COPD in the Workplace

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Objectives

• review current diagnostic criteria and clinical practice guidelines for Chronic Obstructive Pulmonary Disease (COPD)
• discuss various occupational exposures implicated in development of COPD
• highlight effective and practical approaches to optimizing the management of COPD, including in the workplace.
The COPD ‘Problem’

- COPD is the 4th leading cause of death in North America (1,2)
  - COPD death rates are increasing - faster than any other leading cause of death
  - WHO projects ‘#3’ in the next 10 yrs
- COPD is the most common chronic medical condition leading to hospitalization in adults
- COPD is now [...] also] a disease of women (2)

More COPD Problems ...

- COPD prevalence is higher than diagnosed
  - 3-4x overall, 2x for mod/severe disease (1,2,3)
- 21% of the population is still smoking in Canada (aged 12 and older, self-reported)
  - large population at risk: >5 million current smokers added to >7 million former smokers
- society [...] and many of us] blames the smoker, rather than the cigarette
Lung disease will kill millions in China: report

HONG KONG (Reuters) — Tens of millions of people will die from respiratory illness and lung cancer during the next 25 years in China if nothing is done to reduce smoking and fuel burning indoors, scientists warned.

In an article published in The Lancet, they predicted 65 million deaths from chronic obstructive pulmonary disease (COPD) and 18 million deaths from lung cancer between 2003 and 2033 from smoking and biomass burning at home.

Those figures would account for 19 and 5 percent respectively of all deaths in China during that period, said the researchers at the Harvard School of Public Health (HSPH).

However, interventions to reduce smoking and household use of biomass — like wood, charcoal, crop residues and dung — for cooking and heating could reduce the number of deaths.

Using mathematical models, they said gradual elimination of smoking and biomass burning would avoid 26 million deaths from COPD and 6.3 million deaths from lung cancer by 2033.

Interventions include building proper chimneys, air circular stoves with chimneys ending outside the house and ventilated ground stoves to cut respirable particulates, carbon dioxide and sulphur dioxide circulating indoors.

Respiratory diseases are among the 10 leading causes of deaths in China. About half of Chinese men smoke and in more than 70 percent of homes, Chinese cook and heat their homes with wood, coal and crop residues.
COPD Risk Factors - 1990

- tobacco smoke exposure
- other: genetics, lung development, exposure to particles, occupational dusts (organic and inorganic), chemical agents/fumes, indoor air pollution from heating and cooking with biomass, outdoor air pollution, gender, age, respiratory infections, socioeconomic status, nutrition, co-morbidities

COPD Risk Factors - 2010

- tobacco smoke
- genetics, lung growth and development
- exposure to particles
  - occupational dusts (organic/inorganic), indoor pollution from heating/cooking with biomass, chemical agents/fumes, outdoor air pollution
- gender, age, respiratory infections, socioeconomic status, nutrition, co-morbidities, atopy

COPD in the Workplace

**Occupational Causation (?)**

- COPD is multi-factorial
- presents via multiple clinical pathways
  - most common is “not yet diagnosed”
- COPD diagnostic criteria change
- no distinguishing features between occupational and non-occupational related COPD (unlike with ILD/pneumoconiosis)
- concurrent smoking - so much easier to blame!


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**Occupational Causation (cont’d)**

- “healthy worker effect”
- workforce studies are often limited to a “survivor” population, because of inability or difficulty in assessing or monitoring workers who leave their jobs
  - underestimate the chronic effects of occupational exposures
- perception(s) that we’ve fixed all the bad occupational lung diseases
**Biologic Plausibility**

- biological plausibility of associations between occupational exposures and COPD is supported by animal studies and inhalational toxicological studies
  - exposure to endotoxin, mineral dusts, sulphur dioxide, and vanadium has been shown to induce chronic bronchitis
  - exposure to cadmium, coal, endotoxin, and silica has been documented to cause emphysema

**Occupational Exposures**

- established links between specific occupations and development of COPD
  - coal mining, hard-rock mining, tunnel digging, concrete-manufacturing, non-mining heavy industries
- moderate smoking and occupational exposures have approximately comparable effects on COPD risk in these studies.
- exposure-response gradient is evident

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**Occupational Causation – “Not”**

- no correlation found between COPD and occupational exposures among 20,245 Chinese non-smokers, after accounting for education and smoking
  - noted a healthy worker effect (more healthy individuals employed in jobs with dusts/gases/fumes) and significant differences between smokers and non-smokers in types of occupational exposure
  - subjects with occupational exposures did have more respiratory symptoms


**COPD in the Workplace**

**Occupational COPD – Frequency**

- estimates of COPD attributable to work exposures vary:
  - 19.2% overall, and 31.1% among never smokers (NHANES III) (1)
  - 15-20% of COPD (ATS) (2,3)
  - 10% in North-East England (55% of the sampled population had symptoms related to occupational exposures - mining and shipbuilding) (4)

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**COPD Definition**

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

• spirometry is essential for diagnosis (1), yet is significantly underutilized (2) - change in management occurs in >50% of patients diagnosed with COPD in primary practice through targeted testing (3) • “a post-bronchodilator FEV$_1$/FVC <70% indicates airflow obstruction that is not fully reversible, and is necessary for the diagnosis of COPD to be established" (1)

**Exercise in Mild COPD**

* = p <0.05; mild COPD [FEV1 91%, 2.28±0.56 L] vs age/sex matched controls


**Physical Activity in COPD**

70 COPD [9 / 28 / 23 / 10] and 30 control subjects; activity monitor x 6-8 days.

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Effects of COPD on the Patient

**Impairment**
- FEV₁, FVC
- IC, EELV
- FRC, RV

**Disability**
- Dyspnea
- Exercise Endurance
- Exacerbations (AECOPD)

**Handicap**
- Quality of Life
- Health Care Utilization

Adapted from Can Respir J, 2004; 11(Suppl B): 7B-59B

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**COPD - Effect on Work**

- in a cohort of over 1000 established COPD cases, workers missed a mean of 4.6 days over a 6 month period (1)
- while COPD patients have more days off, appropriate treatment of exacerbations leads to a reduction in further exacerbations and comparatively less work loss (2)

**COPD in the Workplace**

**Work and Quality of Life**

![Graph showing the comparison of CQ-domains between not working and non-paid volunteers compared to working COPD subjects.](image)

- Black = not working; Grey = non-paid volunteers (compared to working COPD)


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**A Comprehensive Approach to COPD Management**

- **Surgery**
- **Oxygen**
- **Inhaled corticosteroids/LABA**
- **Pulmonary rehabilitation**
- **Long-acting bronchodilator(s)**
- **PRN short-acting bronchodilators**
- **Smoking cessation/exercise/self-management/education**

**Lung function impairment**
- Mild

**MRC Dyspnea**
- Early Diagnosis (Spirometry) + Prevention
- Prevent/Rx AECOPD Follow-up
- End of Life Care

Combination Therapy


Optimizing COPD Management

"What do you mean you’re out of breath?"
"I haven’t switched it on yet!"
Pulmonary Rehabilitation in COPD

- Pulmonary Rehabilitation improves dyspnea in COPD patients (1)
- COPD patients can benefit from pulmonary rehabilitation regardless of age, disease severity, and sex (2)
- pulmonary rehabilitation is beneficial across all levels of COPD severity, and should be considered earlier in the course of COPD (3)
  - would allow for a greater emphasis on promoting health rather than regaining function.


Optimizing mild COPD

Pulmonary Rehabilitation in chronic obstructive pulmonary disease – practical issues:

A Canadian Thoracic Society Clinical Practice Guideline

Denny D. Marciniuk MD, FRCPC*
Dina Isaack, MD, MSc
Dana Bentley, MD, MSc
Andrew D. Vella, MD, MSc
Katherine H. Pedersen, MSc

- Pulmonary rehabilitation (PR) participation is the standard of care for patients with chronic obstructive pulmonary disease (COPD) who require oxygen therapy.

- COPD patients can benefit from pulmonary rehabilitation regardless of age, disease severity, and sex.

- Pulmonary rehabilitation is beneficial across all levels of COPD severity, and should be considered earlier in the course of COPD.
  - would allow for a greater emphasis on promoting health rather than regaining function.

Increasing Disability and Lung Function Impairment

**Mild**

- Infrequent AECOPD (< 1/year)
- SABD prn
- LAAC + SABA prn
  or
- LABA + SABD prn

**Moderate**

- LAAC or LABA + SABA prn
- LAAC + LABA + SABA prn
- LAAC + ICS/LABA + SABA prn

**Severe**

- Frequent AECOPD (≥ 1/year)
- LAAC or LABA + SABA prn
- LAAC + LABA + SABA prn
- LAAC + ICS/LABA + SABA prn

Persistent dyspnea

Workplace Considerations

- assessing / managing the environment - heat, humidity, particulates
- match work expectations with physical capabilities (limitations)
  - impairment / disability / handicap [and occasional issues related to insurance ...]
  - objective assessment of disability with cardiopulmonary exercise testing (CPET) can be most helpful in this setting
- goal is to enable optimal management

Adherence - Effect on Outcomes

Kaplan-Meier plot of survival in patients adherent, and not adherent to study treatment (n = 5919)

Kaplan-Meier plot of survival in patients adherent, and not adherent to study treatment (n = 5919)

We need minimally disruptive medicine

Chronic illness is the great epidemic of our times, but the strategies we have developed to contain it are creating a growing burden of avoidable, preventable, and untreatable diseases. In the UK, for example, patients with chronic obstructive pulmonary disease (COPD) are among those who are hardest hit. The burden of illness is thus currently being underestimated, and the cost is not borne by the state but by the patients themselves.

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AECOPD Preventive Strategies

- Smoking cessation
- Vaccinations
  - Influenza (annually)
  - Pneumococcal vaccine (every five to 10 years)
- Self-management education with a written action plan for AECOPD
- Regular long-acting bronchodilator therapy
- Regular therapy with inhaled corticosteroids/long-acting beta₂-agonists combination
- Oral corticosteroid therapy for moderate to severe AECOPD
- Pulmonary rehabilitation
COPD in the Workplace

Mortality After Hospitalization

<table>
<thead>
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<th>30</th>
<th>60</th>
<th>90</th>
<th>365</th>
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<tbody>
<tr>
<td>FP/GP Only</td>
<td>13.03*</td>
<td>17.13*</td>
<td>20.14*</td>
<td>36.26*</td>
</tr>
<tr>
<td>(n=6,122)</td>
<td></td>
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<tr>
<td>FP/GP with COPD Specialist</td>
<td>6.47</td>
<td>9.41</td>
<td>11.72</td>
<td>24.80</td>
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<tr>
<td>(n=13,311)</td>
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(days after discharge, %, * = statistically significantly higher)

Retrospective cohort study, pts 65 yrs and older admitted in Ontario between 2001-2004 with primary diagnosis of COPD


Benefits of Education
- Patient support
- Improves self-confidence
- Enhances family concerns
- Provides disease specific information
- Improves risk factor awareness
- Helps with lifestyle changes

Benefits of Exercise
- Lowers Blood Pressure
- Improves Cholesterol Profile
- Aids with Weight Control
- Helps with Diabetes Prevention and Management
- Improves Quality of Life
- Decreases Stress Level
- Increases Energy Level
- Improves Bone Mass

Benefits of Self-management
- Quick confidence
- Prevents life-threatening crisis
- Provides practical action planning
- Develops problem-solving abilities
- Improves symptom management

CDM Program Goals
- To develop and implement a coordinated, effective, and cost-effective care for people with chronic conditions
- To optimize care of people by promoting a team approach and enhanced self-management of disease
- To promote inter-professional collaboration and education

LiveWell Chronic Disease Management Program

For more information about the CDM Program, please contact:
Chronic Disease Management Program
Royal University Hospital
180 Hospital Drive
Saskatoon SK S7N 0W0
Office: (306) 655-LIVE (5483)
Fax: (306) 655-5833
Email: cdm@ruh.scied@ruhsc.edu
**Group Exercise and Rehabilitation**

- Community-based exercise and rehabilitation programming
- Group education
- Group and social support

**LiveWell™ Optimizing Chronic Disease Management**

**Patient Self-Management**

- Individualized plan of action
- Patient-led group support “LiveWell with Chronic Conditions”
- Enhanced self-management skills
<table>
<thead>
<tr>
<th><strong>Group Exercise and Rehabilitation</strong></th>
<th><strong>Disease-Specific Management</strong></th>
<th><strong>Patient Self-Management</strong></th>
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<tbody>
<tr>
<td>• Community-based exercise and rehabilitation programming</td>
<td>• Interprofessional team working with the patient, family, and Family Physician</td>
<td>• Individualized plan of action</td>
</tr>
<tr>
<td>• Group education</td>
<td>• Evidence-based optimal care delivery</td>
<td>• Patient-led group support “LiveWell with Chronic Conditions”</td>
</tr>
<tr>
<td>• Group and social support</td>
<td></td>
<td>• Enhanced self-management skills</td>
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**Patient Benefits and Outcomes**

- reduced system-wide COPD re-admission rates by 23%, hospital days by 22%, ICU days by 44%
- comprehensive program benefits:
  - 1 year follow-up: COPD re-admissions reduced by 71%, hospital days by 62%, ER visits by 44%
  - 1 year follow-up: SGRQ reduced (ie, improved) by 8.3 (52.9 to 44.6) at 3 months, 5.6 at 6 months, 5.3 at 12 months
  - 3 year follow-up: COPD re-admissions reduced by 64%, hospital days by 29%, ER visits by 30%
- improved quality of life (decreased shortness of breath and enhanced exercise tolerance), reduced exacerbations and hospitalizations, and reduced healthcare costs.
COPD in the Workplace

**Summary**

- reviewed the current *diagnostic criteria* and *clinical practice guidelines* for Chronic Obstructive Pulmonary Disease (COPD)
- discussed various *occupational exposures* implicated in development of COPD
- highlighted effective and practical approaches to *optimizing the management of COPD*, including in the workplace.