Compliance and Efficacy of Cardiac Rehabilitation and Risk Factor Modification in the Medically Indigent

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To compare the compliance and efficacy of cardiac rehabilitation in medically indigent patients with more affluent patients, we evaluated the first 65 patients referred to a new cardiac rehabilitation program of whom 36 were medically indigent (i.e., dependent on Medicaid for health care reimbursement) and 29 were funded by private medical insurance. Attendance during 12 weeks of monitored, supervised, phase II cardiac rehabilitation was examined retrospectively. In addition, training history, cardiovascular response to submaximal exercise, dietary fat intake, and smoking incidence were studied at baseline and repeated prospectively between 6 months and 1 year (8.2 ± 1.1 months) after program completion. Both the indigent and private patients attended >90% of scheduled sessions and achieved a significant improvement in submaximal work capacity which was well maintained at the time of follow-up. Also, both groups continued to eat a diet low in saturated and total fat. The indigent patients smoked more before the program but were equally successful at quitting cigarette smoking as the private patients. We conclude that in the appropriate setting, indigent patients can successfully complete and maintain excellent compliance with a program of coronary risk factor modification including exercise training, dietary modification, and cessation of cigarette smoking, to a degree equivalent to more affluent and educated patients. Compliance may be enhanced by employing a small program emphasizing extensive personal contact with rehabilitation staff.

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Cardiac rehabilitation is widely accepted as the standard of care for patients with cardiovascular disease.[1] However, the ability to deliver this service to all appropriate patients has been hampered by significant problems with physician and patient compliance.[2] In particular, medically indigent patients have traditionally been excluded from cardiac rehabilitation services because of both their inability to pay and perceived problems with compliance.

The cardiac rehabilitation program at Parkland Memorial Hospital is available both to the indigent population of Dallas County, as well as the privately insured patients from the clinics and hospitals of the University of Texas Southwestern Medical Center at Dallas. In this environment, both indigent patients and their more affluent counterparts take part in the same education and risk factor modification programs. We took advantage of this unique patient population mix to ask whether cardiac rehabilitation can be successfully applied to the medically indigent in terms of smoking cessation, diet, and exercise.

METHODS

Patient group: We evaluated the first 65 patients referred to a newly established cardiac rehabilitation program at Parkland Hospital in Dallas, Texas. Thirty-six of the patients were medically indigent, defined as persons with no form of third-party medical insurance other than Medicaid, upon which they were dependent for medical support. To qualify for Medicaid in the State of Texas, patients must have <$2,000 in total assets per individual (<$3,000 for couple), and have an income of <$438/month per individual (<$687/month per couple). Patients who did not have private insurance, but were too affluent for Medicaid and paid for their healthcare "out of pocket" were not considered indigent (n = 1). The remaining 29 were referred from the private clinics of the University of Texas Southwestern Medical Center at Dallas. The patient characteristics of the 2 groups are better defined in Table I.

Protocol: All patients participated in ≥4 weeks, and 91% attended 12 weeks, of monitored, supervised, phase II cardiac rehabilitation.[3] On entry into the program, each patient responded to a simple clinical questionnaire designed to characterize semiquantitatively the patient's risk factor profile. Questions were asked to determine: (1) physical activity assessed crudely by asking how many times per week the patient performed regular dynamic exercise (patients were divided categorically into those that exercised ≥3 times/week vs less than 3 times/week for ≥20 minutes); (2) smoking or not smoking; and (3) whether the subject attempted to eat a low fat diet, or whether he/she made no specific dietary choices based on nutritional content. There were 3 sessions weekly for each participant. Exercise prescriptions were established based on standardized exercise testing and were frequently reevaluated.[4] At the beginning of the rehabilitation process, patients were prescribed an exercise intensity of 75% to 85%

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TABLE 1 Patient Characteristics

	Indigent	Private
Number of patients	36	29
Age (yr)	53 ± 2	56 ± 3
Race		
White	21 (58%)*	29 (100)*
Black	9 (25%)	
Hispanic	6 (17%)	
Men	29 (80%)*	19 (65)*
Weight (kg)	89.6 ± 4.5*	79.1 ± 2.8*
Education (yr)	10.4 ± 2.8*	14.6 ± 3.2*
Myocardial infarction	18 (50%)	3 (10%)
Other coronary disease	2 (6%)	12 (41%)
Congestive heart failure	4 (11%)	2 (7%)
Heart surgery	12 (33%)	11 (38%)
Pulmonary hypertension		1 (3%)

* $p < 0.05$ compared with indigent patients.
Values are expressed as mean ± SEE.

of maximal heart rate achieved on a symptom-limited exercise test, as long as this range fell below the ischemic threshold. If ST-segment depression developed during the test, the heart rate at this work rate was noted and a maximal exercise heart rate of ≥10 beats/min below this threshold was prescribed. Over the course of the 12 weeks of rehabilitation, exercise intensity was adjusted upwards twice each week to keep the training heart rate within the prescribed zones. At the conclusion of these 12 weeks, each patient was given an individualized exercise prescription, and a specific plan was developed for maintenance of physical activity at home, including mall walking, stair climbing, or use of neighborhood fitness facilities.

In addition to exercise training, the program concentrated heavily on education emphasizing a step I American Heart Association diet for most patients, smoking cessation, and general medical compliance.[3] Each patient was confronted aggressively to quit smoking "cold turkey" as soon as they began the program, reserving nicotine patches for patients with significant withdrawal symptoms.[3] Family members were also encouraged to quit smoking at the same time as the patients, and to participate in dietary modification and physical activity.

Attendance was recorded during the 12 scheduled weeks of rehabilitation services and reviewed retrospectively. In addition to this retrospective review, all participants were contacted prospectively by telephone and asked to return for subjective and objective evaluation of their current exercise, dietary, and cigarette smoking habits. This evaluation occurred between 6 months and 1 year (mean 8.2 ± 1.1 months) after completing the program. Patients were brought back to the hospital at which time the same semiquantitative clinical questions were asked as on entry into the program. To buttress the answers to these simple questions, objective assessment was also obtained. A standardized 24-hour food intake recall was obtained by a trained dietitian and analyzed for concentration of saturated and total fat (Nutrition Prospector, Constructive Solutions). Because medical management of dyslipidemia was left to the discretion of the primary care physician during this stage of program development and not standardized, blood values for cholesterol or lipoprotein fractions were unavailable for analysis. Urinary nicotine levels were determined from a random, spot urine sample (Medtox Labs, Minneapolis, Minnesota). A level of 200 ng/ml was considered indicative of recent smoking. Repeat symptom-limited exercise testing was not possible secondary to logistical and financial constraints. However, submaximal exercise performance was evaluated by recording heart rate, blood pressure, and Rating of Perceived Exertion (Borg scale of 6 to 20[5]) at the end of 5 minutes of treadmill exercise at 2 submaximal workrates: (1) the same speed and grade at which the patient began the program, and (2) the same speed and grade at which the patient completed the program. Medications at the time of the prospective evaluation were compared with medications the patients were taking at the conclusion of the program. Patients who had a change in dosage or the addition of a medication that could affect the heart rate response to exercise (β blockers or calcium channel blockers) were excluded from analysis by protocol. In fact, no patient was excluded based on this criterion.

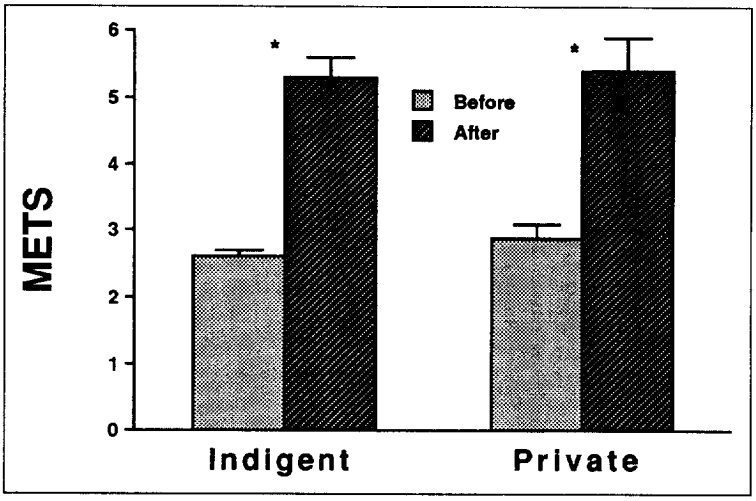
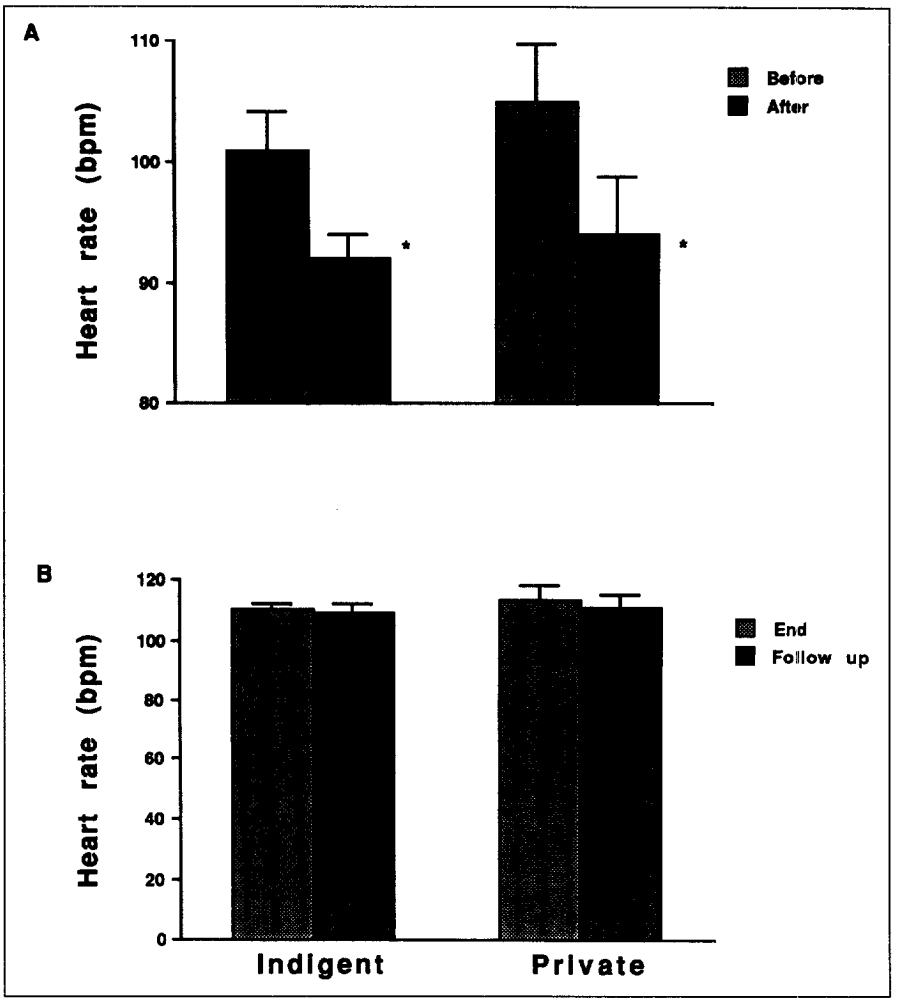


FIGURE 1. Submaximal work capacity of all patients before and after completing the cardiac rehabilitation program. Values represent the training intensity based on heart rate goals (75% to 85% of symptom-limited maximum) and are expressed as mean ± SEE. *p <0.05 compared with pretraining. METS = metabolic equivalents.

Statistical analysis: Categorical variables were compared before and after cardiac rehabilitation using McNemar's test of correlated proportions with continuity correction. Continuous variables were compared with a 2-way, repeated-



FIGUR E 2. *A,* heart rate before and after cardiac rehabilitation at the treadmill work rate at which patients began the program. *B,* heart rate at time patients completed the program (end) and at time of follow-up at the treadmill work rate at which patients finished the program. Values represent mean ± standard errors of the mean. *p <0.05 compared to before training.

measures analysis of variance, with Newman-Keul's post hoc test for multiple comparisons.

RESULTS

The indigent patients attended 92% of scheduled rehabilitation sessions and the private patients attended 93% (p = NS). Both groups of patients achieved a significant improvement in submaximal work capacity during training (Figure 1).

Sixty-five patients were contacted 8.2 ± 1.1 months after completing phase II cardiac rehabilitation. Follow-up time was no different in the 2 groups. At that point in time, 94% of the indigent and 95% of the private patients reported continuation of regular aerobic exercise ≥3 times per week (compared with 23% and 14% before rehabiliation [p <0.01] vs after rehabilitation [p = NS indigent vs affluent]). This reported activity was confirmed objectively by the maintenance of a high level of physical fitness as manifested by (1) significant reduction in heart rate at the speed and grade on the treadmill at which patients began the cardiac rehabilitation program (i.e., a persistent training bradycardia at low work rates in the absence of a change in medication, Figure 2A); and (2) the ability to exercise at the same treadmill speed and grade at which they completed the formal training program without an increase in heart rate (Figure 2B). Also, the rating of perceived exertion was 11 to 12 on a scale of 6 to 20 at the higher workload both at the time of completion of the program and at follow-up. These observations argue against any significant deterioration in work capacity after leaving the supervised portion of the rehabilitation program.

Both groups of patients quit smoking successfully (p <0.05) and continued not to smoke at the time of follow-up (Figure 3). One patient in each group reported not smoking but had nicotine levels consistent with recent smoking on urinalysis. Of particular note, the indigent patients had a higher incidence of smoking at the start of the program (45% vs 9%, p <0.05) and a similar relative reduction during phase II cardiac rehabilitation (60% vs 67%, p = NS). This resulted in a greater absolute reduction in numbers of indigent patients smoking than in private patients (10 vs 2, p <0.05).

Dietary modification was also successful. Upon entering the program, 41% of the indigent and 77% of the private patients said they were eating a "low fat diet." At follow-up, this frequency was increased to 82% and 100%, respectively (p <0.01). Direct assessment by 24-hour recall at follow-up confirmed

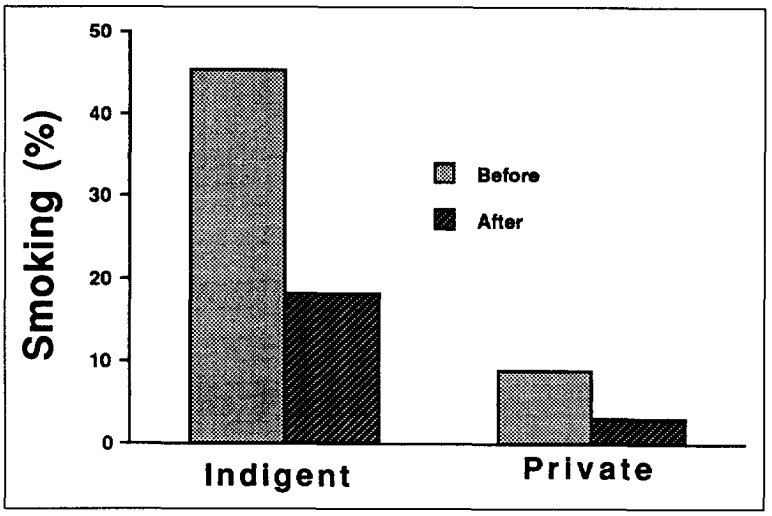


FIGURE 3. Patients who smoked before beginning cardiac rehabilitation and at the time of follow-up.

that both groups were conforming to the recommended American Heart Association Step I diet[6] with 30 ± 2% of calories derived from fat (10 ± 1% saturated) for the indigent, and 28 ± 2 (9 ± 1% saturated) for the private patients. The private and indigent patients lost 3.8 ± 1.1 and 3.3 ± 0.9 lbs, respectively, during rehabilitation.

DISCUSSION

The principal observation from this study is that in an appropriate setting, indigent patients can successfully adhere to and complete a program of cardiac rehabilitation to a degree equivalent to a more affluent and educated control. Importantly, these changes can be maintained after completion of the formal, supervised program, suggesting a potential lasting effect on the risk of cardiovascular disease.

Although the sample sizes were small, these rates of compliance with cardiac rehabilitation, in the present study equaling 90% of all scheduled sessions, both for the indigent and private patients are, to our knowledge, among the highest recorded for any patient population. Oldridge et al[7] recently reported on cardiac rehabilitation attendance records in a much larger series of 492 patients. Their overall mean attendance was only 75%, with up to 50% dropping out within the first year.[2] Of particular interest, the factor most directly associated with poor attendance was a patient's having Medicaid. This group attended only 39% of sessions. In fact, over half of their indigent patients came <33% of scheduled sessions. Medicaid patients also have a higher rate of missing other types of medical appointments.[8]

The reasons for the difference in compliance between other reports and ours are not entirely clear. One potential explanation is the size of our program.[3] Because of limited resources, our program began with only 1 small room, 4 exercise stations, and a staff-to-patient ratio of 1:4 as recommended by the American College of Sports Medicine.[4] In addition, we took a creative approach to overcoming commonly reported inconveniences such as transportation,[2,9] by arranging with Red Cross services or local public transportation for special discount rates. Parking fees were also waived for cardiac rehabilitation participants. Although such exceptions are not always possible, the very high compliance rates reported in this study suggest that an individualized, personal approach may be equally or more efficacious than strategies employing larger, but more impersonal, health club–like atmospheres.

This study was not a randomized selection of all patients eligible for cardiac rehabilitation. Rather, we, like most programs, were limited by the referral patterns of our physicians. Indeed, we suspect that many patients who were eligible may not have been referred. The underutilization of cardiac rehabilitation services is a recognized problem even in well-established programs on a national basis, with <15% of eligible patients actually referred.[10] Moreover, any referral bias that did exist (if only patients who were perceived by their physicians as being likely to comply were referred) likely would be equally applied to both the indigent and affluent populations. Therefore, referral bias, along with a small, personalized program could explain, in part, the outstanding compliance in our entire cohort, but would not alter the fundamental conclusion that the indigent patients performed as well as the affluent patients.

In addition to our excellent compliance rates, the patients in this study remained physically fit almost 1 year after completing the program. Although we could not specifically measure maximal exercise performance, important information regarding work capacity can be obtained by evaluating steady-state submaximal exercise.[11] There is substantially more plasticity in the adaptive response to submaximal exercise than to maximal exercise, and submaximal tests may demonstrate significant improvements in work capacity, even when maximal performance is unchanged,[12] particularly in patients with significant heart disease. Moreover, submaximal performance may be more specifically relevant for a patient with heart disease who performs most occupational and recreational activities at work rates substantially below maximum. In the present study, heart rate and rate of perceived exertion at the work rate when patients entered the program remained low compared with that observed at the beginning of the program, and were unchanged at the highest work rates achieved during the supervised training sessions (Figure 2). These observations suggest that the relative intensity of the exercise work rates remained at a similar percentage of the maximum and argue strongly for a persistent training effect.

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