CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

Ardhi Bustami

Internal Medicine Department of

Muhammadiyah University Malang Hospital

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DEFINITION AND OVERVIEW

Definition of COPD

COPD :

a common preventable and treatable disease, is characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases.

Mechanisms Underlying Airflow Limitation in COPD

Small Airways Disease

- Airway inflammation
- Airway fibrosis, luminal plugs
- Increased airway resistance

Parenchymal Destruction

- Loss of alveolar attachments
- Decrease of elastic recoil

AIRFLOW LIMITATION

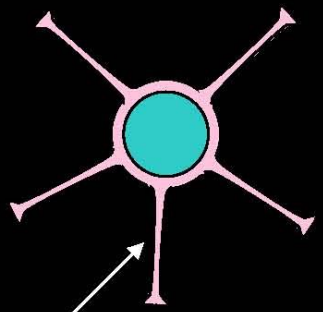
AIR TRAPPING IN COPD

Normal

COPD

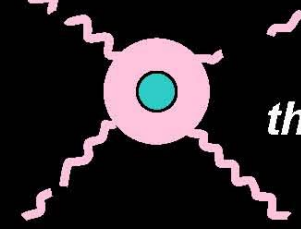
Inspiration

small airway



alveolar attachments

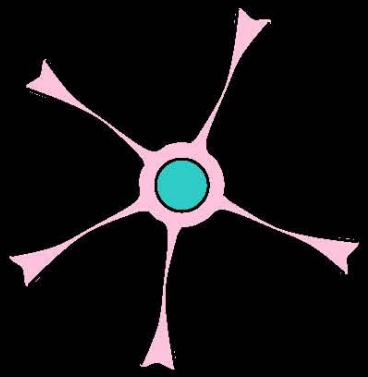
Inflammation

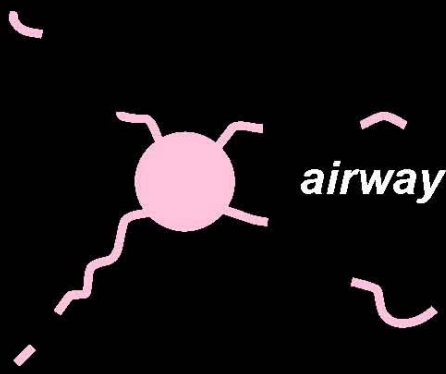


thickened airway

loss of alveolar attachments
loss of elasticity (emphysema)

Expiration

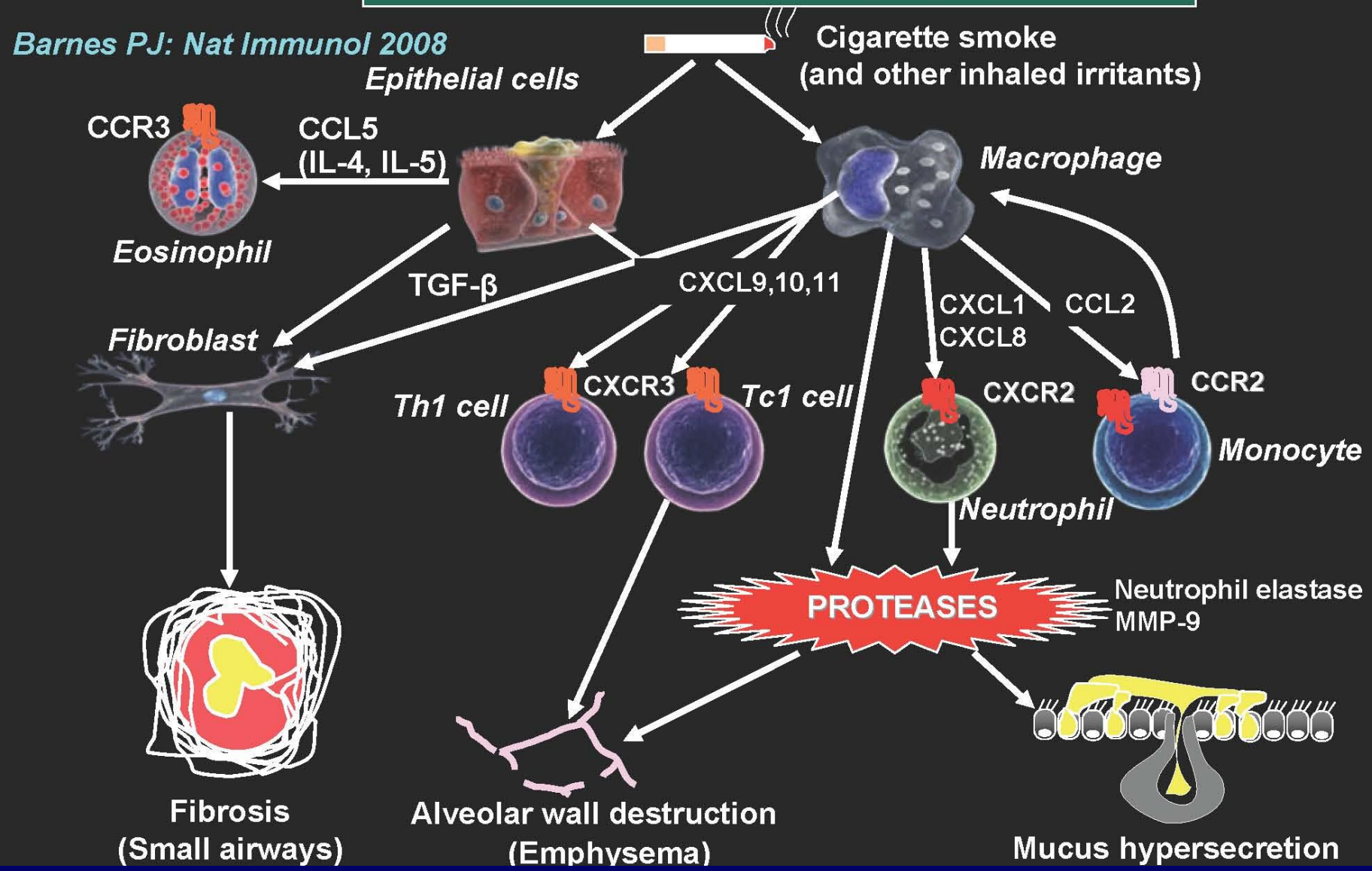




airway closure

Professor Peter J. Barnes, MD
National Heart and Lung Institute, London UK

CELLULAR MECHANISMS OF COPD



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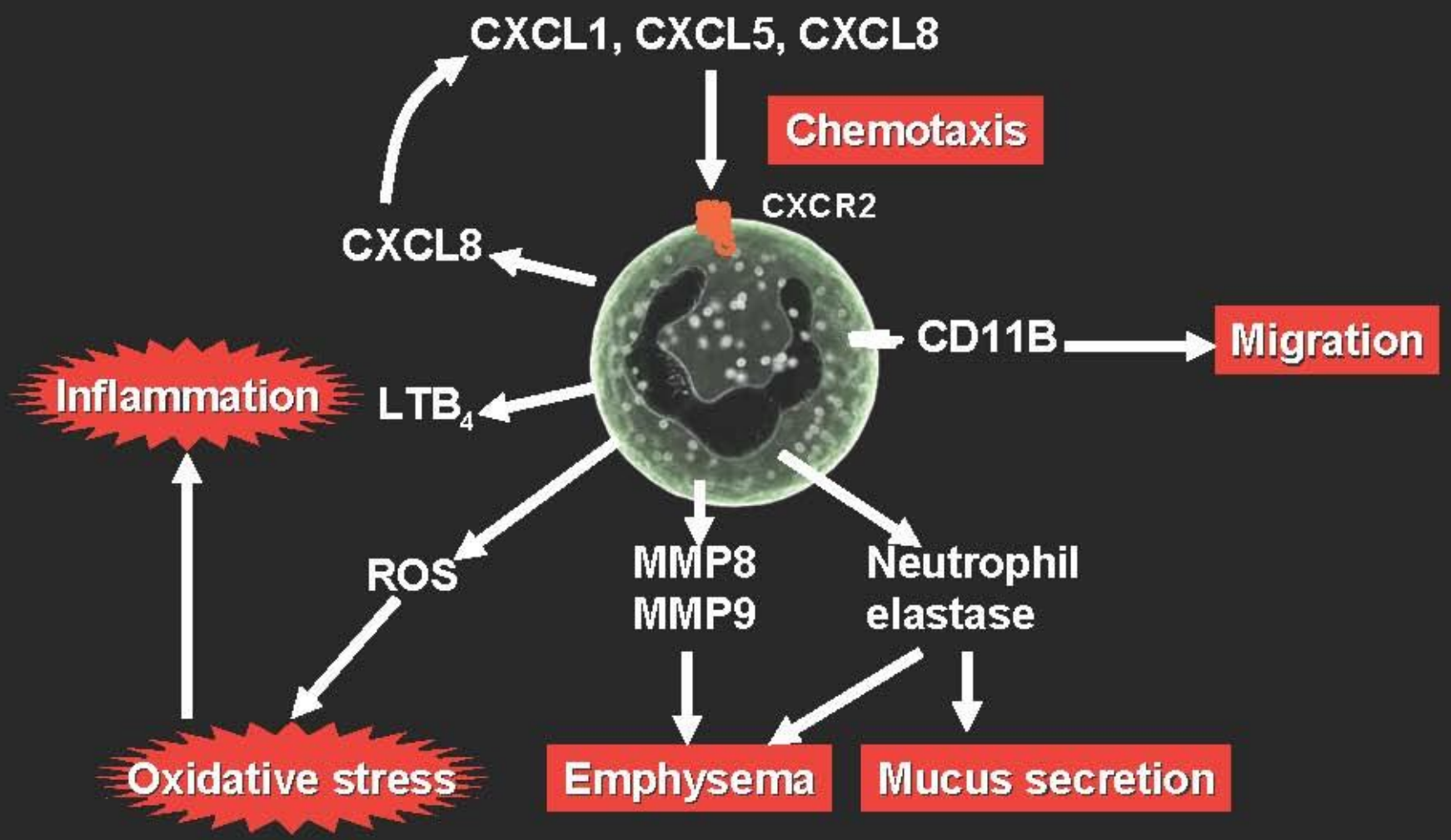
NEUTROPHILS IN COPD



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Burden of COPD

- COPD is a leading cause of morbidity and mortality worldwide.
- The burden of COPD is projected to increase in coming decades due to continued exposure to COPD risk factors and the aging of the world's population.
- COPD is associated with significant economic burden.

Risk Factors for COPD

Genes

Exposure to particles

- Tobacco smoke
- Occupational dusts, organic and inorganic
- Indoor air pollution from heating and cooking with biomass in poorly ventilated dwellings
- Outdoor air pollution

Lung growth and development

Gender

Age

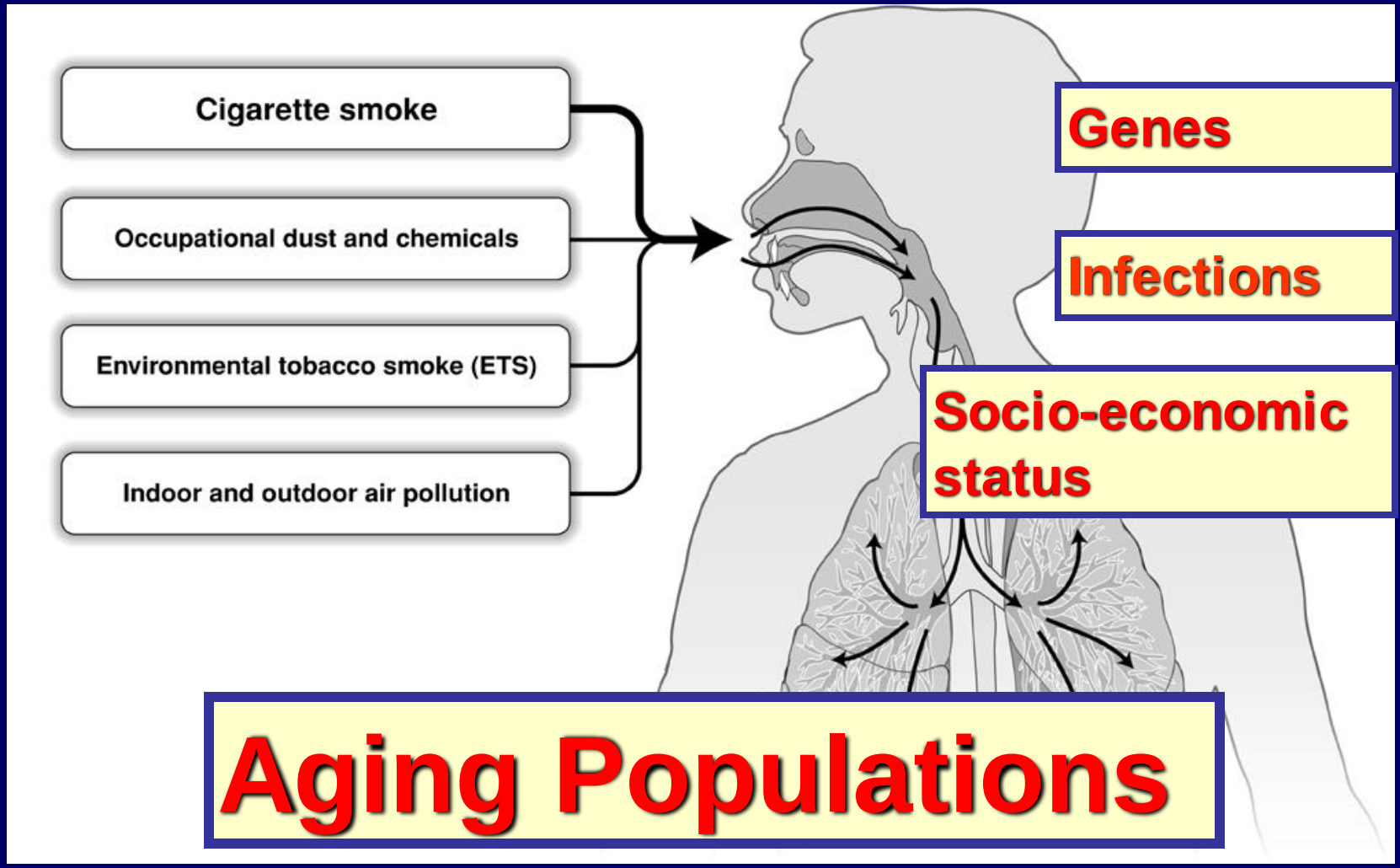
Respiratory infections

Socioeconomic status

Asthma/Bronchial hyperreactivity

Chronic Bronchitis

Risk Factors for COPD



DIAGNOSIS AND ASSESSMENT

Diagnosis of COPD

- A clinical diagnosis of COPD :
  - dyspnea, chronic cough or sputum production, and a history of exposure to risk factors for the disease.
- Spirometry is required to make the diagnosis;
  - the presence of a post-bronchodilator $FEV_1/FVC < 0.70$ confirms the presence of persistent airflow limitation and thus of COPD.

Diagnosis of COPD

SYMPTOMS

shortness of breath

chronic cough

sputum

EXPOSURE TO RISK FACTORS

tobacco

occupation

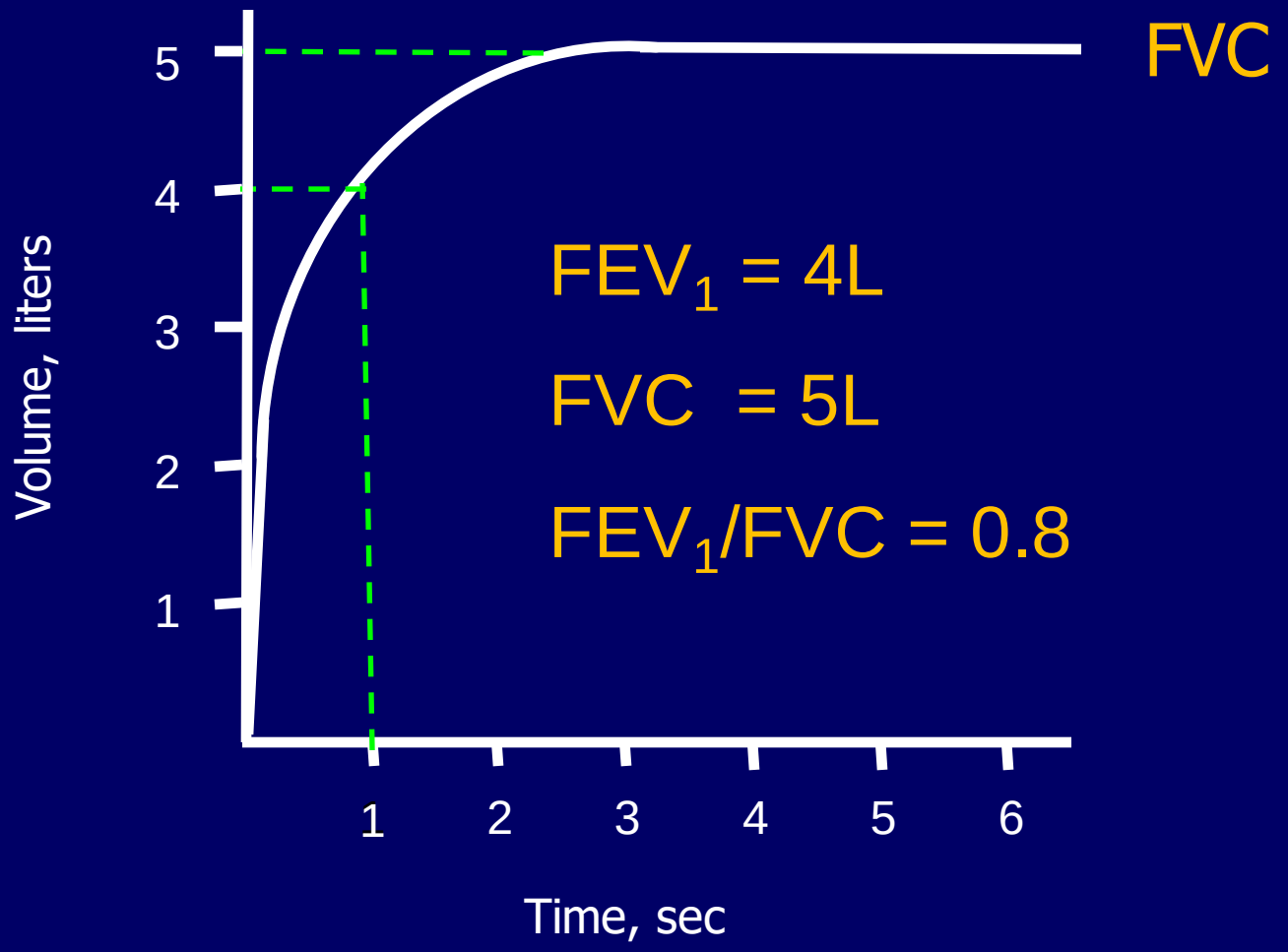
indoor/outdoor pollution

SPIROMETRY: Required to establish diagnosis

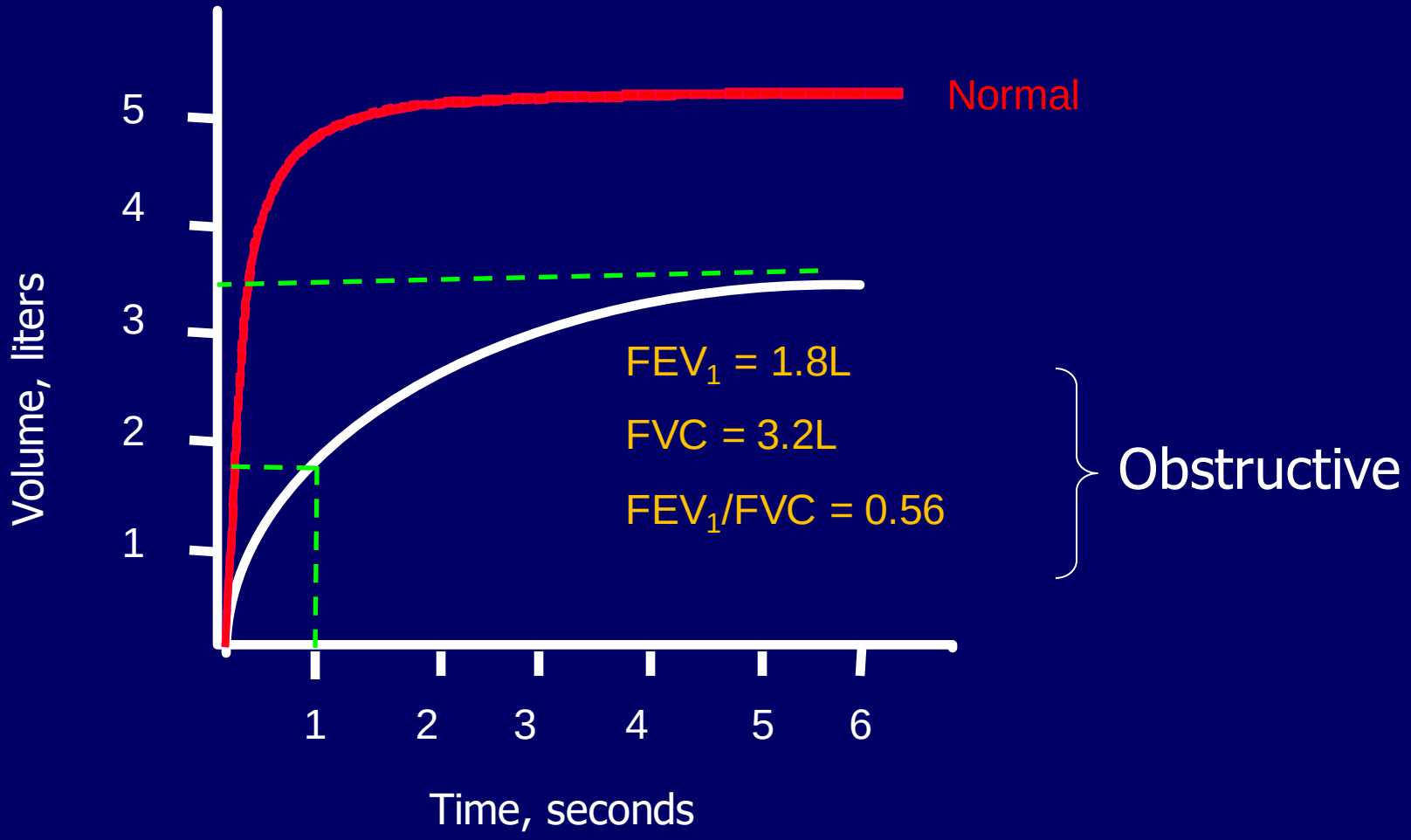
Assessment of Airflow Limitation: Spirometry

- Spirometry should be performed after the administration of an adequate dose of a short-acting inhaled bronchodilator to minimize variability.
- A post-bronchodilator $FEV_1/FVC < 0.70$ confirms the presence of airflow limitation.
- Where possible, values should be compared to age-related normal values to avoid overdiagnosis of COPD in the elderly.

Spirometry: Normal Trace Showing FEV_1 and FVC



Spirometry: Obstructive Disease



Assessment of COPD

- Assess symptoms
- Assess degree of airflow limitation using spirometry
- Assess risk of exacerbations
- Assess comorbidities

Symptoms of COPD

The characteristic symptoms of COPD are chronic and progressive dyspnea, cough, and sputum production that can be variable from day-to-day.

Dyspnea: Progressive, persistent and characteristically worse with exercise.

Chronic cough: May be intermittent and may be unproductive.

Chronic sputum production: COPD patients commonly cough up sputum.

Assessment of COPD

- Assess symptoms

COPD Assessment Test (CAT)

or

Clinical COPD Questionnaire (CCQ)

or

mMRC Breathlessness scale

Modified MRC (mMRC)Questionnaire

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. ☐

Assessment of COPD

- Assess symptoms
- Assess degree of airflow limitation

Use spirometry for grading severity according to spirometry, using four grades split at 80%, 50% and 30% of predicted value

Classification of Severity of Airflow Limitation in COPD*

In patients with $FEV_1/FVC < 0.70$:

GOLD 1: Mild	$FEV_1 \geq 80\%$ predicted
GOLD 2: Moderate	$50\% \leq FEV_1 < 80\%$ predicted
GOLD 3: Severe	$30\% \leq FEV_1 < 50\%$ predicted
GOLD 4: Very Severe	$FEV_1 < 30\%$ predicted

*Based on Post-Bronchodilator FEV_1

Assessment of COPD

- Assess symptoms
- Assess degree of airflow limitation using spirometry
- Assess risk of exacerbations

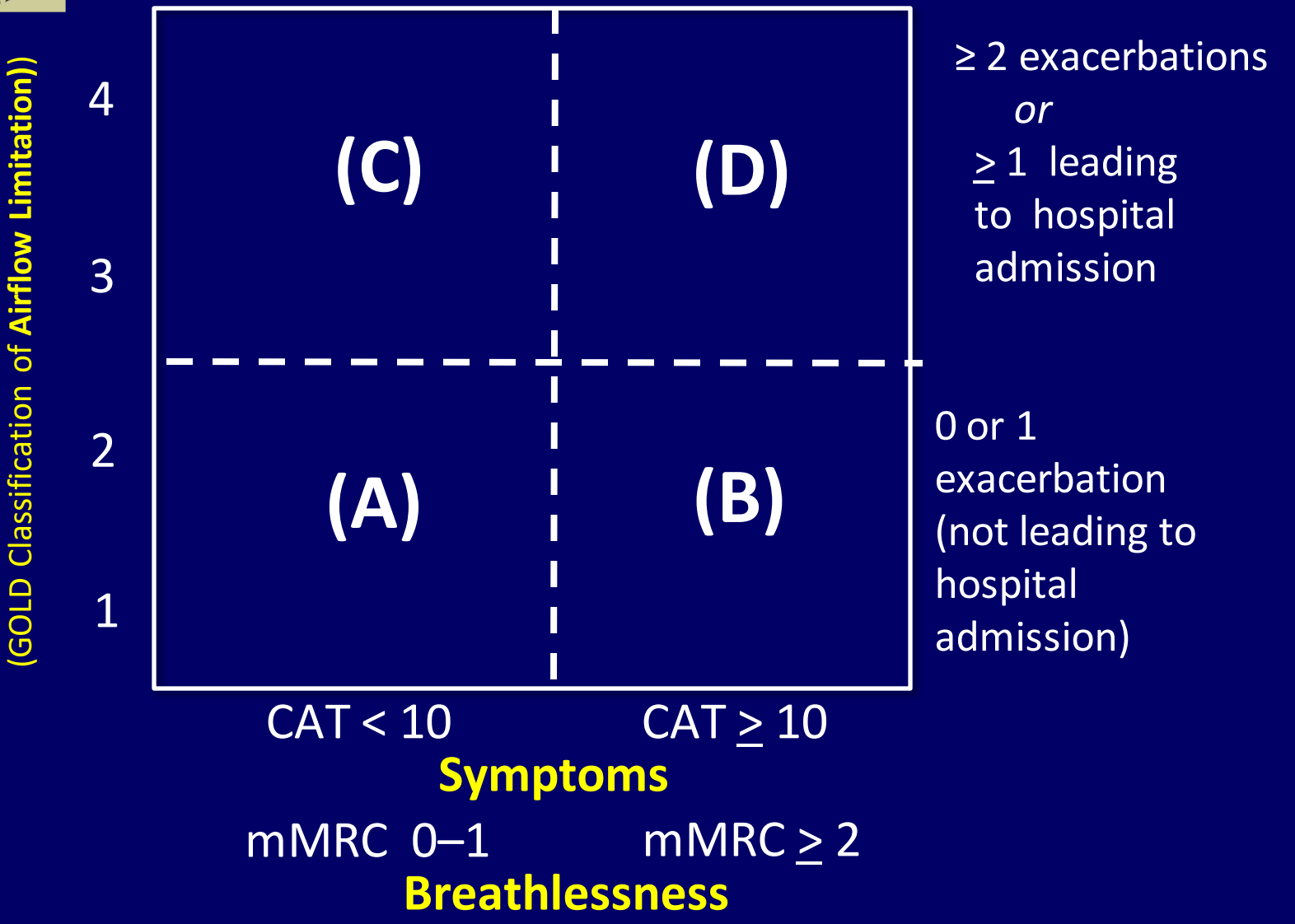
Use history of exacerbations and spirometry. Two exacerbations or more within the last year or an $FEV_1 < 50$ % of predicted value are indicators of high risk. Hospitalization for a COPD exacerbation associated with increased risk of death.

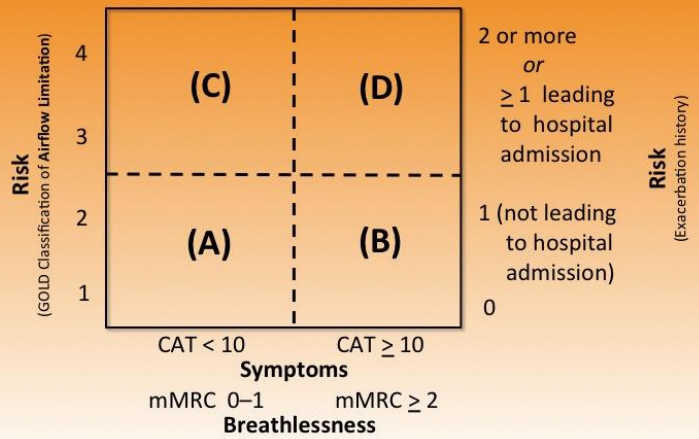
Combined Assessment of COPD

- Assess symptoms
- Assess degree of airflow limitation using spirometry
- Assess risk of exacerbations

Combine these assessments for the purpose of improving management of COPD

Combined Assessment of COPD





Combined Assessment of COPD

*When assessing risk, choose the **highest** risk according to GOLD grade or exacerbation history. One or more hospitalizations for COPD exacerbations should be considered high risk.)*

Patient	Characteristic	Spirometric Classification	Exacerbations per year	CAT	mMRC
A	Low Risk Less Symptoms	GOLD 1-2	≤ 1	< 10	0-1
B	Low Risk More Symptoms	GOLD 1-2	≤ 1	≥ 10	≥ 2
C	High Risk Less Symptoms	GOLD 3-4	≥ 2	< 10	0-1
D	High Risk More Symptoms	GOLD 3-4	≥ 2	≥ 10	≥ 2

Assess COPD Comorbidities

COPD patients are at increased risk for:

- Cardiovascular diseases
- Osteoporosis
- Respiratory infections
- Anxiety and Depression
- Diabetes
- Lung cancer
- Bronchiectasis

These comorbid conditions may influence mortality and hospitalizations and should be looked for routinely, and treated appropriately.

Differential Diagnosis: COPD and Asthma

COPD

- Onset in mid-life
- Symptoms slowly progressive
- Long smoking history

ASTHMA

- Onset early in life (often childhood)
- Symptoms vary from day to day
- Symptoms worse at night/early morning
- Allergy, rhinitis, and/or eczema also present
- Family history of asthma

Additional Investigations

- Chest X-ray
- Lung Volumes and Diffusing Capacity
- Oximetry and Arterial Blood Gases
- Alpha-1 Antitrypsin Deficiency Screening
- Exercise Testing

THERAPEUTIC OPTION

Therapeutic Options: Key Points

- Smoking cessation
- Regular physical activity
- Pharmacologic therapy

Therapeutic Options: COPD Medications

Beta$_2$-agonists
Short-acting beta$_2$-agonists
Long-acting beta$_2$-agonists
Anticholinergics
Short-acting anticholinergics
Long-acting anticholinergics
Combination short-acting beta$_2$-agonists + anticholinergic in one inhaler Combination long-acting beta$_2$-agonist + anticholinergic in one inhaler
Methylxanthines
Inhaled corticosteroids
Combination long-acting beta$_2$-agonists + corticosteroids in one inhaler
Systemic corticosteroids
Phosphodiesterase-4 inhibitors

Therapeutic Options: Other Pharmacologic Treatments

Influenza vaccines

Antibiotics

Alpha-1 antitrypsin augmentation therapy

Mucolytics

Therapeutic Options: Rehabilitation

Exercise training programs

Oxygen Therapy

Ventilatory Support

Therapeutic Options: Surgical Treatments

- Lung volume reduction surgery (LVRS)
- Lung transplantation

MANAGE STABLE COPD

Manage Stable COPD: Goals of Therapy

- Relieve symptoms
- Improve exercise tolerance
- Improve health status

Reduce symptoms

- Prevent disease progression
- Prevent and treat exacerbations
- Reduce mortality

Reduce risk

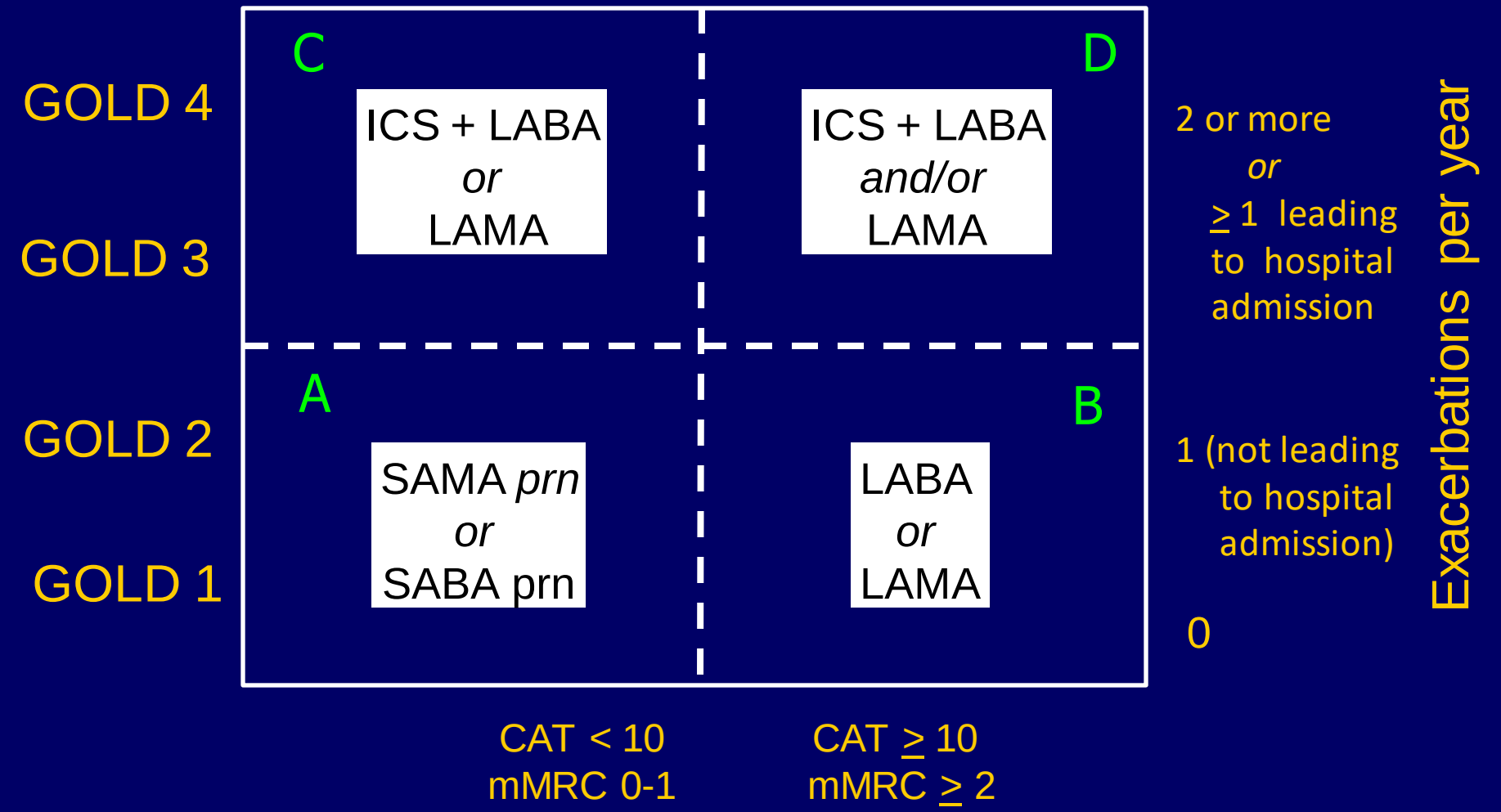
Manage Stable COPD: All COPD Patients

- Avoidance of risk factors
  - smoking cessation
  - reduction of indoor pollution
  - reduction of occupational exposure
- Influenza vaccination

Manage Stable COPD: Non-pharmacologic

Patient Group	Essential	Recommended	Depending on local guidelines
A	Smoking cessation (can include pharmacologic treatment)	Physical activity	Flu vaccination Pneumococcal vaccination
B, C, D	Smoking cessation (can include pharmacologic treatment) Pulmonary rehabilitation	Physical activity	Flu vaccination Pneumococcal vaccination

Manage Stable COPD: Pharmacologic Therapy
RECOMMENDED FIRST CHOICE



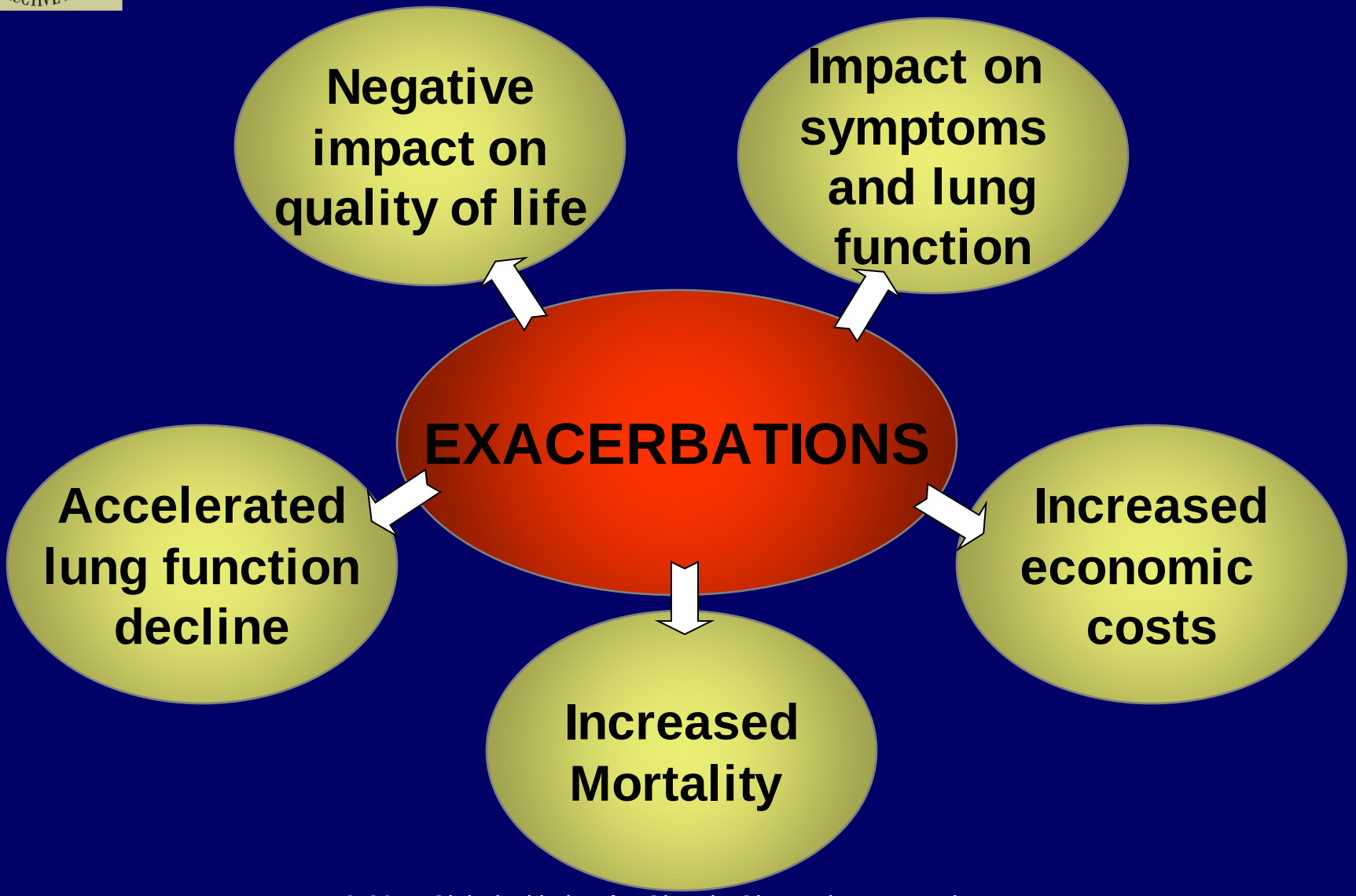
MANAGE EXACERBATIONS COPD

Manage Exacerbations

An exacerbation of COPD is:

"an acute event characterized by a worsening of the patient's respiratory symptoms that is beyond normal day-to-day variations and leads to a change in medication."

Consequences Of COPD Exacerbations



Manage Exacerbations: Assessments

- Arterial blood gas measurements (in hospital)
- Chest radiographs
- ECG
- Whole blood count
- Purulent sputum
- Biochemical tests
- Spirometric tests

Manage Exacerbations: Treatment Options

Oxygen: titrate to improve the patient's hypoxemia with a target saturation of 88-92%.

Bronchodilators: Short-acting inhaled beta$_2$-agonists with or without short-acting anticholinergics are preferred.

Systemic Corticosteroids: Shorten recovery time, improve lung function (FEV_1) and arterial hypoxemia (PaO_2), and reduce the risk of early relapse, treatment failure, and length of hospital stay. A dose of 40 mg prednisone per day for 5 days is recommended .

Manage Exacerbations: Treatment Options

Antibiotics should be given to patients with:

- Three cardinal symptoms: increased dyspnea, increased sputum volume, and increased sputum purulence.
- Who require mechanical ventilation.

Manage Exacerbations: Indications for Hospital Admission

- Marked increase in intensity of symptoms
- Severe underlying COPD
- Onset of new physical signs
- Failure of an exacerbation to respond to initial medical management
- Presence of serious comorbidities
- Frequent exacerbations
- Older age
- Insufficient home support

MANAGE COMORBIDITIES

Manage Comorbidities

Cardiovascular disease (including ischemic heart disease, heart failure, atrial fibrillation, and hypertension) is a major comorbidity in COPD. Benefits of cardioselective beta-blocker treatment in heart failure outweigh potential risk even in patients with severe COPD.

Manage Comorbidities

Osteoporosis and anxiety/depression: often under-diagnosed and associated with poor health status and prognosis.

Lung cancer: frequent in patients with COPD; the most frequent cause of death in patients with mild COPD.

Serious infections: respiratory infections are especially frequent.

Metabolic syndrome and manifest diabetes: more frequent in COPD and the latter is likely to impact on prognosis.

SUMMARY

SUMMARY

- Prevention of COPD is to a large extent possible and should have high priority
- Spirometry is required to make the diagnosis of COPD; the presence of a post-bronchodilator $FEV_1/FVC < 0.70$ confirms the presence of persistent airflow limitation and thus of COPD
- The beneficial effects of pulmonary rehabilitation and physical activity cannot be overstated

SUMMARY

- Assessment of COPD requires assessment of symptoms, degree of airflow limitation, risk of exacerbations, and comorbidities
- Combined assessment of symptoms and risk of exacerbations is the basis for non-pharmacologic and pharmacologic management of COPD

SUMMARY

- Treat COPD exacerbations to minimize their impact and to prevent the development of subsequent exacerbations
- Look for comorbidities – and if present treat to the same extent as if the patient did not have COPD

WORLD COPD DAY
November 18th

Raising COPD Awareness Worldwide