What You Should Know About Chronic Lung Disease?

Andrew L. Ries, MD, MPH
Associate Dean for Academic Affairs
Professor of Medicine and
Family and Preventive Medicine
University of California, San Diego

September 25, 2006
# Leading Causes of Deaths U.S. 2000

<table>
<thead>
<tr>
<th>Cause of Death</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Heart Disease</td>
<td>710,760</td>
</tr>
<tr>
<td>2. Cancer</td>
<td>553,091</td>
</tr>
<tr>
<td>3. Cerebrovascular disease (stroke)</td>
<td>167,661</td>
</tr>
<tr>
<td>4. <strong>Respiratory Diseases (COPD)</strong></td>
<td>122,009</td>
</tr>
<tr>
<td>5. Accidents</td>
<td>97,900</td>
</tr>
<tr>
<td>6. Diabetes</td>
<td>69,301</td>
</tr>
<tr>
<td>7. Pneumonia and influenza</td>
<td>65,313</td>
</tr>
<tr>
<td>8. Alzheimers</td>
<td>49,558</td>
</tr>
<tr>
<td>9. Nephritis</td>
<td>37,251</td>
</tr>
<tr>
<td>10. Septicemia</td>
<td>31,224</td>
</tr>
<tr>
<td>All other causes of death</td>
<td>499,283</td>
</tr>
<tr>
<td>Cause of Death</td>
<td>Number</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>1. Heart Disease</td>
<td>711,000</td>
</tr>
<tr>
<td>2. Lung Disease</td>
<td>500,000+</td>
</tr>
<tr>
<td>a. Lung Cancer</td>
<td>155,000</td>
</tr>
<tr>
<td>b. COPD</td>
<td>122,000</td>
</tr>
<tr>
<td>c. Pneumonia/influenza</td>
<td>65,000</td>
</tr>
<tr>
<td>d. Thromboembolism</td>
<td>50,000+</td>
</tr>
<tr>
<td>e. Asthma, TB, ARDS, CF</td>
<td>100,000+</td>
</tr>
<tr>
<td>Occup/envir, Pulm Vasc,</td>
<td></td>
</tr>
<tr>
<td>Inflamm/immunol, etc</td>
<td></td>
</tr>
</tbody>
</table>

Proportion of 1965 Rate

- **Coronary Heart Disease**: -59%
- **Stroke**: -64%
- **Other CVD**: -35%
- **COPD**: +163%
- **All Other Causes**: -7%
COPD: A Growing Health Problem

- Prevalence: 10-15% > age 55
- Affects 14 million (known)
- >5% MD office visits
- >13% hospitalizations
- 4th leading cause of death: >122,000 in 2000; >95% after age 55
- WHO burden of disease: COPD #12 in 1990; projected #5 in 2020
Clinical COPD Is Just the Tip of the Iceberg

*Repeated exacerbations and hospitalizations
Global Initiative for Chronic Obstructive Lung Disease

In collaboration with:

National Heart, Lung, and Blood Institute, NIH

and

World Health Organization

www.goldcopd.com
COPD: Pathology

Normal

Chronic Obstructive Pulmonary Disease

- Mucus hypersecretion (luminal obstruction)
- Disrupted alveolar attachments (emphysema)
- Mucosal and peribronchial inflammation and fibrosis (obliterative bronchiolitis)

Airway held open by alveolar attachments
COPD: An Ill-defined Mixture

Few Patients Have “Pure” Disease

Chronic Bronchitis → Emphysema

Asthma

Airflow Obstruction

COPD

The Mountain of COPD

Cigarette Consumption

COPD Deaths

1900 1940 1980 2000
any turkey can smoke!
Risk Factors for COPD

- Smoking
- Smoking
- Smoking
- Smoking
- Airway hyperreactivity
- Childhood infections
- Air pollution
- Genetic
Life Expectancy – United States

Years of life


Female 84.3
Male 79.7

Projection
Assess and Monitor Disease: Key Points

• For the diagnosis and assessment of COPD, spirometry is the gold standard.

• Health care workers involved in the diagnosis and management of COPD patients should have access to spirometry.
The image depicts a graph showing the relationship between lung volume and time. The graph is divided into two main sections:

1. **Top Graph**: This section shows the volume of air in the lungs over time (Volume, L on the y-axis and Time, s on the x-axis). The graph highlights specific points of interest:
   - **FVC ( Forced Vital Capacity)**: The volume of air that can be forcibly expired after maximum inspiration.
   - **FEV<sub>1</sub> (First Second Forced Expiration Volume)**: The volume of air that can be expired in the first second of expiration.
   - **FEV<sub>3</sub> (First Three Second Forced Expiration Volume)**: The volume of air that can be expired in the first three seconds of expiration.

2. **Bottom Graph**: This section shows the percentage of the forced vital capacity (Volume, % FVC on the y-axis) over time (Volume, L on the x-axis). The graph includes:
   - A line indicating the slope, which represents the 
     \[ \text{Slope} = \text{FEF}_{25-75\%}, \text{L/s} \]

The graphs illustrate the dynamics of lung function, particularly in assessing obstructive lung diseases.
The vicious circle of dyspnea
COPD: Goals of Rx

• Prevention
  • Slow progression
  • Maintain function
  • Minimize complications

• Reduce symptoms

• Improve function
Management of COPD by Severity of Disease

Stage 0: At risk

Stage I: Mild COPD

Stage II: Moderate COPD

Stage III: Severe COPD

Stage IV: Very Severe COPD
## Classification by Severity

<table>
<thead>
<tr>
<th>Stage</th>
<th>Characteristics</th>
</tr>
</thead>
</table>
| 0: At risk | Normal spirometry  
Chronic symptoms (cough, sputum) |
| I: Mild | $\text{FEV}_1/\text{FVC} < 70\%$; $\text{FEV}_1 \geq 80\%$ predicted  
With or without chronic symptoms (cough, sputum) |
| II: Moderate | $\text{FEV}_1/\text{FVC} < 70\%$; $50\% \leq \text{FEV}_1 < 80\%$ predicted  
With or without chronic symptoms (cough, sputum, dyspnea) |
| III: Severe | $\text{FEV}_1/\text{FVC} < 70\%$; $30\% \leq \text{FEV}_1 < 50\%$ predicted  
With or without chronic symptoms (cough, sputum, dyspnea) |
| IV: Very Severe | $\text{FEV}_1/\text{FVC} < 70\%$; $\text{FEV}_1 < 30\%$ predicted or $\text{FEV}_1 < 50\%$ predicted plus chronic respiratory failure |
## Therapy at Each Stage of COPD

<table>
<thead>
<tr>
<th>New (2003)</th>
<th>0: At Risk</th>
<th>I: Mild</th>
<th>II: Moderate</th>
<th>III: Severe</th>
<th>IV: Very Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Chronic Symptoms</td>
<td>• FEV₁/FVC &lt; 70%</td>
<td>• FEV₁/FVC &lt; 70%</td>
<td>• FEV₁/FVC &lt; 70%</td>
<td>• FEV₁/FVC &lt; 70%</td>
<td></td>
</tr>
<tr>
<td>• Exposure to risk factors</td>
<td>• FEV₁ ≥ 80%</td>
<td>• 50% &lt; FEV₁ &lt; 80%</td>
<td>• 30% &lt; FEV₁ &lt; 50%</td>
<td>• FEV₁ &lt; 30% or FEV₁ &lt; 50%</td>
<td></td>
</tr>
<tr>
<td>• Normal spirometry</td>
<td>• With or without symptoms</td>
<td>• With or without symptoms</td>
<td>• With or without symptoms</td>
<td>predicted plus chronic respiratory failure</td>
<td></td>
</tr>
</tbody>
</table>

### Avoidance of risk factor(s); influenza vaccination

- **Add** short-acting bronchodilator when needed
- **Add** regular treatment with one or more long-acting bronchodilators
- **Add** rehabilitation
- **Add** inhaled glucocorticosteroids if repeated exacerbations
- **Add** long-term oxygen if chronic respiratory failure
  - **Consider** surgical treatments
Treatment of COPD

- Stop smoking
- Medications
- Oxygen
- Vaccination
- RT/Chest PT
- Rehabilitation
- Surgery: LVRS, Transplant
Smoking Cessation Slows Lung Function Decline

Manage Stable COPD

Key Points

- None of the existing medications for COPD has been shown to modify the long-term decline in lung function that is the hallmark of this disease (Evidence A). Therefore, pharmacotherapy for COPD is used to decrease symptoms and/or complications.
Manage Stable COPD

Key Points

• Bronchodilator medications are central to the symptomatic management of COPD (Evidence A). They are given on an as-needed basis or on a regular basis to prevent or reduce symptoms.

• The principal bronchodilator treatments are beta$_2$-agonists, anticholinergics, theophylline, and a combination of these drugs (Evidence A).
Therapy at Each Stage of COPD: **Rehabilitation**

<table>
<thead>
<tr>
<th>Staging</th>
<th>0 At Risk</th>
<th>I Mild</th>
<th>II Moderate</th>
<th>III Severe</th>
<th>IV Very Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Add</strong> rehabilitation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Improves exercise capacity, quality of life
- Reduces breathlessness, hospitalization, anxiety, depression (15% of NETT patients withdrew after rehabilitation because they felt better)
- Usually includes exercise training, nutrition counseling, education
- Patients at all stages may benefit from exercise training
- Minimum length is 2 months; longer programs are best

*Adapted from NIH/NHLBI. Global Initiative for Chronic Obstructive Lung Disease (“GOLD”), Updated 2003. Available at www.goldcopd.com.*
Pulmonary Rehabilitation

...an individually tailored, multidisciplinary program ... which through accurate diagnosis, therapy, emotional support and education, stabilizes or reverses both the physio- and psychopathology of pulmonary diseases ...

ACCP, 1974
Pulmonary Rehabilitation

Goal

Restore the patient to the highest level of independent function i.e., improve disability from disease, not necessarily change disease process
Patient Selection

• Chronic lung disease
• Symptomatic, stable
• Motivated
• Realistic goals
• Earlier the better
Program Content

- Initial evaluation
- Education
- Chest Physiotherapy
- Psychosocial support
- Exercise
Is It Worth It?
EDUCATION
CPT
02
RT
BRT
EXERCISE
PSYCHOSOCIAL
REHAB
After Rehab, Patients ....

- Feel better
- Know more
- Do more
- Demand less
- Cost less
Pulmonary Rehabilitation
Joint ACCP/AACVPR
Evidence-Based Guidelines

Chest 1997; 112:1363
J Cardiopulm Rehabil 1997; 17:371
Pulmonary Rehab Guidelines

Components:
- Lower extremity exercise
- Upper extremity exercise
- Ventilatory muscle training (no)
- Psychosocial

Outcomes:
- Dyspnea
- Quality of life
- Health care utilization
- Survival
- Psychosocial
Pulmonary Rehab Project

- Prospective, randomized clinical trial
- Comprehensive rehab vs. education
- 119 patients with COPD
- Outcomes: physiology & psychosocial
- F/U 6 years

Ries, Ann Int Med 95; 122:823
Pulmonary Rehab in COPD Practice Guidelines

• WHO/NHLBI GOLD, 2001
• ATS, 1995
• ERS, 1995
• CTS (Canada), 1992
• Others 1994-99: Arg, Nor, Aust/NZ, Ger, Spa, Swi, Pol, Fre, BTS, SAfr, Chile, Fin
California Collaborative Project
J Cardiopulmonary Rehabil 2004; 24:52

• 10 center outcome study:
  • Comprehensive PR: education, exercise, psychosocial support, outcome assessment

• Purpose
  • Evaluate the effectiveness of pulmonary rehab as practiced in California
  • Does pulmonary rehab
    • Improve quality of life
    • Reduce symptoms
    • Reduce health care utilization and costs
The graph shows the SOBQ scores over time from pre-rehabilitation to 18 months post-rehabilitation. The scores are significantly different from baseline at p<.05 for the post-rehabilitation and 3-month marks, indicating a decline followed by recovery.
SF-36: MCS/PCS

Significantly different from baseline, p<.05

*Significantly different from baseline, p<.05
Health Care Utilization

*Significantly different from baseline, p<.05

* * *
Conclusions

• Pulmonary rehab, as practiced in centers across California, is effective and results in significantly:
  • Improved quality of life
  • Decreased symptoms of dyspnea
  • Reduced health care utilization

• Improvements declined after 3 months but remained significant up to 12-18 months after rehabilitation
Changing Paradigm for Chronic Disease Management: Nihilism to Optimism

- Genetics of COPD – minority of smokers are susceptible
- In chronic disease, less bad is good
- Biologic advances hold hope for optimism to modify disease and improve function, not just manage symptoms
Summary

• COPD is a big problem and will continue to be so for many years

• New and better treatment options are available

• Learning more about the pathogenesis of COPD with development of targeted, disease modifying treatments give cause for future optimism and hope
  • COPD may not be the irreversible, progressive disease process we have considered it to date