Both cardiovascular disease (CVD) and diabetes mellitus (DM) require changes in health behaviour, particularly physical activity (PA), for prevention of recurrence and complications respectively. This study examined PA behaviour and its correlates, including motivational readiness and self-efficacy, among 355 DM, 144 CVD, 75 DM and CVD, and 390 residents with cardiovascular (CV) risk factors recruited through multiple means including random digit dialing, from rural (32.3%), northern (13.9%), and urban regions with increased CV prevalence and hospitalizations.

Methods & Measures: This constitutes a cross-sectional study from a larger randomized controlled trial (Community Outreach Heart Health Risk Reduction Trial; COHRT). Ontarians at elevated risk for CVD (ie 2 or more risk factors) were invited to participate. Participants completed a self-report survey, and clinical data were provided by healthcare providers. PA frequency, intensity and duration were evaluated through items from the 1996 National Population Health Survey. Motivational readiness was assessed with two items, both scored on a 5-point scale ranging from “No, I am not at all ready” to “Yes, regularly for more than 6 months.” Corresponding items were created to assess PA efficacy in the domains of moderate-to-vigorous intensity activity and lifestyle activity most days of the week.

Results: Results revealed that non-DM participants participated in a greater number of PA activities ($P < .001$) more frequently ($P < .013$) than DM participants. Most participants were in the maintenance stage of readiness regarding planned lifestyle activity most days of the week; however they were more frequently in earlier stages with regard to vigorous PA. Motivational readiness for moderate to vigorous PA was significantly lower in DM participants than CVD participants ($P < .007$) and those with neither condition ($P = .009$). An examination of PA correlates by disease status revealed lower PA readiness and efficacy among those with DM when compared to non-DM participants ($P < .009$). In a logistic regression analysis controlling for demographic and clinical characteristics ($\chi^2(12) = 51.98, P < .001$), disease status (DM OR = 0.65) and region (northern OR = 0.55) were significant correlates of PA frequency.

Conclusion: Physical inactivity is prevalent and threatens primary and secondary prevention of CVD. Yet factors influencing PA behaviour in medical populations (particularly those with DM) have been neglected in the literature. These results suggest that northern residents and those with DM are at increased risk of physical inactivity. Further efforts to increase motivational readiness and efficacy among people with DM are required to ensure the prevention and delay of complications including CVD, particularly interventions which can ‘reach’ people living in northern regions.
A PILOT STUDY

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0.019; HTX: 20.6 ± 7.5 vs. HF: 16.4 ± 5.8 ml·kg⁻¹·min⁻¹, P = 0.011), and percent of

age-predicted VO2peak (HTX: 70 ± 22 vs. HF: 60 ± 20%, P = 0.044) compared to HF patients.

HTX recipients had increased peak heart rate (HTX: 144 ± 22 vs. HF: 112 ± 30 bpm, P < 0.001), systolic blood pressure (HTX: 174 ± 26 vs. HF: 150 ± 30 mmHg, P = 0.001) and rate pressure product (HTX: 25 ± 6 vs. HF: 17 ± 6 bpm · mmHg · 10³, P = 0.001) compared to individuals with HF. Brachial artery endothelial function was not different between groups (Figure 1).

Conclusions: The use of an informational videotape increases intent to participate in a CRSP program and thus holds promise as a tool to increase CRSP participation. However, before this intervention is widely implemented, its impact on actual CRSP participation will need to be evaluated.

PERIPHERAL VASCULAR ENDOTHELIAL FUNCTION REMAINS IMPAIRED IN HEART TRANSPLANT RECIPIENTS

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Background and Rationale: Individuals with heart failure (HF) have severely reduced peak aerobic power (VO2peak) and abnormal peripheral vascular endothelial function. Previous investigations have shown that heart transplantation (HTX) is associated with an improvement in VO2peak. However, the effect of HTX on peripheral vascular endothelial function has not been well studied.

Objective: The aim of this study was to compare VO2peak and brachial artery endothelial function in clinically stable individuals with HF and HTX recipients.

Methods: Forty-two HF (NYHA functional class I to III; age (mean ± SD): 62 ± 12 years; 76% men) and 31 HTX patients (age: 58 ± 11 years; 77% mm) were recruited for this investigation. VO2peak, peak heart rate, systolic blood pressure and rate pressure product were obtained during a symptom-limited cycle exercise test. Age-predicted VO2peak was calculated from regression equations for healthy sedentary men and women. Brachial artery endothelial function was measured using the flow-mediated dilution procedure.

Results: HTX patients had increased VO2peak (HTX: 1.7 ± 0.6 vs. HF: 1.4 ± 0.5 L·min⁻¹, P = 0.019; HTX: 20.6 ± 7.5 vs. HF: 16.4 ± 5.8 ml·kg⁻¹·min⁻¹, P = 0.011), and percent of age-predicted VO2peak (HTX: 70 ± 22 vs. HF: 60 ± 20%, P = 0.044) compared to HF patients.

Conclusions: VO2peak is increased in HTX recipients compared to HF patients but it remains 30% lower in comparison to healthy sedentary individuals. Reduced VO2peak in HTX recipients may be secondary to abnormal peripheral vascular endothelial function that remains impaired following HTX. Interventions that improve endothelial function may play an important role in improving the reduced VO2peak in HTX recipients.

Figure 1. Endothelium-dependent function in individuals with HF and HTX recipients. (all comparisons, P < 0.05)

ONE YEAR FOLLOW-UP ANALYSIS OF A THERAPEUTIC HEALTHY LIFESTYLE INTERVENTION TARGETING CARDIOVASCULAR DISEASE RISK

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Background & Aims: This paper will describe and present original one-year follow-up data from the 5-year “Cardiovascular Health Best Practice Project” (CCHBP), a large (n = 611) RCT that tests whether cardiovascular disease (CVD) risk factors can be lowered using a low-intensity, widely diffusible lifestyle intervention based upon an expert patient model.

Methods & Materials: The Simon Fraser Heart Health Report Card System® is an intervention that provides a report card for subjects and their primary care physicians, and tailored behavioural lifestyle counseling provided over the telephone by trained health professionals in lifestyle areas including smoking, physical activity, nutrition, stress and medication compliance.

Results: Preliminary one-year follow-up data will be presented separately for the primary (n = 310) and secondary (n = 301) prevention arms of the RCT. Analyses of these data lend support to the efficacy of this intervention. For the primary prevention group, the mean Framingham 10-year absolute risk score for treatment subjects decreased approximately 24%, whereas the control group risk score did not change. The treatment/control difference over time was statistically significant after controlling for age, sex, SF-36, education, income and living arrangement using ANOVA. Statistically significant group differences over time were also found for total cholesterol, nutrition level, level of physical activity, and blood pressure at the bivariate level. For the secondary prevention group, no statistically significant associations were found except for physical activity.

Conclusions: The findings are discussed in terms of their clinical significance and their implications for diffusion at the population level. The results of this study provide evidence of CVD risk reduction, using a lifestyle intervention.
**PREDICTING EXERCISE STAGE TRANSITION FROM A SOCIAL ECOLOGICAL PERSPECTIVE IN PATIENTS WITH CORONARY HEART DISEASE**

J Kocurek; RD Reid, University of Ottawa Heart Institute, Ottawa, ON.

Background and objectives: Regular exercise is associated with decreased mortality and improved quality of life in individuals living with coronary artery disease (CAD). It has been suggested that individual’s progress through stages-of-change in adopting regular exercise can be predicted.

In this study, we examined the influence of the variables from the Social Ecological Model in predicting stage progression over 2 time periods following hospitalization in patients with CAD.

Methods: 801 patients, hospitalized with CAD were recruited from 3 hospitals in Eastern Ontario. Patients’ completed measures of exercise stage of change, demographics, social ecological variables (perceived seriousness of heart disease, perceived risk of future event, exercise intentions, self efficacy, barriers to exercise, availability of home exercise equipment, availability of community exercise facilities, and participation in cardiac rehabilitation), smoking status, and BMI at hospital discharge (baseline) and 6 months and 1 year later. Exercise stage progression was measured over 2 consecutive time periods: baseline to six months (time 1) and six months to one year (time 2). Individuals in the maintenance stage were excluded from the analysis as they could not progress to a higher stage. At each time point participants were categorized as: 1) Regressors and Stables (moved back at least one stage or no change) or 2) Progressors (moved forward at least one stage). Univariate and multivariate analyses were conducted to identify predictors of stage progression over each time period.

Results: For time 1-2, there were 242 Regressors and Stables compared to 359 Progressors. Univariate analyses revealed that education, BMI availability of community exercise resources, and participation in cardiac rehabilitation were significant (F = 0.001) predictors of stage progression. A multivariate analysis revealed that only participation in cardiac rehabilitation (β = 0.05; P < 0.001) was a significant independent predictor of stage progression. For time 2-3, there were 345 Regressors and Stables compared to 222 Progressors. Univariate analyses revealed that age, BMI, smoking status, exercise intentions, self-efficacy, barriers to exercise and participation in cardiac rehabilitation were significant (F = 0.001) predictors of stage progression. In the multivariate analysis, there were three independent predictors of stage progression: participation in cardiac rehabilitation (β = 0.31; P = 0.018), BMI (β = -0.05; P = 0.020), and age (β = -0.02; P = 0.048).

Conclusions: Progression in exercise stages occurred following hospitalization for CAD. Progression was predicted by variables from different categories including social ecological, demographic, behavioral and biological. Participation in cardiac rehabilitation was an independent predictor of early and late exercise stage progression. These findings have implications for the design of interventions to promote physical activity in patients with CAD.

**DAILY WALKING DISTANCE IS THE BEST PREDICTOR OF PEAK AEROBIC CAPACITY IN PATIENTS WITH CORONARY ARTERY DISEASE FOLLOWING ONE YEAR OF CARDIAC REHABILITATION**

P Yang; P Oh, Toronto Rehabilitation Institute, Toronto, Canada.

Background and Aims: Reduced exercise and functional capacity are observed characteristics in patients with coronary artery disease. Diminished capacity may threaten the ability to maintain minimal activities of daily living (generally requiring a VO_2peak between 10 and 18 ml kg^-1 min^-1). The restoration and recovery of normal exercise and functional capacity is a goal of exercise-based cardiac rehabilitation. The ability to identify which exercise component(s) best predict incremental improvements in peak aerobic capacity (VO_2peak) within the exercise prescription may provide better direction to patients and improve exercise rehabilitation efficacy. The aim of this study was to determine which component(s) of exercise prescription predict peak aerobic capacity in patients with coronary artery disease following one year of exercise training.

Methods and Materials: Hierarchical regression was performed on cross-sectional data from patients with coronary artery disease who were enrolled in the cardiac rehabilitation program of the Toronto Rehabilitation Institute between January of 1999 and June of 2004 (n = 3048; mean age = 63.1 ± 10.1 SD; men = 2586; women = 462). Inclusion criteria were medical referral following recent bypass surgery, angina, myocardial infarction, angioplasty and or insertion of a stent. Chronic heart failure patients were excluded. Following an initial cardiopulmonary assessment using a graded, cycle ergometer test, patients were prescribed walking exercise (50 to 85% heart rate reserve) in distance per day (DIST), duration (DUR) of exercise per day, and intensity as a minute/mile/int (INT). Patients exercised an average of 4 to 5 times per week for one year attending weekly supervised classes. Variables used to predict post-training VO_2peak were age, sex, body mass index (BMI), percent body fat (%BF), initial VO_2peak at baseline, DIST, DUR and INT.

Results: Age and gender accounted for 29.1% of the variance in VO_2peak (F = 0.001). BMI and the fat hour explained an additional 8.4% variance, although only BMI contributed significantly (BMI: F = 0.001; %BF: F = 0.50). Initial VO_2peak added 30.1% of explained variance (F = 0.001). Controlling for all previously mentioned variables, exercise prescription in terms of DIST and DUR were the only significant predicting variables of VO_2peak (R^2 = 0.04; DIST: P = 0.001; DUR: P = 0.001; INT: P = 0.261). Overall, the best component of exercise prescription to predict peak aerobic capacity was DIST at the end of 12 months of supervised exercise (β = 0.35). For every increase in miles walked per day would predict an increase in VO_2peak of 2.12 ml kg^-1 min^-1. The final prediction model included gender, age, BMI, initial VO_2peak, DIST, and DUR which together significantly predicted VO_2peak (F = 0.001) explaining a total of 71.3% of the variance.

Conclusions: Within aerobic exercise prescription, DIS and DUR were the best predictors of VO_2peak. Exercise prescriptions for patients with coronary artery disease may improve peak aerobic capacity without emphasis on intensity of walking. This regression model effectively quantifies a specific DRS of exercise required to find functional improvements.

**THE EFFECTS OF INCREASING HIGH-DENSITY LIPOPROTEIN ON CORONARY HEART DISEASE**

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Rationale and Objective: Coronary Heart Disease (CHD) is a leading cause of death for men and women in Canada and worldwide. Current evidence indicates Fibric acid therapy increased HDL-C by 6% to 18% and achieved a RRR between 9% and 38% in the absence of simultaneous changes in other lipids needs to be determined. The lack of reduced risk of CHD outcomes. However, whether or not this relationship remains significant reduced risk of CHD remains under debate. The objective of this systematic review was to examine the effects of increasing HDL-C on CHD-related end points among participants in the intervention group.

Methods: A systematic literature search of the PubMed and Web of Science databases (1977 to 2005) as well as a bibliographic search of relevant articles, was conducted. All randomized controlled trials of lipid-modifying agents that assessed changes in HDL-C and subsequent effects on CHD events were identified. Percent changes in lipid levels due to treatment were compared to the relative risk reduction (RHR) for major CHD-related events and for total mortality.

Results: Nine randomized controlled trials that met the inclusion criteria were identified. Stanin therapy increased HDL-C by 3.8% to 8% and achieved a RRR between 27% and 41% Fibrin acid therapy increased HDL-C by 6% to 18% and achieved a RRR between 9% and 34%. Combination therapy achieved the greatest increase in HDL-C (29% to 38%) and the greatest RRR in CHD-related events (53% to 80%). Most trials achieved a difference in HDL-C levels between treatment and control groups of >10%. However, there were also simultaneous changes in other lipid fractions such as LDL-C. Significant RRR ranged from 22% to 80%. In three studies a significant CHD risk reduction was associated with a rise in low HDL-C at baseline, regardless of whether LDL-C levels were reduced. Two post hoc analyses found that a 1% increase in HDL-C indicated a 2.3% reduction in CHD risk. No considerable beneficial effect on total mortality was associated with treatment.

Conclusions: There appears to be a linear relationship between higher HDL-C levels and reduced risk of CHD outcomes. However, whether or not this relationship remains significant in the absence of simultaneous changes in other lipids needs to be determined. The lack of consistency among these trials regarding definitions of CHD and of normal and abnormal baseline lipid profiles of subjects limits the comparison of the effects of increasing HDL-C. More clinical trials are essential to directly assess the benefits of increasing HDL-C on the risk of CHD development.
THE EFFECTS OF ATRIOVENTRICULAR DYSSYNCHRONY ON VO₂ KINETICS DURING EXERCISE RECOVERY
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Background and Purpose: Atrioventricular (AV) dyssynchrony attenuates oxygen uptake (VO₂) kinetics during the onset to constant work rate exercise. However, the effect of AV dyssynchrony on VO₂ kinetics during recovery from constant workload exercise was unknown. Identifying mechanisms responsible for alterations in VO₂ kinetics has the potential to significantly alter clinical management, and improve quality of life in those with cardiac dyssynchrony. Therefore, the purpose of this study was to determine the effect of AV dyssynchrony on VO₂ kinetics during exercise recovery.

Methods: Seven chronotopically competent male pacemaker dependent patients (mean ± SEM; age, 76 ± 3 years; BMI, 28 ± 1 kg/m²; peak VO₂, 1.24 ± 0.02 L/min (16.4 ± 1.6 ml/kg/min; peak work rate, 90 ± 7 watts) were included in this study. Breath-by-breath VO₂ was collected throughout a 5 min recovery period following exercise termination. VO₂ kinetics were determined with non-linear regression using a monoeponential equation. Stroke volume was determined with impedance cardiography and heart rate with an integrated (lead II) electrocardiogram. Cardiac output was calculated as stroke volume × heart rate.

Results: The main finding of this study was that VO₂ kinetics during exercise recovery were significantly (P = 0.05) slower during dysynchronous (82 ± 6 vs 95% confidence interval, 4.7 s) compared with synchronous (86 ± 6 ± 95% confidence interval, 4.5 s) AV pacing. Cardiac output and stroke volume responses were also significantly (P < 0.05) reduced at exercise termination and at matched time points throughout recovery during dysynchronous AV pacing.

Conclusion: The findings of this study suggest that a reduction in stroke volume associated with AV dyssynchrony contribute to altered VO₂ kinetics, and thus a prolonged exercise recovery time.

IMPROVED PHYSIOLOGICAL OUTCOMES IN STROKE PATIENTS ATTENDING A CARDIAC REHABILITATION PROGRAM OF RESISTANCE AND AEROBIC TRAINING
Susan Marzolini; Paul Van Wiechen; Christine Ford; Lesley Thacker; Joan Kitchen; Renee Komidas; Valerie Skeffington; Emily Szydelko; Ada Tang; Paul Oh, Toronto Rehabilitation Institute, Toronto, Canada.

Rationale and Objectives: Both coronary artery disease and stroke share modifiable risk factors and it is not uncommon for these disease states to co-exist in patients attending a cardiac rehabilitation (CR) program. The aim of this investigation was to evaluate the effects of a 20 to 32 week CR program of resistance training (RT) and aerobic training (AT) on changes in cardiorespiratory fitness, muscle strength, joint flexibility, walking speed, and sit and stand time in stroke survivors.

Methods: Seven male patients with a diagnosis of stroke aged 41 to 72 years (mean age ± 13 ± 13 years) and 22 to 44 weeks post stroke (mean 42 ± 17 weeks) participated in a CR program. Four of these patients had coronary artery disease. Patients participated in an AT program (walking or cycling) five times per week (once at the CR program center and 4 times at home) and a progressive individualized RT program performed twice per week (once at the center and once at home). A symptom limited maximal cycle ergometer exercise test, with collection of expired gas samples, was conducted at entry and after 32 weeks of training. Measures of isotonic arm flexion and knee extension peak torque, grip strength, shoulder and hip range of motion, repeated chair sit and stand time, and 22 meter walking time were taken before and after 20 weeks of training. Effects of training were examined with Student’s paired t-tests using SPSS 13.0. Data are presented as means ± standard deviation.

Results: Baseline VO₂max increased significantly from 16.7 ± 5 to 20.3 ± 5.4 ml · kg⁻¹ · min⁻¹ post training (t = 0.001) (64% and 75% of age predicted norms respectively) representing a 24% gain in cardiovascular fitness. Isometric arm extension peak torque improved 35 ± 7% (P = 0.02) on the stroke-affected side and 35 ± 7% (P < 0.05) on the non-affected side (NS). Arm flexion strength improved 17.3 ± 29.4% on the affected side and 11.2 ± 21.2% on the non-affected side (NS). Grip strength showed a trend for improvement on the non-affected side (78.9 ± 68.2%) (P = 0.09) and increased by 19.6 ± 42% on the affected side (NS). Hip flexion range of motion on the non-affected side showed a trend for improvement (17.3 ± 20%) (P = 0.06) while shoulder flexion range of motion showed no significant changes. Repeated chair sit and stand time improved significantly by 21.8 ± 14 % (P = 0.02) and time to walk 22 meters decreased by 5.5 ± 12% (NS).

Conclusion: Stroke patients enrolled in a CR program of RT combined with AT demonstrate significant improvements in cardiovascular fitness, sit and stand time, static lower extremity strength, with trends for gains in other functional measures.

CANADIAN CARDIAC REHABILITATION PROGRAMS: WHAT OUTCOMES DO THEY MEASURE?
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Background and Aims: The purpose of the survey was to determine current program characteristics, components and current practice standards across Canadian Cardiac Rehabilitation (CR) sites. Information will assist the Winnipeg CR program to modify/improve upon its program delivery and service. Data from the survey will also facilitate the Winnipeg Program to evaluate current practice and to potentially compare patient outcomes with similar facilities across Canada. The purpose of this research paper is to report on the outcomes measured CR programs in Canada.

Methods and Materials: The University of Manitoba Research Ethics Board approved the research project. The Canadian Association of Cardiac Rehabilitation (CACR) provided a mailing list of current CACR members to the study coordinator. Other CR sites were identified from searching the Internet. In September 2005, 118 surveys were mailed to eligible CR programs across Canada. The mailed survey packages included a cover letter, survey, and a postage-paid, self-addressed envelope. A small gift incentive was used to facilitate the return of completed surveys. Reminder letters were mailed two weeks after the initial mail out. The structure of the entire survey included six sections dealing with program description, medical, psychological/behavioral, dietary education, exercise, and social and vocational support.

Results: The response rate was 62% (73/118). CR programs indicated measuring a variety of outcomes to evaluate their programs. The four most common outcome areas were medications, lipid profile, stress test (GSTX) results, and anthropometric measures. Most programs monitor medication compliance in some manner (62.5%) and many rely on self-reported patient compliance to medication regimen (68.6%) as well as tracking all medications the patient is prescribed (48.6%). In terms of lipid profile, programs measured an average of 3.3 outcomes out of a list of 14 outcomes. The most common outcome information tracked was total cholesterol, LDL, and HDL (all 85.5%). This was followed by fasting blood sugar (77.4%). Programs tracked an average of 6.8 outcomes out of a list of 12 GXT outcomes. The most common GXT outcomes measured were initial blood pressure (85.5%), maximum heart rate (82.3%), and MET levels (80.6%). The most common anthropometric outcomes measured were resting blood pressure (97.3%), resting heart rate (90.4%), Body Mass Index (79.5%), and waist measurement (74.0%). Nearly 82% of the repeat measures used to measure outcomes to evaluate their programs. The four most common outcome areas were medications, lipid profile, stress test (GSTX) results, and anthropometric measures.

Conclusions: This is the first attempt to systemically survey CR programs in Canada. A comprehensive CR program inventory may facilitate local program planning, quality improvement initiatives, and a means for potential benchmarking with comparable facilities. This information may also provide direction for future program development and expansion within the Winnipeg Regional Health Authority.

THE EFFECT OF PHYSICAL ACTIVITY ON QUALITY OF LIFE IN PATIENTS WITH CORONARY HEART DISEASE: SHOULD GENDER BE CONSIDERED?
LA McDonnell; C Blanchard; B Reid; L Morrin; A Pipe; W Dafoe, University of Ottawa Heart Institute, Ottawa, Ontario.

Background and Aims: Among coronary heart disease (CHD) patients, women consistently report poorer quality of life (QOL) compared to men. Unfortunately, studies that have adjusted for confounding clinical factors (e.g., demographics, co-morbidity, and disease severity) to determine the effects of PA on QOL failed to explain this gender difference. One potential variable that may partially explain this gender difference is physical activity (PA). Specifically, it may be that males have better QOL because they engage in significantly more PA compared to females. Although increased PA has been associated with increased QOL in CHD patients, it has not been used to specifically explain the gender difference in QOL from a mediational perspective. Furthermore, there is a paucity of data comparing QOL in men and women over extended periods of time. Therefore, the present study examined the mediating effect of PA on the gender/QOL relationship over a one year period in CHD patients.

Methods and Materials: Six hundred and four male (Mean age = 63; 36% AML; 38% PTCA, 27% CABG) and 197 female (Mean age = 63; AML, 37% PTCA, 25% CABG) CHD patients who participated in the TEACH trial were included in the present study. Quality of life and PA were assessed in-hospital, and 6 and 12 months after hospitalization.

Results: Analyses of covariance indicated that males were significantly more active than females at baseline, F(1,794) = 5.81, P < 0.05, 6 months, F(1,795) = 12.77, P < 0.01, and 12 months, F(1,795) = 3.74, P > 0.05. Additionally males had a higher QOL than females at baseline, F(1,663) = 5.37, P < 0.05, and 6 months F(1,788) = 4.47, P < 0.05, but not at 12 months F(1,795) = 0.21, P > 0.05. Additionally, the Baron and Kenny mediation procedure showed that PA was partially mediating the gender/QOL relationship in-hospital and at 6 months. Specifically, the male patients engaged in significantly more PA compared to females, which resulted in better QOL.

Conclusions: Results from the current study suggest that increased PA partially explains why males report having better QOL than females within the first 6 months after hospitalization. This suggests that future PA interventions need to focus on reducing the gender disparity in PA. In doing so, this will reduce the gender disparity in QOL as well. Therefore, the recognition of the importance of PA for female QOL needs to be made a central building block in cardiac rehabilitation in order for women to achieve maximal benefit from the treatment for CHD.
AEROBIC ENDURANCE AND ARTERIAL COMPLIANCE IN KIDNEY TRANSPLANT RECIPIENTS

Kenneth Riesen,1 Sita Gourishankar,2 Richard Lewanzuk,2 Antigone Dueck,1 Lee Jones,3 Jon McGavock,2 Mark Haykowsky,1,2 Department of Rehabilitation Medicine; 2Department of Medicine, University of Alberta, Edmonton, Alberta, Canada.

Background: Cardiovascular disease was a leading cause of morbidity and mortality in kidney transplant recipients (KTR). Risk factors for coronary artery disease are well established. However, two novel risk factors that have not been well studied in this population are arterial compliance and aerobic endurance.

Purpose: The aim of this study was to examine arterial compliance and aerobic endurance in KTR and age-matched healthy individuals. We hypothesized that arterial compliance and aerobic endurance would be lower in KTR than healthy, age-matched individuals. We also hypothesized that older KTR would have reduced arterial compliance compared to younger KTR.

Methods: Sixty-two (mean ± SD, age: 51 ± 14 years) clinically stable KTR were recruited for this study from the University of Alberta Kidney Transplantation Clinic. Resting small (SAC) and large (LAC) arterial compliance were assessed non-invasively using computerized arterial pulse waveform analysis (Hypertension Diagnostics, Eagan, MN). The assessment of aerobic endurance was performed using the six-minute walk test. Age-matched comparisons were made for SAC, LAC and distance walked in 6 minutes. Secondary analysis was performed to determine if SAC and LAC were different between younger (<51 years) and older (≥51 years) KTR.

Results: Small arterial compliance was significantly lower in KTR (0.5 ± 3 ml/mmHg ± 100) compared to age-matched predicted values (7.9 ± 0.9 ml/mmHg ± 100, P < 0.0001). No significant difference was found for SAC between KTR (16± ± 6.6 ml/mmHg ± 10) and age-matched predicted values (15.2 ± 1.3 ml/mmHg ± 10, P = 0.5). In addition, SAC and LAC were 35% (P = 0.0258) and 36% (P = 0.0052) higher, respectively, in younger versus older KTR. The distance walked in 6 minutes was 28% lower in KTR compared to age-matched predicted values (P < 0.0001).

Conclusions: Kidney transplant recipients have significantly lower SAC and arterial compliance compared to age-matched healthy individuals. Further, older KTR have significantly lower SAC and LAC compared to younger KTR. Interventions, such as exercise training, that improve aerobic endurance and arterial compliance may play an important role reducing the cardiovascular disease risk that occurs in this population.

SUCCESSFUL APPLICATION OF A CARDIAC REHABILITATION MODEL IN DIABETES MELLITUS

Paul Oh; Pearl Yang; Catherine Statton; Renee Konidis; Marcella Calouros; Michael Sarin, Toronto Rehabilitation Institute, Toronto, Canada.

Rationale and Objectives: Individuals with Type 2 diabetes mellitus (T2DM) have low fitness and typically present with elevated risk factors for cardiovascular disease. In several small controlled studies, endurance and resistance training have been shown to improve fitness and glycemic control. Cohort studies have furthermore suggested a strong relationship between fitness and cardiovascular complications and mortality. Exercise is therefore advocated as a core intervention for persons with T2DM – unfortunately physical activity is actually adopted only sporadically. In our community we felt that development of a formal exercise program in partnership with diabetes centers patterned after a cardiac rehab model could address this care gap. The present study examines the effect of a 6 month structured exercise program on measures of fitness and risk factors in T2DM.

Methods: 385 consecutive men and women (mean age 56, 56% women) previously diagnosed with T2DM (mean duration 6 years) enrolled in this program contributed data for this analysis. After an initial cardiopulmonary exercise assessment with direct VO2 measure, subjects were prescribed an exercise program consisting of walking 5–5 days/week at 50–85% heart rate reserve for 20–60 minutes per session. They also engaged in light resistance training towards the end of their 6 months. Fasting blood glucose (FBG), hemoglobin A1C, LDL and HDL cholesterol were measured along with VO2peak and body composition (BMI % body fat (BF), waist circumference) pre- and post- six months training. Effects of training on VO2peak and body composition were examined with Student’s paired t-tests using SPSS 13.0. Changes in glucose and lipids at baseline, 3 and 6 months were examined using an analysis of variance. Data are presented as means ± standard deviation.

Results: Average walking prescriptions increased from 1.1 miles in 22 mins at baseline to 2.2 miles in 39 mins at 6 mos. Following training, cardiovascular fitness improved significantly (pre: 18.1 ± 4.4 ml·kg⁻¹·min⁻¹; post: 20.5 ± 6.6 ml·kg⁻¹·min⁻¹, P < 0.001), BMI, %BF, and waist circumference demonstrated significant reductions (BMI: pre: 32.0 ± 6 kg·m²⁻¹; post: 31.6 ± 6; BMI: 35.6 ± 9.7; post: 34.4 ± 6.9; P < 0.001; Waist: pre: 103 ± 13 cm; post: 101 ± 13 cm; P < 0.001). LDL cholesterol fell significantly over 6 months without any modification in lipid medication (pre: 2.84 ± 1.04 mmol·L⁻¹; post: 2.47 ± 0.78 mmol·L⁻¹, P < 0.01). However, HDL was fairly high at baseline and was unchanged (pre: 1.20 ± 0.35; post: 1.31 ± 0.39; P = NS). Both FBG and A1C improved significantly (FBG: pre: 9.1 mmol·L⁻¹ ± 3.0; 3 mos: 7.4 ± 2.0; 7 mos: 7.0 ± 1.8; P < 0.02; A1C: pre: 7.3 mmol·L⁻¹ ± 1.5; 3 mos: 6.8 ± 1.3; post: 6 ± 0.8 mmol·L⁻¹; P = 0.002). Doses of diabetes medications were reduced over this period.

Conclusions: Type 2 diabetes represents a coronary equivalent in future risk and prognosis. Participation in a structured exercise program patterned after a cardiac model is an effective intervention in appreciably modifying this risk.

UTILIZATION OF THE WORLD WIDE WEB TO PROVIDE CARDIAC REHABILITATION AT A DISTANCE: A VIRTUAL CARDIAC REHABILITATION PROGRAM (vCRP)

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Background and Aims: Cardiac Rehabilitation Programs (CRP) have been proven to reduce CVD risk, decrease health care cost and decrease mortality by 25%. However, despite the benefits of these programs, it is believed that as little as 10%-25% of eligible patients actually attend. Barriers to this reported low attendance include accessibility and availability of programs. With currentwaitlistsof2to5monthsandtheinaccessibilityofCRPtourbanandruralpatients,conductingcardiacrehabilitationthroughtheInternetmaydecreasebarriersrelatedtotravelandsafetyandallowpatientstoaccesscardiacrehabilitationprogramsfromanywhereinCanadaandtheUSassuccessfullyastheinpersonprogram. The purpose of this study was to pilot test the delivery of an interactive, 12-week web-based CRP to rural patients, conducting cardiac rehabilitation through the Internet may decrease barriers related to distance and service delivery and allow patients from around the province to interact with cardiac rehabilitation specialists, essentially bridging the treatment gap. The purpose of this study was to pilot test the delivery of an interactive, 12-week web-based CRP through the internet to assess patient safety and changes in cardiovascular risk factors.

Methods and Materials: The virtual cardiac rehabilitation program (vCRP) was a randomized controlled trial (n = 15) investigating a 12-week web-based CRP. Patients with diagnosed cardiovascular disease were recruited from the waiting list of a hospital-based CRP. Those in the intervention underwent an online baseline assessment and were prescribed a home exercise program. The vCRP website was designed to include interactive heart rate, blood pressure and exercise upload components, live chats with specialists and weekly education sessions. The primary outcome investigated was change in exercise capacity (total time on an exercise stress test). Secondary outcomes included changes in physical activity participation, lipid profiles, diet composition and level of self-efficacy. Patient interviews were also conducted to evaluate user satisfaction.

Results: Significant findings within the intervention group only included the lipid values for HDL-C (2.13 ± 1.01); TG (7.31 ± 0.73); TC/HDL-C ratio (1.41 ± 1.17), self-efficacy (P < 0.018) and physical activity participation (P < 0.018). There was an improvement in both groups with exercise stress test performance with the intervention group improving by 2.9 METs from baseline with an increase in total time on the stress test of 58 seconds greater than that of the control group. There were no statistically significant findings between groups. There were no adverse events reported in the intervention group. Other reported outcomes from patient interviews indicate overall satisfaction with the program and a noted positive behaviour change.

Conclusions: The improvements in exercise capacity and lipids in the intervention group were similar to that reported from current face-to-face CRP. The improvement of exercise capacity in the intervention group, above and beyond the control group, was deemed to be of clinical relevance. In this pilot study, the vCRP provided safe and effective delivery of cardiac rehabilitation at a distance. Future directions include further investigation in a larger study sample and development in the delivery of telhealth services for cardiac rehabilitation and other chronic conditions.
NATURE AND FREQUENCY OF ADVERSE EVENTS DURING EXERCISE IN A MEDICALLY SUPERVISED OUTPATIENT CARDIAC REHABILITATION PROGRAM

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Background and Aims: The incidence of fatal and non-fatal cardiac events occurring during or shortly after cardiac rehabilitation exercise sessions is low. The infrequency of these events challenges the notion of onsite physician supervision during exercise. The interventional cardiac rehabilitation program (CRP) offered at the Cardiac Wellness Institute of Calgary (CWIC) utilizes risk stratification, based on the results of an initial treadmill test, to determine candidates for EKG telemetry monitoring. Patients attend this community-based, onsite medically supervised exercise program for one hour twice per week for a period of up to twelve weeks. Exercise sessions are directly supervised by Exercise Specialists with Registered Nurses available in the exercise area to triage patient symptoms and determine the need for further assessment by the onsite physician.

The purpose of this investigation was to: 1. Quantify the nature and frequency of adverse events during supervised exercise at the CWIC; and 2. Determine whether a relationship exists between the frequency of adverse events and patient risk stratification (RS) and/or telemetry monitoring.

Methods: Data were prospectively collected over 36 months from March 2003 to February 2006. When patients experienced adverse events during exercise warranting physician assessment and/or treatment, patient risk stratification, telemetry monitoring status, nature of event and treatment were recorded.

Results: No fatal events were observed during the timeline studied. A total of 494 adverse events requiring physician assessment occurred in 34,995 patient exercise hours. The nature and frequency of events distributed by RS are presented in Figure 1. Frequency of telemetry monitoring by adverse event was as follows: dysrhythmia (Dys): 43.0%, other events (Oth): 11.4%, blood pressure (BP): 9.5%, classic symptoms (CS) (ie: shortness of breath, pallor, diaphoresis, nausea, fatigue): 6.3%, chest pain (CP): 3.3% and blood sugar (BS): 0.0%. Of the 494 adverse events observed, 14 patients were sent to hospital for further evaluation, 9 classified as urgent transport via ambulance (1 Code 99), 5 classified as non-urgent transport by car with a family member.

Conclusions: Adverse events occurred at a rate of approximately 3 per week during the study period. Of patients presenting with adverse events, 14.6% were telemetry monitored and events related to CP occurred most frequently. The overall incidence of adverse events by RS mirrored the distribution of patient RS within the program, i.e., most patients were stratified as moderate risk and the majority of adverse events occurred within this group. Although the observed number of adverse events is relatively low in this study, onsite physician evaluation resulted in 480 fewer additional physician interactions and/or ambulance transports and emergency room (ER) visits. Furthermore, patient concerns were addressed in a timely fashion, resulting in less interruption of their course in the CRP.

Figure 1. Adverse Event Incidence Distribution by RS (%).

CACR Abstracts / 279