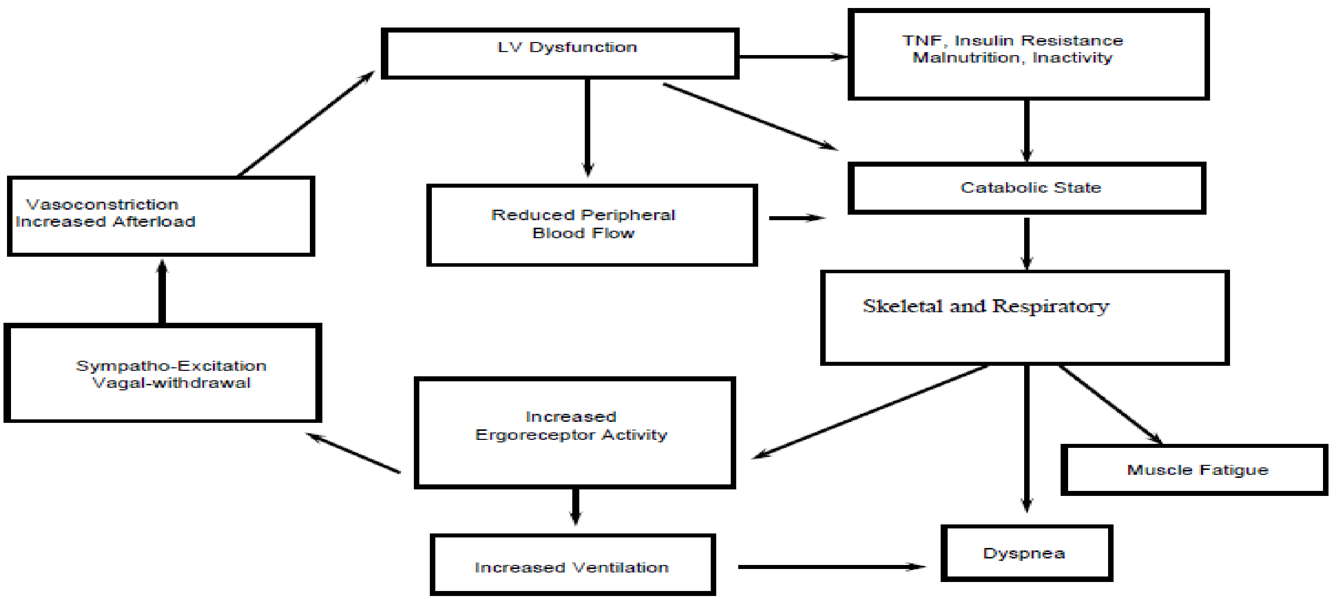
Please take time to answer the survey which will be shortly sent to all members. You participation will help us better understand your needs and preferences.

I am looking forward to seeing you soon in Toronto.

Yours sincerely,

Warner Mampuya

Figure 1



analysis, 9 studies that used the Minnesota Living With Heart Failure Questionnaire were included with a total of 463 patients. Exercise training resulted in a highly significant improvement of the Minnesota Living With Heart Failure Questionnaire score of 9.7 points (28% improvement), which is considered to be a clinically meaningful difference.[1] Interestingly, only one of the studies included in the meta-analysis could demonstrate a significant positive correlation between change in exercise capacity and change in QOL. This finding supports that QOL is only partly determined by the fitness level and that other factors affect the patient's perception of health. The Heart Failure: A Controlled Trial Investigating Outcomes of Exercise Training (HF-ACTION) study of 2331 patients assessed QOL using the Kansas City Cardiomyopathy Questionnaire (KCCQ).[12] After three months of exercise training, there was a great improvement in the overall KCCQ score (mean 5.21, 95% CI 4.42 to 6.00) compared with usual care alone (3.28, 95% CI 2.48 to 4.09). The additional 1.93 point increase (95% CI 0.84 to 3.01) in the exercise training group was statistically significant ($p < 0.001$). For the remainder of the study, there were no further significant changes in KCCQ for either group and there was a maintained greater overall improvement for the exercise group ($p < 0.001$).

Effects of Exercise Training on Mortality and Morbidity

The demonstrated changes in the central and peripheral mechanisms would suggest that exercise training should result in a reduction in mortality and morbidity. For the most part, the individual studies have been relatively small and not specifically designed to examine clinical outcomes. Pooling data from smaller studies, that are not powered to examine clinical outcomes, is often used to determine if there is a potentially beneficial effect of an intervention on mortality and morbidity. Smart and Marwick[13] found 17 studies, including 871 patients, randomized to exercise training or control examining the composite end point of mortality or adverse events. For this composite end point, the odds ratio was 0.68 (95% CI 0.46 to 1.00, $p = 0.05$). There were also 11 trials, with a total of 729 patients, reporting total mortality and the odds ratio was 0.61 (95% CI 0.37 to 1.02, $p = 0.06$). There was no evidence to suggest differences within various subgroups in this analysis, indicating benefit regardless of variables such as age, symptomatic status, and degree of cardiac dysfunction.

The ExTraMATCH Collaborative group examined nine studies totaling 801 patients using a primary outcome of total mortality and a composite secondary outcome of mortality or hospital admission.[14] The hazard ratio (HR) for the primary outcome was 0.65 (95% CI 0.46 to 0.92; $p = 0.015$). For the secondary composite outcome the HR was 0.72 (95% CI 0.56 to 0.93; $p = 0.018$). There were no significant differences observed between the pre-specified sub groups of age, gender, New York Heart Association class, HF etiology, peak VO_2, LV ejection fraction, and duration of exercise program.

The HF ACTION study randomized 2331 HF patients to a minimum of 12 months of exercise training or usual care.8 The primary outcome was all cause mortality or hospitalization. The secondary outcomes were all-cause mortality, cardiovascular mortality or cardiovascular hospitalization, and cardiovascular mortality or HF hospitalization. There was also a pre-specified supplementary analysis, adjusting for highly prognostic baseline characteristics, performed on these outcomes. Exercise training resulted in a non-significant reduction in the primary outcome (HR 0.93; 95% CI 0.84 to 1.02; p = 0.13), with an absolute reduction in the primary event rate at three years of 4%. After the pre specified adjustment of the baseline covariates exercise training was found to result in a significant (HR 0.89; 95% CI 0.81 to 0.99; p = 0.03) reduction in the primary outcome. The pre specified adjusted analysis also demonstrated a significant reduction (HR 0.85; 95% CI 0.74 to 0.99; p = 0.03) of the secondary outcome of cardiovascular mortality or HF hospitalization.

SAFETY OF EXERCISE TRAINING FOR HEART FAILURE PATIENTS

Although there are potentially many benefits associated with exercise training, the potential risks must be considered to gain an understanding of the overall safety related to training HF patients. The systematic review by Smart and Marwick[13] found there were no exercise-related deaths reported in patients during more than 60,000 patient-hours of exercise training. These data compare quite favourably to those found in normal and cardiac populations.[15]

The HF-ACTION study found there was no difference between the usual care and exercise groups for the occurrence of major cardiovascular events including worsening HF or myocardial infarction.[8] As well, there was no difference between the groups for hospitalization or death following exercise, ICD firing, or major musculoskeletal injuries. Therefore, the HF-ACTION study further supports the safety of exercise training.

CONCLUSIONS

Exercise training should be advised for HF patients. Training will improve exercise performance and QOL. Patients compliant with exercise training can expect an improvement in mortality and morbidity. Importantly, the studies would suggest that exercise training is safe.

References

1. Pina IL, Apstein CS, Balady GJ, et al. A statement from the American HeartAssociation Committee on exercise, rehabilitation, and prevention. Circulation 2003;107:1210-1225.
2. Piepoli M, Clark AL, Volterrani M, et al. Contribution of muscle afferents to the hemodynamic, autonomic, and ventilatory responses to exercise in patients with chronic heart failure. Effects of physical training. Circulation 1996;93:940-52.
3. Scott A, Wensel R, Davos CH, et al. Chemical mediators of the muscle ergoreflex in chronic heart failure: A putative role for prostaglandins in reflex ventilatory control. Circulation 2002;106:214-20.
4. Lloyd-Williams F, Mair FS, & Leitner M. Exercise training and heart failure: A systematic review of current evidence. Br J Gen Pract. 2002;52:47-55.
5. McKelvie RS. Heart Failure. In: Skinner JS, editor. Exercise Testing and Exercise Prescription for Special Cases: Theoretical Basis and Clinical Application. Lippincott Williams & Wilkins (Third Edition) 2005;Chapter 21:323-36.
6. Belardinelli R, Georgiou D, Cianci G, et al. Randomized, controlled trial of long-term moderate exercise training in chronic heart failure. Effects on functional capacity, quality of life, and clinical outcome. Circulation 1999;99:1173-182.
7. McKelvie RS, Teo KK, Roberts R, et al. Effects of exercise training in patients with heart failure: The Exercise Rehabilitation Trial (EXERT). Am Heart J 2002;144:23-30.
8. O'Connor CM, Whellan DJ, Lee KL, et al. Efficacy and safety of exercise training in patients with chronic heart failure: HF-ACTION Randomized Controlled Trial. JAMA 2009;301:1439-450.
9. Roveda F, Middlekauff HR, Urbana M, et al. The effects of exercise training on sympathetic neural activation in advanced heart failure. J Am Coll Cardiol 2003;42:854-60.
10. Passino C, Severino S, Poletti R, et al. Aerobic training decreases B-type natriuretic peptide expression and adrenergic activation in patients with heart failure. J Am Coll Cardiol 2006;47:1835-1839.
11. Van Tol BAF, Huijsmans RJ, Kroon DW, et al. Effects of exercise training on cardiac performance, exercise capacity and quality of life in patients with heart failure: A meta analysis. Eur J Heart Fail 2006;8:841-50.
12. Flynn KE, Piña IL, Whellan DJ, et al. Effects of exercise training on health status in patients with chronic heart failure: HF-ACTION Randomized Controlled Trial. JAMA 2009;301:1451-459.
13. Smart N and Marwick TH. Exercise training for patients with heart failure: A systematic review of factors that improve mortality and morbidity. Am J Med 2004;116:693-706.
14. ExTraMATCH Collaborative. Exercise training meta-analysis of trials in patients with chronic heart failure (ExTraMATCH). BMJ 2004;328:189-91.
15. Fletcher GF, Balady GJ, Amsterdam EA, et al. Exercise standards for testing and training: A statement for healthcare professionals from the American Heart Association. Circulation 2001;104:1694-1740.

References and Reviews

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Improving support for heart failure patients: a systematic review to understand patients' perspectives on self-care.

Spaling MA, Currie K, Strachan PH, Harkness K, & Clark AM. J Adv Nurs. 2015 Jun 18. doi: 10.1111/jan.12712. [Epub ahead of print]

Beyond clinical management of heart failure, patients' ongoing self-care is an important aspect of long-term heart failure treatment. This systematic review aimed to qualitatively examine the perspectives of heart failure patients, their caregivers, and health professionals to help inform strategies for improving heart failure self-care among patients.

A total of 37 papers were included in the study, with a sample of 1343 patients ranging in age from 25-98 years (mean age of 66 years). Experiences from 75 caregivers and 63 health professionals were also considered. Common themes that arose were patients' lack of knowledge around the role of medication in managing heart failure as well as the rationale for fluid restriction and daily monitoring of body weight. No recent symptoms or improved symptoms meant patients had difficulty viewing their condition as being chronic in nature. Furthermore, symptoms were sometimes misinterpreted as side effects of medications or other concurrent conditions (e.g., shortness of breath related to asthma versus heart failure).

Findings from this systematic review remind readers that educating patients on heart failure self-management does not end with information sharing. Rather, ongoing experiential learning, where patients are encouraged to reflect upon both successful and unsuccessful self-care situations, is strongly recommended to provide opportunity for improved self-efficacy and long-term self-care strategies.

Exercise therapy for heart failure patients in Canada.
Stone JA, Hauer T, Haykowsky M, & Aggarwal S. Heart Failure Clin. 2015; 11:83-33.

In this paper, Stone et al. aim to provide an overview of exercise training among heart failure patients. The authors begin by reporting on the prevalence and annual incidence of heart failure in the Canadian adult population (1.5% and 0.5%, respectively). Medical therapy (e.g., diuretics, beta blockers, etc.), and in certain cases ICD or CRT therapy, is informed by clinical practice guidelines, and remains a cornerstone of heart failure management.

The authors then turn their focus to the use of exercise therapy and the peripheral adaptations that can be achieved, independent of left ventricular function, through an appropriately prescribed exercise program. Increased enzymes and improved efficiency are examples of such adaptations that occur at the level of the skeletal muscle. Together, aerobic and resistance training improve the functional capacity and quality of life of a patient living with heart failure.

The paper reviews aerobic and resistance training guidelines generally used among heart failure patients, as outlined in the Canadian Guidelines for Cardiac Rehabilitation and Cardiovascular Disease Prevention. In addition, the authors highlight high intensity interval training (HIIT) as one approach to aerobic exercise prescription that is becoming increasingly attractive to cardiac rehabilitation health professionals given its potential for greater gains in functional capacity. In time, HIIT could earn its place in cardiovascular rehabilitation programs and be applied to higher functioning heart failure patients, but further evidence is needed.

Building your Professional Profile - Case Studies

Exercise training in Pre-transplant Patients - A Case Study

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Patients referred to the University of Ottawa Heart Institute Prevention and Rehabilitation Centre (HIPRC) cardiac rehabilitation (CR) program prior to heart transplant (HT) surgery are at end stage heart failure (HF) and generally have lived with their disease for several years. Some of these patients have left ventricular assisted devices (LVADs) to support their failing hearts and bridge them to transplant. They may also have internal cardiac defibrillator (ICD) implants. In this article we will discuss an exercise program for a patient who is waiting for HT and has both LVAD and ICD.

AssistiveDevices

The LVAD is an implantable circulatory-support device. Its parts include an internal mechanical pump, an external controller and an external power supply. Contemporary LVAD systems (e.g., HeartMate II) use continuous-flow rotary blood pump technology.[1] The LVAD, placed in the abdominal cavity, receives blood from the left ventricular apex and returns it to the ascending aorta. The electronic controller monitors system parameters such as pumping speed, power and flow. Cables attach the pump to external batteries or a power supply. Prior to hospital discharge, patients and significant family members are instructed in monitoring and care of the LVAD.

ICDs have defibrillator capabilities and may also have pacemaker functions. They are utilized in individuals who have history of life-threatening arrhythmias (e.g., ventricular tachycardia (VT), ventricular fibrillation (VF))or those who are at high risk for developing such an arrhythmia. Pacemaker and defibrillator limits are set specifically for each patient.

Exercise training for LVAD patients

Exercise prescription follows the guidelines set by CACR[2] and ACSM[3] for HF and ICD; there are no existing guidelines for LVAD patients. CACR[2] and ACSM[3] guidelines state that the exercise heart rate (HR) should be set at 10-15 beats below the ICD detection of defibrillation.

In the HIPRC program, patients waiting for HT attend on-site low intensity exercise program twice weekly for one hour. The one hour class is a combination of aerobic exercise training and skeletal muscle strength and stretching exercises. The program is closely supervised by the nurse and the physiotherapist. Telemetry monitoring is used initially during the first class. Blood pressure (BP) and HR assessment may be challenging and less reliable as the continuous flow rotary design of the LVAD diminishes or eliminates the arterial pulse.[3] The use of a doppler stethoscope can assist in more accurate BP and HR assessment. Exercise intensity is titrated to rating of perceived exertion (RPE) range 3 to 5 and to an asymptomatic level.

The LVAD pump is implanted in the abdominal cavity with percutaneous lead attachments and the patient carries the battery bag harnessed on the shoulders. This can cause some restriction in trunk movement and for core strength exercises. Range of motion (ROM) in the shoulders is relatively unimpeded and an upper extremity strength program is possible. Lower extremity exercise is without restrictions. Fast movements, large ballistic type of mobility exercise, and extreme ROM should be avoided. Resistance training should be limited to less than 10 lbs. In case of an emergency, each program should follow its own polices and procedures.

Exercise training goals for patients with LVAD waiting for HT are to maintain and increase skeletal muscle strength and endurance and to maintain or improve native heart function.[4] Patients waiting for their transplant surgery may also have a need for emotional and/or vocational counseling.

Case Presentation

Mr. X., currently a 66 year old male, was initially referred to the CR program in 2005. He had a longstanding history of atrial fibrillation/flutter. In 2004 he suffered a cardiac arrest, had PCI to LAD and RCA and was diagnosed with CHF (LV severe global dysfunction). In 2004 he had an ICD insertion with an upgrade to bi-ventricular cardiac resyncronization therapy in 2008. LVEF in 2008 was 22%. In 2009 he had several episodes of VT including one episode of syncope due to VT. HeartMate II LVAD was inserted in August 2009. Mr. X.'s ICD settings are dual chamber pacing DDD system, lower rate is 70 bpm, upper rate 120 bpm, VT therapy is delivered at 150 bpm, VF therapy at 200 bpm. Past medical history includes hypertension, dyslipidemia, and resection of basal cell cancer.

He was referred to CR in 2005 post-MI and PCI, in 2007 for assessment of functional capacity and conditioning and in December 2009 following insertion of LVAD. Mr. X. has been referred to Social Work for adjustment counseling and Vocational Counsellor to discuss return to work vs retirement. In May 2010, his wife met with Social Work regarding transportation assistance for Mr. X. to attend the CR program.

Exercise Prescription and Program

Mr. X. attended exercise classes from June 2005 to August 2005; from December 2007 to March 2008 and started exercise classes again in February 2010. Six minute walk tests were performed as part of outcome measures (see Table 1). Mr. X.'s exercise HR was set at resting HR+20-30 beats and exercise intensity as per six minute walk test results.

In December 2007, Mr. X. was able to walk for 15 minutes on the treadmill at 2 mph with RPE of 4. At graduation he was walking for 25 min on the treadmill at 2 mph with RPE of 2-3. Home exercise program was 5 to 7 sessions per week with target HR of 50 to 54 bpm, training METS of 2.5 to 3, duration of 25 to 30 minutes of walking, stationary cycle or treadmill at 2 mph.

In February 2010, Mr. X. was walking slowly on an indoor track for 4-5 minutes in 3 intervals with RPE of 2-3. Currently he is walking for 20 minutes on the treadmill at 2 mph with RPE of 2 and 5-10 minutes slowly on an indoor track.

Case Conclusion

Mr. X. is making progress and has been able to improve his exercise endurance in the program. He is anxiously waiting to be listed for HT.

As the incidence of HF increases, CR programs will face new challenges in the management of these patients. In our program, we have been able to successfully incorporate HF patients in the existing structure including medical supervision and close monitoring of vital signs and weight changes. In any CR program, it is paramount to have the support of Heart Function Clinics in the overall management and care of the patient.

Date	17 Dec 2007	19 Mar 2008	01 Feb 2010	19 May 2010
Rest blood pressure	104/64	104/58	98/60	98/75
Exercise blood pressure	92/52	104/46	88/60	88/65
Peak RPE	3/10	2/10	3/10	3/10
Distance walked	366m	413m	303m	485m
% predicted distance	75%	86%	60%	95%
Peak MET	2.7	3.0	2.4	3.3

Table 1 Six Minute Walk Tests

References:

1. Haennel RG, Brassard CP, Tomczak CR et al. Chapter 14. Special Populations in Cardiac Rehabilitation. In: Canadian Guidelines for Cardiac Rehabilitation and Cardiovascular Disease Prevention. Eds. Stone JA, Arthur HM, & Suskin N. CACR. Winnipeg, MB. 2009.
2. ACSM's Guidelines for Exercise Testing and Prescription, 8thEdition. Chapter 8: Exercise Prescription Modifications for Cardiac Patients
3. Slaughter MS, Pagani FD, Rogers JG et al. Clinical management of continuous-flow left ventricular assist devices in advanced heart failure. J Heart Lung Transplant 2010;29:S1-39.
4. de Jong N, Kirkels H, Lahpor J et al. Exercise Performance in patients with end-stage heart failure after implantation of left ventricular assist device and after heart transplantation: An outlook for permanent assisting? J Am Coll Cardiol 2001;37:1794-99.

Call for CACPR's CCRR Executive Co-Chair

5 Year Term - Starting As Soon As Possible
Volunteer Position

Roles

- Develop strategic direction for the CCRR
- Define policies and procedures for CCRR in consultation with CACPR and the sub-committees
- Lead stakeholder engagement, including sponsors (current and new), linking with partner organisations, seeking collaborative opportunities
- Provide support to provincial organisations
- Champion the importance of quality monitoring and registries
- Chair the CCRR Executive committee
- Support the work of the liaison and research sub-committees
- Presentations at the annual meeting and with partner organisations
- Represent the CCRR to the CACPR board

Qualifications and skills

- Experience within a Cardiac rehab programme (knowing how programmes run)
- Passionate about the value of information in the context of care
- General management experience
- Experience with engaging stakeholders, e.g., pharmaceutical companies and other aligned organisations.
-

If you are interested in the the volunteer position please send a Letter of Interest and your CV to Linda Smith, Executive Director at lsmith@cacpr.ca.

CCRR
Canadian Cardiac Rehab Registry

by CACPR
Canadian Association of Cardiovascular Prevention and Rehabilitation

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