Understanding and Managing Chronic Obstructive Pulmonary Disease (COPD)

Chronic Obstructive Pulmonary Disease (COPD) is a progressive lung disease characterized by persistent respiratory symptoms and airflow limitations. It is primarily caused by long-term exposure to harmful substances such as cigarette smoke, air pollution, occupational dust and chemicals. Genetic factors, age and female sex also increase risk. As a chronic and debilitating condition, effective management of COPD is crucial for improving the quality of life and reducing mortality among patients. This post aims to outline the current guidelines for the management of COPD, emphasizing evidence-based practices.

Diagnosis and Assessment

Clinical Diagnosis
The diagnosis of COPD should be considered in any patient with shortness of breath, chronic cough or sputum production, and a history of exposure to risk factors, particularly tobacco smoke. Spirometry (PFTs) is essential for the diagnosis, with a post-bronchodilator FEV1/FVC ratio of less than 0.70 confirming the presence of persistent airflow limitation. Severity is determined by symptoms and the decrease in predicted FEV1, the amount of air expelled in the first second.

Assessing Severity
The severity of COPD is assessed using a combination of the following:
- Symptoms: The Modified British Medical Research Council (mMRC) dyspnea scale or the COPD Assessment Test (CAT) are commonly used.
- Airflow Limitation: Classified by the Global Initiative for Chronic Obstructive Lung Disease (GOLD) into four grades based on FEV1:
  GOLD 1 (Mild): FEV1 ≥ 80% predicted
  GOLD 2 (Moderate): 50% ≤ FEV1 < 80% predicted
  GOLD 3 (Severe): 30% ≤ FEV1 < 50% predicted
  GOLD 4 (Very Severe): FEV1 < 30% predicted
- Exacerbation History: The frequency and severity of exacerbations in the past year are considered. 0-1 exacerbation is considered low risk, 2 or more exacerbations or an exacerbation requiring hospitalization is considered high risk.

Modified MRC dyspnea scale	
Grade	**Degree of breathlessness related to activities**
0	No breathlessness, except with strenuous exercise
1	Breathlessness when hurrying on the level or walking up a slight hill
2	Walks slower than contemporaries on level ground because of breathlessness or has to stop for breath when walking at own pace
3	Stops for breath after walking about 100 m or after a few minutes on level ground
4	Too breathless to leave the house, or breathless when dressing or undressing
(MRC = Medical Research Council)	

Non-Pharmacological Interventions

1. Smoking Cessation
   - The single most effective intervention for preventing and slowing the progression of COPD.
   - Resources include behavioral counseling, nicotine replacement therapy (NRT), and pharmacotherapies like varenicline and bupropion.

2. Vaccinations
   - Pneumococcal pneumonia (PCV20 or PCV13 + PSV23), annual influenza vaccinations and RSV vaccination for those over 60 are recommended to reduce the risk of respiratory infections.

3. Pulmonary Rehabilitation
   - A comprehensive program including exercise training, education, and behavior change designed to improve the physical and emotional condition of patients.

4. Nutritional Support
   - Nutritional counseling and intervention are important for patients with unintentional weight loss and muscle wasting.

Pharmacological Therapy

Medications play a vital role in managing COPD, aiming to relieve symptoms, improve lung function, and prevent exacerbations. Treatment regimens are often tailored to the severity of the disease and the individual patient's needs. Knowing your disease severity, and the medications recommended to treat it, ensures your management is appropriate.

1. Bronchodilators
   - Short-acting beta2-agonists (SABAs) and anticholinergics (SAMAs): Medications such as albuterol and ipratropium, are used for immediate symptom relief.
   - Long-acting beta2-agonists (LABAs) and long-acting muscarinic antagonists (LAMAs): LABAs (long-acting beta2-agonists) salmeterol, formoterol, and vilanterol, and LAMAs (long-acting muscarinic antagonists) tiotropium, glycopyrrolate, umeclidinium and revefenacin are used for maintenance therapy to provide prolonged symptom control.

   - Inhaled bronchodilators in COPD are central to symptom management and commonly given to prevent or reduce symptoms.
   - Regular and as-needed use of SABA or SAMA improves FEV1 and symptoms.
   - Combinations of SABA and SAMA (Combivent, DuoNeb) are superior compared to either medication alone in improving FEV1 and symptoms.
   - LABAs and LAMAs significantly improve lung function, dyspnea, health status, and reduce exacerbation rates.
   - LAMAs have a greater effect on exacerbation reduction compared with LABAs and decrease hospitalizations.
   - Combination treatment with a LABA and LAMA increases FEV1 and reduces symptoms compared to monotherapy.
   - Combination treatment with a LABA and LAMA (Anoro, Stiolto, Bevespi, Duaklir) reduces exacerbations compared to monotherapy or ICS+LABA (Breo, Symbicort, Dulera, Advair).
   - Tiotropium improves the effectiveness of pulmonary rehabilitation in increasing exercise performance.
   - Theophylline exerts a small bronchodilator effect in stable COPD and that is associated with modest symptomatic benefits.

2. Inhaled Corticosteroids (ICS)
   - Recommended for patients with a history of exacerbations despite appropriate bronchodilator therapy.
   - ICS such as budesonide, mometasone, and fluticasone can reduce inflammation and are often used in combination with LABAs (ICS+LABA) for better

control. Combination inhalers (ICS+LABA) provide both anti-inflammatory and bronchodilating effects.
- An ICS combined with a LABA is more effective than the individual components in improving lung function and health status and reducing exacerbations in patients with exacerbations and moderate to very severe COPD.
- Regular treatment with ICS increases the risk of pneumonia especially in those with severe disease.
- Triple inhaled therapy of ICS+LAMA+LABA (Trelegy, Breztri) improves lung function, symptoms and health status and reduces exacerbations compared to ICS+LABA (Breo, Symbicort, Dulera, Advair) or LAMA monotherapy (Spiriva, Yupelri).
- Long-term use of oral glucocorticoids has numerous side effects with no evidence of benefits.

3. Phosphodiesterase-4 Inhibitors
- Medications like roflumilast reduce inflammation. Roflumilast may be considered in patients with severe COPD associated with chronic bronchitis and a history of exacerbations.
- 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.
    A PDE4 inhibitor improves lung function and decreases exacerbations in patients who are on fixed-dose LABA/ICS.

4. Mucolytics
- N-acetylcysteine and carbocysteine help thin mucus and can be beneficial in selected patients to reduce exacerbations.

5. Antibiotics
- Long-term azithromycin and erythromycin therapy reduces exacerbations over one year.
- Treatment with azithromycin is associated with an increased incidence of bacterial resistance and hearing test impairments.

Management of Exacerbations

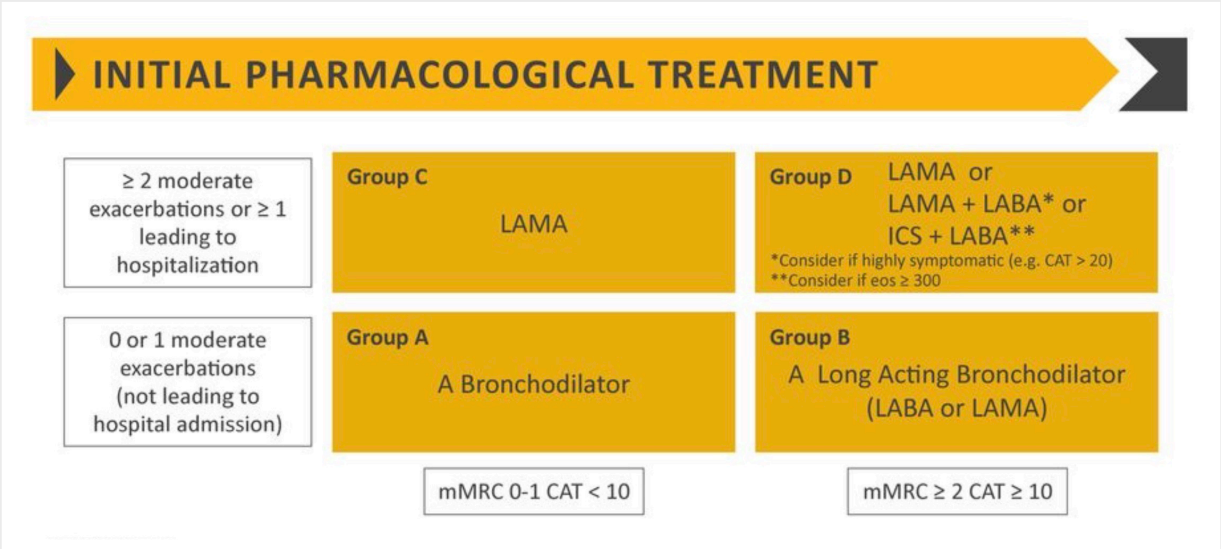
1. Early Recognition and Treatment
- Patients should be educated to recognize the signs of exacerbations early and seek prompt medical attention.
- Exacerbations are typically treated with short-acting bronchodilators, systemic corticosteroids, and antibiotics when bacterial infection is suspected.

2. Hospital Management
- Severe exacerbations may require hospitalization. Oxygen therapy, non-invasive ventilation (NIV), and, in some cases, invasive mechanical ventilation are employed.

Treating Stable COPD

1. Initial Assessment:
- Conduct spirometry to confirm diagnosis (FEV1/FVC < 0.70).
- Assess symptom burden using mMRC or CAT.
- Determine exacerbation risk based on history.

2. Initial Treatment Based on GOLD Grouping:
- Group A (Low symptoms, low risk of exacerbations):
  First choice: Short-acting bronchodilator (SABA or SAMA).
- Group B (High symptoms, low risk of exacerbations):
  First choice: Long-acting bronchodilator (LABA or LAMA).
- Group C (Low symptoms, high risk of exacerbations):
  First choice: LAMA.
- Group D (High symptoms, high risk of exacerbations):
  - First choice: LAMA or LAMA + LABA (if highly symptomatic) or ICS + LABA (if eosinophil count ≥ 300 cells/µL).



3. Follow-up and Adjust Treatment:
- Persistent symptoms or further exacerbations:
  - Group B: If on LABA, consider LABA + LAMA.
  - Group C: If on LAMA, consider LAMA + LABA or LABA + ICS.
  - Group D: If on LAMA or LABA + LAMA, consider triple therapy (LAMA + LABA + ICS).

- Further considerations:
  - If exacerbations persist, consider adding roflumilast (especially if FEV1 < 50% and chronic bronchitis) or a macrolide (e.g., azithromycin).

Long-term Management and Follow-up

Regular Monitoring
- Routine follow-up visits are essential to monitor disease progression, assess treatment effectiveness, and modify therapy as needed.
- Spirometry (pulmonary function tests) should be performed regularly to track lung function decline.

Palliative Care
- For patients with advanced COPD, palliative care focuses on symptom relief and quality of life.
- Discussions about advanced directives and end-of-life care should be part of the comprehensive management plan.

Conclusion

Effective management of COPD requires a multifaceted approach tailored to the individual patient. By combining non-pharmacological strategies, appropriate medication therapy, and regular monitoring, we can significantly improve the lives of those living with COPD.

American Lung Association.

Asthma and COPD Medicines

Quick Reliever Medicines

Short-Acting Beta$_2$-Agonists (SABA)

- **Albuterol Sulfate HFA** — albuterol sulfate 90 mcg — G
- **Albuterol Sulfate Neb** — 0.64 mg/3 ml; 1.25 mg/3 ml; 2.5 mg/3 ml
- **ProAir® Digihaler™** — albuterol sulfate 117 mcg
- **ProAir® RespiClick** — albuterol sulfate 117 mcg
- **Proventil® HFA** — albuterol sulfate 120 mcg — G
- **Ventolin® HFA** — albuterol sulfate 90 mcg
- **Xopenex HFA®** — levalbuterol tartrate 50 mcg — G
- **Xopenex® Neb** — levalbuterol hydrochloride 0.31 mg/3 ml; 0.63 mg/3 ml; 1.25 mg/3 ml — G

Short-Acting Muscarinic Antagonists (SAMA)

- **Atrovent® HFA** — ipratropium bromide 17 mcg — C
- **Atrovent® Neb** — ipratropium bromide 250/500 mcg — G

Short-Acting Combinations (SABA-SAMA)

- **Combivent® Respimat®** — ipratropium bromide and albuterol 20/100 mcg — C
- **DuoNeb®** — ipratropium bromide and albuterol sulfate 0.5 mg-3 mg/3 ml — G

How-To Videos

Maintenance/Controller Medicines

Inhaled Corticosteroids (ICS) asthma only

- **Alvesco® HFA** — ciclesonide 80/160 mcg
- **ArmonAir™ RespiClick®** — fluticasone propionate 55/113/232 mcg
- **Arnuity® Ellipta®** — fluticasone furoate 100/200 mcg
- **Asmanex® HFA** — mometasone furoate 100/200 mcg
- **Asmanex® Twisthaler®** — mometasone furoate 110/220 mcg
- **Budesonide Inhalation Suspension** — 0.25 mg/2 ml; 0.5 mg/2 ml; 1 mg/2 ml
- **Flovent® Diskus®** — fluticasone propionate 50/100/250 mcg
- **Flovent® HFA** — fluticasone propionate 44/110/220 mcg
- **Pulmicort® Flexhaler®** — budesonide 90/180 mcg
- **Pulmicort Respules®** — budesonide inhalation suspension 0.25 mg/2 ml; 0.5 mg/2 ml; 1 mg/2 ml
- **QVAR® Redihaler™** — beclomethasone dipropionate 40/80 mcg

Combination Therapy (Inhaled Corticosteroid - Long-Acting Beta$_2$-Agonists) (ICS-LABA)

- **Advair Diskus®** — fluticasone propionate and salmeterol 100/50, 250/50, 500/50 mcg — G
- **Advair® HFA** — fluticasone propionate and salmeterol inhalation aerosol 45/21, 115/21, 230/21 mcg
- **AirDuo® RespiClick®** — fluticasone propionate and salmeterol 55/14, 113/14, 232/14 mcg — G
- **Breo® Ellipta®** — fluticasone and vilanterol 100/25, 200/25 mcg — G
- **Symbicort®** — budesonide and formoterol fumarate dihydrate 80/4.5, 160/4.5 mcg — G, S
- **Dulera®** — mometasone furoate and formoterol fumarate dihydrate 50/5, 100/5, 200/5 mcg — A, S
- **Wixela™ Inhub™** — fluticasone propionate and salmeterol inhalation aerosol 100/50, 250/50, 500/50 mcg

Triple Therapy (ICS-LABA-LAMA)

- **Trelegy Ellipta** — fluticasone/vilanterol/umeclidinium 100 mcg/62.5 mcg/25 mcg — A, C; 200 mcg/62.5 mcg/25 mcg — A
- **Breztri Aerosphere®** — budesonide glycopyrrolate formoterol fumarate 160/9/4.8 mcg — C

Long-Acting Muscarinic Antagonists (LAMA)

- **Incruse® Ellipta®** — umeclidinium 62.5 mcg — C
- **Lonhala Magnair®** — glycopyrrolate 25 mcg/1 ml — C
- **Spiriva® HandiHaler®** — tiotropium bromide 18 mcg
- **Spiriva® Respimat®** — tiotropium bromide 1.25 mcg
- **Tudorza™ Pressair™** — aclidinium bromide 400 mcg — C
- **Yupelri® Neb** — revefenacin 175 mcg/3 ml — C

Long-Acting Beta$_2$-Agonists (LABA) COPD only

- **Brovana® Neb** — arformoterol 15 mcg
- **Perforomist® Neb** — formoterol fumarate dihydrate 20 mcg
- **Serevent® Diskus®** — salmeterol xinafoate 50 mcg
- **Striverdi® Respimat®** — olodaterol hydrochloride 2.5 mcg

LAMA-LABA COPD only

- **Anoro® Ellipta** — umeclidinium and vilanterol 55/22, 62.5/25 mcg
- **Bevespi Aerosphere®** — glycopyrrolate and formoterol 9/4.8 mcg
- **Duaklir® Pressair®** — aclidinium and formoterol 400/12 mcg
- **Stiolto® Respimat®** — olodaterol and tiotropium bromide 2.5/2.5 mcg

Add-On Medicines

Monoclonal Antibody (biologics, injection) — A

- **Cinqair®** — reslizumab 100 mg
- **Dupixent®** — dupilumab 100/200/300 mg
- **Fasenra™** — benralizumab 30 mg
- **Nucala®** — mepolizumab 100 mg
- **Tezspire™** — tezepelumab-ekko 210 mg
- **Xolair®** — omalizumab 75/150 mg

PDE4 Inhibitor

- **Daliresp®** — roflumilast 250/500 mcg — C

Leukotriene Receptor Antagonists (LTRA)

- **Singulair®** — montelukast sodium 4/5/10 mg
- **Zyflo®** — zileuton ER 600 mg

Use a valved holding chamber/spacer

All HFA inhalers should be used with a compatible valved holding chamber/spacer.

Definitions

- ICS = Inhaled Corticosteroid
- ICS-LABA or LAMA-LABA = Combination Therapy
- ICS-LABA-LAMA = Triple Therapy
- LABA = Long-Acting Beta$_2$-Agonist
- LAMA = Long-Acting Muscarinic Antagonist
- LTRA = Leukotriene Receptor Antagonist
- SABA = Short-Acting Beta$_2$-Agonist
- SAMA = Short-Acting Muscarinic Antagonist
- SMART = Single Maintenance and Reliever Therapy

Disease States: A Asthma C COPD G Generic S SMART Therapy

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SMART

SMART (Single Maintenance And Reliever Therapy) is a next-generation asthma treatment containing an ICS (inhaled corticosteroid) with formoterol (long-acting beta agonist) combined into one inhaler. SMART includes formoterol due to its ability to be fast-acting for rapid onset of asthma symptoms (similar to a short-acting beta agonist) with a longer lasting effect. This SMART treatment option may be prescribed to those with moderate to severe persistent asthma, as a daily controller medication (ICS/ formoterol) and/or to treat rapid onset of symptoms as a quick-relief medicine.

Key Messages

- Less complicated to use (one single inhaler) for managing asthma symptoms and just as effective
- Used to treat symptoms when they start and also for daily maintenance
- Always recommend use of MDI with a valved holding chamber/spacer
- This treatment option is not available for everyone. If someone is already well controlled on current treatment, shared decision making is important before making changes.
- Rinse mouth and spit out after use
- Talk to your healthcare provider for more information

Resources for Asthma and COPD

- **Asthma Care Quick Reference**
  https://www.nhlbi.nih.gov/files/docs/guidelines/asthma_qrg.pdf
- **GOLD Reports for COPD**
  www.goldcopd.org
- **American Lung Association**
  www.lung.org/asthma www.lung.org/COPD

How to use a metered-dose inhaler with a valved holding chamber (spacer)

Prime a brand-new inhaler: Before using it for the first time, if you have not used it for more than 7 days, or if it has been dropped.

1. Shake inhaler 10 seconds.

2. Take the cap off the inhaler and valved holding chamber. Make sure the mouthpiece and valved holding chamber are clean and there is nothing inside the mouthpieces.

3. Put inhaler into the chamber/spacer.

4. Breathe out away from the device.

5. Put chamber mouthpiece in mouth.

6. Press inhaler once and breathe in deep and steadily.

7. Hold your breath for 10 seconds, then breathe out slowly.

   If you need another puff of medicine, wait 1 minute and repeat steps 4-7.

8. Rinse with water and spit it out.

Proper inhalation technique is important when taking your asthma medicine(s) and monitoring your breathing. Make sure to bring all your medicines and devices to each visit with your primary care provider or pharmacist to check for correct use, or if you have trouble using them.

For more videos, handouts, tutorials and resources, visit Lung.org.

Scan the QR Code to access How-To Videos

You can also connect with a respiratory therapist for one-on-one, free support from the American Lung Association's Lung HelpLine at **1-800-LUNGUSA**.