Update on COPD 2019

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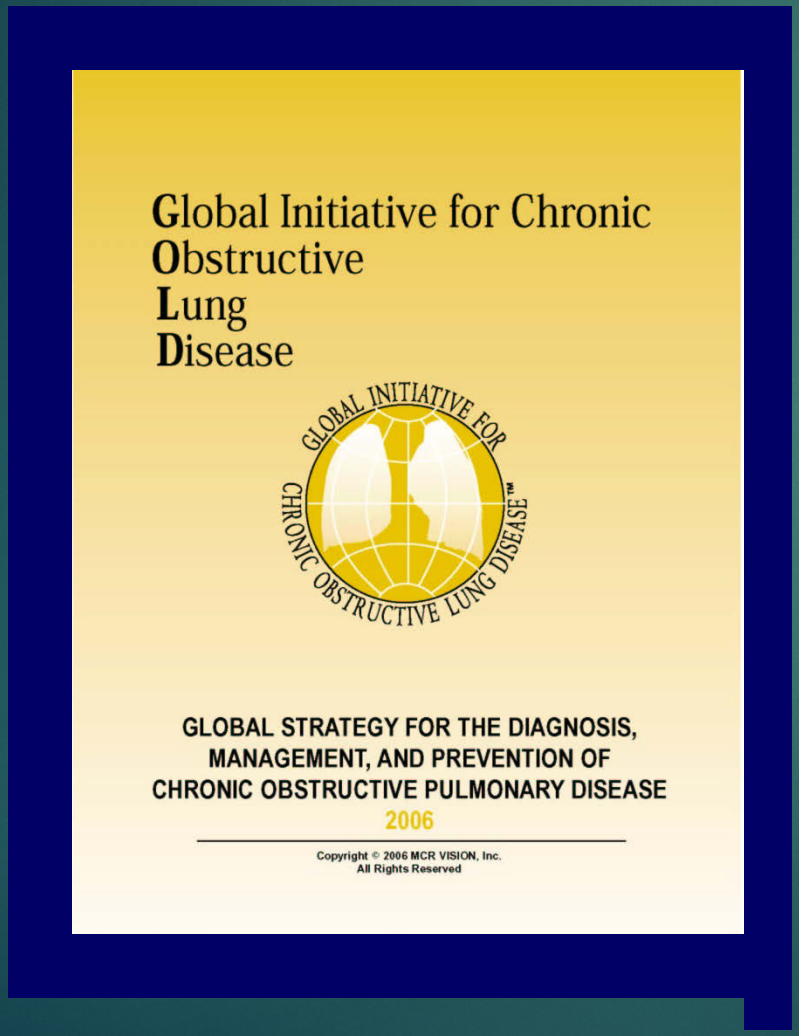
Online Resource

- http://goldcopd.org/
- https://goldcopd.org/wp-content/uploads/2018/02/WMS-GOLD-2018-Feb-Final-to-print-v2.pdf
- http://pulmccm.org/main/2016/copd-review/new-2017-gold-guidelines-copd-released/

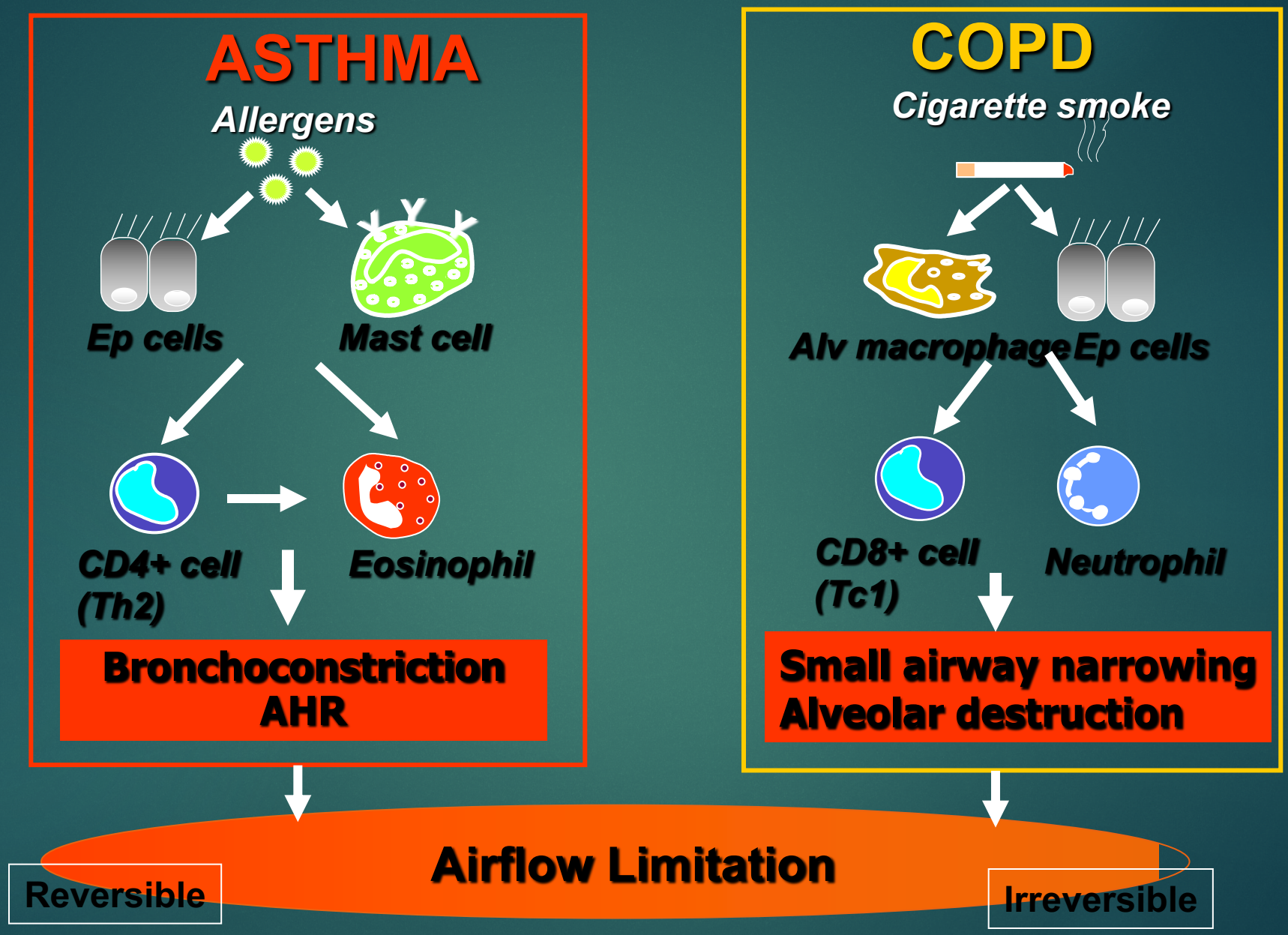
Global Strategy for Diagnosis, Management and Prevention of COPD



- Definition, Classification
- Burden of COPD
- Risk Factors
- Pathogenesis, Pathology, Pathophysiology
- Management
- Practical Considerations

Definition of COPD

- COPD is a preventable and treatable disease with significant extra pulmonary effects that may contribute to 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 in the lung in response to noxious particles or gases.



Source: Peter J. Barnes, MD

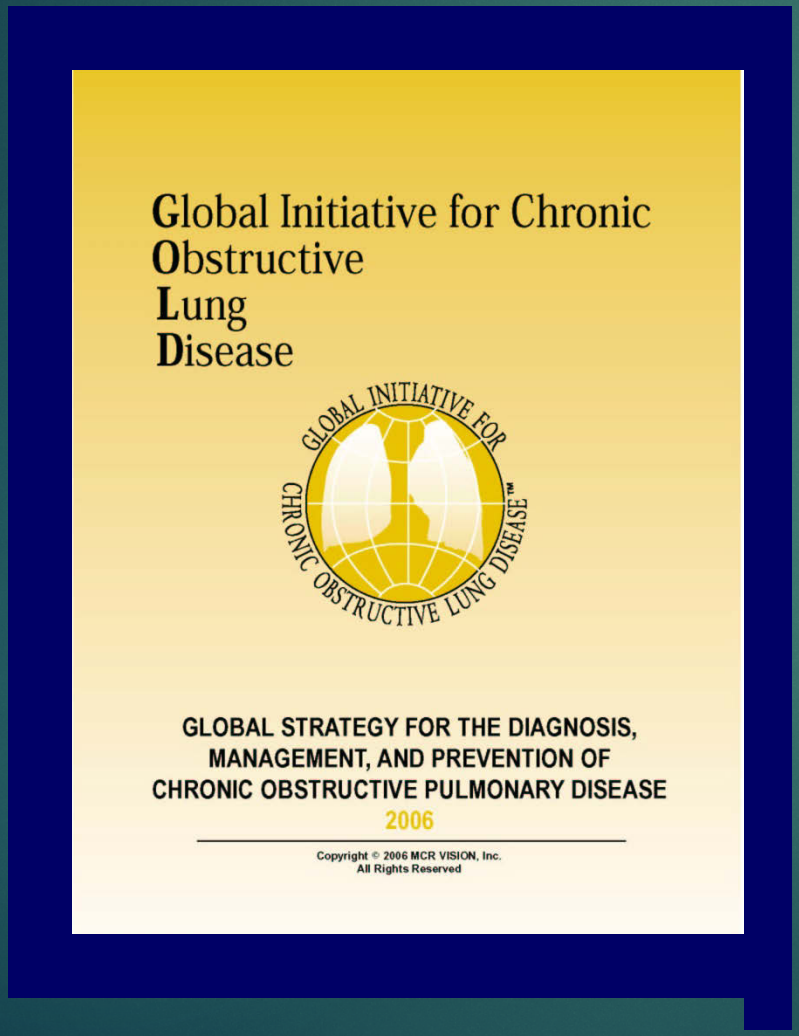
Semin Respir Infect. 2003 Mar;18(1):9-16.

Inflammation and infection in exacerbations of chronic obstructive pulmonary disease.

Pietila MP[1], Thomas CF.

- https://www.ncbi.nlm.nih.gov/pubmed/12652449

Global Strategy for Diagnosis, Management and Prevention of COPD



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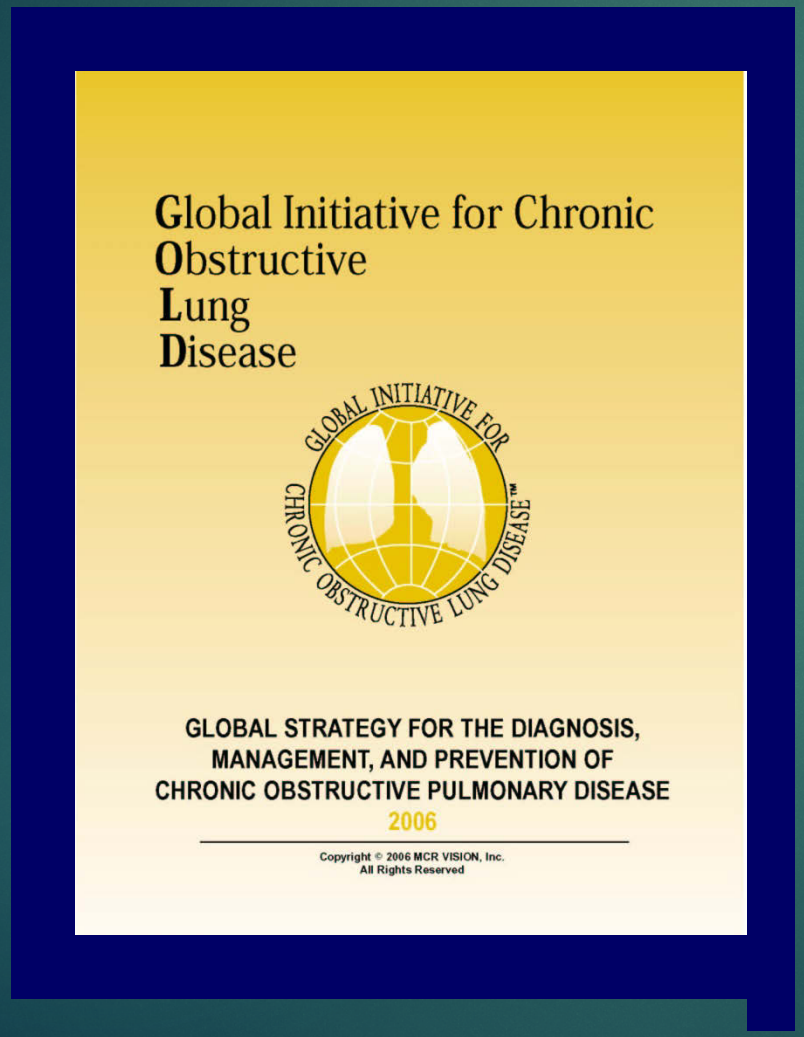
Four Components of COPD Management



1. Assess and monitor disease
2. Reduce risk factors
3. Manage stable COPD
   - Education
   - Pharmacologic
   - Non-pharmacologic
4. Manage exacerbations

Management of Stable COPD

Assess and Monitor COPD: Key Points

- A clinical diagnosis of COPD should be considered in any patient who has dyspnea, chronic cough or sputum production, and/or a history of exposure to risk factors for the disease.
- The diagnosis should be confirmed by spirometry. A post-bronchodilator $FEV_1/FVC < 0.70$ confirms the presence of airflow limitation that is not fully reversible.
- Comorbidities are common in COPD and should be actively identified.

GOALS of COPD MANAGEMENT

VARYING EMPHASIS WITH DIFFERING SEVERITY

- Relieve symptoms
- Prevent disease progression
- Improve exercise tolerance
- Improve health status
- Prevent and treat complications
- Prevent and treat exacerbations
- Reduce mortality

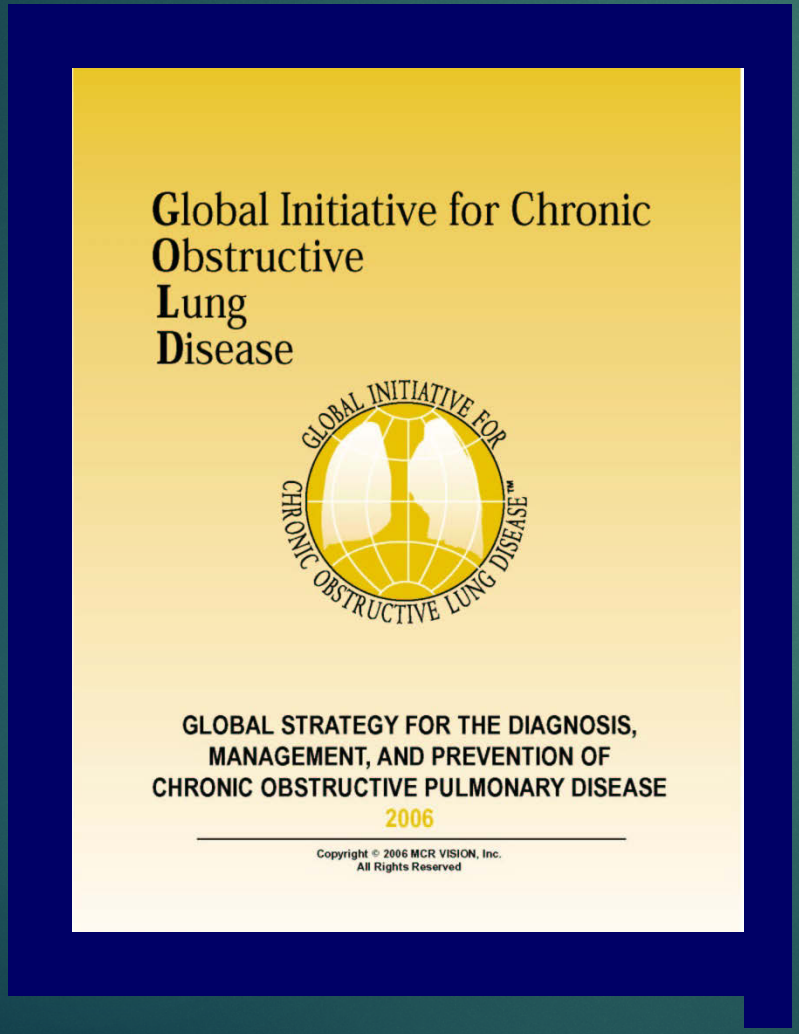
Management of Stable COPD

Reduce Risk Factors: Key Points

- Reduction of total personal exposure to tobacco smoke, occupational dusts and chemicals, and indoor and outdoor air pollutants are important goals to prevent the onset and progression of COPD.

- Smoking cessation is the single most effective — and cost effective — intervention in most people to reduce the risk of developing COPD and stop its progression (Evidence A).

Four Components of COPD Management



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Manage Stable COPD: Key Points

- The overall approach to managing stable COPD should be individualized to address symptoms and improve quality of life.
- For patients with COPD, health education plays an important role in smoking cessation (Evidence A) and improving skills and the ability to cope with illness and health status.
- Few if any of the existing medications for COPD have 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 and improve quality of life.

Management of Stable COPD

Pharmacotherapy: Bronchodilators

- 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 and exacerbations.
- The principal bronchodilator treatments are $ß_2$- agonists or anticholinergics, used singly or in combination (Evidence A).
- Regular treatment with long-acting bronchodilators is more effective and convenient than treatment with short-acting bronchodilators (Evidence A).

Management of Stable COPD

Pharmacotherapy: Glucocorticosteroids

- The addition of regular treatment with inhaled glucocorticosteroids to bronchodilator treatment is appropriate for but limited too symptomatic COPD patients with an FEV1 < 50% predicted (*Stage III: Severe COPD and Stage IV: Very Severe COPD*) and repeated exacerbations (Evidence A).

- An inhaled glucocorticosteroid combined with a long-acting $ß_2$-agonist is more effective than the individual components (Evidence A).

Management of Stable COPD

Pharmacotherapy: Glucocorticosteroids

- The dose-response relationships and long-term safety of inhaled glucocorticosteroids in COPD are not known.
- Chronic treatment with systemic glucocorticosteroids should be avoided because of an unfavorable benefit-to-risk ratio (Evidence A).

Management of Stable COPD

All Stages of Disease Severity

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

Management of Stable COPD

Pharmacotherapy: Vaccines

- In COPD patients influenza vaccines can reduce serious illness (Evidence A).

- Pneumococcal conjugate vaccine PCV13 (Prevnar) and Pneumococcal polysaccharide PPSV23 (Pneumovax) vaccine are recommended for all patients age 65 or older. Pneumovax alone is recommended for COPD patients younger than age 65 (Evidence B)

GOLD Grouping System

- ●Group A: Low risk, **less symptoms**: 0 to 1 exacerbation per year and no prior hospitalization for exacerbation; and CAT score <10 or mMRC grade 0 to 1.
- ●Group B: Low risk, **more symptoms**: 0 to 1 exacerbation per year and no prior hospitalization for exacerbation; and CAT score ≥10 or mMRC grade ≥2.
- ●Group C: High risk**, less symptoms**: ≥2 exacerbations per year or ≥1 hospitalization for exacerbation; and CAT score <10 or mMRC grade 0 to 1.
- ●Group D: High risk, **more symptoms**: ≥2 exacerbations per year or ≥1 hospitalization for exacerbation; and CAT score ≥10 or mMRC grade ≥2.

Managing Stable COPD

- Guided by disease severity
  - Use the GOLD Classification/grouping system
- Aim to control symptoms and decrease exacerbations
- Improve patient function and quality of life

Managing Stable COPD

- TORCH, INSPIRE and UPLIFT major clinical trials proving the efficacy of long acting bronchodilators with or without ICS.
- LABA and LAMA:
  - Improve lung function, decrease symptoms and improve quality of life
  - Decrease exacerbations
  - Do not slow the decline in FEV1 or mortality

Managing Stable COPD

- Steroids play a limited role.
  - Decrease exacerbations in patient with moderate to severe disease that have suffered exacerbations recently despite the use of long acting bronchodilators (LABD).
  - Must be used in combination with LABD
  - Increased risk for pneumonia, especially at higher doses.

Managing Stable COPD

- Triple therapy appears to be most affective for patients with severe COPD (moderate too?)
  - Combination of LABA/LAMA and ICS
    - Decreased mortality, Hospital admits, exacerbations and exposure to systemic steroids
    - No increased risk for adverse events (including cardiac events)

THE REFINED ABCD ASSESSMENT TOOL

Spirometrically Confirmed Diagnosis

Post-bronchodilator $FEV_1/FVC < 0.7$

Assessment of airflow limitation

Grade	FEV_1 (% predicted)
GOLD 1	≥ 80
GOLD 2	50-79
GOLD 3	30-49
GOLD 4	< 30

Assessment of symptoms/risk of exacerbations

Moderate or Severe Exacerbation History

≥2 or ≥ 1 leading to hospital admission

0 or 1 (not leading to hospital admission)

C	D
A	B

mMRC 0-1 CAT < 10 | mMRC ≥ 2 CAT ≥ 10

Symptoms

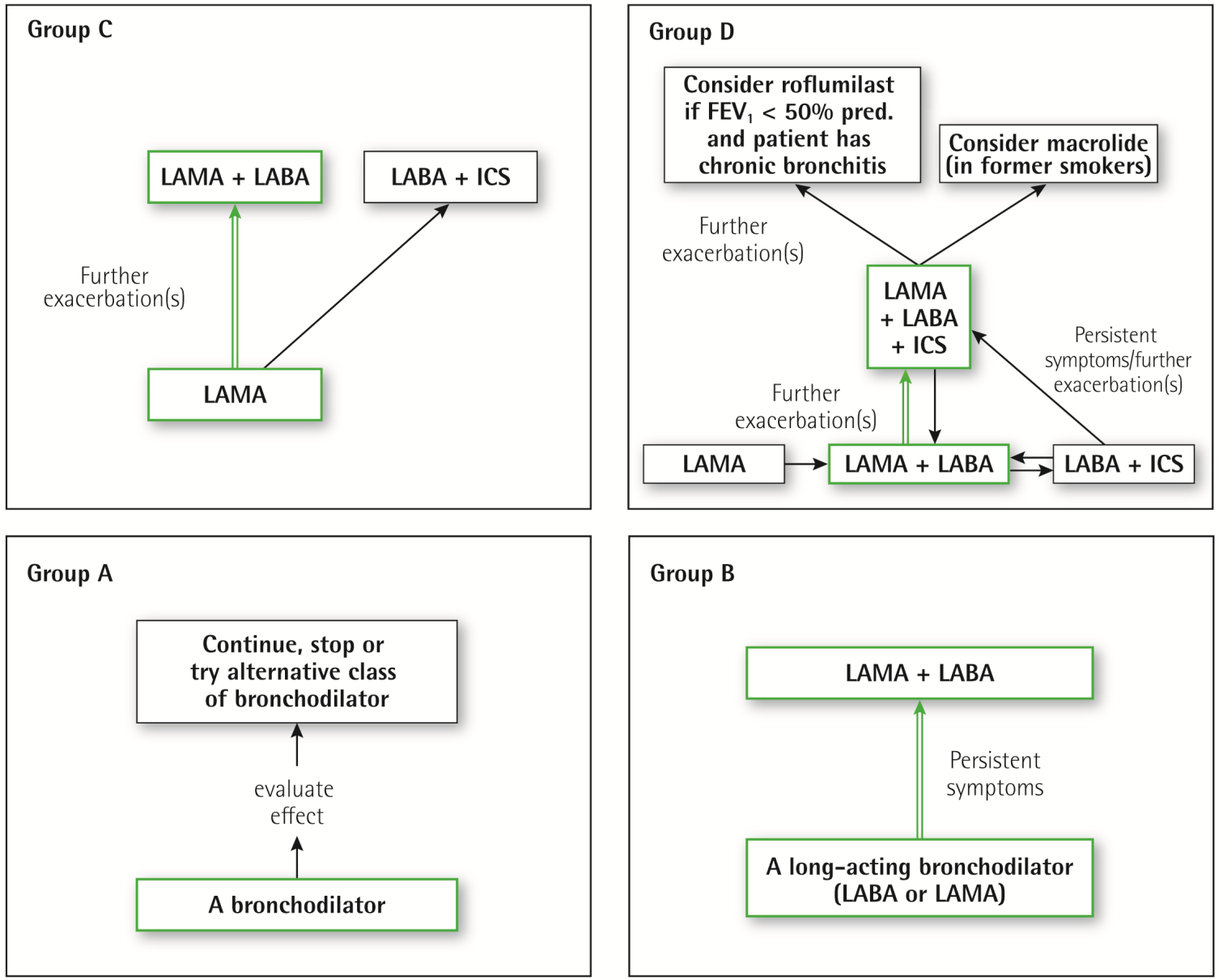
FIGURE 2.4

INITIAL PHARMACOLOGICAL TREATMENT

≥ 2 moderate exacerbations or ≥ 1 leading to hospitalization	**Group C** LAMA	**Group D** LAMA or LAMA + LABA* or ICS + LABA** *Consider if highly symptomatic (e.g. CAT > 20) **Consider if eos ≥ 300
0 or 1 moderate exacerbations (not leading to hospital admission)	**Group A** A Bronchodilator	**Group B** A Long Acting Bronchodilator (LABA or LAMA)
	mMRC 0-1 CAT < 10	mMRC ≥ 2 CAT ≥ 10

FIGURE 4.1

Figure 4.1. Pharmacologic treatment algorithms by GOLD Grade [highlighted boxes and arrows indicate preferred treatment pathways]



Preferred treatment =

In patients with a major discrepancy between the perceived level of symptoms and severity of airflow limitation, further evaluation is warranted.

MANAGEMENT CYCLE

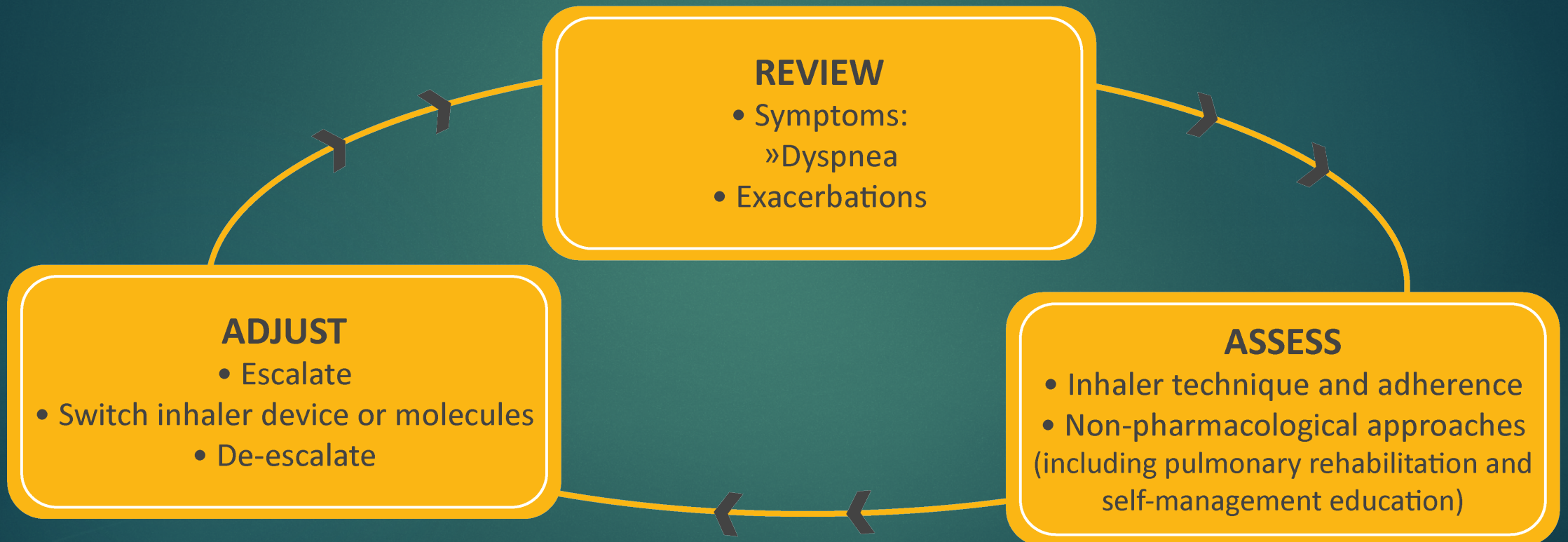


FIGURE 4.2

GOLD & ATS Recommendations Treatment of COPD by Stages

Table 8 - Therapy at Each Stage of COPD

Old	0: At Risk	I: Mild	II: Moderate IIA	II: Moderate IIB	III: Severe
New	**0: At Risk**	**I: Mild**	**II: Moderate**	**III: Severe**	**IV: Very Severe**
Characteristics	• Chronic symptoms • Exposure to risk factors • Normal spirametry	• $FEV_1/FVC < 70\%$ • $FEV_1 \geq 80\%$ • With or without symptoms	• $FEV_1/FVC < 70\%$ • $50\% \leq FEV_1 < 80\%$ • With or without symptoms	• $FEV_1/FVC < 70\%$ • $30\% \leq FEV_1 < 50\%$ • With or without symptoms	• $FEV_1/FVC < 70\%$ • $FEV_1 < 30\%$ or $FEV_1 < 50\%$ predicted plus chronic respiratory failure
	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

Allergy & Asthma Network

American College of Allergy, Asthma & Immunology

Respiratory Inhalers *At a Glance* 2016

Allergy & Asthma Network is a national, nonprofit organization dedicated to ending needless death and suffering due to asthma, allergies and related conditions through outreach, education, advocacy and research.

Learn More at:

AllergyAsthmaNetwork.org

800.878.4403

Short-acting beta$_2$-agonist bronchodilators

- **ProAir® HFA** albuterol sulfate — DOSE INDICATOR, A
- **ProAir® RespiClick** albuterol sulfate inhalation powder — DOSE INDICATOR, A
- **Proventil® HFA** albuterol sulfate — A
- **Ventolin® HFA** albuterol sulfate — DOSE INDICATOR, A
- **Xopenex HFA®** levalbuterol tartrate — A

Long-acting beta$_2$-agonist bronchodilators

- **Arcapta™ Neohaler™** indacaterol inhalation powder — C
- **Serevent® Diskus®** salmeterol xinafoate inhalation powder — DOSE INDICATOR, A, C
- **Striverdi® Respimat®** olodaterol hydrochloride — DOSE INDICATOR, C

Inhaled corticosteroids

- **Aerospan®** 80 mcg flunisolide — ★, A
- **Alvesco® HFA** 80 mcg, 160 mcg ciclesonide — DOSE INDICATOR, A
- **Arnuity® Ellipta®** 100 mcg, 200 mcg fluticasone furoate inhalation powder — DOSE INDICATOR, A
- **Asmanex® HFA** mometasone furoate — DOSE INDICATOR, A
- **Asmanex® Twisthaler®** 110 mcg, 220 mcg mometasone furoate inhalation powder — DOSE INDICATOR, A
- **Flovent® Diskus®** 50 mcg, 100 mcg, 250 mcg fluticasone propionate inhalation powder — DOSE INDICATOR, A
- **Flovent® HFA** 44 mcg, 110 mcg, 220 mcg fluticasone propionate — DOSE INDICATOR, A
- **Pulmicort Flexhaler®** 90 mcg, 180 mcg budesonide inhalation powder — DOSE INDICATOR, A
- **QVAR® (HFA)** 40 mcg, 80 mcg beclomethasone dipropionate — DOSE INDICATOR, A

Combination Inhaled corticosteroids and long acting beta2-agonist

- **Advair Diskus®** 100/50, 250/50, 500/50 fluticasone propionate and salmeterol inhalation powder — DOSE INDICATOR, A, C
- **Advair® HFA** 45/21, 115/21, 230/21 fluticasone propionate and salmeterol xinafoate — DOSE INDICATOR, A
- **Breo® Ellipta®** 100/25 mcg, 200/25 mcg fluticasone furoate and vilanterol inhalation powder — DOSE INDICATOR, A, C
- **Dulera®** 100/5, 200/5 mometasone furoate and formoterol fumarate dihydrate — DOSE INDICATOR, A
- **Symbicort® (HFA)** 80/4.5, 160/4.5 budesonide and formoterol fumarate dihydrate — DOSE INDICATOR, A, C

Combination Inhaled anticholinergic and long acting beta2-agonist

- **Anoro® Ellipta®** umeclidinium and vilanterol inhalation powder — DOSE INDICATOR, C
- **Stiolto™ Respimat®** tiotropium bromide and olodaterol — DOSE INDICATOR, C
- **Utibron™ Neohaler®** glycopyrrolate and indacaterol inhalation powder — DOSE INDICATOR, C

Anticholinergics

Short-acting

- **Atrovent® HFA** ipratropium bromide — DOSE INDICATOR, C

Long-acting

- **Seebri™ Neohaler®** glycopyrrolate inhalation powder — C
- **Incruse® Ellipta®** umeclidinium inhalation powder — DOSE INDICATOR, C
- **Spiriva® HandiHaler®** tiotropium bromide inhalation powder — C
- **Spiriva® Respimat®** 1.25, 2.5 mcg tiotropium bromide — DOSE INDICATOR, A, C
- **Tudorza™ Pressair™** aclidinium bromide inhalation powder — DOSE INDICATOR, C

Combination Inhaled anticholinergic and short acting beta2-agonist

- **Combivent® Respimat®** ipratropium bromide and albuterol — DOSE INDICATOR, C

DOSE INDICATOR = DOSE INDICATOR, A = ASTHMA, C = COPD, ★ = BUILT-IN SPACER

Reviewed by Dennis Williams, PharmD

PC-ASTH-0008-1902

Short acting Muscarinic Antagonists (SAMA)
Short acting Beta-agonists (SABA)

- Atrovent – 2-4 puffs every 4 hours as needed
- SABA – multiple preparations – Albuterol and Levalbuterol
  - ProAir
  - Ventolin
  - Proventil
  - Xopenex
  - 2-4 puffs every 4 hours as needed
  - Nebulized options for albuterol, levalbuterol and ipratropium
    - Duoneb is combination SABA/SAMA
    - Combivent is combination SABA/SAMA

Long Acting Muscarinic Antagonist (LAMA)

- Cornerstone of treatment. Indicated for ALL PATIENTS with symptomatic COPD. First line therapy.
- Inhaled preparations:
  - Incruse ellipta – dry powder inhaler, one inhalation once daily dosing
  - Spiriva Handihaler – capsule delivered powder inhaler, once daily
  - Spiriva Respimat – propelled mist inhaler, 2 inhalations once daily
  - Tudorza – dry powder inhaler, one inhalation twice daily
  - Yupelri – nebulized once daily LAMA
  - Seebri Neohaler – dry powder inhaler

Long Acting Beta Agonists (LABA)

- Another cornerstone of therapy but delivered almost exclusively in combination with LAMA or inhaled corticosteroids (ICS)

- Serevent – dry powder inhaler, one inhalation twice daily
- Striverdi Respimat – propelled mist, 2 inhalations once daily
- Arcapta Neohaler – dry powder capsule, one inhalation daily
- Brovana – nebulized twice daily
- Perforomist – nebulized twice daily

LABA/LAMA Combination Therapy

- Indicated for ALL PATIENTS in Group B,C, and D
- Anoro Ellipta – dry powder inhaler, one inhalation daily
- Stiolto Respimat – propelled mist inhaler, two inhalations once daily
- Utibron Neohaler – dry powder capsule, one inhalation daily

Inhaled Corticosteroids (ICS)

- Added AFTER LAMA/LABA for severe COPD. Almost always delivered with a LABA or LAMA.
- Dosing varies depending on brand
  - Flovent
  - Qvar
  - Pulmicort
  - Asmanex
  - Aerospan
  - Alvesco
  - Arnuity

Inhaled Corticosteroid/LABA Combinations

- Many patients are incorrectly started on this combination for COPD when ICS are only indicated in severe disease.
- ICS are the cornerstone of therapy for Asthma.
- Breo Ellipta – dry powder, one inhalation daily
- Advair Discus or HFA – dry powder inhaled twice daily
- Symbicort HFA – dry powder inhaled twice daily
- Dulera HFA – dry powder inhaled twice daily

Nebulized Options for Maintenance Therapy in COPD

- LAMA
  - Yupelri – nebulized once daily
  - Lonhala Magnair – nebulized once daily
- LABA
  - Brovana – nebulized twice daily
  - Perforomist – nebulized twice daily
- ICA
  - Budesonide – nebulized twice daily

Triple Inhaled Therapy – (ICS/LAMA/LABA)

- All patients with severe or very severe COPD, especially those with recurrent exacerbations.
- Trelegy Ellipta – dry powder inhaler, inhaled once daily.
- Any combination of the previously mentioned ICS/LABA, LABA/LAMA or ICS
  - If on ICS/LABA add a LAMA
  - If on LABA/LAMA add an ICS

Oxygen Therapy

- Indicated for all patients with RESTING oxygen saturation <89%.
- Indicated for nighttime hypoxemia secondary to COPD
  - Not indicated for treatment of hypoxemia due to Sleep Apnea
- May be indicated for patients that desaturate with activity
  - Those with comorbid conditions, especially heart disease
  - Those patient's that report significant improvement in their exertional SOB and whose exercise tolerance improves with O2
- Many COPD patients are prone to CO2 retention. O2 must be used CAUTIOUSLY and titrated to maintain a saturation of 89-95%.

Pulmonary Rehabilitation

- Pulmonary rehabilitation is defined as a comprehensive intervention based on a thorough patient assessment followed by patient-tailored therapies that include, but are not limited to, exercise training, education, and behavior change, designed to improve the physical and psychological condition of people with chronic respiratory disease and to promote the long-term adherence to health-enhancing behaviors.
- Pulmonary rehabilitation, when coupled with smoking cessation, optimization of blood gases, and medication, is part of the optimal treatment program for patients with symptomatic airflow obstruction, particularly patients with chronic obstructive pulmonary disease (COPD) categories B, C, and D.

Palliative Medicine, Advanced Care Planning and Shared Decision Making

- COPD Is a chronic and progressive medical illness typically occurring in older patients with multiple comorbid medical illnesses.
- Patients are frequently disabled as a consequence of this condition and are subject to symptoms on a daily basis that can cause them to be quite uncomfortable.
- It is critical to discuss and understand the patient's wishes with respect to managing these symptoms now and as the time of their death approaches.
- I advise advanced care planning including documentation of their wishes with respect to cardiopulmonary resuscitation and intubation at the time of diagnosis.

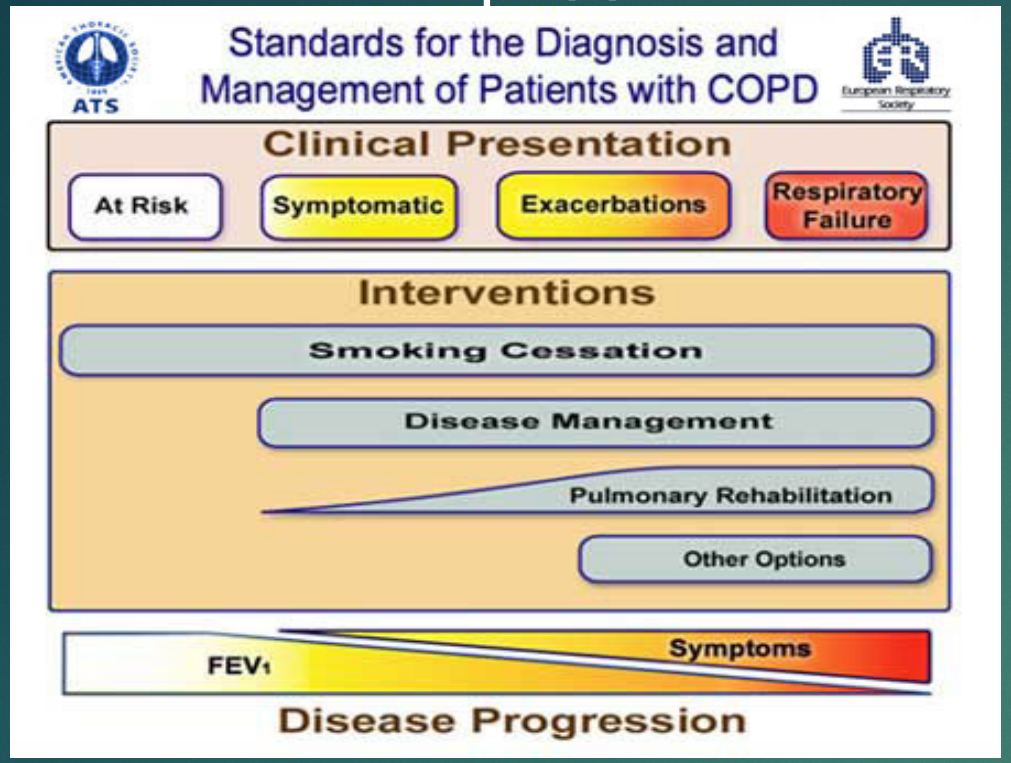
In Summary

- Consider a diagnosis of COPD in any patient with risk factors and symptoms of SOB or persistent cough.
- History, exam and spirometry are critical to making the diagnosis, assigning a stage and classifying by group.
- Treatment begins by reducing risk factors and exposures.
  - Smoking cessation, occupational rehab, controlling environmental exposure
  - Vaccination
  - Maintenance of overall health

In Summary

- Treatment should be offered for all symptomatic patients with the primary goal being an improvement in quality of life.
  - Reducing cough and SOB
  - Preventing exacerbations – avoidance of hospitalization
  - Prolonging life
- Long acting bronchodilators are the cornerstone of therapy (LAMA and LABA)
- Inhaled corticosteroids should be added for severe disease
- Pulmonary Rehabilitation is very beneficial and should be advised at the time of diagnosis
- Oxygen therapy improved quality or life and prevents complications in the appropriate patient

http://www.thoracic.org/copd/



COPD BASIC INFORMATION:

Definition, Diagnosis & Staging

Epidemiology, Risk Factors & Natural History

Prevalence, Morbidity, Mortality, Economic burden

Host Factors, Exposures

Pathology, Pathogenesis & Pathophysiology

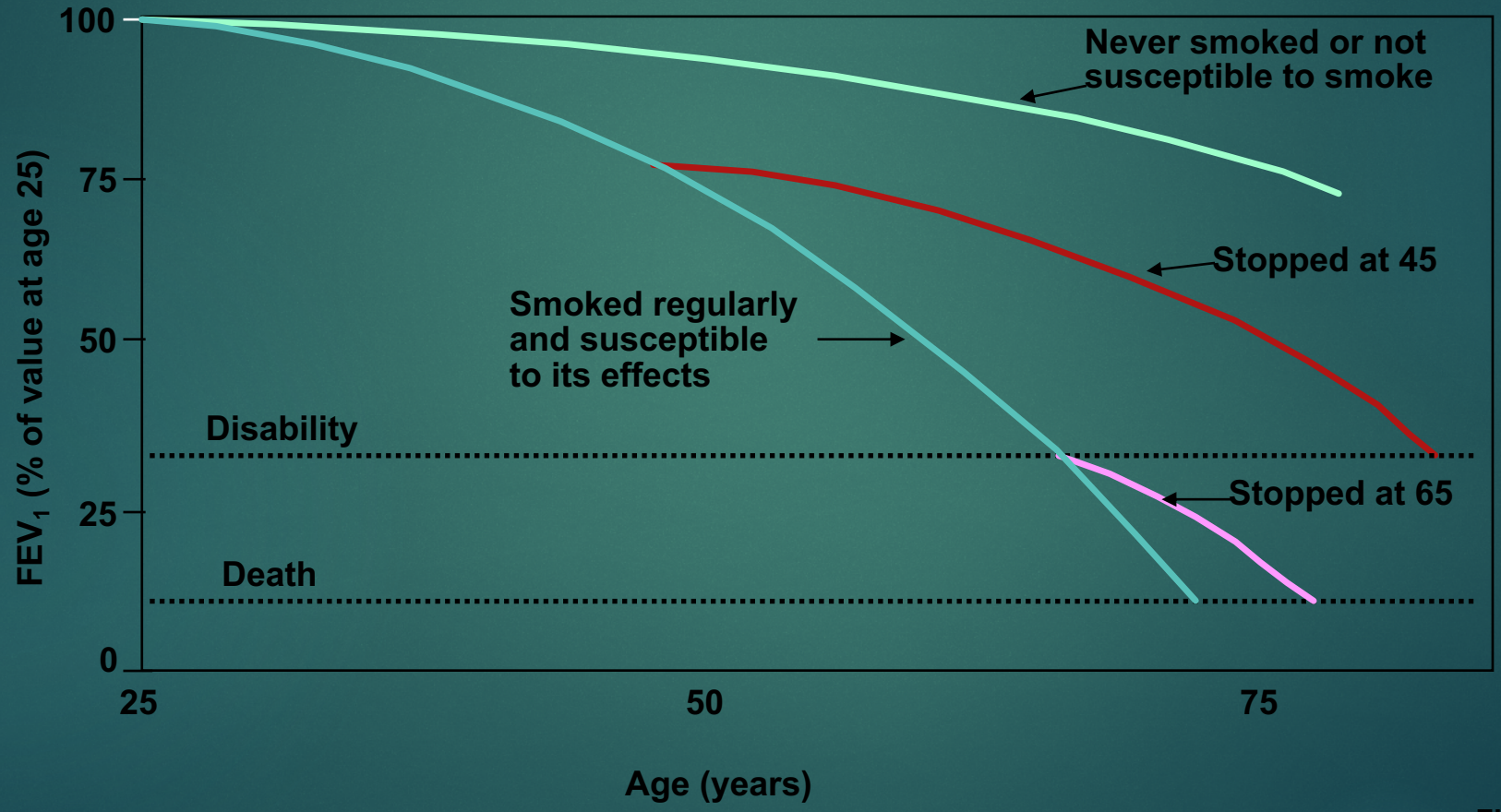
Assessment, Testing & Differential Diagnosis

MANAGEMENT OF STABLE COPD: Smoking Cessation, Pharmacological Therapy, Long-Term Oxygen Therapy, Pulmonary Rehabilitation, Nutrition, Surgery In & For COPD, Sleep, Air Travel

EXACERBATIONS: Definition, Evaluation & Treatment, Inpatient Oxygen Therapy, Ethical and Palliative Care Issues, Integrated Disease Management for Primary Care

PATIENT SECTION: General, Medication, Other Treatments

How does smoking affect the lungs and mortality COPD?



Fletcher & Peto, 1977

DIFFERENTIAL DIAGNOSIS OF COPD

DIAGNOSIS	SUGGESTIVE FEATURES
COPD	Onset in mid-life. Symptoms slowly progressive. History of tobacco smoking or exposure to other types of smoke.
Asthma	Onset early in life (often childhood). Symptoms vary widely from day to day. Symptoms worse at night/early morning. Allergy, rhinitis, and/or eczema also present. Family history of asthma. Obesity coexistence.
Congestive Heart Failure	Chest X-ray shows dilated heart, pulmonary edema. Pulmonary function tests indicate volume restriction, not airflow limitation.
Bronchiectasis	Large volumes of purulent sputum. Commonly associated with bacterial infection. Chest X-ray/CT shows bronchial dilation, bronchial wall thickening.
Tuberculosis	Onset all ages. Chest X-ray shows lung infiltrate. Microbiological confirmation. High local prevalence of tuberculosis.
Obliterative Bronchiolitis	Onset at younger age, nonsmokers. May have history of rheumatoid arthritis or acute fume exposure. Seen after lung or bone marrow transplantation. CT on expiration shows hypodense areas.
Diffuse Panbronchiolitis	Predominantly seen in patients of Asian descent. Most patients are male and nonsmokers. Almost all have chronic sinusitis. Chest X-ray & HRCT show diffuse small centrilobular nodular opacities & hyperinflation.

These features tend to be characteristic of the respective diseases, but are not mandatory. For example, a person who has never smoked may develop COPD (especially in the developing world where other risk factors may be more important than cigarette smoking); asthma may develop in adult and even in elderly patients.

TABLE 2.7

Management of stable COPD: Therapy by GOLD disease category severity as assessed by symptoms and risk risk (as determined by exacerbations and airflow limitation)

Category	Symptoms	Risk	Suggested treatment
All			Avoidance of risk factor(s), such as smoking Annual influenza vaccination Pneumococcal vaccination Regular physical activity Long-term oxygen therapy if chronic hypoxemia
A	**Less symptomatic** Mild or infrequent symptoms (ie, breathless with strenuous exercise or when hurrying on level ground or walking up a slight hill)* or CAT <10¶	**Low risk** FEV_1/FVC ratio <0.7 and an FEV_1 ≥50 percent predicted (GOLD I, II) AND 0 or 1 exacerbations in the past year	**First choice:** short-acting bronchodilator when needed: anticholinergic alone or beta-agonist alone **Second choice:** long-acting anticholinergic or long-acting beta agonist or short-acting beta-agonist and short-acting anticholinergic as needed **Alternative:** theophylline
B	**More symptomatic** Moderate to severe symptoms (ie, patient has to walk more slowly than others of same age due to breathlessness, has to stop to catch breath when walking on level ground at own pace, or has more severe breathlessness)* or CAT ≥10¶	**Low risk** FEV_1/FVC ratio <0.7 and an FEV_1 ≥50 percent predicted (GOLD I, II) AND 0 or 1 exacerbations in the past year	Short-acting bronchodilator when needed and pulmonary rehabilitation **First choice:** regular treatment with a long-acting bronchodilator **Second choice:** regular treatment with a long-acting anticholinergic and long-acting beta agonist **Alternatives:** short-acting beta-agonist and/or short-acting anticholinergic, theophylline
C	**Less symptomatic** Mild or infrequent symptoms (ie, breathless with strenuous exercise or when hurrying on level ground or walking up a slight hill)* or CAT <10¶	**High risk** FEV_1/FVC ratio <0.7 and an FEV_1 <50 percent predicted (GOLD III, IV) OR ≥2 exacerbations per year or one hospitalization for an exacerbation	Short-acting bronchodilator when needed and pulmonary rehabilitation **First choice:** regular treatment with a combination long-acting beta agonist and inhaled glucocorticoid or a long-acting anticholinergic **Second choice:** regular treatment with a long-acting anticholinergic and a long-acting beta agonist **Alternatives:** phosphodiesterase-4 inhibitor, SABA and/or SAMA, theophylline Consider surgical treatments
D	**More symptomatic** Moderate to severe symptoms (ie, patient has to walk slower than others of same age due to breathlessness, has to stop to catch breath when walking on level ground at own pace, or has more severe breathlessness)* or CAT ≥10¶	**High risk** FEV_1/FVC ratio <0.7 and an FEV_1 <50 percent predicted (GOLD III, IV) OR ≥2 exacerbations per year or one hospitalization for an exacerbation	Short-acting bronchodilator when needed and pulmonary rehabilitation **First choice:** regular treatment with combination inhaled glucocorticoid and a long-acting beta agonist and/or long-acting anticholinergic **Second choice:** regular treatment with one of the following combinations: • Inhaled glucocorticoid and a long-acting beta agonist PLUS a long acting anticholinergic • Inhaled glucocorticoid and a long-acting beta agonist PLUS a phosphodiesterase-4 inhibitor • Long-acting anticholinergic and a long-acting beta agonist • Long-acting anticholinergic and a phosphodiesterase-4 inhibitor **Alternatives:** carbocysteine, short-acting beta-agonist and/or short-acting anticholinergic, theophylline Consider surgical treatments

Patients must be taught how and when to use their treatments, and treatment choices are adjusted based on patient responses. Medications being prescribed for other conditions should be reviewed.

FEV_1: forced expiratory volume in one second; FVC: forced vital capacity; SABA: short acting beta agonist; SAMA: short acting muscarinic antagonist.
* Symptom severity based on: modified Medical Research Council Dyspnea scale (mMRC).
¶ Symptom severity based on: COPD Assessment Test (CAT): http://www.catestonline.org (Accessed on September 28, 2012).
The mMRC and CAT are described in the topic on the diagnosis of COPD.

Adapted from: Global Initiative for Chronic Obstructive Pulmonary Disease. Executive Summary: Global Strategy for the Diagnosis, Management, and Prevention of COPD (Updated 2013), www.goldcopd.com (Accessed November 8, 2013).

Pneumococcal Vaccine

- PPSV23 – (Pneumovax) Pneumococcal polysaccharide vaccine.
  - 1970's – widely used and approved for all people > 2 yo

- PCV13 – (Prevnar) Pneumococcal conjugate vaccine.
  - Replaced the PCV7 in 2010 for use in infants and toddlers
- PPSV23 and PCV13 BOTH indicated in all adults > 65 yo
- PPSV23 limited indications in adults < 65 yo
- PCV13 NOT indicated for routine use in adults < 65 yo

Pneumococcal vaccine – the basics

- All patients > 65 yo should be vaccinated.
  - Give PCV13 followed 1 year later by PPSV23
  - If they have had PPSV23 before age 65 wait 1 year and give PCV13
    - And then give another PPSV23 5 years after the first PPSV23

  - So if 65 and never vaccinated what should you do?
    - Give PCV 13 followed 1 year later by PPSV23
  - If given PPSV23 at 63 yo what should you do?
    - Give PCV 13 at age 65 followed by PPSV at age 68
  - If given PPSV23 at 50 yo what should you do?
    - Give PCV at age 65 wait 1 year and give PPSV23

Pneumococcal Vaccination – Just PPSV23

- Adults with the following underlying conditions who are <65 years of age should receive PPSV23 (but should **not** receive PCV13):
- ●Current cigarette smoking
- ●Chronic heart disease, including congestive heart failure and cardiomyopathy but excluding hypertension
- ●Chronic lung disease, including asthma and chronic obstructive pulmonary disease (see "Management of infection in exacerbations of chronic obstructive pulmonary disease", section on 'Vaccination')
- ●Diabetes mellitus
- ●Alcoholism
- ●Chronic liver disease, including cirrhosis (see "Immunizations for patients with chronic liver disease")

Pneumococcal vaccine – **BOTH** PCV12 and PPV23

- The ACIP states that the persons who should receive **both** PCV13 and PPV23 include those with any of the following risk factors:
- ●Cerebrospinal fluid leak
- ●Cochlear implant
- ●Functional or anatomic asplenia, including sickle cell disease, other hemoglobinopathies, congenital asplenia, and acquired asplenia – In the absence of antibody (most unvaccinated adults lack measurable antibody to most pneumococcal capsular polysaccharides [10]), the only clearance of pneumococci from the bloodstream is by the spleen. Asplenic individuals are at risk for overwhelming pneumococcal sepsis that may occur even in the absence of a focal infection such as pneumonia. (See "Clinical features and management of sepsis in the asplenic patient", section on 'Role of the spleen in host defense' and "Prevention of sepsis in the asplenic patient".)

Pneumococcal vaccine

Immunocompromised Conditions:

- Congenital or acquired immunodeficiency, including B or T lymphocyte deficiency, complement deficiencies (particularly C1, C2, C3, and C4 deficiencies), and phagocytic disorders (excluding chronic granulomatous disease)
- •HIV infection (see "Pneumococcal immunization in HIV-infected adults", section on 'When to immunize')
- •Chronic renal failure
- •Nephrotic syndrome
- •Leukemia
- •Lymphoma
- •Hodgkin disease
- •Multiple myeloma
- •Generalized malignancy
- •Iatrogenic immunosuppression, including long-term systemic glucocorticoids or radiation
- •Solid organ transplant

Allergy & Asthma Network

American College of Allergy, Asthma & Immunology

Respiratory Inhalers *At a Glance* 2016

Allergy & Asthma Network is a national, nonprofit organization dedicated to ending needless death and suffering due to asthma, allergies and related conditions through outreach, education, advocacy and research.

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Short-acting beta$_2$-agonist bronchodilators

- **ProAir® HFA** albuterol sulfate — DOSE INDICATOR, A
- **ProAir® RespiClick** albuterol sulfate inhalation powder — DOSE INDICATOR, A
- **Proventil® HFA** albuterol sulfate — A
- **Ventolin® HFA** albuterol sulfate — DOSE INDICATOR, A
- **Xopenex HFA®** levalbuterol tartrate — A

Long-acting beta$_2$-agonist bronchodilators

- **Arcapta™ Neohaler™** indacaterol inhalation powder — C
- **Serevent® Diskus®** salmeterol xinafoate inhalation powder — DOSE INDICATOR, A, C
- **Striverdi® Respimat®** olodaterol hydrochloride — DOSE INDICATOR, C

Inhaled corticosteroids

- **Aerospan®** 80 mcg flunisolide — ★, A
- **Alvesco® HFA** 80 mcg, 160 mcg ciclesonide — DOSE INDICATOR, A
- **Arnuity® Ellipta®** 100 mcg, 200 mcg fluticasone furoate inhalation powder — DOSE INDICATOR, A
- **Asmanex® HFA** mometasone furoate — DOSE INDICATOR, A
- **Asmanex® Twisthaler®** 110 mcg, 220 mcg mometasone furoate inhalation powder — DOSE INDICATOR, A
- **Flovent® Diskus®** 50 mcg, 100 mcg, 250 mcg fluticasone propionate inhalation powder — DOSE INDICATOR, A
- **Flovent® HFA** 44 mcg, 110 mcg, 220 mcg fluticasone propionate — DOSE INDICATOR, A
- **Pulmicort Flexhaler®** 90 mcg, 180 mcg budesonide inhalation powder — DOSE INDICATOR, A
- **QVAR® (HFA)** 40 mcg, 80 mcg beclomethasone dipropionate — DOSE INDICATOR, A

Combination Inhaled corticosteroids and long acting beta2-agonist

- **Advair Diskus®** 100/50, 250/50, 500/50 fluticasone propionate and salmeterol inhalation powder — DOSE INDICATOR, A, C
- **Advair® HFA** 45/21, 115/21, 230/21 fluticasone propionate and salmeterol xinafoate — DOSE INDICATOR, A
- **Breo® Ellipta®** 100/25 mcg, 200/25 mcg fluticasone furoate and vilanterol inhalation powder — DOSE INDICATOR, A, C
- **Dulera®** 100/5, 200/5 mometasone furoate and formoterol fumarate dihydrate — DOSE INDICATOR, A
- **Symbicort® (HFA)** 80/4.5, 160/4.5 budesonide and formoterol fumarate dihydrate — DOSE INDICATOR, A, C

Combination Inhaled anticholinergic and long acting beta2-agonist

- **Anoro® Ellipta®** umeclidinium and vilanterol inhalation powder — DOSE INDICATOR, C
- **Stiolto™ Respimat®** tiotropium bromide and olodaterol — DOSE INDICATOR, C
- **Utibron™ Neohaler®** glycopyrrolate and indacaterol inhalation powder — DOSE INDICATOR, C

Anticholinergics

Short-acting

- **Atrovent® HFA** ipratropium bromide — DOSE INDICATOR, C

Long-acting

- **Seebri™ Neohaler®** glycopyrrolate inhalation powder — C
- **Incruse® Ellipta®** umeclidinium inhalation powder — DOSE INDICATOR, C
- **Spiriva® HandiHaler®** tiotropium bromide inhalation powder — C
- **Spiriva® Respimat®** 1.25, 2.5 mcg tiotropium bromide — DOSE INDICATOR, A, C
- **Tudorza™ Pressair™** aclidinium bromide inhalation powder — DOSE INDICATOR, C

Combination Inhaled anticholinergic and short acting beta2-agonist

- **Combivent® Respimat®** ipratropium bromide and albuterol — DOSE INDICATOR, C

DOSE INDICATOR = DOSE INDICATOR, A = ASTHMA, C = COPD, ★ = BUILT-IN SPACER

Reviewed by Dennis Williams, PharmD

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