Respiratory System Diseases

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University of the Witwatersrand
Causes of Mortality Worldwide

1990

- Ischaemic heart disease
- Cerebrovascular disease
- Lower resp infection
- Diarrhoeal disease
- Perinatal disorders
- COPD
- Tuberculosis
- Measles
- Road Traffic Accidents
- Lung Cancer

2020

- Stomach Cancer
- HIV
- Suicide

Some Facts about Pneumonia

• Commonest reason for admission of persons to hospital after childbirth
• Together with Influenza is second commonest cause of death in South Africa and is the commonest infection cause of death
• Involves all strata of society
• HIV infection is a major risk factor
• Should include tuberculosis in the discussion
Risk Factors for Pneumonia

- Age (young and elderly)
- Socioeconomic factors
- Smoking and alcohol
- HIV infection
- Chronic medical conditions – cardiac, lung, liver, kidney
- Occupational risk factors
Prognosis associated with Pneumonia

- Treatment with antibiotics for ~7 days
- Mostly recover complete lung function except HIV infected persons
- Ongoing symptoms may be due to underlying risk factors
- Outpatients less than 1%
- In-hospital patients 5-15%
- ICU patients up to 50%
Natural History and Prognosis of Pneumonia

- Most studies have examined short-term prognosis – in-hospital or 30-day
- Evaluation of older patients from Medicare database
  - 158,960 patients
  - 794,333 controls
- In-patient mortality 11% versus 5.5%
- 1 year mortality 40.9% versus 29.1%

Kaplan et al Arch Intern Med 2003
Patients

Hospital mortality

1 Year mortality

Kaplan et al Arch Intern Med 2003
PSI Risk Classification

Class 1 & 2 (n=617)
Class 3 (n=613)
Class 4 (n=1306)
Class 5 (n=748)
Introduction to COPD

The deviation of man from the state in which he was originally placed by nature seems to have provided him with a prolific source of diseases

Jenner 18th Century

• This was never more true than when applied to the effects of cigarette smoke and chronic obstructive pulmonary disease (COPD)

Parr DG. Proc Am Thorac Soc 2011; 8: 338-349
COPD Mortality Worldwide

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Ischaemic heart disease
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COPD
Tuberculosis
Measles
Road Traffic Accidents
Lung Cancer

2020

3rd
Stomach Cancer
HIV
Suicide

6th

Overlapping disease entities included in the definition of COPD

Friedlander AL et al. J COPD 2007; 4: 355-384
COPD is a preventable and treatable disease with some significant extrapulmonary effects that may contribute to the severity in individual patients.

Its pulmonary component is characterized by airflow limitation that is not fully reversible.

The airflow limitation is usually progressive and associated with an abnormal inflammatory response of the lung to noxious particles or gases.

www.goldcopd.org
Risk Factors for COPD

- Smoking
- Genetic
- Socioeconomic
- Gestational
- Occupational - silicosis
- Tuberculosis
- HIV infection
COPD and Associated Co-Morbidities

- COPD patients are at increased risk of:
  - Myocardial infarction, angina
  - Osteoporosis
  - Respiratory infection
  - Depression
  - Diabetes
  - COPD and lung cancer
When do Patients Present?

- Symptoms generally develop only after a significant drop in FEV$_1$ (to less than 50%) has occurred.
How do you Diagnose COPD?

SYMPTOMS
- cough
- sputum
- shortness of breath

EXPOSURE TO RISK FACTORS
- tobacco
- occupation
- indoor/outdoor pollution

SPIROMETRY
Obstructive
Very severe obstruction
Non reversible
COPD

<table>
<thead>
<tr>
<th></th>
<th>Actual</th>
<th>Pred</th>
<th>%Pred</th>
<th></th>
<th>Actual</th>
<th>%Pred</th>
<th>%Chng</th>
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</thead>
<tbody>
<tr>
<td>FVC</td>
<td>3.02</td>
<td>3.63</td>
<td>83</td>
<td>FVC</td>
<td>3.47</td>
<td>96</td>
<td>15</td>
</tr>
<tr>
<td>FEV 1</td>
<td>0.59</td>
<td>2.91</td>
<td>20</td>
<td>FEV 1</td>
<td>0.53</td>
<td>18</td>
<td>-11</td>
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<tr>
<td>FEV 1 % FVC</td>
<td>19.5</td>
<td>80.26</td>
<td>24</td>
<td>FEV 1 % FVC</td>
<td>15.12</td>
<td>19</td>
<td>-23</td>
</tr>
<tr>
<td>PEF</td>
<td>2.67</td>
<td>7.25</td>
<td>37</td>
<td>PEF</td>
<td>2.94</td>
<td>41</td>
<td>10</td>
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<tr>
<td>FEF 25</td>
<td>0.27</td>
<td>6.34</td>
<td>4</td>
<td>FEF 25</td>
<td>0.29</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>FEF 50</td>
<td>0.22</td>
<td>3.89</td>
<td>6</td>
<td>FEF 50</td>
<td>0.18</td>
<td>5</td>
<td>-18</td>
</tr>
<tr>
<td>FEF 75</td>
<td>0.16</td>
<td>1.52</td>
<td>10</td>
<td>FEF 75</td>
<td>0.12</td>
<td>8</td>
<td>-26</td>
</tr>
<tr>
<td>MMEF 75/25</td>
<td>0.19</td>
<td>3.17</td>
<td>6</td>
<td>MMEF 75/25</td>
<td>0.18</td>
<td>6</td>
<td>-6</td>
</tr>
<tr>
<td>FVC IN</td>
<td>3.25</td>
<td>3.63</td>
<td>90</td>
<td>FVC IN</td>
<td>3.38</td>
<td>93</td>
<td>4</td>
</tr>
<tr>
<td>FIF 50</td>
<td>6.10</td>
<td></td>
<td></td>
<td>FIF 50</td>
<td>5.14</td>
<td></td>
<td>-16</td>
</tr>
</tbody>
</table>
## Classification of COPD Severity by Spirometry

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
<th>FEV(_1)/FVC</th>
<th>FEV(_1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I: Mild</td>
<td></td>
<td>(&lt; 0.70)</td>
<td>(\geq 80%) predicted</td>
</tr>
<tr>
<td>II: Moderate</td>
<td></td>
<td>(&lt; 0.70)</td>
<td>(50% \leq \text{FEV}_1 &lt; 80%) predicted</td>
</tr>
<tr>
<td>III: Severe</td>
<td></td>
<td>(&lt; 0.70)</td>
<td>(30% \leq \text{FEV}_1 &lt; 50%) predicted</td>
</tr>
<tr>
<td>IV: Very Severe</td>
<td></td>
<td>(&lt; 0.70)</td>
<td>(\text{FEV}_1 &lt; 30%) predicted or (\text{FEV}_1 &lt; 50%) predicted plus chronic respiratory failure</td>
</tr>
</tbody>
</table>
Combined Assessment of COPD

Risk (GOLD Classification of Airflow Limitation)

- mMRC 0-1
- CAT < 10

Symptoms (mMRC or CAT score)

- mMRC > 2
- CAT ≥ 10

- (A) mMRC 0-1, CAT < 10
- (B) mMRC ≥ 2, CAT ≥ 10
- (C) mMRC 0-1, CAT ≥ 10
- (D) mMRC ≥ 2, CAT < 10

Risk (Exacerbation history)

≥ 2
GOLD 2013 combined assessment

Simplified to 2 key questions

Low symptoms  High symptoms

C  D

Yes

More than 1 exacerbation or 1 admission in previous year?

No  Yes

No

Breathless during usual daily activity on most days?

No  Yes

Higher risk

Lower risk
GOLD 2013 combined assessment

Simplified to 2 key questions

Low symptoms High symptoms

More than 1 exacerbation or 1 admission in previous year?

Yes

No

Breathless during usual daily activity on most days?

No

Yes

Higher risk

Lower risk
# How is your COPD? Take the COPD Assessment Test™ (CAT)

This questionnaire will help you and your healthcare professional measure the impact COPD (Chronic Obstructive Pulmonary Disease) is having on your wellbeing and daily life. Your answers, and test score, can be used by you and your healthcare professional to help improve the management of your COPD and get the greatest benefit from treatment.

For each item below, place a mark (X) in the box that best describes you currently. Be sure to only select one response for each question.

**Example:**  
I am very happy 0 X 2 3 4 5  I am very sad

<table>
<thead>
<tr>
<th>Item</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>I never cough</td>
<td>4</td>
</tr>
<tr>
<td>I have no phlegm (mucus) in my chest at all</td>
<td>4</td>
</tr>
<tr>
<td>My chest does not feel tight at all</td>
<td>4</td>
</tr>
<tr>
<td>When I walk up a hill or one flight of stairs I am not breathless</td>
<td>3</td>
</tr>
<tr>
<td>I am not limited doing any activities at home</td>
<td>5</td>
</tr>
<tr>
<td>I am confident leaving my home despite my lung condition</td>
<td>5</td>
</tr>
<tr>
<td>I don’t sleep soundly because of my lung condition</td>
<td>4</td>
</tr>
<tr>
<td>I have lots of energy</td>
<td>5</td>
</tr>
<tr>
<td>I have no energy at all</td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL SCORE**: 34
PLEASE TICK IN THE BOX THAT APPLIES TO YOU
(ONE BOX ONLY)
mMRC Grade 0. I only get breathless with strenuous exercise. □
mMRC Grade 1. I get short of breath when hurrying on the level or walking up a slight hill. □
mMRC Grade 2. I walk slower than people of the same age on the level because of breathlessness, or I have to stop for breath when walking on my own pace on the level. □
mMRC Grade 3. I stop for breath after walking about 100 meters or after a few minutes on the level. □
mMRC Grade 4. I am too breathless to leave the house or I am breathless when dressing or undressing. □
Definition of an Exacerbation

“an event in the natural course of the disease characterized by a change in the patient’s baseline dyspnoea, cough, and/or sputum that is beyond normal day-to-day variations, Is acute in onset, and may warrant a change in regular medication in a patient with underlying COPD”
Symptoms
Usual pattern

(a)

Symptoms
Time

(b) Treatment failure

Initial treatment
Additional treatment

(c) Recurrence

Symptoms
Time

> 4 weeks
> 6 weeks

Soler-Cataluna JJ et al. COPD: J COPD 2010; 7: 276-284
What Does an Exacerbation Mean to a Patient?

- Decline in lung function
- Increased symptoms (i.e. breathlessness)
- Greater anxiety
- Worsening quality of life
- Social withdrawal
- More exacerbations
- Increased risk of hospitalisation
- Increased risk of mortality

References:
- Garcia-Aymerich J et al. 2001
- Donaldson D et al. 2002
- Gore JM et al. 2000
- Seemungal T et al. 1998
- Seemungal T et al. 2000
- Pauwels Pet al. 2001
- Garcia-Aymerich J et al. 2003
- Anto JM et al. 2001
Lung attack: A call to arms

In February the Canadian Thoracic Society published a comprehensive report called The Human and Economic Burden of COPD. The report points out that COPD is the most underdiagnosed chronic disease in our

There is a movement in respiratory medicine to call a COPD exacerbation a “lung attack” to call attention to the seriousness of such an event and the implications it has for patient morbidity and mortality. When lung attacks COPD is not difficult or expensive to diagnose. Spirometry done pre- and post-bronchodilators can make the diagnosis in the vast majority of cases—this costs less than $50 and should be available in most hospitals in Canada.

Republished editorial: Targeting lung attacks

J Mark FitzGerald

Acute exacerbations of asthma and chronic obstructive lung disease (COPD) are significant burdens on the health care system. However, the most difficult diagnostic challenge is not identifying an exacerbation, which is relatively straightforward in most cases. The real challenge is distinguishing an exacerbation from a typical day-to-day respiratory symptom in a patient with COPD. To date, there are no definitive diagnostic tools to distinguish exacerbations from non-exacerbation days.

The recently published Canadian Thoracic Society (CTS) guidelines for the management of COPD make a strong recommendation that physicians use a combination of symptoms, including sputum production, to identify exacerbations. However, distinguishing exacerbations from non-exacerbation days is still difficult, and there is a need for new tools to improve the accuracy of exacerbation identification.

Common to both conditions will be the opportunity to provide smoking cessation interventions including both pharma-
“Lung Attacks” vs “Heart Attacks”

Lung attack

In-hospital mortality
8 – 11%

Mortality within 1 year of attack
22 – 43%

Heart attack

8 – 9.4%

25 – 38%

Chapman K and Kaplan A, with COPD Canada and Family Physician Airways Group of Canada 2011
Mortality after a COPD Exacerbation

## Classification of Bronchitis

<table>
<thead>
<tr>
<th>Baseline Clinical Status</th>
<th>Criteria Risk Factors</th>
<th>Pathogens</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute tracheo-bronchitis</td>
<td>No underlying lung disease</td>
<td>Usually viral</td>
<td>Usually none</td>
</tr>
<tr>
<td>Simple chronic bronchitis</td>
<td>Younger patient, FEV$_1$ &gt; 50%, increased sputum volume and virulence</td>
<td><em>H. influenzae</em></td>
<td>Aminopenicillin, Amox-clavulanate, Macrolide or azalide or ketolide</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>M. catarrhalis</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>S. pneumoniae</em></td>
<td></td>
</tr>
</tbody>
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## Classification of Bronchitis

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</tr>
</thead>
<tbody>
<tr>
<td>Complicated chronic bronchitis</td>
<td>As for 2 plus elderly, FEV&lt;sub&gt;1&lt;/sub&gt; &lt; 50%, &gt;4 AECB per year, with sig. morbidity</td>
<td>Same pathogens but increased risk of antibiotic resistance</td>
<td>Amox-clavulanate 2&lt;sup&gt;nd&lt;/sup&gt; or 3&lt;sup&gt;rd&lt;/sup&gt; gen. cephalosporin, or new fluoroquinolone</td>
</tr>
<tr>
<td>Chronic bronchial sepsis</td>
<td>As above plus continuous sputum / year or co-morbidity</td>
<td>Above plus Enterobacteria P aeruginosa</td>
<td>Fluoroquinolone, old or new, or other agent acc to sensitivity</td>
</tr>
</tbody>
</table>

Causes of Mortality Worldwide

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Tuberculosis
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2020

Stomach Cancer
HIV
Suicide

Healthy Lung Tissue
Diseased Lung Tissue
Diagnostic Tests

- CXR
- CT Scans
- MRI
- Sputum cytology
- Fibreoptic bronchoscopy
- Transthoracic fine needle aspiration
A bronchoscope is used to view the airways and check for any abnormalities.
## Lung Cancer Staging

<table>
<thead>
<tr>
<th>Clinical Staging</th>
<th>Pathological</th>
</tr>
</thead>
<tbody>
<tr>
<td>• based on findings gathered by the doctor</td>
<td>• Based on the examination of the tissue samples obtained from the primary tumor, nodes or metastasis</td>
</tr>
<tr>
<td>• used to plan the initial therapy</td>
<td>• Helpful in planning additional treatment and follow-up</td>
</tr>
<tr>
<td>• may be modified by additional information found during pathological examination</td>
<td></td>
</tr>
</tbody>
</table>
Diseases Under discussion

- Under discussion today
  - Pneumonia
  - Bronchitis
  - COPD
  - Lung Cancer
- Also need to be considered?
  - Asthma
  - Tuberculosis
  - HIV infection