

Positive Outcomes in Cardiac Rehabilitation: The Little Program That Could

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Cardiac rehabilitation programs (CRPs) are receiving increasing attention because they restore, maintain, or improve both physiologic and psychosocial client outcomes (Evenson, Rosamond & Luepker, 1998). However, less attention has been paid to the effect such programs may have on the health-related quality of life of participants. The objective of this study was to measure health-related quality of life outcomes before and after participation in a CRP. Participants were 64 clients entering one of five CRP groups at the Lethbridge Regional Hospital in southern Alberta. Participants completed the Short Form 36 Health Survey (SF-36) (Ware, 1997) both at the beginning and at the end of one 13-week CRP intervention. The SF-36 examines eight health concepts: physical functioning (PF), role-physical

(RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role-emotional (RE), and mental health (MH). Analysis showed a significant difference between the pre-test and post-test scores for six of the eight categories. Larger effect sizes were found for PF ($d=.746$), RP ($d=.657$), and VT ($d=.593$). Smaller effects were found for BP ($d=.299$), SF ($d=.337$), and RE ($d=.271$). The findings of this study highlight improved health-related quality of life outcomes for clients participating in comprehensive cardiac rehabilitation programs.

Key words: cardiac rehabilitation program, cardiac, heart disease, program evaluation, quality of life, stress management, therapeutic exercise

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Cardiac rehabilitation programs are receiving increasing attention because rehabilitation restores, maintains, or improves both physiologic and psychosocial client outcomes (Evenson et al., 1998). Researchers have found that cardiac rehabilitation programs (CRPs) are an important strategy in comprehensive cardiac health care because they have been shown to reduce mortality and morbidity (Bittner & Oberman, 1993; Thompson, 1996), improve psychological health (Gavin et al., 2000), and cut medical costs (Blackburn et al., 2000; Thompson, 1996). However, less attention has been paid to the impact that CRPs might have on the overall health-related quality of life for CRP participants. Therefore, the objective of the present study was to assess the overall health-related quality of life of CRP participants, both before and after involvement in a CRP at a small, regional centre in southern Alberta.

Cardiac rehabilitation is a relatively new and rapidly expanding intervention that has been

largely developed, delivered, and evaluated by nurses (Thompson, 1996). In recent years, there has been a trend toward more comprehensive and preventative cardiovascular programs. For example, national cardiac rehabilitation guidelines in the United Kingdom (UK) include medical, psychosocial, exercise-based, educational, and vocational components (Thompson, 1996). In the UK and the United States, risk factor modification, participation of partners, stress management, and psychological intervention are considered as equal, fundamental components of a comprehensive, interdisciplinary CRP (Harper et al., 1999; Thompson, 1996). There is evidence that comprehensive CRPs that integrate these components result in both medical and psychosocial improvements, such as significant reductions in anxiety for both client and partner, significant improvement in sexual adjustment, and resumption of leisure activities (Thompson, 1996).

Fridlund, Hogstedt, Lidell, and Larsson (1991) evaluated a multifactorial rehabilitation program based on biopsychosocial content and interdisciplinary caring efforts for myocardial infarction (MI) clients. In terms of biophysical improvements, re-infarctions were significantly lower 12 months after MI among the intervention clients. Physical capacity was also increased, and intervention clients reported decreased pain, breathlessness, and exertion. Psychological improvements were not as pronounced, but were demonstrated in higher life satisfaction for the intervention group. Social improvements were manifested in better leisure situations and improvements in relationships with spouses/partners. Fridlund et al. (1991) concluded that self-ratings of health, in combination with objective measurements by health care professionals, are clearly important.

Daumer and Miller (1992) found that the level of psychosocial functioning and perception of life satisfaction were strongly related in cardiac rehabilitation clients. They concluded that rehabilitation nurses could enhance their clients' quality of life by directing their practice toward enhancing the psychosocial functioning of their clients. They also emphasized the importance of considering the client within the context of family, a theme echoed by Harper and Groves et al. (1999) in their discussion of cardiac rehabilitation support groups.

Jette and Downing (1994) used the Short Form Health Survey (SF-36) to measure the self-perceived health status of 789 individuals entering a cardiac rehabilitation program. The SF-36 is a self-administered survey designed to measure health-related quality of life (Jette & Downing, 1994; Ware, 1997). It measures eight health-related concepts that make up a multidimensional scale: physical functioning; social functioning; role limitations due to physical problems; role limitations due to emotional problems; mental health; energy /fatigue; bodily pain; and general health perception. Jette and Downing's study showed that cardiac disease was associated with reductions in health-related quality of life. Clients were most disabled or limited in their performance of roles by physical problems. Limitations affected the kind of activities performed, the amount of time spent on activities, and the ability to perform activities taken on. Clients also experienced considerable lack of energy or fatigue. Health was least limited by bodily pain. Jette and Downing concluded that the SF-36 has potential as a useful instrument for objectively measuring the health-related quality of life of cardiac rehabilitation clients, and identifying the dimensions of health most affected. Nevertheless, their study was restricted to

clients *entering* a CRP and did not address the question of whether participation in a CRP actually influences health-related quality of life (as measured by the SF-36).

In the present study, the authors aimed to extend the work of Jette and Downing (1994) by measuring health-related quality of life of clients both before *and after* participation in a CRP. The SF-36 survey was chosen, not only due to its wide acceptance as a health-related quality of life tool (Anderson, Aaronson & Wilkin, 1993), but also for its ability to capture quality of life facets particularly important to cardiac patients, such as vitality (Corcoran & Durham, 2000; Smith, Taylor & Mitchell, 2000; Ware, 1997). Therefore, the objective of the present study was to assess health-related quality of life (as measured by the SF-36) both before and after participation in a comprehensive 13-week cardiac rehabilitation program (CRP). The hypothesis of this study was that there would be a statistically significant difference between the paired pre-test and post-test SF-36 scores, with higher post-test scores reflecting the positive effect of the CRP on the participant's health-related quality of life.

The Cardiac Rehabilitation Program

The present study took place at the Lethbridge Regional Hospital (LRH) in southern Alberta. The LRH serves the Chinook Health Region (CHR), and the cardiac rehabilitation program (CRP) was developed as a comprehensive recovery, rehabilitation, and risk-reduction program for cardiac clients in the CHR. The CHR population is approximately 120,000, and the number of annual referrals to the CRP is approximately 300. The program is small, with the equivalent of 1.2 full-time positions being shared by two nurses. Despite a lack of funding and human resources, creative partnerships have been developed to secure resources and to integrate multi-agency support services funded both by the CHR and outside agencies. To ensure consistency of the program, the CRP nursing staff is responsible for coordinating all components of the program, among various disciplines and community partners. This administrative activity is combined with responsibilities in clinical assessment, as well as education and fitness/exercise leadership and programming.

The referral process is consistent for the majority of clients who ultimately participate in the CRP. Automatic referral for all MI clients takes place as a function of admission to any hospital in the region with acute coronary syndrome; a standardized "clinical pathway" has been developed for health care providers caring for this population. The pathway cues the nurse early in the process to begin to establish connections between the client and the

CRP to ensure early follow-up and to introduce program services. Other referrals are received directly through physicians' offices and other health care providers, as well as directly from clients and families.

Once the referral occurs, the client receives a regionally developed "survival" package of cardiac educational materials. Information is standardized throughout the CRP: the materials are consistent with - and complement - information distributed by external health care agencies specializing in cardiopulmonary health. The package provides information about specific resources and services available, as well as more general introductory information on topics such as lifestyle management, angina, common medications, activity, nutrition, and stress. Tobacco users receive additional information about smoking and heart disease, smoking cessation techniques, coping tips and available resources. Additional resources including videos, journals, newsletters, and other printed materials are available at no charge from the Heart Health Resource Centre. While they are in the hospital, clients are invited to tune in to an inhouse televised "Medicine Show" which delivers the same information, but in a different format.

Upon discharge from hospital, a CRP staff member contacts all clients personally. If appropriate and possible, the client is then scheduled for a rehab/risk reduction assessment, ideally within one month of discharge. Depending on acuity, disability, comorbidity, and individual client need, this assessment can either be scheduled as a separate outpatient visit or in conjunction with a Heart "CHEK" (Cardiac Health Education Klass). The one-day Heart "CHEK" involves group presentations and discussions on heart health issues, and provides an opportunity to reinforce important heart health messages. Also built into this day is a one-on-one discussion between the client and a CRP nurse; during this discussion, the health history, unique needs, attainable goals, and available resources/consult services are explored in-depth. Partners, spouses, and other interested support persons are invited to participate in all aspects of programming. A "teamwork" approach is strongly encouraged in the hope of relieving anxiety, promoting confidence, and improving long-term outcomes (Trodden, 2001).

Following assessment, clients are scheduled for a 10-week exercise and education program. Each group session involves a twice-a-week exercise program led by a CRP nurse. The exercise session incorporates intensity modification, upper body exercise, and light resistance training, given an overall objective of

improvement of cardiovascular and functional fitness. This session is followed by a half-hour education session provided by health care professionals from various disciplines. Upon completion of the program, clients are encouraged to continue with their new healthy habits at home. Clients may be connected with community resources that will assist them. The popular option is a twice per week exercise session offered by the "Be Fit for Life" Centre at the local community college and taught by the CRP staff nurses.

Method

Participants

Participants were 64 clients joining in one of five CRP sessions at the LRH between September 1999 and January 2001. Although 214 surveys were initially collected, only matched pre-test/post-test pairs which had consistent wait and program start times of less than three months from initial assessment until exercise start were included in this study. Eight surveys which did not have consistent wait times were discarded, and 51 surveys were discarded for incomplete data. Twenty-seven individuals completed a pre-test but no post-test. Of these 27 individuals, 11 chose not to complete the survey, and 16 did not complete the program for a variety of reasons, including return to work, lack of transportation arrangements, co-morbid problems, and non-heart-related surgery. Therefore, 128 surveys representing 64 participants were included in this study (n=64).

All participants met the admission requirements to the CRP as set out in the Guidelines for Cardiac Rehabilitation and Cardiovascular Disease Prevention (Canadian Association for Cardiac Rehabilitation, 1999). The average age of the entire sample was 65.25 years, with five clients over the age of 80 and four clients under the age of 50. Eighty per cent of the participants were male, and 20% were female. Fifty-seven per cent of the males had partner participation, while only 30% of the females had partner participation.

The majority of clients were accepted into the CRP based on automatic referral from their physicians. Thirty-eight per cent of the subjects were referred for cardiac rehabilitation with a diagnosis of PTCA (percutaneous transluminal coronary angioplasty), 31% had undergone coronary artery bypass graft (CABG) surgery, 27% were referred post-myocardial infarction (MI), and 5% had congestive heart failure.

Procedure

Ethical approval for the research study was received from the regional research ethics committee. All participants were informed about the general goals

and nature of the study, and signed an informed consent form prior to their participation. Participants completed the SF-36 surveys twice: at the beginning (pre-test) of the 13-week CRP session, and at the end (post-test) of the CRP session. The questionnaire takes about 10 minutes to complete. All pre-test surveys were mailed to the participants, who brought the completed documents to their initial assessments. The post-tests were completed on site at the last class, or, if the client was absent on that day, at the post assessment session.

Instrument

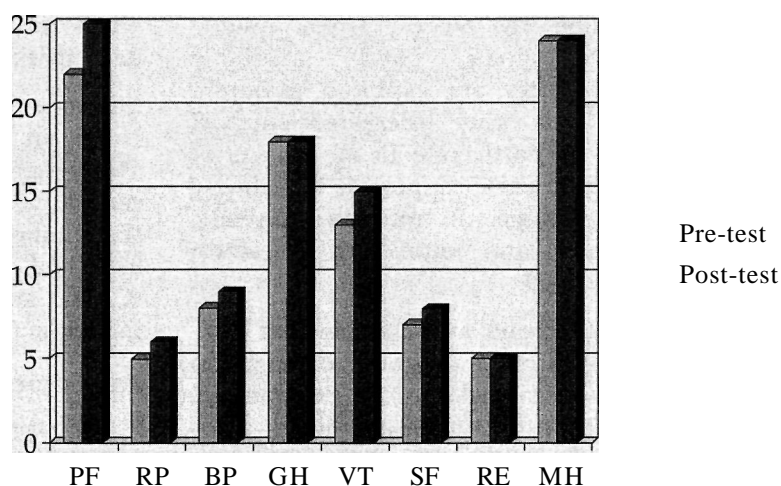
The SF-36 is one of the most widely-used international health-related quality of life tools, and has proven reliability, precision, and validity (Failde & Ramos, 2000; Gandek et al., 1998; Ware, 1997). The SF-36 has 36 questions, which are primarily Likert-type questions generally containing five or six choices (e.g., ranging from 'all of the time' to 'none of the time.'). The 36 questions are grouped to form scores for eight health concepts, which are measured on a scale of 0 to 100, with a higher score indicating better health (Ware, 1997). Physical functioning (PF) measures the limitations in performance of self-care, mobility, and physical activities. Highest scores indicate an ability to engage in vigorous activity without limitations due to health (10 items). Role-physical (RP) measures the degree to which an individual performs or has the capacity to perform activities typical for a specified age and social responsibility. These activities include working at a job, housework, school work, child care, community activities, and volunteer work. Highest scores indicate that no problems with work or other daily activities are occurring as a result of physical health (four items). Bodily pain (BP) measures the intensity, duration, and frequency of bodily pain and limitations in usual activities due to pain, such as headaches or backaches. Highest scores indicate no pain or limitations due to pain (two items). General health (GH) measures the beliefs and evaluations of a person's overall health, including current and prior health, health outlook, and resistance

to illness. Highest scores indicate a self-perception of health as excellent (five items). Vitality (VT) measures feelings of energy, pep, fatigue, and tiredness. Highest scores indicate self-perception of energy and pep all of the time (four items). Social functioning (SF) measures the ability to develop, maintain, and nurture social relationships including relationships with family, friends, neighbours; marital functioning; and sexual functioning. Highest scores indicate an ability to perform normal social activities without interference due to physical or emotional problems (two items).

Table 1
Comparison of pre- and post-test scores to USA general population

Pairs categories	Mean scores	Highest possible score	Mean as %	US population mean as %
PF1	22.06	30	74	
PF2	24.78	30	83	84.2
RP1	4.82	8	60	
RP2	6.06	8	76	81
BP1	7.94	12	66	
BP2	8.86	12	74	75
GH1	17.72	25	71	
GH2	17.67	25	71	72
VT1	12.67	24	53	
VT2	14.96	24	62	60.9
SF1	7.39	10	74	
SF2	8.27	10	82	83.3
RE1	4.92	6	82	
RE2	5.32	6	89	81.3
MH1	23.36	30	78	
MH2	23.78	30	79	74.7

Figure 1
Bar graph of mean pre- and post-test results



Role—emotional (RE) measures problems/ limitations with role due to emotional problems. Highest scores indicate no problems with work or other activities as a result of emotional problems (three items). Mental health (MH) measures emotional, cognitive, and intellectual status. Highest scores indicate self-perception of feeling peaceful and happy all of the time (five items).

Data Analysis

Statistical analysis was possible for this sample size ($n = 64$) since, according to Ware (1997), tests of statistical significance for SF-36 surveys may be conducted on sample populations with a minimal size of $n = 30$. Survey results were recoded and scored according to Ware (1997), and recoded data was entered and analyzed using SPSS 10.0 computer software (Paired Samples t-Test). Means and standard deviations were calculated for each of the scales, and SF-36 scores were compared with scores reported for a general population (see Table 1).

Results

Statistical analysis showed a significant difference between the pre-test and post-test scores in six of the

eight SF-36 categories: physical functioning (PF); role-physical (RP); bodily pain (BP); vitality (VT); social functioning (SF) and role-emotional (RE). In the categories PF, RP and VT, $p < .0001$. In the categories BP, SF and RE, $p < .05$. There were no statistically significant differences in categories GH ($p = .908$) or MH ($p = .323$) (see Table 2).

A bar graph depicting the mean pre-test and post-test scores of each category visually represents the differences between the eight categories (see Figure 1). The higher post-test scores in six categories indicate an improvement in the health concepts represented by these categories. These findings are supported by the large effect size in the categories PF ($d = .746$) and RP ($d = .657$), and the moderate effect size in the category VT ($d = .593$) (Ware, 1997) (see Table 3).

Discussion

The hypothesized difference between the paired pre-test and post-test SF-36 scores was supported by the data. Statistical analysis showed a significant difference between the pre-test and post-test scores of six of the eight SF-36 categories. These findings highlight the value of comprehensive cardiac rehabilitation programs in improving health-related quality of life, as measured by the SF-36.

In placing the results of this study within the larger context of cardiac rehabilitation research, it is of note that the socio-demographic characteristics of the sample population were consistent with other studies. For example, the average age of participation (65) and the substantially higher percentage of male versus female participation (80% versus 20%) are comparable to other studies in which older clients and women have been shown to have lower participation rates in CRPs (Bittner & Oberman, 1993; Blackburn et al., 2000; Evenson et al., 1998).

The reasons for referral to the physician in the present study are also consistent with other studies. For example, the sample population consisted of a higher percentage of clients referred post-PTCA

Table 2

Paired samples test-paired differences (SPSS 10.0)

	Mean	Standard Deviation	t-value	Degrees of freedom	Significance
Pair 1 - PF1 - PF2	-2.72	3.64	-5.967	63	.000
Pair 2 - RP1 - RP2	-1.24	1.89	-5.180	61	.000
Pair 3 - BP1 - BP2	-0.92	3.08	-2.389	63	.020
Pair 4 - GH1 - GH2	5.39	3.68	0.116	62	.908
Pair 5 - VT1 - VT2	-2.29	3.87	-4.744	63	.000
Pair 6 - SF1 - SF2	-0.87	2.59	-2.678	62	.011
Pair 7 - RE1 - RE2	-0.39	1.45	-2.030	55	.029
Pair 8 - MH1 - MH2	-0.41	3.32	-0.997	63	.323

Table 3

Effect sizes

Pairs categories	d - value	Effect size
PF	-0.746	Large
RP	-0.657	Large
BP	-0.299	Small
GH	0.015	-
VT	-0.593	Medium
SF	-0.337	Small
RE	-0.271	Small
MH	-0.1246	-

(38%) and post-CABG (31%), compared to myocardial infarction (MI) clients (27%). Researchers have found that surgical clients (e.g. CABG) were more likely to enter rehabilitation than MI clients (Blackburn et al., 2000; Bunker, McBurney, Cox, & Jelinek, 1999). Richardson et al. (2000) reported a dramatic increase in the absolute and relative number of clients entering and completing cardiac rehabilitation after PTCA.

Where the sample population differed from populations reported elsewhere is in the overall rating in some of the categories; this may have influenced the results. For example, no statistically significant differences were found between the pre-test and post-test scores in the general health [GH] and mental health [MH] categories. However, the high initial scores of the MH category suggest that there was not much room for improvement in this category from the outset, a circumstance which may have influenced the final results of "no difference." In addition, it is interesting to note that the mean post-test scores of the population under study exceeded the mean of the general population of the United States according to Ware (1997) in the categories vitality [VT] (62 versus 60.9%), role-emotional [RE] (89 versus 81.3%), and mental health [MH] (79 versus 74.9%). Finally, in the category of role-pain [RP], even the pre-test score (60%) was substantially higher than that reported by Jette and Downing (1994) in their study of 789 men and women entering cardiac rehabilitation programs (RP = 27.1%). Thus, even with high pre-test scores, participants' health-related quality of life improved in a statistically significant way.

Limitations

The major advantage of a one-group pre-test/post-test design is that extraneous variation among participants is controlled (each participant acts as his or her own control) (Daniel, 1999). There were a number of threats to validity in this study, however, including reactive effect (where the participants react to the characteristics of the research situation rather than the treatment itself, for example, wishing to please the CRP staff); testing (where taking a pre-test may affect the post-test scores); and history effect (where an event that is not related to the study may influence the responses of the participants, such as favourable media attention to the CRP) (Burns & Grove, 2001; Norwood, 2000). However, since addressing such limitations would involve a randomized trial without ensuring clinical significance, the present design was considered the most appropriate.

Another limitation that may have influenced the results was self-selection: the participants may have intrinsic characteristics that affect the outcome scores (Norwood, 2000). For example, since only matched pairs of surveys were included (128 surveys in total), 86

surveys were rejected. This raises the possibility that those participants who completed both pre- and post-tests were different from participants who did not complete a post-test, and different from the total population of CRP participants (e.g., greater motivation /commitment to the program; greater ability to comprehend written instructions and communicate written responses).

A final limitation is the potentially limited generalizability of our findings to large, urban settings. Given the comparatively small and non-random sample taken from a smaller, rural setting, additional research using a larger, randomly-selected sample from a different type of setting would help to establish the impact of CRPs on participants' health-related quality of life.

Implications for Nursing Practice

The present study confirms the value of comprehensive cardiac rehabilitation programs. Given their statistical significance, these findings are generalizable to CRPs in similar (rural) settings, with similar approaches to cardiac rehabilitation. Of particular relevance is that the CRP under review has had measurable success in health-related quality of life outcomes despite its small size and lack of specialized on-site resources (i.e., cardiologist; exercise specialist; dietitian; social worker). This is particularly important for nurses involved or interested in CRPs in rural and remote settings where it might be assumed that lack of local resources precludes outstanding patient care and education, thereby precluding significant outcomes for cardiac patients. This study confirms that *nurses can and do make a difference*.

Although this study supports the findings of other investigations as to the benefits of CRPs, it is worth noting that, despite such benefits, CRPs in general - including the CRP under review - are woefully under-utilized. For example, Blackburn et al. (2000) found that only 11% of eligible clients participated in a hospital-based CRP. Bunker et al. (1999) found that only 32% of those eligible to attend CRPs participated at least once. Evenson et al. (1998) found that 47% of myocardial infarction clients and 21% of angina clients were referred to and participated in CRPs. In the Chinook Health Region Cardiac Rehab Program in southern Alberta, initial participation rates are generally much higher than those reported in other studies (i.e., roughly 80% of the 300 annual referrals come for the initial session), but only half of eligible clients actually follow through with the exercise program. Reasons cited by clients include lack of time, transportation, finances and support. Considering the demonstrable benefits of CRPs, the greatest challenge may be to find ways to address the needs of those not accessing the services.

Implications for Further Research

Further research focusing on the underserved population of potential CRP participants (those who did not access or follow through on program) could provide insight into how to further extend CRP benefits (e.g., effect on participation rates if exercise classes were offered at various rural sites more accessible to patients). Also, further research looking at the effectiveness of CRPs among patients differing in age, gender, and social support could provide insight into how to adapt the programs to meet more specific needs (e.g., married versus widowed or otherwise single patients). Finally, a larger, randomized study would increase the generalizability of the findings.

Studies focusing on cardiac rehabilitation are vital. This is an era when hospital stays are becoming shorter, the population is aging, and cost containment is increasingly important (Bittner & Oberman, 1993). As a result of cost constraints and

limited resources, there is growing pressure for accountability and emphasis on outcomes measurement (Harper et al., 1999). Measures of health status help to assess the effectiveness of health care interventions, help practitioners in decision-making, and supplement other measures of impairment in clients with cardiovascular disease, thus resulting in a more comprehensive assessment of health (Jette & Downing, 1994). The present study confirms the value of comprehensive CRPs. The small program size (limited staff and funding) of the CRP under study exemplifies the importance of characteristics such as creativity, interdisciplinary communication, and coordination as well as consistent client-focused support. The broad skill base and holistic approach to client care brought to this program by the expert nursing staff has been instrumental to its success. The findings of this study should lend support to other "little programs who think they can." ¶

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