Putting GOLD COPD 2023 Guidelines into Practice

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Conflicts of Interests

- None to report

Objectives

- Describe the value of using evidence-based guidelines to advance quality improvement in clinical care.
- Understand that chronic obstructive pulmonary disease (COPD) is often unrecognized and untreated
- Discuss the prevalence and leading causes of COPD and how those and mortality rates differ between rural and urban
- Identify best practices for screening to identify and risk stratify COPD patients
- Discuss initial management and maintenance goals in the treatment of COPD
- Discuss guidelines for assessment and management of acute exacerbations of COPD

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TUKHS Care Collaborative

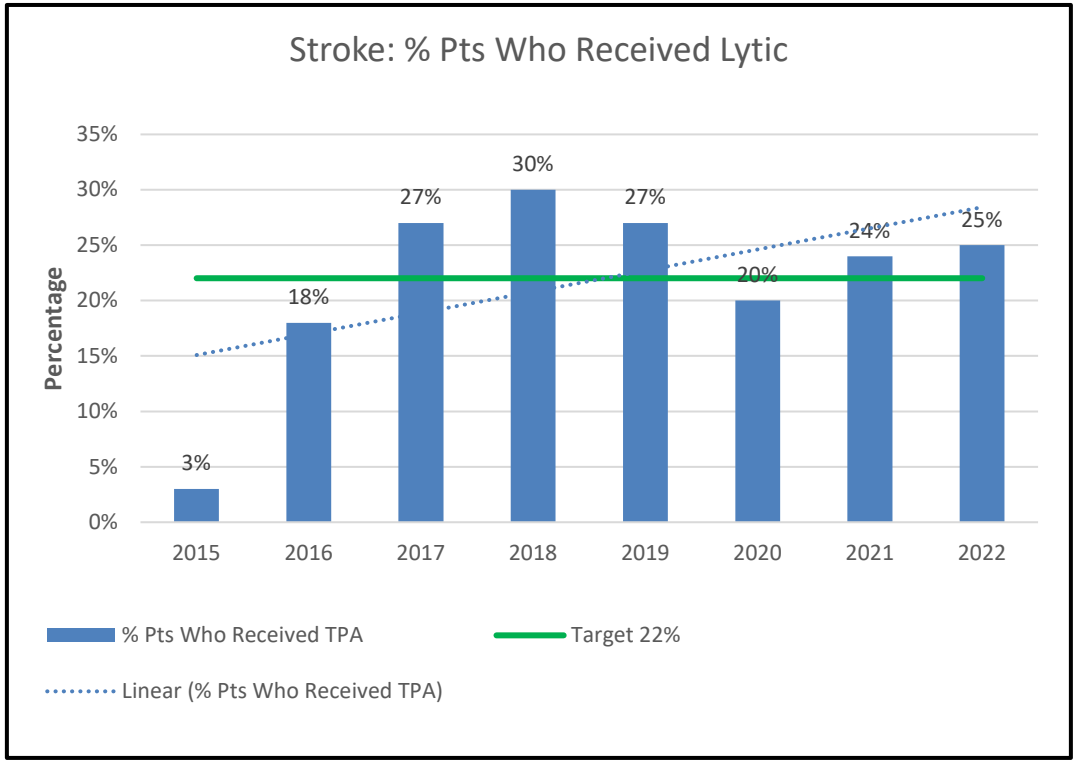
2023 Participation Map

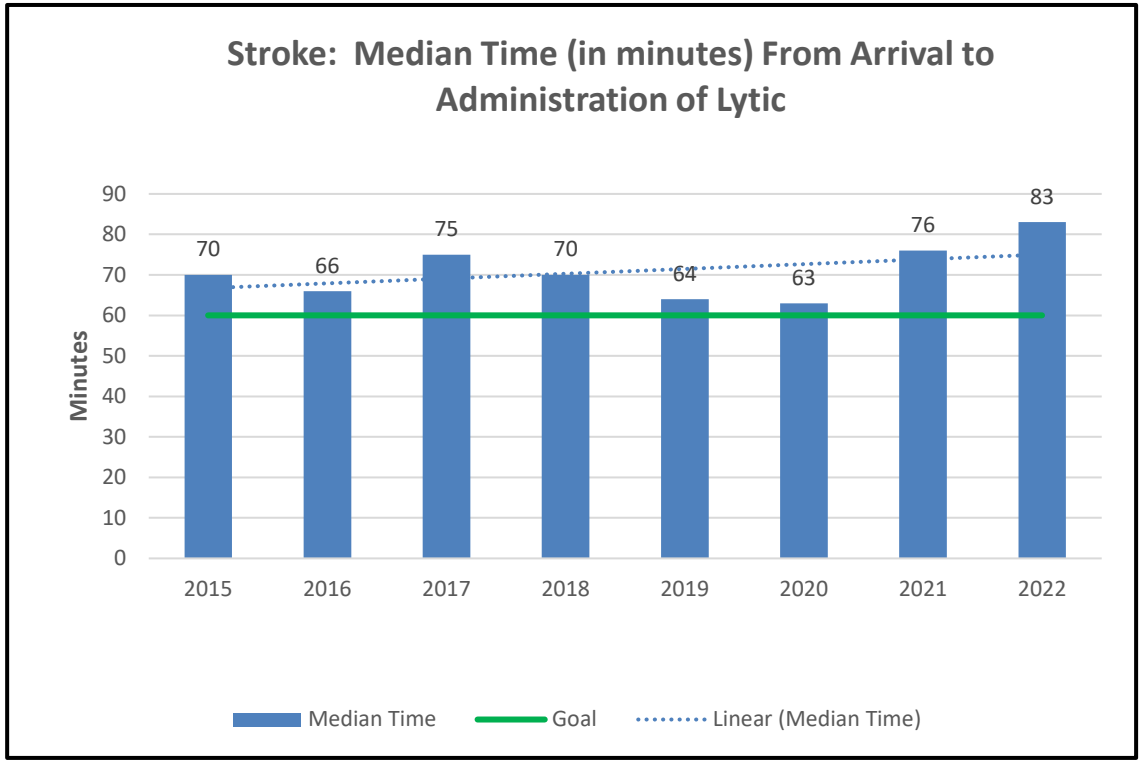
81 Members*: 39 ACO/PSO (incl. 4 clinics) and 42 PSO Only (incl. 2 EMS)

*Represented in 72 Kansas counties

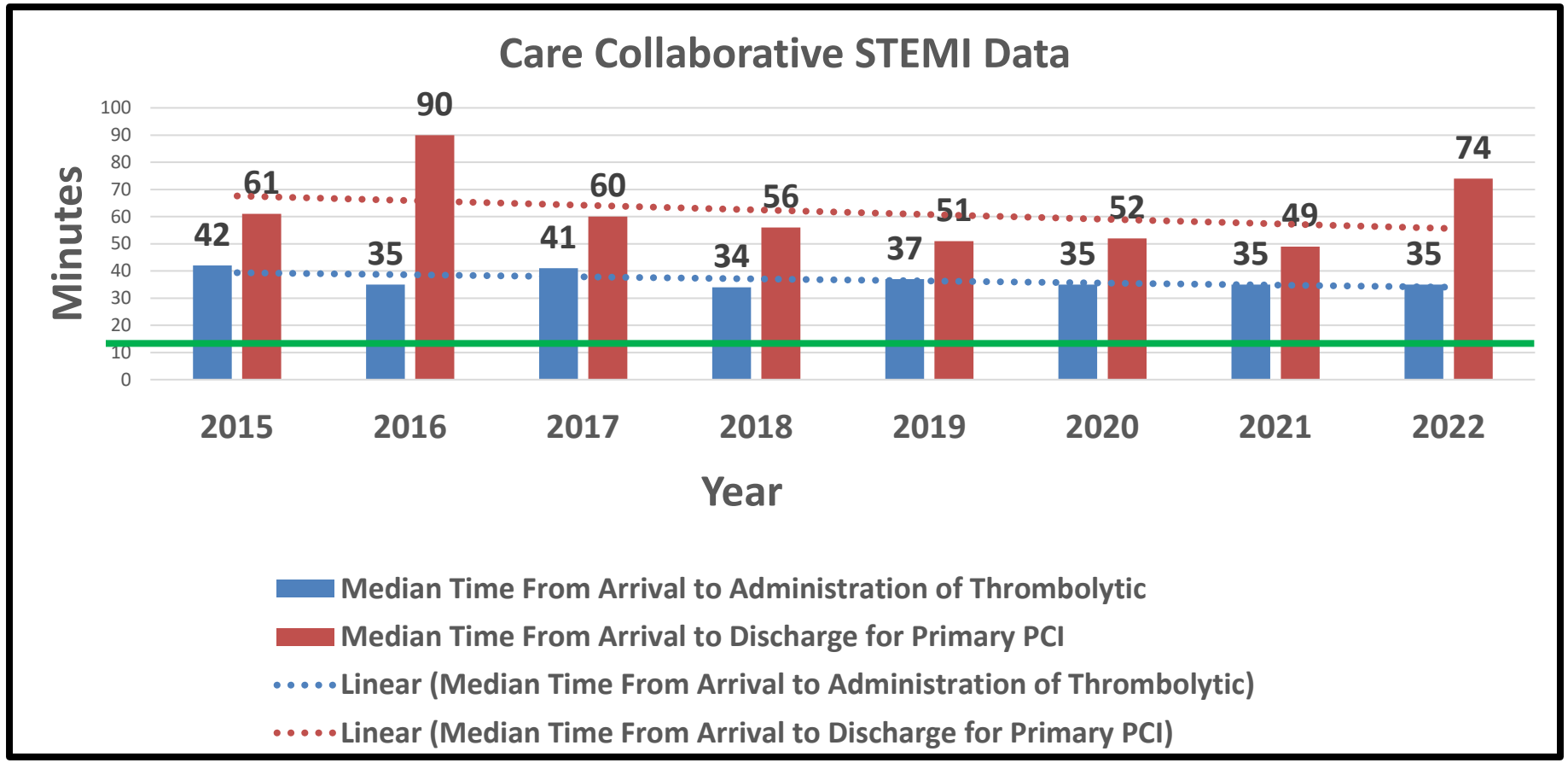
THE UNIVERSITY OF KANSAS HEALTH SYSTEM

Care Collaborative Quality Performance Measures





Care Collaborative Quality Performance Measures



COPD Definition

- COPD is a heterogeneous lung condition characterized by chronic respiratory symptoms (dyspnea, cough, sputum production) due to abnormalities of the airways (bronchitis, bronchiolitis) and/or alveoli (emphysema) that cause persistent, often progressive, airflow obstruction (Chapter 1, page 5 GOLD 2023 Report)
  - a syndrome with multiple contributing factors and high morbidity and mortality rates.

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COPD Disparities

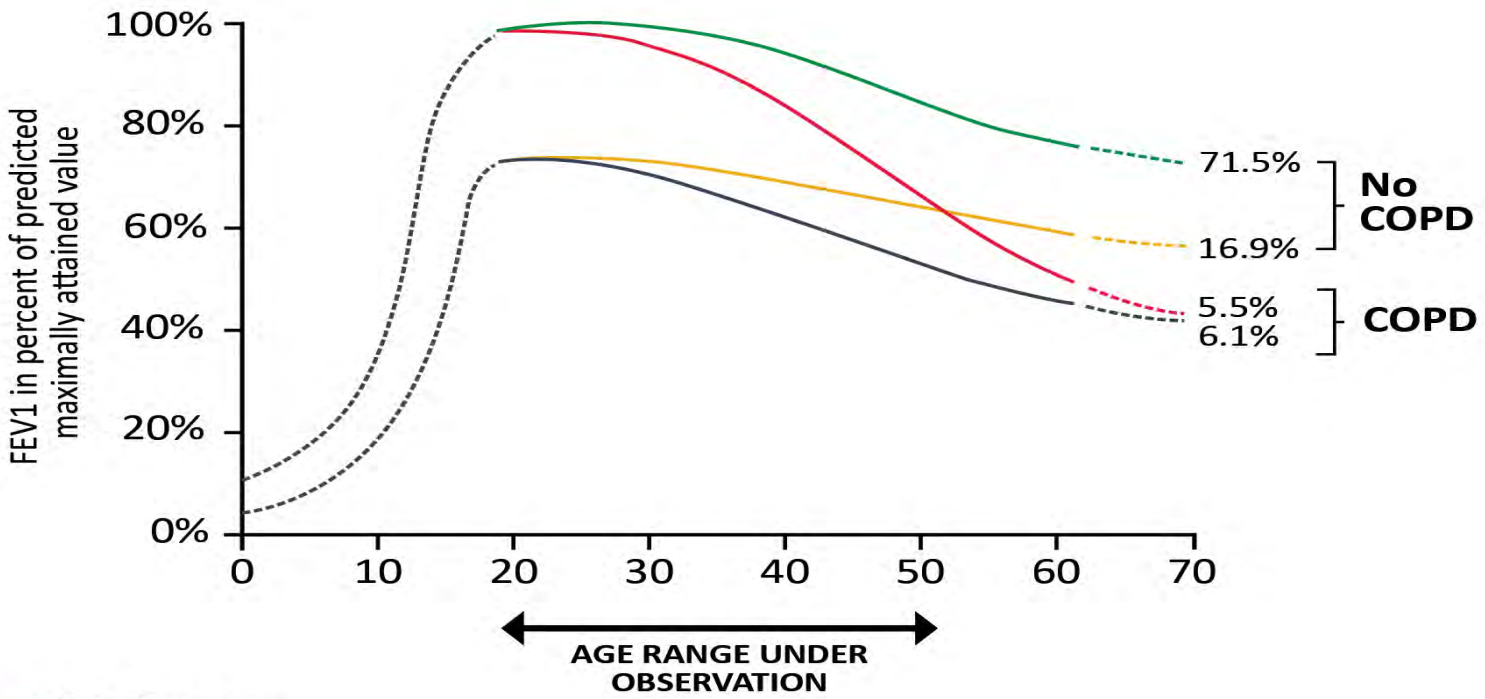
- The prevalence rate in rural U.S. is almost double that in urban areas
- The mortality rate in rural U.S. is also double that when compared with large urban areas.
- COPD is the third leading cause of death from chronic diseases.
- COPD prevalence and mortality rates are showing that COPD is more common in women
  - More intense shortness of breath than men
  - Diagnosed at a younger age, at a more advanced stage, and having less overall tobacco use
  - More likely to be misdiagnosed as asthma instead of COPD
  - More likely to have chronic bronchitis versus emphysema in men
  - Respond less well to treatments

Risk Factors

- Smoking is primary risk factor for most patients
  - Twenty-five percent of patients with COPD have never smoked.
- Environmental exposures can lead to COPD
  - Occupational exposure
    - Ag economy in KS reflects an increased risk in some cases from grain dust, grain molds, and other inhaled particles, chemicals used in farming
    - Even the occupational exposures experienced by hair dressers or bakers can trigger the development of chronic lower respiratory diseases
- Genetic Risks – alpha-1 antitrypsin deficiency
- COPD doesn’t usually exists as a single condition.
  - Patients with COPD often have heart disease and other conditions that can worsen COPD — or be worsened by it

FEV1 Trajectories (TR) Over the Life Course

Figure 1.1



Note: This is a simplified diagram of FEV1 progression over time. In reality, there is heterogeneity in the rate of decline in FEV1 owing to the complex interactions of genes with environmental exposures and risk factors over an individual's lifetime [adapted from Lange et al. NEJM 2015;373:111-22].

Clinical Indicators for Considering a Diagnosis of COPD

Table 2.1

Consider the diagnosis of COPD, and perform spirometry, if any of these clinical indicators are present:
(these indicators are not diagnostic themselves, but the presence of multiple key indicators increases the probability of the presence of COPD; in any case, spirometry is required to establish a diagnosis of COPD)

Dyspnea that is	Progressive over time Worse with exercise Persistent
Recurrent wheeze	
Chronic cough	May be intermittent and may be unproductive
Recurrent lower respiratory tract infections	
History of risk factors	Tobacco smoke (including popular local preparations) Smoke from home cooking and heating fuels Occupational dusts, vapors, fumes, gases and other chemicals Host factors (e.g., genetic factors, developmental abnormalities, low birthweight, prematurity, childhood respiratory infections etc.)

Keys to the Diagnosis of COPD

- **HPI** - assess clinical history, especially respiratory symptoms, and risk factors
  - Clinical history of dyspnea, recurrent wheeze, chronic cough, and recurrent lower respiratory tract infections.
- **PMH** – asthma, allergies, sinusitis, nasal polyps, childhood resp infections, other co-morbid conditions
    - History of COPD ED or Hospitalizations
    - Medication and treatment history
- **SHx** – smoking and exposure to other risk factors; social and family support
- **FHx** – COPD or other respiratory diseases; liver disease
- **Physical Exam** – less helpful for diagnosis but together with rest of the history, it can help with differential diagnoses.
- Demonstrating the Presence of Airflow Obstruction
  - Spirometry required to establish diagnosis
  - Using only patient symptoms to diagnosis COPD, we would be wrong 30% of the time

Screening for COPD

- **Spirometry: The Diagnostic Test Required for COPD Dx**
  - Spirometry is underutilized in primary care practice
  - To establish a diagnosis of COPD, a ratio between FEV1 and FVC of less than 0.7 is considered diagnostic of obstructive lung disease.
    - Bhatt, SP et al. *Discriminative Accuracy of FEV1:FVC Thresholds for COPD-Related Hospitalization and Mortality.* JAMA. 2019 Jun 25;321(24):2438-2447. The results of this study endorsed the clinical importance of this ratio.
- U.S. Preventive Services Task Force May 2022, recommends against screening for chronic obstructive pulmonary disease in asymptomatic adults
  - Among adult patients visiting a primary care practitioner, as many as one in five with known risk factors met spirometric criteria for COPD
    - Risk Factors : $\geq$ 40 years, at least a 20 pack-year smoking history and at least one respiratory symptom
- Are there other options if spirometry isn't available?
  - Screening via self-administered questionnaire with PEF performed on patients with positive questionnaire. Determines which patients should be referred for further diagnostic evaluation for COPD

Martinez, FJ et al. A New Approach for Identifying Patients with Undiagnosed Chronic Obstructive Pulmonary Disease. Am J Respir Crit Care Med. 2017 Mar 15; 195(6): 748–756.

Considerations in Performing Spirometry

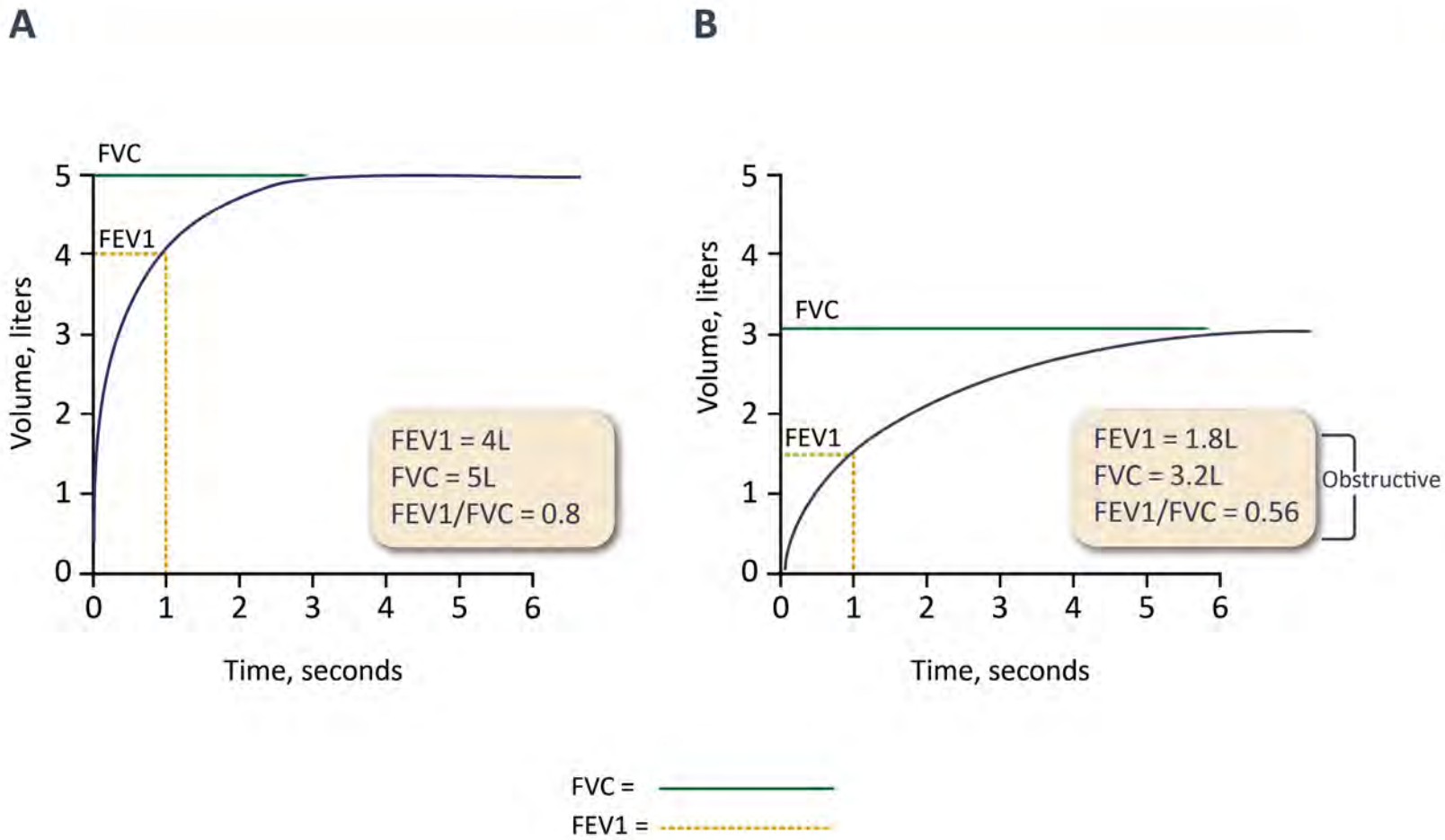
Table 2.4

PREPARATION	• Spirometers should produce hard copy or have a digital display of the expiratory curve to permit detection of technical errors or have an automatic prompt to identify an unsatisfactory test and the reason for it • The supervisor of the test needs training in optimal technique and quality performance • Maximal patient effort in performing the test is required to avoid underestimation of values and hence errors in diagnosis and management
PERFORMANCE	• Spirometry should be performed following national and/or international recommendations[a] • The expiratory volume/time traces should be smooth and free from irregularities • The pause between inspiration and expiration should be < one second • The recording should go on long enough for a volume plateau to be reached, which may take more than 15 seconds in severe disease • Both FVC and FEV1 should be the largest value obtained from any of three technically satisfactory curves and the FVC and FEV1 values in these three curves should vary by no more than 5% or 150 mL, whichever is greater • The FEV1/FVC ratio should be taken from the technically acceptable curve with the largest sum of FVC and FEV1
BRONCHODILATION	• Possible dosage protocols are 400 mcg short-acting beta$_2$-agonist, 160 mcg short-acting anticholinergic, or the two combined[b]; FEV1 should be measured 10-15 minutes after a short-acting beta$_2$-agonist is given, or 30-45 minutes after a short-acting anticholinergic or a combination of both classes of drugs • Patients already on bronchodilator treatment, in whom spirometry is requested for monitoring purposes do not need to stop their regular treatment for spirometry
EVALUATION	• Spirometry measurements are evaluated by comparison of the results with appropriate reference values based on age, height, sex, and race • The presence of a postbronchodilator FEV1/FVC < 0.7 confirms the presence of non-fully reversible airflow obstruction

[a]Miller *et al.* Eur Respir J 2005; 26(2): 319; [b]Pellegrino *et al.* Eur Respir J 2005; 26(5): 948.

A. Spirometry - Normal Trace B. Spirometry - Airflow Obstruction

Figure 2.1



Next Steps after Diagnosis of COPD

- **Risk Stratification Using GOLD ABE Assessment Tool**
  - Grades 1-4 based on post-bronchodilator FEV1 and assessment of clinical symptoms and exacerbation history
- **Other Tests and Assessments**
  - Use of CT in stable COPD
    - Helps with differential diagnoses, assessing other therapeutic options like endobronchial valve therapy or lung volume reduction surgery and, if qualified, annual low-dose CT screening for lung cancer.
  - Assess for alpha-anti-trypsin deficiency (AATD), regardless of smoking history
    - especially in asthma with irreversible defect after bronchodilator therapy, patients with abnormal liver functions, and anybody with family member with AATD.
  - CBC with eosinophil count
  - Self-paced 6-minute walking distance
- **Management of co-morbid conditions** – CAD, HF, HTN, DM, OSA
- **Medication and non-pharmacological management**
  - Guided by GOLD Grades, symptoms, and exacerbation history – such as A, B, or E
  - Addressing modifiable risk factors
    - Smoking cessation
    - Vaccinations
    - Pulmonary rehabilitation

Evidence Supporting a Reduction in Mortality with Pharmacotherapy and Non-pharmacotherapy in COPD Patients

Table 3.6

Therapy	RCT*	Treatment effect on mortality	Patient characteristics
Pharmacotherapy			
LABA+LAMA+ICS[1]	Yes	Single inhaler triple therapy compared to dual LABD therapy relative risk reduction: IMPACT: HR 0.72 (95% CI: 0.53, 0.99)[1a] ETHOS: HR 0.51 (95% CI: 0.33, 0.80)[1b]	Symptomatic people with a history of frequent and/or severe exacerbations
Non-pharmacological Therapy			
Smoking cessation[2]	Yes	HR for usual care group compared to intervention group (smoking cessation) HR 1.18 (95% CI: 1.02, 1.37)[2]	Asymptomatic or mildly symptomatic
Pulmonary rehabilitation[3#]	Yes	Old trials: RR 0.28 (95% CI 0.10, 0.84)[3a] New trials: RR 0.68 (95% CI 0.28, 1.67)[3b]	Hospitalized for exacerbations of COPD (during or ≤ 4 weeks after discharge)
Long-term oxygen therapy[4]	Yes	NOTT: ≥ 19 hours of continuous oxygen vs ≤ 13 hours: 50% reduction[4a] MRC: ≥ 15 hours vs no oxygen: 50% reduction[4b]	PaO_2 ≤ 55 mmHg or < 60 mmHg with *cor pulmonale* or secondary polycythemia
Noninvasive positive pressure ventilation[5]	Yes	12% in NPPV (high IPAP level) and 33% in control HR 0.24 (95% CI 0.11, 0.49)[5]	Stable COPD with marked hypercapnia
Lung volume reduction surgery[6]	Yes	0.07 deaths/person-year (LVRS) vs 0.15 deaths/person-year (UC) RR for death 0.47 (p = 0.005)[6]	Upper lobe emphysema and low exercise capacity

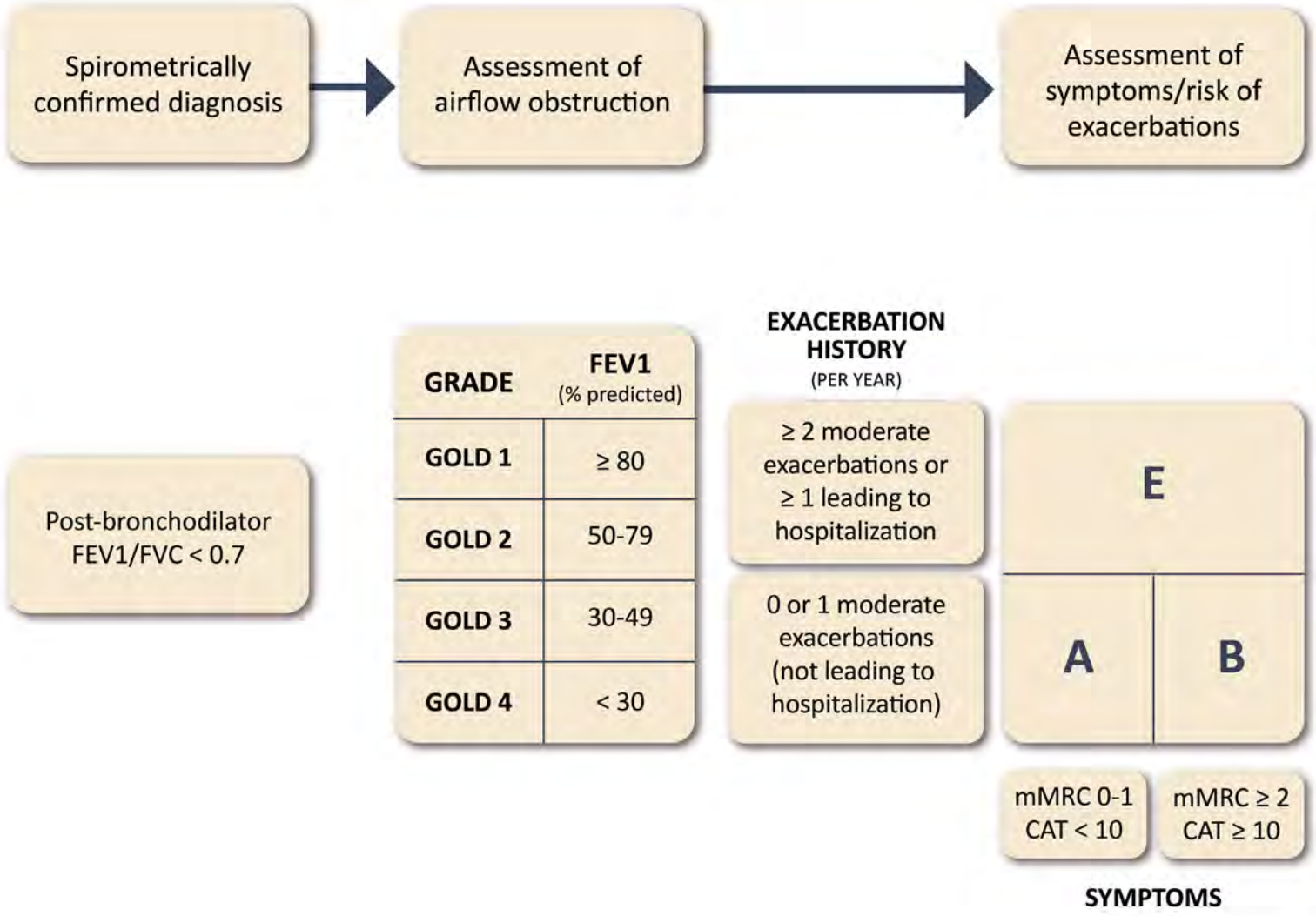
*RCT with pre-specified analysis of the mortality outcome (primary or secondary outcome); #Inconclusive results likely due to differences in pulmonary rehabilitation across a wide range of participants and settings.

1. a) IMPACT trial (Lipson et al. 2020) and b) ETHOS trials (Martinez et al. 2021); 2.Lung Health Study (Anthonisen et al. 2005); 3. a) Puhan et al. (2011) and b) Puhan et al. 2016; 4. a) NOTT (NOTT, 1980) and b) MRC (MRC, 1981); 5. Kohlein trial (Kohlein et al. 2014); 6. NETT trial (Fishman et al. 2003)

ICS: inhaled corticosteroid; IPAP: inspiratory positive airway pressure; LABA: long-acting beta$_2$-agonist; LABD: long-acting bronchodilator; LAMA: long-acting anti-muscarinic; LTOT: long-term oxygen therapy; NPPV: noninvasive positive pressure ventilation; LVRS: lung volume reduction surgery; UC: usual treatment control group.

GOLD ABE Assessment Tool

Figure 2.3



Modified MRC Dyspnea Scale

Table 2.7

PLEASE TICK IN THE BOX THAT APPLIES TO YOU | ONE BOX ONLY | Grades 0 - 4

mMRC Grade 0	mMRC Grade 1	mMRC Grade 2	mMRC Grade 3	mMRC Grade 4
I only get breathless with strenuous exercise ☐	I get short of breath when hurrying on the level or walking up a slight hill ☐	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 ☐	I stop for breath after walking about 100 meters or after a few minutes on the level ☐	I am too breathless to leave the house or I am breathless when dressing or undressing ☐

Reference: ATS (1982) Am Rev Respir Dis. Nov;126(5):952-6.

CAT™ Assessment

Figure 2.2

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

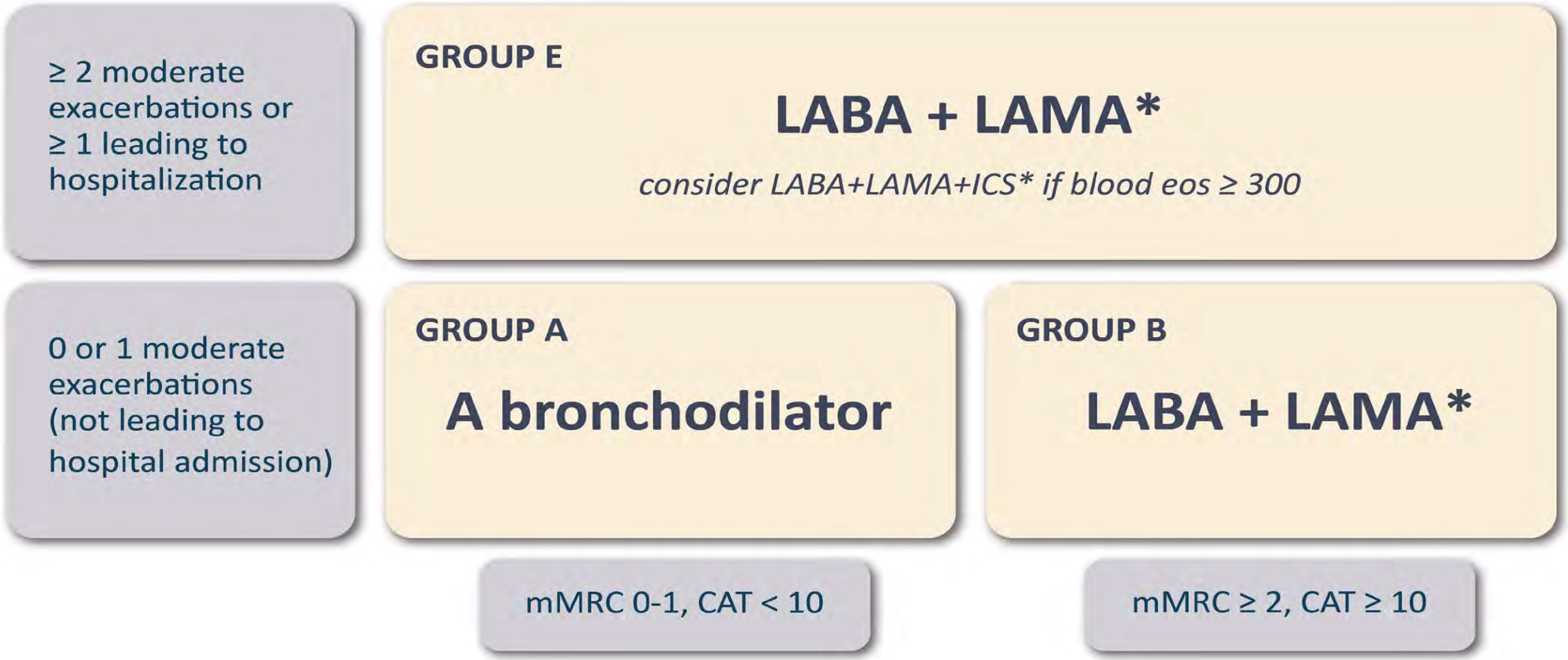
EXAMPLE: I am very happy	0 X 2 3 4 5	I am very sad	Score
I never cough	0 1 2 3 4 5	I cough all the time	
I have no phlegm (mucus) in my chest at all	0 1 2 3 4 5	My chest is completely full of phlegm (mucus)	
My chest does not feel tight at all	0 1 2 3 4 5	My chest feels very tight	
When I walk up a hill or one flight of stairs I am not breathless	0 1 2 3 4 5	When I walk up a hill or one flight of stairs I am very breathless	
I am not limited doing any activities at home	0 1 2 3 4 5	I am very limited doing activities at home	
I am confident leaving my home despite my lung condition	0 1 2 3 4 5	I am not at all confident leaving my home because of my lung condition	
I sleep soundly	0 1 2 3 4 5	I don't sleep soundly because of my lung condition	
I have lots of energy	0 1 2 3 4 5	I have no energy at all	

Reference: Jones et al. ERJ 2009; 34 (3); 648-54.

TOTAL SCORE: ☐

Initial Pharmacological Treatment

Figure 4.2



*single inhaler therapy may be more convenient and effective than multiple inhalers
Exacerbations refers to the number of exacerbations per year

Rx Management of COPD

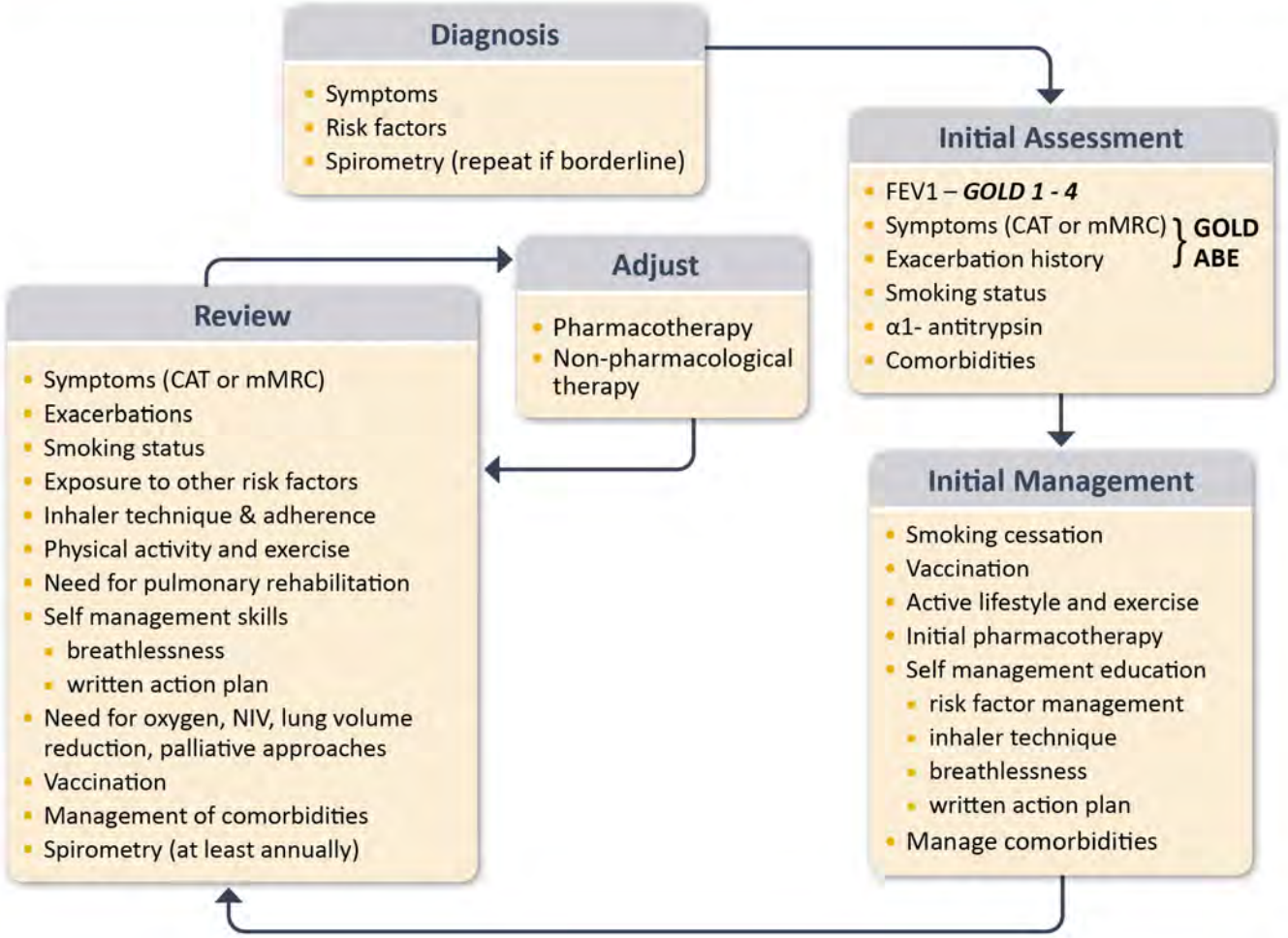
Bronchodilators in Stable COPD

Table 3.4

- Inhaled bronchodilators in COPD are central to symptom management and commonly given on a regular basis to prevent or reduce symptoms **(Evidence A)**
- Regular and as-needed use of SABA or SAMA improves FEV1 and symptoms **(Evidence A)**
- Combinations of SABA and SAMA are superior compared to either medication alone in improving FEV1 and symptoms **(Evidence A)**
- LABAs and LAMAs significantly improve lung function, dyspnea, health status, and reduce exacerbation rates **(Evidence A)**
- LAMAs have a greater effect on exacerbation reduction compared with LABAs **(Evidence A)** and decrease hospitalizations **(Evidence B)**
- Combination treatment with a LABA and a LAMA increases FEV1 and reduces symptoms compared to monotherapy **(Evidence A)**
- Combination treatment with a LABA+LAMA reduces exacerbations compared to monotherapy **(Evidence B)**
- Tiotropium improves the effectiveness of pulmonary rehabilitation in increasing exercise performance **(Evidence B)**
- Theophylline exerts a small bronchodilator effect in stable COPD **(Evidence A)** and that is associated with modest symptomatic benefits **(Evidence B)**
- Single inhaler therapy may be more convenient and effective than multiple inhalers

Management of COPD

Figure 4.1



Goals for Treatment of Stable COPD

Table 4.1

- Relieve Symptoms
- Improve Exercise Tolerance
- Improve Health Status

▶ **REDUCE SYMPTOMS**

AND

- Prevent Disease Progression
- Prevent and Treat Exacerbations
- Reduce Mortality

▶ **REDUCE RISK**

Identify & Reduce Risk Factor Exposure

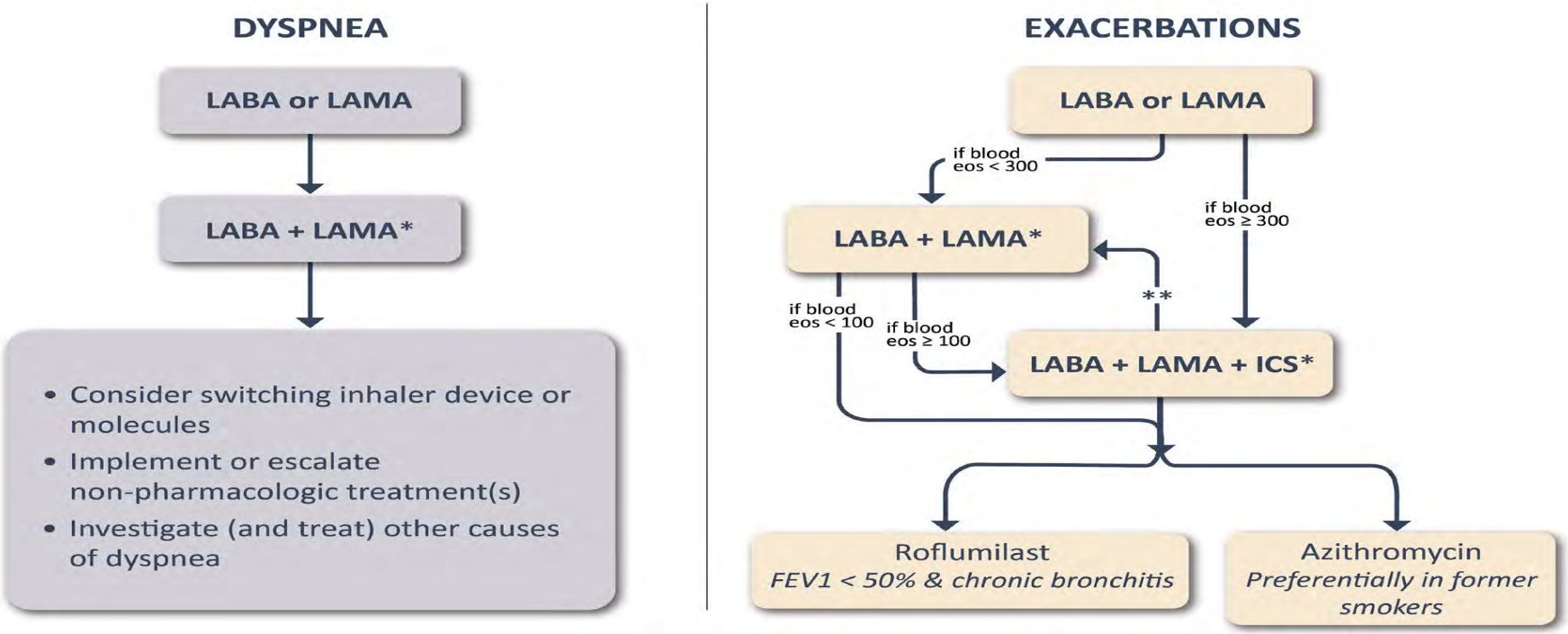
Table 4.3

- Smoking cessation interventions should be actively pursued in all people with COPD **(Evidence A)**
- Efficient ventilation, non-polluting cooking stoves and similar interventions should be recommended **(Evidence B)**
- Clinicians should advise patients to avoid continued exposures to potential irritants, if possible **(Evidence D)**

Follow-up Pharmacological Treatment

Figure 4.4

1. **IF RESPONSE TO INITIAL TREATMENT IS APPROPRIATE, MAINTAIN IT.**
2. **IF NOT:**
   - Check adherence, inhaler technique and possible interfering comorbidities
   - Consider the predominant treatable trait to target (dyspnea or exacerbations)
     - Use exacerbation pathway if both exacerbations and dyspnea need to be targeted
   - Place patient in box corresponding to current treatment & follow indications
   - Assess response, adjust and review
   - These recommendations do not depend on the ABE assessment at diagnosis

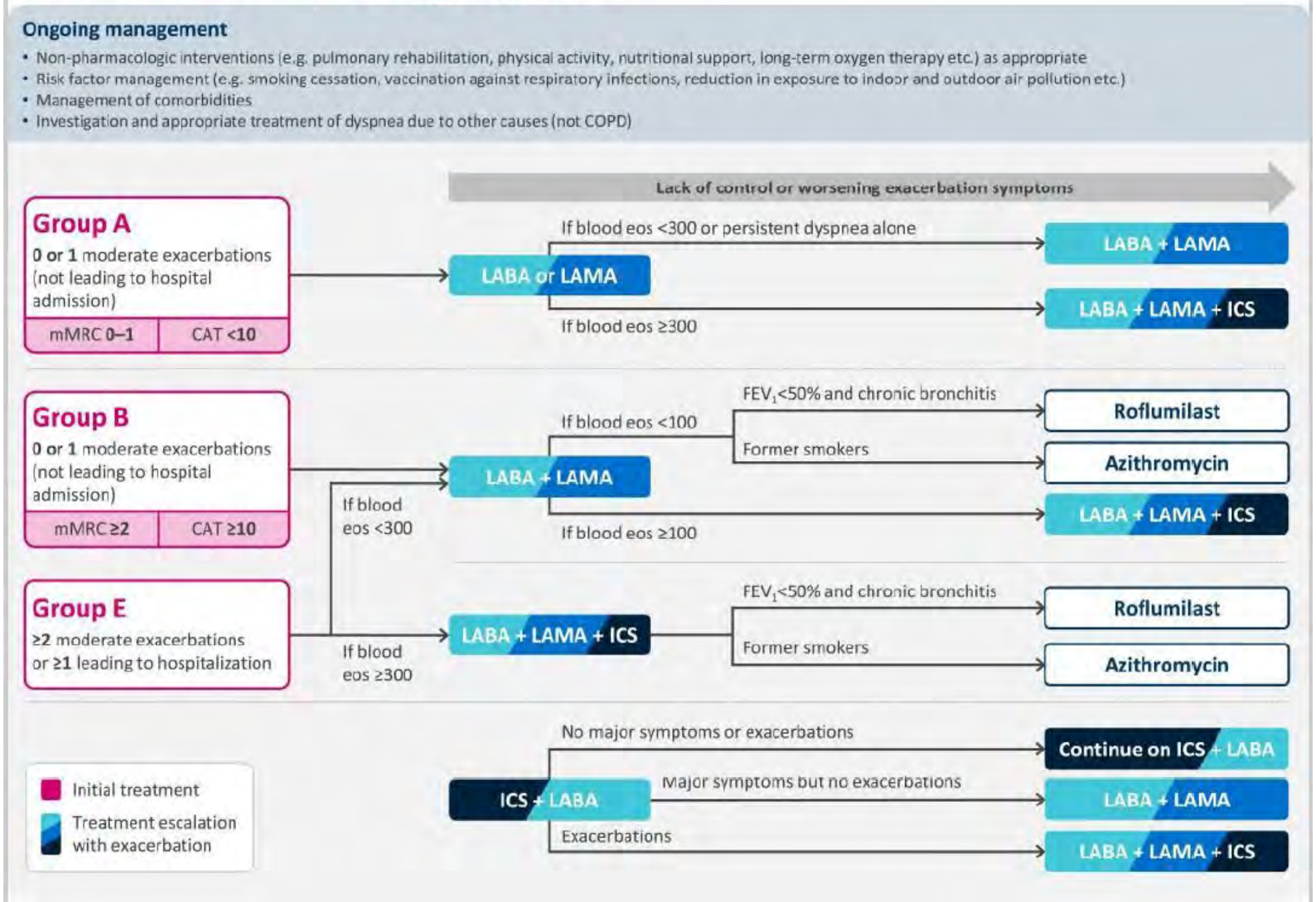


*Single inhaler therapy may be more convenient and effective than multiple inhalers

**Consider de-escalation of ICS if pneumonia or other considerable side-effects. In case of blood eos ≥ 300 cells/µl de-escalation is more likely to be associated with the development of exacerbations

Exacerbations refers to the number of exacerbations per year

GOLD 2023 infographic



Tamondong-Lachica, D. R., Skolnik, N., Hurst, J. R., Marchetti, N., J Rabe, A. P., & Celli, B. R. (2023). GOLD 2023 Update: Implications for Clinical Practice. *International Journal of Chronic Obstructive Pulmonary Disease*, *18*, 745-754.

Factors to Consider when Initiating ICS Treatment

Figure 3.1

Factors to consider when adding ICS to long-acting bronchodilators:

(note the scenario is different when considering ICS withdrawal)

STRONGLY FAVORS USE	**History of hospitalization(s) for exacerbations of COPD#**
	≥ 2 moderate exacerbations of COPD per year#
	Blood eosinophils ≥ 300 cells/µL
	History of, or concomitant asthma
FAVORS USE	1 moderate exacerbation of COPD per year#
	Blood eosinophils 100 to < 300 cells/µL
AGAINST USE	**Repeated pneumonia events**
	Blood eosinophils < 100 cells/µL
	History of mycobacterial infection

#despite appropriate long-acting bronchodilator maintenance therapy (see Table 3.4 and Figure 4.3 for recommendations);
*note that blood eosinophils should be seen as a continuum; quoted values represent approximate cut-points; eosinophil counts are likely to fluctuate.

Other Anti-inflammatory Therapy in Stable COPD

PDE4 Inhibitors	• In patients with chronic bronchitis, severe to very severe COPD and a history of exacerbations:
	  • A PDE4 inhibitor improves lung function and reduces moderate and severe exacerbations **(Evidence A)**
	  • A PDE4 inhibitor improves lung function and decreases exacerbations in patients who are on fixed-dose LABA+ICS combinations **(Evidence A)**

Antibiotics	• Long-term azithromycin and erythromycin therapy reduces exacerbations over one year **(Evidence A)** • Treatment with azithromycin is associated with an increased incidence of bacterial resistance **(Evidence A)** and hearing test impairments **(Evidence B)**
Mucoregulators and Antioxidant Agents	• Regular treatment with mucolytics such as erdosteine, carbocysteine and NAC reduces the risk of exacerbations in select populations **(Evidence B)**
Other Anti-Inflammatory Agents	• Simvastatin does not prevent exacerbations in COPD patients at increased risk of exacerbations and without indications for statin therapy **(Evidence A)**. However, observational studies suggest that statins may have positive effects on some outcomes in patients with COPD who receive them for cardiovascular and metabolic indications **(Evidence C)** • Leukotriene modifiers have not been tested adequately in COPD patients

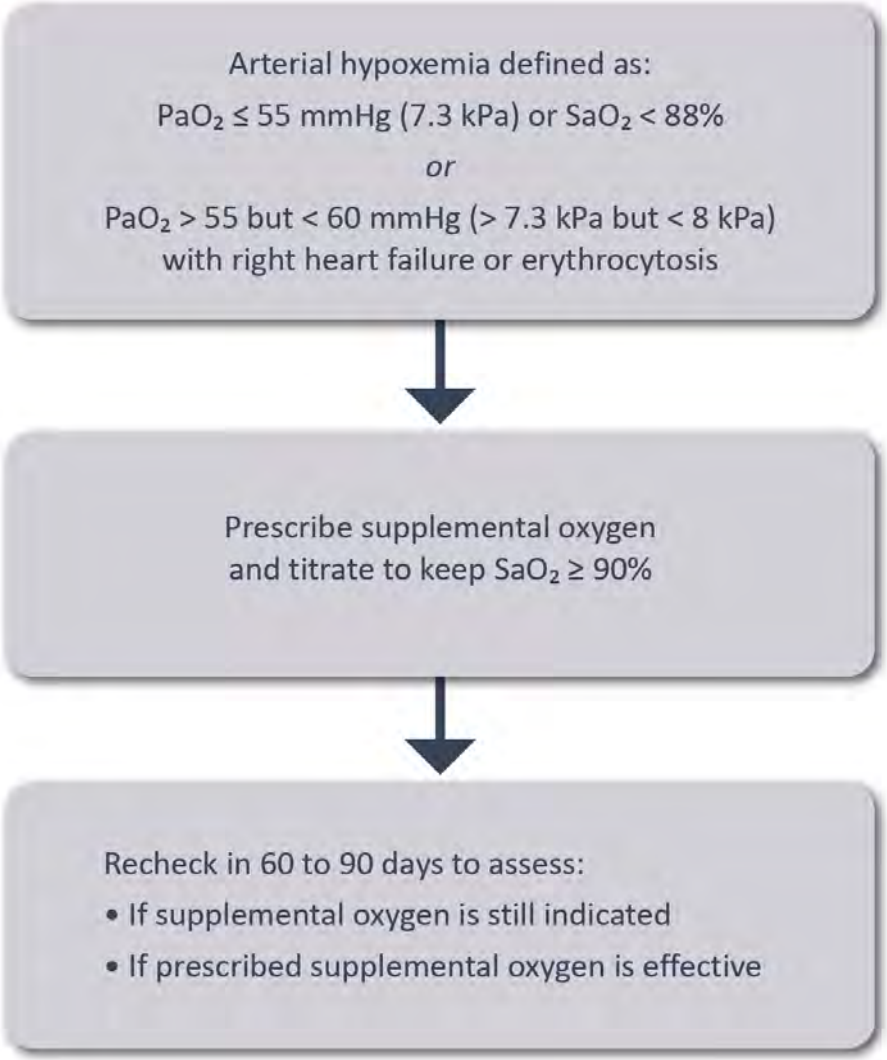
Oxygen Therapy and Ventilatory Support in Stable COPD

Table 3.10

Oxygen Therapy	• The long-term administration of oxygen increases survival in patients with severe chronic resting arterial hypoxemia **(Evidence A)** • In patients with stable COPD and moderate resting or exercise-induced arterial desaturation, prescription of long-term oxygen does not lengthen time to death or first hospitalization or provide sustained benefit in health status, lung function and 6-minute walk distance **(Evidence A)** • Resting oxygenation at sea level does not exclude the development of severe hypoxemia when traveling by air **(Evidence C)**
Ventilatory Support	• NPPV may improve hospitalization-free survival in selected patients after recent hospitalization, particularly in those with pronounced daytime persistent hypercapnia ($PaCO_2$ > 53 mmHg) **(Evidence B)**

Prescription of Supplemental Oxygen to COPD Patients

Figure 4.5



Pulmonary Rehabilitation, Self-Management and Integrative Care in COPD

Table 3.8

Pulmonary Rehabilitation	• Pulmonary rehabilitation improves dyspnea, health status and exercise tolerance in stable patients **(Evidence A)** • Pulmonary rehabilitation reduces hospitalization among patients who have had a recent exacerbation (≤ 4 weeks from prior hospitalization) **(Evidence B)** • Pulmonary rehabilitation leads to a reduction in symptoms of anxiety and depression **(Evidence A)**
Education and Self-Management	• Education alone has not been shown to be effective **(Evidence C)** • Self-management intervention with communication with a health care professional improves health status and decreases hospitalizations and emergency department visits **(Evidence B)**
Integrated Care Programs	• Integrative care and telehealth have no demonstrated benefit at this time **(Evidence B)**

Follow-Up of Non-Pharmacological treatment

Table 4.10

1. If response to initial treatment is appropriate, maintain it and offer:

- Flu vaccination every year and other recommended vaccinations according to guidelines
- Self-management education
- Assessment of behavioral risk factors such as smoking cessation (if applicable) and environmental exposures

Ensure

- Maintenance of exercise program and physical activity
- Adequate sleep and a healthy diet

2. If not, consider the predominant treatable trait to target

DYSPNEA

- Self-management education (written action plan) with integrated self-management regarding:
  - Breathlessness, energy conservation techniques, and stress management strategies
- Pulmonary rehabilitation (PR) program and/or maintenance exercise program post PR

EXACERBATIONS

- Self-management education (written action plan) that is personalized with respect to:
  - Avoidance of aggravating factors
  - How to monitor/manage worsening of symptoms
  - Contact information in the event of an exacerbation

All patients with advanced COPD should be considered for end of life and palliative care support to optimize symptom control and allow patients and their families to make informed choices about future management.

COPD Acute Exacerbations

Diagnosis and Assessment

Table 5.2

1.	Complete a thorough clinical assessment for evidence of COPD and potential respiratory and nonrespiratory concomitant diseases, including consideration of alternative causes for the patient's symptoms and signs: primarily pneumonia, heart failure, and pulmonary embolism.
2.	**Assess:** a. Symptoms, severity of dyspnea that can be determined by using a VAS, and documentation of the presence of cough. b. Signs (tachypnea, tachycardia), sputum volume and color, and respiratory distress (accessory muscle use).
3.	Evaluate severity by using appropriate additional investigations such as pulse oximetry, laboratory assessment, CRP, arterial blood gases.
4.	Establish the cause of the event (viral, bacterial, environmental, other).

Definition of abbreviations: COPD = chronic obstructive pulmonary disease; CRP = C-reactive protein; VAS = visual analog scale.

Confounders or Contributors to be Considered in Patients Presenting with Suspected COPD Exacerbation

Table 5.1

Most frequent	**Pneumonia**	• Chest radiograph
	Pulmonary embolism	• Clinical probability assessment (Hemoptysis, surgery, fracture, history of cancer, DVT) • D-dimer • CT angiography for pulmonary embolism
	Heart failure	• Chest radiograph • NT Pro-Brain Natriuretic Peptide (Pro-BNP) and BNP • Echocardiography
Less frequent	**Pneumothorax, pleural effusion**	• Chest radiograph • Thoracic ultrasound
	Myocardial infarction and/or cardic arrhythmias (atrial fibrillation/flutter)	• Electrocardiography • Troponin

Classification of the Severity of COPD Exacerbations

Figure 5.1

COPD Patient with Suspected Exacerbation

Confirm ECOPD Diagnosis and Episode Severity

Severity	Variable thresholds to determine severity
Mild (default)	• Dyspnea VAS < 5 • RR < 24 breaths/min • HR < 95 bpm • Resting SaO_2 ≥ 92% breathing ambient air (or patient's usual oxygen prescription) AND change ≤ 3% (when known) • CRP < 10 mg/L (if obtained)
Moderate (meets at least three of five*)	• Dyspnea VAS ≥ 5 • RR ≥ 24 breaths/min • HR ≥ 95 bpm • Resting SaO_2 < 92% breathing ambient air (or patient's usual oxygen prescription) AND/OR change > 3% (when known) • CRP ≥ 10 mg/L *If obtained, ABG may show hypoxemia (PaO_2 ≤ 60 mmHg) and/or hypercapnia ($PaCO_2$ > 45 mmHg) but no acidosis
Severe	• Dyspnea, RR, HR, SaO_2 and CRP same as moderate • ABG show new onset/worsening hypercapnia and acidosis ($PaCO_2$ > 45 mmHg and pH <7.35)

Consider Differential Diagnosis

- Heart failure
- Pneumonia
- Pulmonary embolism

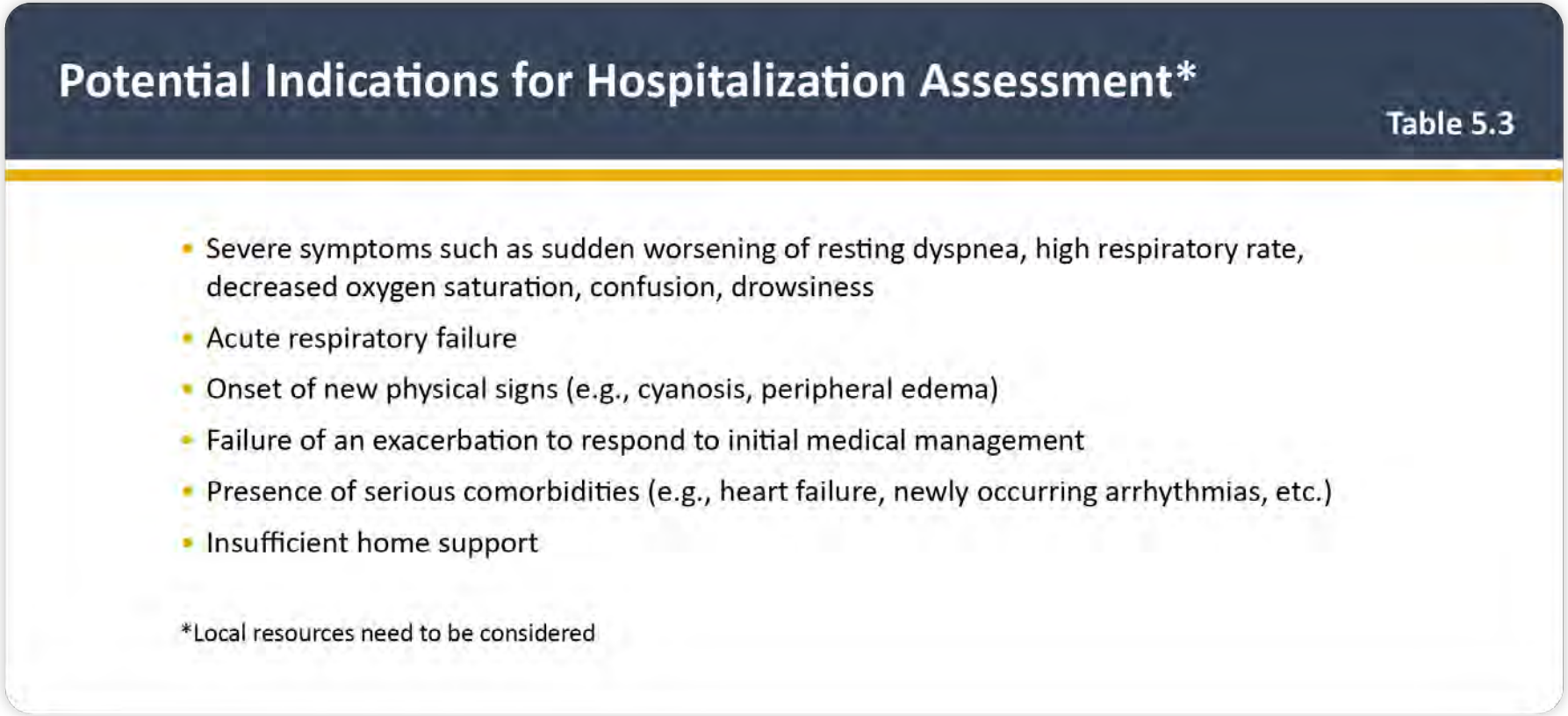
- Appropriate testing and treatment

Determine etiology:
viral testing, sputum culture, other

Adapted from: The ROME Proposal, Celli et al. (2021) Am J Respir Crit Care Med. 204(11): 1251-8. Abbreviations: VAS visual analog dyspnea scale; RR respiratory rate; HR heart rate; SaO_2 oxygen saturation; CRP C-reactive protein; ABG arterial blood gases; PaO_2 Arterial pressure of oxygen.

From [44], mod.

COPD Acute Exacerbations



Management of Severe but not Life-threatening Exacerbations*

Table 5.4

- **Assess severity of symptoms, blood gases, chest radiograph**
- **Administer supplemental oxygen therapy, obtain serial arterial blood gas, venous blood gas and pulse oximetry measurements**
- **Bronchodilators:**
  - Increase doses and/or frequency of short-acting bronchodilators
  - Combine short-acting beta$_2$-agonists and anticholinergics
  - Consider use of long-acting bronchodilators when patient becomes stable
  - Use spacers or air-driven nebulizers when appropriate
- **Consider oral corticosteroids**
- **Consider antibiotics (oral) when signs of bacterial infection are present**
- **Consider noninvasive mechanical ventilation (NIV)**
- **At all times:**
  - Monitor fluid balance
  - Consider subcutaneous heparin or low molecular weight heparin for thromboembolism prophylaxis
  - Identify and treat associated conditions (e.g., heart failure, arrhythmias, pulmonary embolism etc.)

*Local resources need to be considered

Key Points for the Management of Exacerbations

Table 5.5

- Short-acting inhaled beta$_2$-agonists, with or without short-acting anticholinergics, are recommended as the initial bronchodilators to treat an acute exacerbation **(Evidence C)**
- Systemic corticosteroids can improve lung function (FEV1), oxygenation and shorten recovery time and hospitalization duration. Duration of therapy should not normally be more than 5 days **(Evidence A)**
- Antibiotics, when indicated, can shorten recovery time, reduce the risk of early relapse, treatment failure, and hospitalization duration. Duration of therapy should normally be 5 days **(Evidence B)**
- Methylxanthines are not recommended due to increased side effect profiles **(Evidence B)**
- Non-invasive mechanical ventilation should be the first mode of ventilation used in COPD patients with acute respiratory failure who have no absolute contraindication because it improves gas exchange, reduces work of breathing and the need for intubation, decreases hospitalization duration and improves survival **(Evidence A)**

Indications for Noninvasive Mechanical Ventilation (NIV)

Table 5.7

At least one of the following:

- Respiratory acidosis ($PaCO_2 \geq 6.0$ kPa or 45 mmHg and arterial pH ≤ 7.35)
- Severe dyspnea with clinical signs suggestive of respiratory muscle fatigue, increased work of breathing, or both, such as use of respiratory accessory muscles, paradoxical motion of the abdomen, or retraction of the intercostal spaces
- Persistent hypoxemia despite supplemental oxygen therapy

Indications for Invasive Mechanical Ventilation

Table 5.8

- Unable to tolerate NIV or NIV failure
- Status post-respiratory or cardiac arrest
- Diminished consciousness, psychomotor agitation inadequately controlled by sedation
- Massive aspiration or persistent vomiting
- Persistent inability to remove respiratory secretions
- Severe hemodynamic instability without response to fluids and vasoactive drugs
- Severe ventricular or supraventricular arrhythmias
- Life-threatening hypoxemia in patients unable to tolerate NIV

Indications for Respiratory or Medical Intensive Care Unit Admission*

Table 5.6

- Severe dyspnea that responds inadequately to initial emergency therapy
- Changes in mental status (confusion, lethargy, coma)
- Persistent or worsening hypoxemia (PaO_2 < 5.3 kPa or 40 mmHg) and/or severe/worsening respiratory acidosis (pH < 7.25) despite supplemental oxygen and noninvasive ventilation
- Need for invasive mechanical ventilation
- Hemodynamic instability - need for vasopressors

*Local resources need to be considered.

Acute Exacerbation Assessment and Management of COPD

Assess patient clinically who presents with as unknown or with history of COPD who has significant dyspnea with tachypnea and tachycardia that may have diffuse wheezing with distant breath sounds. If severe, they may have fragmented speech, using accessory muscles, unable to lie supine, diaphoretic and/or agitated.

Observe for signs of impending respiratory arrest – inability to maintain respiratory effort, cyanotic, unstable hemodynamically and decreasing mental status.

Identify precipitating cause, usually by viral or bacterial infection, but assess co-morbid conditions such as acute coronary syndrome, decompensated heart failure, pulmonary embolism, or pneumothorax.

Assess ABCs and manage time critical conditions as identified.

Document patient preferences regarding intubation from advanced directives or from direct questioning.

☐ DNR – no intubation per patient instructions or advance directive

Assess COPD exacerbation severity (per ROME Proposal and GOLD 2023 COPD guidelines)

☐ **Mild**	☐ **Moderate**	☐ **Severe**
Dyspnea VAS <5	Dyspnea VAS >5	Same as Moderate but ABG shows new onset or worsening of acidosis and hypercapnia (PaCO2>45 and pH < 7.35
RR <24 bpm	RR > 24 bpm	
HR < 95 bpm	HR > 95 bpm	
O2 sat ≥ 92% ambient or usual	O2 sat < 92% ambient on usual or change >3%	
CRP < 10 mg/l	CRP > 10 mg/l	

☒ Obtain IV access.

☐ Diet as tolerated; if stable and on NIV, may discontinue NIV during meals

☒ Thromboembolism prophylaxis as per protocol

☒ Place on continuous vitals and cardiac monitoring with O2 sats

☒ Notify RT

☒ Stat labs while obtaining IV access:
CBC, ABG, U/A, CMP, (EKG, troponin, BNP, or D-dimer if indicated), CRP and cultures.

☒ Bedside CXR

☒ Provide supplemental oxygen to target O2 saturation of 88-92% or PaO2 of 60-70 mm Hg.

☐ Recheck ABG 2-4 hours after starting O2 therapy to monitor for impact and trend of PaCO2

☐ O2 via Nasal Canula

☐ Venturi Mask useful for titrating Fi)2 as high FiO2 usually not needed and can contribute to hypercapnia

Start aggressive bronchodilator therapy

☐ Inhaled beta agonist: **Albuterol 2.5 mg diluted to 3 ml via nebulizer** or 2-4 inhalations from MDI every hour for 2-3 doses. (up to 8 inhalations my be used for intubated patients, if needed.)

☐ Inhaled short-acting muscarinic antagonist- can be combined with albuterol above: **Ipratropium 500 mcg**; if given alone, combine with 3 ml via nebulizer or 2-4 inhalations from MDI every hour for 2-3 doses.

Start aggressive ventilatory support (NIV or invasive ventilation if clinically indicated):

Noninvasive ventilation indicated when the patient continues to have severe dyspnea despite initial therapy and ABG shows PaCO2>45 or arterial pH ≤ 7.35; or the patient has clinical signs of respiratory fatigue and/or increased work of breathing, or persistent hypoxemia despite supplemental O2 therapy. It is contraindicated in respiratory or cardiac arrest, hemodynamic instability, inability to use mask, excessive secretion, high risk for aspiration, and uncooperative patient.

☐ Start NIV (bilevel positive airways pressure)
Start on timed mode and titrate FiO2
Start EPAP at 4 or 5 cmH2O and IPAP at 10-12 cm H2O, but titrating IPAP rapidly in 2-5 cm increments at a rate of approximately 5cmH2O each 10 minutes with a usual pressure target of 20cms H2O or until a therapeutic response is achieved or patient tolerability has been reached.

☐ Repeat ABG one hour after starting NIV
Bilevel NPPV setting changes should be guided by serial ABGs with aim for pH >= 7.35, SaO2 88-92% and decreasing hypercapnia.

NIV weaning: Once patients improve and clinically stable with RR < 24, HR <110, pH >=7.35, and SaO2 > 88%, give longer trials off. I able tolerate at least 4 hours of unassisted breathing, NIV can be weaned by progressively reducing NIV use during the day but continuing its use overnight or in some cases, directly discontinued.

☐ If patient fails NIV (not tolerating NIV with persistent or worsening of hypoxemia, and worsening of respiratory acidosis – if consistent with patient instruction/advance directive, admit to ICU to intubate and provide invasive mechanical ventilation.

☐ IV glucocorticoid: methylprednisolone 60 mg to 125 mg IV (_____mg), repeat every __6 __8 __12 hrs

☐ Monitor Fingerstick blood glucose: _____AC, HS, and 3 am.

☐ Antibiotic therapy:

No pseudomonas risk factors: (Hospitalized for AE last 12 months or more than 2 AE last 12 months, or + pseudomonas cultured before)
- ☐ Cetriaxone 1-2 rams IV, or
- ☐ Cefotaxime 1-2 grams IV, or
- ☐ Levofloxacin 500 mg, or Moxifloxacin 400 mg IV or orally

+ for pseudomonas risk factors:
- ☐ Piperacillin-tazobactam 4.5 gm IV, or
- ☐ Cefepime 2 gm IV, or
- ☐ Ceftazidime 2 gm IV

Discharge Criteria and Recommendations for Follow-up

Table 5.9

1. Full review of all clinical and laboratory data.
2. Check maintenance therapy and understanding.
3. Reassess inhaler technique.
4. Ensure understanding of withdrawal of acute medications (steroids and/or antibiotics).
5. Assess need for continuing any oxygen therapy.
6. Provide management plan for comorbidities and follow-up.
7. Ensure follow-up arrangements: early follow-up < 4 weeks, and late follow-up < 12 weeks as indicated.
8. All clinical or investigational abnormalities have been identified.

1 – 4 Weeks Follow-up

- Evaluate ability to cope in his/her usual environment
- Review and understanding treatment regimen
- Reassessment of inhaler techniques
- Reassess need for long-term oxygen
- Document the capacity to do physical activity and consider patient eligibility to be enrolled in pulmonary rehabilitation
- Document symptoms: CAT or mMRC
- Determine status of comorbidities

12 – 16 Weeks Follow-up

- Evaluate ability to cope in his/her usual environment
- Review understanding treatment regimen
- Reassessment of inhaler techniques
- Reassess need for long-term oxygen
- Document the capacity to do physical activity and activities of daily living
- Measure spirometry: FEV1
- Document symptoms: CAT or mMRC
- Determine status of comorbidities

In-person Follow-up □ **Phone Follow-up** □ **Virtual/online Follow-up** □

Date: YYYY / MM / DD	**Diagnosis:**

1. BASELINE SYMPTOMS – Breathlessness on a regular day: mMRC /4

Daily sputum production: □ no □ yes, color: Regular cough □ no □ yes

Recent change in symptoms □ no □ yes If yes, since when: □ Sputum color: □ Sputum volume ↑ = ↓ □ Dyspnea ↑ = ↓ □ Fatigue ↑ = ↓ □ Cough ↑ = ↓ □ Other □ Signs of hypercapnia **CAT:** /40	*Maintenance Medication and adherence:* □ SABA □ LABA/LAMA □ LABA □ LABA/ICS □ LAMA □ ICS/LABA/LAMA □Other: *Non pharmacological Rx:* O2: CPAP: BIPAP :

2. COVID-19 – If patient is feeling unwell, check other symptoms: □ Fever____ □ Sore throat □ Anosmia □ Others_____

Contact with someone COVID-19 positive? □ no □ yes Tested for COVID-19? □ no □ yes If yes □ positive □ negative

3. WRITTEN ACTION PLAN – no □ yes □

Instruction and any additional treatment: _____

Last time it has been used (date):

4. RECENT ADMISSIONS AND EMERGENCY VISITS

Comments:

Hospital/ER	Where	Date	Length	Reason (Dx)

5. COPD Self-management (healthy behaviors) – Integrated (patient has used it in his daily life)**?**

Smoke-free environment	yes	no	cannot tell
Medication adherence	yes	no	cannot tell
Prevention/management of exacerbations	yes	no	cannot tell
Breathing control	yes	no	cannot tell
Stress management	yes	no	cannot tell
Physical activity and exercise	yes	no	cannot tell
Other	yes	no	

Comments and what patient should prioritize based on his/her need:

6. MAIN ISSUES

1.	*2.*	*3.*

7. SUMMARY, INTERVENTIONS & PLAN

(healthcare professional name & signature)

Protocol for Tobacco Cessation Management

ASK every patient, at every visit if they smoke cigarettes or use other tobacco products. Be mindful that in 5 minutes or less you can increase the odds that our patients will quit by using the Ask, Advise, Assist, and Refer method. The information you collect for the provider will save them time and remove a barrier that can prevent cessation counseling opportunities. Even when patients are not willing to make a quit attempt, brief advice can enhances motivation and increases the likelihood of future quit attempts as well as having a cumulative effect on quitting. Have scripted messages ready that are positive and reflect the challenges they face trying to quit. Provide them with information and access to counseling and tell them you're ready to help them quit when they are ready.

Ask all patients at Every Visit About Tobacco Use and Record

Patient Tobacco Use Status:

- ☐ Current every day smoker/Chew
- ☐ Current some day smoker/Chew
- ☐ Former smoker/Chew
- ☐ Never smoker/Chew
- ☐ Smoker/Chew, current status unknown
- ☐ Unknown if ever smoked

Secondhand smoke exposure:

- ☐ Current
- ☐ Former or ☐ Never
- ☐ work, ☐ home or ☐ social

If ready to quit or considering, collect the following information for the provider:

HISTORY

Type of tobacco:

- ☐ Cigarettes Packs per day/week (20 cigarettes/pack): _____
- ☐ Pipe Bowls per day/week: _____
- ☐ Cigars Number per week: _____
- ☐ Smokeless Cans/pouches per day/week: _____
- ☐ Other tobacco products (orbs, strips, sticks, hookah, etc) Amount per day/week: _____
- ☐ E-Cigarettes Cartridges per day/week: _____

Approx date of last quit attempt: _____

a) How long were they able to quit that time? _____

b) How long ago? _____

c) What caused relapse? _____

Medication used in previous quit attempt:

- ☐ Nicotine patch
- ☐ Nicotine gum
- ☐ Nicotine lozenge
- ☐ Nicotine nasal spray
- ☐ Nicotine oral inhaler
- ☐ Varenicline
- ☐ Bupropion
- ☐ Nortryptiline
- ☐ Other (i.e., herbal): _____
- ☐ No medication

What problems did you have with medications you have used in the past?_____

What medication have you felt worked best for you previously?_____

ASSESSMENT

Readiness to Quit:

- ☐ Not interested in quitting – emphasize/connect
- ☐ Would like to quit sometime (but not within the next month) – encourage/project
- ☐ Would like to quit now or soon (within the next month) - act

Provider Protocol for Tobacco Cessation Management

Your staff will collect tobacco use on every patient at every visit. They will ASSESS their readiness to quit and if ready they will complete some questions with the patient to gather information that will assist you in counseling your patient. This template complements the one your staff completes and helps to document your counseling and assists with proper coding. Our goal is to use a simple team-based approach to assist our patients in their tobacco cessation efforts. Be mindful that in 5 minutes or less you can increase the odds that our patients will quit by using the Ask, Advise, Assist, and Refer method.

ICD-10 CM DIAGNOSIS CODE	DESCRIPTION
☐ F17.200	Nicotine dependence, unspecified, uncomplicated
☐ F17.201	Nicotine dependence, unspecified, in remission
☐ F17.210	Nicotine dependence, cigarettes, uncomplicated
☐ F17.211	Nicotine dependence, cigarettes, in remission
☐ F17.220	Nicotine dependence, chewing tobacco, uncomplicated
☐ F17.221	Nicotine dependence, chewing tobacco, in remission
☐ F17.290	Nicotine dependence, other tobacco product, uncomplicated
☐ F17.291	Nicotine dependence, other tobacco product, in remission

Counseling:

Time counseled:

- ☐ 10 minutes
- ☐ > 10 minutes
- ☐ 99406 Intermediate Smoking and tobacco use cessation counseling visit is greater than three minutes, but not more than 10 minutes
- ☐ 99407 Intensive Smoking and tobacco use cessation counseling visit is greater than 10 minutes

Topics covered:

- ☐ Tobacco-proof home and car
- ☐ Changing daily routines
- ☐ Dealing with urges to smoke
- ☐ Getting support
- ☐ Anticipating/avoiding triggers
- ☐ Secondhand smoke
- ☐ Teach behavioral skills
- ☐ Reinforce benefits

Counseling notes:

PLAN

Quit date: _____

☐ Refer patients to the tobacco Quitline via fax or warm handoff
KSquit.org or 1-800-QUIT-NOW (784-8669)

☐ Enroll in Text2Quit by completing the online registration at KSquit.org or complete the enrollment by phone
KSquit.org or 1-800-QUIT-NOW (784-8669)

☐ Mobile Application (quitforlifeapp.com)

Tobacco Treatment Specialist Training

KU MEDICAL CENTER
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Mission:

To improve the health of rural Kansans through focused education, relevant research, collaborative services, and health policy leadership

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