To Air is Human,
To Not Wheeze Divine

Obstructive Lung Disease in The Elderly

Meyer Balter, MD, FRCPC
Mount Sinai Hospital
University of Toronto
Disclosure Statements

I have served on advisory boards for:
- Almirall, AstraZeneca, Boehringer Ingelheim, GlaxoSmithKline, Novartis, Takeda

I have received honoraria for speaking from:
- Almirall, AstraZeneca, Boehringer-Ingelheim, Merck, Novartis, Takeda

I have no financial interests in any pharmaceutical company
Learning Objectives

- Understand how to diagnose and differentiate between asthma and COPD in the elderly
- Discuss the importance of co-morbidities when treating obstructive lung disease in the elderly
- Learn appropriate management strategies for treating obstructive lung disease
Which of the following most clearly coincides with your feelings?

A. There is no need to differentiate between asthma and COPD as the treatments are similar.
B. I would like to separate the two but my patients can’t cooperate with appropriate testing.
C. Diagnosis is irrelevant as my patients can’t be taught how to use inhalers properly.
D. I thought this was the lecture on bowel obstructions.
Relationship Between Chronic Bronchitis, Emphysema and Asthma

Chronic Bronchitis

Emphysema

Asthma

Airflow Obstruction
Asthma: Definition

Asthma is defined as an inflammatory disorder of the airways characterized by paroxysmal or persistent symptoms such as dyspnea, chest tightness, wheezing, sputum production and cough, associated with variable airflow limitation and a variable degree of airway hyperresponsiveness to endogenous or exogenous stimuli.
Asthma in the Elderly

- Sometimes considered as two categories
  - symptoms developing in childhood
  - symptoms develop de novo later in life

- Risk factors and triggers identical in asthmatics in all age groups
  - dyspnea less common at same level of FEV1

- Comorbid conditions are important
  - 20% CHF, 20% MI, 45% HTN
  - COPD overlap syndrome

- Spirometry/methacholine better than PEFR

- Treatment similar to that in younger pts
All That Wheezes is Not Asthma: Differential Diagnosis of Asthma

- Post-infectious cough
- Post-nasal drip
- Gastroesophageal reflux disease
- COPD
- Heart failure

- Angina
- Foreign body
- Lung cancer
- Hyperventilation syndrome
- Vocal cord dysfunction
Definition of COPD

“COPD is a respiratory disorder largely caused by smoking, which is characterized by progressive, partially reversible airway obstruction and lung hyperinflation, systemic manifestations, and increasing frequency and severity of exacerbations”

COPD: Leading Cause of Readmission and ED Returns

Canadian Institute for Health Information. June 14, 2012
Comorbidities of COPD

- Cardiovascular disease is a major comorbidity in COPD and probably both the most frequent and most important disease co-existing with COPD.

- Other major comorbidities:
  - Osteoporosis
  - Depression
  - Lung cancer (most frequent cause of death in mild COPD)

Global Initiative for Chronic Obstructive Lung Disease (GOLD), 2011.
Relationship Between FEV$_1$, Smoking Status and CV mortality

Odds Ratio for CV mortality

Current smoker
Ex-smoker
Never-smoker

FEV$_1$ % pred

<65
65-79
80-100
>100

COPD is Common and Increasing in Prevalence

- Total # COPD patients in Canada (including undiagnosed) estimated at 3.45 million in 2011, increasing to 5.83 million in 2035
- Prevalence increases with age
- Canadian population age >40 yrs will increase from 17 million to 24 million by 2035; the population >70 years will double to 8 million

Najafzadeh et al. Plos ONE 2012
Barriers to Diagnosis

- Patients attribute symptoms to ageing and do not seek medical attention
- Physicians dismiss early symptoms and focus only on the immediate issue at hand
- Differentiating COPD from asthma

Price et al. Prim Care Respir J 2011
COPD is Underdiagnosed: Screening Spirometry in Primary Practice

Patients >40 years + 20 pack-year history of smoking visiting a primary care physician for any reason (n=1,003)

Screening for COPD

Patients meeting criteria for COPD* (n=208; 20.7%)

Previous diagnosis of COPD (n=67; 32.7%)

No previous diagnosis of COPD (n=141; 67.3%)

Patients not meeting criteria for COPD* (n=795; 79.3%)

*Criteria for COPD: FEV$_1$/FVC < 0.70

Spirometry
Diagnostic Criteria For COPD

In order to qualify for a diagnosis of COPD, a patient must have:

- Postbronchodilator FEV$_1$ < 80% of predicted; and
- FEV$_1$/FVC < 0.7

FEV$_1$ = forced expiratory volume in 1 s
FVC = forced vital capacity

## Spirometry Results

### Is this asthma or COPD?

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Pred. value</th>
<th>Observe. pre</th>
<th>% Pred.</th>
<th>Observe. post</th>
<th>% pred.</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>FVC (L)</td>
<td>5.64</td>
<td>5.23</td>
<td>93</td>
<td>5.77</td>
<td>102</td>
<td>10.3</td>
</tr>
<tr>
<td>FEV₁ (L)</td>
<td>4.57</td>
<td>2.92</td>
<td>64</td>
<td>3.01</td>
<td>66</td>
<td>3.2</td>
</tr>
<tr>
<td>FEV₁/FVC (%)</td>
<td>81</td>
<td>56</td>
<td>69</td>
<td>52</td>
<td>64</td>
<td>-6.4</td>
</tr>
<tr>
<td>FEF₂₅₋₇₅ (L/S)</td>
<td>11.27</td>
<td>5.52</td>
<td>49</td>
<td>5.70</td>
<td>51</td>
<td>3.3</td>
</tr>
<tr>
<td>FEF₅₀ (L/S)</td>
<td>5.64</td>
<td>2.02</td>
<td>36</td>
<td>1.73</td>
<td>31</td>
<td>-14.3</td>
</tr>
<tr>
<td>FEF₇₅ (L/S)</td>
<td>2.82</td>
<td>0.75</td>
<td>27</td>
<td>0.59</td>
<td>21</td>
<td>-21.2</td>
</tr>
<tr>
<td>VE (L/min)</td>
<td>173</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Raw insp. (cmH₂O/l/s)</td>
<td>0.68</td>
<td>1.71</td>
<td>256</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>
Example of Results Consistent with Asthma

**PULMONARY FUNCTION ANALYSIS**

<table>
<thead>
<tr>
<th>Spirometry</th>
<th>Ref</th>
<th>Pre Meas</th>
<th>Pre % Ref</th>
<th>Post Meas</th>
<th>Post % Ref</th>
<th>Post % Chg</th>
</tr>
</thead>
<tbody>
<tr>
<td>FVC</td>
<td>Liter</td>
<td>3.81</td>
<td>3.45</td>
<td>90</td>
<td>3.78</td>
<td>99</td>
</tr>
<tr>
<td>FEV1</td>
<td>Liter</td>
<td>3.27</td>
<td>2.34</td>
<td>72</td>
<td>2.90</td>
<td>89</td>
</tr>
<tr>
<td>FEV1/FVC</td>
<td>%</td>
<td>86</td>
<td>68</td>
<td>79</td>
<td>77</td>
<td>89</td>
</tr>
<tr>
<td>FEF25-75%</td>
<td>L/sec</td>
<td>3.83</td>
<td>1.44</td>
<td>38</td>
<td>2.40</td>
<td>63</td>
</tr>
<tr>
<td>FEF50%</td>
<td>L/sec</td>
<td>4.11</td>
<td>1.93</td>
<td>47</td>
<td>3.33</td>
<td>81</td>
</tr>
<tr>
<td>FEF75%</td>
<td>L/sec</td>
<td>1.91</td>
<td>0.57</td>
<td>30</td>
<td>0.98</td>
<td>51</td>
</tr>
<tr>
<td>PEF</td>
<td>L/sec</td>
<td>6.55</td>
<td>6.08</td>
<td>93</td>
<td>7.57</td>
<td>116</td>
</tr>
<tr>
<td>PIF</td>
<td>L/sec</td>
<td>3.63</td>
<td>4.53</td>
<td>25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- An acceptable effort was provided.
- There is evidence of slight airflow limitation that improved with acute bronchodilator.
- This study is similar to those seen in patients with asthma.
$\beta_2$ agonists - short-acting

**Bronchodilator = “Reliever”**

- salbutamol (Ventolin, Apo-salvent)
- terbutaline (Bricanyl)
Which of the following regarding inhaled corticosteroid usage in asthma is true?

A. There is no benefit to the use of ICS in an asthmatic patient with normal lung function

B. Use of an ICS alone to prevent exacerbations is inferior to a combination ICS/LABA as initial maintenance therapy of asthma

C. ICS increases the risk of pneumonia in asthmatic patients on long term therapy

D. ICS usage reduces asthma mortality
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C. ICS increases the risk of pneumonia in asthmatic patients on long term therapy

D. ICS usage reduces asthma mortality
Effects of Inhaled Corticosteroids on Inflammation

Pre- and post-3–month treatment with budesonide (BUD) 600 mcg b.i.d.

Inhaled Corticosteroids (ICS)

Anti-inflammatory = “Preventer”

- beclomethasone (QVAR)
- budesonide (Pulmicort)
- fluticasone (Flovent)
- ciclesonide (Alvesco)
- mometasone (Asmanex)
Compared to doubling the dose of ICS, adding a LABA to low dose ICS:

- reduced daytime SABA needs
- decreased nocturnal symptoms
- improved quality of life
- increased FEV1
- increased morning and evening PEFRs
- reduces mild and severe exacerbations
Combination Products

- salmeterol + fluticasone (Advair™)
- formoterol + budesonide (Symbicort™)
- formoterol + mometasone (Zenhale™)
## Indicators of Asthma Control

*Educate Patients That This Level of Asthma Control is Generally Achievable*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Acceptable Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daytime symptoms</td>
<td>&lt; 4 days/week</td>
</tr>
<tr>
<td>Night-time symptoms</td>
<td>&lt; 1 night/week</td>
</tr>
<tr>
<td>Physical activity</td>
<td>Normal</td>
</tr>
<tr>
<td>Exacerbations</td>
<td>Mild, infrequent</td>
</tr>
<tr>
<td>Absence from work or school due to asthma</td>
<td>None</td>
</tr>
<tr>
<td>Need for a fast-acting beta-agonist</td>
<td>&lt; 4 doses/week</td>
</tr>
<tr>
<td>FEV1 or PEF</td>
<td>&gt; 90% personal best</td>
</tr>
<tr>
<td>PEF diurnal variation†</td>
<td>&lt; 10% to 15%</td>
</tr>
</tbody>
</table>

FEV₁ = forced expiratory volume in 1 second; PEF = peak expiratory flow.

†Diurnal variation is calculated as the highest PEF minus the lowest PEF divided by the highest PEF multiplied by 100 for morning and night (determined over a 2-week period).

Poorly Controlled Asthma

- confirm diagnosis
- check compliance
- review technique
- question exposures/environment
  - allergens, irritants, sensitizers
- conditions that worsen asthma
  - GERD, sinus disease
- obesity
- drugs
  - beta-blockers, NSAIDs
- complications of asthma
  - ABPA
  - E-GPA
Definition of Asthma

Reversible obstructive airway disease

Chronic desquamating eosinophilic bronchitis
Asthma Management Continuum

Children (6 years and over) and Adults

Controlled

Uncontrolled

• Control
• Spirometry or PEF
• Inhaler technique
• Adherence
• Triggers
• Co-morbidities

Regularly Reassess

Confirm Diagnosis

Fast-acting Bronchodilator on Demand

Environmental Control, Education and Written Action Plan

Inhaled Corticosteroid (ICS)*

*Second-Line: Leukotriene Receptor Antagonist (LTRA)

Low Dose

≥12 yrs: ≤250 mcg/day†
6-11 yrs: ≤200 mcg/day†

Medium Dose

251 – 500 mcg/day†
201 – 400 mcg/day†

High Dose

>500 mcg/day†

≥12 yrs: Add LABA*
6-11 yrs: Increase ICS

≥12 yrs: Add LTRA
6-11 yrs: Add LABA or LTRA

Anti-IgE‡

Prednisone

≥12 yrs: Add LTRA

6-11 yrs: Increase ICS

Adjunct Therapy to Achieve and Maintain Control

Low Dose

≥12 yrs: ≤250 mcg/day†
6-11 yrs: ≤200 mcg/day†

Medium Dose

251 – 500 mcg/day†
201 – 400 mcg/day†

High Dose

>500 mcg/day†

6-11 yrs: Increase ICS

≥12 yrs: Add LABA*

6-11 yrs: Add LABA or LTRA

Inhaled Corticosteroid (ICS)*

*Second-Line: Leukotriene Receptor Antagonist (LTRA)

† HFA Beclomethasone or equivalent; *Second-line: LTRA; ‡ Approved for 12 years and over

Approach to COPD

- Diagnosis (Screening)
- Preventative Measures
- Pharmacologic Therapy
- Non-Pharmacologic Therapy
- Prevention of AECOPD
- Surgical and Investigational Measures
Which of the following regarding ICS use in COPD is true?

A. They are first line therapy because of their anti-inflammatory effects
B. Their use increases the risk of developing pneumonia in COPD patients
C. They should not be combined with long-acting beta-agonists
D. Long term use has been shown to decrease mortality in COPD
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D. Long term use has been shown to decrease mortality in COPD
## Probability* of having a pneumonia reported during the study

<table>
<thead>
<tr>
<th></th>
<th>Placebo (N = 1544)</th>
<th>SALM (N = 1542)</th>
<th>FP (N = 1522)</th>
<th>SFC (N = 1546)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumonia</td>
<td>12.3</td>
<td>13.3</td>
<td>18.3†</td>
<td>19.6 ††</td>
</tr>
</tbody>
</table>

† p<0.001 FP vs placebo; †† p<0.001 SFC vs placebo and salmeterol

* Kaplan-Meier estimate

Calverley PM et al. NEJM 2007;356:775-89.
Role of ICS Monotherapy in COPD

“ICS should not be used as monotherapy in COPD and when used should be combined with a LABA”

Why do we use bronchodilators as first-line therapy?
Cycle of Air Trapping, Dyspnea, Reduced Exercise Endurance, and Poor HRQL

- Expiratory airflow limitation
  - Air trapping
    - Hyperinflation
      - Dyspnea
        - Deconditioning
          - Reduced activity
            - Poor health-related quality of life
Long Acting Bronchodilators in COPD:

**LABA**
- Formoterol (Oxeze® Turbuhaler®, Foradil® Aerolizer®)
  - 12-24 μg inh bid

**LAMA**
- Aclidinium (Tudorza® Genuair®)
  - 400 μg inh bid
- Glycopyrronium (Seebri® Breezhaler®)
  - 50 μg inh qd
- Tiotropium (Spiriva® Diskus®, Handihaler®)
  - 18 μg inh qd
- Indacaterol (Onbrez® Breezhaler®)
  - 75 μg inh qd
- Salmeterol (Serevent® Diskus®, Foradil® Aerolizer®, Turbuhaler®, Oxeze® Breezhaler®)
  - 50 μg inh bid

**Formoterol**
- 12-24 μg inh bid

**Indacaterol**
- 75 μg inh qd

**Salmeterol**
- 50 μg inh bid
Unique Issues To Nursing Home COPD Management

- Diagnosis may not be known and equipment to make it not available
- Treated as an acute problem ("bronchitis") rather than as a chronic disease
- Severity and prognosis frequently misunderstood
- Medications may be difficult to deliver
Comprehensive Management of COPD

- Early Diagnosis (spirometry) + prevention
- Prevent / Rx AECOPD Follow-up
- End of Life Care
- Oxygen
- Inhaled corticosteroids
- Pulmonary rehabilitation
- Long-acting bronchodilators
- PRN Short-acting bronchodilator(s)
- Smoking cessation / exercise / self-management / education

Lung function impairment
- Mild
- Very severe

MRC dyspnea scale
- II
- V

Asthma vs COPD

**Asthma**
- early or late onset
- variable symptoms
- reversible obstruction
- 85% steroid responsive
- role for anticholinergics being defined
- normal or high DLCO
- no role for antibiotics

**COPD**
- late onset
- progressive symptoms
- mostly fixed obstruction
- no role for ICS monotherapy
- prominent role for anticholinergics
- reduced or normal DLCO
- antibiotics for purulent exacerbations