AACVPR
American Association of Cardiovascular and Pulmonary Rehabilitation

Promoting Health & Preventing Disease

The Best Kept Secret in Your Medical Neighborhood

Evidence Based Cardiac and Pulmonary Rehabilitation

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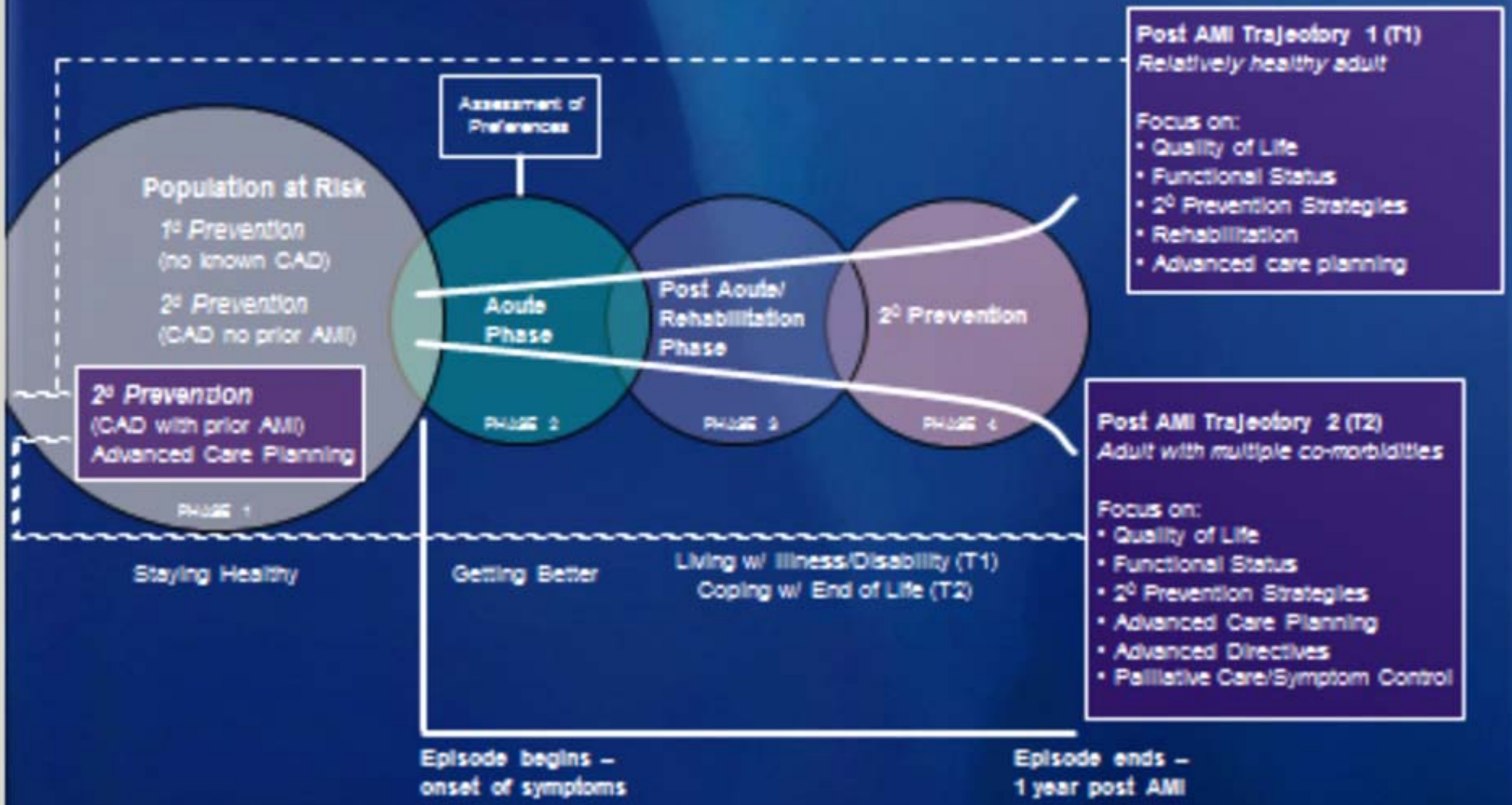
NQF's Evolving View of Quality Care: Importance of Longitudinal Measures



What is Cardiac Rehabilitation?

- Cardiac rehabilitation is a comprehensive exercise, education, and behavioral modification program designed to improve the physical and emotional condition of patients with heart disease
- Prescribed to control symptoms, improve exercise tolerance, and improve overall quality of life
- The primary goal of Cardiac Rehabilitation is to enable the participant to achieve his/her optimal physical, psychological, and social and vocational functioning through exercise training and lifestyle change
- Although traditional program models provide episode care, many are now providing longitudinal services, ranging from integration with home care to population health

The Comparative Effectiveness of Heart Disease Prevention and Treatment Strategies

Kottke TE et al, Am J Prev Med 2009;36(1):82–88)

- Model developed to calculate number of deaths prevented or postponed if perfect care for heart disease treatment was achieved
- Hypothetical population aged 30-84, 2007-2008
- 44% of deaths were from heart disease
- Perfect care included achieving guidelines recommendations for physical activity, diet, and medications

The Comparative Effectiveness of Heart Disease Prevention and Treatment Strategies

Kottke TE et al, Am J Prev Med 2009;36(1):82–88) © 2009 American Journal of Preventive Medicine

Results:

- Perfect care before first event would prevent or postpone 33% of prevented or postponed deaths
- Perfect care between events would prevent or postpone 23% of prevented or postponed deaths
- Perfect care during acute events would prevent or postpone 8% of prevented or postponed deaths

Impact of Physical Activity on Deaths Prevented or Postponed (DPP)

- Prior to diagnosis of heart disease
  - Meeting physical activity guidelines had most impact
  - Followed by diet, omega 3, tobacco cessation, BP control
- Heart disease without heart failure
  - Largest percent increase in DPP by increasing physical activity
  - Followed by coumadin, omega 3, tobacco cessation, ACEI, statins, beta blockers, aspirin, environmental tobacco
- Heart disease with heart failure
  - Largest percent increase in DPP by increasing physical activity
  - Followed by ICD, drugs, tobacco cessation

Cardiac Rehab is not Just Exercise!

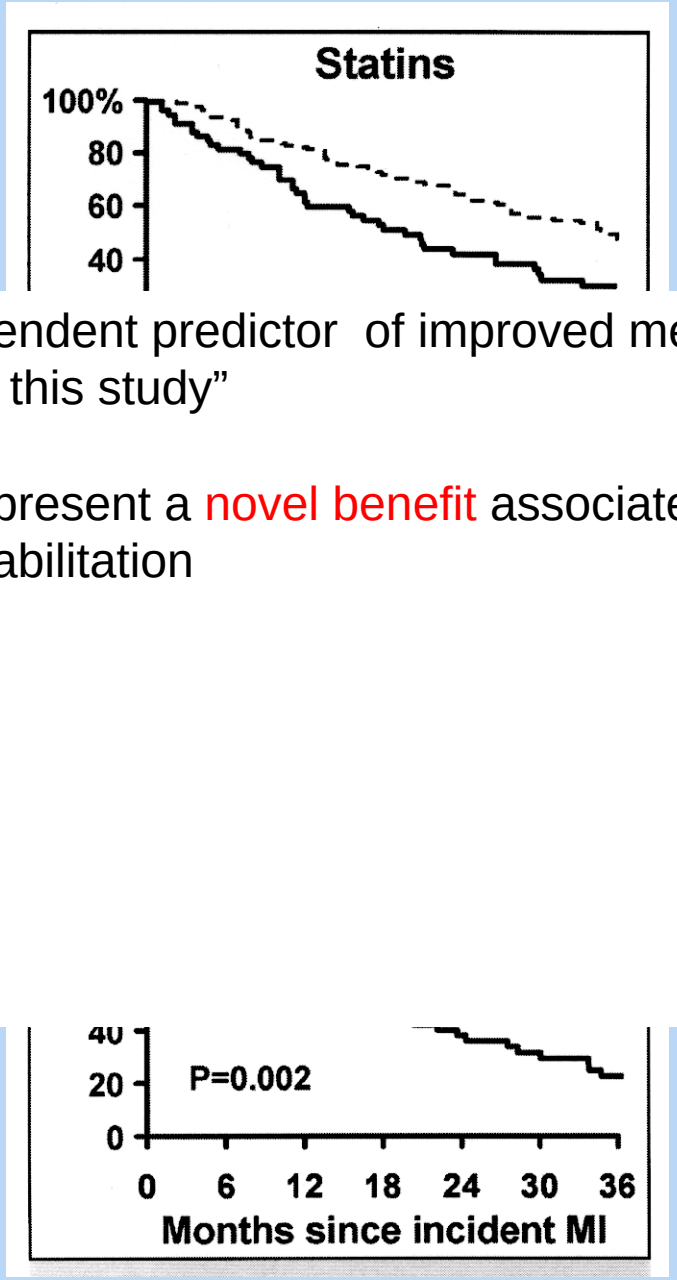
- Prescribed exercise to improve cardiovascular fitness without exceeding safe limits.
- Education about heart disease along with counseling on ways to stabilize or reverse heart disease by improving risk factors.
  - Reduction/Cessation of Smoking
  - Lowering Cholesterol
  - Controlling High Blood Pressure
  - Weight Loss/Control
  - Improve/Manage Diabetes
  - Increasing Physical Activity
- Encourage Healthy Eating Habits
- Improve Psychological Well Being

Known efficacy of CR for elderly

Table 4. Benefits of Cardiac Rehabilitation for Older Adults

Cardiac Rehabilitation Effects	Clinical Implication
Exercise training CV effects	
Increased functional capacity (10%–60%) with decrease myocardial work (10%–25%) at standardized work with 12 weeks of exercise training posthospitalization.	• Improved CV health, both in terms of plaque stability and CV work efficiency • Enhanced ability to perform ADLs and prolonged independence with aging
Training effect from improved skeletal muscle work capacity, although exercise may also improve health of the vasculature, autonomic balance, and cardiac performance.	Peripheral physiology is an important part of CV health
Absolute levels of functional gain are less in elderly than in younger cohorts, particularly for those patients ≥75 years of age.[4–6]	
Extended periods of training result in further modest gains.	Lifelong training is a worthwhile goal
Improved heart rate recovery	Decreased susceptibility to arrhythmia
Exercise training non-CV effects	
Enhanced quality of life	Improved self-efficacy and self-worth
Reduced depression	Improved quality of life
Decreased BMI and body fat	Improved metabolism and decreased inflammation, increased joint stability
Improved lipid profiles	Decreased CV events and mortality
Cardiac rehabilitation effects on diet and lifestyle	
Comprehensive assessment and management in relation to diet, medications, exercise that can compensate/reinforce compliance, monitor for iatrogenesis, and monitor/compensate for possible cognitive deficiencies.	Appropriate care for a population with predictable polypharmacy, multimorbidity, frailty, cognitive limitations, and atypical symptoms.

Fleg, Forman, et al. *Circulation.*2013;128:2422-46



Hazard Ratio

0.66

“Cardiac Rehabilitation was the sole independent predictor of improved medication adherence in this study”

“Improved medication adherence may represent a novel benefit associated with cardiac rehabilitation

Shah et al, Am J Med. 2009

Mortality Benefit from Cardiac Rehabilitation Participation

MI, Angina, CABG surgery 70,040 matched pairs of Medicare patients in 1997 *Suaya et al, J Am Coll Cardiol 2009*	34% relative risk reduction in mortality at 5 years Benefit seen in regardless of age, sex, or presence of heart failure
Percutaneous Intervention 2,395 patients from 1994-2005 Retrospective analysis from registry *Goel et al, Circulation 2011*	46% relative risk reduction mortality Median f/u 6.3 years
CABG surgery 846 patients from 1996-2007 Retrospective analysis from registry *Pack et al, Circulation 2013*	46% relative risk reduction in mortality at 10 years Absolute 10 year risk reduction 12.7%
CABG plus valve surgery 201 patients from 1996-2007 *Goel et al, Eur J Prev Cardiol 2013*	14.5% absolute risk reduction in morality at 10 years

Cardiac Rehab and Heart Failure

- Exercise reverses changes in muscle oxygen extraction, perfusion, and function caused by heart failure
- Supervised exercise is safe
- HF-Action Trial
  - Close relationship between volume of exercise and prognosis
  - 30% reduction in hospitalization and mortality
- Cochrane Review
  - 19 trials with 3647 participants
  - 28% reduction in hospitalization rates at 1 year
- ExTraMATCH meta-analysis
  - 801 patients in 9 studies
  - 2 year follow-up
  - 35% reduction in mortality

ACC/AHA Guideline Recommendations Recognize the Value of Cardiac Rehabilitation

Referral to Cardiac Rehabilitation

- Class I indication in clinical guidelines for
  - Myocardial Infarction
  - Percutaneous Coronary Intervention
  - Coronary Bypass Grafting
  - Chronic stable angina
  - Heart failure
  - Peripheral arterial disease
  - Cardiovascular prevention in women

Diagnoses Covered, Based on Evidence

- Medicare Coverage:
  - Stable Angina Pectoris
  - Myocardial Infarction
  - Coronary Artery Bypass Graft
  - Heart Transplant
  - Valve Surgery, including TAVR
  - Following PTCA/Stent
  - Heart Failure – Systolic, EF≤35%, stable for 6 weeks
- Private insurance coverage may vary and may cover
  - Peripheral Artery Disease with claudication
  - Other Heart Failure Patients
  - Other cardiovascular disease or surgery

Referral to Cardiac Rehabilitation Performance Measures

Referral to CR is included in ACC/AHA Performance Measure Sets for

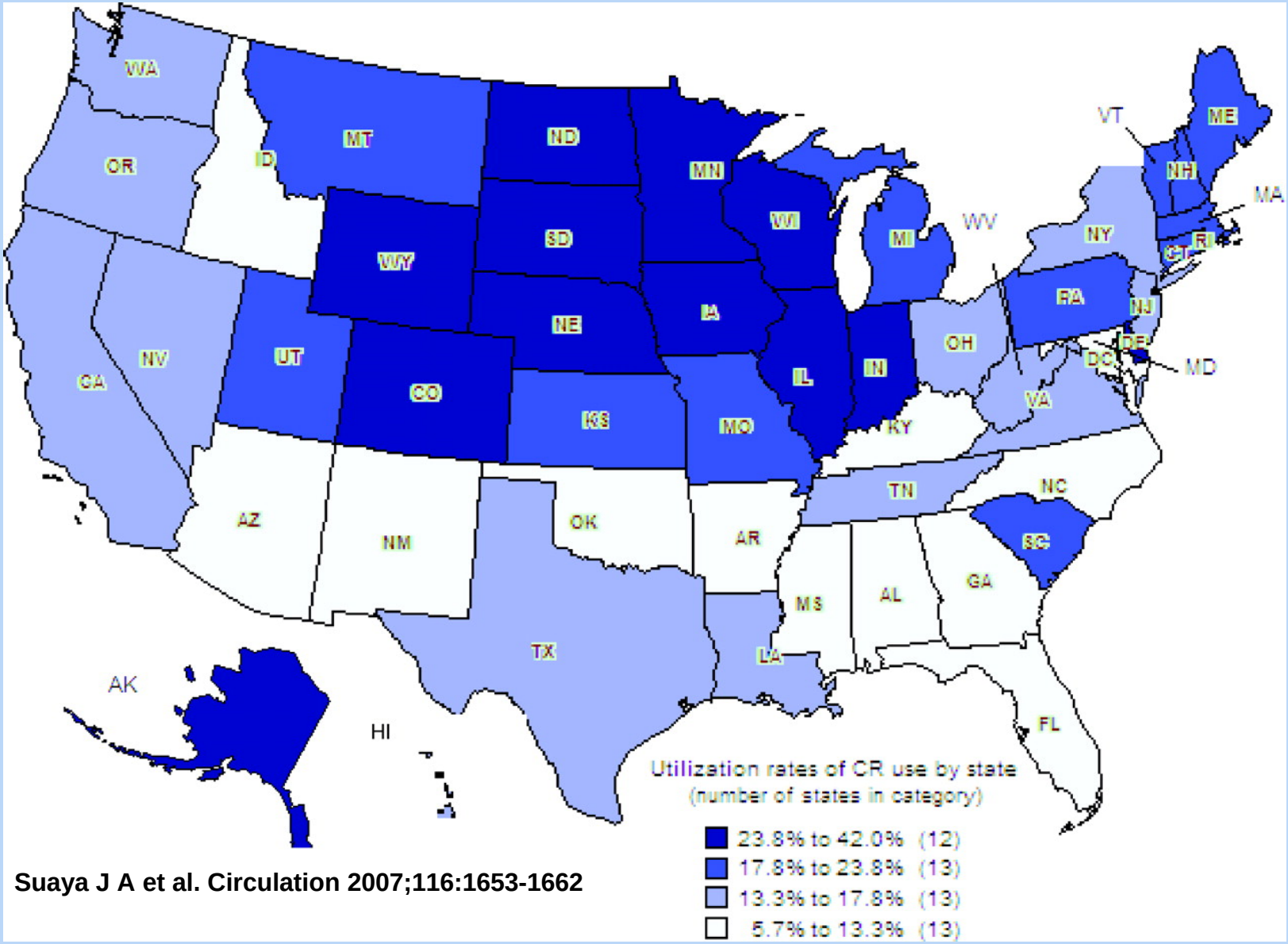
- Coronary Artery Disease
- Myocardial Infarction
- Percutaneous Intervention

and included in ACC/AHA Registries

- PINNACLE
- GWTG/Action
- Cath PCI

Plus included in PQRS as a quality measure

Geographic Variation in Cardiac Rehabilitation Participation



Suaya J A et al. Circulation 2007;116:1653-1662

Despite Evidence Showing Benefit, Cardiac Rehabilitation is Underutilized

- Of eligible patients, only 14-35% of heart attack survivors and approximately 31% of patients after CABG participate in cardiac rehabilitation

- Participation is lowest in women, minorities, socio-economically disadvantaged patients, and the elderly

JA Suaya, DS Shepard, ST Normand, PA. Ades, J Prottas, WB Stason. Use of Cardiac Rehabilitation by Medicare Beneficiaries After Myocardial Infarction or Coronary Bypass Surgery. *Circulation* 2007;116;1653-1662

AHA Presidential Advisory

Referral, Enrollment, and Delivery of Cardiac Rehabilitation/Secondary Prevention Programs at Clinical Centers and Beyond

A Presidential Advisory From the American Heart Association

Gary J. Balady, MD, FAHA, Chair; Philip A. Ades, MD; Vera A. Bittner, MD, FAHA; Barry A. Franklin, PhD, FAHA; Neil F. Gordon, MD, PhD, MPH; Randal J. Thomas, MD, FAHA; Gordon F. Tomaselli, MD, FAHA; Clyde W. Yancy, MD, MSc, FAHA

The remarkably wide treatment gap between scientific evidence of the benefits of cardiac rehabilitation and clinical implementation of rehabilitation programs is unacceptable.

Circulation. 2011;124:2951-2960

Barriers to Cardiac Rehabilitation Participation	Potential Solutions to Cardiac Rehabilitation Under-utilization
▪ Patient-oriented – Knowledge – Cost, travel concerns – Perceived need ▪ Provider-oriented – Referral – Competing concerns ▪ System-oriented – Insurance coverage – Program availability	▪ Patient-oriented *- Education* *- Flexible models, coverage* *- One-on-one, incentives* ▪ Provider-oriented *- Education, accountability* *- Systematic tools* ▪ System-oriented *- Coverage, accountability* *- Networks, new models*

Refs: (1) Gurewich D, JCRP 2008;28:380-5. (2) Dunlay SM, Am Ht J 2009158:852-9.

Patients who were automatically referred after talking with healthcare professionals or peer liaisons were the most likely to enroll in cardiac rehabilitation

Referral System	Percent Referred to CR	Percent Enrolled in CR
Combined automatic and liaison referral	85.8%	73.5%
Automatic referral	70.2%	60.0%
Liaison referral	59.0%	50.6%
Usual referral	32.2%	29.0%

Contemporary CR: Is it Time for an Updated Rationale and Design?

- Exercise surveillance (telemetry) usually less critical as patients less prone to arrhythmia
- Secondary prevention medications addressed in physicians' offices
- Return to work promptly is important for younger patients
- Older patients have complex needs

Is it time to rethink our program model – at least for some patients – and especially in light of healthcare payment reform which includes medical homes and neighborhoods?

Home-based versus centre-based cardiac rehabilitation

Cochrane Database of Systematic Reviews 2010

- Twelve studies (1,938 participants), majority of studies recruited a lower risk patient
- There was no difference in outcomes of home- versus center-based cardiac rehabilitation in
  - mortality
  - cardiac events
  - exercise capacity
  - modifiable risk factors (systolic blood pressure; diastolic blood pressure; total cholesterol; HDL-cholesterol; LDL-cholesterol)
  - proportion of smokers at follow up
  - health-related quality of life
  - healthcare costs

Using CR Expertise in Wellness and Prevention

- Evaluated a 6-month worksite health intervention using CR staff
- 308 employees and 31 spouses
- Randomized to active intervention versus usual care
- Active intervention included
  - Health education and counseling
  - Nutritional counseling
  - Smoking cessation counseling
  - Physical activity promotion
  - Selected physician referral

Milani and Lavie, Impact of Worksite Wellness Intervention on Cardiac Risk Factors and One-Year Health Care Costs. Am J Cardiol 1009;104:1389-1392

Using CR Expertise in Wellness and Prevention

Significant Improvements were noted in:

- Quality of life scores
- Behavioral symptoms
- High density lipoprotein cholesterol
- Diastolic blood pressure
- Health habits
- Total health risk

– Of employees categorized at high risk at baseline, 57% were converted to low risk status

– Average employee annual claim costs decreased by 48% for 12 months after the intervention

– Control employees claim costs remained the same

– Six-fold return on investment

Milani and Lavie, Impact of Worksite Wellness Intervention on Cardiac Risk Factors and One-Year Health Care Costs. Am J Cardiol 1009;104:1389-1392

Next Frontiers for Cardiac Rehabilitation

- Integrating cardiac rehabilitation into heart failure, stroke, and peripheral artery disease management
- Working with home care, medical homes, accountable care organizations, and community resources to improve patient engagement in healthy behaviors
- Leveraging cardiac rehabilitation expertise to enhance population health via worksite and other prevention and wellness programs

What About Pulmonary Rehabilitation?

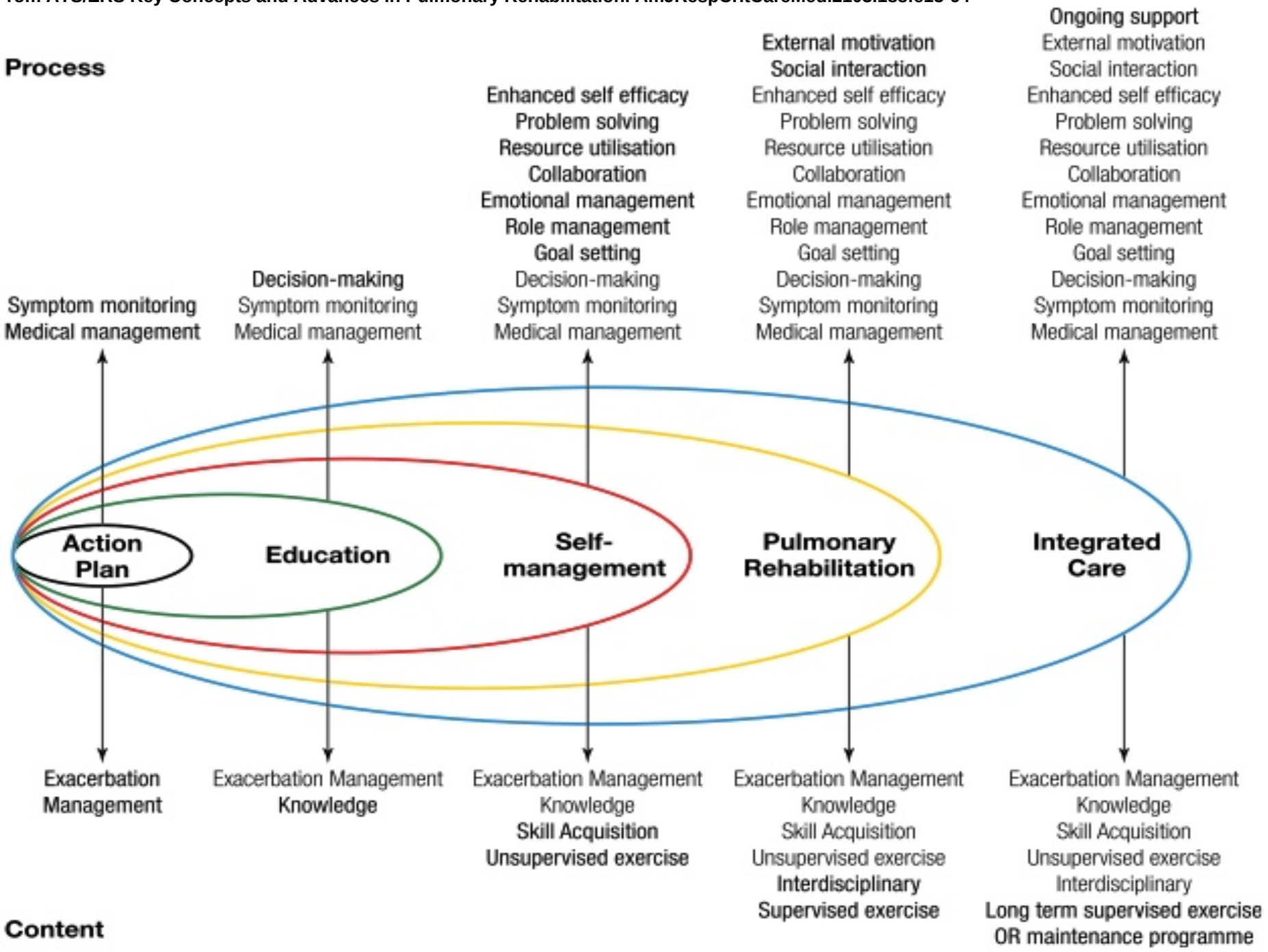
Pulmonary rehabilitation is a multidisciplinary program integrating

- Supervised Exercise (aerobic, strength-training, upper and lower)
- Education in Self Management Skills
- Monitoring (oximetry, symptoms)

Benefits of Pulmonary Rehabilitation

- Improves quality of life
- Increases functional capacity
- Decreases sensations of dyspnea
- Improves self management skills
- Decreases acute exacerbations of COPD
- Decreases acute care hospital utilization

From ATS/ERS Key Concepts and Advances in Pulmonary Rehabilitation. AmJRespCritCareMed.2103.188:e13-64



ATS/ERS Key Concepts and Advances in Pulmonary Rehabilitation. AmJRespCritCareMed.2103.188:e13-64

TABLE 7. CONDITIONS APPROPRIATE FOR REFERRAL TO PULMONARY REHABILITATION

Obstructive diseases
- COPD (including α_1-antitrypsin deficiency)
- Persistent asthma
- Diffuse bronchiectasis
- Cystic fibrosis
- Bronchiolitis obliterans

Restrictive diseases
- Interstitial lung diseases
- Interstitial fibrosis
- Occupational or environmental lung disease
- Sarcoidosis
- Connective tissue diseases
- Hypersensitivity pneumonitis
- Lymphangiomyomatosis
- ARDS survivors
- Chest wall diseases
- Kyphoscoliosis
- Ankylosing spondylitis
- Posttuberculosis syndrome

Other conditions
- Lung cancer
- Pulmonary hypertension
- Before and after thoracic and abdominal surgery
- Before and after lung transplantation
- Before and after lung volume reduction surgery
- Ventilator dependency
- Obesity-related respiratory disease

Definition of abbreviations: ARDS = acute respiratory distress syndrome; COPD = chronic obstructive pulmonary disease.

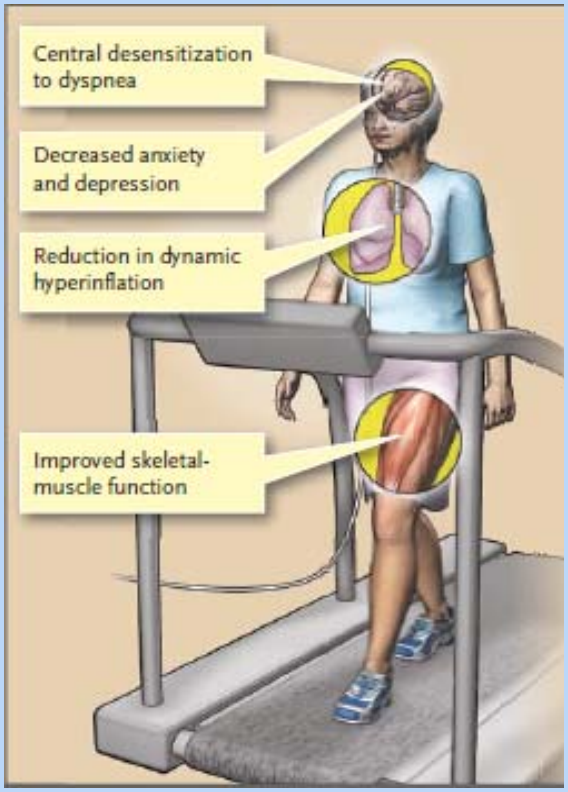
ATS/ERS Key Concepts and Advances in Pulmonary Rehabilitation. AmJRespCritCareMed.2103.188:e13-64

TABLE 8. INDICATIONS FOR INDIVIDUALS WITH CHRONIC RESPIRATORY DISEASE THAT COMMONLY LEAD TO REFERRAL TO PULMONARY REHABILITATION

- Dyspnea/fatigue and chronic respiratory symptoms
- Impaired health-related quality of life
- Decreased functional status
- Decreased occupational performance
- Difficulty performing activities of daily living
- Difficulty with the medical regimen
- Psychosocial problems attendant on the underlying respiratory illness
- Nutritional depletion
- Increased use of medical resources (e.g., frequent exacerbations, hospitalizations, emergency room visits, MD visits)
- Gas exchange abnormalities including hypoxemia

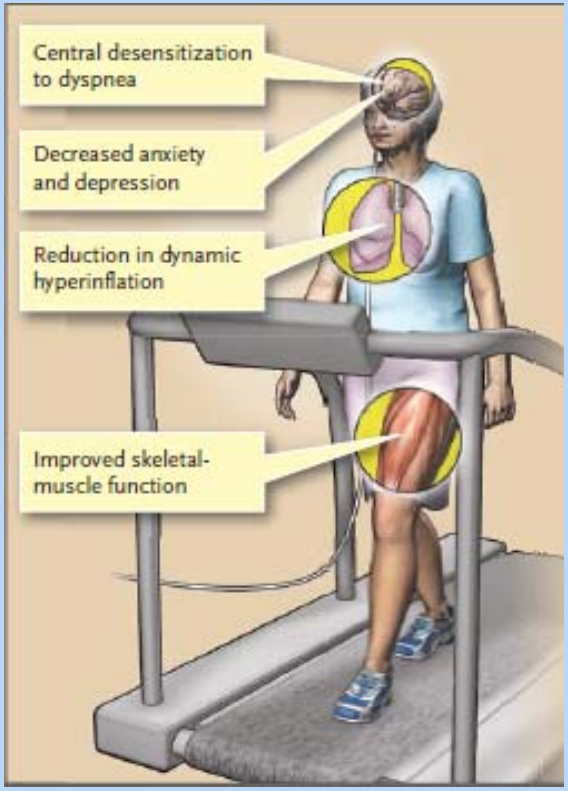
Targeted Outcomes of Pulmonary Rehabilitation

- **Exercise training does not improve lung function**
- Increasing exercise tolerance
  - Exercise training improves aerobic function of the muscles of ambulation.
  - Improves strength and endurance of secondary muscles of respiration
- Reducing dyspnea
  - Reduction in dynamic hyperinflation
  - Exercise training reduces the ventilatory requirement and respiratory rate during heavy exercise, prolonging the time allowed for expiration
  - Desensitization to dyspnea occurs centrally as a result of exercise training; underlying mechanism is uncertain.



Targeted Outcomes of Pulmonary Rehabilitation

- **Exercise training does not improve lung function**
- Improves quality of life
  - Decreased anxiety and depression are thought to result from increased exercise capacity and consequent increases in activities of daily living, coupled with feelings of mastery.



ATS/ERS Key Concepts and Advances in Pulmonary Rehabilitation. AmJRespCritCareMed.2103.188:e13-64

TABLE 4. EDUCATIONAL TOPICS CONCERNING SELF-MANAGEMENT

- Normal pulmonary anatomy and physiology
- Pathophysiology of chronic respiratory disease
- Communicating with the health care provider
- Interpretation of medical testing
- Breathing strategies
- Secretion clearance techniques
- Role and rationale for medications, including oxygen therapy
- Effective use of respiratory devices
- Benefits of exercise and physical activities
- Energy conservation during activities of daily living
- Healthy food intake
- Irritant avoidance
- Early recognition and treatment of exacerbations
- Leisure activities
- Coping with chronic lung disease

ATS/ERS Key Concepts and Advances in Pulmonary Rehabilitation. AmJRespCritCareMed.2103.188:e13-64

TABLE 5. EDUCATIONAL TOPICS CONCERNING ADVANCE CARE PLANNING

- Diagnosis and disease process
- Prognosis
- Patient autonomy in medical decision-making
- Life-sustaining treatments
- Advance directives documents
- Surrogate decision-making
- Durable powers of attorney for health care
- Discussing advance care planning with health care professionals and family caregivers
- Process of dying
- Prevention of suffering

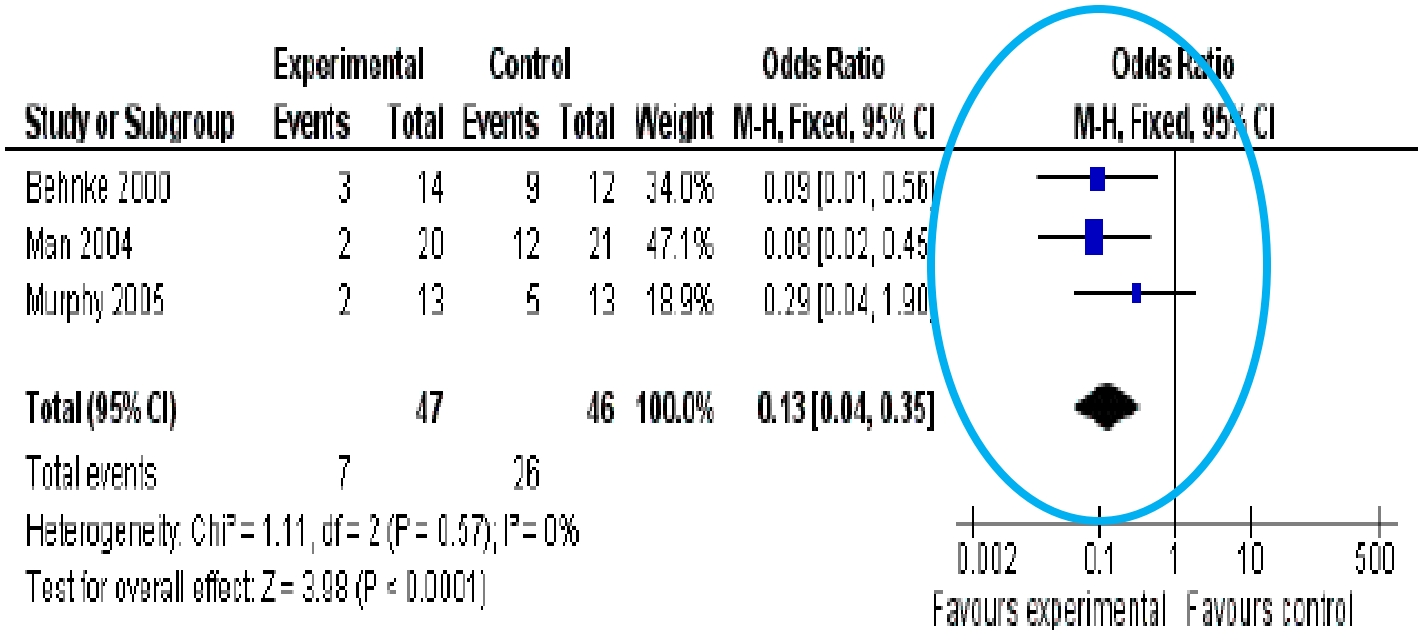
Evidence for Outpatient Pulmonary Rehabilitation

	Functional Capacity*	Dyspnea	QOL	Health Care Utilization	Mortality	O_2 with Hypoxemia	O_2 w/o Hypoxemia
COPD	1A	1A	1A	2B	X	1C	2C
Others	1B	1B	1B	X	X	X	X

*1A evidence for both upper& lower extremity training

Effect of Pulmonary Rehabilitation on Hospitalization Rate

Figure 2. Forest plot of comparison: 1 Rehabilitation versus control, outcome: 1.1 Hospital admission (to end of follow-up).



Lacasse et al, Pulmonary rehabilitation for chronic obstructive pulmonary disease. Cochrane, 2006

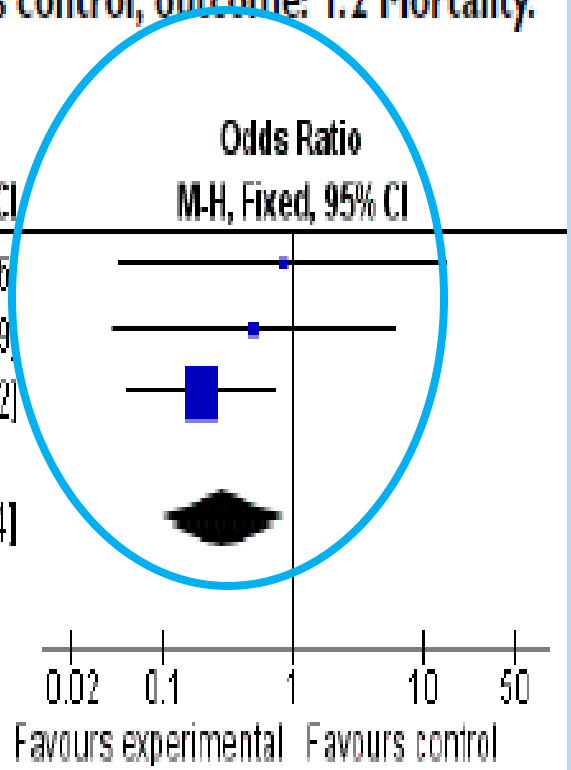
Effect of Pulmonary Rehabilitation on Mortality

Figure 4. Forest plot of comparison: 1 Rehabilitation versus control, outcome: 1.2 Mortality.

Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Odds Ratio M-H, Fixed, 95% CI
Behnke 2000	1	14	1	12	7.8%	0.85 [0.05, 15.16]
Man 2004	1	20	2	21	14.4%	0.50 [0.04, 5.99]
Troosters 2000	6	24	12	19	77.9%	0.19 [0.05, 0.72]
Total (95% CI)		**58**		**52**	**100.0%**	**0.29 [0.10, 0.84]**
Total events	8		15			

Heterogeneity: Chi² = 1.07, df = 2 (P = 0.59); I² = 0%

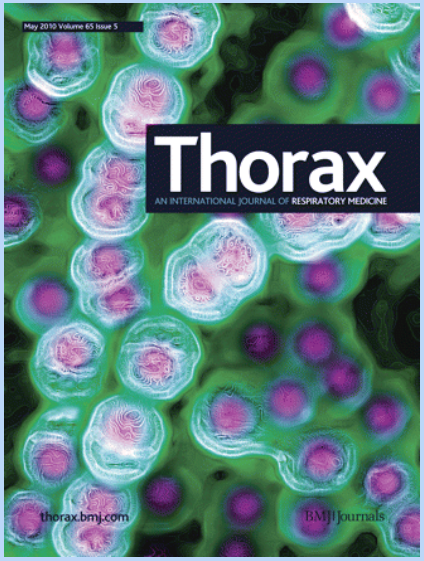
Test for overall effect: Z = 2.29 (P = 0.02)



Lacasse et al, Pulmonary rehabilitation for chronic obstructive pulmonary disease. Cochrane, 2006

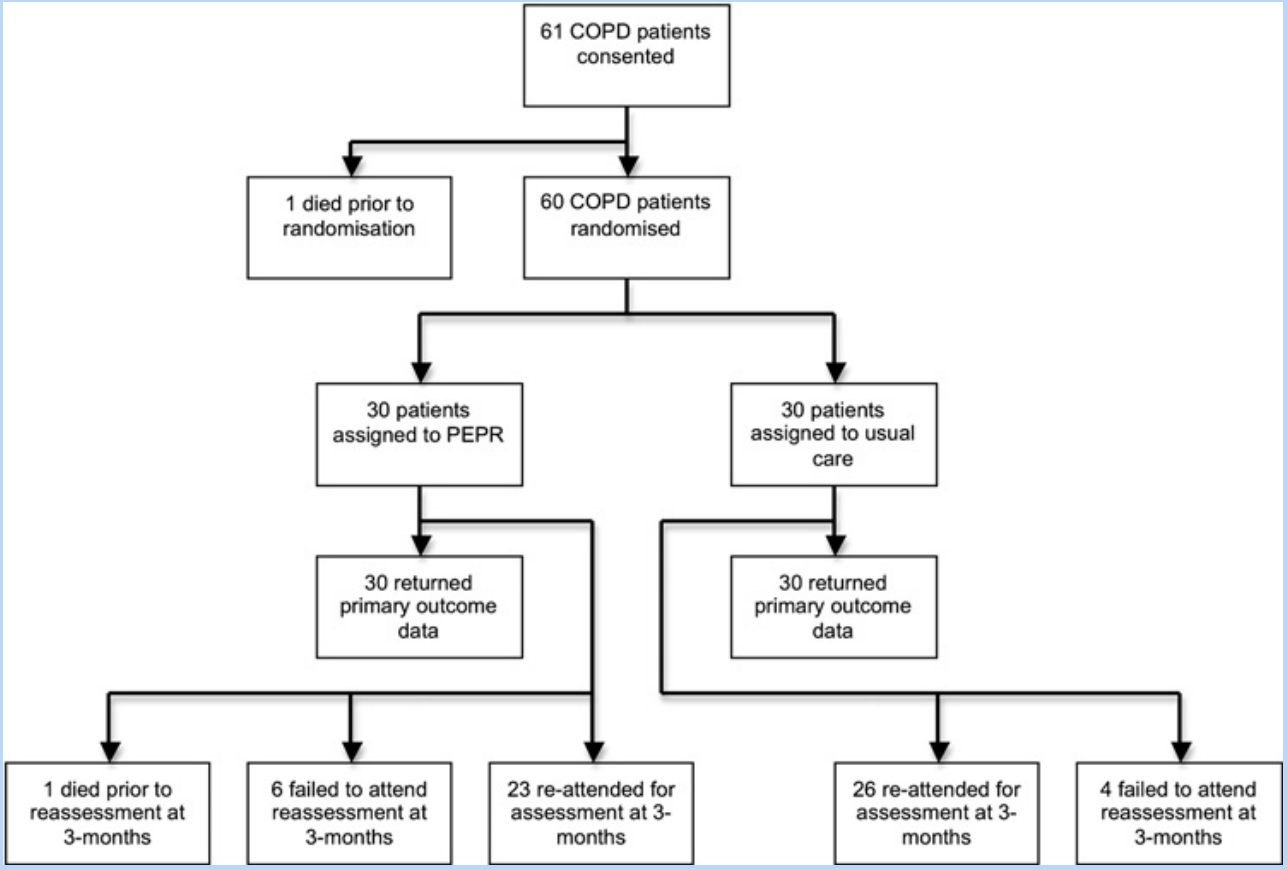
Outpatient Pulmonary Rehabilitation Following Acute Exacerbations of COPD

- Exacerbations of chronic obstructive pulmonary disease (COPD) are characterized by increased dyspnea, reduced quality of life and muscle weakness. Re-exacerbation and hospital admission are common.
- Tested the hypothesis that pulmonary rehabilitation following a COPD exacerbation can reduce subsequent hospital admissions over a 3-month period.



John M Seymour, Lauren Moore, Caroline J Jolley, Katie Ward, Jackie Creasey, Joerg S Steier, Bernard Yung, William D-C Man, Nicholas Hart, Michael I Polkey, John Moxham. *Thorax* 2010;65:423e428.

Methods



The PR programs used were standard programs that consisted of two 2-hour sessions per week for 8 weeks that included aerobic exercise as well as upper- and lower-extremity strength training.

Results

- The PR group completed 77% of the scheduled sessions.
- In the 3 months following study enrollment, 12/60 patients were readmitted for COPD exacerbation and an additional 13/60 were treated in the emergency department for an exacerbation (p=0.02).
- For both, the ***PR group had significantly less re-hospitalization*** (PR=7% vs. usual care=33%).
- Additionally, the ***usual care group sought care earlier*** following hospitalization than the PR group (median + 16 days vs. median +48 days, $p < 0.01$).
- Secondary findings also report ***improvement in quadriceps strength*** ($p < 0.01$) in the PR group that is thought to explain improvement seen in exercise capacity.
- ***Quality of life was also improved*** in the PR group.

Conclusions

- This study provides ***support for the use of early intervention in the form of PR*** following hospitalization.
- While improvements in exercise capacity and quality of life are well-known benefits of PR, this study describes ***reduction in re-hospitalization and emergency department use*** in this group.
- The authors suggest that the ***frequent contact with PR professionals improves health care utilization***.

Thank you
Any Questions?