Physical Therapists as Providers of Care: Exercise Prescriptions and Resultant Outcomes in Cardiac and Pulmonary Rehabilitation Programs in New York State

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ABSTRACT

Purpose: Physical therapists have engaged in cardiac rehabilitation (CR) and pulmonary rehabilitation (PR) for decades, but the extent of their current involvement in this practice area is unclear. This study surveyed directors of CR and PR programs on a statewide level to ascertain what type of provider is writing the prescription, which methods of exercise formulation are used, which outcome measures are used and their congruency with established guidelines. **Methods:** A convenience sample of outpatient CR and PR directors (n=31) representing 38 CR and/or PR programs located in New York completed a survey in spring 2005 (29 CR and 9 PR). **Results:** Results showed that only 2 physical therapists were responsible for writing exercise prescriptions in CR and PR programs. Most program directors were registered nurses (53%), who also wrote the majority of CR exercise prescriptions. Exercise intensity was most frequently determined using formulae and data that were highly patient-specific. Clinical outcomes most frequently included Quality of Life scales and stress tests. **Conclusions:** Physical therapists are minimally involved in directing programs and writing exercise prescriptions. Exercise prescriptions are individualized to the patient. Outcome measures most frequently used by participating CR and PR program directors are consistent with nationally-recognized best practice.

Key Words: cardiopulmonary rehabilitation program(s), exercise prescription, outcomes, training

INTRODUCTION

Cardiovascular disease continues to be the leading cause of death in New York State, including Nassau and Suffolk counties, killing more than 70,000 residents each year. However, for every person who dies from a heart attack or angina, 18 people survive.[1] Chronic obstructive pulmonary disease (COPD) also is lethal. In the geographic area of Long Island, NY, heart disease took the life of 8,711 residents in 2002 with 937 additional deaths from COPD.[2,3] State and local mortality data underscore the magnitude of the disease process; survival data suggest a significant need for cardiopulmonary rehabilitation programs.

Many patients with stable cardiopulmonary disease are candidates for either cardiac rehabilitation (CR) or pulmonary rehabilitation (PR). There is strong evidence that men and women who participate in an outpatient cardiac rehabilitation program (with frequent monitoring of heart rate, blood pressure, electrocardiogram (ECG), and signs and symptoms) following hospital discharge for a cardiac event or procedure can significantly improve functional capacity, quality of life, symptom reduction, and have a lower risk of death and recurrent myocardial infarction (MI).[4-8]

Patients with cardiac disease frequently complain of symptoms, usually angina and/or shortness of breath, which may produce intolerance to exercise. Similarly, patients with chronic obstructive or restrictive lung disease may complain of shortness of breath, decreased exercise capacity, and the inability to complete routine activities of daily living.[9] Even though there may be overlap of symptoms, the nature of the disease, monitoring parameters, and outcomes are different enough that CR and PR programs exist as separate entities. These programs typically offer multifactorial services, which include counseling about cardiac risk factor modification, education about the disease process, behavioral interventions, and exercise.[9] Many or all of these services may be used in order to bring the patient to a higher level of function and an improved quality of life. Inherent in the multidisciplinary approach to CR and PR is empowerment of the patient as an active participant in his or her own rehabilitation.

For many years, physical therapists have been accepted by both the health care community and the public at large as being qualified to provide safe and effective exercise programs to a wide variety of patient populations. It would appear that physical therapy would be an essential component in CR and PR programs, and indeed historically this has been the case. It would seem also that the broad scope of their training qualifies physical therapists to treat severely disabled patients with cardiac and/or pulmonary disease, or those patients with multiple co-morbidities.

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Despite poor access and utilization among a significant proportion of eligible patients,[4] there has been significant growth in the demand for CR and PR programs nationwide during the last 30 years. The American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) was founded in 1985 to recognize the many health disciplines responsible for care of patients with cardiac and pulmonary disease and to provide a platform for professional development for its members. The AACVPR also established standards for CR and PR programs.[10,11] These standards now include guidelines for exercise prescription and measurement of outcomes. The American College of Sports Medicine (ACSM)[12] and the American Heart Association (AHA)[13] have developed similar guidelines for exercise prescription. However, little is known about whom among the cardiopulmonary team of providers is responsible for writing the exercise prescription, what information is used to develop the prescription, and what measures of program effectiveness are used.

There is an interest in uniform and standardized outcomes measurement at the national AACVPR and its regional affiliate levels (including the New York State Association of Cardiovascular and Pulmonary Rehabilitation, NYSAC&PR). This interest is motivated in large part by a desire to document, on a regional and national population level, trends in CR and PR performance-related outcomes. Data of this scope will likely benefit all stakeholders in the field of CR and PR by facilitating outcome analysis on a large scale (rather than current studies that are limited to single programs or health systems) to show clinically significant improvements in CR and PR outcomes. The NYSAC&PR's leadership is working to establish a statewide benchmark and outcomes measurement reporting system for CR and PR programs.[14] The NYSAC&PR leadership recently conducted a series of small demonstration projects to assess the feasibility of quarterly reporting of outcomes such as peak exercise heart rate and blood pressure, resting blood pressure and heart rate, metabolic equivalents (METs), and health related quality of life among a small sample (n=34) of participating NYS programs.[14]

There are no published studies that describe the role of the physical therapist as provider of CR and PR services. No published studies have assessed exercise prescription characteristics of programs on a statewide level. The purpose of this study was to identify the degree to which physical therapy currently is involved in these services. The purpose of this study also was to describe those health care providers responsible for writing exercise prescriptions, what parameters are used to write exercise prescriptions, and whether those parameters are congruent to standards of care for exercise prescription and outcomes measures set forth by national professional organizations. This analysis will provide a description of the exercise prescription and outcomes measurement practices among a sample of programs in New York State that care for thousands of patients with cardiac and pulmonary disease across a variety of settings (eg, affiliation with a university or community hospital, physician office, or group practice).

METHODS

Overview

This study involved a cross-sectional self-report survey completed by CR and PR program directors located throughout Long Island and New York State. The study protocol and all materials were reviewed and approved by the Committee on Research Involving Human Subjects at Stony Brook University prior to the start of this research.

Subjects

Participants were a convenience sample of CR and PR program directors. Recruitment involved a two-phase approach. In Phase One, all program directors practicing on Long Island, NY (n= 22 programs represented by 18 directors) were contacted by phone to discuss the purpose of this study and solicit their commitment to participate. The phone call confirmation was followed within a week by a priority mailed survey packet which included a cover letter describing the study's purpose, a statement of informed consent, a survey, and a self-addressed stamped envelope to facilitate the return of the completed survey within 2 weeks. Telephone reminders were used to encourage the return of surveys within a week of the initial mailing. In Phase Two, the leadership of the NYSAC&PR gave the investigators permission to include the survey packet materials in the conference folders of attendees at their annual meeting held in May 2005 in Lake George, NY. During the conference, the study was announced and a request was made for completion. At that time the NYSAC&PR represented approximately 145 members and 85 CR and PR programs in New York State. There were 83 attendees at the annual meeting who received the survey packet. As an incentive to participate, a raffle ticket was attached to each responder's completed survey. At the end of data collection, 1 raffle ticket was randomly drawn by the investigators to select a prize winner. The program director holding the winning raffle ticket received a reimbursed registration (paid by the authors' institution) to the 2006 annual meeting of the NYSAC&PR.

Survey Description

An 11-page survey was developed for the purposes of this research. Sections of the survey included measures that were adapted (with permission) from a tool created by Evenson and Rosamond[15] to assess outpatient CR utilization trends in North Carolina. Closed- and open-ended response formats were used to assess several descriptive measures related to director characteristics (credentials, job title), program characteristics (services provided, affiliation with hospitals, referral sources), patient population characteristics (how many patients served, percent female, percent within race/ethnicity categories), and exercise prescription practices. The survey items developed by the authors (who have content and survey design expertise) were reviewed by an outside expert in cardiopulmonary rehabilitation with minor revisions made prior to distribution (face validity). The measures used to collect descriptive information about the actions of health care providers at each program with regard to exercise prescription, exer-

cise intensity, training zone, and program outcomes are described below.

The survey took approximately 20 minutes to complete as there were additional measures included beyond the scope of the results reported here. The survey included instructions indicating that responders should use program data derived from the previous calendar year (the 12 months of 2004) with consideration only to CR and/or PR training as it relates to monitoring programs (thus excluding maintenance programs for which monitoring is rare or absent). Training was defined as:

1) exercise with frequent monitoring, either ECG or pulse oximetry;
2) initiation of program generally up to 6-8 weeks post-hospital discharge; and
3) duration of program generally up to 36 sessions over a 12-week period.

Measures

Exercise prescription

The authors defined exercise prescription as the formulation of an individualized exercise program that uses parameters of exercise intensity, frequency, duration, and training modality that is sufficient to induce an aerobic endurance training effect. A single item assessed what type of health care provider is responsible for writing the exercise prescription for training. Response options included "cardiologist," "physical therapist," "exercise physiologist," "registered nurse (RN)," "other," and "do not know."

Exercise intensity

Exercise intensity was defined as the level of physiological response to an external physical stressor necessary to achieve an aerobic endurance training effect. This exercise level may be measured using heart rate, METs, a Rating of Perceived Exertion (RPE) scale, or onset of symptoms of exercise intolerance. A maximum symptom limited exercise test is useful in formulating an appropriate exercise training intensity that is both efficacious and safe. This item asked the participants to indicate whether or not the prescribed exercise is based on the results of a maximum symptom limited exercise test[12] ("yes," "no," "do not know") and what unit of measurement is used[12(p141)] ("heart rate," "METs," "symptoms," "do not know").

Training zone

The training zone was defined as the range of exercise intensities that can be sustained for a period time sufficient to induce an aerobic endurance training effect. This item assessed how program directors determine the training zone whereby participants were asked to select all response options that applied to their program(s) including use of "Karvonen formula," "direct percentage of maximum heart rate,"[12] "trial and error," "other," and "do not know."

Program outcomes

Program outcomes were defined as those parameters used to measure achievement of overall patient and program objectives. Measures of program outcomes usually take the form of tests that are administered to the patient at the beginning of the program and again at the end. Improvement in program outcomes are reflected in exit scores that are "better" than those taken at entrance into the program. For example, a maximum symptom limited exercise test taken at the end of the program reflects a positive outcome if the patient is able to go further into the test before the onset of symptoms when compared to the entrance exercise test. Participants were asked to select all program outcomes that are routinely measured including "Quality of Life measures" (such as QualityMetric Short Form-36 [SF-36][16] or QualityMetric Short Form-12 [SF-12][17]), Chronic Respiratory Disease Questionnaire,[18,19] Seattle Obstructive Lung Questionnaire,[20] other), "post-training stress tests"[21] (Bruce, Naughton, other), "functional outcomes assessment" (such as the New York State Heart Association Class System,[22] other), "return to work," "mental health" (eg, depressive symptomology), "other," and "do not know." Although both the SF-12 and the SF-36 are generic forms, they have produced reliable and valid results in several European countries and in a diverse range of conditions, and have been found to be both reliable and valid in patients with cardiac[23,24] and pulmonary disease.[25]

Data Analysis

Statistical analyses were completed using the Statistical Package for the Social Sciences (SPSS) version 14.0 for Windows. We executed basic univariate descriptive statistics (such as frequency counts, percentages, means, and standard deviations) to explore the programmatic characteristics of the sample.

RESULTS

Sample Characteristics

There were 38 CR and/or PR programs represented by the directors (n=31) who participated in this study. The majority of programs offered CR only (n= 22, 58%), with 7 facilities that offered CR and PR (n= 7 additional CR and 7 PR programs, 37%) and 2 facilities that only offered PR (n= 2, 5%). Therefore, 29 CR programs and 9 PR programs were represented by the sample of directors who completed the survey. The majority of program directors indicated holding credentials as a registered nurse (55%), an exercise physiologist (16%), or both (10%). The remaining 19% of responders included 1 physical therapist (Chief PT), 2 respiratory therapists, 2 medical doctors, and one who indicated "other." The response rate for Phase One data collection revealed that of the 22 CR and/or PR programs in practice on Long Island, NY in 2004, the directors of 19 programs completed a survey (86% response rate for Phase One). In addition, Phase Two data collection procedures yielded the participation of 19 programs located in other regions of New York State through the recruitment of program directors in attendance at the annual meeting of the NYSAC&PR held in 2005. It was not possible to calculate an exact response rate for the convenience sample of program directors recruited from the annual meeting of the NYSAC&PR. Although 83 individuals attended the confer-

ence, it was not known how many CR and PR program directors were among the attendees. We estimate that the total sample of 38 participating programs is representative of approximately 45% of the 85 CR and PR programs that were members of the NYSAC&PR at the time of data collection.

The majority of participating programs served less than 200 patients per annum in 2004 (61% of CR, 75% of PR). The range of the number of patients served was 30 to 918 for CR programs (mean = 250, S.D. = 213) and 10 to 400 patients (mean = 126, S.D. = 132) for PR programs. Programs were mostly located in a hospital-based outpatient center (n=31, 82%) with a few programs located by a physician office or medical clinic (n= 5, 13%) or a community-based rehabilitation center (n = 2, 5%).

Determinants of Exercise Intensity and Training Intensity
Exercise prescription

Table 1 provides the frequency of the type of clinician(s) responsible for writing the exercise prescription as reported by participating CR and PR program directors in New York State. Directors indicated that the responsibility for writing the exercise prescription for training among CR program participants was that of an exercise physiologist (34.4%), a registered nurse (17.2%), or both (20.7%). In the case of PR, the responsibility was most frequently that of the exercise physiologist independently (42.8%) or in concert with a registered nurse (14.3%). Only one physical therapist was responsible for writing exercise prescriptions in CR and PR programs. The ACSM[12] and the AACVPR[10] recommend that exercise prescriptions in both CR and PR programs be individuated to the patient. This may include utilization of data obtained from a stress test, preferably a maximum symptom-limited exercise test. These results are used to develop a target (or training) zone. Program directors of CR programs overwhelmingly indicated that prescribed exercise is based on the results of a maximum symptom limited exercise test (90%), and only 2 PR programs indicated that they do not use the results of such a test for exercise prescription.

Determinants of exercise intensity

Table 2 reflects parameters that prescribers of exercise use to determine intensity of exercise during an exercise session. Responders were invited to select from HR, METs, or symptoms, or any combination. None of the responders chose any single item, but rather chose a combination of the above. The most frequent combination was that of HR, METS, and symptoms for both Cardiac Rehabilitation and PR programs (79.3%, 71.4%), followed at a distance by HR and METs among CR programs (13.8%).

Formulation of the training zone

The frequency distributions for methods used to determine the training zone among the participating CR and PR programs are provided in Table 3. The most widely accepted method of determining training zone for the purpose of inducing an aerobic endurance training effect in CR appears to be utilization of heart rate, either using the Karvonen formula or percent of maximum heart rate. CR program directors most frequently reported that the method used to determine the training zone was the Karvonen formula alone (48.3%) with an additional 20.6% using the Karvonen formula in combination with other methods (total of 68.9%). The use of direct percent of maximum heart rate alone was only 10.3%, and was the second most frequently used measure to determine the training zone in combination with either Karvonen formula, trial and error, or other methods (41.4%). Although 62.5% of PR program directors indicated that direct % of maximum heart rate is used to determine the training zone (alone or in combination with trial and error, Karvonen, or "other"), the remainder (37.5%) indicated that an "other" method (either a dyspnea exertion scale or the Borg rating of perceived exertion) was used to determine exercise intensity.

Table 1. Frequencies for Type of Clinician Responsible for Exercise Prescription Among Participating CR and PR Programs in New York

Type of Clinician	CR Exercise Prescription (N=29) Frequency	PR Exercise Prescription (N=7) Frequency
Exercise Physiologist Alone	10 (34.4%)	3 (42.8%)
RN Alone	5 (17.2%)	1 (14.3%)
Exercise Physiologist + RN	6 (20.7%)	1 (14.3%)
Physical Therapist Alone	1 (3.4%)	1 (14.3%)
Cardiologist Alone	1 (3.4%)	0
Cardiologist + Exercise Physiologist	3 (10.3%)	0
Cardiologist + Exercise Physiologist + RN	3 (10.3%)	0
Other	--	1 (14.3%)

RN = registered nurse
NOTE: The sample size for PR programs is 7 because the directors of 2 additional PR programs did not provide a response to this item.
Percentages are rounded up to the nearest tenth.

Table 2. Frequency of Methods Used in Practice to Determine Exercise Intensity

Methods Used to Determine Exercise Intensity	CR (N=29) Frequency	PR (N=7) Frequency
Heart Rate + METs + Symptoms	23 (79.3%)	5 (71.4%)
Heart Rate + METs	4 (13.8%)	0
Heart Rate + Symptoms	1 (3.4%)	1 (14.3%)
METs + Symptoms	1 (3.4%)	0
Symptoms only	0	1 (14.3%)

METs = metabolic equivalents; multiples of resting oxygen consumption
NOTE: The sample size for PR programs is 7 because the directors of 2 additional PR programs did not provide a response to this item.
Percentages are rounded up to the nearest tenth.

Table 3. Frequency of Methods Used to Determine Training Zone

Method Used to Determine Training Zone	CR (N=29) Frequency	PR (N=8) Frequency
Karvonen formula alone	14 (48.3%)	0
% maximum heart rate alone	3 (10.3%)	1 (12.5%)
Karvonen formula + % of maximum heart rate	3 (10.3%)	0
Karvonen formula + % of maximum heart rate + other	3 (10.3%)	1 (12.5%)
% of maximum heart rate + Trial & Error	2 (7.0%)	1 (12.5%)
% of maximum heart rate + Other	4 (13.8%)	2 (25.0%)
Other	0	3 (37.5%)

NOTE: The sample size for PR programs is 8 because the director of 1 additional PR program did not provide a response to this item.
Percentages are rounded up to the nearest tenth.

Program Outcome Measures

The CR and PR program directors tended to indicate that several outcomes are routinely measured by their program(s) (respectively): quality of life (75.9% and 66.7%), post-training stress test (55.2% and 44.4%), functional outcomes (44.8% and 55.6%), and mental health such as depression (69.0% and 44.4%). Return to work was not found to be a routinely measured outcome for CR (only 24.1% of programs indicated collecting this measure) and none of the PR programs indicated routine measurement of return to work. Table 4 provides the frequency of program outcomes routinely measured by the participating CR and PR programs.

DISCUSSION

The purpose of this study was to describe the current practice of CR and PR programs located on Long Island and throughout greater New York with regard to physical therapists as providers of care, exercise prescription, and clinical outcome measures. Information obtained from the survey did indeed identify those allied health practitioners who provide the bulk of CR and PR services. Survey results also provided new information on characteristics of the exercise prescription and the use of program outcomes to document program effectiveness.

Significance to Cardiopulmonary Physical Therapy

Since its inception in the 1960s, the hallmark of cardiopulmonary rehabilitation programs has been a multidisciplinary team approach to the management of patients with cardiac and pulmonary disease. A physician, frequently a cardiologist, served as program director. Other team members typically included a nurse, occupational therapist, psychologist, social worker, vocational rehabilitation counselor, and a physical therapist.[26] The physical therapist was the "exercise expert," who assumed responsibility for the exercise training component of CR and PR, and the development of individualized exercise prescriptions.[26] However, the 1980s witnessed a surge of interest in exercise physiology, and the recognition that principles of exercise training of healthy individuals could be applied to patients with disease. This fact, coupled with *de facto* health care reform, including a market-driven health care system and cost containment legislation, caused a shift in

Table 4. Frequency of Outcomes Routinely Measured by Participating CR and PR Programs

Outcome Measures	CR (N=29) Frequency	PR (N=9) Frequency
Quality of Life	22 (75.9%)	6 (66.7%)
Post-training Stress Test	16 (55.2%)	4 (44.4%)
Functional Outcomes	13 (44.8%)	5 (55.6%)
Mental Health (such as depression)	20 (69.0%)	4 (44.4%)
Return to Work	7 (24.1%)	0
Other	15 (51.7%)	3 (33.3%)
Do not Know	1 (3.4%)	0
Percentages are rounded up to the nearest tenth. Responses are based on "yes/no" response options. Therefore, cumulative responses will not equal 100%.		

the marketplace that provided an opportunity for exercise physiologists to enter the medical environment. At the same time, training of nurses was broadened to include management of CR and PR programs.

Cardiovascular and pulmonary physical therapy is a specialized area of practice. This practice area was formally recognized in 1985 when the American Physical Therapy Association (APTA) instituted a process leading to board certification in Cardiopulmonary Physical Therapy, the first of 7 specialty practice areas to be recognized. Since 1985 the number of cardiovascular and pulmonary clinical specialists has grown to 130, but it is a small group compared to the other specialty practice areas.[27] Additionally, many of these specialists practice in the acute care environment, making their presence in outpatient rehabilitation facilities even smaller. This is not to suggest that only clinical specialists practice cardiopulmonary rehabilitation--indeed, any physical therapist is qualified to practice in cardiac and/or pulmonary rehabilitation, but it does underscore the fact that only a small number of physical therapists practice in this environment.

These health care trends, and the small number of cardiovascular and pulmonary physical therapists, account for current staffing of CR and PR programs. Current practice is noteworthy for its strong exercise physiologist and nursing presence, and the smaller number of physical therapists practicing in this field.

Exercise Prescription

Current best practice supports the notion that, whenever possible, and particularly for those individuals with cardiopulmonary disease, exercise prescriptions be based on a symptom-limited maximum exercise test.[12(p135)] The test is typically performed on either a treadmill or a bicycle ergometer. It progresses the patient through a series of increasing workloads. Heart rate, blood pressure, the electrocardiogram, and signs and symptoms of exercise intolerance are monitored continuously throughout exercise and recovery. The test is terminated if the patient achieves their maximum age-related heart rate, or becomes symptomatic. The HR at which the test is stopped is designated as the patient's individualized maximum heart rate. This maximum HR is used to develop a target, or training zone, a HR range of moderate to high intensity that is sustained for a designated period of time during a training session. The exercise prescription is a function of 4 variables: exercise intensity, duration, frequency, and modality. In order to induce an aerobic endurance training effect, the workload is titrated such that the patient's HR is elevated to a level that falls within the training zone. The duration of this level of exercise is usually at least 20 minutes; it is preceded by a warm-up period, and followed by a cool down.[28] The intensity of activity needed to show improvement in exercise capacity varies among individuals and may be as little as 50% of $\dot{V}O_{2max}$ for 20 minutes at a frequency of 3 times per week. Such a training regimen will prompt physiological changes consistent with the acquisition of an aerobic endurance training effect.[29,30] The physiological expression of such a training effect is a decreased HR response at any given submaximal workload, an increase in peripheral oxygen extraction, an increase in systemic oxygen consumption, and the ability to do more work before the onset of either symptoms or fatigue.

Exercise intensity may be established by a variety of methods, more commonly using either HR, oxygen consumption, or Rating of Perceived Exertion (RPE). The training zone obtained from HR data can be formulated using either a percent of maximum HR (%HRmax) or HR reserve method (Karvonen formula). The %HRmax is easy to calculate but is a somewhat conservative method that can under-treat the patient. It also tends to be inaccurate at low target zone intensities.[12] The Karvonen method tends to be better individualized to the patient because it takes into account the patient's resting HR. It is also more closely related to the patient's actual oxygen consumption across the entire range of fitness levels.[31] Our study indicated that those health care practitioners who write exercise prescriptions in CR programs not only recognize these differences between formulae for calculating exercise intensities, but preferentially choose the method that is more linear in its relationship to oxygen consumption, and is better individualized. Thirty-one percent of practitioners used other methods; however, most of them did so using percent of maximum heart rate in combination with other data, thereby enhancing individuation of the exercise prescription.

Those practitioners in PR programs are more likely to use other methods instead of HR formulae to determine exercise intensity. Patients with pulmonary disease tend to be more debilitated, and therefore less likely to be able to maintain an exercise intensity within standardized target zones for patients with cardiac disease. Use of the RPE scale is a frequently encountered method of monitoring exercise response of patients with pulmonary disease, as well as those with cardiac disease.[32] Direct measurement of oxygen consumption during exercise also reflects exer-

cise intensity. Oxygen consumption is frequently expressed in units of METs (ie, metabolic equivalents, or multiples of resting oxygen consumption). Survey results showed that METs were not used as a stand-alone method of determining exercise intensity, perhaps because of the need for a metabolic cart and the added expense to the patient for such testing.

Outcome Measures

The AACVPR Outcomes Committee recommends that outcome assessment for both cardiac and pulmonary rehabilitation programs span 4 domains: health, clinical, behavioral, and service.[10,11] Health domain outcome measures include health-related quality of life measures, quality of life being defined as "the gap between that which is desired in life and that which is achieved."[33] Well established measures of health-related quality of life include the Short Form 36 (SF-36) and the shortened version Short Form 12 (SF-12). The SF-12 contains 12 questions from which are derived physical and mental component scores (PCS & MCS) that have strong psychometric properties consistent with the SF-36.[34] Our survey included questions on use of quality of life scales, and provided examples of such scales.

Similarly, the clinical domain was represented in our study by questions focused on the use of stress tests as outcome measures, functional classification systems, mental health inventories, and return to work data. When used as outcome measures, these tests are usually administered at the time of induction into the program, and again at discharge, so that efficacy of the intervention can be assessed. The inclusion of tests and questionnaires to assess health and clinical outcomes by participating cardiac and pulmonary rehabilitation programs on Long Island and Greater New York is consistent with nationally-recognized best practice.

Most recently in 2007, the AACVPR joined forces with the AHA and the American College of Cardiology (ACC) to identify data elements that allow the quality of cardiovascular care to be measured.[35] These Performance Measurement Sets break down cardiac rehabilitation services into areas of practice that include within them measurable outcomes, which can then be used to document quality of care. The results of this study can be compared to portions of this 2007 performance measures document. All of the performance measures found in the AACVPR/ACC/AHA paper call for an individualized assessment of the patient. Performance Measure B-3g is an individualized assessment of the presence or absence of depression. Performance Measure B-3h is an individualized assessment of exercise capacity. Included within B-3h is assessment of maximal or submaximal exercise capacity with standard endpoints, as described by the ACSM and ACC/AHA practice guidelines. This performance measure also calls for an exercise prescription that includes frequency, intensity, duration and modalities. The results of our study are consistent with some of the performance measures put forward by the AACVPR/ACC/AHA. Mental health, including presence or absence of depression, is assessed in 69% of CR programs. All responding CR program directors individualize exercise programs using either HR, METS, and /or symptoms. Prescribed exercise is predominantly based on a maximum symptom limited exercise test in CR programs (89.7%). All responding CR program directors calculated intensity of effort using a variety of indices, including HR, METs, and symptoms.

Limitations

Although our response rate of 86% for CR and PR programs operating on Long Island compares favorably to another study of CR program directors in North Carolina (which achieved a response rate of 85%)[36] our overall sample of programs throughout New York State may not be representative of all CR and PR programs in New York and may not be generalizeable to programs outside of New York. The 38 programs represented by the participating directors primarily were located in a hospital-based outpatient center (82%) and most were relatively small programs serving less than 200 patients per year.

CONCLUSIONS

Despite the limitations noted, this study improves our understanding of the type of clinician most frequently responsible for CR and PR exercise prescription in New York, how the exercise prescription is formulated, and the clinical determinants and resultant outcome measures most used in practice. There is poor representation of physical therapy in these programs, perhaps due to the small number of physical therapists who have chosen to enter this specialty area of practice. This is unfortunate, given that the broad scope of their training includes not only management of patients with cardiovascular and pulmonary disease but also those with orthopedic and neurologic conditions. This training suggests that they would be particularly qualified to manage complex patients with cardiac and pulmonary disease who present with orthopedic or neurologic co-morbidities.

State and national professional organizations are seeking to implement CR and PR standardized benchmarks and outcomes reporting systems. Future research should explore current practices for the management of clinical cardiopulmonary outcomes information such as the use of paper vs. electronic patient records. Studies could investigate the capacity of CR and PR programs to electronically share select clinical outcomes for population-level analysis (regionally, statewide) and the extent to which programs would require labor-intensive individual patient chart reviews to participate in requests for data sharing and reporting.

Overall the results of this study support the conclusion that the outcome measures most frequently used by CR and PR programs operating in New York to assess program effectiveness reflect current best practice.

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