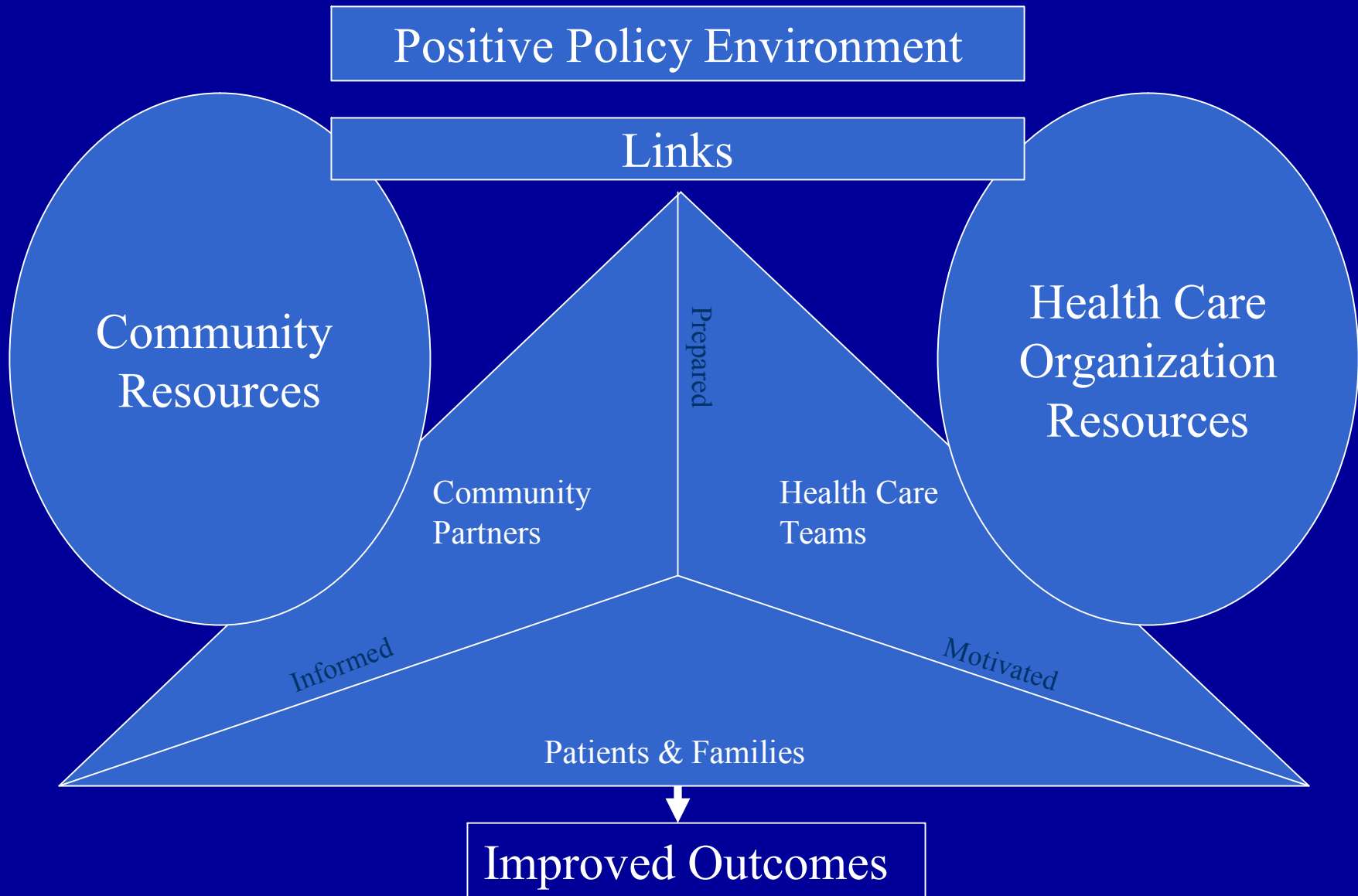


# Update on Pulmonary Rehabilitation

David Coultas, MD  
University of Texas  
Health Science Center-Tyler

# Innovative Care for Chronic Conditions

Epping-Jordan et al. Qual Saf Health Care 2004;13:299-305



# Objectives

- The rationale for pulmonary rehabilitation (PR).
- The methods and results of PR in stable COPD.
- The role of PR in acute exacerbation.
- Future directions.

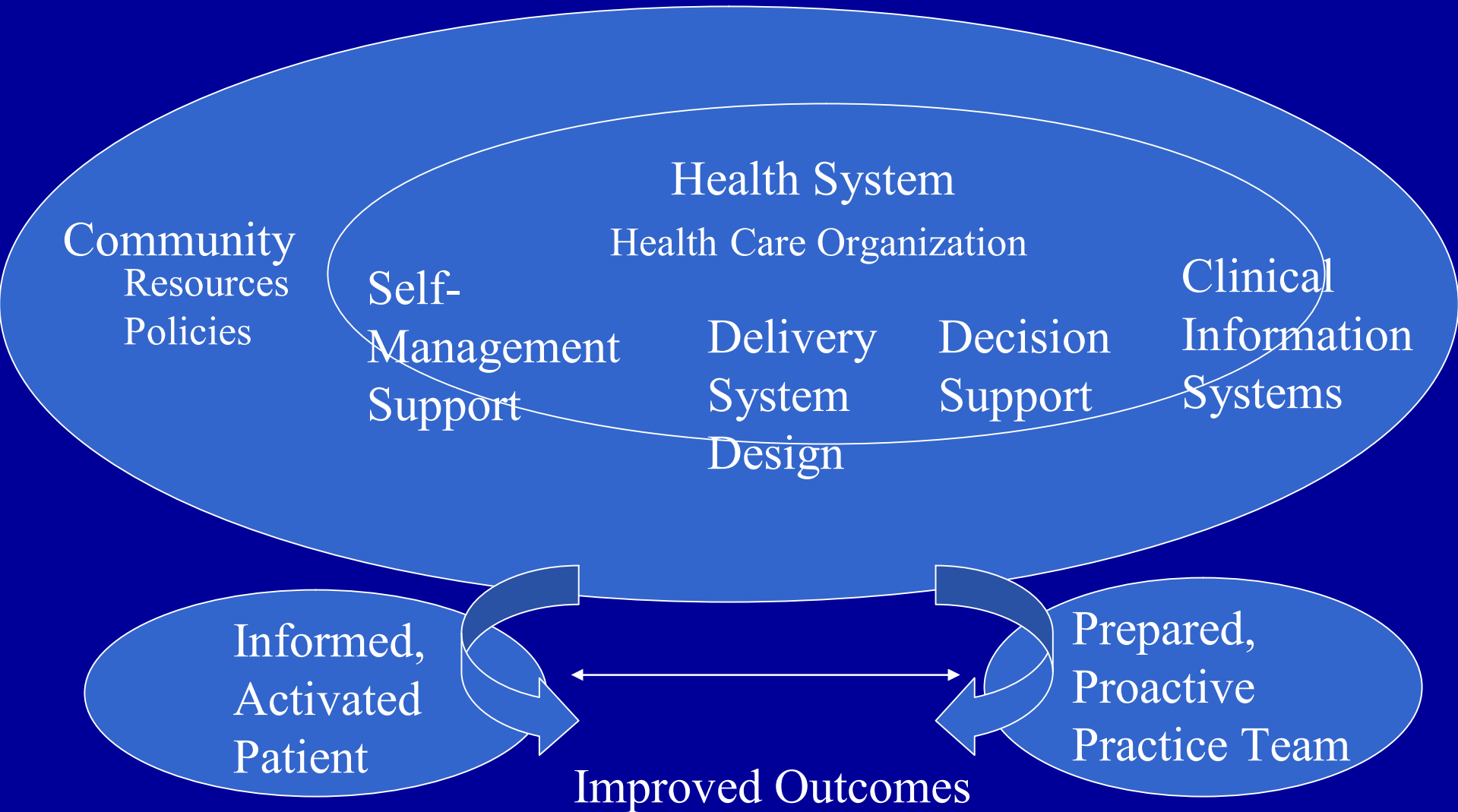
Efficacy vs. Effectiveness?

# Questions

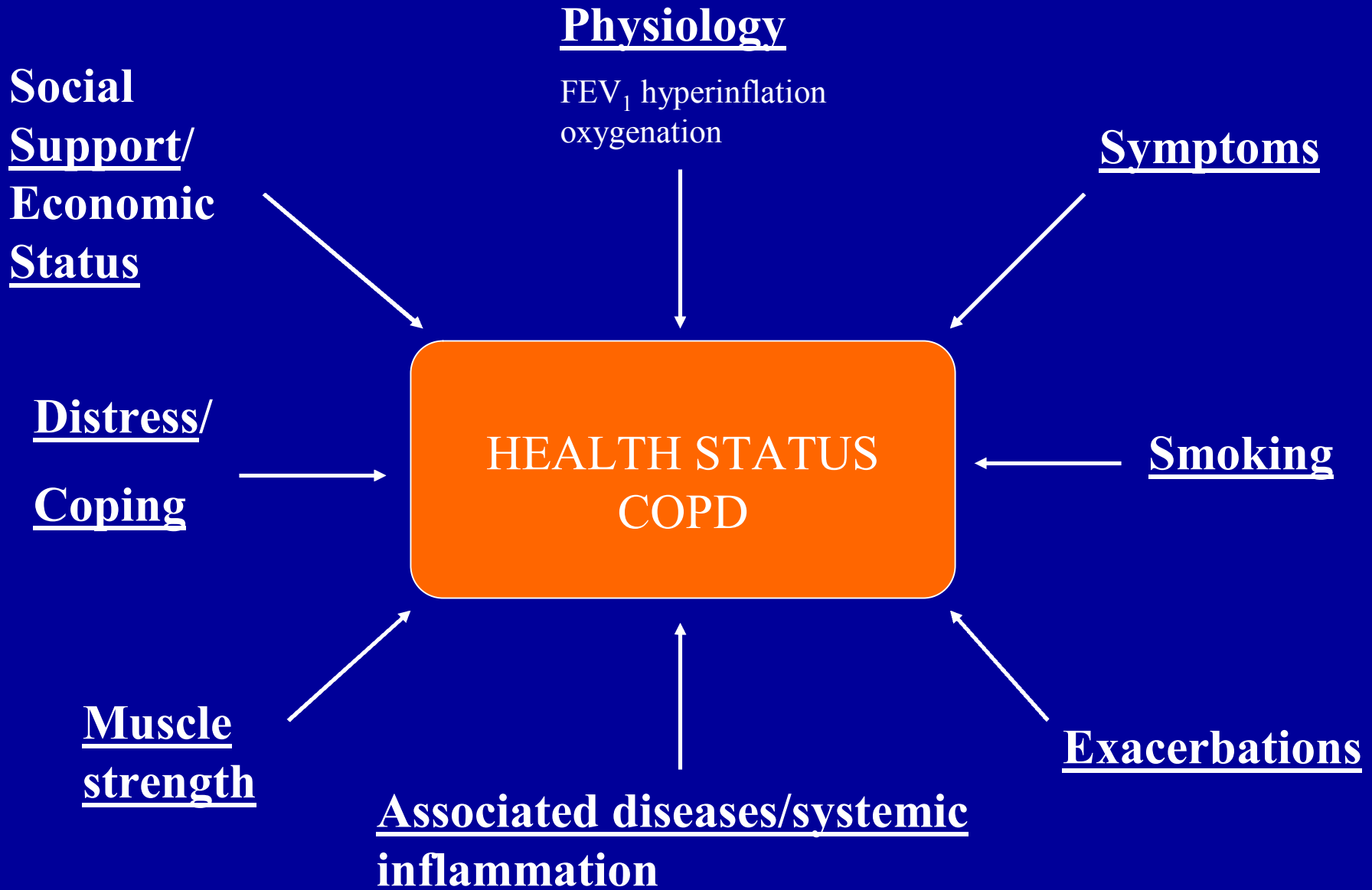
- What proportion of patients with COPD utilize pulmonary rehabilitation (PR)?
- What factors limit utilization and effectiveness of PR?
- What is the role of PR in chronic management and acute exacerbation?

# Chronic Care Model

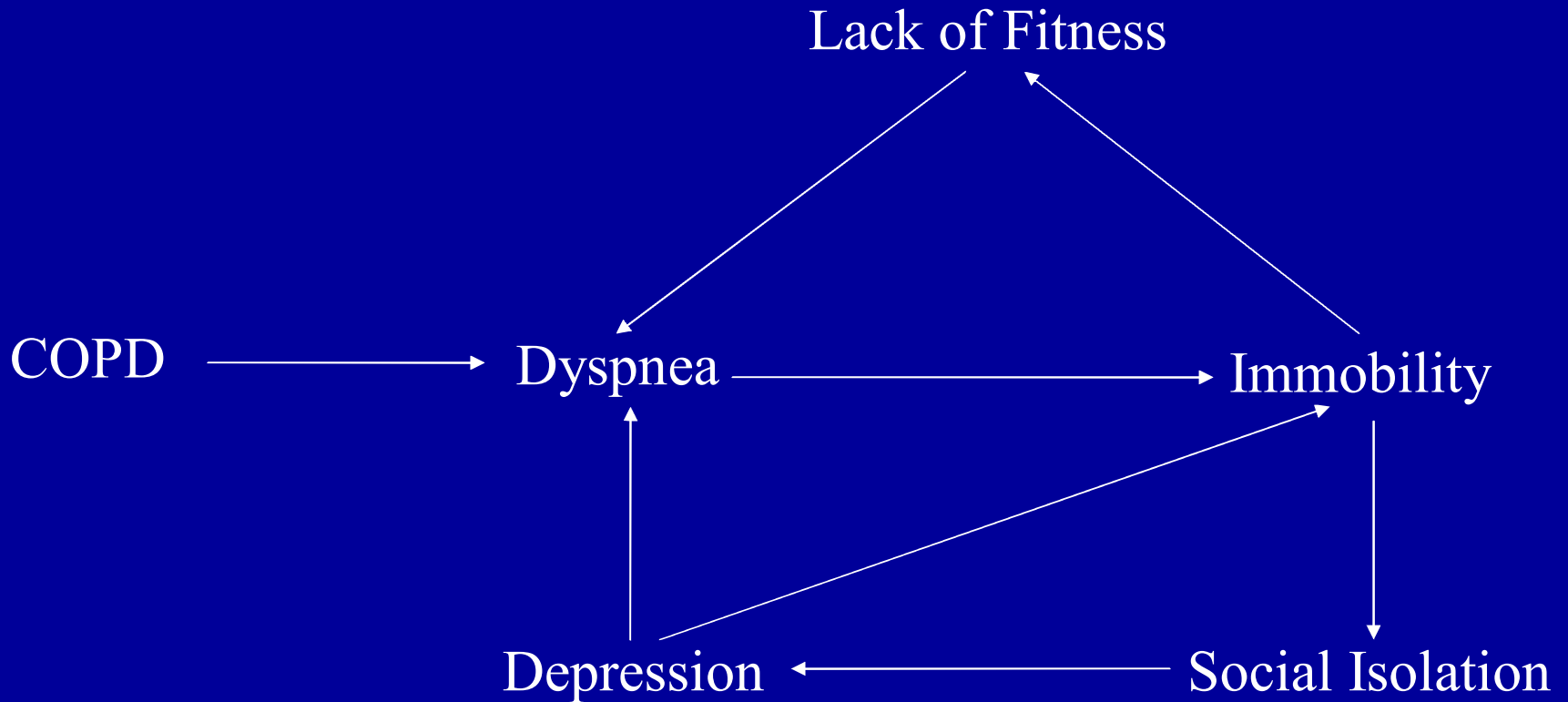
Wagner et al. Managed Care Quarterly 1999;7:56-66



# Determinants of Health Status in COPD



# Physical, Social, Psychological Consequences of COPD



# PR and COPD Management

- Chronic stable
  - Non-homebound
  - Homebound
- Acute exacerbation
  - Hospital phase
  - Post-hospital

# Chronic Stable Management

# Current State of COPD Management

- COPD is often under- and over-diagnosed.
- Patients are under- and over-treated.
- Fewer than 1-2% have access to PR.

# Pulmonary Rehabilitation

- “...an evidence-based, multidisciplinary, and comprehensive intervention for patients with chronic respiratory diseases who are symptomatic and often have decreased daily life activities. Integrated into the individualized treatment of the patient, pulmonary rehabilitation is designed to reduce symptoms, optimize functional status, increase participation, and reduce health care costs through stabilizing or reversing the systemic manifestations of the disease.”  
Am J Respir Crit Care Med 2006;173:1390-413.

# Components of PR

- Self-management education
- Exercise training
- Psychosocial support

# Efficacy of PR

Lacasse et al. Cochrane Rev 2006;4:CD003793

- Meta-analysis of 31 randomized trials
  - 667 rehabilitation, 609 controls
- PR=Exercise training for at least 4 wks with/without education and/or psychological support

# Efficacy of PR

Lacasse et al. Cochrane Rev 2006;4:CD003793

## Setting

- Inpatient (n=4)
  - Outpatient (n=16)
  - Community (n=1)
  - Home (n=10)
- 
- Duration: median 10 wks (4-52 wks)

# Results of PR

- Clinically and statistically significant improvements regardless of setting:
  - Dyspnea
  - Quality of life
  - Functional performance
    - (e.g., 6-min walk)
  - Maximal exercise performance

# Psychosocial Outcomes

- Pulmonary rehabilitation may improve psychosocial morbidity without specific psychological interventions

Guell et al. Chest 2006;129:899-904.

- Coping may be enhanced by peer interactions

Cicutto et al. Patient Educ Counseling 2004;55:168-76

# PR vs. Pharmacological Rx

- Improvements in quality of life and functional performance at least as great as pharmacological treatments

# Center-based vs In-home Rehab

- Home-based rehab is efficacious
  - Maltais et al. Ann Intern Med 2008;149:869
- Higher adherence with home-based rehab
- Non-supervised regular brisk walking provides similar results in health status and exercise tolerance

# Limitations and External Validity

- Selection bias
  - 60% of eligible patients refuse
  - Program setting: referral/center-based
- Feasibility of methods
  - Multi-disciplinary team
  - Maximal exercise testing

# Factors Influencing Results

- Patient
  - Negative perception of exercise
  - Fear
  - Motivation
  - Self-efficacy
  - Muscle weakness
  - Co-morbidity
  - Medical management
- Program
  - Components
  - Dose (frequency, intensity, duration)
  - Attitudes and skills of team

Efficacy vs. Effectiveness?

# Effectiveness of PR

- J Cardiopulm Rehab 2004;24:52-62.
  - Improvements in dyspnea, QOL, healthcare utilization
  - No improvement for 2/9 programs
- J Cardiopulm Rehab 2006;26:231-6.
  - Decreased healthcare utilization and costs

# Pilot Study: In-Home Rehab for Homebound Patients with COPD

- CMS pays for up to 25 home visits for homebound patients, but no standardization of intervention
- Homebound = not driving independently and require a 'taxing' effort to leave home

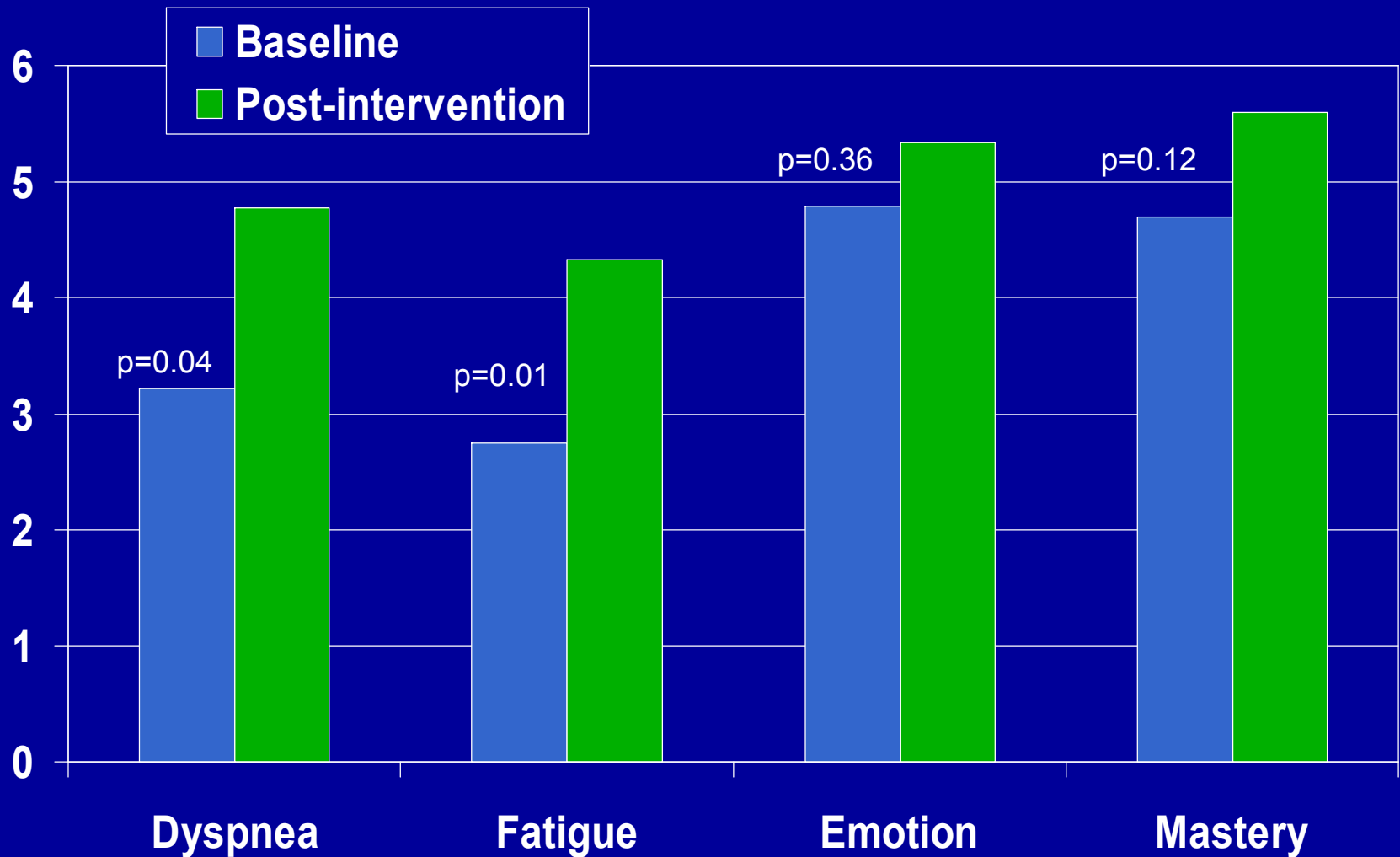
# In-Home Study for Homebound Patients with COPD

- Intervention delivered over 8 weeks up to 25 sessions
  - Education and physical therapy emphasizing strengthening or aerobic activity
- 20 patients enrolled
  - Mean age=70.7, male 70%
  - Mean FEV1=0.76 (28.6% predicted)

# In-Home Results at 8 wks (n=10)

CRQ Domain	Baseline (SD)	Post-intervention (SD)	p-value
Dyspnea	3.22 (1.87)	4.77 (1.27)	0.04
Fatigue	2.75 (1.57)	4.33 (0.61)	0.01
Emotion	4.79 (1.63)	5.33 (0.82)	0.36
Mastery	4.69 (1.45)	5.60 (0.99)	0.12
2MWT	47.8m (14.1)	44.4m (15.3)	0.63

# CRQ Results at 8 wks (n=10)



# Challenges of PR

- Adherence
- Success
- Maintenance

# Program Adherence

- >20% do not complete program
  - Decreased quadriceps strength
  - Higher smoking pack-years
  - Depression
  - Low self-efficacy
  - Social isolation

# Program Success

- 65%-80% improve
- Varies with outcome
  - Exercise capacity: response associated with less ventilatory limitation and reduced muscle strength
  - Quality of life: no clear predictors of response

# Maintenance

- Benefits gradually decline over 12 to 18 months
- Possible methods to sustain benefits
  - Continuous or repeating program
  - Regular physical activity, exercise

# Addressing Challenges in PR

- Access
  - Policy
  - Program
  - Physician
  - Patient
- Program
  - Adherence
  - Success
  - Maintenance

# Factors Influencing Access

- Policy
  - Reimbursement
- Programs
  - Number
  - Settings

# Factors Influencing Access

- Physician
  - Knowledge
  - Recommendations/Referrals

# Factors Influencing Access

- Patient
  - Physician recommendation
  - Desire for self-help, perceived benefit
  - Depression
  - Social isolation
  - Transportation, time

# Components of PR

- Self-management education
- Exercise training
- Psychosocial support

# Self-management Programs

- Teach skills needed to carry out disease specific medical regimens, guiding change in health behavior, and providing emotional support to enable patients to adapt to their illness for optimal function and control of their disease

# Components of Self-management

- COPD knowledge
- Self-efficacy support
- Symptom management
  - Medications/oxygen
  - Breathing technique
  - Energy conservation
  - Relaxation
  - Coping
  - Action plan
- Lifestyle change
  - Smoking cessation
  - Exercise/physical activity
  - Nutrition
- Social support
  - Communication
  - Social interactions
  - Social services

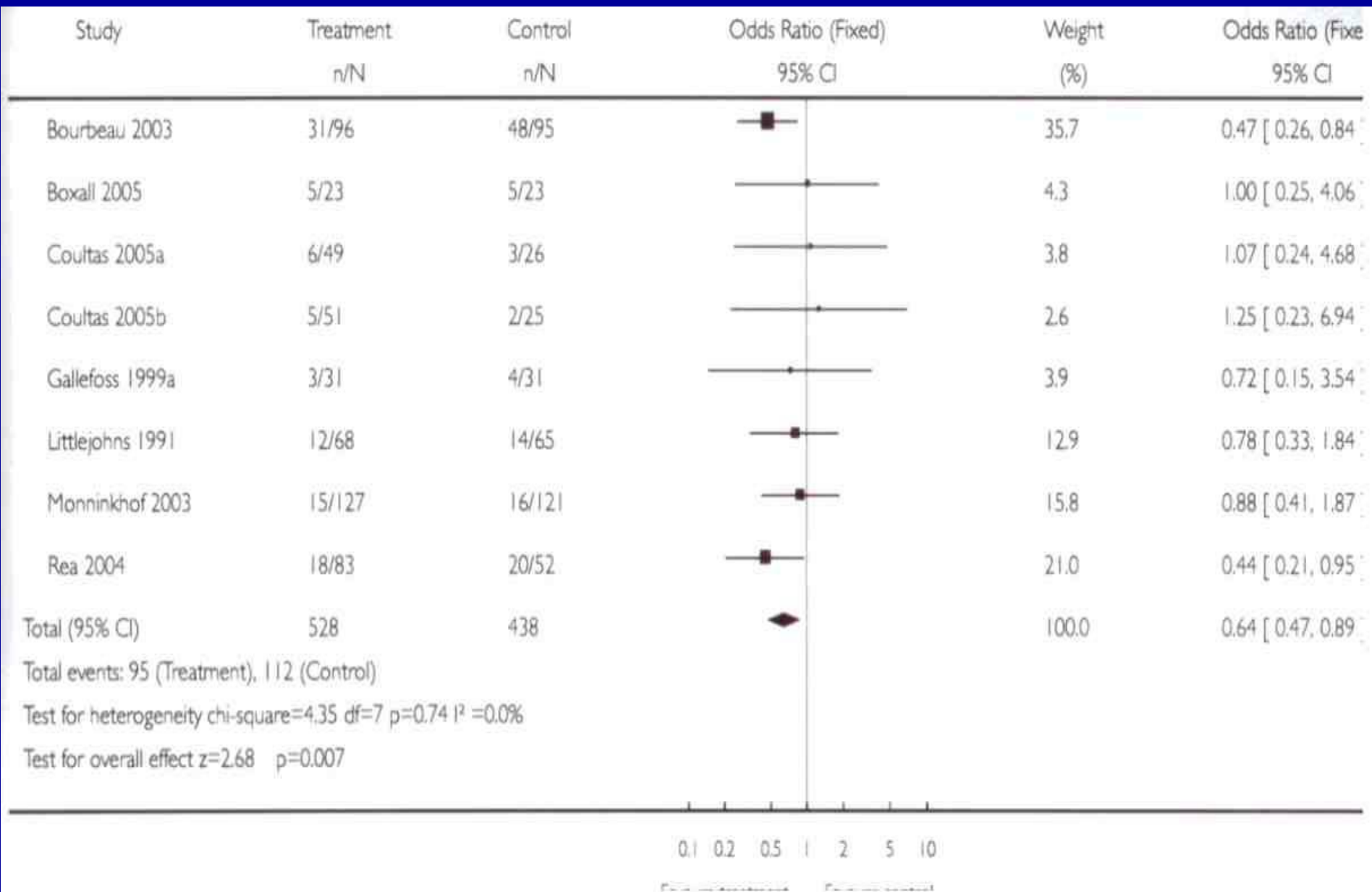
# Self-management Education

- Effing et al. Cochrane Database Syst Rev 2007;4:CD002990.
  - Self-management education
- Adams et al. Arch Intern Med 2007;167:551-61
  - Chronic illness care model
- Peytremann-Birdevaux et al. Am J Med 2008;121:433-43.
  - Disease management

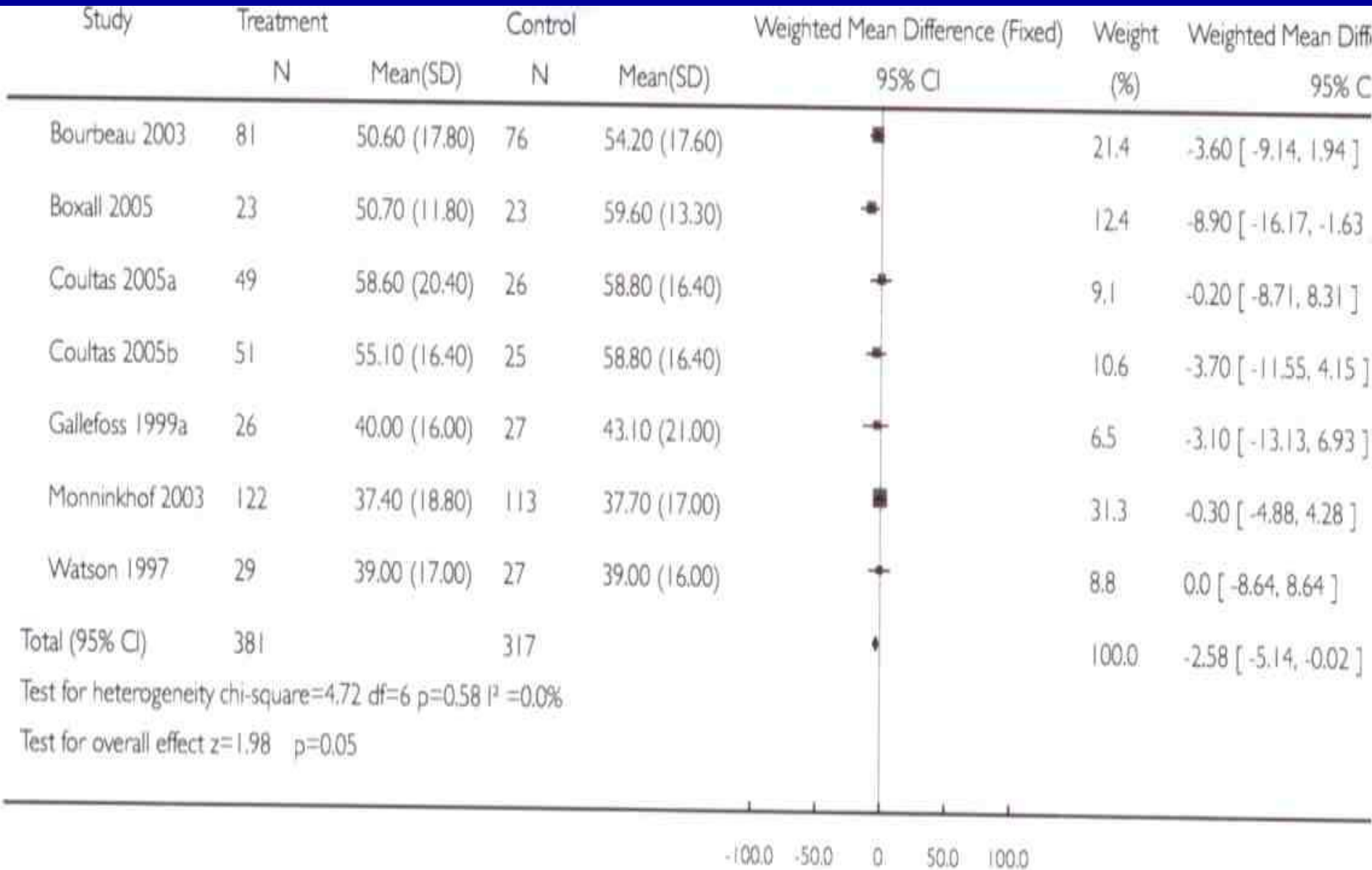
# Self-Management Education

- Effing et al. Cochrane Database Syst Rev 2007;4:CD002990.
  - 14 randomized trials of COPD self-management education
  - Reduction in hospitalizations (OR 0.64 [0.47-0.89]) and improved quality of life (did not achieve clinical significance)

# Respiratory-related Hospitalizations



# SGRQ total



Adams et al. Arch Intern Med  
2007;167:551-61

- 32 studies: self-management, delivery system design, decision support, clinical information systems
- No improvements in symptoms or QOL
- Decreased healthcare utilization with two or more components

Peytremann-Birdevaux et al. Am J Med  
2008;121:433-43.

- 13 studies of disease management
  - $\geq$  2 self-management, exercise, structured follow-up
  - $\geq$  2 health professionals
  - $\geq$  12 months for at least one component
- Improved QOL, exercise capacity, and lower hospitalization

# Self-management Education

- Variation between studies in content and methods prevent specific recommendations
- Self-management is necessary, but may be insufficient for improving outcomes

# Exercise Training

- Endurance training key component of pulmonary rehabilitation
- Enhance self-efficacy
- Dyspnea/fatigue 4-6, 10-point Borg scale
- Interval training effective
- Supervision/monitoring needed

Am J Respir Crit Care Med 2006;173:1390-413.

# Strategies to Enhance Self-efficacy

- Personal experience and practice in safe setting
- Feedback and reassurance
- Analysis of negative experiences/failures
- Learning from peers

Bourbeau et al. Patient Educ Counseling 2004;53:271-7.

# Borg Rating of Perceived Exertion Scale

0.....	Nothing
1.....	Very Weak
2.....	Weak
3.....	Moderate
4.....	Somewhat Strong
5.....	Strong
6.....	
7.....	Very Strong
8.....	
9.....	
10.....	Extremely Strong Almost Maximal
11.....	Maximal

# Borg Scale

- The rating of perceived exertion should reflect how strenuous the activity feels to you combining all sensations including shortness of breath, fatigue, effort. Don't just focus on one feeling.
- 4 is somewhat hard, but feels okay to continue.
- Use the scale to increase or decrease the intensity of activity.

# Future Research

- Physical activity self-management in patients with COPD

# Structured Exercise vs Physical Activity

- Randomized trial
  - Supervised, structured exercise 6 months
  - Lifestyle physical activity intervention 24 months
    - 6 intensive
    - 18 maintenance
- Psychological models
  - Stages of motivational readiness
  - Social cognitive theory

Dunn AL et al. JAMA 1999; 281:327-334.

# Lifestyle Physical Activity Intervention

- 6 months
  - Group meetings with facilitator 1 night/wk for 16 wks, biweekly for 8 wks, home workbook
  - 5 cognitive and 5 behavioral skills
  - Goal: 30 min, moderate level physical activity, most/all days/wk
- 6-24 months
  - Tapering meeting schedule

# Structured Exercise

- Supervised, structured exercise
  - 50%-85% of maximal aerobic capacity for 20-60 min
  - 3-5 sessions/wk
  - 6 months

# Results

- Among healthy sedentary, physical activity intervention as effective as structured exercise at increasing physical activity and exercise capacity

# Physical Activity, Self-management

- Test effectiveness of a home-based COPD physical activity, self-management intervention compared to usual care
  - Outcomes: 6-minute walk, CRQ, cost-effectiveness

# Proposed Intervention

- Self-management education
- Lifestyle physical activity intervention  
(Active Living Every Day-ALED)

Dunn AL et al. JAMA 1999; 281:327-334.

# Active Living Every Day

- Adoption (weeks 1-8)
- Action (weeks 9-28)
- Maintenance (weeks 29-72)

# Physical Activity Intervention

- Trained health educator
- Active Living Every Day
  - 20 module workbook
- Computer-assisted telephone follow-up

# Acute Exacerbations

In-hospital

Post-hospital

# Physical Activity and Exacerbation of COPD

Pitta et al. Chest 2006;129:536-44

- After admission physical activity reduced to 6-7 minutes/day for >1 month
- Muscle strength declines
- Outdoor physical activity reduced up to 5 weeks after an exacerbation

# Pulmonary Rehabilitation following Exacerbation of COPD

Cochrane Collaboration 2009

- 6 RCT with 219 patients.
- In- or out-patient rehab ( $\geq$  physical exercise) immediately after or up to 3 wks after acute hospital care.

# Pulmonary Rehabilitation following Exacerbation of COPD

Cochrane Collaboration 2009

- Hospital admission – OR =0.13 (0.04,0.35)
  - NNT-3 (2,4)
- Mortality – OR=0.29 (0.10,0.84)
  - NNT-6 (5,30)
- Clinically and statistically significant improvements in HRQOL and exercise capacity
- No adverse events.

# Pulmonary Rehabilitation: Conclusions

- Improves QOL and functional performance
- Decreases healthcare utilization

# Pulmonary Rehabilitation: Future Directions

- Need to increase access
  - Policy changes to increase funding
  - Raise awareness among health professionals
  - Motivate and refer patients
  
- Need to improve
  - Adherence
  - Maintenance

# COPD and PR Guidelines

- [www.goldcopd.com](http://www.goldcopd.com)
- ATS/ERS Statement on PR
  - AJ Respir Crit Care Med 2006;173:1390-413.
- ACCP/AACVPR
  - Chest 2007;131(5S):4S-42S.