ABSTRACT

KAWAMURA, T. Characteristics of current and past participants in the University of Wisconsin-La Crosse cardiac rehabilitation program with a historical review of cardiac rehabilitation. MS in Adult Fitness/Cardiac Rehabilitation, May 1999, 71pp. (P. Wilson)

The purpose of this study was to review the development of cardiac rehabilitation, and summarize the characteristics of current (CP) and past (PP) participants of the Cardiac Rehabilitation Unit in the La Crosse Exercise and Health Program at the University of Wisconsin-La Crosse. A questionnaire was distributed to CP ($N = 102$) and PP ($N = 62$) who left the program between August 1992 and June 1998. One-hundred and fifteen participants responded for a return rate of 70.7%. Overall, 34.4% of PP were women, as opposed to 16.9% in CP. CP had a significantly higher peak MET level ($p < .05$), and had lower BMI, despite the fact that CP were relatively older than PP. Congestive heart failure, congenital heart problems, and orthopedic problems were more prevalent among PP ($p < .05$). Family members of CP were also more likely to participate in the program. Although 53.2% of PP dropped out the program within a year, nearly 40% of CP had been in the program more than 5 years. PP favored less a year-round program as a reason for their program entrance ($p < .05$). Nearly 80% of CP and PP engaged in some form of physical activity on regular basis. Therefore, majority of PP should not be considered as dropouts, but rather graduates of the program.

CHARACTERISTICS OF CURRENT AND PAST PARTICIPANTS IN THE UNIVERSITY OF WISCONSIN-LA CROSSE CARDIAC REHABILITATION PROGRAM WITH A HISTORICAL REVIEW OF CARDIAC REHABILITATION

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Advisory Board:	Mrs. Marna
Financial Board:	My parents
Psychological Board:	The LEHP participants, New & Old classmates
Nutritional Board:	Pat & Erine, Chris & Kim, Helen & Jay, Big Apple Bagel®, etc
Housing Board:	Jason, Dr. Keaton & Mrs. Martha
Nightlife Board:	Lance & Jeff

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INTRODUCTION

"Cardiac rehabilitation services are comprehensive, long-term programs involving medical evaluation, prescribed exercise, education and counseling. These programs are designed to limit the physiologic and psychological effects of cardiac illness, reduce the risk for sudden death or reinfarction, control cardiac symptoms, stabilize or reverse the atherosclerotic process, and enhance a psychological and vocational status of selected patients." As stated, this is the definition of cardiac rehabilitation by the United States Public Health Service.[1] In 1995 the Agency for Health Care Policy and Research (AHCPR) released a Clinical Practice Guideline, entitled Cardiac Rehabilitation as Secondary Prevention,[2] which was based on over 400 scientific reports. This guideline indicated the following benefits of cardiac rehabilitation:

1. Improvement in exercise tolerance
2. Improvement in symptoms
3. Improvement in blood lipid levels
4. Reduction in cigarette smoking
5. Improvement in psychological well being and reduction of stress
6. Reduction in mortality

This guideline also emphasized that cardiac rehabilitation is currently underutilized, and can benefit many patients, men and women. In addition, this guideline provided evidence that cardiac rehabilitation can be beneficial for patients with angina pectoris, heart transplant, cardiomyopathies, valvular heart disease, hypertension, and patients with

implanted pacemakers and cardioverter-defibrillators. Lastly, the AHCPR's guidelines suggested that alternative approaches to the delivery of cardiac rehabilitation can be implemented effectively and safely. A variety of techniques such as regular telephone contact, mail, fax, video recording, internet, and transtelephonic ECG monitoring may be used to facilitate monitoring and communication between patients managed at home.[3]

It took many years for cardiac rehabilitation to be established. Many exercise physiologists, cardiologists, epidemiologists, scientists, and organizations have contributed to today's well-accepted cardiac rehabilitation services (see Appendix A). With new technology and new theories regarding the recovery of cardiac patients, it is now possible to discharge patients within four days after coronary artery bypass surgery.[4] Financial constraints are also leading to a shortened length of stay in the hospital. However, the number of the patients who undergo various heart surgery procedures has been increasing every year.[5] As the patient population has been increasing, the emphasis in each phase of cardiac rehabilitation has also been shifting to an initial focus on rehabilitation (Phase I, II, and III), followed by a focus on maintenance (Phase IV). As there has been an increased number of cardiac patients, the need for cardiac rehabilitation has also increased. Nevertheless, a recent national survey indicated that less than a third of the patients who are eligible to participate in cardiac rehabilitation programs actually enter a program.[6] Those who do not enter a program are often women, non-white, and the elderly.[6] Another major problem identified in cardiac rehabilitation is patient dropout. Approximately 40 to 60% of those who participate in cardiac rehabilitation programs drop out of programs within 6 to 12 months.[7]

The American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) defines the four stages of cardiac rehabilitation[8] as;

Phase I (inpatient): this stage can last as short as 1 day to as long as 14 days. Intervention in this stage includes discharge planning, education, and physical activity from admission through discharge.

Phase II (immediate outpatient): the length of this stage is partly determined by risk stratification and monitoring needs. Ideally the Phase II program is initiated within two weeks after discharge. This stage includes physician-referred exercise and behavior change therapy with intensive monitoring and supervision, including electrocardiographic (ECG) monitoring for some patients.

Phase III (intermediate outpatient): the third stage of recovery begins when patients do not need continuous or frequent intermittent ECG monitoring. Regular endurance exercise and lifestyle change is emphasized continuously under supervision in Phase III.

Phase IV (maintenance outpatient): the maintenance program is structured for patients who have reached a plateau in exercise endurance and have achieved stable risk factor management. The length of participation is as long as appropriate via the individuals' needs and interests.

The La Crosse Cardiac Rehabilitation Program (renamed the La Crosse Exercise and Health Program in 1985, [LEHP]) began in 1971 as a joint effort between the University of Wisconsin-La Crosse, the La Crosse County Medical Society, and La Crosse area hospitals and medical clinics. This program, which offers both a preventive Adult Fitness Unit and a medically supervised Cardiac Rehabilitation Unit,

has been a service to the residents of the La Crosse area for more than 27 years. One of the unique features of the LEHP Cardiac Rehabilitation Unit is that it consists of a variety of participants, including Phase III and IV cardiac patients, pulmonary and stroke patients, and patients who are at high risk for cardiovascular disease.

The purpose of this study is to review the development of cardiopulmonary rehabilitation, and summarize both current and past participants in the Cardiac Rehabilitation Unit offered by the LEHP.

METHODS

Subjects

The study involved a questionnaire for current and past LEHP participants. Current participants were defined as individuals who had paid for a membership fee to the LEHP office prior to June 1998. Past participants included individuals who left the program after initial participation between August 1992 to June 1998 for some reasons other than death or relocation from the La Crosse area. As a result, 102 current and 71 past participants were included for this study. Before this survey was conducted, it was found that six participants had died and three had relocated from the La Crosse area. A cover letter and questionnaire was distributed to 102 current and 62 past participants in the Cardiac Rehabilitation Unit (see Appendix B - E).

Questionnaire

The questions for the current and past participants included questions about gender, age, height, weight, smoking, current occupation, time and method for transportation to the facility, current health status, and length and frequency of participation. Peak METs (metabolic equivalent) was obtained from the latest data in individual files. Additional

questions were as follows;

1) Initial reason(s) for their involvement in the program,

2) Possible reason(s) for leaving the program, (if a past participant),

3) Current exercise habits, and

4) Suggestions for the program

The questionnaire for past participants also include details of any cardiac related complications after leaving the cardiac rehabilitation program. Compliance questions were answered using a five-point Likert scale. The scores on each scale were coded so that a higher score reflected a greater importance for each compliant or incompliant factor.

Additional information was obtained from individual participant files. One of the founders of the program, Dr. Philip Wilson and the current Executive Director, Dr. John Porcari were interviewed regarding the development of the program and current status of the program.

Statistical Analysis

All data were reported as mean ± SD. Standard descriptive statistics were used to summarize characteristics of the participant population. Differences in various medical profiles, health behaviors, and motivation to participate or leave the cardiac rehabilitation program were compared between current and past participants by using an independent t-test, one-way ANOVA with post hoc test, chi square evaluation, or Mann-Whitney test.

RESULTS

Study Group

As a result of the first and second mailing, and a follow-up phone call, a total of 115 questionnaires (70.6%) were returned (see Table 1). Eighty-three current (81.4%) and 32 past participants (55.2%) responded.

Table 1. Summary of Returns

	Current	Past
Returns	83	32
No returns	19	26
Relocation	0	6
Death	0	7

Although men were dominant in both groups, a higher percentage of women were past participants compared to current participants (see Table 2).

Physical Characteristics

Physical characteristics of current and past participants are listed in Table 3. There were no significant differences between current and past participants for these characteristics except peak METs ($P < 0.05$).

Table 2. Comparison of Number of Participants by Gender

	Current (n = 83)		Past (n = 32)	
	n	Percent	n	Percent
Male	69	83.1	21	65.6
Female	14	16.9	11	34.4

$\chi^2(1, N = 115) = 4.161, P = 0.048$

Table 3. Physical Characteristics of the LEHP Participants

		Current				Past			
		n	M	SD	Range	n	M	SD	Range
Age (N = 115)	Total	83	66.9	10.1	26-85	32	63.3	14.0	18-80
	Male	69	66.8	10.5	26-85	21	61.2	13.6	18-77
	Female	14	67.7	8.5	51-78	11	67.4	14.4	36-80
BMI (kg/m^2) (N = 109)	Total	79	26.7	4.4	17.0-44.7	30	29.0	6.0	16.3-43.2
	Male	65	26.9	3.9	17.0-40.0	20	29.5	4.7	22.7-40.5
	Female	14	25.7	4.7	19.4-44.7	10	28.1	8.1	16.3-43.2
Peak METs (N = 108)	Total	78	9.2	3.4	3.0-19.5	30	7.5*	3.5	2.6-17.0
	Male	65	9.6	3.4	3.0-19.5	19	8.5	3.7	2.6-17.0
	Female	13	6.9!	2.6	3.5-13.3	11	5.9!!	2.2	2.5-10.0

N is based on total number of participants whose data were available. Age in past participant were at the time they left the program
*current vs. past $P < 0.05$; ! current male vs. current female $P < 0.05$, !! vs. past female $P < 0.005$

As shown in Table 4, subjects' body mass index (BMI) [kg/m²] were categorized according to the Federal Obesity Clinical Guidelines released in June 1998.[9] This guideline defines overweight as a BMI between 25 and 29.9, and obesity as BMI greater than or equal to 30. There was a significant difference on BMI between the two groups ($P < 0.05$).

Table 4. Comparison of Body Mass Index Distributions Based Upon Classifications Defined by the U.S. Federal Guidelines

Category	Current (n = 79)		Past (n = 30)	
	n	Percent	n	Percent
Desirable	28	35.4	7	23.3
Overweight	38	48.1	10	33.3
Obese	13	16.5	13	43.3

Four current and two past participants' BMI were unavailable.
$\chi^2(2, N = 109) = 8.655$, $P = 0.013$
Desirable: < 25kg/m², Overweight: 25-29.9kg/m², Obese: ≥ 30kg/m²

As shown on Table 5, both groups were divided into either more than eight METs or less, which is based upon a criteria in the ACSM's Guidelines[10] for progression to independent exercise with minimal or no supervision. More current participants were in the "> 8 METs" category than past participants ($P < 0.05$).

Table 5. Comparison of Exercise Capacity [METs] Based Upon ACSM's Guidelines for Minimum or No Supervision in Exercise Program

METs	Current (n =78)		Past(n = 30)	
	n	Percent	n	Percent
< 8 METs	22	28.2	16	53.3
≥ 8 METs	56	71.8	14	46.7

Five of current and two of past participants' METs were unavailable.
χ^2 (1, N = 108) = 5.999, P = 0.023

Current Occupation

Current occupational status is shown in Table 6. There was no difference between groups (P > 0.05). More than 60% of both current and past participants had been retired and nearly 30% had engaged in fulltime work.

Table 6. Current Employment Status

Occupation status	Current (n = 82)		Past (n = 30)	
	n	Percent	n	Percent
Retired	51	62.2	19	63.3
Part-time	5	6.1	1	3.3
Full-time	23	28.0	7	23.3
N/A	3	3.7	3	10.0

One current and two participants did not answer the question.
χ^2(3, N=112) = 2.149, P = 0.542

Smoking Status

Only two current (2.4%) and one past participant (3.2%) reported that they are still smoking (see Table 7).

Table 7. Current Smoking Status

	Current (n = 82)		Past (n = 31)	
	n	Percent	n	Percent
Yes	2	2.4	1	3.2
No	80	97.6	30	96.8

One of each current and past participant did not answer the question.
$\chi^2(1, N = 113) = 0.054$, P = 1.000

Commute

Except for one current participant who uses a bus and one who walks, all other participants commuted to the program by car. In addition most past participants drove their own vehicle to the program (see Table 8). Approximately 90% of current and all past participants lived within a 20 minute drive to the program (see Table 9).

Cardiovascular History

A comparison of cardiovascular clinical profiles between groups is shown in Table 10. Current and past participants were similar with regard to history of cardiac disease. However, congenital heart problems and congestive heart failure (CHF) were more

prevalent among past participants ($P < 0.05$), while a greater number of current participants reported a history of arrhythmia ($P < 0.05$).

Table 8. Driving Status

	Current (n = 80)		Past (n = 25)	
Driver	n	Percent	n	Percent
Myself	69	86.3	24	96.0
Someone	11	13.8	1	4.0

Two current and seven past participants did not answer the question.
$\chi^2(1, N = 105) = 1.789, P = 0.286$

Table 9. Commute Time to UWL

	Current (n = 79)		Past (n = 25)	
Time (min)	n	Percent	n	Percent
< 10	43	54.4	11	44.0
10-19	28	35.4	14	56.0
> 20	8	10.1	---	---

Four current and seven past participants did not answer the question.
$\chi^2(2, N = 104) = 4.917, P = 0.086$

Cardiac Risk Factors and Medical Problems

When the presence of cardiac risk factors was analyzed, similar trends emerged between current and past participants (see Table 11). Orthopedic problems were more prevalent among past participants ($P < 0.05$), and women ($P < 0.05$) when current and past female participants were combined . In addition, more women complained about having arthritis ($P < 0.005$).

Table 10. Cardiovascular History

Diagnosis	Current (n = 83)		Past (n = 31)		χ^2
	n	Percent	n	Percent	
CABG	54	67.5	19	61.3	0.383
MI	36	43.4	17	54.8	1.183
PTCA	32	38.6	14	45.2	0.409
Angina	31	37.3	8	25.8	1.336
Arrhythmia	24*	28.9	3	9.7	4.622
Valve surgery	7	8.4	2	6.5	0.122
Pacer/ICD	4	4.8	1	3.2	0.137
CHP	4	4.8	6*	19.4	5.959
CMP	3	3.8	4	12.9	3.379
PVD	2	2.4	1	3.2	0.059
CHF	1	1.2	4*	12.9	7.635
Transplant	1	1.2	--	--	0.377

The data for one past participant were unavailable. *$P < 0.05$
CABG: coronary artery bypass graft; MI: myocardial infarction; PTCA: percutaneous transluminal coronary angioplasty; ICD: implantable cardioverter defibrillator; CHP: congenital heart problem; CMP: cardiomyopathy; PVD: peripheral vascular disease; CHF: congestive heart failure

Table 11. Cardiac Risk Factors and Medical Problems

Characteristics	Current (n = 83)		Past (n = 31)		χ^2
	n	Percent	n	Percent	
Hyperlipidemia	54	65.1	14	45.2	3.713
Hypertension	45	55.4	10	51.6	0.132
Arthritis	14	16.9	10	32.3	3.217
Orthopedic	10	12.0	9*	29.0	4.688
Obesity	10	12.0	7	22.6	1.973
Thyroid	9	10.8	7	22.6	2.577
Stroke	9	10.8	3	9.7	0.033
Diabetes	8	9.6	7	22.6	3.308
COPD/Asthma	8	9.6	5	16.1	0.941
Cancer	3	3.6	1	3.2	0.010
Other	6	--	3	--	--

The data for one past participant was unavailable.
*P < 0.05

Cardiac Complications

Eighteen current participants (17 male, 1 female, 21.7%) had experienced a cardiac complication since they entered to the program. Those conditions were as follows: CABG (n = 10), angina (n = 5), PTCA (n = 5), pacemaker (n = 2), atherectomy (n = 1), MI (n = 1) or stroke (n = 1). Since leaving the CR program, eight of the past participants

(five males, three females, 25.0%) developed one or more cardiac complications including PTCA (n = 5), CABG (n = 3), valve surgery (n = 1), and angina (n = 1).

Program Attendance

Approximately 40% of current CR participants had been in the program for a prolonged period of time, ranging from 5 years to 24 years. In contrast, more than 50% of past participants dropped out of the program within a year (see Table 12). A majority of current and past participants were either attending or had been attending the program three days per a week (74.7% and 69.0%, respectively), as indicated in Table 13.

Table 12. Length of Stay in the LEHP

Length	Current (n = 83)		Past (n = 32)	
	n	Percent	n	Percent
< 3 months	3	3.6	4	12.5
3-6 months	9	10.8	10	31.3
6-12 months	10	12.0	3	9.4
1-3 years	18	21.7	9	28.1
3-5 years	10	12.0	2	6.3
5-10 years	11	13.3	1	3.1
> 10 years	22	26.5	3	9.4

$\chi^2(6, N = 115) = 15.503, P = 0.017$

Spouse Attendance

Although not significant ($P > 0.05$), as shown in Table 14, a slightly higher percentage of current participants joined with their spouse or other family member compared to past participants (27.7 vs. 12.9%).

Table 13. Frequency of Weekly Attendance in Cardiac Rehabilitation

	Current (n = 83)		Past (n =31)	
Session/ week	n	Percent	n	Percent
1	3	3.6	2	6.9
2	17	21.7	6	24.1
3	60	74.7	18	69.0

The data for one past participant was unavailable.
$\chi^2(2, N = 114) = 0.673, P = 0.714$

Table 14. Comparison of Family Attendance

	Current (n = 83)		Past (n = 31)	
	n	Percent	n	Percent
Yes	23	27.7	4	12.9
No	60	72.3	27	87.1

The data for one past participant was unavailable.
$\chi^2(1, N = 114) = 2.738, P = 0.137$

Referring Sources

There was no difference between the two groups in their referral source, as shown in Table 15. More than half of the current participants finished Phase II cardiac rehabilitation program at Gundersen Lutheran hospital. It was found that recommendations from their primary physicians led many cardiac patients to join the LEHP.

Table 15. Comparison of Referring Sources

Referring sources	Current (n = 83)		Past (n = 30)	
	n	Percent	n	Percent
Phase II staff at GL	44	53.0	13	43.3
Physician	39	47.0	11	36.7
Another Participant	8	9.6	5	16.7
Advertisement	5	6.0	2	6.7
Family	5	6.0	2	6.7
LEHP Staff	6	7.2	---	---
Phase II staff at FS	4	4.8	2	6.7
Other	4	4.8	2	6.7

Two past participants did not answer the question.
GL: Gurdensen Lutheran Hospital; FS: Franciscan Skemp Healthcare

Attractive Features

There was a statistical difference between current and past participants as well as between genders, regarding reasons for their interest in the program. Current participants perceive "the year round program" as an important feature of the program as opposed to past participants (see Table 16). Women regard "# 4 supervision, support by staff " as more important than men (P = 0.02). Men viewed "#7 exercise equipment" as more important than women (P = 0.02).

Reasons for Noncompliance

Both groups tended to regard "lack of interest," "inconvenient time," "medical complications," and "cost" as important factors for their noncompliance to the program. However, it was found that the two groups were statistically different in three of the listed eight reasons for leaving the program, (see Table 17). "Program/staff problem" ($P < 0.01$), "cost" ($P < 0.05$) and "medical complications" ($P < 0.01$) were significantly less important factors for past participants than current participants. Some past participants chose a "5, greatest importance," on more than one factor that led them to leave the program. Other important reasons why they left the program were taking care of their spouse (n = 2), vacation/temporary dropout (n = 3), and facility space in winter (n = 1). Nearly 25% of current participants thought that the development of medical complications was the least important reason to discontinue the program.

Table 16. Comparison of the Reasons for Initial Program Involvement

Reasons	Participants	Likert Scale 1	2	3	4	5	Mean Rank
#1 All weather	Current	11.0†	4.9	11.0	23.2	50.0	57.16
	Past	13.3‡	6.7	16.7	13.3	50.0	54.70
#2 Year-round	Current	6.1	1.2	7.3	23.2	62.2	62.21**
	Past	13.3	6.7	33.3	13.3	33.3	40.90
#3 BP & exercise record	Current	12.2	7.3	17.1	19.5	43.9	57.13
	Past	16.7	---	30.0	10.0	43.3	54.77
#4 Supervision, support by staff	Current	8.5	6.1	8.5	22.0	54.9	58.46
	Past	6.7	3.3	30.0	16.7	43.3	51.15
#5 Certified staff	Current	9.6	2.4	16.9	12.0	59.0	57.40
	Past	6.7	3.3	16.7	20.0	53.3	55.90
#6 Socialization	Current	13.4	6.1	23.2	31.7	25.6	58.38
	Past	20.0	20.0	13.3	20.0	26.7	51.37
#7 Exercise equipment	Current	19.5	7.3	20.7	24.4	28.0	57.04
	Past	26.7	6.7	20.0	13.3	33.3	55.03
#8 Special exercise classes	Current	51.2	9.8	15.9	7.3	15.9	59.63
	Past	70.0	16.7	---	---	13.3	47.93
#9 Educational program	Current	32.9	20.7	25.6	11.0	9.8	58.65
	Past	43.3	16.7	33.3	---	6.7	50.63
#10 Fee	Current	24.4	4.9	19.5	15.9	35.4	58.49
	Past	23.3	3.3	40.0	13.3	20.0	51.07

One current and two past participants did not answer the question.
**P < 0.01
†: % of current participants (n = 82); ‡: % of past participants (n = 30)
Likert scale: 1 = least importance; 5 = greatest importance

Table 17. Comparison of the Possible (for Current Participants) or Actual Reasons (for Past Participants) for Program Noncompliance

Reasons	Participant	Likert Scale 1	2	3	4	5	Mean Rank
#1 Goal	Current	67.1†	13.4	6.1	3.7	9.8	52.85
	Past	57.7‡	7.7	11.5	3.8	19.2	59.71
#2 Program/staff problem	Current	52.4	15.9	12.2	8.5	11.0	59.09**
	Past	81.5	7.4	7.4	---	3.7	42.57
#3 Lack of spouse support	Current	65.4	6.2	7.4	13.6	7.4	55.94
	Past	76.9	---	23.1	---	---	47.96
#4 Lack of interest, motivation	Current	45.1	11.0	11.0	12.2	20.7	56.21
	Past	57.7	3.8	19.2	3.8	15.4	49.10
#5 Inconvenient commute	Current	53.7	8.5	17.1	13.4	7.3	55.42
	Past	65.4	3.8	11.5	---	19.2	51.80
#6 Inconvenient time	Current	41.5	9.8	7.3	19.5	22.0	54.29
	Past	42.3	7.7	15.4	3.8	30.8	55.15
#7 Medical complication	Current	24.1	3.6	9.6	14.5	48.2	59.67**
	Past	63.0	---	---	3.7	33.3	42.67
#8 Cost	Current	32.9	9.8	20.7	11.0	25.6	58.03*
	Past	65.4	3.8	7.7	---	23.1	43.37

One current participant did not answer the question.
*P < 0.05, **P < 0.01
†: % of current participants (n = 82); ‡: % of past participants (n = 26)
Likert scale: 1 = least importance; 5 = greatest importance

Physical Activity

Regarding exercise habits, nearly 80% of current participants engaged in outside physical activity in addition to the exercise program in the UWL. A similar percentage of past participants also reported that they had been doing exercise on their own (see Table 18). Approximately half of both groups, (current: 57.1%, past: 52.2%), chose walking as their favorite mode of exercise. However, some current (30.4%) and past participants (17.4%) engaged in several modes of exercise. Six (26.1%) of physically active past participants work out at other facilities such as Gundersen Lutheran Hospital (n = 2), Franciscan Skemp Phase III program (n = 2), or a private fitness club (n = 2).

Table 18. Engagement in Physical Activity between Current and Past Participants

	Current (n = 80)		Past (n = 30)	
	n	Percent	n	Percent
Yes	65	79.3	23	76.7
No	17	20.7	7	23.3

Three current and two past participant did not answer the question.
$\chi^2(1, N = 110) = 0.088$, P = 0.797

As shown in Table 19, one half of past participants made it a rule to do some kind of activity three days a week or more. In addition to attendance to the LEHP, current participants also exercise at home.

Table 19. Frequency of Exercise in Current and Past Participants

d/wk	Current (n = 63)		Past (n = 23)	
	n	Percent	n	Percent
1-2	19	23.8	5	16.7
3-4	25	31.3	9	36.7
5-7	19	23.8	4	23.3

Two current participants did not answer the question.
$\chi^2(2, N = 86) = 0.276, P = 0.871$

In the last question, some current participants gave their suggestions for the LEHP. The summary suggestions were as following:

- Satisfied with the current program management (n = 19),
- Discontent with the facility that needs to be shared with other groups (n = 6),
- Discontent with the frequency or time of the exercise program (n = 5),
- Concerns about program cost (n = 2).

Some participants not only want to know the amount of exercise they did, but would like feedback regarding their blood pressure, and heart rate which are measured and recorded upon arrival and departure from the program each day. Others included that educational programs, warm-up, or spouse enrollment should be emphasized.

DISCUSSION

This study summarized the characteristics of current and past cardiac rehabilitation participants of the Cardiac Rehabilitation Unit in the La Crosse Exercise and Health Program. The differences between those two groups were also examined.

Gender

Comparing the ratio of gender, only 16.4% of the current participants in the cardiac rehabilitation program are women. Although they had low participation rates, a higher percentage of women (34.4%) than men dropped out of the program. These findings supported the well-documented phenomenon that women are less likely than men to enroll in cardiac rehabilitation (6.9% vs. 13.3%),[6] and are more likely to dropout.[11] The low rate of women's participation may be related to different preferences for cardiac rehabilitation services from men.[12] It was found that women were more likely to favor not having pains and not tiring while exercising. The differences in clinical profiles of women also may affect their low attendance rate.[11]

Age

Past participants were relatively younger than current participants (ages 63.3 ± 10.1 vs. 66.9 ± 14.0). This finding conflicted with some other studies[13] which found those who dropout were likely to be older. Since both groups were rather old, it was assumed that current participants were older than past participants.

Body Mass Index

There was no significant difference in body mass index (BMI) between current and past participants (26.7 ± 4.4 vs. 29.0 ± 6.4, P = 0.06). When their values were distributed

into the three categories of "desirable," "overweight," or "obese," it was revealed that more past participants (43.3%) were in the range of BMI equal to 30 or greater as were current participants (16.5%). The National Center for Health Statistics estimates that among non-Hispanic White adults ages 20 to 74, 59.6% of men and 45.5% of women are categorized as overweight or obese (BMI of ≥ 25).[5] The average BMI of both current and past participants is higher than a BMI of 25. The Agency for Health Care Policy and Research (AHCPR) noted that since exercise training as a sole intervention is ineffective for weight control, multifactorical rehabilitation is required.[2] Therefore, it was found that many past participants were doing exercise on their own, but such exercise alone did not result in managing or controlling their body weight.

Exercise Capacity

Despite their older age, exercise capacity was significantly higher in current participants than past participants (9.2 ± 3.4 vs. 7.5 ± 3.5 METs, $P < 0.05$). It is typical that women may have lower functional capacity after a coronary event,[13] thus women usually have a lower exercise capacity than men in cardiac rehabilitation.[11] However, peak METs showed no difference in either the current female participants and past male participants, or past male and female participants. Cannistra et al. also showed women did increase their peak METs as men did by the end of 12-week cardiac rehabilitation program.[11]

Predictors

Participants may begin a program but may not continue for a number of reasons. Possible predictors may include 1) economic status, 2) current fulltime work, 3) presence

of angina, 4) smoking, 5) large myocardial infarction, 6) low left ventricular ejection fraction, 7) hypertension, 8) lack of social or spouse support, or 9) emotional unstability.[14] The greater the number of predictors that are present, the greater is the probability for dropping out and noncompliance with the cardiac regimen.[15]

Cardiac History

There were a number of differences between current and past participants in their cardiac history. Past participants tended to have congenital heart problems and congestive heart failure, and higher percentages of current participants had a history of arrhythmia. Orthopedic problems as well as presence of arthritis were more prevalent among past participants ($P < 0.05$), and women ($P < 0.05$). Ades and his colleagues found that chronic diseases such as arthritis, chronic obstructive pulmonary diseases (COPD), diabetes and peripheral vascular diseases (PVD) affected patients' entry rate into cardiac rehabilitation programs; 11% of people with those chronic diseases entered a cardiac rehabilitation program, while 28% of those not suffering from such diseases were involved with cardiac rehabilitation programs.[16] The Minnesota Heart Survey showed that women with angina and/or a myocardial infarction were significantly less likely to participate in cardiac rehabilitation.[17] They also found that revascularization procedures (coronary artery bypass graft [CABG] or percutaneous transluminal coronary angioplasy [PTCA]) and younger age were the strongest independent predictors for cardiac rehabilitation. Of the cardiac rehabilitation participants in this study, a total of 65.8% and 40.4% of participants had experienced either CABG and/or PTCA, respectively.

There were no significant differences between current and past participants concerning smoking, occupation, transportation to the facility, or other cardiac history and other medical complications. Driving time was not rated as problematic by subjects in a study by Moore and Kramer,[18] and cardiac entrants were likely to have recently quit smoking.[19]

Cardiac Complications

The incidence of cardiac related complications were 21.7% among current participants during their participation in the program. However, about 70% of all cardiovascular complications occurred among longtime participants who participated in the program for more than 10 years. In addition, one in four of past participants experienced additional cardiovascular problem(s) or procedures since leaving the program. In another study, it was reported that dropouts were more likely to have a recurrent myocardial infarction than compliers.[20] In this study, the rate of incidence could not be compared between two groups because it was not identified when they experienced cardiac complications. However, extended (> 1 year) outpatient cardiac rehabilitation enabled an improvement in body composition, functional capacity, and blood lipids compared with a three-month standard cardiac rehabilitation program.[21] Furthermore, participants who dropped out of a rehabilitation program or those who did not utilize cardiac rehabilitation at all tended to have higher subsequent hospitalization than those who completed a cardiac rehabilitation program.[19]

Referring Source

There was no difference in the referring sources between the current and past

participants. Most participants were encouraged to participate in the program by their physicians and/or Phase II staff at Gundersen Lutheran Hospital, which does not have a Phase III program. Ades et al. also found that physician recommendation is the most powerful predictor of cardiac rehabilitation participation in older coronary patients.[13] The reason for few participant referrals by a Phase II staff at Franciscan Skemp Healthcare might be that they provide their own Phase III program.

Patient Dropout

One inevitable problem identified in cardiac rehabilitation programs is patient dropout. However, extended compliance with behavior changes is a critical factor in the success of secondary prevention of coronary artery disease.[22] Furthermore, the cardiac rehabilitation participants are seen much more frequently by physicians or other professionals supervising their exercise program, where symptoms can be recognized at an early stage and dealt with in a preventive manner.[19] This is especially true for the participants with PTCA patients.[23] In addition, supervision in this group will likely help to detect problems.[24] In the Cardiac Rehabilitation Unit of the LEHP, it was found that 43.8% of past participants had dropped out the program within 6 months and 53.2% within a year. These finding were similar to many other studies which document ranges from 40 to 60% within 6 to 12 months.[22,25,26] Although a zero dropout is ideal for cardiac rehabilitation, Oldridge estimated 75 to 80% compliance might be the maximum that can be expected.[26] In contrast to early exit in past participants, nearly 40% of current participants have been in the LEHP for longer than 5 years, with some being enrolled for as long as 24 years.

Reason for Program Participation and Dropout

Interestingly, a lower number of past participants were not seeking a year round program as compared to current participants. In this study, three past participants explained that they dropped out of the program due to vacation or another commitment in the summer. Also, as La Crosse is known for having cold winters, some participants used the facility as a winter exercise area. When all responses were analyzed by gender, women preferred support from staff and they were not as attracted by the exercise equipment as men. A recent study identified that both men and women indicated encouragement from professionals was a highly important feature when choosing a program.[18]

Friedman et al. explained that the high compliance rate observed at their program may be achieved by an individualized and personal approach, which may be equally or more efficacious than strategies employing larger, but more impersonal health club-like atmospheres.[27] Also, social support from family and friends has consistently been shown to predict exercise participation and is a more important predictor for women than men.[18] In this study, it was found that a higher percentage of current participants were attending the Cardiac Rehabilitation Unit with their spouse or family member than that of past participants (27.7 vs. 12.9%). Partner attendance is known as one of the most important factors to program entrance.[28] In addition, spouse support has important implications for long term compliance.[26,29] Since about 70% of the participants have lived alone or with their spouse only, participants may have looked to staff members at the cardiac rehabilitation program for assistance in dealing with stress. One of the unique features in

the LEHP program is that graduate students are working as staff. Some participants might think of the staff members as their own children.

It is believed that many of the avoidable reasons for dropping out are often more amenable to change than patient characteristics. Therefore, an awareness of the reasons for patient dropout may have important, immediate, and potentially effective consequences for program planning.[30] The reasons for dropouts from cardiac rehabilitation can be classified as avoidable (e.g., staff, program, prescription difficulties, inconvenience, lack of motivation and interest, etc.) or unavoidable (e.g., medical reasons, relocation, etc.).[7] In this survey, current participants predicted the program and/or staff problems, medical complication, and cost would lead them to leave the program. Past participants reported that those factors did not actually cause them to leave the program as current participants thought. A study by the Cardiopulmonary Rehabilitation Institute found that the three major barriers to continued participation with participants were exercise conflicting with other activities, inconvenient time, and transportation.[31] Oldridge and Streiner reported that about 40% of dropouts occurred for avoidable reasons and that medical reasons accounted for almost 60% of unavoidable dropout.[22] Furthermore, approximately 45% of the patients who drop out early from cardiac rehabilitation have medical and other unavoidable reasons.[26,32]

Of past participants, nine reportedly left the program due to medical reasons, and five reported that they felt they had achieved their individual goals. Those who achieved their own goal all had been doing some exercise regularly on their own at home, or at a convenient site for them. In addition, a total of 76.7% of past participants exercised on a

regular basis. Therefore, those who exit a structured cardiac rehabilitation program but remain physically active might be better regarded as "graduated", rather than "dropped out" from the program. Daltroy also found that 78% of patients reported doing some exercise on their own although less than 10% were attending the supervised sessions after 11 months.[33] AACVPR suggested that a patient's independence should be a primary goal of all cardiac rehabilitation programs.[8] Therefore, dropout from supervised programs does not always mean that the behavior change of regular exercise is not maintained.

Unfortunately in this study, four of the past participants lost interest in the program and one left a comment that she "did not feel comfortable in the environment." Although participants are ultimately responsible for their own behavior, presumably they would ask for help. Therefore, the provider has a responsibility to try to improve compliance if it is low, and such actions have been shown to be effective.[7] We should improve the lines of communication between the LEHP staff and its participants so that staff would be more aware of early signs of participant dropout. Although some suggestions (e.g., facility should not be shared with other school programs) are unlikely to be achieved in the university setting, other suggestions would be beneficial. In fact, it was quite a while for most participants since they had graduated from Phase II program. Furthermore, the local Phase II cardiac rehabilitation programs have been shortened or omitted for some uncomplicated cardiac patients. Accordingly, as some participants suggested, educational programs may need to be emphasized to help participants brush up what they had learned at Phase II programs in hospital settings.

Until recently, cardiac rehabilitation programs typically focused on short-term exercise and single-risk factor reduction, to help patients recover functional capacity enough to live the rest of their lives comfortably. As evidence accumulates, during the 27 years of the Cardiac Rehabilitation Unit in the LEHP, the program has expanded the range of health concerns addressed. Today, cardiac rehabilitation is shifting its focus to multifactorial, long-term risk reduction and lifestyle management.[34]

The major findings of this study are:

1. Currently, Phase III/IV participants in the Cardiac Rehabilitation Unit of the LEHP are slightly older, but have a lower body mass index and higher exercise capacity than those who left the program.
2. Past participants were more likely to have orthopedic problems when compared to current participants.
3. Approximately 40% of current participants had been in the program for more than five years, though 43.8% of past participants had dropped out the program within six months and 53.2% within a year.
4. Three out of four of both current and past participants reported that they had been doing exercise on their own.
5. Fifteen percent of past participants responded that they left the program because they had achieved their own exercise goals. Therefore, they possibly should be looked on as successfully graduated from cardiac rehabilitation program, as opposed to "dropouts".

6. Very few of the past participants lost interest or felt uncomfortable in the LEHP cardiac rehabilitation program.
7. Some current participants indicated that they want increased medical support and/or supervision. Therefore, LEHP staff should focus more on each individual every visit and provide what participants really need.

In the future, it is anticipated that there will be continued debate regarding the appropriate roles for preventive and rehabilitative services with the increasing emphasis of government and other health managed care systems.[35] It is hoped that professionals will continue to work to restructure existing services necessary to best serve this community.

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APPENDIX A

ASSOCIATION DOCUMENTS

ASSOCIATION DOCUMENTS

Year	Source	Document
1972	AHA	Exercise Testing and Training of Apparently Healthy Individuals: A Handbook for Physicians
1974	North Carolina Heart Association	Organizational Guidelines for Myocardial Infarction Rehabilitation Program
1975	AHA	Exercise Testing and Training of Individuals with Heart Disease or at Risk for its development: A Handbook for Physicians
1975	ACSM	Guidelines for Graded Exercise Testing and Exercise Prescription
1978	AHA, Great Los Angels	Guidelines for Cardiac Rehabilitation Centers
1978	ACSM	Position Statement: Recommended Quantity and Quality of Exercise for Developing and Maintaining Fitness in Healthy Adults
1979	AHA	The Exercise Standard Book
1980	ACSM	Guidelines for Graded Exercise Testing and Exercise Prescription, (2nd ed.)
1981	ANA/AHA	Standards of Cardiovascular Nursing Practice
1981	AACVPR	The Journal of Cardiac Rehabilitation
1984	AHA, Orange County,California	Guidelines For Cardiac Rehabilitation Centers
1984	North Carolina Department of Human Resources	Rules Governing the Certification of Cardiac Rehabilitation Programs
1986	AACVPR	Cardiac Rehabilitation Services: A Scientific Evaluation

Year	Source	Document
1986	ACC	Position Report on Cardiac Rehabilitation
1986	Massachusetts Society for Cardiac Rehabilitation	Guidelines for Cardiac rehabilitation
1986	ACSM	Guidelines for Exercise Testing and Exercise Prescription, (3rd ed.)
1986	ACC/AHA	Guidelines for Exercise Testing
1987	AMA	Diagnostic and Therapeutic Technology Assessment: Coronary Rehabilitation Services
1987	North Carolina Cardiopulmonary Rehabilitation Association	Organizational Guidelines for Cardiac Rehabilitation Programs in North Carolina
1988	Health and Public Policy Committee/ ACP	Position Paper: Cardiac Rehabilitation Services
1988	California Society for Cardiac Rehabilitation	Standards for Cardiac Rehabilitation in California
1989	ACP	Position Paper: Evaluation of Patients After Recent Acute Myocardial Infarction
1990	AACVPR	Position Paper: Scientific Evidence of the Value of Cardiac Rehabilitation with Emphasis on Patients following Myocardial Infarction: Exercise Conditioning Component
1990	AACVPR	Position Paper: The Efficacy of Risk Factor Intervention and Psychosocial Aspects of Cardiac Rehabilitation
1990	AACVPR	Position Paper: Scientific Basis of Pulmonary Rehabilitation

Year	Source	Document
1990	ACSM	Position Stand: The Recommended Quantity and Quality of Exercise for Developing and Maintaining Cardiorespiratory and Muscular Fitness in Healthy Adults
1990	ACC/ACP/AHA	Clinical Competence in Exercise Testing: A Statement for Physicians
1990	AHA	A Position Statement for Health Professionals by the Committee on Exercise and Cardiac Rehabilitation of the Council on Clinical Cardiology of the American Heart Association
1990	AHA	Exercise Standards: A Statement for Health Professionals
1990	North Carolina Department of Human Resources	Rules Governing the Certification of Cardiac Rehabilitation Programs
1991	AACVPR	Guidelines for Cardiac Rehabilitation Programs
1991	ACSM	Guidelines for Exercise Testing and Exercise Prescription, (4^{th} ed.)
1992	AHA	Statement on Exercise: Benefits and Recommendations for Physical Activity Program for All Americans
1993	ANA	The Scope of Cardiac Rehabilitation Nursing Practice
1993	North Carolina Cardiopulmonary Rehabilitation Association	Recommended Guidelines for Cardiac Maintenance Program (Phase IV)
1993	AACVPR	Guidelines for Pulmonary Rehabilitation
1994	ACSM	Position Stand: Exercise for Patients with Coronary Artery Disease
1994	AHA	Cardiac Rehabilitation: A Statement for Health Care Professionals
1995	AACVPR	Guidelines for Cardiac Rehabilitation Programs, (2^{nd} ed.)

Year	Source	Document
1995	AHCPR/NHLBI	Clinical Practice Guidelines for Cardiac Rehabilitation
1995	ACSM	Guidelines for Exercise Testing and Exercise Prescription, (5^{th} ed.)
1995	AHA	Exercise Standards: A Statement for Health Professionals
1995	CDC/ACSM	Physical Activity and Public Health
1996	AHA	Statement on Exercise: Benefits and Recommendations for Physical Activity for All Americans
1996	NIH	Physical Activity and Cardiovascular Health: National Institute of Health Consensus Development Panel on Physical Activity and Cardiovascular Health
1996	U.S. Department of Health and Human Services	Physical Activity and Health: A Report of the Surgeon General
1997	AHA	How to Implement Physical Activity in Primary and Secondary Prevention: A Statement for Healthcare Professionals
1997	ACC/AHA	ACC/AHA Guidelines for Exercise Testing
1997	ACCP/AACVPR	Pulmonary Rehabilitation: Joint ACCP/AACVPR Evidence-Based Guidelines
1998	ACSM	Position Stand: The Recommended Quantity and Quality of Exercise for Developing and Maintaining Cardiorespiratory and Muscular Fitness, and Flexibility in Healthy Adults
1998	ACSM	Exercise and Physical Activity for Older Adults
1998	AACVPR	Guidelines for Pulmonary Rehabilitation, (2^{nd} ed.)

APPENDIX I

COVER LETTER FOR CURRENT PARTICIPANTS

UNIVERSITY of WISCONSIN
La Crosse

Dear Cardiac Rehabilitation Participants:

How are you doing? As you know, I am a graduate student at the University of Wisconsin-La Crosse in the Adult Fitness/Cardiac Rehabilitation Masters Degree Program.

I am conducting a thesis on our current cardiac rehabilitation participants as well as past participants to survey and learn more about our La Crosse Exercise and Health Program, from its beginning to the future. In addition, the information you provide will be beneficial in future development of the La Crosse Exercise and Health Program. Of course your response and personal information will be confidential.

Please understand that completion and return of the enclosed survey grants us permission to use the results in future presentations and publications. After completing the questionnaire, I appreciate you turning it in to me by July 10th by mail (envelope enclosed), or when you come to the program.

If you have any questions or concerns, I may be reached at (608)782-4795. Also if there are any questions regarding the protection of human subjects, you may contact Dr. Garth Tymeson, Chair of the UW-La Crosse Institutional Review Board, at (608)785-8155.

Thank you so much for your time and contribution.

Sincerely,

Takayuki Kawamura

University of Wisconsin-La Crosse
221 Mitchell Hall
La Crosse, WI 54601

cc: Dr. John Porcari
Dr. Phil Wilson

APPENDIX C

QUESTIONNAIRE FOR CURRENT PARTICIPANTS

La Crosse Exercise and Fitness Program
Survey of Cardiac Rehabilitation Program
[Current participant]

Name _____
Age _____
Sex Male / Female
Current Height [ins]
Weight [lbs]
Currently how many people live with you? [ ]
Do you smoke? Yes / No
Current occupation [(part time/full time)]
Commute method to UWL [ ]
-If you come to UWL by car, do you drive by yourself? Yes / No
Commute time [minutes]

Please read the questions carefully and circle the number precisely.

Q1. What is your cardiac medical condition?
[please choose all that apply]

1. Heart attack
2. Angina/chest pain
3. Coronary bypass surgery [CABG]
4. Angioplasty [PTCA] (that used "balloon" or "stent")
5. Valve surgery
6. Peripheral vascular disease
7. Congenital heart problem
8. Abnormal heart beats
9. Pacemaker
10. Heart transplant
11. Other [please detail] _____

Q2. Have you experienced any cardiac complications since participating to the LEHP?

1. Yes or No

If yes, please detail

_____ _____
_____ _____
_____ _____

Q3. Do you have any other medical problems?

1. No

2. Yes, I have [please circle all that apply]

   a) Diabetes
   b) High cholesterol
   c) High blood pressure
   d) Lung problem
   e) Stroke
   f) Cancer
   g) Obesity
   h) Arthritis
   i) Other [please detail]_____

Q4. How long have you been in the cardiac rehabilitation program?

1. Less than 3 months
2. 3-6 months
3. 6-12 months
4. 1-3 years
5. 3-5 years
6. 5-10 years
7. More [years) ..Can you remember?

Q5. On average, how often do you come to the program?

1. 1 session/week
2. 2 sessions/week
3. 3 sessions/week

Q6. Does your partner come to the LEHP?

1. Yes,

   a) my husband or wife
   b) my brother or sister

2. No

Q7. How did you find out about the program?
[Please choose all that apply]

1. Your physician
2. Your family
3. Another participant
4. Program staff
5. Advertisement
6. Phase II staff at Gundersen/Lutheran Hospital
7. Phase II staff at Franciscan Skemp Healthcare
8. Other [please detail] _____

Q8. What attracted you to join in the program?
[1 = least importance, 5 = greatest importance]

1.	All-weather facility	1	2	3	4	5
2.	Year-round program	1	2	3	4	5
3.	Records kept of blood pressure, heart rate and the amount of exercise completed	1	2	3	4	5
4.	Supervision, support by staff	1	2	3	4	5
5.	Certified staff for medical emergency needs	1	2	3	4	5
6.	Socialization with participants	1	2	3	4	5
7.	Exercise equipment	1	2	3	4	5
8.	Special exercise class [e.g. water & chair aerobics]	1	2	3	4	5
9.	Educational program [e.g. meditation, 10-minutes tidbits]	1	2	3	4	5
10.	Reasonable and affordable fee	1	2	3	4	5
11.	Other [please detail] _____					

Q9. We hope not, but what factor would lead you to leave the cardiac rehabilitation program?
[1 = least importance, 5 = greatest importance]

1.	Achieved your personal goal	1	2	3	4	5
2.	Program/staff problem	1	2	3	4	5
3.	Lack of spouse support	1	2	3	4	5
4.	Lack of interest, motivation	1	2	3	4	5
5.	Inconvenience-commute	1	2	3	4	5
6.	Inconvenience-time	1	2	3	4	5
7.	Medical complication	1	2	3	4	5
8.	Increase in membership fee	1	2	3	4	5
9.	Other [please detail] _____					

Q10. Are you doing any exercise outside of the program?

1. Yes or No

If Yes,
-Where? _____

-What kind of exercise? _____

-How often? _____

Q11. What suggestions do you have for further improvement of the program?

All done! Thank you for your contribution.

Please return this questionnaire in the enclosed self-addressed envelope by **July 10th**. Otherwise, you can turn this questionnaire to me when you come to the program.

Takayuki Kawamura

221 Mitchell hall
University of Wisconsin-La Crosse
La Crosse, WI 54601

Phone (608)782-4795 (home)

APPENDIX D

COVER LETTER FOR PAST PARTICIPANTS

UNIVERSITY of WISCONSIN
La Crosse

Dear Cardiac Rehabilitation Participants:

I am a graduate student at the University of Wisconsin-La Crosse in the Adult Fitness/Cardiac Rehabilitation Masters Degree Program.

I am conducting a thesis on our current and past cardiac rehabilitation participants. The information you provide will be beneficial for the future development of the La Crosse Exercise and Health Program. Of course your response and personal information will be confidential.

Please understand that completion and return of the enclosed survey grants us permission to use the results in future presentations and publications. After completing the questionnaire, I appreciate you returning it in the enclosed self-addressed envelope by **July 13th**.

If you have any questions or concerns, I may be reached at (608)782-4795. Also if there are any questions regarding the protection of human subjects, you may contact Dr. Garth Tymeson, Chair of the UW-La Crosse Institutional Review Board, at (608)785-8155.

Thank you so much for your time and contribution.

Sincerely,

Takayuki Kawamura

University of Wisconsin-La Crosse
221 Mitchell Hall
La Crosse, WI 54601

Cc: Dr. John Porcari
Dr. Phil Wilson

APPENDIX E

QUESTIONNAIRE FOR PAST PARTICIPANTS

La Crosse Exercise and Health Program
Survey of Cardiac Rehabilitation Program
[Past participants]

Name _____
Age _____
Sex Male / Female
Current Height [ins]
Weight [lbs]
Currently how many people live with you? [ ]
Do you smoke? Yes / No
Current occupation [(part time/full time)]
Commute method to UWL [ ]
-If you come to UWL by car, do you drive by yourself? Yes / No
Commute time [minutes]

Please read the questions carefully and circle the number precisely.

Q1. What is your cardiac medical condition?
[please choose all that apply]

1. Heart attack
2. Angina/chest pain
3. Coronary bypass surgery [CABG]
4. Angioplasty [PTCA] (that used "balloon" or "stent")
5. Valve surgery
6. Peripheral vascular disease
7. Congenital heart problem
8. Abnormal heart beats
9. Pacemaker
10. Heart transplant
11. Other [Please detail] _____

Q2. Have you experienced any cardiac complications since leaving the LEHP?

1. Yes or No

If Yes, please detail

_____ _____
_____ _____
_____ _____

Q3. Do you have any other medical problems?

1. No

2. Yes, I have [please circle all that apply]

   a) Diabetes
   b) High cholesterol
   c) High blood pressure
   d) Lung problem
   e) Stroke
   f) Cancer
   g) Obesity
   h) Arthritis
   i) Other [please detail] _____

Q4. How long were you in the program?

1. Less than 3 months
2. 3-6 months
3. 6-12 months
4. 1-3 years
5. 3-5 years
6. 5-10 years
7. More [years] ..Can you remember?

Q5. On average, how often did you come to the program?

1. 1 session/week
2. 2 sessions/week
3. 3 sessions/week

Q6. Did your partner come to the LEHP?

1. Yes,
   a) my husband or wife
   b) my brother or sister

2. No

Q7. How did you find out about the program?

1. Your physician
2. Your family
3. Another participant
4. Program staff
5. Advertisement
6. Phase II staff at Gundersen/Lutheran Hospital
7. Phase II staff at Franciscan Skemp Healthcare
8. Other [please detail] _____

Q8. What attracted you to join in the program?
[1 = least importance, 5 = greatest importance]

1.	All-weather facility	1	2	3	4	5
2.	Year-round program	1	2	3	4	5
3.	Records kept of blood pressure, heart rate and the amount of exercise completed	1	2	3	4	5
4.	Supervision, support by staff	1	2	3	4	5
5.	Certified staff for medical emergency needs	1	2	3	4	5
6.	Socialization with participants	1	2	3	4	5
7.	Exercise equipment	1	2	3	4	5
8.	Special exercise class [e.g. water & chair aerobics]	1	2	3	4	5
9.	Educational program [e.g. meditation, 10-minutes tidbits]	1	2	3	4	5
10.	Reasonable and affordable fee	1	2	3	4	5
11.	Other [please detail] _____					

Q9. Why did you leave the cardiac rehabilitation program?
[1 = least importance, 5 = greatest importance]

1.	Achieved your personal goal	1	2	3	4	5
2.	Program/staff problem	1	2	3	4	5
3.	Lack of spouse support	1	2	3	4	5
4.	Lack of interest, motivation	1	2	3	4	5
5.	Inconvenience-commute	1	2	3	4	5
6.	Inconvenience-time	1	2	3	4	5
7.	Medical complication	1	2	3	4	5
8.	Cost	1	2	3	4	5
9.	Other [please detail] _____					

Q10. Are you doing any exercise regularly now?

1. Yes or No

If yes,
-Where? _____

-What kind of exercise? _____

-How often? _____

All done! Thank you for you contribution.

Please return this questionnaire in the enclosed self-addressed envelope by **July 26th.**

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APPENDIX F

REVIEW OF LITERATURE

HISTORY OF CARDIAC REHABILITATION

Introduction

In 1995, the federal guidelines on cardiac rehabilitation stated that exercise-based cardiac rehabilitation is safe and plays an important role in the medical management of patients with heart disease. Although early pioneers had showed its benefit, their practices had been often regarded as ridiculous or ignored.

The history of cardiopulmonary rehabilitation is divided into the following periods: pre 1800, 1800-1900, 1900-1950, 1960s, 1970s, 1980s, and the 1990s.

Pre 1800

In 384 BC, Greek physicians identified the center of the human body as the vascular system.[1] In 131, Galen stated, "Exercise strengthens, activity wastes",[2] meaning if you exercise you do not waste your body. However, it was not until 1665 that the coronary circulation was discovered by Vieussens.[3] Then, in 1679, Bonnetus discovered that the cause of death was an occlusion of a coronary vessel,[1] though at that time it was not identified as a disorder of the circulatory system or related to a disease process. In 1772 the pioneering physician, Heberden, prescribed 30-minutes a day of sawing for his patients with chest disorders.[4] In 1789 Lavoisier conducted the first quantitative exercise physiology experiment, in which oxygen uptake at rest, after eating a meal and during exercise was measured.[5]

The 1800s

In 1800, Beddoes established the Pneumatic Institute of Bristol for the study of heart disease and asthma.[6] In 1801 Heberden described angina pectoris[7] and in 1854 Stokes of Dublin introduced regular exercise and walking to cardiac patients.[8] Also during this time Ortel of Munich began a comprehensive walking program for patients who had "fatty heart disease".[9] However, bed rest was the standard strategy for cardiac patients. This misconception was supported by Hilton who emphasized in his 1863 book "Rest in Pain"[10] that cardiac patients should stay in the bed. However, Flint stated in 1886 that "patients exchanging habits of activity for complete rest are likely to become rapidly worse."[9] While some researchers were studying the process of cardiac disease, others developed equipment and laboratory techniques to understand the disease further. In 1870 the German physician Adolph Fick began to measure cardiac output and established the "Fick equation" to estimate cardiac output from the difference between the oxygen content of arterial and mixed venous blood, and oxygen uptake per a minute.[11] Williams began cardiac fluoroscopy in 1896.[12] In Britain, the phenomena that came to be known as "athlete's heart" was debated as early as in the 19th century.[13]

1900-1950

Following the development of equipment for determining the cardiac function in the late 1800s, Einthoven constructed the first electrocardiograph in 1903.[1] At the same time, experimentally produced atherosclerosis in animals was examined by Otto.[10] Herrick suggested that the occlusion of a coronary artery would lead to death in 1912.[14] In England a special hospital was established for the study of heart conditions among

members of the armed services in 1916.[15] At that hospital, McKenzie investigated the effects of exercise on the cardiovascular system. The measurement of arterial oxygen saturation was established in 1919, but it took about 30 years to be used in a practical situation.[2] Barach, "the father of physiologic respiratory therapy", began to treat his pulmonary patients with a ventilated and cooled oxygen tent.[6]

In the 1930s the subtle changes by some physicians toward the treatment of cardiac patient began. The Swedish physician, Sjostand, developed the first cardiac tolerance laboratory in 1930.[9] Schneider provided a 12-week exercise program for his patients, and reported that their cardiovascular endurance was increased by an average of 24%.[2] Additionally, Gemmll used endurance training to treat his patients.[9] In support of these challenges against the conservative approach, White in 1935 and other cardiologists in the United States cautioned the use of bed rest.[16] Finally, the negative effect of bed rest on physical characteristics was presented by the National Aeronautics and Space Administration (NASA) in the United States in 1935.[17] Bishop published the article "Exercise in the Treatment of Chronic Cardiovascular Disease" in 1938.[18] In the early 1940s, pulmonary rehabilitation was applied to the pulmonary patients who had asthma, bronchitis, and pulmonary emphysema.[2] In 1947 Beck et al. succeeded in defibrillating the human heart.[19] His successful contribution made other physicians consider cardiac disease as reversible. In 1948 the National Heart Institute was established as a part of the National Institute of Health in the United States. The new institute was made responsible for heart research, training, and administration. In 1949 Paffenbarger showed the relationship between vocational and leisure-time physical activity and cardiovascular

fitness.[13] His research on the risk of coronary heart disease by involving bus drivers and mail carriers became one of the classic studies contributing to modern day exercise physiology. The American College of Cardiology was founded in 1949.

1950s

In 1950 Hellerstein studied and developed work classification units, emphasizing selective placement proceeded by comprehensive multidisciplinary evaluation of cardiovascular structure and function, emotional needs and social needs.[20] Hellerstein's work classification units also included vocational aptitude and skills. In 1951 Levine and Lown presented research that patients with coronary thrombosis could be saved as a result of moving patients from a bed into a chair.[21] However, the patients were told to be as quiet and inactive as possible. A walking program was developed by Newman et al. in 1952.[22] Newman applied his walking program to patients in the forth week after myocardial infarction. In 1952 Millar and associates used treadmill exercise testing on patients with severe pulmonary emphysema, for the purpose of identifying the effect of breathing control and relaxation techniques.[23] Following Paffenbarger's work with bus drivers and mail carriers, Morris and his colleagues did a similar epidemiological study.[24] They studied the relationship between physical activity and cardiovascular fitness, and the risk of Coronary Heart Disease (CHD), by comparing sedentary drivers with the conductors on double-decker buses in London in 1953. In 1954 the American College of Sports Medicine (ACSM) was formed, consisting of the expertise of physical education, physiology, and medicine.[15] In 1957 Karvonen and colleagues presented a formula to estimate an appropriate training intensity by using heart rate.[25]

1960s

At the 1960 annual ACSM meeting Bishop presented his paper titled "Exercise Prescription for the Heart Patient."[15] In 1961 Kornblueh and Micheals outlined an exercise program for cardiac patients.[26] At the same year, Cain et al. began to monitor patients with an electrocardiograph during activities of daily living.[27] Portable liquid oxygen units were evaluated by a study in 1964.[2] A classic report of cardiac reconditioning and rehabilitation was presented by Gottheiner in 1968.[28] In 1968 Saltin reported on a paper "Response to submaximal exercise and maximal exercise after bed rest and training", which emphasized the importance of regular exercise.[29] In 1968 a book titled "Aerobics" was published by Cooper,[30] following the jogging book by Bowerman. Cooper's book was a best seller at that time, and it contributed to masses of people becoming involved in "heart, lung, and legs" fitness. In 1968 Berra initiated the Young Men's Christian Association (YMCA) program in California. In 1969 Cantwell and Fletcher reported two cases of cardiac complications during running, suggesting that more complete screening and supervision of participants prior to exercise was necessary.[31]

1970s

From the early 1970s, Americans were focusing on a lifestyle with an emphasis on the importance of aerobic exercise, especially in the form of jogging. In 1971 Kaufman described a walking program for cardiac patients.[32] Also during 1971, the cardiac rehabilitation program was started at the University of Wisconsin-La Crosse (former Wisconsin State University-La Crosse) as a joint effort between the University of

Wisconsin-La Crosse and the La Crosse County Medical Society. The Physician and Sports Medicine was first published in 1972. Also in 1972 the American Heart Association published a physician handbook on exercise that included guidelines for exercise prescription in healthy persons.[33] In 1973 Wenger designed a graduated inpatient program to be used until the patient was discharged from the hospital.[34] In 1973 the La Crosse Exercise Program began offering exercise testing workshops. In 1974 the North Carolina Heart Association completed the "Organizational Guideline for Myocardial Infarction Rehabilitation Programs."[35] A pulmonary rehabilitation program was formally defined in 1974 by a committee of the American College of Chest Physicians.[36] In 1975 a pilot outpatient cardiac rehabilitation program was initiated by Risibl and Miller at Wake Forest University, in Winston-Salem, North Carolina.

In 1975 the ACSM began a certification program for exercise test technologists, exercise specialists, and program directors which evolved due to a concern for a need to increase the competencies of individuals involved in health and fitness programs. Also in 1975 the ACSM published the book titled Guidelines for Graded Exercise Testing and Exercise Prescription.[37] In this guideline, it was stated that "When properly prescribed, physical activity is beneficial since it maintains or increases functional capacity and may modify some risk factors associated with atherosclerotic disease". Additionally, in 1975 the American Heart Association (AHA) released a physician's handbook, titled "Exercise testing and training of individuals with heart disease or at risk for its development".[38] In 1978 the ACSM released a position stand that addressed "guideline for exercise prescription."[39] Haskell showed complications for the cardiac patient during exercise

testing in 1978.[40] In 1979 the AHA supported the development of the cardiac rehabilitation programs by publishing material entitled "The Exercise Standard Book" for its practitioners. This book provided information and standards for adult exercise laboratories, cardiovascular treatment programs, and supervised cardiovascular maintenance programs.

1980s

In 1980 the ACSM published its second edition of Guidelines for Graded Exercise Testing and Exercise Prescription.[41] In 1981 the Journal of Cardiac Rehabilitation was published, (since 1986 it has been the official journal of the AACVPR as the Journal of Cardiopulmonary Rehabilitation). In 1985 the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) was formed. The purpose of the AACVPR, as stated in the bylaws, is as follows: "Recognizing that cardiovascular and pulmonary rehabilitation is a multidisciplinary field, the AACVPR has designated to the improvement of clinical practice, promotion of scientific inquiry, and advancement of education for the benefit of healthcare professionals and the public."[42] In 1984 a national lipid research study was conducted to assure the efficacy of cholesterol lowering in reducing risk of coronary artery disease (CHD) in 3809 men.[43,44] The results of this research showed that reducing total cholesterol by lowering LDL-C levels could diminish the incidence of CHD morbidity and mortality. The American College of Cardiology approved and released the document "Position Report on Cardiac Rehabilitation" in 1985.[45] In 1986 the ACSM published the third edition of Guidelines for Graded Exercise Testing and Prescription.[46] This third edition included two new chapters, "Exercise for

special patient populations" and "Principles of behavioral medicine useful in helping clients initiate and maintain a healthy lifestyle". In addition, the 1986 guideline included changes in exercise testing that had occurred in recent years, a section on submaximal testing, expanded sections on cardiac medications and pacemakers, and revised sections on the knowledge based on exercise testing and prescription for pulmonary disease patients and inpatient exercise programs. In 1986 Paffenbarger, in studying Harvard alumni, showed the amount of physical activity was inversely related to total mortality, primarily to death due to cardiovascular or respiratory causes.[47] In 1988 the American College of Physicians presented a position paper for cardiac rehabilitation.[48] In 1988 a meta-analysis carried out by Oldridge and his colleagues indicated the effectiveness of cardiac rehabilitation for those who have myocardial infarction.[49]

1990s

In 1990 the U.S. Public Health Service released "Healthy People 2000" objectives, which was intended to encourage health promotion and disease prevention.[50] In early 1990 the ACSM replaced its 1978 position stand on exercise prescription with "the Recommended Quantity and Quality of Exercise for Developing and Maintaining Cardiorespiratory and Muscular Fitness in Healthy Adults."[51] In September 1990, the AACVPR released its first Guideline for Cardiac Rehabilitation Programs book,[42] and in 1991 ACSM published its fourth edition of Guidelines for Exercise Testing and Prescription.[52] This edition included new chapters on "clinical exercise physiology and physical fitness training", and new material on the area of clinical exercise testing, exercise prescription in special population in special population, and health screening. In

1993 the Guidelines for Pulmonary Rehabilitation Programs book was published by the AACVPR.[53] In 1994 the AACVPR also revised its Guideline for Cardiac Rehabilitation book.[54] This second edition of the AACVPR's guideline redefined the patient population, focusing on low-risk and high-risk patients. This guideline also emphasized the educational and counseling interventions for patients. In 1994 the Center for Disease Control and Prevention and the ACSM issued a public health recommendation on the types and amounts of physical activity needed for health promotion and disease prevention.[55] In a panel discussion on the article, Franklin recommended that physicians should encourage cardiac patients to avoid high-intensity activity, use a perceived exertion scale as well as heart rate as an intensity guide, and emphasize the importance of warm-up and cool-down.[56] In 1995 the ACSM published its fifth edition of Guidelines for Exercise Testing and Exercise Prescription.[57] In addition the guideline[58] released in 1995 by the Agency for Health Care Policy and Research (AHCPR) revealed that cardiac rehabilitation services are under utilized despite proven benefits. In 1995, the American Nurses Credentialing Center introduced a certification exam in cardiac rehabilitation nursing.[59] The first Surgeon General's Report on Physical Activity and Health was released in 1996.[60] This document stated that people could substantially improve their health and quality of life by doing moderate amounts of physical activity in their daily lives. In 1996 the AHA also revised its statement on exercise for all Americans.[61] In early 1990s Ornish dev loped a non-surgery program, which consists of exercise, a low-fat diet, and stress management for people with heart disease.[62] His research showed that lifestyle modification not only stopped the progression of Coronary Artery Disease

(CAD), but also may reverse it. In 1997, for the first time, Medicare agreed to fund a program of up to 1,000 patients in selected hospitals. If effective, Medicare may begin reimbursing hospitals for enrolling heart patients in the program.

Since the 1990s, many hospitals have been converting to for-profit business by the Health Maintenance Organization (HMO) process, which is a health plan that both pays for and provides comprehensive service. The cost is reimbursed for services on a fixed monthly or annual basis. HMO officials emphasized that HMO members incur minimal out-of-pocket costs compared to the person with conventional insurance.

However, some physicians and patients have been concerned about a lowering of the quality of cardiac rehabilitation via the HMO process. In terms of cardiac rehabilitation services, the largest profits are achieved by applying guidelines for inpatient and outpatient, respectively. For the inpatient, the length of stay, the units of service ordered and applied, and the number of staff applying treatment may be reduced. For the outpatient the HMO provides primary and secondary prevention so as to reduce the number of patient visits for physician and/or medical services. Also patients are taught how to manage chronic disease with the least medical assistance necessary.

The primary problem with the HMO concept is the limiting of the amount of money for inpatient procedures and screening the hospital admission, both for the purpose of the hospitals' profit. For example, in 1997 the U.S. Justice department accused Columbia/ HCA Healthcare, the nation's largest hospital chain, of defrauding the government's Medicare health program.

In 1996 the World Council for Cardiovascular and Pulmonary Rehabilitation (WCCPR) was organized. The purpose of this organization is to foster the growth and development of cardiopulmonary rehabilitation worldwide. In 1998, countries of membership in the WCCPR included the following: Australia, Canada, Europe, Great Britain, Ireland, Korea, Mexico, Philippines, South Africa, Thailand, and United States.

Summary

Historically, the concept of rehabilitation for cardiac and pulmonary patients has been recorded for centuries. The clinical implementation of comprehensive cardiac and pulmonary rehabilitation, however, has made its greatest advances since the 1940s. Until the 1950s acute MI patients usually remained in bed for weeks, while patients today are out of bed soon, with hospital stay of three to five days.[63] Because of early ambulation and renovation in revascularization, deconditioning is no longer a problem for most patients. Accordingly, the emphasis in four phases of cardiac rehabilitation is shifting away from physical conditioning to modification of the disease process through their lifestyle changes, not just exercise. Also of considerable importance is a new emphasis on the accumulating evidence of atherosclerosis regression or "reversing heart disease."[62] Along with the health care reform in 1990s, and the efforts of health related organizations, public attention is now focusing on disease prevention.

Conclusion

It has been interesting and exciting to find much of the development of the cardiovascular care. The current consensus for primary and secondary prevention of cardiovascular diseases may be summarized as the following keyword "A,B,C,D,Es.":

- "A" stands for Aspirin, ACE inhibitor,
- "B" is behavior changes, blood pressure control, beta blockers, and vitamin B complex,
- "C" is cholesterol lowering,
- "D" is diet, and controlling diabetes,
- "E" is exercise, estrogen replacement therapy, and vitamin E,
- "s" means smoking cessation, social support, and stress management.

In the future, it is expected that the number of supportive evidences to reverse or prevent the progression of underlying the disease process will be available.

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