

Improving COPD Care

This toolbox provides practical tips and resources to help prevent and treat COPD exacerbations as well as prevent COPD-related admissions and readmissions.

Abbreviations: BID = twice daily; CAT = COPD assessment test; COPD = chronic obstructive pulmonary disease; h = hours; ICS = inhaled corticosteroid; LABA = long-acting beta-2 agonist; LAMA = long-acting muscarinic-antagonist; MDI = metered-dose inhaler; q = every.

Goal	Suggested Strategies or Resources
<p>Prevent and treat influenza.</p>	<ul style="list-style-type: none"> • Vaccinate all patients six months and older, including pregnant women, yearly.¹⁻³ <ul style="list-style-type: none"> ○ Don't let egg allergies keep patients from getting vaccinated. See our chart, <i>Flu Vaccination and Egg Allergy</i>, for the latest recommendations. ○ Use our checklist, <i>Vaccine Administration Strategies</i>, to help reduce a patient's fears, prevent injuries, and reduce pain associated with injections. • Get vaccinated yourself, to set a good example for patients and coworkers. • U.S. subscribers can easily find the CDC's latest recommendations regarding flu prevention, treatment, diagnosis, and access a web-based interactive application about flu activity at https://www.cdc.gov/flu/weekly/index.htm • Choose the right flu vaccine for the patient. <ul style="list-style-type: none"> ○ See our CE, <i>Influenza Update (U.S.)</i>. ○ Also get our <i>Flu Vaccines</i> chart (U.S. subscribers); (Canadian subscribers). • Canadians can get information and materials to educate healthcare professionals about flu vaccination and other preventive actions from the Public Health Agency of Canada at https://www.canada.ca/en/public-health/services/diseases/flu-influenza.html. • Provide immunization in your pharmacy. U.S. subscribers can get our resource, <i>Pharmacy Immunization Clinics: Making It Happen</i>, for help getting started. • Treat flu cases using up-to-date recommendations on influenza antiviral medications with the CDC Guidelines: https://www.cdc.gov/flu/professionals/antivirals/summary-clinicians.htm. • See our chart, <i>Antivirals for Influenza</i>, for details on appropriate use of antivirals for both prevention and treatment of influenza.

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Goal	Suggested Strategies or Resources
Educate patients about flu prevention and treatment.	<ul style="list-style-type: none"> • Get patient education materials about vaccination and other preventive actions from: <ul style="list-style-type: none"> ○ CDC: https://www.cdc.gov/flu/resource-center/freeresources/index.htm. ○ Public Health Agency of Canada: https://www.canada.ca/en/public-health/services/diseases/flu-influenza.html. • Use the CDC patient handout, <i>No More Excuses: You Need a Flu Vaccine</i>, to encourage vaccination. • Educate patients using our handout, <i>What To Do If You Get The Flu</i>. Available in English, Spanish, and French.
Prevent pneumonia.	<ul style="list-style-type: none"> • See our toolbox, <i>Preventing and Treating Community-Acquired Pneumonia</i>, for information on pneumonia vaccination and other prevention strategies, including patient education resources. • Reserve ICSs for severe or very severe disease, not controlled with long-acting bronchodilators (e.g., LABA [salmeterol]; LAMA [tiotropium]), with eosinophil counts of about 4% (300 cells/mcL [0.3×10^9 cells/L]) or higher [Evidence Level B-3], as well as for patients with an asthma component.^{4,21,22} • Consider “stepping down” inhaled corticosteroids when possible. <ul style="list-style-type: none"> ○ Background therapy with long-acting bronchodilators (e.g., LABA, LAMA) may reduce ICS withdrawal symptoms.⁴
Help patients quit smoking.	<ul style="list-style-type: none"> • See our toolbox, <i>Smoking Cessation: Helping Patients Who Use Tobacco</i>, for lots of practical tips and resources to help patients quit smoking. • Get our CE, <i>The Pharmacist’s Role in Promoting Tobacco Cessation</i>. • Get our chart, <i>Smoking Cessation Drug Therapy</i>, for help choosing smoking cessation pharmacotherapy. Includes a link to the Fagerstrom Nicotine Tolerance Scale.
Educate patients and caregivers about COPD.	<ul style="list-style-type: none"> • The NIH’s <i>COPD Learn More, Breathe Better</i> program is aimed at getting patients diagnosed early, as well as helping COPD patients understand the disease and live better with it. Patient education handouts, fact sheets, an awareness toolkit, and a speaker’s guide are available at https://www.nhlbi.nih.gov/health-topics/education-and-awareness/copd-learn-more-breathe-better. • The American Lung Association has patient resources on smoking cessation, exposure to pollutants, preventing infection, and exercise at http://www.lung.org/lung-health-and-diseases/protecting-your-lungs/. • The Canadian Lung Association has patient handouts on medicines, oxygen, avoiding triggers and flare ups, exercise, and healthy eating with COPD available at http://www.lung.ca/lung-health/lung-disease/chronic-obstructive-pulmonary-disease-copd/resources. • Canadian patients can also call the Canadian Lung Association’s free helpline at 866-717-2673 to get information on COPD symptoms, diagnosis, treatment, and more from a certified respiratory educator. • Use our patient handouts to encourage symptom awareness and healthy habits, <i>Staying Healthy with COPD</i>. Available in English, Spanish, and French.

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Goal	Suggested Strategies or Resources
<p>Ensure patients are STARTED on the right inhalers for their disease severity.</p> <p><i>Continued...</i></p>	<ul style="list-style-type: none"> • Group A: <i>Patients with CAT score <10, with ≤1 exacerbation, and no COPD-related hospitalizations per year.</i>⁴ <ul style="list-style-type: none"> ○ Provide a short- or long-acting bronchodilator (e.g., albuterol, ipratropium, salmeterol, tiotropium).⁴ <ul style="list-style-type: none"> ▪ Start with a short-acting bronchodilator, used as needed (e.g., albuterol, ipratropium [may consider albuterol over ipratropium due to cost]).^{18,20,21} ▪ A long-acting bronchodilator can be ADDED for patients with more persistent symptoms (e.g., aclidinium, glycopyrrolate, tiotropium, umeclidinium).^{18,20,21} <ul style="list-style-type: none"> • Tiotropium may improve lung function and reduce exacerbations that require antibiotics or systemic steroids, but has NOT been shown to reduce hospitalizations [Evidence Level A-1].¹⁹ • Short-acting bronchodilators, scheduled or as needed, have not been shown to reduce exacerbations (e.g., albuterol, albuterol/ipratropium, ipratropium).⁴ • Group B: <i>Patients with CAT score ≥10, with ≤1 exacerbation, and no COPD-related hospitalizations per year.</i>⁴ <ul style="list-style-type: none"> ○ Ensure patients are on at least one long-acting bronchodilator (e.g., LABA [salmeterol], LAMA [tiotropium]).⁴ <ul style="list-style-type: none"> ▪ Two long-acting bronchodilators can be used (e.g., LABA/LAMA) if symptoms improve compared to using a single long-acting bronchodilator.⁴ • Group C: <i>Patients with CAT score <10, with ≥2 exacerbations or ≥1 COPD-related hospitalization per year.</i>⁴ <ul style="list-style-type: none"> ○ Ensure patients are on at least one long-acting bronchodilator. LAMAs are preferred over LABAs if only one long-acting bronchodilator is used.^{4,10,21} <ul style="list-style-type: none"> ▪ Two long-acting bronchodilators can be used (e.g., LABA/LAMA) if symptoms improve compared to using a single long-acting bronchodilator.^{4,21} • Group D: <i>Patients with CAT score ≥10, with ≥2 exacerbations or ≥1 COPD-related hospitalization per year.</i>⁴ <ul style="list-style-type: none"> ○ Ensure patients are on TWO long-acting medications. <ul style="list-style-type: none"> ▪ Two long-acting bronchodilators (e.g., LABA/LAMA) are preferred over a LABA with an ICS due to a reduced risk of exacerbations with LABA/LAMA and increased risk for pneumonia with ICS use.⁴ ▪ LABA with an ICS may be preferred in patients with eosinophil counts of about 4% (300 cells/mcL [0.3 x 10⁹ cells/L]) or higher [Evidence Level B-3] or in patients with asthma symptoms.^{4,21,22} Steroids may not be beneficial for patients with baseline eosinophil counts less than about 2% (100 cells/mcL).²⁵ ○ Reserve ICSs for more severe disease (e.g., CAT ≥20) in patients already receiving a LABA/LAMA with frequent exacerbations, patients with eosinophil counts of about 4% (300 cells/mcL [0.3 x 10⁹ cells/L]) or higher, or patients with asthma, due to increased risk of pneumonia and possibly fractures.⁴ <ul style="list-style-type: none"> ▪ Don't use eosinophil counts to determine when to stop ICS. Discontinue ICS if improvement is not seen after added, due to increased risk of pneumonia with use and a lack of harm with discontinuation (ICS can be stopped abruptly; no need to taper).^{4,23,24} • Use short-acting, as-needed bronchodilators (e.g., albuterol [salbutamol in Canada] with or without ipratropium) for episodic symptoms.⁴ Note that levalbuterol is NOT more effective than albuterol.⁴

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Goal	Suggested Strategies or Resources
Right inhaler for disease severity, continued	<ul style="list-style-type: none"> ○ Combine agents from different classes (e.g., albuterol plus tiotropium) for more benefit and better tolerability.⁴ ○ Don't use the combination of tiotropium and ipratropium for most patients. In patients taking tiotropium, a short-acting beta-2 agonist may be a better choice than ipratropium for acute symptoms.¹¹ ○ Short-acting beta-2 agonists are still effective for episodic symptoms in patients already using a LABA.^{4,15} ● Get our chart, <i>Inhaled Medications for COPD</i>, for a list of inhalers, their role in stable disease, dosing frequency, and cost. ● Reserve nebulizers for patients who cannot achieve the same symptomatic benefit with an MDI (e.g., patients who cannot physically use an MDI; patients with low inspiratory flow rate).⁴
Ensure patients understand how to use their inhaler.	<ul style="list-style-type: none"> ● Stress adherence and daily use of controllers. ● For step-by-step instructions for different types of inhaler devices, links to instructional videos, information on how to obtain demo inhalers, and guidance on priming and cleaning the devices, see our chart, <i>Correct Use of Inhalers</i> (U.S. Subscribers); (Canadian Subscribers). Detailed information for use and care of inhalers is found in their product labeling and patient information leaflet. ● Give patients our patient handout, <i>Tips for Correct Use of Inhalers</i>. Available in English, Spanish, and French. ● Consider a <u>spacer</u> for patients using MDIs. Use our patient education handout, <i>Using A Spacer Device</i>. Available in English, Spanish, and French. ● Review inhaler technique at all visits, including at the time of discharge from the hospital or emergency department.⁴ In the U.S., the CPT code 94664 can be used to bill for teaching patients correct inhaler technique. ● Become familiar with resources for inhaler teaching available at your practice site. To help educate your patients see the videos from VUCA Health, "<i>Video Resources to Improve Patient Care.</i>" (U.S.). ● Pharmacists can get our technician tutorial, <i>Dispensing Inhaled Medications</i>, which covers ways technicians can assist the pharmacist in helping patients get the most out of their inhaled medications, such as by identifying patients getting frequent or early refills. ● Keep patients on MDIs in the hospital; nebulizer use in the hospital is a missed opportunity for MDI teaching.
Help patients stay on their medications.	<ul style="list-style-type: none"> ● See our toolbox, <i>Medication Adherence Strategies</i>, for ways to improve adherence including smartphone apps. ● Provide our patient education handout, <i>Tips for Sticking With Your Meds</i>, to encourage adherence. ● Encourage patients to seek refills, if needed, in advance of weekends and holidays so they don't run out of medication. ● U.S. subscribers can use our chart, <i>Guide for Helping Patients Afford Their Medications</i>, if cost is a barrier to adherence.

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Goal	Suggested Strategies or Resources
Identify need for treatment modification.	<ul style="list-style-type: none"> • Perform spirometry at least yearly.⁴ • Perform physical exam and ask about symptoms at each visit.⁴ <ul style="list-style-type: none"> ○ Patient questionnaires such as the COPD Assessment Test (CAT) at http://www.catestonline.org can be completed every two to three months to identify trends.⁴ ○ To determine if a new treatment is improving the patient's symptoms, ask:⁴ <ul style="list-style-type: none"> ▪ Are you less breathless? ▪ Can you do more? ▪ Can you sleep better? ▪ What difference has it made to you? Is the change worthwhile?
Provide additional COPD medications when appropriate.	<ul style="list-style-type: none"> • Provide supplemental oxygen for at least 15 h/day for patients who qualify to improve survival.⁴ • Consider adding roflumilast (<i>Daliresp</i> [U.S.], <i>Daxas</i> [Canada]) to optimized inhaler therapy to reduce recurrent exacerbations in patients with chronic bronchitis symptoms and severe to very severe COPD.^{4,21} <ul style="list-style-type: none"> ○ The NNT to prevent one hospitalization is 24 patients for one year.¹⁴ ○ Does not reduce mortality¹⁴ or improve quality of life or symptoms.⁸ ○ CYP3A4 inhibitors may increase side effects.^{5,9} ○ Do not combine with theophylline; mechanisms are similar.⁴ ○ About 1 in 20 patients will lose >10% of body weight.⁹ ○ About 1 in 38 patients will have psychiatric side effects (e.g., anxiety, depression, insomnia).⁹ ○ About 1 in 20 patients will stop treatment, usually due to gastrointestinal side effects (e.g., diarrhea, nausea).⁹ • Regular use of mucolytics (e.g., acetylcysteine) may reduce exacerbations in patients NOT receiving ICSs.⁴ • Prophylactic antibiotic use (e.g., azithromycin, erythromycin) may reduce frequency of exacerbations.⁴ <ul style="list-style-type: none"> ○ Consider daily azithromycin to prevent COPD exacerbations in former smokers using two long-acting bronchodilators (e.g., LABA and LAMA) with an ICS still having frequent exacerbations or patients who require supplemental oxygen.⁴
Control chronic comorbidities. <i>Continued...</i>	<p>Asthma</p> <ul style="list-style-type: none"> • Asthma and COPD are different conditions, but may share some common traits and clinical features (e.g., eosinophilia, some degree of reversibility).⁴ If an asthma diagnosis is suspected in a patient who has COPD, medications should primarily be prescribed based on guidelines for treating asthma.⁴ • Dose asthma medications correctly. Use our toolbox, <i>Improving Asthma Care</i>, and get our chart, <i>Comparison of Inhaled Asthma Meds</i> (U.S. Subscribers); (Canadian Subscribers), for help. • Access the National Heart, Lung, and Blood Institute's National Asthma Education and Prevention Program at https://www.nhlbi.nih.gov/files/docs/guidelines/asthgdln.pdf. • Canadian asthma guidelines are available from the Canadian Thoracic Society at https://cts-sct.ca/guideline-library/.

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Goal	Suggested Strategies or Resources
<p>Chronic comorbidities, continued</p>	<p>Diabetes</p> <ul style="list-style-type: none"> • Diabetes is common among patients with COPD and may be associated with a poor COPD prognosis.⁴ • American Diabetes Association Standards of Medical Care are available at https://care.diabetesjournals.org/content/42/Supplement_1. • Canadian diabetes guidelines are available at http://guidelines.diabetes.ca/. • Canadian subscribers can get our algorithm, <i>Stepwise Treatment of Type 2 Diabetes</i>. • U.S. subscribers, get our chart, <i>Drugs for Type 2 Diabetes</i>. • Get our algorithm, <i>Initiation and Adjustment of Insulin Regimens for Type 2 Diabetes</i> (U.S. Subscribers); (Canadian Subscribers). • Get our chart, <i>Comparison of Insulins and Injectable Diabetes Meds</i> (U.S. Subscribers); (Canadian Subscribers). <p>Gastroesophageal Reflux Disease (GERD)</p> <ul style="list-style-type: none"> • GERD is an independent risk factor for COPD exacerbations.⁴ • U.S. GERD guidelines are available from the American College of Gastroenterology at https://journals.lww.com/ajg/Fulltext/2013/03000/Guidelines_for_the_Diagnosis_and_Management_of.6.aspx. • Canadian guidelines are available from the Canadian Association of Gastroenterology Consensus Group at https://www.cag-acg.org/images/publications/GERD_Consensus_Update_2004.pdf. <p>Heart Failure</p> <ul style="list-style-type: none"> • There is no evidence to show heart failure should be treated differently in patients with COPD.⁴ • Use a beta-blocker when indicated to improve cardiovascular outcomes. Choose a cardioselective agent, start with a low dose, and monitor for worsening COPD.^{16,17} • Get our toolbox, <i>Improving Heart Failure Care</i>, for links to guidelines and other helpful tools. <p>Osteoporosis</p> <ul style="list-style-type: none"> • Reduced bone mineral density and fractures are more common in patients with COPD, even after adjusting for age, smoking history, steroid use, and frequency of exacerbations.⁴ • U.S. osteoporosis guidelines are available from the American Association of Clinical Endocrinologists and the American College of Endocrinology at https://journals.aace.com/doi/pdf/10.4158/EP161435.GL. • Canadian guidelines from Osteoporosis Canada contain details on medication availability within each province: http://www.osteoporosis.ca/multimedia/pdf/Osteoporosis_Guidelines_2010_Background_And_Technical_Report.pdf. • See our chart, <i>Managing Osteoporosis: Screening, Treatment, and More</i>, for numbers needed to treat and dosing considerations.

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Goal	Suggested Strategies or Resources
Empower patients for self-care.	<ul style="list-style-type: none"> • Get the customizable <i>My COPD Action Plan</i> from the American Lung Association at http://www.lung.org/lung-disease/copd/awareness/copd-action-plan-generic.pdf. Delineates green, yellow, and red zone symptoms, facilitating early intervention. Helps differentiate symptoms that require a call to the provider (e.g., more breathless than usual, sputum change) vs emergency medical attention (e.g., severe dyspnea, mental status change). • The Canadian Lung Association’s <i>Managing COPD</i> handout includes a customizable action plan. It is available at https://www.lung.ca/lung-health/lung-disease/chronic-obstructive-pulmonary-disease-copd/resources. This handout provides general self-management tips and delineates symptoms that require a call to the provider vs emergency medical attention.
Ensure appropriate pharmacotherapy for treatment of exacerbations in the outpatient setting.	<p>Optimize short-acting inhalers</p> <ul style="list-style-type: none"> • Use short-acting, as-needed bronchodilators (e.g., albuterol [salbutamol in Canada] with or without ipratropium) for episodic symptoms.⁴ <ul style="list-style-type: none"> ○ Don’t use the combination of tiotropium and ipratropium for most patients. In patients taking tiotropium, a short-acting beta-2 agonist may be a better choice than ipratropium for acute symptoms.¹¹ ○ Short-acting beta-2 agonists are still effective for episodic symptoms in patients already using a LABA.^{4,15} • Increase dose and/or frequency.⁴ <ul style="list-style-type: none"> ○ Albuterol (salbutamol [Canada]) max dose: six to eight puffs (MDI with spacer) or unit dose nebulizer solution every 30 minutes to two hours.¹² ○ Ipratropium max dose: six to eight puffs (MDI with spacer) every three to four hours or nebulizer solution 0.5 mg every four to eight hours.¹² • Consider spacer or nebulizer to maximize medication delivery.⁴ <p>Prescribe Corticosteroids for COPD Exacerbation</p> <ul style="list-style-type: none"> • Prednisone 40 mg once daily for five days is reasonable.⁴ • Get our toolbox, <i>Corticosteroids: Selection, Tapering, and More</i>, for answers to common clinical questions about these agents. <p>Prescribe a five- to seven-day course of antibiotics for an increase in dyspnea, increase in sputum purulence, and increased sputum volume (or two of the three symptoms if increased sputum purulence is one of the symptoms), or if mechanical ventilation is required.⁴ Shorter antibiotic courses (e.g., <5 days) may be appropriate for mild exacerbations.</p> <ul style="list-style-type: none"> • Take into account local resistance patterns, patient history, and disease severity.^{4,13} Oral antibiotic choices include:^{4,6} <ul style="list-style-type: none"> ○ Typical empiric therapy (also see footnote “a”):⁴

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Goal	Suggested Strategies or Resources
Outpatient exacerbations, continued	<ul style="list-style-type: none"> ▪ Amoxicillin/clavulanic acid (e.g., 875/125 mg BID, 500/125 mg q8h, 2000/125 mg BID [U.S. only]).⁶ ▪ Macrolide (e.g., azithromycin 500 mg x 1, then 250 mg q24h x 4 days; or 500 mg q24h x 3 days).⁶ <ul style="list-style-type: none"> • For a review of the role of macrolides in respiratory infections and in light of increasing macrolide-resistant <i>Streptococcus pneumoniae</i>, see our commentary, <i>Should Macrolides Be Used for Respiratory Tract Infections?</i> ▪ Doxycycline 100 mg BID.⁶
Triage patients for possible hospital admission.	<ul style="list-style-type: none"> • Potential indications for hospital treatment:⁴ <ul style="list-style-type: none"> ○ acute respiratory failure ○ history of severe COPD or frequent exacerbations ○ insufficient support at home ○ new symptoms (e.g., cyanosis, peripheral edema) ○ significant increase in symptom severity (e.g., sudden resting dyspnea, high respiratory rate) ○ serious medical comorbidity (e.g., heart failure, new arrhythmias) ○ worsening or no change in symptoms despite recommended treatment
Ensure appropriate pharmacotherapy for inpatient treatment of exacerbations.	<p>Provide supplemental oxygen⁴</p> <p>Optimize short-acting inhalers¹³</p> <ul style="list-style-type: none"> • Use short-acting, as-needed bronchodilators (e.g., albuterol [salbutamol in Canada] with or without ipratropium) for episodic symptoms for patients with more than mild disease.⁴ <ul style="list-style-type: none"> ○ Albuterol (salbutamol [Canada]) max dose: six to eight puffs (MDI with spacer) or unit dose nebulizer solution every 30 minutes to two hours.¹² <ul style="list-style-type: none"> ▪ Short-acting beta-2 agonists are still effective for episodic symptoms in patients already using a LABA.^{4,15} ○ Ipratropium max dose: six to eight puffs (MDI with spacer) every three to four hours or nebulizer solution 0.5 mg every four to eight hours.¹² <ul style="list-style-type: none"> ▪ Don't use the combination of tiotropium and ipratropium for most patients. In patients taking tiotropium, a short-acting beta-2 agonist may be a better choice than ipratropium for acute symptoms.¹¹ • Use MDI with spacer¹³ or nebulizer.⁴ Consider MDI if on ventilator.¹³ <p>Prescribe Corticosteroids for COPD Exacerbation</p> <ul style="list-style-type: none"> • Prednisone 40 mg once daily for five days is reasonable.⁴ Give the equivalent dose using an intravenous corticosteroid if the patient cannot take oral medications.¹³ • Get our toolbox, <i>Corticosteroids: Selection, Tapering, and More</i>, for answers to common clinical questions about these agents.

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Goal	Suggested Strategies or Resources
<p>Inpatient exacerbations, continued</p>	<p>Prescribe a five- to seven-day course of antibiotics for an increase in dyspnea, increase in sputum purulence, and increased sputum volume (or two of the three symptoms if increased sputum purulence is one of the symptoms).⁴ Antibiotics should also be used in patients who require mechanical ventilation or intensive care.^{4,13}</p> <ul style="list-style-type: none"> • Use cultures to guide antibiotic selection in patients with frequent exacerbations, severe airflow obstruction, or need for mechanical ventilation.⁴ • Use oral antibiotics when possible.⁴ (See oral antibiotic choices above in treating exacerbations as an outpatient.) <p>Consider aminophylline or theophylline if there is inadequate response to bronchodilators.⁴</p> <ul style="list-style-type: none"> • Benefits are modest and inconsistent.⁴ Routine use of methylxanthines is not recommended due to potential for side effects (e.g., arrhythmias, seizures).⁴ <p>Maximize long-acting inhalers for maintenance use.⁴</p> <ul style="list-style-type: none"> ○ LAMAs are preferred over LABAs if only one long-acting bronchodilator is used.^{4,10} ○ Consider adding a LABA to a LAMA, if not already on one.¹³ ○ Consider triple therapy (i.e., LAMA/LABA/ICS) for hospitalized, adherent patients to reduce the risk of moderate to severe COPD exacerbations compared to dual therapy [Evidence Level A-1], especially for patients with eosinophil counts >2% (100 cells/mcL [0.1 x 10⁹ cells/L]).^{4,26}
<p>Prepare for “dyspnea crisis” (overwhelming respiratory distress in advanced COPD).</p>	<ul style="list-style-type: none"> • Facilitate end-of-life planning (e.g., written advance directives, communication with family and caregivers about preferences).^{4,7} Consider hospice.⁴ • Prepare a written dyspnea management plan that goes with the patient through transitions of care.⁷ <ul style="list-style-type: none"> ○ Use the COMFORT mnemonic to help prepare the plan: C = Call for help and remain calm; O = Observe and assess dyspnea and environmental factors; M = Medications (e.g., opioids); F = Fan to face; O = Oxygen; R = Reassurance and relaxation techniques; T = Timing of interventions to reduce dyspnea.
<p>Prevent avoidable hospital readmissions.</p>	<ul style="list-style-type: none"> • See our toolbox, <i>Reducing Hospital Readmissions</i>, for strategies and resources to keep “frequent fliers” grounded. • Communicate with the patient within two days of discharge, and see them back within a week. • Ensure patients finish any remaining prednisone or antibiotic doses at home. • Ensure controller MDI is started/restarted at discharge, and that patient understands it is for scheduled use. • Ensure patients have a short-acting bronchodilator. • Provide a written action plan and assess understanding of treatment regimen and proper inhaler technique.⁴ • Ensure patient’s chronic illnesses are tuned up.⁴ • Encourage activity. Refer to pulmonary rehab soon after hospitalization.⁴ • Address depression, anxiety, social issues, and ability for self-care.⁴

a. Adult oral dosing assuming normal renal/hepatic function. May differ from product labeling. Most available generically, at lower cost.

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Users of this resource are cautioned to use their own professional judgment and consult any other necessary or appropriate sources prior to making clinical judgments based on the content of this document. Our editors have researched the information with input from experts, government agencies, and national organizations. Information and internet links in this article were current as of the date of publication.

Levels of Evidence

In accordance with our goal of providing Evidence-Based information, we are citing the **LEVEL OF EVIDENCE** for the clinical recommendations we publish.

Level	Definition	Study Quality
A	Good-quality patient-oriented evidence.*	<ol style="list-style-type: none"> 1. High-quality RCT 2. SR/Meta-analysis of RCTs with consistent findings 3. All-or-none study
B	Inconsistent or limited-quality patient-oriented evidence.*	<ol style="list-style-type: none"> 1. Lower-quality RCT 2. SR/Meta-analysis with low-quality clinical trials or of studies with inconsistent findings 3. Cohort study 4. Case control study
C	Consensus; usual practice; expert opinion; disease-oriented evidence (e.g., physiologic or surrogate endpoints); case series for studies of diagnosis, treatment, prevention, or screening.	

***Outcomes that matter to patients** (e.g., morbidity, mortality, symptom improvement, quality of life).

RCT = randomized controlled trial; **SR** = systematic review

[Adapted from Ebell MH, Siwek J, Weiss BD, et al. Strength of Recommendation Taxonomy (SORT): a patient-centered approach to grading evidence in the medical literature. *Am Fam Physician* 2004;69:548-56. <http://www.aafp.org/afp/2004/0201/p548.pdf>.]

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April 2019 ~ Resource #350407

Inhaled Medications for COPD

The goals of COPD treatment are to reduce symptoms and to decrease the risk and severity of future exacerbations.¹ COPD risk factors (e.g., occupational exposures, air pollution, etc) should be reduced when possible, the most important being smoking cessation.¹ There are several different inhalation devices and nebulizers available for the treatment of COPD. Inhalation delivery appears to be equal between devices, so the choice will depend on availability, cost, as well as the patient's preference and ability to operate the devices properly.¹ Nebulizers may be easier to use in sicker patients. Note that some nebulizer solutions can be used with standard nebulizers (e.g., *Yupelri*) while others require a special nebulizer (e.g., *Lonhala Magnair*).² Appropriate instruction on inhalation technique is very important. Technique should always be assessed prior to determining efficacy of therapy.¹ The following table lists inhalation therapy indicated for the treatment of COPD and their role in therapy of **stable** disease.

Medication ^c	Dosing Frequency ^a	Cost ^b
Short-Acting Bronchodilators		
As-needed, for occasional symptoms. ¹ Can combine beta-2 agonists and ipratropium to improve efficacy and/or limit side effects. ^{1,3} A long-acting bronchodilator (LABA or LAMA) is preferred to regular use of short-acting bronchodilator [Evidence Level A-1]. ¹ However, regular use of short-acting bronchodilators does improve symptoms and FEV1 in patients with COPD. ¹ Note that these agents are also available as nebulizer solutions which may be less expensive but may be more inconvenient to use.		
Beta-2 Agonist Inhalers	Every four to six hours as needed. ^{2,a}	U.S.: \$36/200 doses Canada: \$6/200 doses
Albuterol (also called Salbutamol) (U.S.: <i>ProAir HFA</i> , <i>ProAir RespiClick</i> , <i>Proventil HFA</i> , <i>Ventolin HFA</i> , generics Canada: <i>Airomir</i> , <i>Ventolin Diskus</i> , <i>Ventolin HFA</i> , generics)		
Levalbuterol (U.S. only) (<i>Xopenex HFA</i> , generics)		U.S.: \$59/200 doses
Terbutaline (Canada only) (<i>Bricanyl Turbuhaler</i>)		Canada: \$9/100 doses
Anticholinergic (Maintenance)	U.S. MDI: Four times daily Canada MDI: Three to four times daily Nebulizer: Every six to eight hours	U.S.: MDI \$388/200 doses; Neb: \$22/120 doses Canada: MDI \$21/200 doses; Neb: \$171/120 doses
Ipratropium (<i>Atrovent HFA</i> ; nebulizer solution)		
Combination Beta-2 Agonist/ Anticholinergic: Can use this combination to improve efficacy and/or limit adverse effects. ¹		
Albuterol/Ipratropium (<i>Combivent Respimat</i> ; nebulizer solution)	MDI: Four times daily (in place of long-acting bronchodilator), and/or as needed. ^{2,a} U.S. Neb: Same as MDI above ² Canada Neb: Three to four times daily	U.S.: MDI \$402/120 doses; Neb: \$73/120 doses Canada: MDI \$32/120 doses; Neb: \$172/120 doses

More...

Medication ^c	Dosing Frequency ^a	Cost ^b
Long-Acting Bronchodilators		
Long-Acting Beta-2 Agonists (LABAs) and Long-Acting Muscarinic Antagonists (LAMAs): First-line option for patients with persistent symptoms despite use of a short-acting bronchodilator. ¹ Therapy can start with one or two long-acting bronchodilators (depending on severity of symptoms and exacerbations). ¹ Add a LAMA to a LABA (or vice versa) if one does not control symptoms. ¹ LAMAs are superior to LABAs in preventing exacerbations [Evidence Level A-1] and possibly hospitalizations [Evidence Level B-1], so may be preferred in patients with two or more exacerbations or at least one hospitalization in the last year. ^{1,3}		
Long-Acting Beta-2 Agonists (LABAs)		
Arformoterol (U.S. only) (<i>Brovana</i> nebulizer solution)	Twice daily	U.S.: \$1,030
Formoterol (<i>Perforomist</i> nebulizer solution [U.S.], <i>Foradil</i> [Canada])	Twice daily	U.S.: \$972 Canada: \$57
Indacaterol (<i>Arcapta Neohaler</i> [U.S.], <i>Onbrez Breezhaler</i> [Canada])	Once daily	U.S.: \$235 Canada: \$50
Olodaterol (<i>Striverdi Respimat</i>)	Once daily	U.S.: \$212 Canada: Approved but not marketed at time of publication.
Salmeterol (<i>Serevent Diskus</i>)	Twice daily	U.S.: \$388 Canada: \$63
Long-Acting Muscarinic Antagonists (LAMAs)		
Aclidinium (<i>Tudorza Pressair</i> [U.S.], <i>Tudorza Genuair</i> [Canada])	Twice daily	U.S.: \$352 Canada: \$57
Glycopyrrolate (also called Glycopyrronium) (<i>Seebri Neohaler</i> , <i>Lonhala Magnair</i> nebulizer solution [U.S.], <i>Seebri Breezhaler</i> [Canada])	U.S.: Twice daily Canada: Once daily	U.S.: <i>Seebri Neohaler</i> \$394; <i>Lonhala Magnair</i> \$1,133 Canada: <i>Seebri Breezhaler</i> \$57
Revefenacin (U.S. only) (<i>Yupelri</i> nebulizer solution)	Once daily	U.S.: \$1,030
Tiotropium (<i>Spiriva HandiHaler</i> , <i>Spiriva Respimat</i>)	Once daily	U.S.: \$429 (<i>HandiHaler/Respimat</i>) Canada: \$57 (<i>HandiHaler/Respimat</i>)
Umeclidinium (<i>Incruse Ellipta</i>)	Once daily	U.S.: \$334 Canada: \$54

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Medication ^c	Dosing Frequency ^a	Cost ^b
Long-Acting Bronchodilators, continued		
Combination LABA/LAMA		
Formoterol/Aclidinium (<i>Duaklir Pressair</i> [U.S.], <i>Duaklir Genuair</i> [Canada])	Twice daily	U.S.: \$995 Canada: \$65
Formoterol/Glycopyrrolate (<i>Bevespi Aerosphere</i>)	Twice daily	U.S.: \$365 Canada: Approved but not marketed at time of publication.
Indacaterol/Glycopyrrolate (<i>Utibron Neohaler</i> [U.S.], <i>Ultibro Breezhaler</i> [Canada])	U.S.: Twice daily Canada: Once daily	U.S.: \$367 Canada: \$85
Olodaterol/Tiotropium (<i>Stiolto Respimat</i> [U.S.], <i>Inspiroto Respimat</i> [Canada])	Once daily	U.S.: \$398 Canada: \$67
Vilanterol/Umeclidinium (<i>Anoro Ellipta</i>)	Once daily	U.S.: \$410 Canada: \$89
Combination LABA/ICS: Consider when exacerbations continue despite appropriate long-acting bronchodilator therapy. ¹ Patients with blood eosinophil counts of about 2% (100 cells/mcL [0.1 x 10 ⁹ cells/L]) or more have been shown to have benefit with the addition of an ICS [Evidence Level B-2]. ^{1,4} Patients with eosinophil counts of less than about 2% (100 cells/mcL [0.1 x 10 ⁹ cells/L]) may not benefit from ICS. May be used first-line in patients with blood eosinophil counts of about 4% (300 cells/mcL [0.3 x 10 ⁹ cells/L]) or more, or in patients who also have asthma. ¹ Can combine with LAMA. ¹ Chronic ICS use increases pneumonia risk in patients with severe COPD. ¹		
Formoterol/Budesonide (<i>Symbicort</i> [U.S.], <i>Symbicort Turbuhaler</i> [Canada])	Twice daily	U.S.: \$347 Canada: \$95
Salmeterol/Fluticasone propionate (<i>Advair Diskus</i> , <i>Wixela Inhub</i> [U.S. only], generic [U.S. only]) *Strengths approved for COPD: ^a U.S.: 250/50 Canada: 250/50 and 500/50	Twice daily	U.S.: <i>Advair Diskus</i> \$394; <i>Wixela Inhub</i> \$116; generic \$354 Canada: \$155
Vilanterol/Fluticasone furoate (<i>Breo Ellipta*</i>) *Only the 100/25 mcg strength is approved for COPD. ^a	Once daily	U.S.: \$351 Canada: \$91

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Medication ^c	Dosing Frequency ^a	Cost ^b
Long-Acting Bronchodilators, continued		
Combination ICS/LAMA/LABA: Consider for patients with severe or very severe COPD with continued exacerbations despite use of LABA and LAMA or LABA/ICS. ¹		
Fluticasone furoate/Umeclidinium/Vilanterol (<i>Trelegy Ellipta</i>)	Once daily	U.S.: \$546 Canada: \$143

Abbreviations: COPD = chronic obstructive pulmonary disease; ICS = inhaled corticosteroid; LABA = long-acting beta-2 agonist; LAMA = long-acting muscarinic antagonist (or anticholinergic); MDI = metered-dose inhaler; Neb = nebulizer solution.

- a. **Information from product labeling unless otherwise indicated:** *Airomir* Canada (October 2017); *Atrovent HFA* (August 2012); *Atrovent HFA* Canada (February 2016); Ipratropium nebulizer solution (Actavis; April 2017); Ipratropium nebulizer solution Canada (Pharmascience; May 2017); *Bricanyl Turbuhaler* Canada (January 2018); *Combivent Respimat* Canada (June 2016); *Combivent UDV* Canada (November 2015); *Brovana* (February 2014); *Perforomist* (October 2018); *Foradil* Canada (May 2013); *Arcapta Neohaler* (March 2017); *Onbrez Breezhaler* Canada (January 2015); *Striverdi Respimat* (April 2018); *Striverdi Respimat* Canada (July 2016); *Serevent Diskus* (December 2018); *Serevent Diskus* Canada (January 2017); *Tudorza Pressair* (November 2018); *Tudorza Genuair* Canada (June 2018); *Seebri Neohaler* (January 2017); *Lonhala Magnair* (January 2018); *Seebri Breezhaler* Canada (September 2016); *Yupelri* (November 2018); *Spiriva Handihaler* (February 2018); *Spiriva Respimat* (February 2019); *Spiriva Handihaler* Canada (November 2017); *Spiriva Respimat* Canada (June 2016); *Incruse Ellipta* (October 2017); *Incruse Ellipta* Canada (July 2017); *Duaklir Pressair* (March 2019); *Duaklir Genuair* Canada (June 2018); *Bevespi Aerosphere* (August 2017); *Utibron Neohaler* (January 2017); *Ultibro Breezhaler* Canada (January 2018); *Stiolto Respimat* (October 2018); *Inspiolto Respimat* Canada (June 2018); *Anoro Ellipta* (October 2017); *Anoro Ellipta* Canada (August 2017); *Symbicort* (December 2017); *Symbicort Turbuhaler* Canada (October 2016); *Advair Diskus* (January 2019); *Advair Diskus* Canada (October 2018); *Breo Ellipta* (January 2019); *Breo Ellipta* Canada (January 2019); *Trelegy Ellipta* (January 2019); *Trelegy Ellipta* Canada (October 2018).
- b. Pricing based on wholesale acquisition cost (WAC) for an MDI or 30-day supply of highest strength, of generic if available. U.S. medication pricing by Elsevier, accessed March 2019.
- c. The only long-acting inhalation therapies included are specifically approved for treatment of COPD.

Users of this resource are cautioned to use their own professional judgment and consult any other necessary or appropriate sources prior to making clinical judgments based on the content of this document. Our editors have researched the information with input from experts, government agencies, and national organizations. Information and internet links in this article were current as of the date of publication.

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Levels of Evidence

In accordance with our goal of providing Evidence-Based information, we are citing the **LEVEL OF EVIDENCE** for the clinical recommendations we publish.

Level	Definition	Study Quality
A	Good-quality patient-oriented evidence.*	1. High-quality RCT 2. SR/Meta-analysis of RCTs with consistent findings 3. All-or-none study
B	Inconsistent or limited-quality patient-oriented evidence.*	1. Lower-quality RCT 2. SR/Meta-analysis with low-quality clinical trials or of studies with inconsistent findings 3. Cohort study 4. Case control study
C	Consensus; usual practice; expert opinion; disease-oriented evidence (e.g., physiologic or surrogate endpoints); case series for studies of diagnosis, treatment, prevention, or screening.	



*Outcomes that matter to patients (e.g., morbidity, mortality, symptom improvement, quality of life).

RCT = randomized controlled trial; SR = systematic review [Adapted from Ebell MH, Siwek J, Weiss BD, et al. Strength of Recommendation Taxonomy (SORT): a patient-centered approach to grading evidence in the medical literature. *Am Fam Physician* 2004;69:548-56. <http://www.aafp.org/afp/2004/0201/p548.pdf>.]



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