AARC Clinical Practice Guideline

Pulmonary Rehabilitation

PR 1.0 PULMONARY REHABILITATION: Pulmonary rehabilitation is a restorative and preventive process for patients with chronic respiratory disease.

PR 2.0 DESCRIPTION/DEFINITION: Pulmonary rehabilitation (PR) has been defined as a "multi-disciplinary program of care for patients with chronic respiratory impairment that is individually tailored and designed to optimize physical and social performance and autonomy."[1]

As lung reserve declines, dyspnea worsens and independent daily activity performance erodes. PR provides multidisciplinary training to improve the patient's ability to manage and cope with progressive dyspnea.[2]

Although PR efforts are often focused on patients with chronic obstructive pulmonary disease (chronic bronchitis and/or emphysema),[3-6] other conditions appropriate for this process include, but are not limited to, patients with asthma,[7] interstitial disease,[8] bronchiectasis,[8] cystic fibrosis,[9-11] chest wall diseases,[8] neuromuscular disorders,[12,13] ventilator dependency,[14,15] and before and after lung surgery for transplantation,[16] volume reduction,[17,18] or cancer.[19,20]

PR services include critical components of assessment, physical reconditioning, skills training, and psychological support.[2,21] Additional PR services may include vocational evaluation and counseling.[22] The PR program must be tailored to meet the needs of the individual patient, addressing age-specific and cultural variables, and should contain patient-determined goals, as well as goals established by the individual team discipline.[20,23] Both patients and families participate in this training administered by health care professionals. These pulmonary rehabilitation services are overseen by a medical director to assure appropriate performance by the program staff and to assure proper service delivery.[2]

This guideline is appropriate for pediatric, adult, and geriatric patients in whom clear indications for rehabilitation are present and who possess the necessary cognitive and physical capabilities.

Based on the individualized assessment the following areas of education and training should be considered:[2]

- **2.1** pulmonary anatomy and physiology including the pathophysiology of lung disease[24-26]
- **2.2** description and interpretation of medical tests[27-33]
- **2.3** bronchial hygiene techniques[34,35]
- **2.4** exercise conditioning and techniques that include:[36]
  - **2.4.1** breathing retraining[37]
  - **2.4.2** endurance, strength, and flexibility training
    - **2.4.2.1** upper extremity[37-42]
    - **2.4.2.2** lower extremity[37,41]
  - **2.4.3** ventilatory muscle training (its role is still undetermined, since no evidence exists that it contributes to functional improvement when added to a traditional upper and lower extremity exercise training program).[1,36]
  - **2.4.4** energy conservation as it applies to activities of daily living[43,44]
- **2.5** indications, actions, and side-effects of medications including non-prescription products, such as vitamins, over-the-counter medications, and herbal remedies[6]
- **2.6** functional self-management
  - **2.6.1** self assessment and symptom management[45]
  - **2.6.2** infection control with emphasis on avoidance, early intervention, and immu-

nization[46-48]
2.6.3 environment control
2.6.4 indications for seeking additional medical resources
2.7 sleep disturbances, eg, insomnia and sleep apnea as they relate to chronic lung disease
2.8 sexuality and intimacy[49,50]
2.9 nutrition[51-54]
2.10 smoking cessation[55-57]
2.11 psychosocial intervention and support[21,58]
2.12 available community services, including patient/family support groups[59]
2.13 advance care planning[60,61]
2.14 travel issues[62]
2.15 recreation/leisure activities[63]
2.16 stress management
2.17 indications for oxygen, and methods of delivery[64]

PR 3.0 SETTINGS:
PR may take place in, but is not limited to:
3.1 the inpatient setting, including medical center, skilled nursing facility, or rehabilitation hospital[2]
3.2 the outpatient setting[2,65]
3.2.1 outpatient hospital-based clinic
3.2.2 comprehensive outpatient rehabilitation facility (CORF)
3.2.3 physician's office
3.2.4 alternate or extended care facility
3.2.5 patient's home[65]

PR 4.0 INDICATIONS:
The indications for PR include the presence of respiratory impairment potentially responsive to the techniques available.[1,2,36] Such impairment may be manifested as:
4.1 dyspnea experienced during rest or exertion
4.2 hypoxemia, hypercapnia
4.3 reduced exercise tolerance or a decline in the patient's ability to perform activities of daily living
4.4 an unexpected deterioration or worsening symptoms against a background of long-standing dyspnea and a reduced but stable exercise tolerance level
4.5 the need for surgical intervention (pre- and postoperative lung resection, transplantation, or volume reduction)
4.6 chronic respiratory failure and the need to initiate mechanical ventilation
4.7 ventilator dependence
4.8 increasing need for acute care intervention, including emergency room visits, hospitalizations, and unscheduled physician office visits

PR 5.0 CONTRAINDICATIONS:
The initial assessment of the patient should establish his or her willingness to participate in the rehabilitation process. The presence of certain conditions would make successful completion of the rehabilitation process unlikely.[2]
5.1 Potential contraindications to PR include ischemic cardiac disease, acute cor pulmonale, severe pulmonary hypertension, significant hepatic dysfunction, metastatic cancer, renal failure, severe cognitive deficit, and psychiatric disease that interferes with memory and compliance. The decision to provide or withhold PR should be based on a thorough, individualized assessment.
5.2 Substance abuse without the desire to cease use would seriously interfere with successful PR.
5.3 Physical limitations such as poor eyesight, impaired hearing, a speech impediment, or orthopedic impairment may require modification of the PR setting but should not interfere with participation in a PR program.

PR 6.0 HAZARDS/COMPLICATIONS:
Hazards/complications associated with PR are primarily related to the exercise program. During exercise the cardiovascular and ventilatory systems must be able to respond to increased demands. Exercise can lead to muscle or ligament injuries.

PR 7.0 LIMITATIONS OF METHOD:
7.1 Patient related
7.1.1 The patient may have a disease process that has progressed to the stage where rehabilitation is not possible.
7.1.2 The patient may not adhere to or complete the program because it appears to be complicated or because of a sense of hopelessness, depression, or a lack of motivation.
7.1.3 The patient/patient family may be reluctant to make changes in their usual program, medications, start new therapy,

quit smoking, use supplemental oxygen, or exercise.[23]

7.1.4 There might be concerns or limitations in transportation.

7.1.5 Financial resources might not be available.

7.1.6 The patient may have to stop the program because of an acute exacerbation, or worsening of another medical condition.

7.2 Related to the health care system

7.2.1 Reimbursement by intermediaries or third-party payers is not standardized.

PR 8.0 ASSESSMENT OF NEED:

8.1 The patient must be under the care of a physician for the pulmonary condition for which he or she needs rehabilitation. Appropriate members of the PR team participate in the patient's assessment. The initial evaluation should include the medical history, diagnostic tests, current symptoms, physical assessment, psychological, social, or vocational needs, nutritional status, exercise tolerance, determination of educational needs, and the patient's ability to carry out activities of daily living.[2]

8.2 Areas to be evaluated and reviewed include:[2]

8.2.1 effect on quality of life

8.2.2 pulmonary function assessment, including arterial blood gas analysis

8.2.3 use of medical resources such as hospitalizations, urgent care/emergency room visits, or physician visits

8.2.4 exercise ability

8.2.5 dependence vs independence in activities of daily living

8.2.6 impairment in occupational performance

8.2.7 psychosocial problems such as anxiety or depression

8.2.8 oxygen saturation at rest, with activity, and possibly during sleep

8.2.9 co-morbidity

8.2.10 smoking history

8.2.11 motivation for rehabilitation, including commitment to spending the time necessary for active program participation

8.2.12 current medications

8.2.13 appropriate blood tests

8.2.14 electrocardiogram

8.2.15 chest radiograph

8.2.16 social support

8.2.17 potential need for assistive devices, eg, walker, wheel chair

8.2.18 adherence to recommended treatment modalities

8.2.19 physician support available to patient

8.2.20 availability of transportation and patient/family desire to use what may be available

8.2.21 financial resources

PR 9.0 ASSESSMENT OF OUTCOME:

9.1 Evidence exists for the effectiveness of PR with respect to exercise tolerance, utilization of health care resources, and quality of life.[1,36,66-69] There is some evidence that PR may improve survival in patients with COPD.[36,70-73] The effectiveness of PR can best be established by comparing the baseline condition of the patient to his or her condition as a consequence of participation in the PR program and should involve both qualitative and quantitative measures. Such measurements should include:

9.1.1 indicators of health related quality of life[67,74-81] including a reduction in dyspnea[5,65,67,77,82,83]

9.1.2 enhanced ability to perform activities of daily living including energy conservation[4,84]

9.1.3 increased exercise tolerance and performance[37,41,67,76,77,79,84-88]

9.1.4 decreased respiratory symptoms, eg, frequency of cough, sputum production, wheezing

9.1.5 increased knowledge about pulmonary disease and its management[89-91]

9.1.6 reduced need for medical services including outpatient treatment and hospital admission[70,87,92,93]

9.1.7 increased ventilator-free time in the ventilator-dependent patient

9.1.8 return to productive employment

9.2 Documentation and data collection can develop information regarding the cost-effectiveness of PR.[70,87,92,93]

9.3 The benefit of long-term follow-up, including maintenance programs, should be evaluated.

9.3.1 educational/recreational support group

9.3.2 independent maintenance exercise
9.3.3 scheduled, individualized, on-going exercise/educational input from PR team

10.0 RESOURCES:

10.1 Personnel

The number of disciplines contributing to a PR program varies with the size and scope of the PR program and the availability of those disciplines within the setting. Members might include a respiratory care practitioner, registered or licensed nurse, physical therapist, pharmacist, occupational therapist, dietitian, social worker, exercise physiologist, chaplain, speech therapist, and mental health professional.[2] All personnel should be trained in basic life support techniques and, if possible, advanced cardiac life support.

10.1.1 Medical director: should be a licensed physician with an interest in and knowledge of PR, pulmonary function, and exercise evaluation.

10.1.2 Program director/coordinator: should be trained in health-related profession and have clinical experience and expertise in the care of patients with chronic lung disease. She or he should understand the philosophy and goals of PR and be knowledgeable in administration, marketing, education, patient training, and obtaining reimbursement.

10.1.3 Team members: each member should be well-trained in his or her specialty, demonstrate the ability to establish rapport with and convey the necessary knowledge and skills to patients, and have a good working knowledge of the skills of fellow team members. Each team member should be qualified in their area of expertise to access the patient's needs, provide appropriate intervention, and monitor patient outcomes.[94] The possession of credentials appropriate to each specialty is recommended, as well as appropriate licensing for each state. Persons responsible for pulmonary function testing, blood gas analysis, exercise testing, and those engaged in any patient educational training concerning needed therapy should demonstrate the knowledge and skills specified in the relevant AARC Clinical Practice Guidelines.[33-35,64,95-99] The information and recommendations provided to patients should be evidence-based and consistent across the program. Each team member must be aware of the content of each discipline's educational content.

10.2 Physical facilities

The physical area for PR can vary greatly depending upon program structure, patient population, needs, and resources. The site should provide an appropriate environment with adequate space, few interruptions or other distractions, sufficient lighting and temperature control, and comfortable seating. It is essential to have adequate parking and handicap access.

10.3 Patient education materials[97]

10.3.1 workbooks and videotapes[90]
10.3.2 lung and skeletal models
10.3.3 anatomical posters

10.4 Equipment

10.4.1 stethoscope
10.4.2 manual sphygmomanometer
10.4.3 pulse oximeter[33]
10.4.4 supplemental oxygen source
10.4.5 access to laboratory for arterial blood gas analysis[95]
10.4.6 stopwatch
10.4.7 calibrated cycle ergometer or motorized treadmill (Measured walking distance may be used if an ergometer or treadmill is not available.)[98]
10.4.8 free-weights or elastic bands
10.4.9 patient's own equipment, eg, metered-dose inhaler and spacer, compressor nebulizer for home use[99]
10.4.10 emergency plan and supplies[95]
10.4.11 EKG monitoring during exercise, if indicated, and defibrillation and crash cart[96]
10.4.12 spirometer
10.4.13 peak flow meter

11.0 MONITORING:

11.1 Patient: the following should be monitored at baseline and at appropriate intervals to assure validity of results and appropriateness of intervention:

11.1.1 patient's response to progressive and general reconditioning exercises in conjunction with breathing techniques

11.1.2 patient's oxygen requirements at rest and with exercise

11.1.3 knowledge and skills acquisition: demonstrations and questionnaires should be used to document evidence of change

11.1.4 patient's subjective comments

11.1.5 progress in achieving goals established at baseline

11.2 Patient clinical monitoring during scheduled, supervised session

11.2.1 patient appearance

11.2.2 vital signs

11.2.3 cardiac telemetry, if needed

11.2.4 perceived exertion and dyspnea (eg, use of Borg Scale)

11.2.5 O_2 saturation via oximeter

11.3 PR services: each program should establish clinical indicators that objectively measure the information and instruction provided to the patient and should document the outcomes. Content, goal orientation, and applicability should be reviewed on a regular basis.

12.0 FREQUENCY:

Training and informational components of PR should be delivered in a systematic manner to assure that all patient care issues are addressed. There should be repetition sufficient to ensure retention of information and skills. Giving the patient too much information at one time may cause confusion. Easy-to-read patient education materials should be used to complement and reinforce verbal instructions.[97] Program schedules vary according to staff, facilities, resources, budget, and patient needs.[100] PR services are commonly provided over a period of 12 hours per week for 6 or more weeks, governed by the patient's individual needs.[101] Patients are encouraged, when possible, to participate in an ongoing maintenance exercise program to sustain the training effect.

13.0 INFECTION CONTROL:

13.1 The staff, supervisors, and physicians associated with the PR program should be conversant with "Guideline for Isolation Precautions in Hospitals"[102] and develop and implement policies and procedures for the program that comply with its recommendations for Standard Precautions and Transmission-Based Precautions.

13.2 The program manager and its medical director should maintain communication and cooperation with the mother institution's infection control service and the personnel health service to help assure consistency and thoroughness in complying with the institution's policies related to immunizations, post-exposure prophylaxis, and job- and community-related illnesses and exposures.[103]

13.3 The importance of immunization for influenza[48] and pneumococcal pneumonia,[47] and avoidance of exposure during periods of high incidence of respiratory infections in the community should be stressed to patients. Staff members should receive the influenza vaccination.[104]

13.4 Patients and staff members with signs and symptoms of respiratory infection should avoid contact with patients.

13.5 Adequate handwashing[105] and proper ventilation with prescribed air exchanges should be assured.[106]

13.6 Equipment shared by patients much be cleaned and maintained appropriately. Specific procedures are provided in the 2001 update of static lung volume measurement (Section 13.4-13.7)[107] Proper cleaning methods for the patient's personal therapeutic equipment should be regularly reinforced.[59,97]

14.0 AGE-SPECIFIC ISSUES:

Instructions should be provided and techniques described in a manner that take into consideration the learning ability and communications skills of the patient being served.

14.1 Infant and Neonatal: This Guideline does not apply.

14.2 Pediatric: This Guideline is appropriate for children with indications who can be motivated and who can follow directions.

14.3 Geriatric: This Guideline is appropriate for members of the geriatric population with indications who are motivated and who can follow directions.

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