Asthma and COPD
State of the Art

Angel F. Laureano, MD
Assistant Professor
UPR School of Medicine

Bibliography

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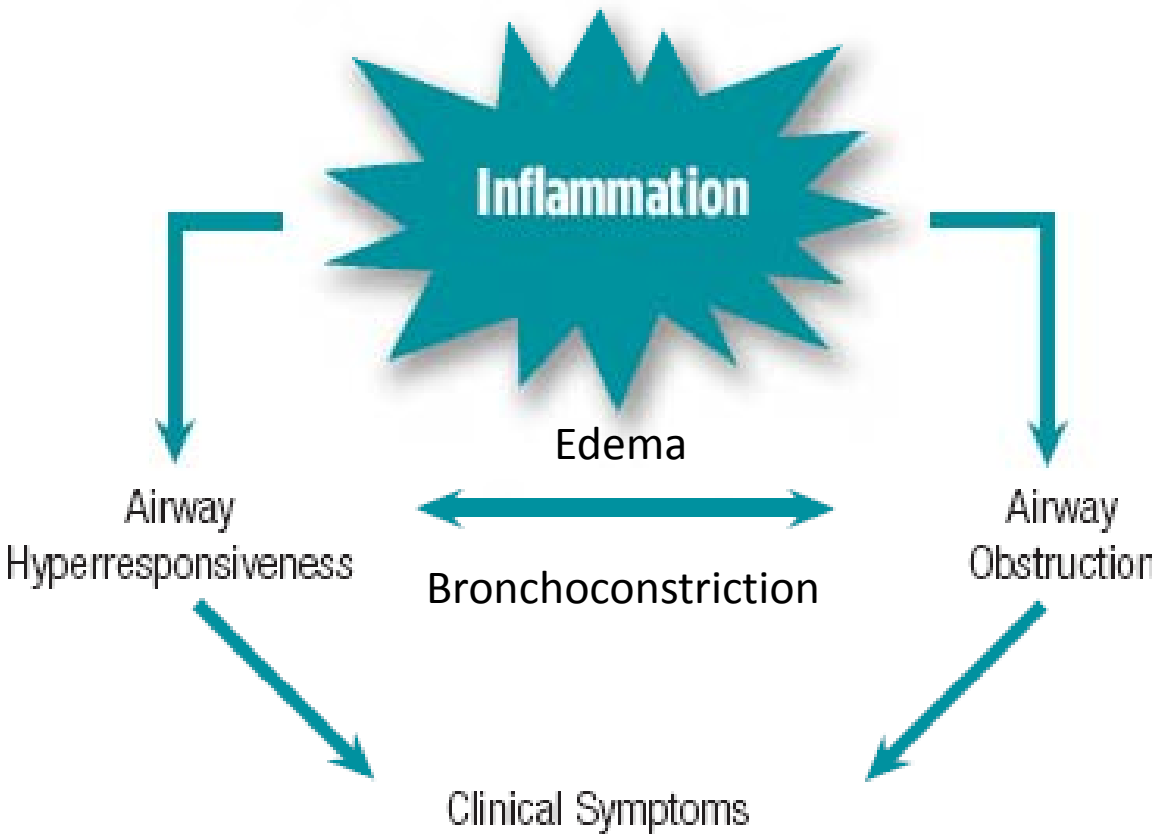
- www.hlbi.nih.gov.guidelines/asthma/
- GOLD Updated Guidelines
- www.goldcopd.com
- British Guideline on the Management of Asthma
- www.britthoracic.org.uk/ClinicalInformation/Asthma/AsthmaGuideline/tabid/83/Default.aspx

Asthma Definition

Asthma is a chronic inflammatory disorder of the airways in which many cells and cellular elements play a role: in particular, mast cells, eosinophils, neutrophils (especially in sudden onset, fatal exacerbations, occupational asthma, and patients who smoke), T lymphocytes, macrophages, and epithelial cells. In susceptible individuals, this inflammation causes recurrent episodes of coughing (particularly at night or early in the morning), wheezing, breathlessness, and chest tightness. These episodes are usually associated with widespread but variable airflow obstruction that is often reversible either spontaneously or with treatment.



THE INTERPLAY AND INTERACTION BETWEEN AIRWAY INFLAMMATION AND THE CLINICAL SYMPTOMS AND PATHOPHYSIOLOGY OF ASTHMA

Causes

Host

- Immunity- Th1, Th2 balance.
- Genetics- Complex.

Critical Period

Environment

- Airborne allergens- specially house-dust mite and Alternaria.
- Viral respiratory infections- including rhinovirus and respiratory syncytial virus (RSV).
- Tobacco smoke.
- Pollution.
- Diet- obesity, low Ω-3, vit. D, acetaminophen.

Hygiene Hypothesis

- Certain infections early in life, exposure to other children (e.g., presence of older siblings and early enrollment in childcare, which have greater likelihood of exposure to respiratory infection), less frequent use of antibiotics, and "country living" is associated with a Th1 response and lower incidence of asthma.

Diagnosis of Asthma

- To establish a diagnosis of asthma, the clinician should determine that symptoms of recurrent episodes of airflow obstruction or airway hyperresponsiveness are present; airflow obstruction is at least partially reversible; and alternative diagnoses are excluded.

Minimal Evaluation

- Detailed medical history
- PE- Special attention to nose(increased nasal secretion, mucosal swelling, and/or nasal polyp), chest (sounds of wheezing during normal breathing or prolonged phase of forced exhalation, hyperexpansion of the thorax, use of accessory muscles, appearance of hunched shoulders, chest deformity), and skin (atopic dermatitis, eczema)
- Spirometry- Reversibility is determined by an increase in FEV1 of >200 mL and ≥12 percent from baseline measure after inhalation of short-acting beta2-agonist (SABA).

Is this the right diagnosis?

- Initial evaluation
- No clear response to initial therapy

DIFFERENTIAL DIAGNOSTIC POSSIBILITIES FOR ASTHMA

- **Infants and Children**

Upper airway diseases- Allergic rhinitis and sinusitis

Obstructions involving large airways-Foreign body in trachea or bronchus, Vocal cord dysfunction (VCD), Vascular rings or laryngeal webs, Laryngotracheomalacia, tracheal stenosis, or bronchostenosis, Enlarged lymph nodes or tumor

Obstructions involving small airways- Viral bronchiolitis or obliterative bronchiolitis, Cystic fibrosis, Bronchopulmonary dysplasia, Heart disease

Other causes- Recurrent cough not due to asthma, Aspiration from swallowing mechanism dysfunction or gastroesophageal reflux

DIFFERENTIAL DIAGNOSTIC POSSIBILITIES FOR ASTHMA

- **Adults**

Chronic obstructive pulmonary disease (COPD)-(e.g., chronic bronchitis or emphysema)

Congestive heart failure

Pulmonary embolism

Mechanical obstruction of the airways-(benign and malignant tumors)

Pulmonary infiltration with eosinophilia

Cough secondary to drugs (e.g., ACE inhibitors)

Vocal cord dysfunction (VCD)

Hx

- **Symptoms**
- Cough
- Wheezing
- Shortness of breath
- Chest tightness
- Sputum production

- **Pattern of symptoms**
- Perennial, seasonal, or both
- Continual, episodic, or both
- Onset, duration, frequency (number of days or nights, per week or month)
- Diurnal variations, especially nocturnal and on awakening in early morning

Hx

- **Precipitating and/or aggravating factors**

Viral respiratory infections

Environmental allergens, indoor-mold, dust mite, cockroach, pets and outdoor

Characteristics of home including age, location, cooling and heating system, wood burning

Smoking (patient and others in home or daycare)

Exercise

Occupational chemicals or allergens

Environmental change-moving to new home; going on vacation; work

Irritants-tobacco smoke, strong odors, air pollutants, occupational chemicals

Emotions-fear, anger, frustration, hard crying or laughing

Stress fear, anger, frustration

Drugs-aspirin; and other NSAID anti-inflammatory drugs, beta-block

Food, food additives, and preservatives (e.g., sulfites)

Changes in weather, exposure to cold air

Endocrine factors (e.g., menses, pregnancy, thyroid disease)

Comorbid conditions (e.g. sinusitis, rhinitis, GERD)

Hx

- **Development of disease and treatment**

Age of onset and diagnosis

History of early-life injury to airways (e.g., bronchopulmonary dysplasia, pneumonia, parental smoking)

Progression of disease (better or worse)

Present management and response, including plans for managing exacerbation

Frequency of using short-acting beta2-agonist (SABA)

Need for oral corticosteroids and frequency of use

- **Family history**

History of asthma, allergy, sinusitis, rhinitis, eczema, or nasal polyps in close relatives

Hx

- **Social history**

Daycare, workplace, and school characteristics that may interfere with adherence

Social factors that interfere with adherence, such as substance abuse

Social support/social networks

Level of education completed

Employment

- **History of exacerbations**

Usual prodromal signs and symptoms

Rapidity of onset

Duration

Frequency

Severity (need for urgent care, hospitalization, intensive care unit (ICU) admission.)

Life-threatening exacerbations (e.g., intubation, ICU admission)

Number and severity of exacerbations in the past year.

Usual patterns and management (what works?)

Hx

- **Impact of asthma on patient and family**

Episodes of unscheduled care (emergency department (ED), urgent care, hospitalization)

Number of days missed from school/work

Limitation of activity, especially sports and strenuous work

History of nocturnal awakening

Effect on growth, development, behavior, school or work performance, and lifestyle

Impact on family routines, activities, or dynamics

Economic impact

- **Assessment of patient's and family's perceptions of disease**

Patient's, parent's, and spouse's or partner's knowledge of asthma and belief in the chronicity of asthma and in the efficacy of treatment

Patient's perception and beliefs regarding use and long term effects of medications

Ability of patient and parents, spouse, or partner to cope with disease

Level of family support and patient's and parents', spouse's, or partner's capacity to recognize severity of an exacerbation

Economic resources

Sociocultural beliefs

GOAL OF THERAPY: CONTROL OF ASTHMA

Reduce Impairment (What is it that you can't do?)

Prevent chronic and troublesome symptoms (e.g., coughing or breathlessness in the daytime, in the night, or after exertion).
Require infrequent use (>2 days a week) of inhaled SABA for quick relief of symptoms (not including prevention of exercise-induced bronchospasm [EIB]).
Maintain (near) normal pulmonary function.
Maintain normal activity levels (including exercise and other physical activity and attendance at school or work).
Meet patients' and families' expectations of and satisfaction with asthma care.

Reduce Risk (How bad does it get?)

Prevent recurrent exacerbations of asthma and minimize the need for ED visits or hospitalizations.
Prevent loss of lung function; for children, prevent reduced lung growth.
Provide optimal pharmacotherapy with minimal or no adverse effects of therapy.

Components of Care

- Assessing and Monitoring
- Education- Different learning pathways
- Environmental Control
- Medications
- (Control of Comorbidities)

TRATAMIENTO DE MANTENIMIENTO

Cada día toma _____
Antes del ejercicio, toma _____

CUANDO AUMENTAR EL TRATAMIENTO

Evalúe su Nivel de Control del Asma

En la última semana ha tenido:

Síntomas de asma durante el día más de 2 veces ? No
Si

Actividades o ejercicio limitado por el asma? No Si

Se ha despertado de noche por el asma? No Si

La necesidad de usar su medicamento de rescate más de 2 veces? No
Si

Si se está monitoreando flujo pico, flujo pico menos de_____? No
Si

Si contestó que SI a ¿ALGUNA? 3 o mas de estas preguntas, su asma esta SIN CONTROL y necesita pasar al siguiente paso del tratamiento

COMO AUMENTAR EL TRATAMIENTO

Aumentar su tratamiento de la siguiente manera:

_____
[Escriba en el próximo tratamiento el paso aquí]
Mantenga este tratamiento por _____ días

CUANDO LLAMAR EL DOCTOR.

Llame a su doctor :

Si usted no responde en .....días (especifique el número telefónico)

_____ [Línea opcional para instrucciones adicionales]

EMERGENCIA/ PERDIDA DE CONTROL SEVERA

www.ginasthma.org

Plan de tratamiento contra el asma SPANISH

Patient Name: _____

Medical Record #: _____

Nombre del proveedor: _____ DOB: _____

N.º de teléfono del proveedor: _____ Completado por: _____ Fecha: _____

Medicamentos de control	Cantidad que se debe tomar	Con qué frecuencia se deben tomar	Otras instrucciones
		_____ veces por día TODOS LOS DÍAS	❑ Hacerse gárgaras o enjuagarse la boca después de tomar el medicamento
		_____ veces por día TODOS LOS DÍAS	
		_____ veces por día TODOS LOS DÍAS	
		_____ veces por día TODOS LOS DÍAS	
Medicamentos de alivio rápido	**Cantidad que se debe tomar**	**Con qué frecuencia se deben tomar**	**Otras instrucciones**
❑ Albuterol (ProAir, Ventolin, Proventil) ❑ Levalbuterol (Xopenex)	❑ 2 inhalaciones ❑ 4 inhalaciones ❑ 1 tratamiento con nebulizador	Deben tomarse SÓLO en caso de ser necesario (ver debajo; comenzar en la Zona amarilla o antes de hacer ejercicio)	NOTA: Si necesita tomar este medicamento más de dos días a la semana, llame a su médico para consultar sobre la necesidad de un aumento de dosis para los medicamentos de control, y para conversar sobre su plan de tratamiento.

Instrucciones especiales en caso de que *Se sienta bien,* *empeore o,* *tenga una emergencia médica.*

ZONA VERDE

Se siente *bien.*

- No tiene tos, resuellos, opresión en el pecho ni dificultad para respirar durante el día o la noche.
- Puede realizar las actividades habituales.

Capacidad pulmonar máxima (para personas de 5 años en adelante): es _____ o más. (80% o más de su mejor nivel de capacidad pulmonar máxima)
Su mejor nivel de capacidad pulmonar máxima (para las personas de 5 años en adelante): _____

Debe *PREVENIR* los síntomas del asma todos los días:

- ❑ Tome los medicamentos de control (mencionados arriba) todos los días.
- ❑ Antes de hacer ejercicio, adminístrese _____ dosis de _____
- ❑ Evite aquello que pueda empeorar el asma. (Ver el reverso del formulario)

ZONA AMARILLA

Su estado *empeora.*

- Tiene tos, resuellos, opresión en el pecho, dificultad para respirar o
- Se despierta por las noches debido a los síntomas del asma, o
- Puede realizar algunas de sus actividades habituales, pero no todas.

Capacidad pulmonar máxima (para personas de 5 años en adelante): _____ a _____ (50% al 79% de su mejor nivel de capacidad pulmonar máxima)

PRECAUCIÓN. Continúe tomando los medicamentos de control todos los días, Y:

- ❑ Reciba ___ inhalaciones o ___ el medicamento de alivio rápido por medio de nebulizador. Si no vuelve a la *Zona verde* en el plazo de 20 o 30 minutos, debe tomar ___ inhalaciones o tratamientos con nebulizador más. Si no vuelve a la *Zona verde* en una hora, entonces debe:
- ❑ Aumentar _____
- ❑ Agregar _____
- ❑ Llamar _____
- ❑ Continúe usando los medicamentos de alivio rápido cada 4 horas según sea necesario. Llame al proveedor si no mejora en _____ días.

ZONA ROJA

Emergencia médica

- Mucha dificultad para respirar, o
- Los medicamentos de alivio rápido no le han ayudado, o
- No puede realizar las actividades habituales, o
- Los síntomas son los mismos o empeoran después de 24 horas.

Capacidad pulmonar máxima (para personas de 5 años en adelante): menos de _____ (50% de su mejor nivel de capacidad pulmonar máxima)

ALERTA MÉDICA ¡Pida ayuda!

- ❑ Tome medicamentos de alivio rápido: _____ inhalaciones cada _____ minuto y pida ayuda de inmediato.
- ❑ Tome _____
- ❑ Llame _____

Peligro. ¡Pida ayuda de inmediato! Llame al 911 si tiene problemas para caminar o hablar debido a la dificultad para respirar, o si tiene los labios o las uñas grises o morados. Si se trata de un niño, llame al 911 en caso de que se le hunda la piel alrededor del cuello y las costillas durante la respiración, o si el niño no responde normalmente.

Health Care Provider: My signature provides authorization for the above written orders. I understand that all procedures will be implemented in accordance with state laws and regulations. Student may self carry asthma medications: ❑ Yes ❑ No self administer asthma medications: ❑ Yes ❑ No (This authorization is for a maximum of one year from signature date.)

_____ _____

Healthcare Provider Signature Date

ORIGINAL (Patient) / CANARY (School/Child Care/Work/Other Support Systems) / PINK (Chart)

Calasthma.org/resources/show_resource/1082/

Assesment

Initial

- Classify severity.
- Identify precipitating factors.
- Identify comorbid conditions.
- Asses the patient's knowledge and skill.

Periodic

- Symptoms or peak flow or both.
- Every 2 to 6 weeks until controlled, every 1 to 6 months when controlled.
- Review **Rx use**, technique, compliance and the written asthma action plan.
- Spirometry.

Rx

Started

- Based on severity, the intrinsic intensity of the disease process. (How often? How severe?)

Adjusted

- Based on control, the degree to which the manifestations of asthma are minimized by therapeutic intervention and the goals of therapy are met.
- Stepwise

Rx Type

Quick-relief medications

- SABAs relax airway muscles to provide prompt relief of symptoms. Do not expect them to provide long-term asthma control. Using SABA >2 days a week indicates the need for starting or increasing long term control medications.

Long-term control medications

- Prevent symptoms, often by reducing inflammation. Must be taken daily. Do not expect them to give quick relief.

Education-Questions

- “What worries you most about your asthma?”
- “What do you want to accomplish at this visit?”
- “What do you want to be able to do that you can’t do now because of your asthma?”
- “What do you expect from treatment?”
- “What medicines have you tried?”
- “What other questions do you have for me today?”
- “Are there things in your environment that make your asthma worse?”

Education-Medications

- “What medications are you taking?”
- “How and when are you taking them?”
- “What problems have you had using your medications?”
- “Please show me how you use your inhaled medications.”

ENVIRONMENT

- Allergens- Skin testing or in vitro testing for patients that have persistent asthma (cockroach, dust-mite, rodent allergen, animal dander, mold, pollen,).
- Advise of risk-ASA, NSAID. Patients with severe asthma or nasal polyps. Sulfites (eg. beer)
- Irritants- TOBACCO, Smoke, strong odors, and sprays
- Exercise or Sports-You should be able to be active without symptoms. Check the air quality index. Cold air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Devices

- Filters- Most studies have not shown an effect on symptoms.
- Humidifiers- Can increase mold or dust mites.

Immunotherapy

- Consider subcutaneous allergen immunotherapy for patients who have persistent asthma when there is clear evidence of a relationship between symptoms and exposure to an allergen to which the patient is sensitive. Evidence is strongest for use of subcutaneous immunotherapy for single allergens, particularly house dust mites, animal dander, and pollen.

Other Non-Rx

- Flu vaccine
- Food

TX- Long Term Control

- **Corticosteroids**- reduce airway hyperresponsiveness, inhibit inflammatory cell migration and activation, and block late phase reaction to allergen.
- Cromolyn sodium and nedocromil. EIB.
- Immunomodulators-Omalizumab (anti-IgE). Sensitivity to relevant allergens (e.g., dust mite, cockroach, cat, or dog) and who require step 5 or 6 care (for severe persistent asthma).
- Leukotriene modifiers- EIB.
- **LABA-The preferred therapy to combine with ICS in youths ≥12 years of age and adults. Never as monotherapy. EIB.**
- Methylxanthines-Monitoring of serum theophylline concentration is essential.

Tx- Quick Relief

- Anticholinergics- Inhibit muscarinic cholinergic receptors and reduce intrinsic vagal tone of the airway. Ipratropium bromide provides additive benefit to SABA in moderate or severe exacerbations in the emergency care setting, not the hospital setting.
- SABA- The treatment of choice for relief of acute symptoms and prevention of EIB. Increasing use of SABA treatment or the use of SABA >2 days a week (not prevention of EIB) generally indicates inadequate asthma control and the need for initiating or intensifying anti-inflammatory therapy
- Systemic Corticosteroids- For moderate and severe exacerbations in addition to SABA to speed recovery and to prevent recurrence

Complementary and Alternative (CAM)

- Do ask. Because patients do use them.
- Chiropractic, homeopathy, herbal, relaxation and accupuncture. Other?
- Not proven and may be harmful.

Delivery Devices for Inhaled Meds.

- Increased concentrations.
- Reduced side effects.
- **Technique should be reviewed at every patient visit.**

Safety- ICS

- ICSs are the preferred long-term control therapy.
- Most benefits of ICS for patients who have mild or moderate asthma occur at the low- to medium-dose.
- Cataracts, reduced bone density, Children growth rate. Use the lowest effective dose.
- Use spacers or valved holding chambers.
- Rinse and spit.
- Consider adding a LABA, or alternative adjunctive therapy.

Safety- LABA

- Improves lung function, decreases symptoms, reduces exacerbations and use of SABA for quick relief in most patients to a greater extent than doubling the dose of ICS.
- Increased risk of asthma related deaths in patients treated with salmeterol (13 deaths among 13,176 patients treated for 28 weeks with salmeterol versus 3 deaths among 13,179 patients treated with placebo).

Asthma Specialist Referral

- Referral to an asthma specialist for consultation or comanagement is recommended if there are difficulties achieving or maintaining control of asthma, if the patient required >2 bursts of oral systemic corticosteriods in 1 year or has an exacerbation requiring hospitalization, if step 4 care or higher is required (step 3 care or higher for children 0–4 years of age), if immunotherapy or omalizumab is considered, or if additional testing is indicated.

If Control Is Not Achieved

- Review the patient's adherence to medications, inhaler technique, environmental control measures, and management of comorbid conditions.
- If an alternative treatment was used initially, use the preferred treatment option before stepping up therapy.
- Step up.
- A short course of oral systemic corticosteroids may be considered.
- If lack of control persists, consider alternative diagnoses before stepping up further.

If Control Is Achieved

- Consider a step down in therapy once asthma is well controlled for at least 3 months. A step down is necessary to identify the minimum therapy required to maintain good control. A reduction in therapy should be gradual and must be closely monitored.

Stepwise Treatment Recommendations

- Three different age groups- 0–4 years, 5–11 years, and 12 years and older.

Special Groups- Youth

- Involve them in making their action plan.
- Take a copy to school.
- SPORTS.

Special Groups- Elderly

- Consider coexisting conditions- e.g. osteoporosis.
- Consider medications- e.g. NSAID’s or ß blockers.

Special Situations- EIB

- SABA- work for >80% for 2-3 hrs.
- LTRA- work in 50%.
- Cromolyn or nedocromil.
- Warm up.
- Mask or scarf for cold air expossures.

Special Situation- Pregnancy

- Uncontrolled asthma increases the risk of perinatal mortality, preeclampsia, preterm birth, and low-birth-weight infants. It is safer for pregnant women to be treated with asthma medications than to have asthma symptoms and exacerbations.
- Monitor at least monthly.
- Albuterol, Budesonide.

Special Situation- Surgery

- Review control, medication use and pulmonary function.
- Optimize lung function- Systemic steroids?
- IV hydrocortizone 100mg q8hr. during the surgical period and 24 hrs. after surgery for patients who received systemic steroids within 6 mo. and some on high dose ICS.

Comorbid Conditions

- ABPA-Diagnostic criteria: positive immediate skin test and elevated serum IgE and/or IgG to Aspergillus, total serum IgE >417 IU (1,000 ng/mL), and central bronchiectasis. Tx- prednisone, initially 0.5 mg per kilogram with gradual tapering. Azole antifungal may also be helpful.
- GERD-especially with nighttime symptoms. Treatment includes: avoiding heavy meals, fried foods, caffeine, and alcohol; avoiding food and drink within 3 hours of retiring; elevating the head of the bed on 6- to 8-inch blocks; using proton pump inhibitor medication.

Comorbid Conditions

- Obesity
- OSA
- Rhinitis or sinusitis- Tx intranasal corticosteroids, antihistamine therapy, and the consideration of immunotherapy (consider decongestants and/or antibiotics for sinusitis).
- Stress and depression

Classifying Asthma Severity and Initiating Therapy in Children

Components of Severity		Intermittent		Persistent					
				Mild		Moderate		Severe	
		Ages 0–4	Ages 5–11	Ages 0–4	Ages 5–11	Ages 0–4	Ages 5–11	Ages 0–4	Ages 5–11
Impairment	Symptoms	≤2 days/week		>2 days/week but not daily		Daily		Throughout the day	
	Nighttime awakenings	0	≤2x/ month	1–2x/month	3–4x/ month	3–4x/ month	>1x/week but not nightly	>1x/ week	Often 7x/week
	Short-acting beta$_2$-agonist use for symptom control	≤2 days/week		>2 days/week but not daily		Daily		Several times per day	
	Interference with normal activity	None		Minor limitation		Some limitation		Extremely limited	
	Lung Function		Normal FEV_1 between exacerbations						
	• FEV_1 (predicted) or peak flow (personal best)	N/A	>80%	N/A	>80%	N/A	60–80%	N/A	<60%
	• FEV_1/FVC		>85%		>80%		75–80%		<75%
Risk	Exacerbations requiring oral systemic corticosteroids (consider severity and interval since last exacerbation)	0–1/year (see notes)		≥2 exacerbations in 6 months requiring oral systemic corticosteroids, or ≥4 wheezing episodes/1 year lasting >1 day AND risk factors for persistent asthma	≥2x/year (see notes) Relative annual risk may be related to FEV_1				
Recommended Step for Initiating Therapy (See "Stepwise Approach for Managing Asthma" for treatment steps.) The stepwise approach is meant to assist, not replace, the clinical decisionmaking required to meet individual patient needs.		Step 1 (for both age groups)		Step 2 (for both age groups)		Step 3 and consider short course of oral systemic cortico-steroids	Step 3: medium-dose ICS option and consider short course of oral systemic cortico-steroids	Step 3 and consider short course of oral systemic cortico-steroids	Step 3: medium-dose ICS option OR step 4 and consider short course of oral systemic cortico-steroids

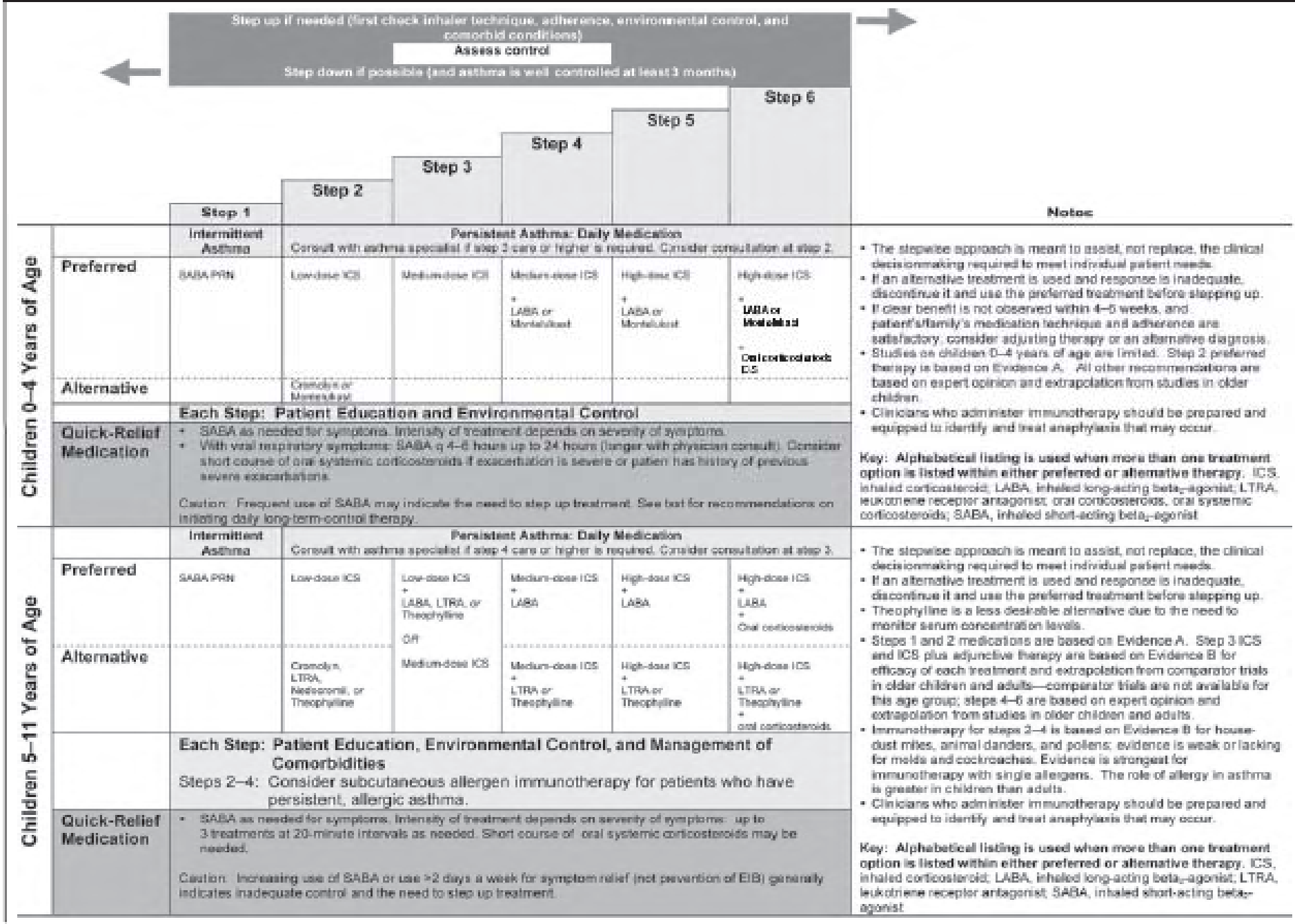
In 2–6 weeks, depending on severity, evaluate level of asthma control that is achieved.

- Children 0–4 years old: If no clear benefit is observed in 4–6 weeks, stop treatment and consider alternative diagnoses or adjusting therapy.
- Children 5–11 years old: Adjust therapy accordingly.

Assessing Asthma Control and Adjusting Therapy in Children

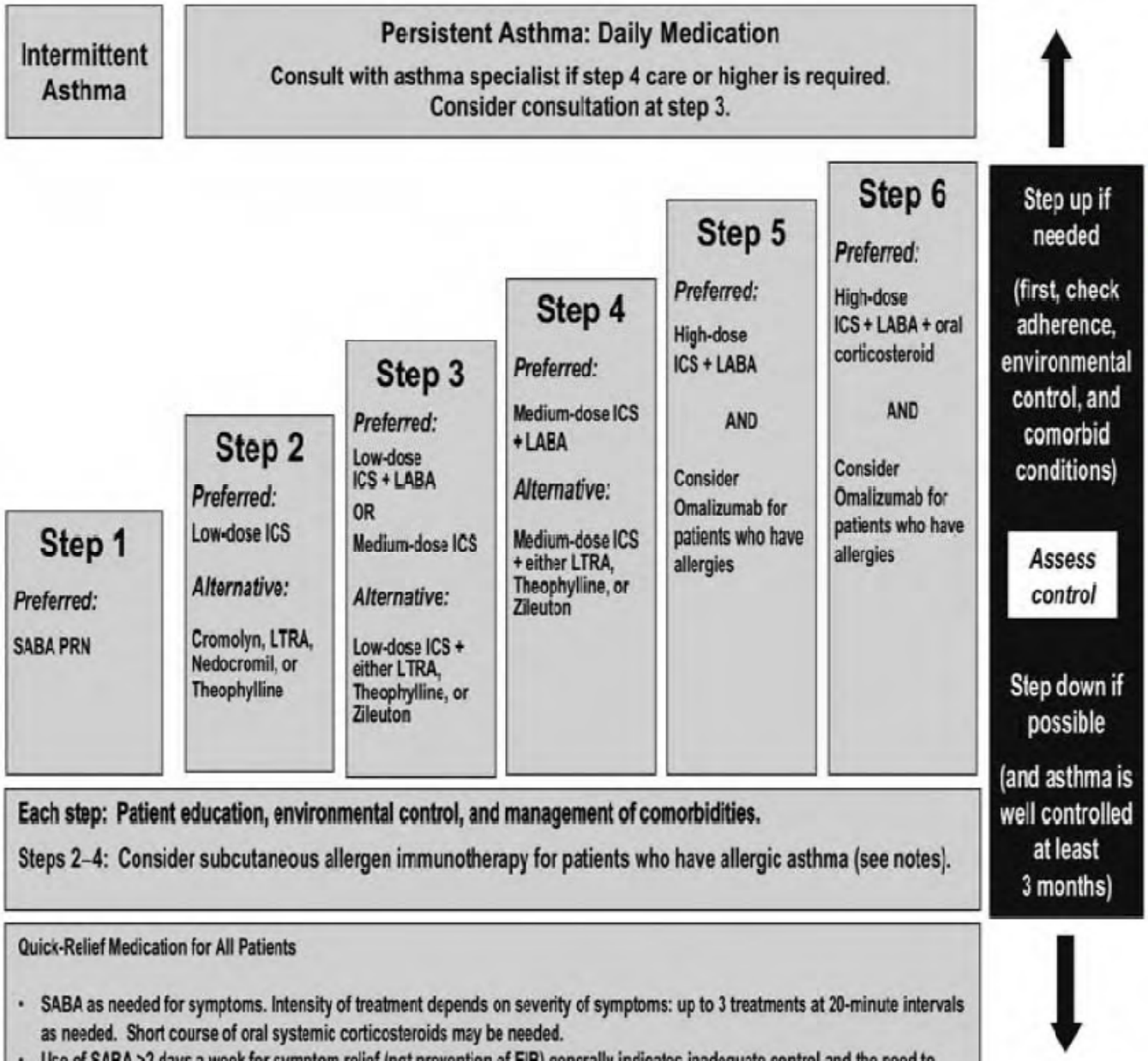
Components of Control		Well Controlled		Not Well Controlled		Very Poorly Controlled	
		Ages 0–4	Ages 5–11	Ages 0–4	Ages 5–11	Ages 0–4	Ages 5–11
Impairment	Symptoms	≤2 days/week but not more than once on each day		>2 days/week or multiple times on ≤2 days/week		Throughout the day	
	Nighttime awakenings	≤1x/month		>1x/month	≥2x/month	>1x/week	≥2x/week
	Interference with normal activity	None		Some limitation		Extremely limited	
	Short-acting $beta_2$-agonist use for symptom control (not prevention of EIB)	≤2 days/week		>2 days/week		Several times per day	
	Lung function • FEV_1 (predicted) or peak flow personal best • FEV_1/FVC	N/A	>80% >80%	N/A	60–80% 75–80%	N/A	<60% <75%
Risk	Exacerbations requiring oral systemic corticosteroids	0–1x/year		2–3x/year	≥2x/year	>3x/year	≥2x/year
	Reduction in lung growth	N/A	Requires long-term followup	N/A		N/A	
	Treatment-related adverse effects	Medication side effects can vary in intensity from none to very troublesome and worrisome. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.					
Recommended Action for Treatment (See "Stepwise Approach for Managing Asthma" for treatment steps.) The stepwise approach is meant to assist, not replace, clinical decisionmaking required to meet individual patient needs.		• Maintain current step. • Regular followup every 1–6 months. • Consider step down if well controlled for at least 3 months.		Step up 1 step	Step up at least 1 step	• Consider short course of oral systemic corticosteroids, • Step up 1–2 steps	
				• **Before step up:** Review adherence to medication, inhaler technique, and environmental control. If alternative treatment was used, discontinue it and use preferred treatment for that step. • **Reevaluate the level of asthma control in 2–6 weeks to achieve control; every 1–6 months to maintain control.** **Children 0–4 years old:** If no clear benefit is observed in 4–6 weeks, consider alternative diagnoses or adjusting therapy. **Children 5–11 years old:** Adjust therapy accordingly. • **For side effects,** consider alternative treatment options.			

FIGURE 13. STEPWISE APPROACH FOR MANAGING ASTHMA LONG TERM IN CHILDREN, 0–4 YEARS OF AGE AND 5–11 YEARS OF AGE



Components of Severity		Classification of Asthma Severity ≥12 years of age			
		Intermittent	Persistent		
			Mild	Moderate	Severe
Impairment	Symptoms	≤2 days/week	>2 days/week but not daily	Daily	Throughout the day
	Nighttime awakenings	≤2x/month	3–4x/month	>1x/week but not nightly	Often 7x/week
	Short-acting $beta_2$-agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week but not daily, and not more than 1x on any day	Daily	Several times per day
	Interference with normal activity	None	Minor limitation	Some limitation	Extremely limited
Normal FEV_1/FVC: 8–19 yr 85%; 20–39 yr 80%; 40–59 yr 75%; 60–80 yr 70%	Lung function	• Normal FEV_1 between exacerbations • FEV_1 >80% predicted • FEV_1/FVC normal	• FEV_1 >80% predicted • FEV_1/FVC normal	• FEV_1 >60% but <80% predicted • FEV_1/FVC reduced 5%	• FEV_1 <60% predicted • FEV_1/FVC reduced >5%
Risk	Exacerbations requiring oral systemic corticosteroids	0–1/year (see note)	≥2/year (see note) →		
		← Consider severity and interval since last exacerbation. → Frequency and severity may fluctuate over time for patients in any severity category. Relative annual risk of exacerbations may be related to FEV_1.			
Recommended Step for Initiating Treatment (See "Stepwise Approach for Managing Asthma" for treatment steps.)		Step 1	Step 2	Step 3 and consider short course of oral systemic corticosteroids	Step 4 or 5
		In 2–6 weeks, evaluate level of asthma control that is achieved and adjust therapy accordingly.			

Components of Control		Classification of Asthma Control (≥12 years of age)		
		Well Controlled	Not Well Controlled	Very Poorly Controlled
Impairment	Symptoms	≤2 days/week	>2 days/week	Throughout the day
	Nighttime awakenings	≤2x/month	1–3x/week	≥4x/week
	Interference with normal activity	None	Some limitation	Extremely limited
	Short-acting $beta_2$-agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week	Several times per day
	FEV_1 or peak flow	>80% predicted/ personal best	60–80% predicted/ personal best	<60% predicted/ personal best
	Validated questionnaires ATAQ ACQ ACT	 0 ≤0.75* ≥20	 1–2 ≥1.5 16–19	 3–4 N/A ≤15
Risk	Exacerbations requiring oral systemic corticosteroids	0–1/year	≥2/year (see note)	
		Consider severity and interval since last exacerbation		
	Progressive loss of lung function	Evaluation requires long-term followup care.		
	Treatment-related adverse effects	Medication side effects can vary in intensity from none to very troublesome and worrisome. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.		
Recommended Action for Treatment (See "Stepwise Approach for Managing Asthma" for treatment steps.)		• Maintain current step. • Regular followup at every 1–6 months to maintain control. • Consider step down if well controlled for at least 3 months.	• Step up 1 step. • Reevaluate in 2–6 weeks. • For side effects, consider alternative treatment options.	• Consider short course of oral systemic corticosteroids. • Step up 1–2 steps. • Reevaluate in 2 weeks. • For side effects, consider alternative treatment options.



Key: **Alphabetical order is used when more than one treatment option is listed within either preferred or alternative therapy.** ICS, inhaled corticosteroid; LABA, long-acting inhaled beta$_2$-agonist; LTRA, leukotriene receptor antagonist; SABA, inhaled short-acting beta$_2$-agonist

Notes:

- The stepwise approach is meant to assist, not replace, the clinical decisionmaking required to meet individual patient needs.
- If alternative treatment is used and response is inadequate, discontinue it and use the preferred treatment before stepping up.
- Zileuton is a less desirable alternative due to limited studies as adjunctive therapy and the need to monitor liver function. Theophylline requires monitoring of serum concentration levels.
- In step 6, before oral corticosteroids are introduced, a trial of high-dose ICS + LABA + either LTRA, theophylline, or zileuton may be considered, although this approach has not been studied in clinical trials.
- Step 1, 2, and 3 preferred therapies are based on Evidence A; step 3 alternative therapy is based on Evidence A for LTRA, Evidence B for theophylline, and Evidence D for zileuton. Step 4 preferred therapy is based on Evidence B, and alternative therapy is based on Evidence B for LTRA and theophylline and Evidence D zileuton. Step 5 preferred therapy is based on Evidence B. Step 6 preferred therapy is based on (EPR—2 1997) and Evidence B for omalizumab.
- Immunotherapy for steps 2–4 is based on Evidence B for house-dust mites, animal danders, and pollens; evidence is weak or lacking for molds and cockroaches. Evidence is strongest for immunotherapy with single allergens. The role of allergy in asthma is greater in children than in adults.
- Clinicians who administer immunotherapy or omalizumab should be prepared and equipped to identify and treat anaphylaxis that may occur.

Acute Exacerbations

- Risk factors for asthma-related death include:

Previous severe exacerbation (e.g., intubation or ICU admission for asthma)

Two or more hospitalizations or >3 ED visits in the past year

Use of >2 canisters of SABA per month

Difficulty perceiving airway obstruction or the severity of worsening asthma

Low socioeconomic status or inner-city residence

Illicit drug use

Major psychosocial problems or psychiatric disease

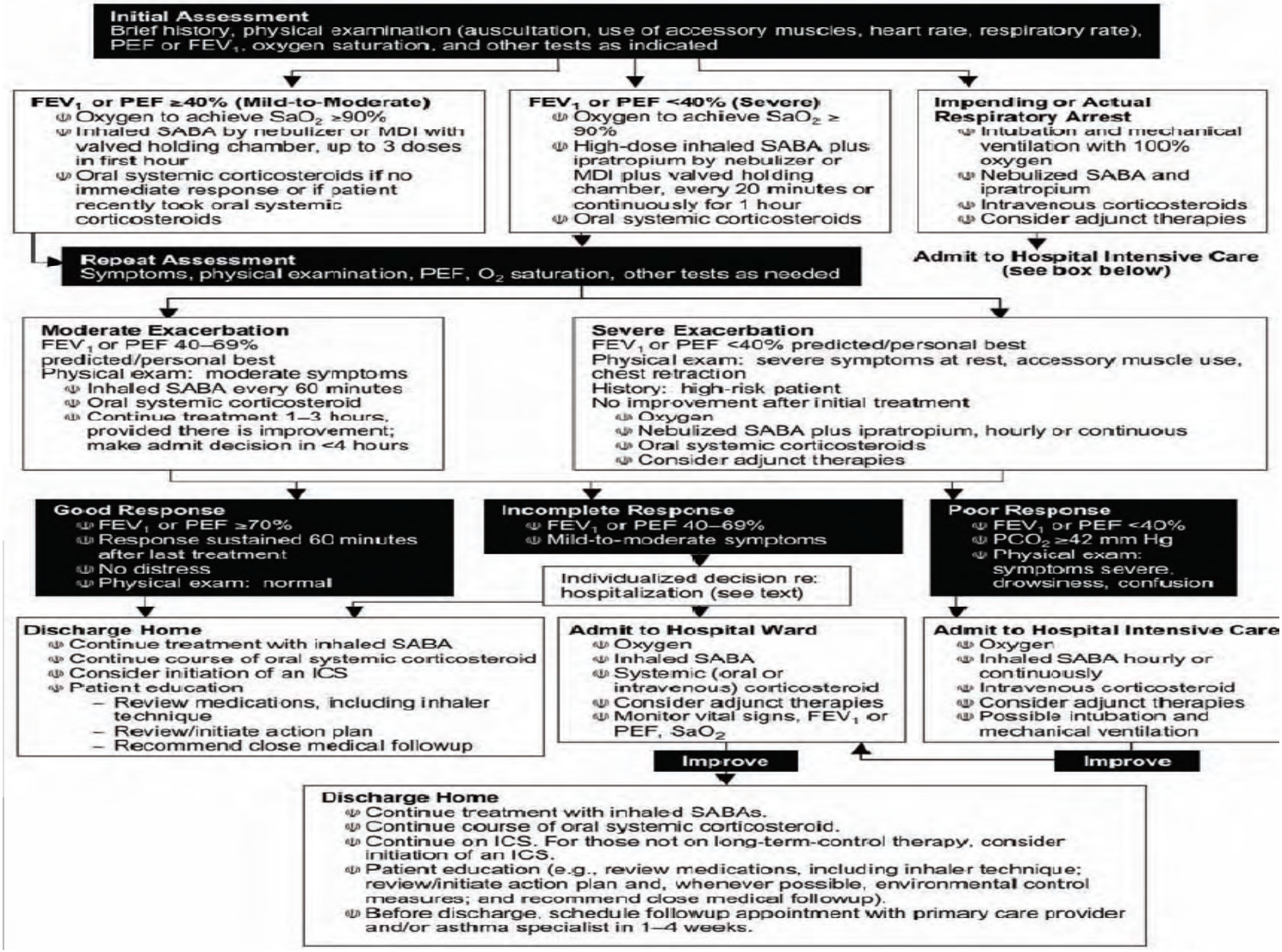
Comorbidities, such as cardiovascular disease or other chronic lung disease

Acute Exacerbations-Home

- **Activate the Action Plan** Peak flow meter for insensitive patients.
- Increase SABA, consider PO corticosteroids.
- Avoid allergens or irritants.
- Communicate with clinician.

Acute Exacerbation- Transport and ER

- Oxygen, SABA, PO corticosteroids.
- Objective monitoring- peak flow, FEV1, oxymetry.
- Periodic reassesment.


Initial Assessment
Brief history, physical examination (auscultation, use of accessory muscles, heart rate, respiratory rate), PEF or FEV1, oxygen saturation, and other tests as indicated
FEV1 or PEF ≥40% (Mild-to-Moderate)
Oxygen to achieve SaO2 ≥90%
Inhaled SABA by nebulizer or MDI with valved holding chamber, up to 3 doses in first hour
Oral systemic corticosteroids if no immediate response or if patient recently took oral systemic corticosteroids
FEV1 or PEF <40% (Severe)
Oxygen to achieve SaO2 ≥ 90%
High-dose inhaled SABA plus ipratropium by nebulizer or MDI plus valved holding chamber, every 20 minutes or continuously for 1 hour
Oral systemic corticosteroids
Impending or Actual Respiratory Arrest
Intubation and mechanical ventilation with 100% oxygen
Nebulized SABA and ipratropium
Intravenous corticosteroids
Consider adjunct therapies
Admit to Hospital Intensive Care (see box below)
Repeat Assessment
Symptoms, physical examination, PEF, O2 saturation, other tests as needed
Moderate Exacerbation
FEV1 or PEF 40–69% predicted/personal best
Physical exam: moderate symptoms
Inhaled SABA every 60 minutes
Oral systemic corticosteroid
Continue treatment 1–3 hours, provided there is improvement; make admit decision in <4 hours
Severe Exacerbation
FEV1 or PEF <40% predicted/personal best
Physical exam: severe symptoms at rest, accessory muscle use, chest retraction
History: high-risk patient
No improvement after initial treatment
Oxygen
Nebulized SABA plus ipratropium, hourly or continuous
Oral systemic corticosteroids
Consider adjunct therapies
Good Response
FEV1 or PEF ≥70%
Response sustained 60 minutes after last treatment
No distress
Physical exam: normal
Incomplete Response
FEV1 or PEF 40–69%
Mild-to-moderate symptoms
Poor Response
FEV1 or PEF <40%
PCO2 ≥42 mm Hg
Physical exam: symptoms severe, drowsiness, confusion
Individualized decision re: hospitalization (see text)
Discharge Home
Continue treatment with inhaled SABA
Continue course of oral systemic corticosteroid
Consider initiation of an ICS
Patient education
– Review medications, including inhaler technique
– Review/initiate action plan
– Recommend close medical followup
Admit to Hospital Ward
Oxygen
Inhaled SABA
Systemic (oral or intravenous) corticosteroid
Consider adjunct therapies
Monitor vital signs, FEV1 or PEF, SaO2
Admit to Hospital Intensive Care
Oxygen
Inhaled SABA hourly or continuously
Intravenous corticosteroid
Consider adjunct therapies
Possible intubation and mechanical ventilation
Improve
Improve
Discharge Home
Continue treatment with inhaled SABAs.
Continue course of oral systemic corticosteroid.
Continue on ICS. For those not on long-term-control therapy, consider initiation of an ICS.
Patient education (e.g., review medications, including inhaler technique; review/initiate action plan and, whenever possible, environmental control measures; and recommend close medical followup).
Before discharge, schedule followup appointment with primary care provider and/or asthma specialist in 1–4 weeks.

Hospitalize vs. Discharge from ER

To Decide

- Serial lung function at 1 hr.
- Serial pulse oxymetry.
- Signs and symptoms after 1 hr. of therapy.
- Experience vs. patient safety.

If Discharged

- Referral or follow up is essential to create or review an Action Plan.
- ER Asthma discharge plan.
- Review inhaler technique.
- Start ICS.

EMERGENCY DEPARTMENT—ASTHMA DISCHARGE PLAN

Name: _____ was seen by **Dr.**_____ on ____/____/____

- Take your prescribed medications as directed—do not delay!
- -term treatment plan.
- Even when you feel well, you may need daily medicine to keep your asthma in good control and prevent attacks.
- Visit your doctor or other health care provider as soon as you can to discuss how to control your asthma and to develop *your own* action plan.

Your followup appointment with _____ is on: ____/____/____. **Tel:** _____

YOUR MEDICINE FOR THIS ASTHMA ATTACK IS:

Medication	Amount	Doses per day, for # days
Prednisone/prednisolone (oral corticosteroid)		_____ a day for _____ days Take the entire prescription, even when you start to feel better.
Inhaled albuterol		_____ puffs every 4 to 6 hours if you have symptoms, for _____days

YOUR DAILY MEDICINE FOR LONG-TERM CONTROL AND PREVENTING ATTACKS IS:

Medication	Amount	Doses per day
Inhaled corticosteroids		

YOUR QUICK-RELIEF MEDICINE WHEN YOU HAVE SYMPTOMS IS:

Medication	Amount	Number of doses/day
Inhaled albuterol		

ASK YOURSELF 2 TO 3 TIMES PER DAY, EVERY DAY, FOR AT LEAST 1 WEEK:

"How good is my asthma compared to when I left the hospital?"

If you feel much better:	**If you feel better, but still need your quick-relief inhaler often:**	**If you feel about the same:**	**If you feel worse:**
• Take your daily long-term control medicine.	• Take your daily long-term control medicine. • See your doctor as soon as possible.	• Use your quick-relief inhaler. • Take your daily long-term control medicine. • See your doctor as soon as possible—don't delay.	• Use your quick-relief inhaler. • Take your daily long-term control medicine. • Immediately go to the emergency department or call 9–1–1.

YOUR ASTHMA IS UNDER CONTROL WHEN YOU:

① Can be active daily and sleep through the night.	② Need fewer than 4 doses of quick-relief medicine in a week.	③ Are free of shortness of breath, wheeze, and cough.	④ Achieve an acceptable "peak flow" (discuss with your health care provider).

FIGURE 23b. EMERGENCY DEPARTMENT—ASTHMA DISCHARGE PLAN: HOW TO USE YOUR METERED-DOSE INHALER

Using an inhaler seems simple, but most patients do not use it the right way. When you use your inhaler the wrong way, less medicine gets to your lungs.

For the next few days, read these steps aloud as you do them or ask someone to read them to you. Ask your doctor, nurse, other health care provider, or pharmacist to check how well you are using your inhaler.

Use your inhaler in one of the three ways pictured below (A or B are best, but C can be used if you have trouble with A and B). (Your doctor may give you other types of inhalers.)

Steps for Using Your Inhaler

Getting ready

1. Take off the cap and shake the inhaler.
2. Breathe out all the way.
3. Hold your inhaler the way your doctor said (A, B, or C below).

Breathe in slowly

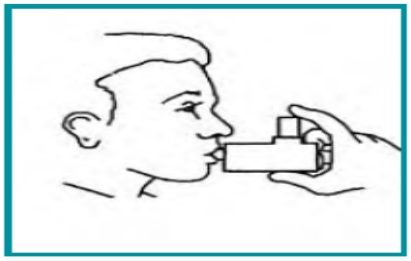
4. As you start breathing in slowly through your mouth, press down on the inhaler one time. (If you use a holding chamber, first press down on the inhaler. Within5 seconds, begin to breathe in slowly.)
5. Keep breathing in slowly, as deeply as you can.

Hold your breath

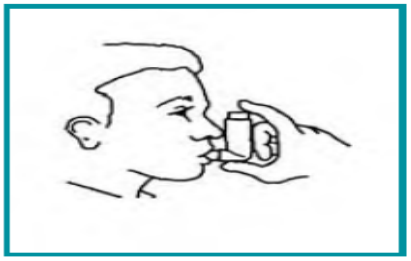
6. Hold your breath as you count to 10 slowly, if you can.
7. For inhaled quick-relief medicine (short-acting $beta_2$ agonists), wait about 15–30 seconds between puffs. There is no need to wait between puffs for other medicines.

A. Hold inhaler 1 to 2 inches in front of your mouth (about the width of two fingers).

B. Use a spacer/holding chamber. These come in many shapes and can be useful to any patient.



C. Put the inhaler in your mouth. Do not use for steroids.



Definition of COPD

- 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.

Classification of COPD Severity by Spirometry

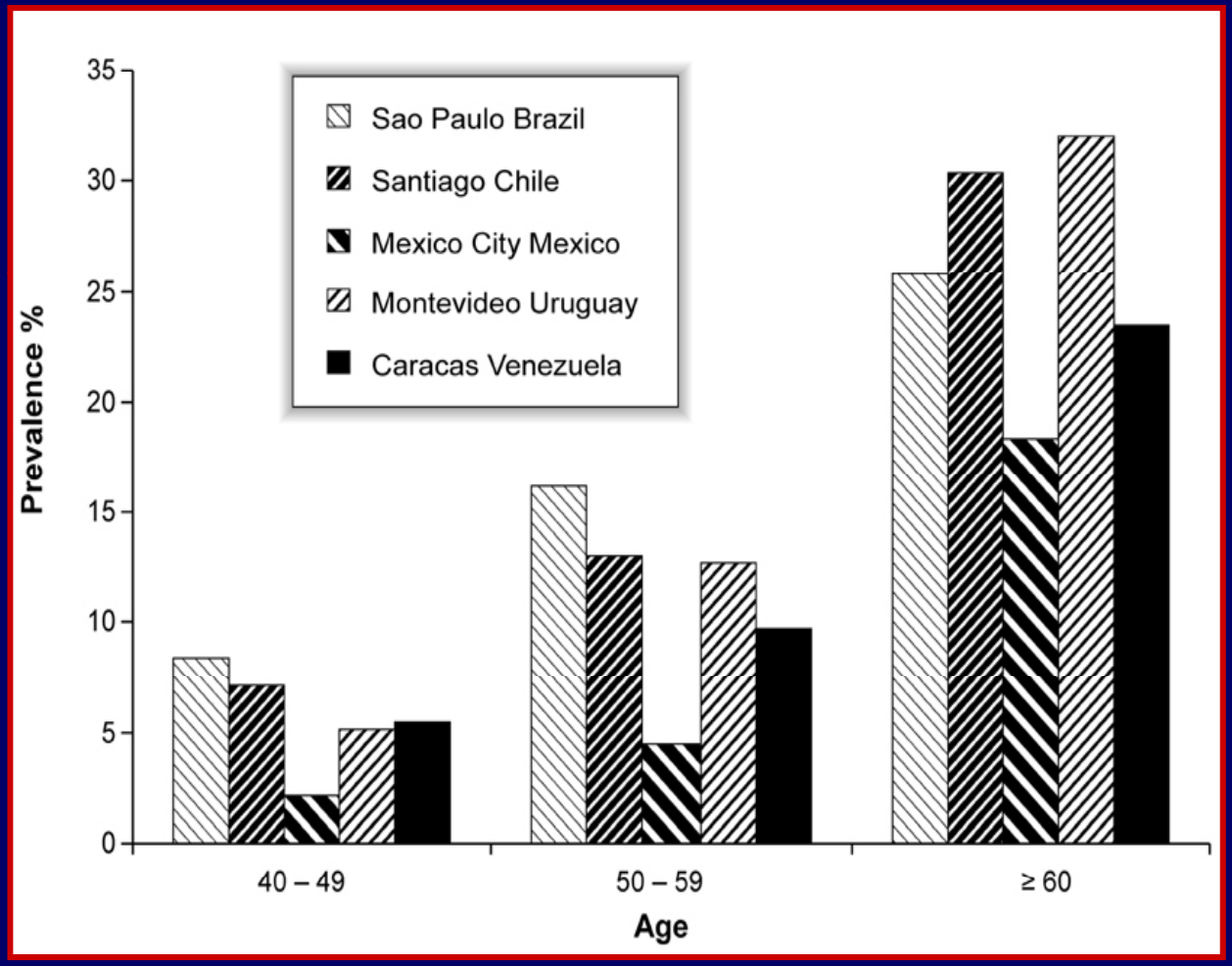
Stage I: Mild	$FEV_1/FVC < 0.70$ $FEV_1 \geq 80\%$ predicted
Stage II: Moderate	$FEV_1/FVC < 0.70$ $50\% \leq FEV_1 < 80\%$ predicted
Stage III: Severe	$FEV_1/FVC < 0.70$ $30\% \leq FEV_1 < 50\%$ predicted
Stage IV: Very Severe	$FEV_1/FVC < 0.70$ $FEV_1 < 30\%$ predicted *or* $FEV_1 < 50\%$ predicted *plus* chronic respiratory failure

"At Risk" for COPD

- COPD includes four stages of severity classified by spirometry.
- A fifth category--*Stage 0: At Risk*--that appeared in the 2001 report is no longer included as a stage of COPD, as there is incomplete evidence that the individuals who meet the definition of "At Risk" (chronic cough and sputum production, normal spirometry) necessarily progress on to *Stage I: Mild COPD*.
- The public health message is that chronic cough and sputum are not normal remains important - their presence should trigger a search for underlying cause(s).

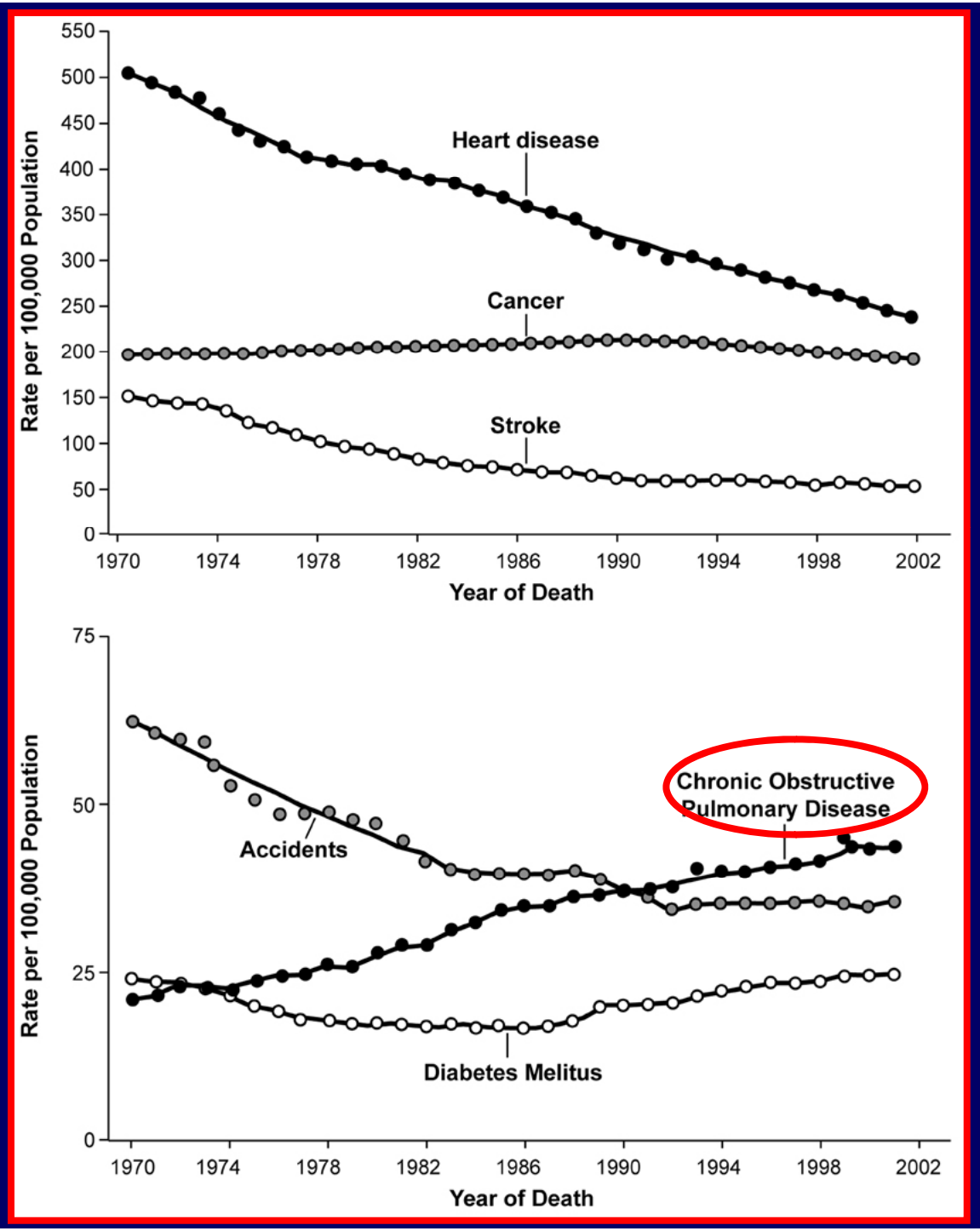
COPD Prevalence Study in Latin America

The prevalence of post-bronchodilator $FEV_1/FVC < 0.70$ increases steeply with age in 5 Latin American Cities



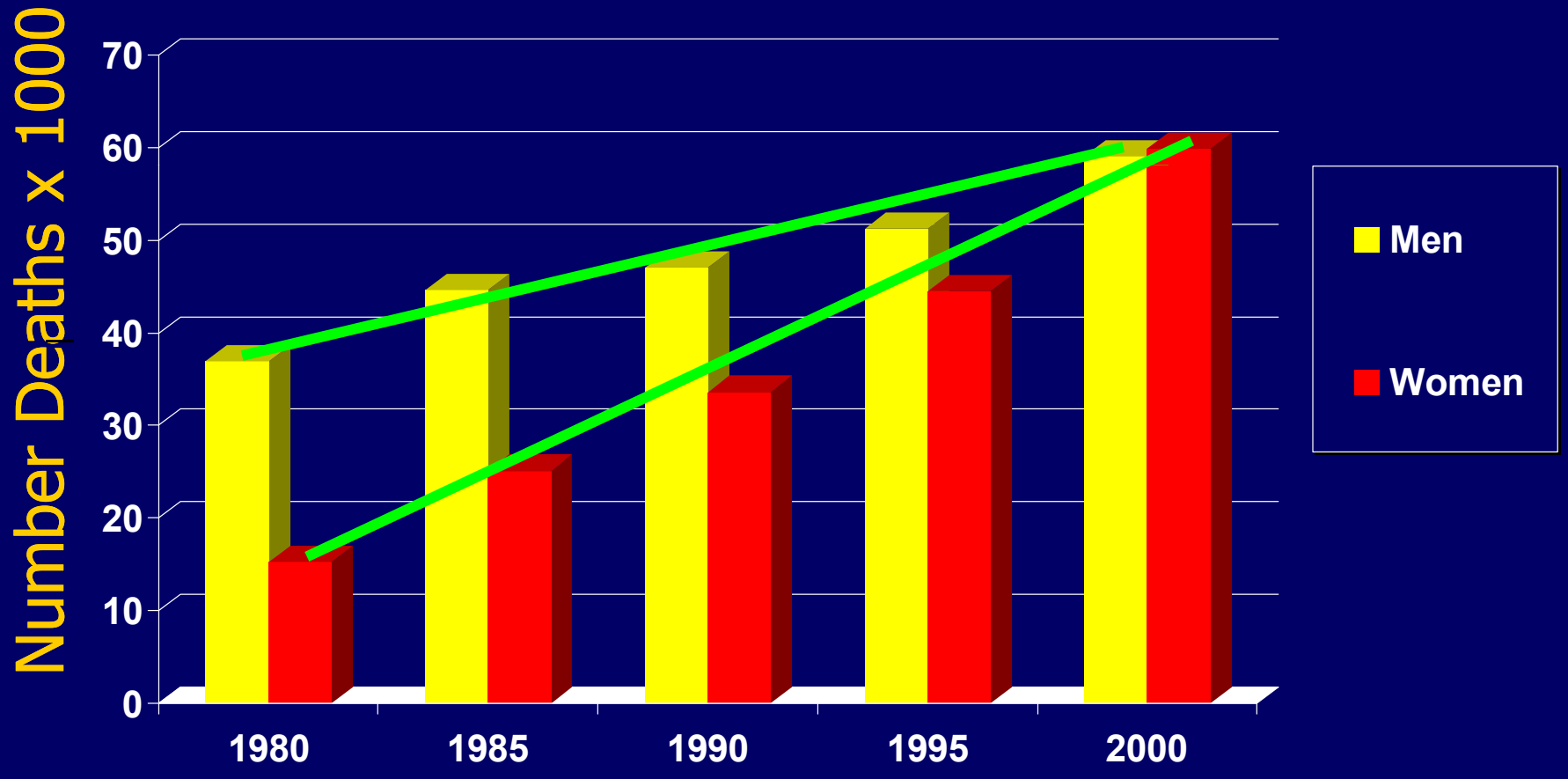
Source: Menezes AM et al. *Lancet* 2005

Of the six leading causes of death in the United States, only COPD has been increasing steadily since 1970



Source: Jemal A. et al. *JAMA* 2005

COPD Mortality by Gender, U.S., 1980-2000



Source: US Centers for Disease Control and Prevention, 2002

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

Oxidative stress

Gender

Age

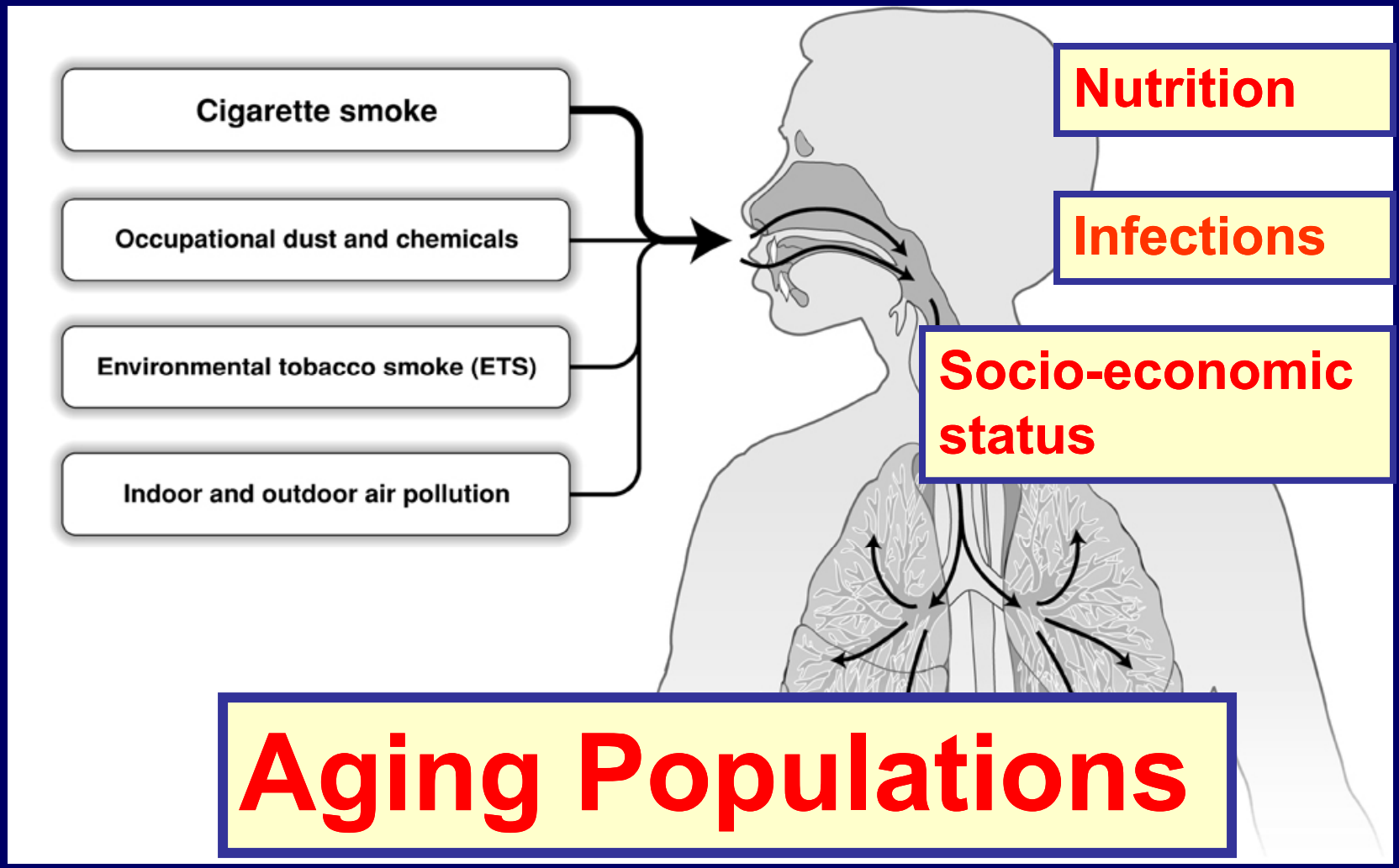
Respiratory infections

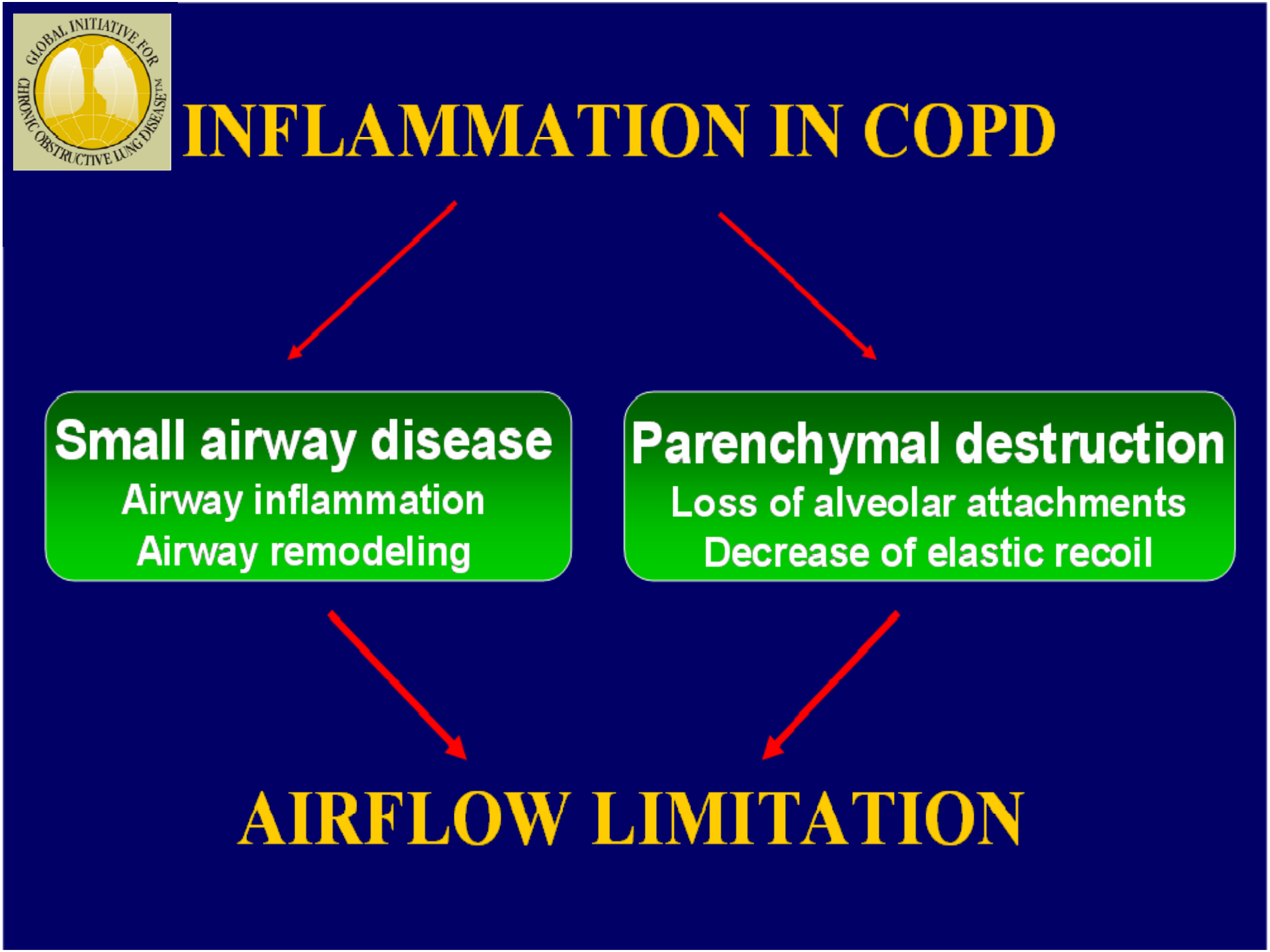
Socioeconomic status

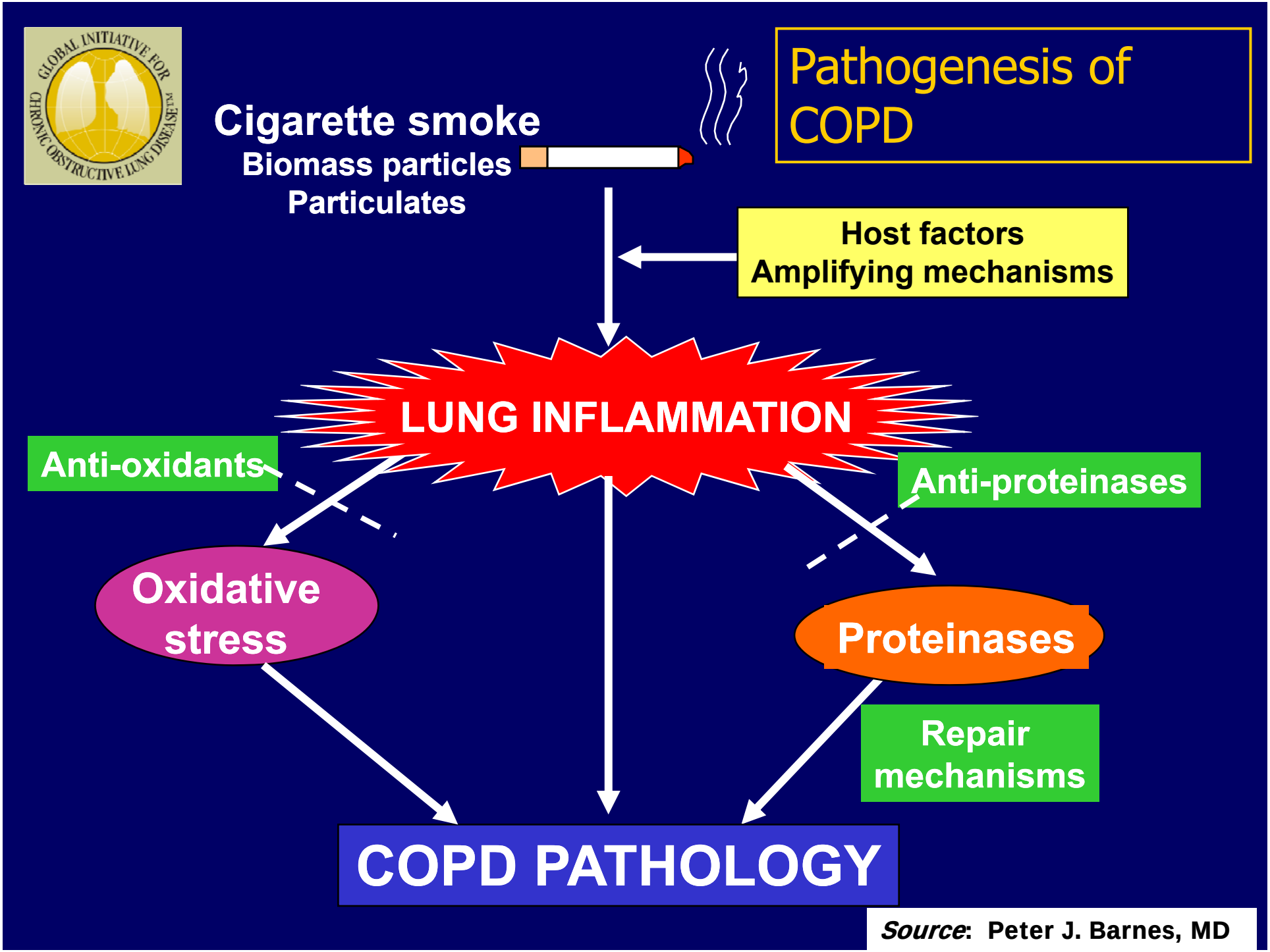
Nutrition

Comorbidities

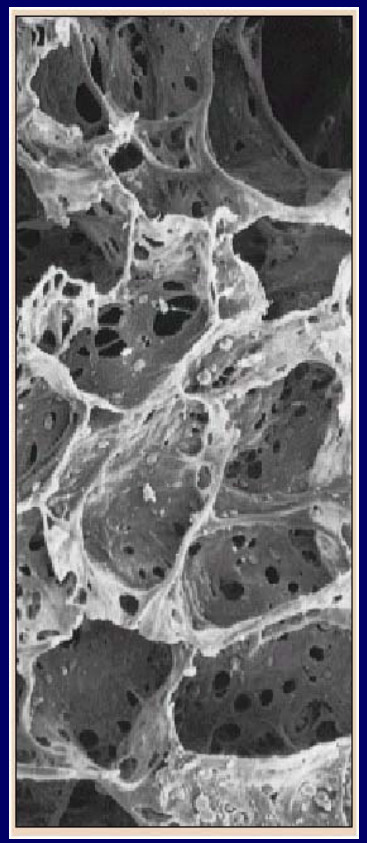
Risk Factors for COPD

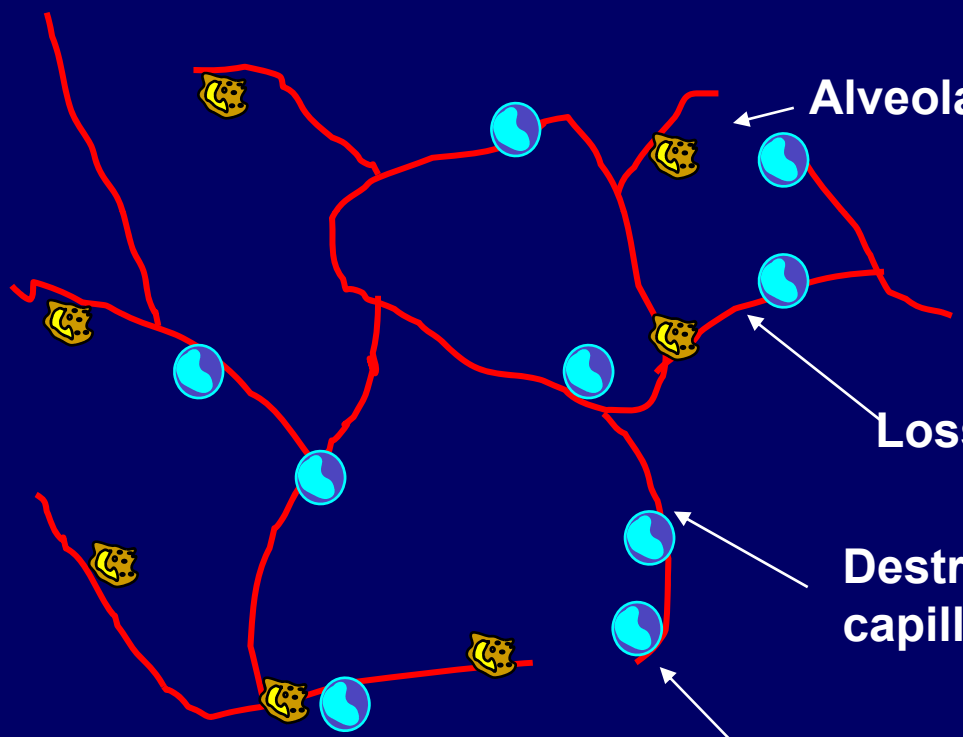



INFLAMMATION IN COPD
Small airway disease
Airway inflammation
Airway remodeling
Parenchymal destruction
Loss of alveolar attachments
Decrease of elastic recoil
AIRFLOW LIMITATION


Pathogenesis of COPD
Cigarette smoke
Biomass particles
Particulates
Host factors
Amplifying mechanisms
LUNG INFLAMMATION
Anti-oxidants
Anti-proteinases
Oxidative stress
Proteinases
Repair mechanisms
COPD PATHOLOGY
Source: Peter J. Barnes, MD

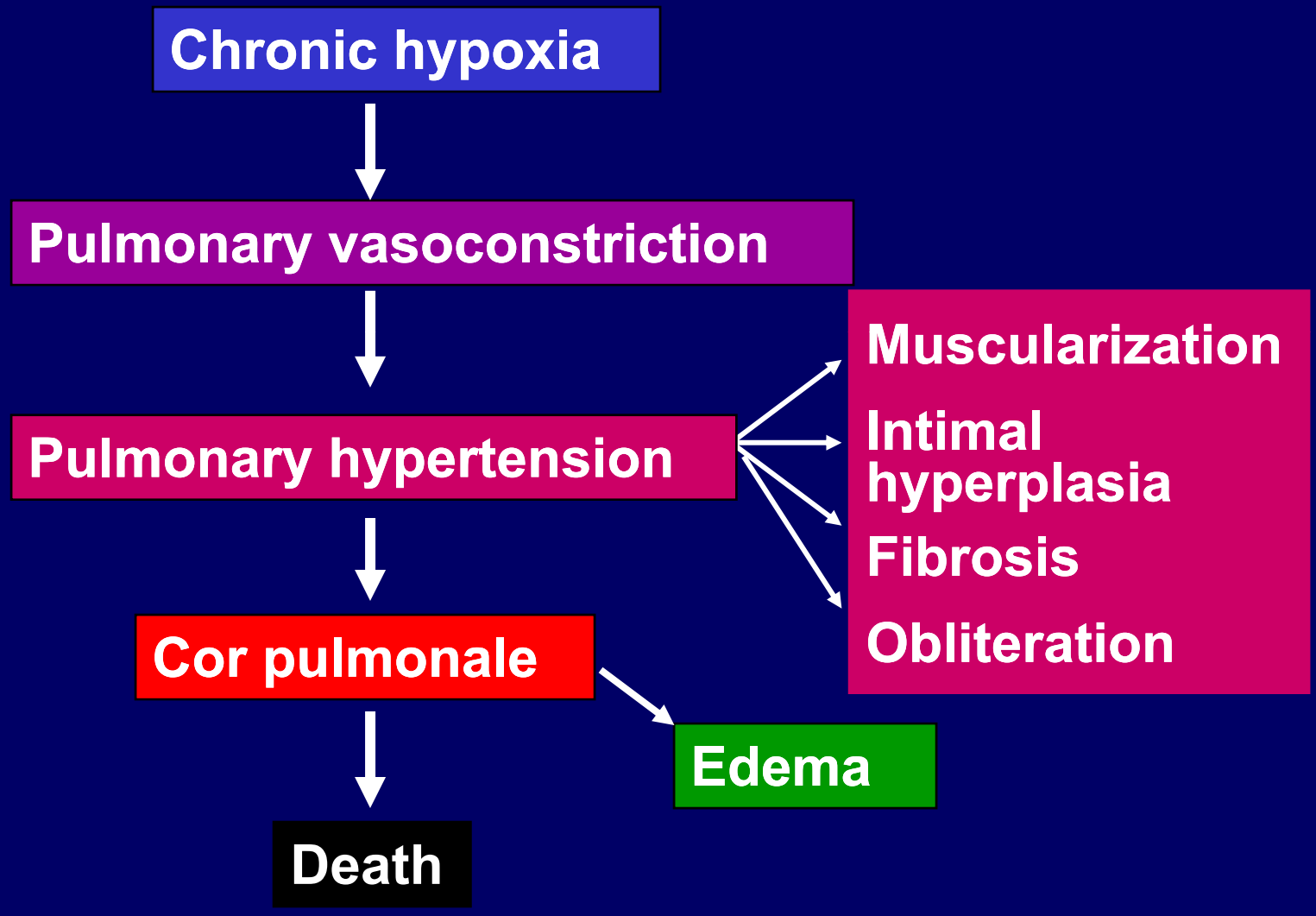
Changes in Lung Parenchyma in COPD



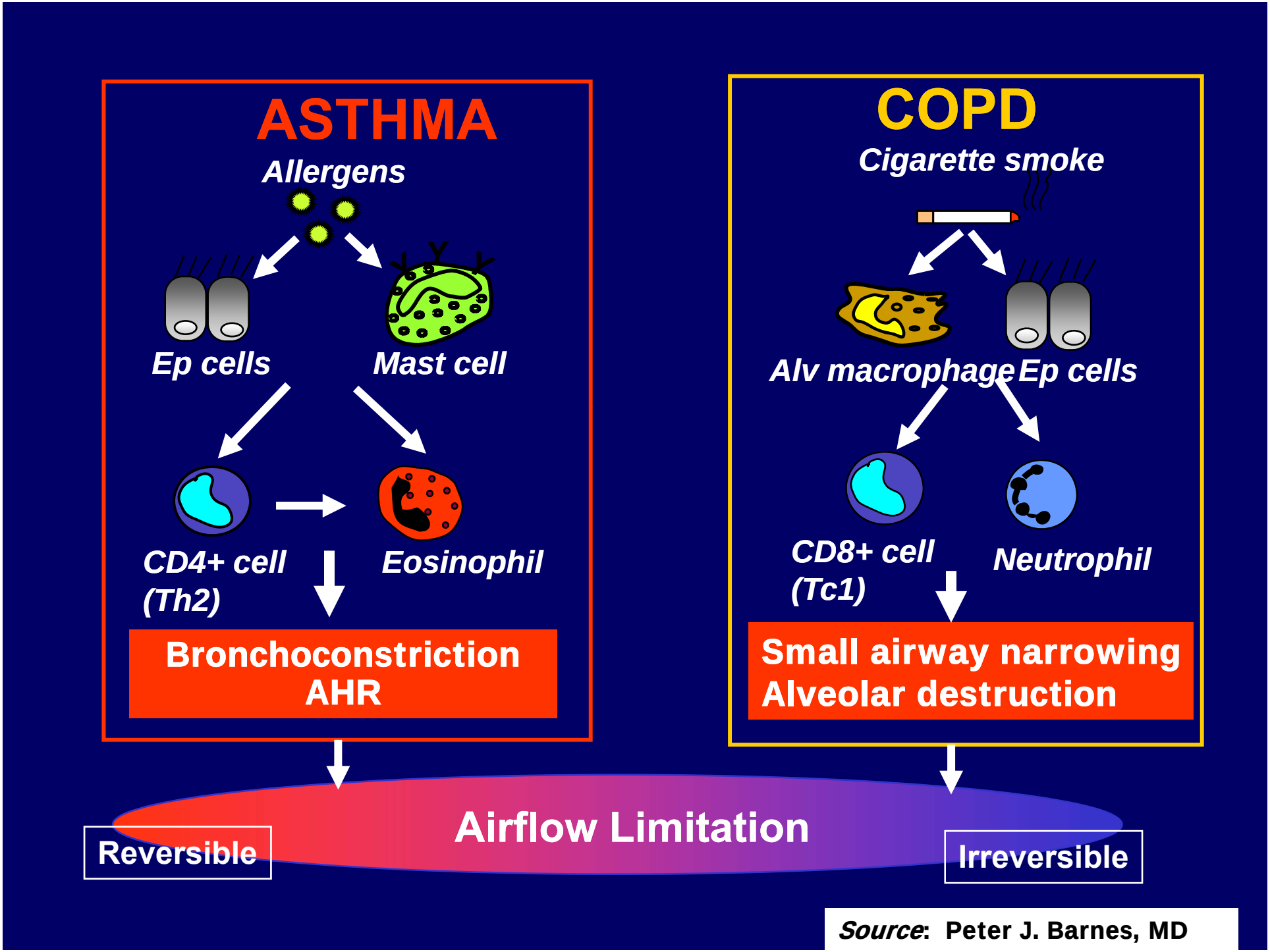


Source: Peter J. Barnes, MD

Pulmonary Hypertension in COPD



Source: Peter J. Barnes, MD



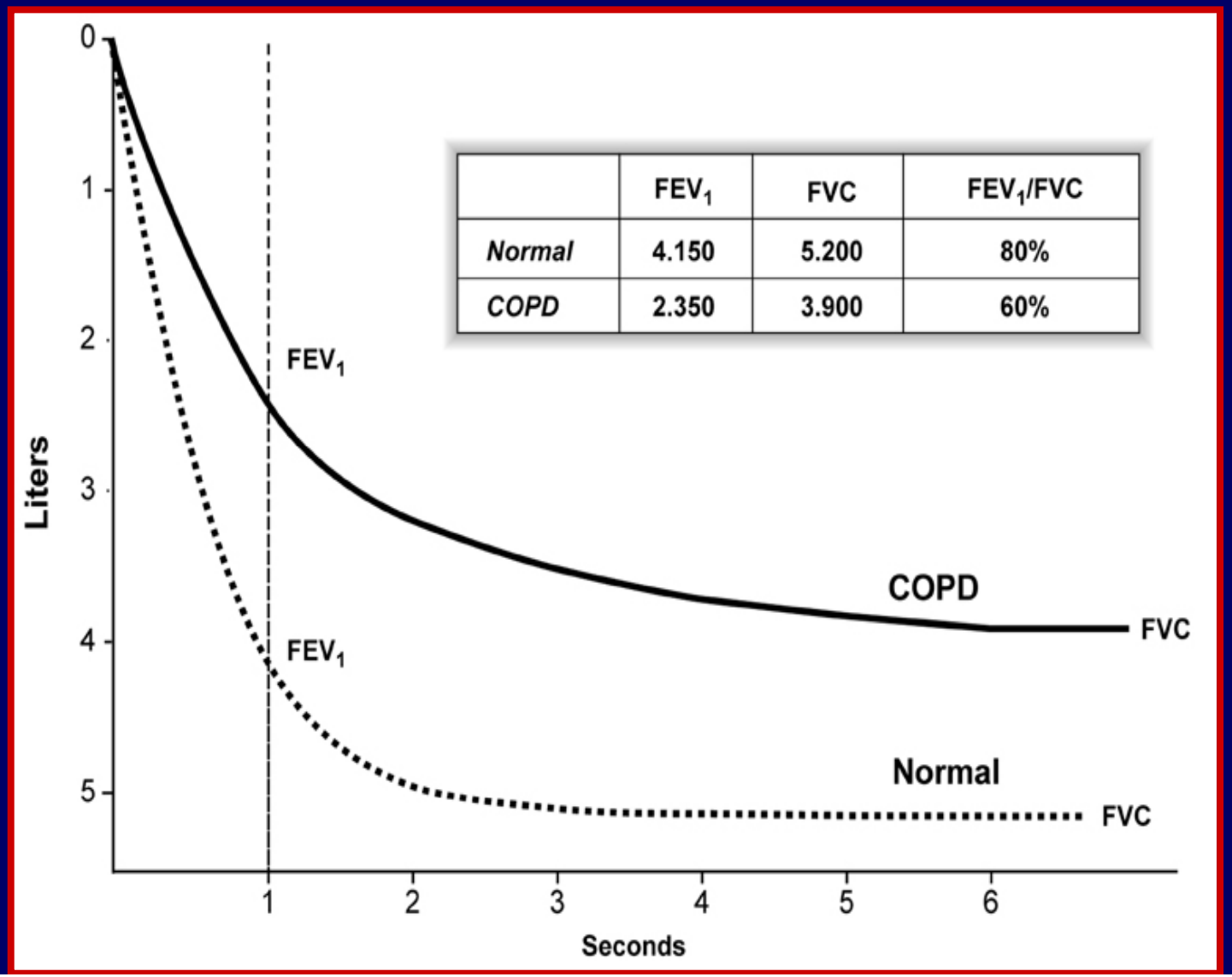
Source: Peter J. Barnes, MD

Management of Stable COPD

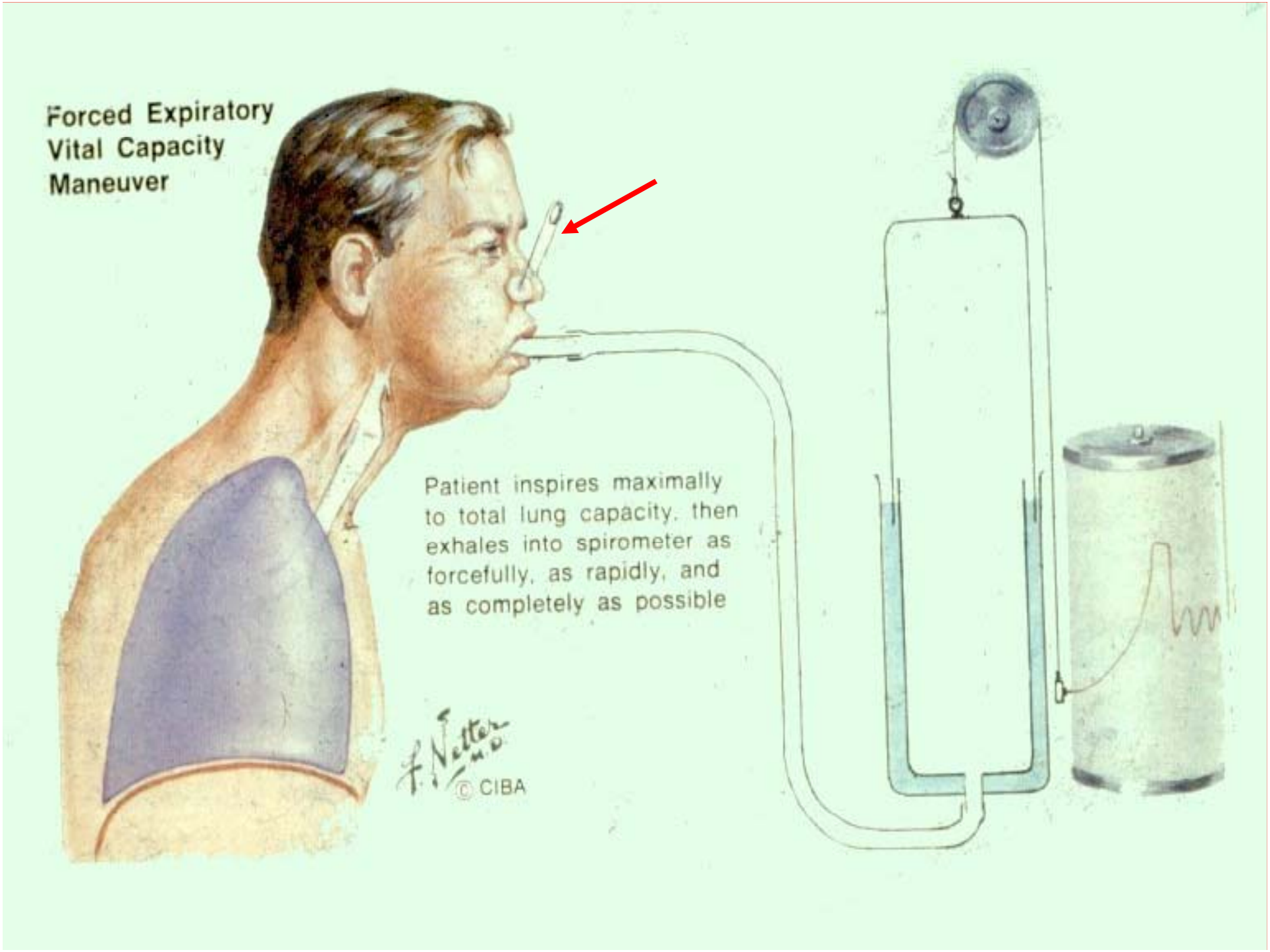
Assess and Monitor COPD: Spirometry

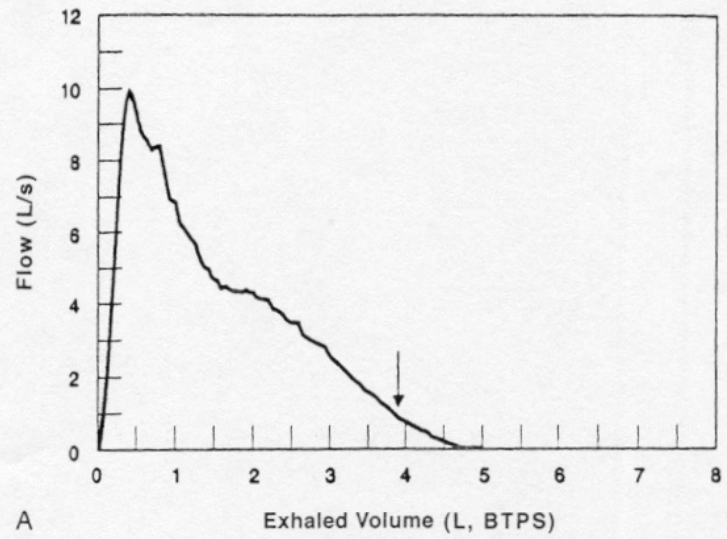
- Spirometry should be performed after the administration of an adequate dose of a short-acting inhaled bronchodilator to minimize variability.
- A post-bronchodilator $FEV_1/FVC < 0.70$ confirms the presence of airflow limitation that is not fully reversible.
- Where possible, values should be compared to age-related normal values to avoid overdiagnosis of COPD in the elderly.

Spirometry: Normal and Patients with COPD



	FEV_1	FVC	FEV_1/FVC
Normal	4.150	5.200	80%
COPD	2.350	3.900	60%


Forced Expiratory
Vital Capacity
Maneuver
Patient inspires maximally to total lung capacity, then exhales into spirometer as forcefully, as rapidly, and as completely as possible
F. Netter M.D.
© CIBA



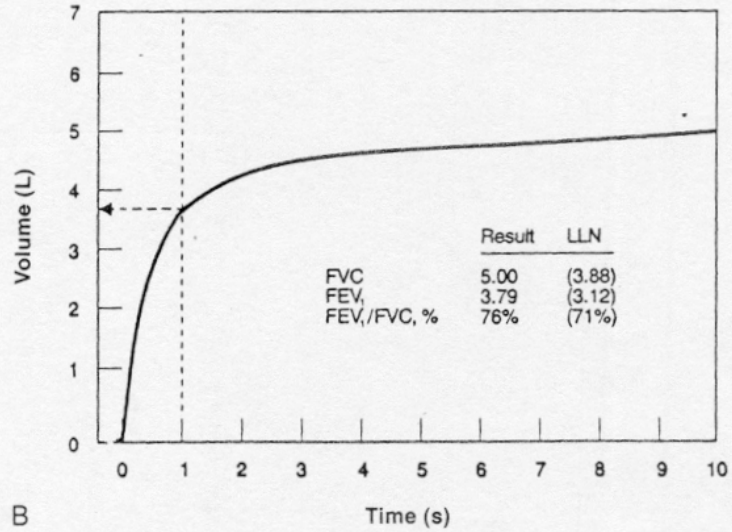
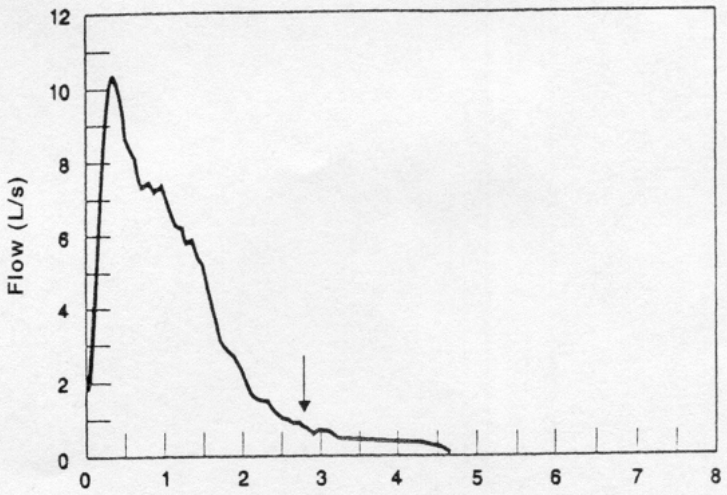
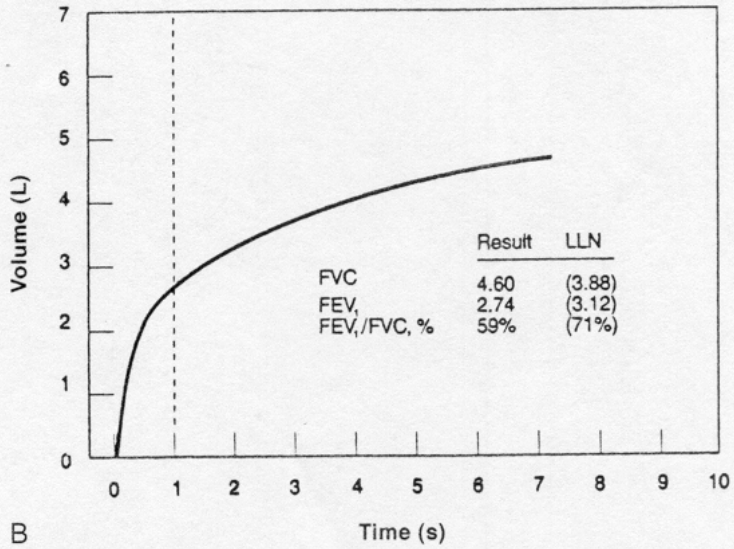


Figure 5. Normal flow–volume *(A)* and time–volume *(B)* expiratory curves.



A



B

Figure 6. Mild airflow obstruction demonstrated in flow–volume *(A)* and time–volume *(B)* curves. $FEV_1/FVC = 59\%$.

Differential Diagnosis: COPD and Asthma

COPD

- Onset in mid-life
- Symptoms slowly progressive
- Long smoking history
- Dyspnea during exercise
- Largely irreversible airflow limitation

ASTHMA

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

COPD and Co-Morbidities

COPD patients are at increased risk for:

- Myocardial infarction, angina
- Osteoporosis
- Respiratory infection
- Depression
- Diabetes
- Lung cancer

COPD and Co-Morbidities

COPD has significant extrapulmonary (systemic) effects including:

- Weight loss
- Nutritional abnormalities
- Skeletal muscle dysfunction

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).

Brief Strategies to Help the Patient Willing to Quit Smoking

- ASK — Systematically identify all tobacco users at every visit.
- ADVISE — Strongly urge all tobacco users to quit.
- ASSESS — Determine willingness to make a quit attempt.
- ASSIST — Aid the patient in quitting.
- ARRANGE — Schedule follow-up contact.

Management of Stable COPD

Reduce Risk Factors: Smoking Cessation

- Counseling delivered by physicians and other health professionals significantly increases quit rates over self-initiated strategies. Even a brief (3-minute) period of counseling to urge a smoker to quit results in smoking cessation rates of 5-10%.

- Numerous effective pharmacotherapies for smoking cessation are available and pharmacotherapy is recommended when counseling is not sufficient to help patients quit smoking.

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 can also play a role in improving skills, ability to cope with illness and health status.
- None 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.

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, anticholinergics, and methylxanthines 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 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 β_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

Pharmacotherapy: Vaccines

- In COPD patients influenza vaccines can reduce serious illness (Evidence A).
- Pneumococcal polysaccharide vaccine is recommended for COPD patients 65 years and older and for COPD patients younger than age 65 with an FEV_1 < 40% predicted (Evidence B).

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

Therapy at Each Stage of COPD

I: Mild	II: Moderate	III: Severe	IV: Very Severe
▪ $FEV_1/FVC < 70\%$ ▪ $FEV_1 \geq 80\%$	▪ $FEV_1/FVC < 70\%$ ▪ $50\% \leq FEV_1 < 80\%$ predicted	▪ $FEV_1/FVC < 70\%$ ▪ $30\% \leq FEV_1 < 50\%$ predicted	▪ $FEV_1/FVC < 70\%$ ▪ $FEV_1 < 30\%$ predicted *or* $FEV_1 < 50\%$ predicted plus chronic respiratory failure

Active reduction of risk factor(s); influenza vaccination →

Add short-acting bronchodilator (when needed) →

Add regular treatment with one or more long-acting bronchodilators (when needed); ***Add*** rehabilitation

Add inhaled glucocorticosteroids if repeated exacerbations

Add long term oxygen if chronic respiratory failure. ***Consider*** surgical treatments

Management of Stable COPD

Other Pharmacologic Treatments

- Antibiotics: Only used to treat infectious exacerbations of COPD
- Antioxidant agents: No effect of n-acetylcysteine on frequency of exacerbations, except in patients *not* treated with inhaled glucocorticosteroids
- Mucolytic agents, Antitussives, Vasodilators: Not recommended in stable COPD

Management of Stable COPD

Non-Pharmacologic Treatments

- Rehabilitation: All COPD patients benefit from exercise training programs, improving with respect to both exercise tolerance and symptoms of dyspnea and fatigue (Evidence A).

- Oxygen Therapy: The long-term administration of oxygen (> 15 hours per day) to patients with chronic respiratory failure has been shown to increase survival (Evidence A).

Oxygen in COPD

- Goal- PaO_2>60mmHg(8kPa) or saturation >90%.
- Uses- Long term continuous (>15h/day), for exercise, and for acute dyspnea.
- Indications- 1)PaO_2<55mmHg(7.3kPa) or saturation <88% with or without hypercapnia or 2)PaO_2 between 55 and 60mmHg or saturation 89% with evidence of pulmonary hypertension peripheral edema or polycythemia (hct>55%).

Management COPD Exacerbations

Key Points

An exacerbation of COPD is defined as:

"An event in the natural course of the disease characterized by a change in the patient's baseline dyspnea, 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."

Management COPD Exacerbations

Key Points

- The most common causes of an exacerbation are infection of the tracheobronchial tree and air pollution, but the cause of about one-third of severe exacerbations cannot be identified (Evidence B).

- Patients experiencing COPD exacerbations with clinical signs of airway infection (e.g., increased sputum purulence) may benefit from antibiotic treatment (Evidence B).

Manage COPD Exacerbations

Key Points

- Inhaled bronchodilators (particularly inhaled β_2-agonists with or without anticholinergics) and oral glucocorticosteroids are effective treatments for exacerbations of COPD (Evidence A).

Management COPD Exacerbations

Key Points

- Noninvasive mechanical ventilation in exacerbations improves respiratory acidosis, increases pH, decreases the need for endotracheal intubation, and reduces $PaCO_2$, respiratory rate, severity of breathlessness, the length of hospital stay, and mortality (Evidence A).
- Medications and education to help prevent future exacerbations should be considered as part of follow-up, as exacerbations affect the quality of life and prognosis of patients with COPD.

Translating COPD Guidelines into Primary Care

KEY POINTS

- Spirometric confirmation is a key component of the diagnosis of COPD and primary care practitioners should have access to high quality spirometry.
- Older patients frequently have multiple chronic health conditions. Comorbidities can magnify the impact of COPD on a patient's health status, and can complicate the management of COPD.

ZITS

BY JERRY SCOTT AND JIM BORGMAN