COPD exacerbations: Prognosis, discharge planning, and prevention

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Literature review current through: **Jan 2024.**
This topic last updated: **Nov 06, 2023.**

INTRODUCTION

An exacerbation of chronic obstructive pulmonary disease (COPD) is defined as "an event characterized by dyspnea and/or cough and sputum that worsens over ≤14 days, which may be accompanied by tachypnea and/or tachycardia and is often associated with increased local and systemic inflammation caused by airway infection, pollution, or other insult to the airways" by the Global Initiative for Chronic Obstructive Lung Disease (GOLD), a report produced by the National Heart, Lung, and Blood Institute (NHLBI) and the World Health Organization (WHO) [1,2]. This generally includes an acute change in one or more of the following cardinal symptoms:

- Cough increases in frequency and severity
- Sputum production increases in volume and/or changes character
- Dyspnea increases

The prognosis after a COPD exacerbation and strategies for prevention of future exacerbations will be discussed here. The risk factors, clinical manifestations, diagnosis, and management of COPD exacerbations are discussed separately. (See "COPD exacerbations: Clinical manifestations and evaluation" and "COPD exacerbations: Management" and "Management of infection in exacerbations of chronic obstructive pulmonary disease".)

PROGNOSIS AFTER AN EXACERBATION

Exacerbations of COPD are associated with increased morbidity and mortality [1,3-5]. Individuals who have experienced a single moderate COPD exacerbation, compared with those without exacerbation, have an increased risk of respiratory and all-cause mortality (hazard ratios 2.98 [95% CI 1.14-7.83] and 1.34 [95% CI 0.79-2.29], respectively) [4].

A number of factors influence mortality following hospital discharge after an exacerbation of COPD, including older age, the severity of the underlying COPD, requirement for long-term oxygen at discharge, presence of comorbidities (eg, cardiovascular disease or lung cancer), and the presence of *Pseudomonas aeruginosa* in the patient's sputum, as described in the following studies [6-14]:

- For patients hospitalized with a COPD exacerbation, in-hospital mortality ranges from three to nine percent [12-14]. In a separate study of patients who required noninvasive ventilation, in-hospital mortality was 11 percent [15].
- In a study of 260 patients admitted with a COPD exacerbation, the one year mortality was 28 percent [9]. Independent risk factors for mortality were age, male sex, prior hospitalization for COPD, arterial tension of carbon dioxide ($PaCO_2$) ≥45 mmHg (6 kPa), and blood urea >8 mmol/L (BUN 22 mg/dL).
- Patients hospitalized for a COPD exacerbation who have *Pseudomonas aeruginosa* in their sputum have a higher risk of mortality at three years than those without (59 versus 35 percent; HR 2.33, 95% CI 1.29-3.86), independent of age, comorbidity, or COPD severity [10].

Even if the COPD exacerbation resolves, many patients never return to their baseline level of health [5].

COMPREHENSIVE DISCHARGE PLANNING

For patients who have required hospitalization for a COPD exacerbation, formal criteria for discharge and a comprehensive discharge plan may help to reduce readmissions and recurrent exacerbations, although supportive data are mixed [1,16-18]. Nonetheless, the following discharge planning steps appear sensible and are consistent with the Global Initiative for Chronic Obstructive Lung Disease (GOLD) strategy [1]. (See "Hospital discharge and readmission".)

Criteria for discharge — Criteria for discharge generally depend on sufficient improvement in the manifestations of COPD such that the patient's condition has stabilized, and frequent nebulizer treatments are no longer required. If the patient is near their prehospital baseline, discharge to home is likely appropriate. However, some patients no longer require hospital-level care but are unable to manage at home due to frailty or severe exercise intolerance; for these patients, a period of inpatient rehabilitation may be more suitable. Patients requiring nocturnal noninvasive ventilation may benefit from a rehabilitation hospital stay. (See "Hospital discharge and readmission", section on 'Determining the post-discharge site of care'.)

When deciding whether a patient can be discharged to home, the patient's ability to manage activities of daily living (ADLs) at home should be assessed along with the need for assistive devices such as a walker, elevated toilet seat, bedside commode, or shower chair. (See "Comprehensive geriatric assessment", section on 'Activities of daily living'.)

Discharge to home checklist — A number of issues pertaining to COPD exacerbations in particular and hospitalizations in general must be assessed as part of discharge planning, such as: the transition from hospital to home (eg, oxygen en route, stairs to climb), the patient's ability to obtain and self-administer medications, meal preparation and self-feeding, and the need for visiting nurse, in-home services, and hospice.

A checklist can ensure that important steps to enable a smooth transition to home are not overlooked. Checklists may be general (table 1) or specific to COPD (form 1). Components that are thought to improve discharge success include the following [1]:

- Explain diagnosis and planned postdischarge therapy with patient/caregiver; ensure understanding and agreement with the regimen
- Review with patient the technique(s) of all inhaler devices that will be used at discharge and assess their technique
- Review management plans for comorbidities (eg, heart failure, coronary heart disease, arrhythmia, lung cancer screening, sleep-related breathing disorders, metabolic syndrome, anxiety, depression)
- Ensure that patient understands written and verbal directions for withdrawal of acute medications (eg, antibiotics, systemic glucocorticoids) used to treat exacerbation
- Confirm that patient has received appropriate vaccinations for seasonal influenza, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), and *S. pneumococcus* (See "Pneumococcal vaccination in adults" and "Standard immunizations for children and adolescents: Overview".)
- Provide smoking cessation education and medication to patients who smoke

- Assess need for supplemental oxygen and prescribe if indicated; ensure that supplemental oxygen will be available for transfer to home and in the home before the patient arrives
- Assess need for home nebulizer treatments and arrange for nebulizer if needed
- Arrange for out-patient pulmonary rehabilitation program, as appropriate
- Advise patient regarding any pending test results or planned follow-up testing (eg, lung cancer screening)
- Confirm follow-up visits at approximately one and four weeks, and as indicated

Patients who have a new prescription for long-term oxygen typically need additional instruction on the use of oxygen delivery systems (eg, tanks, concentrators, portable systems) and safe practices regarding oxygen tubing as a tripping hazard and avoiding exposure to open flames (see "Long-term supplemental oxygen therapy" and "Portable oxygen delivery and oxygen conserving devices"). Such patients should be reassessed two to three months after discharge regarding whether supplemental oxygen is still needed and, if so, at what dose.

Palliative care planning — The disease trajectory in COPD is heterogenous and ranges from gradual worsening of exercise tolerance and oxygenation to a sudden and unanticipated end-of-life. Given the difficulties in predicting the clinical course, an exacerbation requiring hospitalization, particularly one requiring intensive care, creates an opportunity to discuss a palliative care consultation. Criteria for considering a palliative care referral are listed in the table (table 2). (See "Palliative care for adults with nonmalignant chronic lung disease", section on 'What are the indications for a palliative care consultation?'.)

The primary care provider or pulmonary specialist can raise the possibility of a palliative care approach and obtain a palliative care consultation, if needed. Important components of palliative care include exploring the patient's understanding about their illness and prognosis, assessing and managing symptoms, discussing goals of care and advance care planning, coordinating care, and helping to plan end-of-life care, including determining the need and timing of hospice care (table 3). (See "Palliative care for adults with nonmalignant chronic lung disease".)

For patients with advanced COPD, it may be reasonable to discuss hospice care at home. Disease specific guidelines are listed in the table and discussed separately (table 4). (See "Palliative care for adults with nonmalignant chronic lung disease" and "Hospice: Philosophy of care and appropriate utilization in the United States".)

PREVENTION

General measures — Several measures can reduce the frequency of COPD exacerbations including the following [1,19-21]:

- Smoking cessation (see "Overview of smoking cessation management in adults")
- Proper use of medications (including inhaler technique) (table 5 and table 6 and table 7 and table 8) (see "The use of inhaler devices in adults")
- Vaccination against seasonal influenza (see "Seasonal influenza vaccination in adults")
- Vaccination against severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (see "COVID-19: Vaccines")
- Pneumococcal vaccination (figure 1) (see "Pneumococcal vaccination in adults")
- Vaccination against respiratory syncytial virus (suspected benefit, which will be revisited as data emerge) (see "Overview of preventive care in adults", section on 'Immunization')

Pulmonary rehabilitation — Pulmonary rehabilitation has a number of benefits; it significantly reduces future hospital admissions and mortality and improves exercise tolerance and quality of life, compared with usual community care [22]. After a COPD exacerbation, we encourage patients to participate in a pulmonary rehabilitation program, if they have not yet done so. The optimal timing for initiating pulmonary rehabilitation after a COPD exacerbation has not been determined and likely needs to be individualized; patients need to have recovered sufficiently to maximize the benefits of exercise training. (See "Pulmonary rehabilitation", section on 'Benefits' and "Pulmonary rehabilitation", section on 'Setting'.)

Physical activity — While pulmonary rehabilitation programs are preferred, if one is not available, physical activity (exercising two to three times per week for 30 minutes to a level that causes mild shortness of breath) may reduce hospitalizations for COPD exacerbations based on observational data [19]. Further study is needed on alternatives to pulmonary rehabilitation programs in under-resourced settings.

Optimizing medications for COPD — A number of medications for COPD reduce the frequency of COPD exacerbations. A personalized approach to medication selection should be based on the patient's severity of COPD symptoms and exacerbation frequency, noting that certain medications may be of greater benefit for some patients than others [1]. As an example, inhaled glucocorticoids reduce exacerbations in patients with a history of exacerbations but are not likely to be of benefit in patients with low blood eosinophils. (See "Stable COPD: Follow-up pharmacologic management", section on 'Persistent exacerbations with or without dyspnea'.)

The selection among these medications and their efficacy in reducing exacerbations are reviewed separately (algorithm 1 and table 9):

- Long-acting muscarinic antagonists (LAMA). (See "Stable COPD: Initial pharmacologic management", section on 'Long-acting muscarinic antagonists'.)
- Long-acting beta-agonists (LABA). (See "Stable COPD: Initial pharmacologic management", section on 'Long-acting beta-agonists'.)
- LAMA-LABA combination inhalers. (See "Stable COPD: Initial pharmacologic management", section on 'Use of dual bronchodilator therapy'.)
- LABA-glucocorticoid combination inhalers. (See "Stable COPD: Initial pharmacologic management", section on 'Alternative approaches'.)
- LAMA-LABA-glucocorticoid combination inhalers. (See "Stable COPD: Follow-up pharmacologic management".)
- Roflumilast, an oral PDE-4 inhibitor, reduces the risk of COPD exacerbations in patients with severe COPD associated with chronic bronchitis and a history of frequent COPD exacerbations (eg, at least two per year or one requiring hospitalization). (See "Management of refractory chronic obstructive pulmonary disease", section on 'Phosphodiesterase-4 inhibitors (Roflumilast)'.)
- Oral thiol derivatives, such as N-acetylcysteine (NAC), erdosteine, and carbocysteine, are used to thin secretions in patients with bothersome sputum production, but studies have not demonstrated a reduction in exacerbations. (See "Role of mucoactive agents and secretion clearance techniques in COPD", section on 'Thiols and thiol derivatives' and "Management of refractory chronic obstructive pulmonary disease", section on 'Mucoactive agents'.)

For patients whose medications are changed during a hospitalization, it is important to reevaluate discharge medications at office visits in the next one to four weeks. This is a good time to consolidate inhaled medications into a single inhaler if possible or to select inhaler devices that use the same technique. The proper technique should be reviewed for every inhaler that the patient is using. If the patient has poor inspiratory flow or is unable to demonstrate proper technique, nebulized medication from the appropriate class can be substituted: LAMAs (revefenacin), LABAs (formoterol and arformoterol), and glucocorticoid (budesonide).

Prophylactic azithromycin — For patients with recurrent exacerbations (≥2 per year) despite optimal therapy (eg, long-acting bronchodilators with or without inhaled glucocorticoids, smoking cessation, vaccinations, and pulmonary rehabilitation), prophylactic azithromycin may

reduce the frequency of exacerbations. The dosing, potential adverse effects, and evidence in support of prophylaxis with azithromycin are described separately. (See "Management of infection in exacerbations of chronic obstructive pulmonary disease", section on 'Prophylactic macrolides' and "Management of refractory chronic obstructive pulmonary disease", section on 'Macrolides and other chronic antibiotic therapy'.)

GLP-1 receptor agonists and SGLT-2 inhibitors, for diabetic patients — Glucagon-like peptide 1 (GLP-1) receptor agonists (eg, liraglutide) and sodium-glucose cotransporter 2 (SGLT-2) inhibitors (eg, dapagliflozin) may offer some protection against exacerbations in patients with diabetes and COPD, although further data are needed to confirm these findings.

- In one population-based cohort study of patients with COPD and new initiation of an antihyperglycemic agent, 1252 patients who began GLP-1 receptor agonists and 2956 patients who began SGLT-2 inhibitors were matched with similar patients who received sulfonylureas instead [23]. Compared with patients receiving sulfonylureas, those on GLP-1 receptor agonists were less likely to be hospitalized for COPD exacerbations (3.5 versus 5.0 percent of patients per year [HR 0.7, 95% CI 0.49-0.99]); similar results were seen for those on SGLT-2 inhibitors (2.4 versus 3.9 percent per year [HR 0.62, 95% CI 0.48-0.81]).

- In a separate retrospective database analysis, 1642 patients with COPD initiating new oral agents for DM were evaluated over six months following treatment initiation [24]. The adjusted incidence rates of moderate or severe exacerbations were improved with GLP-1RA inhibitors compared with dipeptidyl peptidase-4 inhibitors (incidence rate ratio [IRR] 0.67, 95% CI 0.49-0.93) or sulfonylureas (IRR 0.49, 95% CI 0.37-0.62); there was no difference compared with SGLT-2 inhibitors.

The mechanism underlying the potential benefits of these agents is unclear. GLP-1 receptor agonists have been shown to reduce inflammation and result in weight loss, with improvements in lung function in small clinical trials [25,26]. SGLT-2 inhibitors decrease endogenous carbon dioxide production via metabolic effects and appear to decrease risk of pneumonia based on meta-analyses of cardiovascular trials [27].

Future trials are needed to determine whether use of GLP-1 receptor agonists or SGLT-2 inhibitors are preferable to other antihyperglycemic agents in patients with DM and risk for COPD exacerbations.

Noninvasive ventilation — For patients who require noninvasive ventilation (NIV) during a hospitalization for a COPD exacerbation and who remain hypercapnic, nocturnal NIV at home significantly reduces the risk of rehospitalization. (See "Nocturnal ventilatory support in COPD".)

Vitamin D supplementation — Adhering to current guidelines regarding vitamin D supplementation in patients with a 25-hydroxyvitamin D level <20 or 30 ng/mL (50 or 75 nmol/L) reduces COPD exacerbations in addition to benefits in reducing falls and fractures (see "Overview of vitamin D"). While randomized trials were conflicting [28-31], a systematic review and meta-analysis used individual patient data from three of the four randomized trials to examine the role of supplementation in patients with 25-hydroxyvitamin D (25[OH]D) levels <25 nmol/L [32].

In the meta-analysis, vitamin D supplementation did not reduce the rate of moderate-to-severe COPD exacerbations overall, but a prespecified subgroup analysis revealed protective effects in patients with a baseline serum 25[OH]D level <10 ng/mL (<25 nmol/L; adjusted rate ratio 0.55, 95% CI 0.36-0.84). The trial that was not included in the analysis had separately found a benefit to vitamin D supplementation in this setting, so its exclusion was unlikely to affect the results. No increase in adverse events was noted with vitamin D supplementation.

The serum 25(OH)D level <10 ng/mL (<25 nmol/L) used as a threshold in the meta-analysis is well below the minimum level of 20 or 30 ng/mL (50 or 75 nmol/L) advised by national and international guidelines to prevent falls and fracture. Estimates of vitamin D requirements to achieve sufficient levels vary and depend in part upon sun exposure. The optimal intake of vitamin D to prevent deficiency is discussed separately. (See "Overview of vitamin D" and "Vitamin D deficiency in adults: Definition, clinical manifestations, and treatment", section on 'Optimal intake to prevent deficiency'.)

Separate studies suggest that vitamin D supplementation prevents acute respiratory tract infections, particularly in patients who are vitamin D deficient, which might contribute to the benefit in preventing COPD exacerbations [33].

INEFFECTIVE INTERVENTIONS

Selective beta-blockers — Preliminary data and a meta-analysis of 15 observational studies suggested that therapy with selective beta-blockers (given for comorbid cardiovascular disease) might reduce COPD exacerbations [34-36]. However, a randomized trial that included 532 patients with COPD and an increased risk of exacerbation (eg, moderate airflow limitation, exacerbation in the previous year, prescribed use of oxygen), but no cardiac indication for beta-blocker therapy, found that extended release metoprolol (25 to 100 mg/day) did not decrease the time to first exacerbation compared with placebo (hazard ratio 1.05, 95% CI 0.84 to 1.32) [37]. The study was stopped early for safety concerns. Metoprolol was associated with an increased risk of an exacerbation leading to hospitalization (hazard ratio 1.91, 95% CI 1.29 to

2.83), although the reason for this increase was unclear. There was no between group difference in forced expiratory volume in one second (FEV_1).

Based on this study, selective beta-blockers do not have a role in prevention of COPD exacerbations but continue to be used for patients with a cardiovascular indication. (See "Management of the patient with COPD and cardiovascular disease".)

Statins — Statins (hydroxymethylglutaryl [HMG] CoA reductase inhibitors) do not diminish COPD exacerbations, although they may have other health benefits. In observational studies of COPD, statins were associated with a reduced rate and severity of exacerbations, rate of hospitalizations, and mortality [38-41]. However, these beneficial effects were not supported in a trial that randomly assigned 885 participants with COPD, but without other indications or contraindications for statin therapy, to simvastatin 40 mg daily or placebo for up to 36 months [42]. Simvastatin did not reduce the rate of exacerbations or the time to first exacerbation. A systematic review found no clear benefit to statins in terms of lung function, exercise capacity, or mortality, but deemed evidence to be low quality [43]. (See "Low-density lipoprotein cholesterol-lowering therapy in the primary prevention of cardiovascular disease" and "Management of low density lipoprotein cholesterol (LDL-C) in the secondary prevention of cardiovascular disease".)

SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "Society guideline links: Chronic obstructive pulmonary disease" and "Society guideline links: Pulmonary rehabilitation".)

INFORMATION FOR PATIENTS

UpToDate offers two types of patient education materials, "The Basics" and "Beyond the Basics." The Basics patient education pieces are written in plain language, at the 5^{th} to 6^{th} grade reading level, and they answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials. Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are written at the 10^{th} to 12^{th} grade reading level and are best for patients who want in-depth information and are comfortable with some medical jargon.

Here are the patient education articles that are relevant to this topic. We encourage you to print or e-mail these topics to your patients. (You can also locate patient education articles on a variety of subjects by searching on "patient info" and the keyword(s) of interest.)

- Basics topics (see "Patient education: Pulmonary rehabilitation (The Basics)")

SUMMARY AND RECOMMENDATIONS

- **Prognosis after exacerbations** – Chronic obstructive pulmonary disease (COPD) exacerbations are associated with increased risk of mortality. For patients hospitalized with a COPD exacerbation, in-hospital mortality ranges from 3 to 9 percent and one-year mortality of approximately 25 percent. (See 'Prognosis after an exacerbation' above.)

- **General measures** – Several general measures can help reduce the frequency of COPD exacerbations, including smoking cessation, pulmonary rehabilitation and increased physical activity, proper use of medications (including correct inhaler technique), and vaccination against seasonal influenza, SARS-CoV-2, and pneumococcus (figure 1). (See 'General measures' above.)

- **Pharmacologic interventions** – Most medications for COPD reduce the frequency of COPD exacerbations, including long-acting muscarinic antagonists (LAMAs), long-acting beta-agonists (LABAs), inhaled glucocorticoids, and roflumilast. The selection among these medications is based on the patient's severity of symptoms and risk of exacerbations and is discussed separately. (See 'Optimizing medications for COPD' above.)

  - **Chronic azithromycin** – For patients with recurrent exacerbations (≥2 per year) despite optimal therapy with long-acting bronchodilator and glucocorticoid inhalers, prophylactic azithromycin may also reduce the frequency of exacerbations. (See 'Prophylactic azithromycin' above and "Management of infection in exacerbations of chronic obstructive pulmonary disease", section on 'Prophylactic macrolides' and "Management of refractory chronic obstructive pulmonary disease", section on 'For patients with frequent exacerbations'.)

- **Noninvasive ventilation, for hypercapnic patients** – For patients who require noninvasive ventilation (NIV) during a hospitalization for a COPD exacerbation and who remain hypercapnic, nocturnal NIV at home significantly reduces the risk of rehospitalization. (See 'Noninvasive ventilation' above and "Nocturnal ventilatory support in COPD".)

- **Comprehensive discharge planning** – After hospitalization for a COPD exacerbation, formal criteria for discharge and a comprehensive discharge plan may help to reduce readmissions and recurrent exacerbations after hospitalization for a COPD exacerbation (form 1). (See 'Comprehensive discharge planning' above.)

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Topic 122145 Version 16.0

GRAPHICS

Ideal discharge of the older adult patient: A hospitalist checklist

Data elements	Processes		
	Discharge summary	**Patient instructions**	**Communication to follow-up clinician on day of discharge**
Presenting problem that precipitated hospitalization	x	x	x
Key findings and test results	x		x
Final primary and secondary diagnoses	x	x	x
Brief hospital course	x		x
Condition at discharge, including functional status and cognitive status if relevant	x - functional status o - cognitive status		
Discharge destination (and rationale if not obvious)	x		x
Discharge medications:			
Written schedule	x	x	x
Include purpose and cautions (if appropriate) for each	o	x	o
Comparison with pre-admission medications (new, changes in dose/frequency, unchanged, meds should no longer take)	x	x	x
Follow-up appointments with name of provider, date, address, phone number, visit purpose, suggested management plan	x	x	x
All pending labs or tests, responsible person to whom results will be sent	x		x
Recommendations of any sub-specialty consultants	x		o
Documentation of patient education and understanding	x		

Any anticipated problems and suggested interventions	x	x	x
24/7 call-back number	x	x	
Identify referring and receiving providers	x	x	
Resuscitation status and any other pertinent end-of-life issues	o		

x: required element; o: optional element.

Derived and expanded from: Halasyamani L, Kripalani S, Coleman E, et al. Transition of care for hospitalized elderly patients: Development of a discharge checklist for hospitalists. J Hosp Med 2006; 1:354.

Graphic 54279 Version 6.0

COPD exacerbation discharge to home checklist

		√	Not applicable
Explain diagnosis (reason for hospitalization) and course of hospitalization	COPD is a lung disease that makes it hard to breathe. In people with COPD, the airways become narrow and damaged. A COPD exacerbation is a worsening of COPD symptoms such as shortness of breath and cough and is often caused by an infection.		
Provide written medication list and any changes from before hospitalization.			
Explain and demonstrate use of inhaler devices that patient will use at home. Tip: When possible, consolidate medications in a single combination inhaler or use same type of device to administer different medications.			
MDI	Provide written information and demonstration of MDI.		
DPI	Provide written information and demonstration of DPI.		
SMI	Provide written information and demonstration of SMI.		
Does the patient smoke?	If yes, provide smoking cessation education and medications.		
Will patient require oxygen at home?	If yes, has home oxygen been set up or can it be delivered before patient arrives home? Reinforce cigarette smoking ban in house, avoidance of open flames (eg, candles, gas stove, grill) while wearing oxygen. Does patient need portable oxygen?		
Will patient need a nebulizer at home?	If yes, is there a nebulizer at home or can a nebulizer be delivered before patient arrives home? Educate patient about when and how to use nebulizer and for which medications.		
Will patient be using noninvasive ventilation at night?	Is NIV set up at home and do patient and caregiver know how to use it?		
Are devices needed at home to help with activities of daily living?	Arrange for any aids that are needed after discharge and provide instructions (eg, walker, commode, shower chair, catheter, wound care, meal delivery or other).		
Does patient need a referral to pulmonary rehabilitation?	If so, arrange for pulmonary rehabilitation to start within 4 weeks of discharge.		
What test results are still pending, if any?	Advise patient regarding any follow-up testing (eg, lung cancer screening) or pending test results.		
List of follow-up appointments	After hospitalization for a COPD exacerbation, follow-up visits at <4 weeks and at <12 weeks are advised. Give written information regarding provider name, phone number, appointment date, time, location.		
Resuscitation status and any other pertinent end-of-life issues	Is hospice care appropriate? Do forms need to be completed for Do Not Attempt Resuscitation (DNAR) or Physician Orders for Life-Sustaining Treatment? (www.caringinfo.org)		
In-hospital provider name			
After-discharge provider name			
24/7 call number			

COPD: chronic obstructive pulmonary disease; MDI: metered dose inhaler; DPI: dry powder inhaler; SMI: soft mist inhaler; NIV: noninvasive ventilation.

Graphic 130525 Version 1.0

Criteria for considering a palliative care referral in patients with chronic lung disease

Patient characteristics	Social circumstances or issues related to anticipatory bereavement
Limited options for treatment	Limited access to care
Physical symptoms, such as pain, dyspnea, or cough, that are refractory to conventional management	Familial factors, including: ▪ Limitations of the family/caregiver ▪ Inadequate family support ▪ Family discord ▪ History of intensely dependent relationship(s) ▪ Parental concerns regarding care of dependents
High symptom burden or distress score	Financial limitations
Inability to engage in advance care planning and care plan	Unresolved grief or multiple prior losses
Uncertainty as to prognosis or disease trajectory	Spiritual or existential crisis
Cognitive impairment	Need for coordination of care at multiple sites
Severe or multiple comorbid conditions	
Communication barriers related to language, literacy, or physical issues	
Request for hastened death	
Homebound	

Adapted from: NCCN Guidelines Version 2.2012, Palliative Care.

Graphic 103284 Version 2.0

Primary palliative care assessment of patients with chronic lung disease

Understanding of illness/prognosis and treatment options
Does the patient/family/surrogate understand the current illness, their prognosis for quantity and quality of life, expected disease trajectory/uncertainty about disease trajectory, and treatment options?
Symptom management
Does the patient have uncontrolled/distressing symptoms? In particular, does the patient have any of the following?
▪ Pulmonary symptoms (cough, dyspnea) with daily activities ▪ Pain ▪ Fatigue and sleep disturbance ▪ Distressing psychological symptoms (depression and anxiety) ▪ Constitutional symptoms (anorexia and weight loss)
Social/spiritual assessment
Are there significant social or spiritual concerns affecting daily life?
Decision making
Is the patient comfortable making health care decisions? Or, does the patient rely on family members, friends, or health care professionals to make decisions?
Has the patient identified a surrogate decision-maker and talked with this person about their goals and values?
Would the patient/family/surrogate like help with treatment decision-making?
Identification of patient-centered goals of care
What are the goals for care, as identified by the patient/family/surrogate?
Are treatment options matched to informed patient-centered goals?
Has the patient participated in an advance care planning process?
Has the patient completed an advance care planning document?
Coping with life-threatening illness
How is the patient coping with their illness?
How are the family/family caregivers coping with the illness?
Coordination of care
Are there barriers to safe and sustainable transitions from one setting to another (eg, transportation to appointments)?
Are systems in place to enable good communication between multiple providers?

Adapted from:

1. *Jacobsen J, Jackson V, Dahlin C, et al. Components of early outpatient palliative care consultation in patients with metastatic nonsmall cell lung cancer. J Palliat Medicine 2011; 14:459.*
2. *Weissman DE, Meier DE. Identifying patients in need of a palliative care assessment in the hospital setting. J Palliat Med 2011; 14:17.*

Graphic 103286 Version 1.0

Medical guidelines for determining appropriateness of hospice referral: Disease-specific guidelines

A patient will be considered to have a life expectancy of 6 months and be eligible for hospice services if they meet criteria for the following disease-specific baseline guidelines as well as evidence of decline as outlined in non-disease-specific baseline guidelines (shown on a separate table):

Cancer diagnoses

Disease with metastases at presentation **OR**

Progression from an earlier stage of disease to metastatic disease with either continued decline in spite of therapy or patient declines further disease-directed therapy.

NOTE: Certain cancers with poor prognoses (eg, small-cell lung cancer, brain cancer, and pancreatic cancer) may be hospice eligible without fulfilling the other criteria in this section

Dementia due to Alzheimer disease and related disorders

Patients will be considered to be in the terminal stage of dementia (life expectancy of 6 months or less) if they meet all of the following criteria:

- Stage 7 or beyond according to the Functional Assessment Staging Scale; unable to walk, dress, and bathe without assistance; urinary and fecal incontinence (intermittent or constant); no consistently meaningful verbal communication (stereotypical phrases only or the ability to speak is limited to 6 or fewer intelligible words); **AND**

- At least 1 medical complication within the past 12 months: aspiration pneumonia, pyelonephritis, septicemia, multiple stage 3 to 4 decubitus ulcers, recurrent fever after antibiotics, inability to maintain sufficient fluid and calorie intake (≥10% weight loss over previous 6 months or serum albumin <2.5 g/dL).

NOTE: This section is specific for Alzheimer disease and related disorders and is not appropriate for other types of dementia.

Heart disease

Patients will be considered to be in the terminal stage of heart disease (life expectancy of 6 months or less) if they meet the following criteria (1 and 2 should be present; factors from 3 will add supporting documentation):

1. At the time of initial certification or recertification for hospice, the patient is or has been already optimally treated for heart disease, or the patient is either not a candidate for surgical procedures or they decline those procedures. (Optimally treated means that patients who are no on vasodilators have a medical reason for not being on these drugs, eg, hypotension or kidney disease.)

2. Patients with congestive heart failure or angina should meet the criteria for the New York Heart Association (NYHA) Class IV. (Class IV patients with heart disease have an inability to carry on any physical activity. Symptoms of heart failure or of the anginal syndrome may be present even at rest. If any physical activity is undertaken, discomfort is increased.) Significant congestive heart

failure may be documented by an ejection fraction of ≤20%, but assessment of ejection fraction is not required if not already available.

3. Documentation of the following factors supports but is not required to establish eligibility for hospice care: treatment-resistant symptomatic supraventricular or ventricular arrhythmias, history of cardiac arrest or resuscitation, history of unexplained syncope, brain embolism of cardiac origin, or concomitant HIV disease.

HIV disease

Patients will be considered to be in the terminal stage of their illness (life expectancy of 6 months or less) if they meet the following criteria (1 and 2 should be present; factors from 3 will add supporting documentation):

1. CD4 count <25 cells per microliter or persistent (2 or more assays at least 1 month apart) viral load >100,000 copies/mL, plus 1 of the following:

    - Central nervous system (CNS) lymphoma, untreated or persistent despite treatment; wasting (loss of at least 10% lean body mass); mycobacterium avium complex (MAC) bacteremia, untreated, unresponsive to treatment, or treatment refused; progressive multifocal leukoencephalopathy; systemic lymphoma, with advanced HIV disease and partial response to chemotherapy; visceral Kaposi sarcoma, unresponsive to therapy; kidney failure in the absence of dialysis; cryptosporidium infection; toxoplasmosis, unresponsive to therapy.

2. Decreased performance status, as measured by the Karnofsky Performance Status (KPS) scale, ≤50%.

3. Documentation of the following factors will support eligibility for hospice care: chronic persistent diarrhea for 1 year; persistent serum albumin <2.5 g/dL; concomitant, active substance abuse; age >50 years; absence of or resistance to effective antiretroviral, chemotherapeutic, and prophylactic drug therapy related specifically to HIV disease; advanced AIDS dementia complex; toxoplasmosis; congestive heart failure, symptomatic at rest; advanced liver disease.

Liver disease

Patients will be considered to be in the terminal stage of liver disease (life expectancy of 6 months or less) if they meet the following criteria (1 and 2 should be present; factors from 3 will lend supporting documentation):

1. Both prolonged prothrombin time (more than 5 seconds over control or INR >1.5) **AND** serum albumin <2.5 g/dL.

2. End-stage liver disease with at least 1 of the following: ascites, refractory to treatment or patient noncompliant; spontaneous bacterial peritonitis; hepatorenal syndrome (elevated creatinine and BUN with oliguria [<400 mL/day] and urine sodium concentration <10 mEq/L); hepatic encephalopathy, refractory to treatment or patient noncompliant; recurrent variceal bleeding, despite intensive therapy.

3. Documentation of the following factors will support eligibility for hospice care: progressive malnutrition; muscle wasting with reduced strength and endurance; continued active alcoholism

(>80 g ethanol/day); hepatocellular carcinoma; chronic hepatitis B virus infection (HBsAg-positive); hepatitis C infection, refractory to interferon treatment.

Pulmonary disease

Patients will be considered to be in the terminal stage of pulmonary disease (life expectancy of 6 months or less) if they meet the following criteria. The criteria refer to patients with various forms of advanced pulmonary disease who eventually follow a final common pathway for end-stage pulmonary disease (1 and 2 should be present; documentation of 3, 4, and 5 will lend supporting documentation):

1. Severe chronic lung disease as documented by both of the following:

    - Disabling dyspnea at rest, poorly responsive or unresponsive to bronchodilators, resulting in decreased functional capacity, eg, bed to chair existence, fatigue, and cough (documentation o forced expiratory volume in 1 second [FEV1], <30% predicted value after bronchodilator, is objective evidence for disabling dyspnea but is not necessary to obtain).
    - Progression of end-stage pulmonary disease, as evidenced by increasing visits to the emergency department or hospitalizations for pulmonary infections and/or respiratory failure or increasing clinician home visits prior to initial certification (documentation of serial decrease of FEV1 >40 mL/year is objective evidence for disease progression but is not necessary to obtain).

2. Hypoxemia at rest on room air, as evidenced by pO_2 ≤55 mmHg, or oxygen saturation ≤88%, determined either by arterial blood gases or oxygen saturation monitors (these values may be obtained from recent hospital records), **OR** hypercapnia, as evidenced by pCO_2 ≥50 mmHg (this value may be obtained from recent [within 3 months] hospital records).

3. Right heart failure (RHF) secondary to pulmonary disease (Cor pulmonale, eg, not secondary to left heart disease or valvulopathy).

4. Unintentional progressive weight loss >10% of body weight over the preceding 6 months.

5. Resting tachycardia >100/minute.

Kidney disease (acute and chronic)

Patients will be considered to be in the terminal stage of kidney disease (life expectancy of 6 months or less) if they meet the following criteria:

Acute kidney failure (1 and either 2, 3, or 4 should be present; factors from 5 will lend supporting documentation):

1. The patient is not seeking dialysis or kidney transplant or is discontinuing dialysis. As with any other condition, an individual with kidney disease is eligible for the hospice benefit if that individual has a prognosis of 6 months or less, if the illness runs its normal course. There is no regulation precluding patients on dialysis from electing hospice care. However, the continuation of dialysis will significantly alter a patient's prognosis and thus potentially impac that individual's eligibility.

    When an individual elects hospice care for end-stage kidney disease (ESKD) or for a condition to which the need for dialysis is related, the hospice agency is financially responsible for the

dialysis. In such cases, there is no additional reimbursement beyond the per diem rate. The only situation in which a beneficiary may access both the hospice benefit and the ESKD benefi is when the need for dialysis is not related to the patient's terminal illness.

2. Creatinine clearance <10 cc/minute (<15 cc/minute for diabetics), or <15 cc/minute (<20 cc/minute for diabetics) with comorbidity of congestive heart failure.

3. Serum creatinine >8.0 mg/dL (>6.0 mg/dL for diabetics).

4. Estimated glomerular filtration rate (GFR) <10 mL/minute.

5. Comorbid conditions: mechanical ventilation, malignancy (other organ system), chronic lung disease, advanced cardiac disease, advanced liver disease, immunosuppression/AIDS, albumin <3.5 g/dL, platelet count <25,000/microL, disseminated intravascular coagulation, gastrointestinal bleeding.

Chronic kidney disease (1 and either 2 or 3 should be present; factors from 4 will lend supporting documentation):

1. The patient is not seeking dialysis or kidney transplant or is discontinuing dialysis; as with any other condition, an individual with kidney disease is eligible for the hospice benefit if that individual has a prognosis of 6 months or less, if the illness runs its normal course. There is nc regulation precluding patients on dialysis from electing hospice care. However, the continuation of dialysis will significantly alter a patient's prognosis and thus potentially impac that individual's eligibility.

   When an individual elects hospice care for ESKD or for a condition to which the need for dialysis is related, the hospice agency is financially responsible for the dialysis. In such cases, there is no additional reimbursement beyond the per diem rate. The only situation in which a beneficiary may access both the hospice benefit and the ESKD benefit is when the need for dialysis is not related to the patient's terminal illness.

2. Creatinine clearance <10 cc/minute (<15 cc/minute for diabetics), or <15 cc/minute (<20 cc/minute for diabetics) with comorbidity of congestive heart failure.

3. Serum creatinine >8.0 mg/dL (>6.0 mg/dL for diabetics).

4. Signs and symptoms of kidney failure: uremia; oliguria (<400 cc/24 hours); intractable hyperkalemia (>7.0 mEq/L), not responsive to treatment; uremic pericarditis; hepatorenal syndrome; intractable fluid overload, not responsive to treatment.

Stroke or coma

Patients will be considered to be in the terminal stages of stroke or coma (life expectancy of 6 months or less) if they meet the following criteria:

Stroke:

- KPS or Palliative Performance Scale of 40% or less.
- Inability to maintain hydration and caloric intake with 1 of the following: weight loss >10% in the last 6 months or >7.5% in the last 3 months; serum albumin <2.5 g/dL; current history of

pulmonary aspiration, not responsive to speech-language pathology intervention; sequential calorie counts documenting inadequate caloric/fluid intake; dysphagia severe enough to prevent the patient from continuing food and fluids necessary to sustain life, in a patient who does not receive artificial nutrition and hydration.

Coma (any etiology): Comatose patients with any 3 of the following on day 3 of the coma: abnormal brain stem response, absent verbal response, absent withdrawal response to pain, serum creatinine >1.5 mg/dL.

Documentation of the following factors will support eligibility for hospice care:

- Documentation of medical complications, in the context of progressive clinical decline, within the previous 12 months, that support a terminal prognosis:
  - Aspiration pneumonia, upper urinary tract infection (pyelonephritis), refractory stage 3 to 4 decubitus ulcers, fever recurrent after antibiotics.
- For stroke patients, documentation of diagnostic imaging factors that support poor prognosis after stroke include:
  - For non-traumatic hemorrhagic stroke: large-volume hemorrhage on CT (≥20 mL if intratentorial, ≥50 mL if supratentorial), ventricular extension of hemorrhage, surface area of involvement of hemorrhage ≥30% of cerebrum, midline shift ≥1.5 cm, obstructive hydrocephalus in a patient who declines or is not a candidate for ventriculoperitoneal shunt. For thrombotic/embolic stroke: large anterior infarcts with both cortical/subcortical involvement, large bihemispheric infarcts, basilar artery occlusion, bilateral vertebral artery occlusion.

Amyotrophic lateral sclerosis (ALS)

Patients are considered eligible for hospice care if they do not elect tracheostomy and invasive ventilation and display evidence of critically impaired respiratory function (with or without use of noninvasive positive pressure ventilation [NIPPV]) and/or severe nutritional insufficiency (with or without use of a gastrostomy tube).

Critically impaired respiratory function is as defined by:

- Forced vital capacity (FVC) <40% predicted (seated or supine) and 2 or more of the following symptoms and/or signs: dyspnea at rest, orthopnea, use of accessory respiratory musculature, paradoxical abdominal motion, respiratory rate >20/minute, reduced speech/vocal volume, weakened cough, symptoms of sleep-disordered breathing, frequent awakening, daytime somnolence/excessive daytime sleepiness, unexplained headaches, unexplained confusion, unexplained anxiety, unexplained nausea.
- If unable to perform the FVC test, patients meet this criterion if they manifest 3 or more of the above symptoms/signs.
- Severe nutritional insufficiency is defined as dysphagia with progressive weight loss of at least 5% of body weight with or without election for gastrostomy tube insertion.
- These revised criteria rely less on the measured FVC and, as such, reflect the reality that not all patients with ALS can or will undertake regular pulmonary function tests.

KPS = 50: Requires considerable assistance and frequent medical care.

KPS <50: Unable to care for self; requires equivalent of institutional or hospital care; disease may be progressing rapidly.

HIV: human immunodeficiency virus; CD4: cluster of differentiation 4; AIDS: acquired immunodeficiency syndrome; INR: international normalized ratio; BUN: blood urea nitrogen; HBsAg: hepatitis B surface antigen; pO_2: partial pressure of oxygen; pCO_2: partial pressure of carbon dioxide; CT: computed tomography.

Sources:

1. *The NHO medical guidelines for non-cancer disease and local medical review policy: hospice access for patients with diseases other than cancer. Hosp J 1999.*
2. *Centers for Medicare & Medicaid Services. Medicare Coverage Database. Available at: https://www.cms.gov/medicare-coverage-database/details/lcd-details.aspx?LCDId=34538 (Accessed on January 5, 2021).*

Graphic 61282 Version 21.0

Technique for use of a pressurized metered dose inhaler (MDI) with a spacer or chamber*

Uncap mouthpiece and check for loose objects in the device.
Prime your inhaler if this is the first time you are using it, if you have not used it for several days, or if you have dropped it. Priming an MDI usually involves shaking it and spraying it into the air (away from your face) a total of up to 4 times. See the information that came with your inhaler for exact instructions.
Insert MDI into spacer.
Shake canister vigorously for approximately 5 seconds.
Hold the MDI upright with your index finger on the top of the medication canister and your thumb supporting the bottom of the inhaler. You may need to use the other hand to hold the spacer.
Breathe out normally through your mouth.
Put the mouthpiece between your teeth and close your lips tightly around mouthpiece of spacer. (If using mask attached to the chamber, place the mask completely over your nose and mouth.)
Make sure your tongue does not block the opening of the mouthpiece of the spacer.
Press down the top of the canister with your index finger to release the medicine.
At the same time, breathe in deeply and slowly through your mouth until your lungs are completely filled; this should take 3 to 5 seconds.
Hold the medicine in your lungs for approximately 5 to 10 seconds. If you did not get a full breath or cannot hold your breath long enough, you can inhale a second time to fully empty the chamber and hold your breath again for approximately 5 seconds. For infants and young children, or if unable to cooperate with a deep breath or breath-holding, 5 to 6 normal breaths will allow complete emptying of the chamber.
If you need more than one puff, wait approximately 15 to 30 seconds between puffs. Shake canister again before the next puff. Do **not** load both puffs into the chamber and then empty the chamber with a single inhalation.
When finished, recap mouthpiece.
If your inhaler contains a steroid medicine (sometimes called glucocorticoid or corticosteroid), rinse your mouth and gargle with water after you use it. Then spit out the water. Do not swallow it.
You can use your spacer for more than 1 medication. Just remove the first MDI and insert the other one.

These instructions do **not** apply to dry powder or soft mist inhalers. Cleaning instructions are provided separately.

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* We prefer to use a "valved holding chamber" for the spacer (eg, AeroChamber, Easivent, Optichamber, Vortex). The valve holds the medicine in the chamber until you take your deep breath in. This helps get the medicine into your lungs. Also, when you breathe out into the mouthpiece, the valve prevents your

breath from going into the chamber. If your spacer does not have this valve, you should breathe out through your nose or remove the spacer from your mouth before breathing out.

Graphic 103303 Version 9.0

Technique for use of a metered dose inhaler (MDI) without a spacer or chambe

Remove the cover of the mouthpiece.
Prime your inhaler if this is the first time you are using it, if you have not used it for several days, or if you have dropped it. Priming a metered dose inhaler usually involves shaking it and spraying it into the air (away from your face) up to 4 times. See the information that came with your inhaler for exact instructions
Check the number of doses remaining in the MDI.
Sit or stand up straight with the chi tilted up and neck slightly extended.
Shake MDI canister vigorously for 5 seconds.
Hold the MDI upright with your index finger on the top of the canister and your thumb supporting the bottom of the inhaler.
Breathe out normally.
Put the mouthpiece between your teeth and close your lips around mouthpiece or position mouthpiece about 4 cm (about the width of 2 fingers) from your mouth.
Keep your tongue away from the opening of the mouthpiece.
Press down the top of the canister with the index finger to release the medicine.
At the same time as the canister is pressed, breathe in deeply and slowly through your mouth until your lungs are completely full. This should take 3 to 5 seconds.
Hold the medicine in your lungs for as long as comfortable (about 5 to 10 seconds).
Remove the inhaler from your mouth and exhale normally.
If you need a second puff, wait about 15 to 30 seconds between puffs. Shake the canister again before the next puff.
When finished, put the mouthpiece cover back on.
If your inhaler contains a steroid medicine (sometimes called a "glucocorticoid" or "corticosteroid"), rinse your mouth and gargle with water after you use it. Then spit out the water. Do not swallow it.

We prefer to use metered dose inhalers (MDIs) with a spacer or holding chamber. Instructions for use of MDIs with these devices is provided in a separate graphic.

These instructions do **not** apply to dry powder or soft mist inhalers. Cleaning instructions are provided separately.

More detailed information about individual medicines can be found at http://www.accessdata.fda.gov/scripts/cder/drugsatfda/index.cfm.

MDI: metered dose inhaler.

Graphic 72362 Version 13.0

Technique for use of various dry powder inhalers*

Load a dose of medicine
▪ For single-dose inhalers, load a dose by taking a pill out of its packaging and putting the pill into the inhaler. Then push 1 or more buttons on the inhaler to poke holes in the pill.
▪ For multiple-dose inhalers, load a dose by sliding a lever or twisting part of the inhaler. Loading a dose should decrease the counter on the device by one. This means a dose is ready to be inhaled.
▪ Once the dose is loaded, maintain your inhaler in the correct position - some inhalers need to be held upright, but others need to be horizontal. The dose may be lost or spilled if the inhaler is tipped over after loading.
Medication delivery
▪ Open the device or take off the cap to expose the mouthpiece, if necessary.
▪ While holding the inhaler away from your mouth, breathe out (exhale) fully. Do not exhale into the mouthpiece.
▪ Put the mouthpiece between your lips. Breathe in quickly and steadily through your mouth, as deeply as possible. Do not breathe in through your nose. You might not taste or feel the medicine, even when you are using the inhaler correctly. If your device has air vent holes, do not cover those holes while inhaling through the device.
▪ Remove the device from your mouth and hold your breath for about 10 seconds (or as long as you comfortably can).
▪ Breathe out slowly (away from the mouthpiece).
▪ If you are supposed to take 2 puffs of your inhaler, load/activate another dose and breathe it in.
▪ Rinse your mouth out with water, gargle, and spit out the water.
Device maintenance and storage
▪ After use, close your inhaler or replace the cover or cap. Make sure the device is fully closed before storing.
▪ For single dose inhalers, you often need to dispose of the used dose. Please refer to the package insert.
▪ Pay attention to the number of doses you have remaining. For multi-dose devices, observe the counter to determine when you need a refill on the device. For single dose devices, monitor the number of individual doses remaining.
▪ Store your inhaler in a cool, dry place.

- Dry powder inhalers generally do not require internal cleaning. The mouthpiece may be wiped off with a dry cloth. Please refer to the package insert for additional device-specific instructions.

* Each dry powder inhaler comes with its own directions. Although the general technique is similar, various devices are loaded and activated differently. Some devices load each dose separately, while others contain a month's worth of medication and do not require loading. Refer to the package insert of each device or to the manufacturer website for additional instructions.

Graphic 51020 Version 13.0

Technique for use of soft mist inhalers (SMIs)*

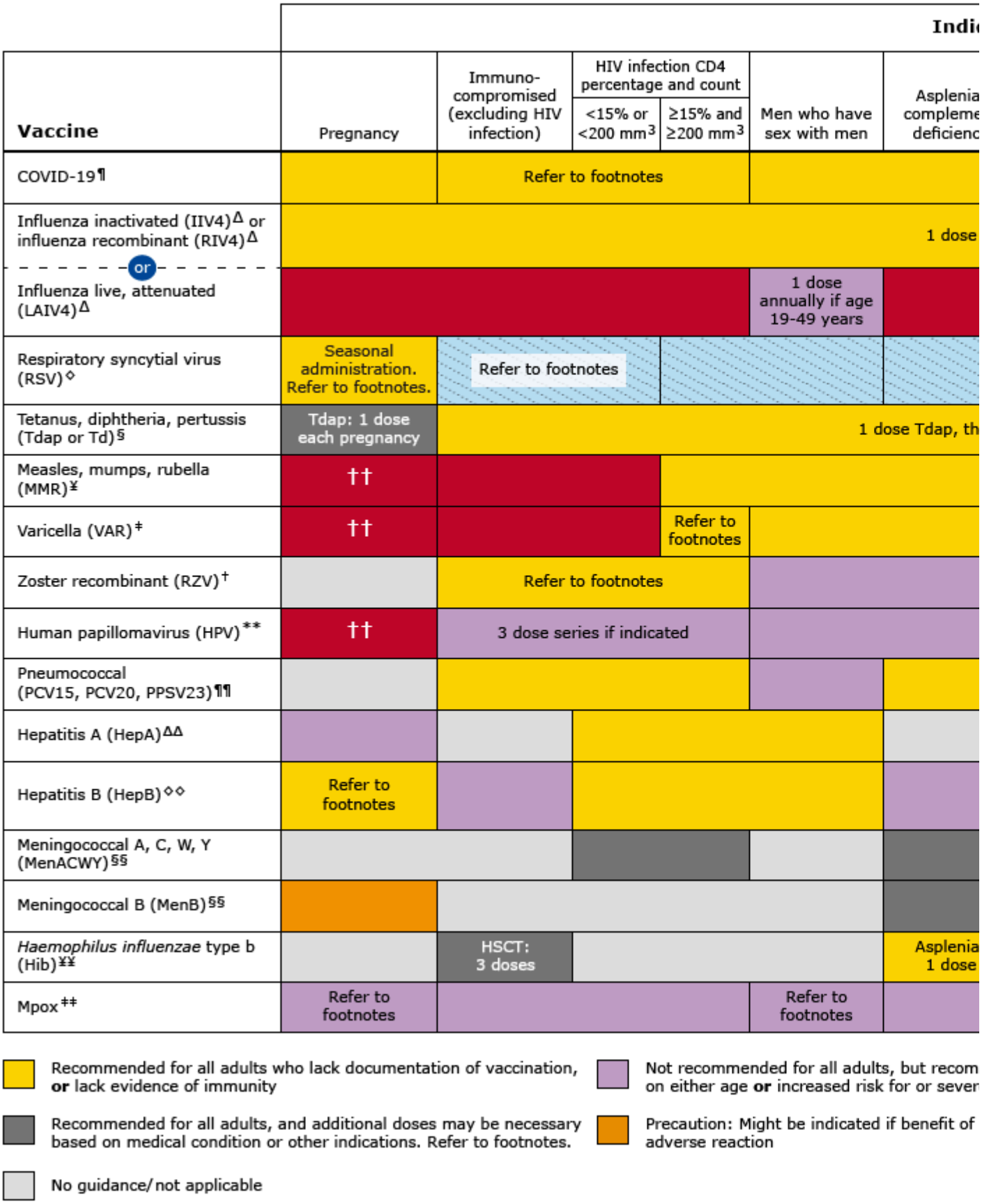
The first time you use a soft mist inhaler, you will need to insert the cartridge.
Keep the cap on the mouthpiece closed. Press the safety catch on the side of the inhaler and pull off the clear plastic base.
Write the discard date on the label. This is 3 months from the date you put in the cartridge.
Push the narrow end of the cartridge into the inhaler.
Push the cartridge against a firm surface or table top to be sure it has gone all the way in. You will know the cartridge is in all the way when it clicks. You will still be able to see a little bit of the cartridge.
Do not remove the cartridge after it has been inserted.
Put the clear base back on. Press until you hear a click.
Do not remove the clear base again.
Prime the inhaler before the first dose.
Hold the inhaler upright with the cap closed. Turn the clear base clockwise (to the right) half a turn until it clicks.
Open the cap by pushing on the small, round opening tab. Then point the inhaler at the floor, away from your face.
Press the dose release button on the side. Check to see if a mist comes out. Close the cap.
If you did **not** see a mist, repeat the priming steps above until you see a mist come out.
After you see a mist come out, repeat these steps 3 more times until you see a total of 4 sprays of medicine.
Your inhaler is now primed and ready for daily use.
If you do not use the inhaler for more than **3 days**, repeat the priming steps 1 time to release 1 spray of medicine.
If you do not use the inhaler for more than **3 weeks**, repeat the priming steps 4 times to release 4 sprays of medicine.
Take a dose of medicine.
Hold the inhaler upright with 1 hand, with the cap closed. You do not need to shake it. Use your other hand to turn the clear base clockwise half a turn in the direction of the arrows. This prepares the dose of medicine.
Open the cap by pushing on the small round opening tab.
Breathe out slowly and fully.
Put the mouthpiece in your mouth, and hold the inhaler horizontally. This means it should point toward the back of your throat.
Close your lips around the inhaler, but do not cover the air vents (holes) on the sides.

Take a slow, deep breath in. As you start to inhale, press the button on the side of the inhaler and inhale the mist.
When your lungs are full, hold your breath for 10 seconds to keep the medicine in your lungs.
Remove inhaler from your mouth and breathe out slowly. Put the cap back on the mouthpiece.
You should clean your inhaler once a week. To do this, wipe the inside and outside of the mouthpiece with a clean, damp cloth.
The inhaler has a dose counter (also called a "dose indicator") on the side. When the arrow is in the red zone, the inhaler is almost empty. When the inhaler is completely empty, the arrow will point to "0," and you will not be able to turn the base of the inhaler. Throw away the inhaler when the counter reads "0" or you reach the discard date, whichever is first. Make sure you always have another inhaler available before you need it.

* Soft mist inhalers are also known as Respimat inhalers.

Graphic 93600 Version 6.0

Adult immunization schedule by medical condition and other indication - Recommendations for ages 19 years or older, United States, 2024



Administer recommended vaccines if vaccination history is incomplete or unknown. Do not restart or add doses to vaccine series if there are extended intervals between doses. The use of trade names is for identification purposes only and does not imply endorsement by the ACIP or CDC.

NOTES

For vaccine recommendations for persons 18 years of age or younger, refer to the Recommended Child and Adolescent Immunization Schedule.

Additional information

- For calculating intervals between doses, 4 weeks = 28 Intervals of ≥4 months are determined by calendar months.
- Within a number range (eg, 12-18), a dash (–) should be read as "through."
- Vaccine doses administered ≤4 days before the minimum age or interval are considered valid. Doses of any vaccine administered ≥5 days earlier than the minimum age or minimum interval should not be counted as valid and should be repeated. **The repeat dose should be spaced after the invalid dose by the recommended minimum interval.** For further details, refer to Table 3-2, Recommended and minimum ages and intervals between vaccine doses, in General Best Practice Guidelines for Immunization.
- Information on travel vaccination requirements and recommendations is available at cdc.gov/travel/.
- For vaccination of persons with immunodeficiencies, refer to Table 8-1, Vaccination of persons with primary and secondary immunodeficiencies, in General Best Practice Guidelines for Immunization.
- For information about vaccination in the setting of a vaccine-preventable disease outbreak, contact your state or local health department.
- The National Vaccine Injury Compensation Program (VICP) is a no-fault alternative to the traditional legal system for resolving vaccine injury claims. All vaccines included in the adult immunization schedule except PPSV23, RSV, RZV, Mpox, and COVID-19 vaccines are covered by the National Vaccine Injury Compensation Program (VICP). Mpox and COVID-19 vaccines are covered by the Countermeasures Injury Compensation Program (CICP). For more information, refer to www.hrsa.gov/vaccinecompensation or www.hrsa.gov/cicp.

Polio vaccination

- **Routine vaccination:**
  - **Adults known or suspected to be unvaccinated or incompletely vaccinated:** Administer remaining doses (1, 2, or 3 IPV doses) to complete a 3-dose primary series (NOTE: Complete primary series consists of at least 3 doses of IPV or trivalent oral poliovirus vaccine [tOPV] in any combination). Unless there are specific reasons to believe they were not vaccinated, most adults who were born and raised in the United States can assume they were vaccinated against polio as children.
- **Special situations:**
  - **Adults at increased risk of exposure to poliovirus who completed primary series** (NOTE: Complete primary series consists of at least 3 doses of IPV or trivalent oral poliovirus vaccine [tOPV] in any combination)**:** May administer one lifetime IPV booster.
  - For detailed information, refer to www.cdc.gov/vaccines/vpd/polio/hcp/recommendations.html.
- **Contraindications and precautions:**

- For contraindications and precautions to Poliovirus vaccine, inactivated (IPV), refer to Poliovirus Appendix.

HSCT: hematopoietic stem cell transplant.

* Precaution for LAIV4 does not apply to alcoholism.

¶ COVID-19 vaccination

- **Routine vaccination:**
  - **Age 19 years or older.**
  - **Unvaccinated:**
    - 1 dose of updated (2023-2024 Formula) Moderna or Pfizer-BioNTech vaccine.
    - 2-dose series of updated (2023-2024 Formula) Novavax at 0, 3-8 weeks.
  - **Previously vaccinated*** with 1 or more doses of any COVID-19 vaccine:** 1 dose of any updated (2023-2024 Formula) COVID-19 vaccine administered at least 8 weeks after the most recent COVID-19 vaccine dose.
- **Special situations**
  - **Persons who are moderately or severely immunocompromised.¶¶¶**
    - **Unvaccinated:**
      - 3-dose series of updated (2023-2024 Formula) Moderna at 0, 4, 8 weeks.
      - 3-dose series of updated (2023-2024 Formula) Pfizer- BioNTech at 0, 3, 7 weeks.
      - 2-dose series of updated (2023-2024 Formula) Novavax at 0, 3 weeks.
  - **Previously vaccinated*** with 1 dose of any Moderna:** 2-dose series of updated (2023-2024 Formula) Moderna at 0, 4 weeks (minimum interval between previous Moderna dose and dose 1: 4 weeks).
  - **Previously vaccinated*** with 2 doses of any Moderna:** 1 dose of updated (2023-2024 Formula) Moderna at least 4 weeks after most recent dose.
  - **Previously vaccinated*** with 1 dose of any Pfizer- BioNTech:** 2-dose series of updated (2023-2024 Formula) Pfizer-BioNTech at 0, 4 weeks (minimum interval between previous Pfizer-BioNTech dose and dose 1: 3 weeks).
  - **Previously vaccinated*** with 2 doses of any Pfizer- BioNTech:** 1 dose of updated (2023-2024 Formula) Pfizer-BioNTech at least 4 weeks after most recent dose.
  - **Previously vaccinated*** with 3 or more doses of any Moderna or Pfizer-BioNTech:** 1 dose of any updated (2023-2024 Formula) COVID-19 vaccine at least 8 weeks after the most recent dose.
  - **Previously vaccinated*** with 1 or more doses of Janssen or Novavax with or without dose(s) of any Original monovalent or bivalent COVID-19 vaccine:** 1 dose of any updated (2023-2024 Formula) of COVID-19 vaccine at least 8 weeks after the most recent dose.
  - There is no preferential recommendation for the use of one COVID-19 vaccine over another when more than one recommended age-appropriate vaccine is available.
  - Current COVID-19 vaccine information available at www.cdc.gov/covidschedule. For information on Emergency Use Authorization (EUA) indications for COVID-19 vaccines, refer to www.fda.gov/emergency-preparedness-and-response/coronavirus-disease-2019-covid-19/covid-19-vaccines.
  - *** Previously vaccinated is defined as having received any Original monovalent or bivalent COVID-19 vaccine (Janssen, Moderna, Novavax, Pfizer-BioNTech) prior to the updated 2023-2024 formulation.

- ¶¶¶ Persons who are moderately or severely immunocompromised have the option to receive one additional dose of updated (2023-2024 Formula) COVID-19 vaccine at least 2 months following the last recommended updated (2023-2024 Formula) COVID-19 vaccine dose. Further additional updated (2023-2024 Formula) COVID-19 vaccine dose(s) may be administered, informed by the clinical judgement of a health care provider and personal preference and circumstances. Any further additional doses should be administered at least 2 months after the last updated (2023-2024 Formula) COVID-19 vaccine dose.

- **Contraindications and precautions:**
  - For contraindications and precautions to COVID-19 vaccination, refer to COVID-19 Appendix.

Δ Influenza vaccination

- **Routine vaccination:**
  - **Age 19 years or older:** 1 dose any influenza vaccine appropriate for age and health status annually.
  - **Age 65 years or older:** Any one of quadrivalent high-dose inactivated influenza vaccine (HD-IIV4), quadrivalent recombinant influenza vaccine (RIV4), or quadrivalent adjuvanted inactivated influenza vaccine (aIIV4) is preferred. If none of these three vaccines is available, then any other age-appropriate influenza vaccine should be used.
  - For the 2023-2024 season, refer to www.cdc.gov/mmwr/volumes/72/rr/rr7202a1.htm.
  - For the 2023-2024 season, refer to the 2024-2025 ACIP influenza vaccine recommendations.
- **Special situations:**
  - **Close contacts (eg, caregivers, health care workers) of severely immunosuppressed persons who require a protected environment:** Should not receive LAIV4. If LAIV4 is given, they should avoid contact with/caring for such immunosuppressed persons for 7 days after vaccination.is given, they should avoid contact with/caring for such immunosuppressed persons for 7 days after vaccination.
  - **NOTE:** Persons with an egg allergy can receive any influenza vaccine (egg-based and non-egg based) appropriate for age and health status.
- **Contraindications and precautions:**
  - For contraindications and precautions to influenza vaccination, refer to IIV4 Appendix, LAIV4 Appendix, ccIIV4 Appendix, and RIV4 Appendix.

◇ Respiratory syncytial virus vaccination

- **Routine vaccination:**
  - **Pregnant at 32-36 weeks gestation from September through January in most of the continental United States** (NOTE: Providers in jurisdictions with RSV seasonality that differs from most of the continental United States [eg, Alaska, jurisdiction with tropical climate] should follow guidance from public health authorities [eg, CDC, health departments] or regional medical centers on timing of administration based on local RSV seasonality. Refer to the 2024 Child and Adolescent Immunization Schedule for considerations regarding nirsevimab administration to infants)**:** 1 dose RSV vaccine (Abrysvo™). Administer RSV vaccine regardless of previous RSV infection.
    - Either maternal RSV vaccination or infant immunization with nirsevimab (RSV monoclonal antibody) is recommended to prevent respiratory syncytial virus lower respiratory tract infection in infants.
  - **All other pregnant persons:** RSV vaccine not recommended.

- There is currently no ACIP recommendation for RSV vaccination in subsequent pregnancies. No data are available to inform whether additional doses are needed in later pregnancies.

- **Special situations:**
  - **Age 60 years or older:** Based on shared clinical decision-making, 1 dose RSV vaccine (Arexvy® or Abrysvo™). Persons most likely to benefit from vaccination are those considered to be at increased risk for severe RSV disease (NOTE: Adults age 60 years or older who are at increased risk for severe RSV disease include those with chronic medical conditions such as lung diseases [eg, chronic obstructive pulmonary disease, asthma], cardiovascular diseases [eg, congestive heart failure, coronary artery disease], neurologic or neuromuscular conditions, kidney disorders, liver disorders, hematologic disorders, diabetes mellitus, and moderate or severe immune compromise [either attributable to a medical condition or receipt of immunosuppressive medications or treatment]; those who are considered to be frail; those of advanced age; those who reside in nursing homes or other long-term care facilities; and those with other underlying medical conditions or factors that a health care provider determines might increase the risk of severe respiratory disease). For additional information on shared clinical decision-making for RSV in older adults, refer to www.cdc.gov/vaccines/vpd/rsv/downloads/provider-job-aid-for-older-adults-508.pdf.
  - For further guidance, refer to www.cdc.gov/mmwr/volumes/72/wr/mm7229a4.htm.
- **Contraindications and precautions:**
  - For contraindications and precautions to Respiratory syncytial virus vaccine (RSV), refer to RSV Appendix.

§ **Tetanus, diphtheria, and pertussis (Tdap) vaccination**

- **Routine vaccination:**
  - **Previously did not receive Tdap at or after age 11 years** (NOTE: Tdap administered at age 10 years may be counted as the adolescent dose recommended at age 11-12 years)**:** 1 dose Tdap, then Td or Tdap every 10 years.
- **Special situations:**
  - **Previously did not receive primary vaccination series for tetanus, diphtheria, or pertussis:** 1 dose Tdap followed by 1 dose Td or Tdap at least 4 weeks later, and a third dose of Td or Tdap 6 to 12 months later (Tdap can be substituted for any Td dose, but preferred as first dose), Td or Tdap every 10 years thereafter.
  - **Pregnancy:** 1 dose Tdap during each pregnancy, preferably in early part of gestational weeks 27-36.
  - **Wound management:** Persons with 3 or more doses of tetanus-toxoid-containing vaccine: For clean and minor wounds, administer Tdap or Td if more than 10 years since last dose of tetanus-toxoid-containing vaccine; for all other wounds, administer Tdap or Td if more than 5 years since last dose of tetanus-toxoid-containing vaccine. Tdap is preferred for persons who have not previously received Tdap or whose Tdap history is unknown. If a tetanus-toxoid-containing vaccine is indicated for a pregnant woman, use Tdap. For detailed information, refer to www.cdc.gov/mmwr/volumes/69/wr/mm6903a5.htm.
- **Contraindications and precautions:**
  - For contraindications and precautions to tetanus, diphtheria, and acellular pertussis (Tdap), refer to Tdap Appendix.

¥ **Measles, mumps, and rubella vaccination**

- **Routine vaccination:**

- **No evidence of immunity to measles, mumps, or rubella:** 1 dose.
  - **Evidence of immunity:** Born before 1957 (except for health care personnel, refer below), documentation of receipt of MMR vaccine, laboratory evidence of immunity or disease (diagnosis of disease without laboratory confirmation is not evidence of immunity).
- **Special situations:**
  - **Pregnancy with no evidence of immunity to rubella:** MMR contraindicated during pregnancy; after pregnancy (before discharge from health care facility), 1 dose.
  - **Nonpregnant women of childbearing age with no evidence of immunity to rubella:** 1 dose.
  - **HIV infection with CD4 percentages ≥15% and CD4 count ≥200 cells/mm^3 for at least 6 months and no evidence of immunity to measles, mumps, or rubella:** 2-dose series at least 4 weeks apart; MMR contraindicated for HIV infection with CD4 percentage <15% or CD4 count <200 cells/mm^3.
  - **Severe immunocompromising conditions:** MMR contraindicated.
  - **Students in postsecondary educational institutions, international travelers, and household or close, personal contacts of immunocompromised persons with no evidence of immunity to measles, mumps, or rubella:** 2-dose series at least 4 weeks apart if previously did not receive any doses of MMR or 1 dose if previously received 1 dose MMR.
  - **In mumps outbreak settings**, for information about additional doses of MMR (including 3rd dose of MMR), refer to www.cdc.gov/mmwr/volumes/67/wr/mm6701a7.htm.
  - **Health care personnel:**
    - **Born before 1957 with no evidence of immunity to measles, mumps, or rubella:** Consider 2-dose series at least 4 weeks apart for measles or mumps or 1 dose for rubella.
    - **Born in 1957 or later with no evidence of immunity to measles, mumps, or rubella:** 2-dose series at least 4 weeks apart for measles or mumps or at least 1 dose for rubella.
- **Contraindications and precautions:**
  - For contraindications and precautions to measles, mumps, rubella (MMR), refer to MMR Appendix.

‡ **Varicella vaccination**

- **Routine vaccination:**
  - **No evidence of immunity to varicella:** 2-dose series 4-8 weeks apart if previously did not receive varicella-containing vaccine (VAR or MMRV [measles-mumps-rubella-varicella vaccine] for children); if previously received 1 dose varicella-containing vaccine, 1 dose at least 4 weeks after first dose.
    - **Evidence of immunity:** US-born before 1980 (except for pregnant women and health care personnel [refer below]), documentation of 2 doses varicella-containing vaccine at least 4 weeks apart, diagnosis or verification of history of varicella or herpes zoster by a health care provider, laboratory evidence of immunity or disease.
- **Special situations:**
  - **Pregnancy with no evidence of immunity to varicella:** VAR contraindicated during pregnancy; after pregnancy (before discharge from health care facility), 1 dose if previously received 1 dose varicella-containing vaccine or dose 1 of 2-dose series (dose 2: 4 to 8 weeks later) if previously did not receive any varicella-containing vaccine, regardless of whether US-born before 1980.

- **Health care personnel with no evidence of immunity to varicella:** 1 dose if previously received 1 dose varicella-containing vaccine; 2-dose series 4-8 weeks apart if previously did not receive any varicella-containing vaccine, regardless of whether US-born before 1980.
- **HIV infection with CD4 percentages ≥15% and CD4 count ≥200 cells/mm^3 with no evidence of immunity:** Vaccination may be considered (2 doses 3 months apart); VAR contraindicated for HIV infection with CD4 percentage <15% or CD4 count <200 cells/mm^3.
- **Severe immunocompromising conditions:** VAR contraindicated.

▪ **Contraindications and precautions:**
- For contraindications and precautions to varicella (VAR), refer to VAR Appendix.

† **Zoster vaccination**

▪ **Routine vaccination:**
- **Age 50 years or older** (NOTE: Serologic evidence of prior varicella is not necessary for zoster vaccination. However, if serologic evidence of varicella susceptibility becomes available, providers should follow ACIP guidelines for varicella vaccination first. RZV is not indicated for the prevention of varicella, and there are limited data on the use of RZV in persons without a history of varicella or varicella vaccination)**:** 2-dose series recombinant zoster vaccine (RZV, Shingrix) 2-6 months apart (minimum interval: 4 weeks; repeat dose if administered too soon), regardless of previous herpes zoster or history of zoster vaccine live (ZVL, Zostavax) vaccination.

▪ **Special situations:**
- **Pregnancy:** There is currently no ACIP recommendation for RZV use in pregnancy. Consider delaying RZV until after pregnancy.
- **Immunocompromising conditions (including persons with HIV regardless of CD4 count;** NOTE: If there is no documented history of varicella, varicella vaccination, or herpes zoster, providers should refer to the clinical considerations for use of RZV in immunocompromised adults aged ≥19 years and the ACIP varicella vaccine recommendations for further guidance: www.cdc.gov/mmwr/volumes/71/wr/mm7103a2.htm)**:** 2-dose series recombinant zoster vaccine (RZV, Shingrix) 2-6 months apart (minimum interval: 4 weeks; repeat dose if administered too soon). For detailed information, refer to www.cdc.gov/shingles/vaccination/immunocompromised-adults.html.

▪ **Contraindications and precautions:**
- For contraindications and precautions to zoster recombinant vaccine (RZV), refer to RZV Appendix.

** **Human papillomavirus vaccination**

▪ **Routine vaccination:**
- **All persons up through age 26 years:** 2- or 3-dose series depending on age at initial vaccination or condition.
  - **Age 9-14 years at initial vaccination and received 1 dose or 2 doses less than 5 months apart:** 1 additional dose.
  - **Age 9-14 years at initial vaccination and received 2 doses at least 5 months apart:** HPV vaccination series complete, no additional dose needed.
  - **Age 15 years or older at initial vaccination:** 3-dose series at 0, 1-2 months, 6 months (minimum intervals: dose 1 to dose 2: 4 weeks / dose 2 to dose 3: 12 weeks / dose 1 to dose 3: 5 months; repeat dose if administered too soon).

- No additional dose recommended when any HPV vaccine series has been completed using the recommended dosing intervals.

- **Shared clinical decision-making:**
  - **Adults age 27-45 years:** Based on shared clinical decision-making, complete a 2-dose series (if initiated age 9-14 years) or 3-dose series (if initiated ≥15 years).
  - For additional information on shared clinical decision-making for HPV; refer to www.cdc.gov/vaccines/hcp/admin/downloads/isd-job-aid-scdm-hpv-shared-clinical-decision-making-hpv.pdf.
- **Special situations:**
  - **Age ranges recommended above for routine and catch-up vaccination or shared clinical decision-making also apply in special situations.**
    - **Immunocompromising conditions, including HIV infection:** 3-dose series, even for those who initiate vaccination at age 9 through 14 years.
    - **Pregnancy:** Pregnancy testing is not needed before vaccination; HPV vaccination is not recommended until after pregnancy; no intervention needed if inadvertently vaccinated while pregnant.
- **Contraindications and precautions:**
  - For contraindications and precautions to human papillomavirus (HPV) vaccination, refer to HPV Appendix.

¶¶ Pneumococcal vaccination

- **Routine vaccination:**
  - **Age 65 years or older who have:**
    - **Not previously received a dose of PCV13, PCV15, or PCV20 or whose previous vaccination history is unknown:** 1 dose PCV15 **or** 1 dose PCV20.
      - If PCV15 is used, administer 1 dose PPSV23 at least 1 year after the PCV15 dose (may use minimum interval of 8 weeks for adults with an immunocompromising condition [NOTE: Immunocompromising conditions include chronic renal failure, nephrotic syndrome, immunodeficiencies, iatrogenic immunosuppression, generalized malignancy, HIV infection, Hodgkin disease, leukemia, lymphoma, multiple myeloma, solid organ transplant, congenital or acquired asplenia, or sickle cell disease or other hemoglobinopathies], cochlear implant, or cerebrospinal fluid leak).
    - **Previously received only PCV7:** Follow the recommendation above.
    - **Previously received only PCV13:** 1 dose PCV20 **or** 1 dose PPSV23.
      - If PCV20 is selected, administer at least 1 year after the PCV13 dose.
      - If PPSV23 is selected, administer at least 1 year after the last PCV13 dose (may use minimum interval of 8 weeks for adults with an immunocompromising condition [NOTE: Immunocompromising conditions include chronic renal failure, nephrotic syndrome, immunodeficiencies, iatrogenic immunosuppression, generalized malignancy, HIV infection, Hodgkin disease, leukemia, lymphoma, multiple myeloma, solid organ transplant, congenital or acquired asplenia, or sickle cell disease or other hemoglobinopathies], cochlear implant, or cerebrospinal fluid leak).
    - **Previously received only PPSV23:** 1 dose PCV15 **or** 1 dose PCV20. Administer either PCV15 or PCV20 at least 1 year after the last PPSV23 dose.
      - If PCV15 is used, no additional PPSV23 doses are recommended.
    - **Previously received both PCV13 and PPSV23 but NO PPSV23 was received at age 65 years or older:** 1 dose PCV20 **or** 1 dose PPSV23.

        - If PCV20 is selected, administer at least 5 years after the last pneumococcal vaccine dose.
        - If PPSV23 is selected, refer to dosing schedule at cdc.gov/vaccines/vpd/pneumo/downloads/pneumo-vaccine-timing.pdf.
    - **Previously received both PCV13 and PPSV23, AND PPSV23 was received at age 65 years or older:** Based on shared clinical decision-making, 1 dose of PCV20 at least 5 years after the last pneumococcal vaccine dose.
    - For guidance on determining which pneumococcal vaccines a patient needs and when, please refer to the mobile app which can be downloaded here: www.cdc.gov/vaccines/vpd/pneumo/hcp/pneumoapp.html.
- **Special situations:**
  - **Age 19-64 years with certain underlying medical conditions or other risk factors who have** (NOTE: Underlying medical conditions or other risk factors include alcoholism, chronic heart/liver/lung disease, chronic renal failure, cigarette smoking, cochlear implant, congenital or acquired asplenia, CSF leak, diabetes mellitus, generalized malignancy, HIV, Hodgkin disease, immunodeficiency, iatrogenic immunosuppression, leukemia, lymphoma, multiple myeloma, nephrotic syndrome, solid organ transplants, or sickle cell disease, or other hemoglobinopathies)**:**
    - **Not previously received a PCV13, PCV15, or PCV20 or whose previous vaccination history is unknown:** 1 dose PCV15 **or** 1 dose PCV20.
      - If PCV15 is used, administer 1 dose PPSV23 at least 1 year after the PCV15 dose (may use minimum interval of 8 weeks for adults with an immunocompromising condition [NOTE: Immunocompromising conditions include chronic renal failure, nephrotic syndrome, immunodeficiencies, iatrogenic immunosuppression, generalized malignancy, HIV infection, Hodgkin disease, leukemia, lymphoma, multiple myeloma, solid organ transplant, congenital or acquired asplenia, or sickle cell disease or other hemoglobinopathies], cochlear implant, or cerebrospinal fluid leak).
    - **Previously received only PCV7:** Follow the recommendation.
    - **Previously received only PCV13:** 1 dose PCV20 **or** 1 dose PPSV23.
      - If PCV20 is selected, administer at least 1 year after the PCV13 dose.
      - If PPSV23 is selected, refer to dosing schedule at cdc.gov/vaccines/vpd/pneumo/downloads/pneumo-vaccine-timing.pdf.
    - **Previously received only PPSV23:** 1 dose PCV15 **or** 1 dose PCV20. Administer either PCV15 or PCV20 at least 1 year after the last PPSV23 dose.
      - If PCV15 is used, no additional PPSV23 doses are recommended.
    - **Previously received PCV13 and 1 dose of PPSV23:** 1 dose PCV20 **or** 1 dose PPSV23.
      - If PCV20 is selected, administer at least 5 years after the last pneumococcal vaccine dose.
      - If PPSV23 is selected, refer to dosing schedule at cdc.gov/vaccines/vpd/pneumo/downloads/pneumo-vaccine-timing.pdf.
  - For guidance on determining which pneumococcal vaccines a patient needs and when, please refer to the mobile app which can be downloaded here: www.cdc.gov/vaccines/vpd/pneumo/hcp/pneumoapp.html.
- **Contraindications and precautions:**
  - For contraindications and precautions to Pneumococcal conjugate (PCV15 and PCV20), refer to PCV Appendix; and for Pneumococcal polysaccharide (PPSV23), refer to PPSV23 Appendix.

ΔΔ **Hepatitis A vaccination**

- **Routine vaccination:**
  - **Any person who is not fully vaccinated and requests vaccination (identification of risk factor not required):** 2-dose series HepA (Havrix 6-12 months apart or Vaqta 6-18 months apart [minimum interval:6 months]) or 3-dose series HepA-HepB (Twinrix at 0,1, 6 months [minimum intervals: dose 1 to dose 2: 4 weeks / dose 2 to dose 3: 5 months]).
- **Special situations:**
  - **Any person who is not fully vaccinated and who is at risk for hepatitis A virus infection:** 2-dose series HepA or 3-dose series HepA-HepB as above. Risk factors for hepatitis A virus infection include:
    - **Chronic liver disease** (eg, persons with hepatitis B, hepatitis C, cirrhosis, fatty liver disease, alcoholic liver disease, autoimmune hepatitis, alanine aminotransferase [ALT] or aspartate aminotransferase [AST] level greater than twice the upper limit of normal).
    - **HIV infection**.
    - **Men who have sex with men**.
    - **Injection or noninjection drug use**.
    - **Persons experiencing homelessness**.
    - **Work with hepatitis A virus** in research laboratory or with nonhuman primates with hepatitis A virus infection.
    - **Travel in countries with high or intermediate endemic hepatitis A** (HepA-HepB [Twinrix] may be administered on an accelerated schedule of 3 doses at 0, 7, and 21 to 30 days, followed by a booster dose at 12 months).
    - **Close, personal contact with international adoptee** (eg, household or regular babysitting) in first 60 days after arrival from country with high or intermediate endemic hepatitis A (administer dose 1 as soon as adoption is planned, at least 2 weeks before adoptee's arrival).
    - **Pregnancy** if at risk for infection or severe outcome from infection during pregnancy.
    - **Settings for exposure**, including health care settings targeting services to injection or noninjection drug users or group homes and nonresidential day care facilities for developmentally disabled persons (individual risk factor screening not required).
- **Contraindications and precautions:**
  - For contraindications and precautions to hepatitis A (HepA) vaccination, refer to HepA Appendix.

◇◇ **Hepatitis B vaccination**

- **Routine vaccination:**
  - **Age 19 through 59 years:** Complete a 2- or 3-, or 4-dose series.
    - 2-dose series only applies when 2 doses of Heplisav-B (NOTE: Heplisav-B and PreHevbrio are not recommended in pregnancy due to lack of safety data in pregnant persons) are used at least 4 weeks apart.
    - 3-dose series Engerix-B, PreHevbrio (NOTE: Heplisav-B and PreHevbrio are not recommended in pregnancy due to lack of safety data in pregnant persons), or Recombivax HB at 0, 1, 6 months (minimum intervals: dose 1 to dose 2: 4 weeks / dose 2 to dose 3: 8 weeks / dose 1 to dose 3: 16 weeks).
    - 3-dose series HepA-HepB (Twinrix at 0, 1, 6 months [minimum intervals: dose 1 to dose 2: 4 weeks / dose 2 to dose 3: 5 months]).

        - 4-dose series HepA-HepB (Twinrix) accelerated schedule of 3 doses at 0, 7, and 21 to 30 days, followed by a booster dose at 12 months.
    - **Age 60 years or older without** known risk factors for hepatitis B virus infection **may** complete a HepB vaccine series.
    - **Age 60 years or older with** known risk factors for hepatitis B virus infection **should** complete a HepB vaccine series.
    - **Any adult age 60 years of age or older** who requests HepB vaccination should receive a HepB vaccine series.
        - **Risk factors for hepatitis B virus infection include:**
            - **Chronic liver disease** (eg, persons with hepatitis C, cirrhosis, fatty liver disease, alcoholic liver disease, autoimmune hepatitis, alanine aminotransferase [ALT] or aspartate aminotransferase [AST] level greater than twice upper limit of normal).
            - **HIV infection**.
            - **Sexual exposure risk** (eg, sex partners of hepatitis B surface antigen [HBsAg]-positive persons; sexually active persons not in mutually monogamous relationships; persons seeking evaluation or treatment for a sexually transmitted infection; men who have sex with men).
            - **Current or recent injection drug use**.
            - **Percutaneous or mucosal risk for exposure to blood** (eg, household contacts of HBsAg-positive persons; residents and staff of facilities for developmentally disabled persons; health care and public safety personnel with reasonably anticipated risk for exposure to blood or blood-contaminated body fluids; persons on maintenance dialysis, including in-center or home hemodialysis and peritoneal dialysis, and persons who are predialysis; patients with diabetes [NOTE: **Age 60 years or older with diabetes:** Based on shared clinical decision making, 2-, 3-, or 4-dose series as above]).
            - **Incarceration**.
            - **Travel in countries with high or intermediate endemic hepatitis B**.
- **Special situations:**
    - **Patients on dialysis:** Complete a 3- or 4-dose series.
        - 3-dose series Recombivax HB at 0, 1, 6 months (NOTE: Use Dialysis Formulation 1 mL = 40 mcg).
        - 4-dose series Engerix-B at 0, 1, 2, and 6 months (NOTE: Use 2 mL dose instead of the normal adult dose of 1 mL).
- **Contraindications and precautions:**
    - For contraindications and precautions to hepatitis B (HepB) vaccination, refer to HepB Appendix.

§§ **Meningococcal vaccination**

- **Special situations for MenACWY:**
    - **Anatomical or functional asplenia (including sickle cell disease), HIV infection, persistent complement component deficiency, complement inhibitor (eg, eculizumab, ravulizumab) use:** 2-dose series MenACWY (Menveo or MenQuadfi) at least 8 weeks apart and revaccinate every 5 years if risk remains.
    - **Travel in countries with hyperendemic or epidemic meningococcal disease, or microbiologists routinely exposed to *Neisseria meningitidis*:** 1 dose MenACWY (Menveo or MenQuadfi) and revaccinate every 5 years if risk remains.

- **First-year college students who live in residential housing (if not previously vaccinated at age 16 years or older) or military recruits:** 1 dose MenACWY (Menveo or MenQuadfi).
- For MenACWY **booster dose recommendations** for groups listed under "Special situations" and in an outbreak setting (eg, in community or organizational settings or among men who have sex with men) and additional meningococcal vaccination information, refer to www.cdc.gov/mmwr/volumes/69/rr/rr6909a1.htm.

- **Shared clinical decision-making for MenB:**
  - **Adolescents and young adults age 16-23 years (age 16-18 years preferred) not at increased risk for meningococcal disease:** Based on shared clinical decision-making, 2-dose series MenB-4C (Bexsero) at least 1 month apart or 2-dose series MenB-FHbp (Trumenba) at 0, 6 months (if dose 2 was administered less than 6 months after dose 1, administer dose 3 at least 4 months after dose 2); MenB-4C and MenB-FHbp are not interchangeable (use same product for all doses in series).
  - For additional information on shared clinical decision-making for MenB, refer to www.cdc.gov/vaccines/hcp/admin/downloads/isd-job-aid-scdm-mening-b-shared-clinical-decision-making.pdf.
- **Special situations for MenB:**
  - **Anatomical or functional asplenia (including sickle cell disease), persistent complement component deficiency, complement inhibitor (eg, eculizumab, ravulizumab) use, or microbiologists routinely exposed to *Neisseria meningitidis*:** 2-dose primary series MenB-4C (Bexsero) at least 1 month apart or 3-dose primary series MenB-FHbp (Trumenba) at 0, 1-2, 6 months (if dose 2 was administered at least 6 months after dose 1, dose 3 not needed; if dose 3 is administered earlier than 4 months after dose 2, a fourth dose should be administered at least 4 months after dose 3); MenB-4C and MenB-FHbp are not interchangeable (use same product for all doses in series); 1 dose MenB booster 1 year after primary series and revaccinate every 2-3 years if risk remains.
  - **Pregnancy:** Delay MenB until after pregnancy unless at increased risk and vaccination benefits outweigh potential risks.
  - For MenB **booster dose recommendations** for groups listed under "Special situations" and in an outbreak setting (eg, in community or organizational settings and among men who have sex with men) and additional meningococcal vaccination information, refer to www.cdc.gov/mmwr/volumes/69/rr/rr6909a1.htm.
  - **NOTE:** MenB vaccines may be administered simultaneously with MenACWY vaccines if indicated, but at a different anatomic site, if feasible.
  - Adults may receive a single dose of Penbraya™ as an alternative to separate administration of MenACWY and MenB when both vaccines would be given on the same clinic day. For adults not at increased risk, if Penbraya™ is used for dose 1 MenB, MenB-FHbp (Trumenba) should be administered for dose 2 MenB. For adults at increased risk of meningococcal disease, Penbraya™ may be used for additional MenACWY and MenB doses (including booster doses) if both would be given on the same clinic day **and** at least 6 months have elapsed since most recent Penbraya™ dose.
- **Contraindications and precautions:**
  - For contraindications and precautions to meningococcal ACWY (MenACWY) [MenACWY-CRM (Menveo); MenACWY-D (Menactra); MenACWY-TT (MenQuadfi)], refer to MenACWY Appendix.
  - For contraindications and precautions to meningococcal B (MenB) [MenB-4C (Bexsero); MenB-FHbp (Trumenba)], refer to MenB Appendix.

¥¥ ***Haemophilus influenzae* type b vaccination**

- **Special situations:**
  - **Anatomical or functional asplenia (including sickle cell disease):** 1 dose if previously did not receive Hib; if elective splenectomy, 1 dose, preferably at least 14 days before splenectomy.
  - **Hematopoietic stem cell transplant (HSCT):** 3-dose series 4 weeks apart starting 6-12 months after successful transplant, regardless of Hib vaccination history.
- **Contraindications and precautions:**
  - For contraindications and precautions to *Haemophilus influenzae* type b (Hib) vaccination, refer to Hib Appendix.

‡‡ **Mpox vaccination**

- **Special situations:**
  - **Any person at risk for Mpox infection:** 2-dose series, 28 days apart.
  - **Risk factors for Mpox infection include:**
    - Persons who are gay, bisexual, and other MSM, transgender or nonbinary people who in the past 6 months have had:
      - A new diagnosis of at least 1 sexually transmitted disease.
      - More than 1 sex partner.
      - Sex at a commercial sex venue.
      - Sex in association with a large public event in a geographic area where Mpox transmission is occurring.
    - Persons who are sexual partners of the persons described above.
    - Persons who anticipate experiencing any of the situations described above.
  - **Pregnancy:** There is currently no ACIP recommendation for Jynneos use in pregnancy due to lack of safety data in pregnant persons. Pregnant persons with any risk factor described above may receive Jynneos.
  - **Health care personnel:** Except in rare circumstances (eg, no available personal protective equipment), health care personnel who do not have any of the sexual risk factors described above should not receive Jynneos.
  - For detailed information, refer to: www.cdc.gov/vaccines/acip/meetings/downloads/slides-2023-10-25-26/04-MPOX-Rao-508.pdfContraindications and Precautions.
- **Contraindications and precautions:**
  - For contraindications and precautions to Mpox, refer to Mpox Appendix.

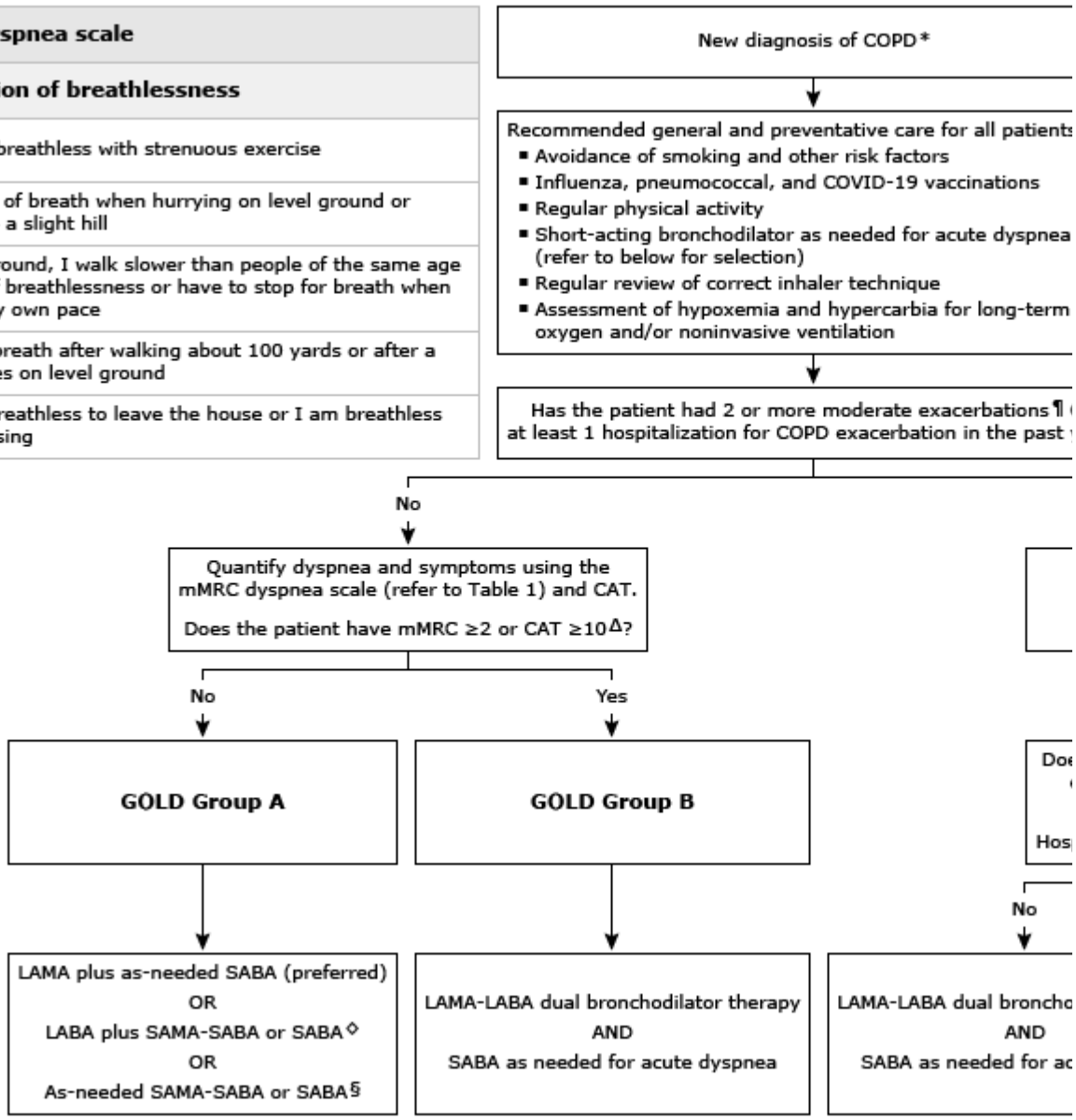
†† Vaccinate after pregnancy, if indicated.

Reproduced from: Advisory Committee on Immunization Practices. Adult Immunization Schedule by Medical Condition and Other Indication, Recommendations for Ages 19 Years or Older, United States, 2024. Centers for Disease Control and Prevention. Available at: https://www.cdc.gov/vaccines/schedules/hcp/imz/adult-conditions.html (Accessed on January 18, 2024).

New diagnosis of COPD

Table 1: mMRC dyspnea scale

Grade	Description of breathlessness
0	I only get breathless with strenuous exercise
1	I get short of breath when hurrying on level ground or walking up a slight hill
2	On level ground, I walk slower than people of the same age because of breathlessness or have to stop for breath when walking my own pace
3	I stop for breath after walking about 100 yards or after a few minutes on level ground
4	I am too breathless to leave the house or I am breathless when dressing



COPD: chronic obstructive pulmonary disease; COVID-19: coronavirus disease 2019; GOLD: Global Initiative for Chronic Obstructive Lung Disease; CAT: COPD Assessment Test; SABA: short-acting beta-agonist; SAMA: short-acting muscarinic antagonist; LAMA: long-acting muscarinic antagonist (anticholinergic); LABA: long-acting beta-agonist; mMRC: Modified Medical Research Council; FEV_1: forced expiratory volume in one second; FVC: forced vital capacity.

* COPD is diagnosed based on the presence of chronic respiratory symptoms (dyspnea, cough, sputum production) accompanied by airflow limitation. All patients with COPD defined by GOLD have airflow limitation based on a reduced FEV_1/FVC ratio <0.70. The severity of airflow limitation is determined by the reduction in FEV_1.

¶ An exacerbation of COPD is characterized by increased dyspnea and/or cough and sputum that worsens in less than 14 days, may be accompanied by tachypnea or tachycardia, and is often caused by infection, environmental irritation, or other insult to the airways. "Moderate exacerbations" are typically defined as those which require treatment with systemic glucocorticoids. More objective severity

classifications have been proposed but are difficult to establish via patient history. Please refer to UpToDate content on "COPD exacerbations: Clinical manifestations and evaluation" for additional information.

Δ CAT: http://www.catestonline.org (Accessed on January 12, 2023).

◇ For those prescribed a LABA alone, SAMA-SABA combination therapy is likely to be most potent but will have some of the same side effects as LAMA. For those prescribed a LAMA, SAMA should generally not be used concomitantly, so SABA alone is preferred.

§ Occasional patients with only minimal intermittent symptoms are appropriate for only as-needed rescue therapy rather than treatment with long-acting bronchodilators.

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Follow-up management of COPD*

No exacerbations and no dyspnea/low COPD impact (ie, mMRC 0 to 1 or CAT <10)[¶]	
Current therapy	**Actions**
SABA or SABA-SAMA as needed	Continue current therapy
LAMA, LABA, or LAMA-LABA	Continue current therapy
LABA-ICS or LABA-LAMA-ICS	Taper or discontinue ICS dose to reduce adverse effects of ICS[Δ]
Persistent dyspnea or high COPD impact (ie, mMRC ≥2 or CAT ≥10)[¶] with no exacerbations	
Current therapy	**Actions**
SABA or SABA-SAMA as needed	Add LAMA or LABA
LAMA or LABA monotherapy	Change to LAMA-LABA
LABA-ICS	▪ LAMA-LABA-ICS ▪ LAMA-LABA if lack of response to ICS or adverse effects from ICS
LAMA-LABA	▪ Substitute alternate delivery system or different LAMA-LABA agents ▪ Trial of LAMA-LABA-ICS, in patients with blood eosinophils ≥100 cells/microL[◇] ▪ Additional interventions may include low-dose theophylline, repeat pulmonary rehabilitation, and nonpharmacologic therapies[§]
LAMA-LABA-ICS	▪ Continue LAMA-LABA-ICS ▪ Additional interventions may include low-dose theophylline, repeat pulmonary rehabilitation, and nonpharmacologic therapies for COPD[§] ▪ Stop ICS, if initial indication unclear, lack of response, or adverse effect to ICS[Δ]
1 or more exacerbations in past year +/– persistent dyspnea or high COPD impact (ie, mMRC ≥2 or CAT ≥10)[¶]	
Current therapy[§]	**Actions**
SABA or SABA-SAMA as needed	Add LAMA
LAMA or LABA monotherapy	▪ LAMA-LABA, if blood eosinophil count <300/microL[◇] **or**

	▪ LAMA-LABA-ICS, if blood eosinophil count ≥300/microL◇ **or** hospitalization for COPD exacerbation **or** ▪ LABA-ICS, if blood eosinophil count ≥100/microL◇ **and** LAMA contraindicated
LAMA-LABA	▪ LAMA-LABA-ICS, if blood eosinophil count ≥100/microL◇ **or** ▪ Continue LAMA-LABA, if blood eosinophil count <100/microL¥ Add roflumilast‡ **or** Add azithromycin†
LABA-ICS	▪ LAMA-LABA-ICS **or** ▪ LAMA-LABA if lack of response to ICS or adverse effects from ICSΔ
LAMA-LABA-ICS	▪ Continue LAMA-LABA-ICS Add roflumilast‡ **or** Add azithromycin† ▪ Stop ICS if initial indication unclear, lack of response, or adverse effects of ICSΔ

COPD: chronic obstructive pulmonary disease; mMRC: modified Medical Research Council; CAT: COPD Assessment Test; SABA: short-acting beta-agonist; SAMA: short-acting muscarinic-antagonist; LAMA: long-acting muscarinic-antagonist; LABA: long-acting beta-agonist; ICS: inhaled corticosteroids (glucocorticoids); BMI: body mass index; SpO_2: pulse oxygen saturation; FEV_1: forced expiratory volume in one second.

* Adjustments to pharmacologic therapy for COPD are based on an assessment of dyspnea/exercise limitation (mMRC or CAT), frequency of exacerbations, and peripheral blood eosinophil counts. Follow-up visits are also an opportunity to assess and reinforce nonpharmacologic interventions for COPD, including: smoking cessation; inhaler technique and adherence to medications; administration of pneumococcal and seasonal influenza vaccinations; pulmonary rehabilitation; and nutrition counselling regarding healthy diet and normal BMI. All patients with COPD should have a rapid relief inhaler available, either a SABA or a SABA-SAMA (SABA preferred for patients using a LAMA). Refer to UpToDate content on the overview of management for stable COPD.

¶ mMRC dyspnea scale: https://www.pcrs-uk.org/mrc-dyspnoea-scale; CAT evaluates health impact of COPD: https://www.catestonline.org.

Δ If blood eosinophil count ≥300 cells/microL, patient is more likely to experience exacerbations after ICS withdrawal. Close patient monitoring is required if ICS are withdrawn.

◇ In patients with exacerbations and blood eosinophil count ≥300 cells/microL, the addition of ICS is likely to be of benefit. For patients with eosinophil counts ≥100 but <300 cells/microL, ICS may improve exacerbation rates and pulmonary function.

§ Nonpharmacologic measures (eg, oxygen therapy if SpO_2 ≤88%, pulmonary rehabilitation, bronchoscopic or surgical lung volume reduction, lung transplantation) can help reduce dyspnea and exacerbations. Contributing comorbidities should be evaluated and treated. Not all patients achieve control of dyspnea or exacerbations despite optimal available pharmacotherapy.

¥ For patients with a blood eosinophil count <100 cells/microL, there is a low likelihood that addition of ICS will be beneficial and higher risk of pneumonia after the addition of ICS.

‡ Roflumilast is used for patients with chronic bronchitis and FEV_1 <50% predicted, particularly if there has been at least 1 hospitalization for an exacerbation in the past year. Potential adverse effects may limit use.

† Azithromycin preventive therapy is more effective in patients who are not current smokers. However, it may lead to development of resistant organisms.

Adapted from: Global Initiative for Chronic Obstructive Lung Disease (GOLD). Global Strategy for the Diagnosis, Management and Prevention of Chronic Obstructive Pulmonary Disease (2023 Report). Available at: www.goldcopd.org (Accessed on December 13, 2022).

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