COPD. infections, vaccination

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- Chronic Obstructive Pulmonary Disease (COPD) is the third leading cause of death worldwide, causing 3.23 million deaths in 2019.
- Over 80% of these deaths occurred in low- and middle-income countries (LMIC).

- COPD COVID?

COVID COPD GOLD?

CHAPTER 7: COVID-19 AND COPD

OVERALL KEY POINTS:

- *Patients with COPD presenting with new or worsening respiratory symptoms, fever, and/or any other symptoms that could be COVID-19 related, even if these are mild, should be tested for possible infection with SARS-CoV-2.*

- *Patients should keep taking their oral and inhaled respiratory medications for COPD as directed as there is no evidence that COPD medications should be changed during this COVID-19 pandemic.*

COVID

- Patients with COPD presenting with new or worsening respiratory symptoms, fever, and/or any
- other symptoms that could be COVID-19 related, even if these are mild, should be tested for possible
- infection with SARS-CoV-2.

COPD COVID

- *Physical distancing and shielding, or sheltering-in-place, should not lead to social isolation and inactivity. Patients should stay in contact with their friends and families by telecommunication and continue to keep active. They should also ensure they have enough medication.*
- *Patients should be encouraged to use reputable resources for medical information regarding COVID-19 and its management.*

COVID COPD

- ACE2 mRNA expression is increased in COPD
- and may be modulated by ICS use.
- It is not known definitively yet whether having COPD affects the risk of becoming infected with COVID

COPD severe COVID?
Smoking COVID?
Hospitalization COPD COVID?

COPD has also been reported to independently increase the risk of severe disease or death in some series[12-15] but not all.[9,16,17] Many factors have been proposed to account for the increased risk for poor outcomes including prior poor adherence to therapy, difficulties performing self-management, limited access to care during the pandemic and a reduced pulmonary reserve.[18,19] There is evidence of a fall in hospitalization rates for COPD during the pandemic.[20,21] The reasons for this remain unclear, but patients experiencing symptoms of an exacerbation should be evaluated in the usual way during the pandemic and hospitalized if necessary.

There are currently no peer-reviewed studies that have evaluated the effect of smoking on the risk of infection with SARS-CoV-2, but studies suggest that smoking is associated with increased severity of disease and risk of death in hospitalized COVID-19 patients.[22]

COPD COVID?

In summary, on current evidence, patients with COPD do not seem to be at greatly increased risk of infection with SARS-CoV-2, but this may reflect the effect of protective strategies. They are at an increased risk of hospitalization for COVID-19 and may be at increased risk of developing severe disease and death.

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increased risk of hospitalization for COVID-19 severe disease and death.

CXR, CTscan COPD COVID

Radiology

Chest radiography is insensitive in mild or early COVID-19 infection[42] and is not routinely indicated as a screening test for COVID-19 in asymptomatic individuals. Chest radiography is indicated in patients with COPD with moderate to severe symptoms of COVID-19 and for those with evidence of worsening respiratory status (**Figure 7.1**).[43] COVID-19 pneumonia changes are mostly bilateral.[44] Chest radiography can be useful for excluding or confirming alternative diagnoses (e.g., lobar pneumonia, pneumothorax, or pleural effusion). Point-of-care lung ultrasound can also be used to detect the pulmonary manifestations of COVID-19.[45]

Computed tomography (CT) screening may show evidence of pneumonia in asymptomatic individuals infected with SARS-CoV-2[46] and false-negative RT-PCR tests have been reported in patients with CT findings of COVID-19 who eventually tested positive.[23] Recommendations have been made on the use of CT as part of diagnostic testing and severity assessment in COVID-19[43] and there are no special considerations for patients with COPD. The initial features of COVID-19 on CT and their progression over time have been reviewed.[47] COPD patients with COVID-19 have an increased prevalence of ground-glass opacities, local patchy shadowing, and interstitial abnormalities on CT compared with patients without COPD.[48] A small case series of patients with emphysema and COVID-19 found that many had bilateral ground glass opacities with areas of consolidation; however, the pattern was variable and patients had more pronounced disease in the lung bases.[49]

Spirometry?

Spirometry & pulmonary function testing

Performing spirometry and pulmonary function testing may lead to SARS-CoV-2 transmission as a result of coughing and droplet formation during the tests.[28,29] During periods of high prevalence of COVID-19 in the community, spirometry should be restricted to patients requiring urgent or essential tests for the diagnosis of COPD, and/or to assess lung function status for interventional procedures or surgery. The ATS and ERS have provided recommendations regarding testing and precautions that should be taken.[28,29] Whenever possible, patients should have a RT-PCR test for SARS-CoV-2 performed and the results available prior to performing the test. Patients with a positive RT-PCR test should normally have the test delayed until negative.

When routine spirometry is not available, home measurement of peak expiratory flow (PEF) combined with validated patient questionnaires could be used to support or refute a possible diagnosis of COPD.[30-33] However, PEF does not correlate well with the results of spirometry[34-36] has low specificity[37] and cannot differentiate obstructive and restrictive lung function abnormalities. When making a diagnosis of COPD, airflow obstruction could also be confirmed by giving patients a personal electronic portable spirometers,[38,39] and instructing them in their use and observing them in their homes using video conferencing technology.

KEY POINTS FOR THE MANAGEMENT OF STABLE COPD DURING COVID-19 PANDEMIC

PROTECTIVE STRATEGIES

- Follow basic infection control measures
- Wear a face covering
- Consider shielding/sheltering-in-place

INVESTIGATIONS

- Only essential spirometry

PHARMACOTHERAPY

- Ensure adequate supplies of medications
- Continue unchanged including ICS

NON-PHARMACOLOGICAL THERAPY

- Ensure annual influenza vaccination
- Maintain physical activity

- Streptococcus Pneumonia
- COPD
- vaccination

Pneumococcal vaccination

- >90 pneumococcal serotype
- All impossible in one vaccine
- PPSV23
- PCV7
- PCV13
- PCV15
- PCV20

Comparison of properties of the pneumococcal polysaccharide and conjugate vaccines

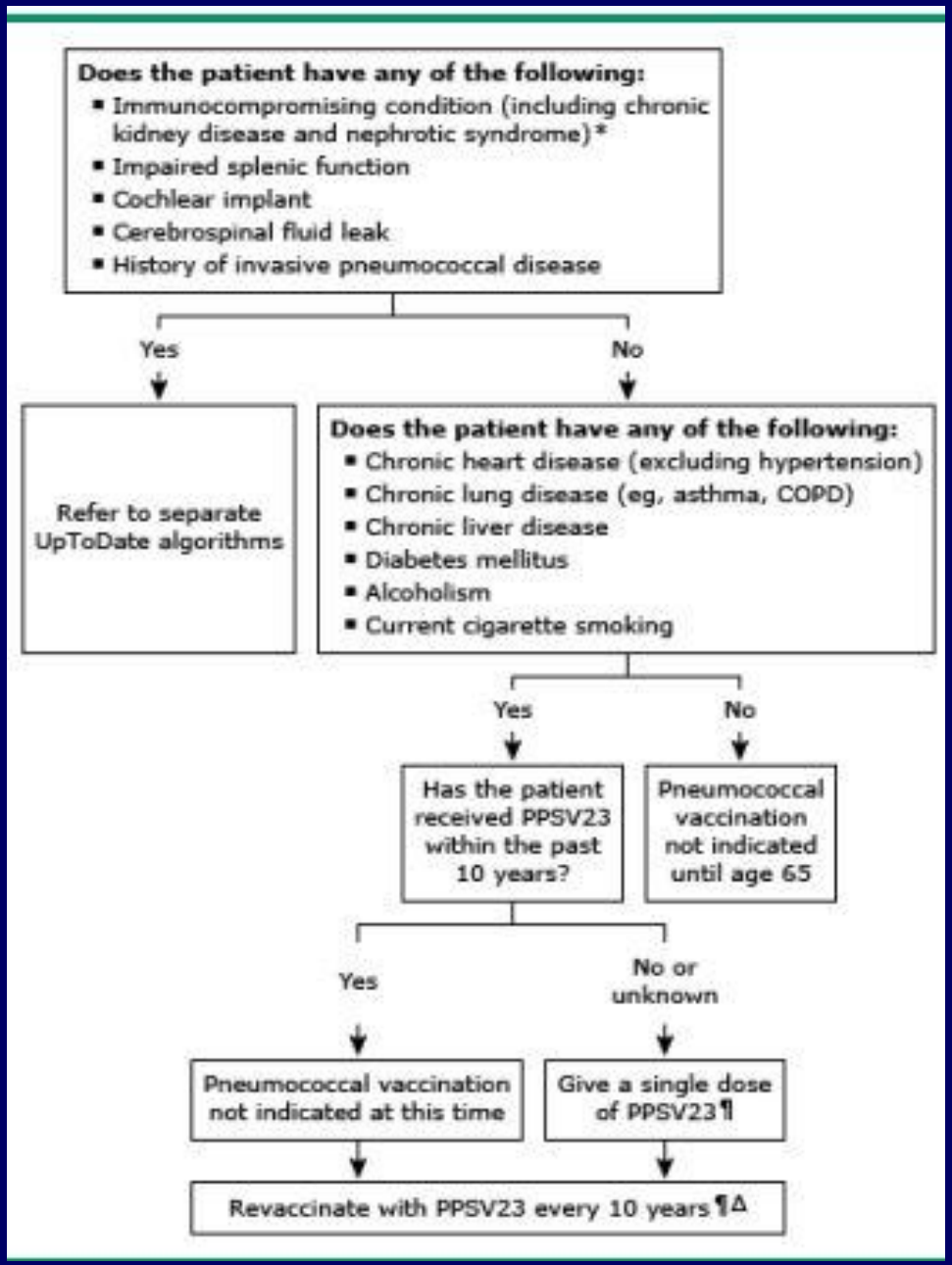
	Polysaccharide vaccine	Conjugate polysaccharide vaccine
Stimulates antibodies in infants and toddlers	No	Yes
Stimulates antibodies in healthy adults	Yes	Yes
Stimulates antibodies in immunocompromised adults	+/-	+/-
Antibodies are long-lasting	+/-	+/-
Primes immunologically for enhanced responses	No	Possibly
Stimulates mucosal immunity, resulting in decreased colonization	No	Yes
Exhibits herd effect (secondary protection of unvaccinated individuals)	No	Yes
Use is associated with replacement strains	No	Yes

PPSV23 coverage

- In the past PPSV23 strain 85-90%
- now 50-60%
- PPSV23 protects 50 to 85 percent of relatively healthy adult recipients against invasive pneumococcal disease

Rout injection

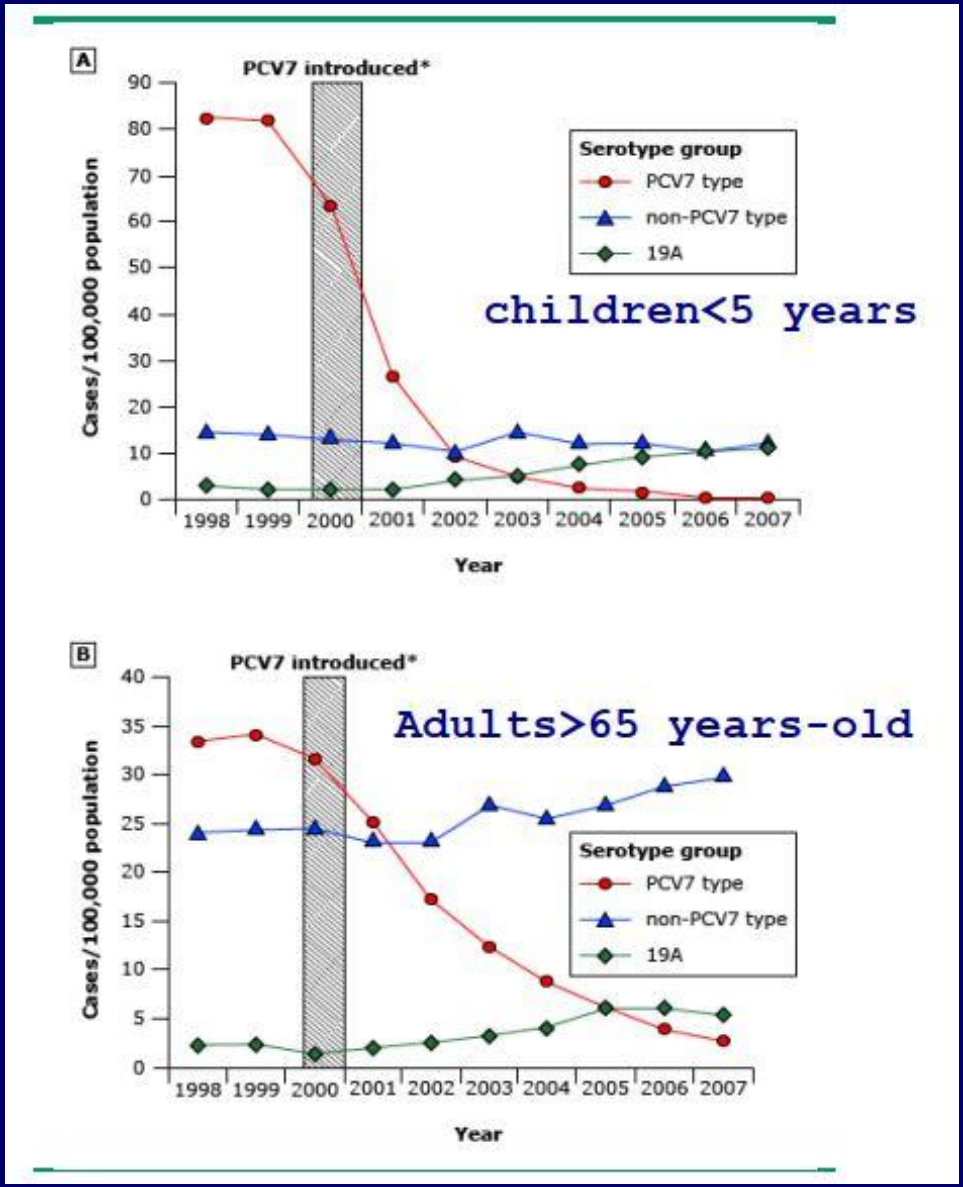
- PPSV23 inject SQ or IM
- PCV13 always IM
- Intradermal=none


Does the patient have any of the following:
Immunocompromising condition (including chronic kidney disease and nephrotic syndrome)*
Impaired splenic function
Cochlear implant
Cerebrospinal fluid leak
History of invasive pneumococcal disease
Yes
No
Refer to separate UpToDate algorithms
Does the patient have any of the following:
Chronic heart disease (excluding hypertension)
Chronic lung disease (eg, asthma, COPD)
Chronic liver disease
Diabetes mellitus
Alcoholism
Current cigarette smoking
Yes
No
Has the patient received PPSV23 within the past 10 years?
Pneumococcal vaccination not indicated until age 65
Yes
No or unknown
Pneumococcal vaccination not indicated at this time
Give a single dose of PPSV23¶
Revaccinate with PPSV23 every 10 years ¶Δ

PCV13 age>65y?

- PCV13>65 America?? Why?
- in nursing homes
- Setting of low pediatric PCV13 uptake
- traveling to settings with no pediatric PCV13
- chronic heart, lung, or liver disease, diabetes, or alcoholism, smoke cigarettes or who have

Children Vaccination effect



Age>65 years

- all PPSV23
- PCV13 in >65 years?
- Why YES why NO?

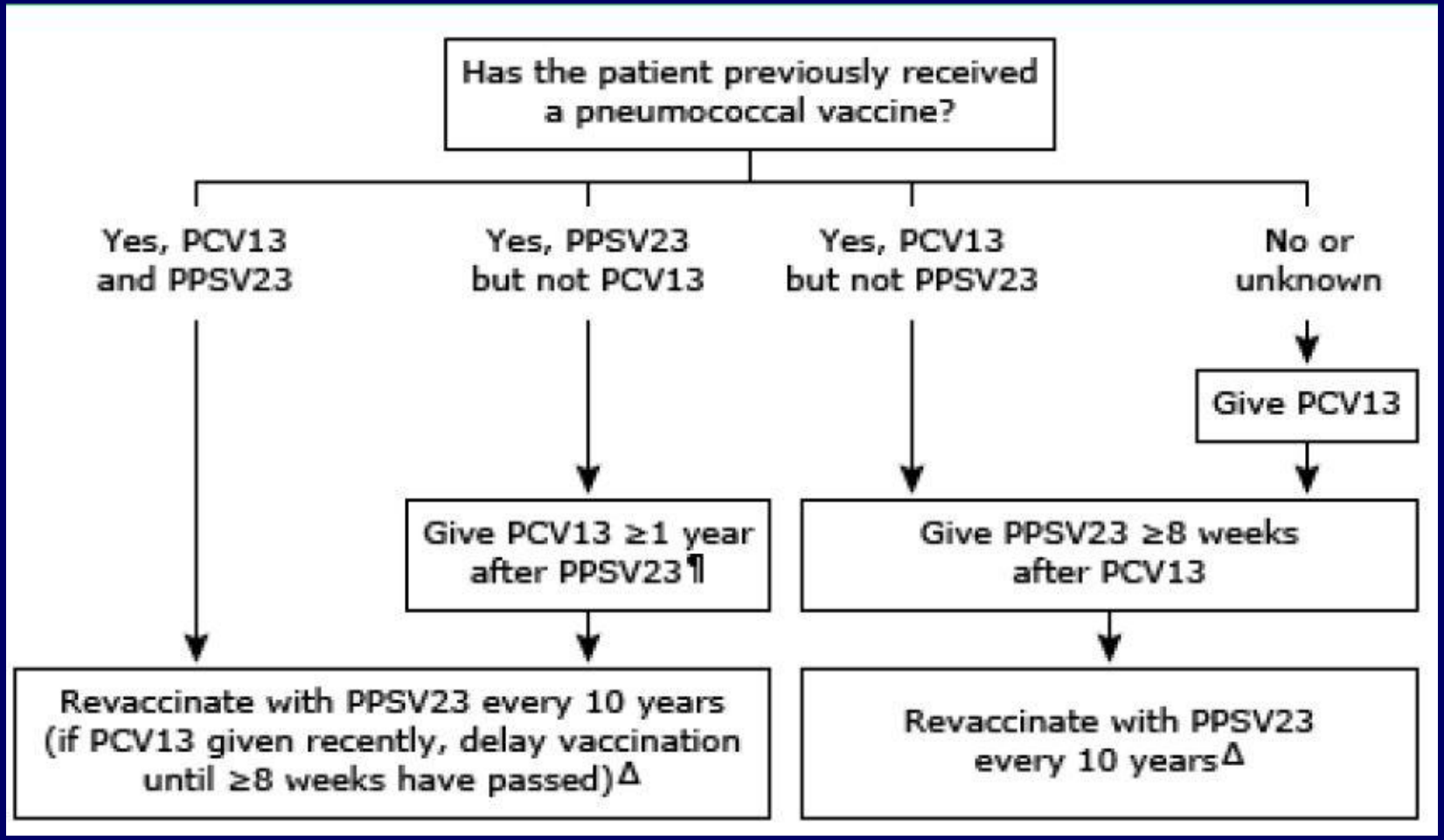
Vaccines together

- PCV13 always first then PPSV23
- Priming
- Increased response
- influenza vaccine + PPSV23?
- PPSV23+Zoster?

PCV13

- PCV13: capsular polysacharid
- nontoxic protein identical diphteria
- Revaccination?

history of invasive pneumococcal disease



Pneumoccal vaccination

	PCV13	PPSV23
Immunocompetent persons		
Chronic heart disease*		X
Chronic lung disease*		X
Diabetes mellitus		X
Cerebrospinal	X	X
Cochlear implant	X	X
Alcoholism		X
Chronic liver disease, cirrhosis		X
Cigarette smoking		X
Age ≥65	????	X
functional or anatomic asplenia/ Sickle cell disease/hemoglobinopathy	X	X
Immunocomprised	X	X
HIV/ Iatrogenic immunosuppression	X	X
Chronic renal failure/ Nephrotic syndrome	X	X
Leukemia/ Lymphoma/ Hodgkin disease/ Multiple myeloma	X	X
Generalized malignancy	X	X
Solid organ transplant	X	X

Influenza

- influenza A viruses that infect mammals,
- 3 major HA subtypes (H1, H2, and H3)
- 2 neuraminidase subtypes (N1 and N2) commonly cause disease in humans;
- other subtypes have caused sporadic infections (eg, H5N1, H7N9).

IIV vaccine

- inactivated influenza vaccine (IIV)
- adults ≥50 years of age;
- Immunocompromised
- have chronic cardiovascular, pulmonary, or metabolic disease;
- pregnant women;
- egg allergy.

Allergy influenza vaccine

- Egg allergy Hives Only?
- 1 dose any influenza vaccine
- Other than hives?(angioedema, respiratory distress??
- 1 dose any influenza vaccine in medical setting
- Previous severe allergic to influenza vaccine?
- Contraindicated

Guillain-Barré inject??

- History of Guillain-Barré syndrome within 6 weeks after previous dose of influenza vaccine:
- Generally, should not be vaccinated unless vaccination benefits outweigh risks for those at higher risk for severe complications from influenza.

Influenza vaccination

- increase AECOPD in the days following vaccination??
- NO

Influenza Vaccine? IHD?

VACCINATIONS

Influenza vaccine

Influenza vaccination can reduce serious illness (such as lower respiratory tract infections requiring hospitalization)[27] and death in COPD patients.[28-31] Only a few studies have evaluated exacerbations and they have shown significant reduction in the total number of exacerbations per vaccinated subject compared with those who received placebo.[28] Vaccines containing either killed or live inactivated viruses are recommended[32] as they are more effective in elderly patients with COPD.[33] Findings from a population-based study suggested that COPD patients, particularly the elderly, had decreased risk of ischemic heart disease when they were vaccinated with influenza vaccine over many years.[34] Occurrence of adverse reactions is generally mild and transient.

Treatment/prophylaxy

Antiviral agent	Dose
Oseltamivir	
Treatment, influenza A and B	75 mg orally twice daily for five days*¶
Chemoprophylaxis, influenza A and B	75 mg orally once daily*Δ
Zanamivir◊§	
Treatment, influenza A and B	10 mg (two 5 mg inhalations) twice daily for five days
Chemoprophylaxis, influenza A and B	10 mg (two 5 mg inhalations) once dailyΔ
Peramivir	
Treatment, influenza A and B	600 mg intravenously as a single dose*
Baloxavir¥	
Treatment, influenza A and B	40 kg to <80 kg: 40 mg orally as a single dose ≥80 kg: 80 mg orally as a single dose
Chemoprophylaxis, influenza A and B	Same as for treatment

- Pertussis vaccination

Whooping cough

- Prevaccine children<10 years
- adults as reservoir
- pertussis common cause chronic cough in adults adsolocents
- Adult>65 years more hospitalization
- all adults age>=19 years vaccination

- Tdap= tetanus, diphteria, acellular pertussis
- Previously did not receive Tdap at or after age 11 years:
- 1 dose Tdap, then Td or Tdap every 10 years.

GOLD Vaccination

VACCINATION FOR STABLE COPD

- Influenza vaccination reduces serious illness and death in COPD patients **(Evidence B)**.
- The 23-valent pneumococcal polysaccharide vaccine (PPSV23) has been shown to reduce the incidence of community-acquired pneumonia in COPD patients aged < 65 years with an FEV_1 < 40% predicted and in those with comorbidities **(Evidence B)**.
- In the general population of adults ≥ 65 years the 13-valent conjugated pneumococcal vaccine (PCV13) has demonstrated significant efficacy in reducing bacteremia & serious invasive pneumococcal disease **(Evidence B)**.
- The CDC recommends the Tdap (dTaP/dTPa) vaccination for adults with COPD who were not vaccinated in adolescence to protect against pertussis (whooping cough).

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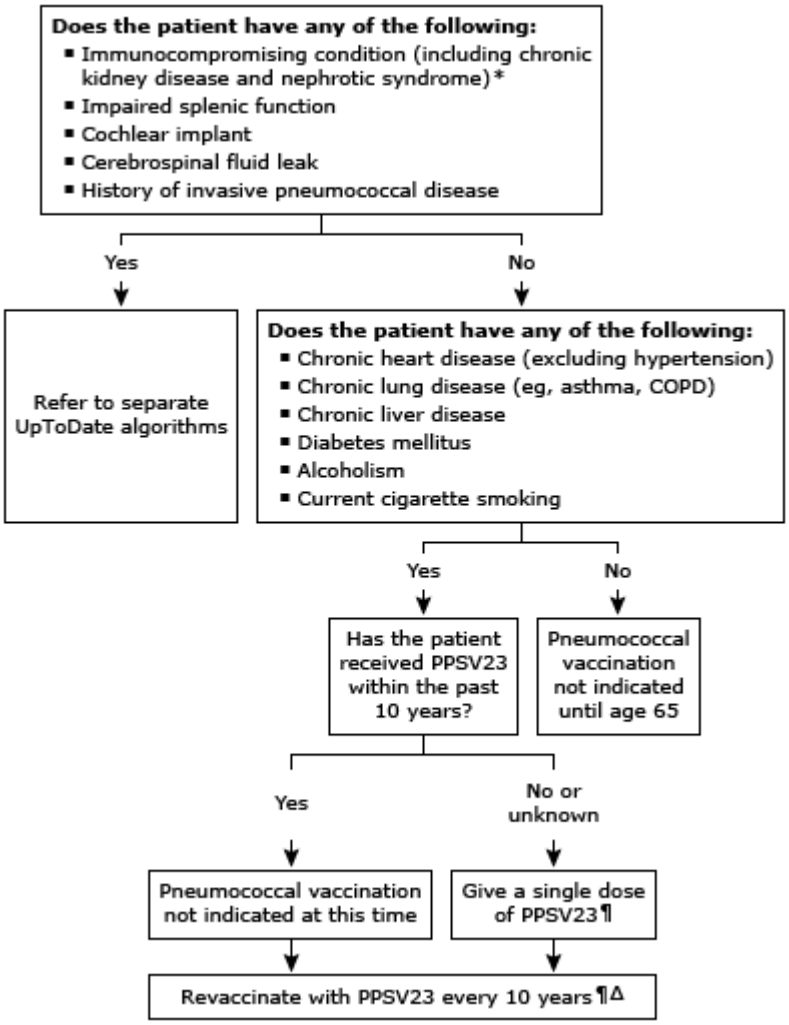
Comparison of properties of the pneumococcal polysaccharide and conjugate vaccines

	Polysaccharide vaccine	Conjugate polysaccharide vaccine
Stimulates antibodies in infants and toddlers	No	Yes
Stimulates antibodies in healthy adults	Yes	Yes
Stimulates antibodies in immunocompromised adults	+/-	+/-
Antibodies are long-lasting	+/-	+/-
Primes immunologically for enhanced responses	No	Possibly
Stimulates mucosal immunity, resulting in decreased colonization	No	Yes
Exhibits herd effect (secondary protection of unvaccinated individuals)	No	Yes
Use is associated with replacement strains	No	Yes

Graphic 87568 Version 1.0

UpToDate recommendations for pneumococcal vaccination in immunocompetent adults ≥19 and <65 years of age in the United States [1]



COPD: chronic obstructive pulmonary disease; PPSV23: 23-valent pneumococcal polysaccharide vaccine; PCV13: 13-valent pneumococcal conjugate vaccine.

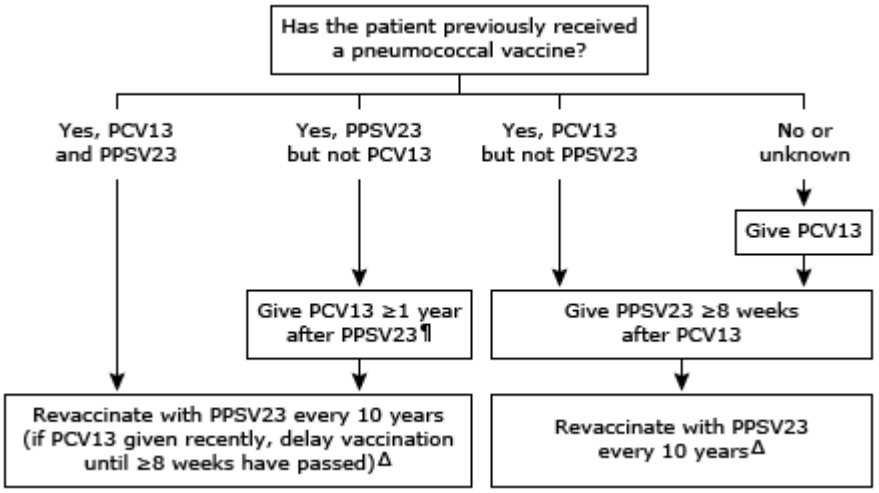
* Because patients with chronic kidney disease can be hypogammaglobulinemic and are at increased risk for invasive pneumococcal disease, these patients are vaccinated according to the same schedule as immunocompromised patients. However, the degree to which chronic kidney disease confers risk for pneumococcal disease likely varies from patient to patient; thus, this is not a strict classification.

¶ UpToDate's recommendations differ from those of the United States Advisory Committee on Immunization Practices (ACIP). The ACIP recommends a single dose of PPSV23 for patients ages 19 to 64 and a single revaccination dose once the patient reaches age 65. We recommend revaccination at more frequent intervals because immunity to PPSV23 wanes with time. Refer to the UpToDate text for detail.

Δ PCV13 can be considered on a case-by-case basis once the patient reaches age 65.

UpToDate recommendations for pneumococcal vaccination in adults (any age) with a history of invasive pneumococcal disease* in the United States [1]

History of invasive pneumoccal



PCV13: 13-valent pneumococcal conjugate vaccine; PPSV23: 23-valent pneumococcal polysaccharide vaccine.

* The United States Advisory Committee on Immunization Practices (ACIP) has not issued a statement on vaccinating patients with invasive pneumococcal disease. However, we vaccinate these individuals because they have proven to be susceptible to pneumococcal infection. Refer to the UpToDate text for detail.

¶ For patients who have been treated for invasive pneumococcal disease and are likely to adhere to medical recommendations, we give the first dose of vaccine two months after recovery because of the possibility that the infection has caused transient immunosuppression. We vaccinate patients who are not likely to return to care at the point of care.

Δ We revaccinate patients every 10 years as immunity to PPSV23 wanes with time. However, the optimal approach to revaccination is not known and recommendations vary among experts.

Reference:

1. *Centers for Disease Control and Prevention (CDC). Use of 13-valent pneumococcal conjugate vaccine and 23-valent pneumococcal polysaccharide vaccine for adults with immunocompromising conditions: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Morb Mortal Wkly Rep 2012; 61:816.*

Graphic 122528 Version 1.0

Recommended dosing of antiviral medications for the prophylaxis and/or treatment of seasonal influenza in adults

influenza

Antiviral agent	Dose
Oseltamivir	
Treatment, influenza A and B	75 mg orally twice daily for five days*¶
Chemoprophylaxis, influenza A and B	75 mg orally once daily*Δ
Zanamivir◊§	
Treatment, influenza A and B	10 mg (two 5 mg inhalations) twice daily for five days
Chemoprophylaxis, influenza A and B	10 mg (two 5 mg inhalations) once dailyΔ
Peramivir	
Treatment, influenza A and B	600 mg intravenously as a single dose*
Baloxavir¥	
Treatment, influenza A and B	40 kg to <80 kg: 40 mg orally as a single dose ≥80 kg: 80 mg orally as a single dose
Chemoprophylaxis, influenza A and B	Same as for treatment

Refer to the UpToDate topic reviews on treatment and prevention of seasonal influenza for additional details about indications for use of an antiviral agent, choice of agent, dosing, and duration.

* A reduction in the dose of oseltamivir and peramivir is recommended for persons with renal impairment.

¶ A longer duration of therapy can be considered in severely ill patients or immunocompromised individuals, particularly in those who continue to have viral RNA detected by polymerase chain reaction from a respiratory specimen.

Δ Duration of prophylaxis depends upon several factors. (Refer to the UpToDate topic review on prevention of seasonal influenza in adults.)

◊ Zanamivir is administered through oral inhalation by using a plastic device included in the medication package. Patients will benefit from instruction and demonstration of the correct use of the device. Zanamivir is contraindicated in persons with asthma or chronic obstructive pulmonary disease. Zanamivir is also not recommended for the treatment of hospitalized patients with influenza due to limited data in patients with severe influenza.

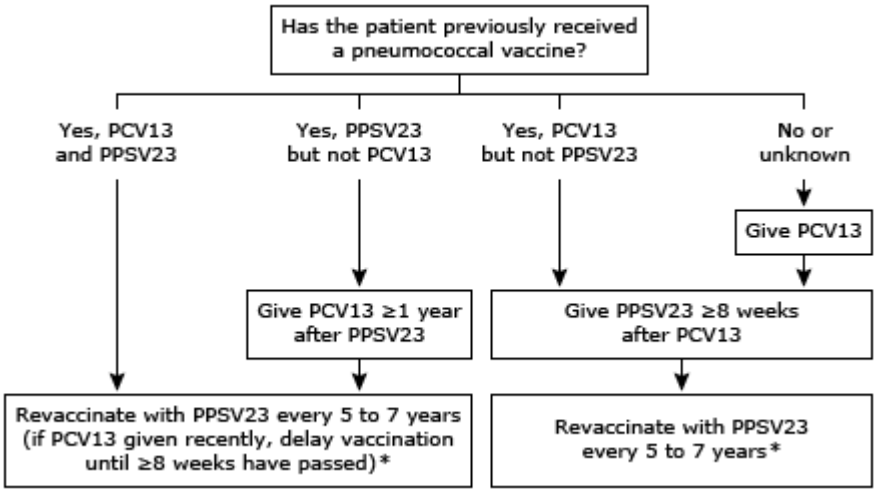
§ Zanamivir should be used during outbreaks caused by oseltamivir-resistant influenza virus. It is important to assess the risk of oseltamivir-resistant influenza before choosing an antiviral drug for influenza prophylaxis. Clinicians should review local or state influenza surveillance data to determine which types of influenza (A or B) and subtypes (pandemic or seasonal H1N1; H3N2) of influenza A are circulating, as well as resistance patterns. This information, which is updated weekly, is available via the United States Centers for Disease Control and Prevention through its website.

¥ Baloxavir has been approved by the US Food and Drug Administration for uncomplicated influenza (including in patients at high risk for complications). Results in severely immunocompromised hosts have not yet been reported and baloxavir is not recommended by the United States Centers for Disease Control and Prevention for monotherapy of influenza in severely immunocompromised hosts. Clinically important influenza virus resistance to baloxavir may occur during treatment.

Adapted from:

1. *Influenza Division, National Center, for Immunization, and Respiratory. Antiviral agents for the treatment and chemoprophylaxis of influenza -- recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Recomm Rep 2011; 60:1.*
2. *Centers for Disease Control and Prevention. Influenza antiviral medications: Summary for clinicians. https://www.cdc.gov/flu/professionals/antivirals/summary-clinicians.htm (Accessed on December 9, 2019).*
3. *Xofluza (baloxavir marboxil) for oral use, prescribing information. https://www.accessdata.fda.gov/drugsatfda_docs/label/2019/210854s001lbl.pdf (Accessed on October 17, 2019).*
4. *Uehara T, Hayden FG, Kawaguchi K, et al. Treatment-emergent influenza variant viruses with reduced baloxavir susceptibility: Impact on clinical and virologic outcomes in uncomplicated influenza. J Infect Dis 2019.*

UpToDate recommendations for pneumococcal vaccination in adults (any age) with a cochlear implant or CSF leak in the United States [1]



CSF: cerebrospinal fluid; PCV13: 13-valent pneumococcal conjugate vaccine; PPSV23: 23-valent pneumococcal polysaccharide vaccine.

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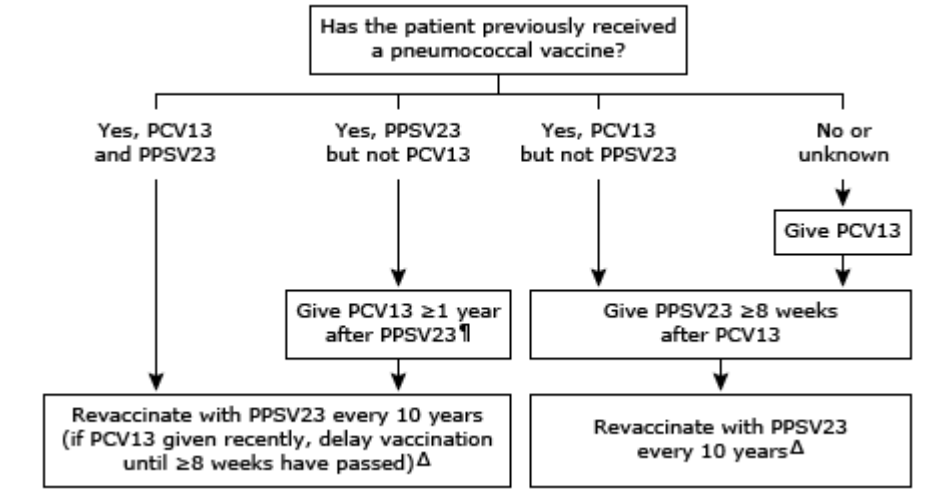
Reference:

1. *Centers for Disease Control and Prevention (CDC). Use of 13-valent pneumococcal conjugate vaccine and 23-valent pneumococcal polysaccharide vaccine for adults with immunocompromising conditions: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Morb Mortal Wkly Rep 2012; 61:816.*

Graphic 107907 Version 6.0

UpToDate recommendations for pneumococcal vaccination in adults (any age) with a history of invasive pneumococcal disease* in the United States [1]



PCV13: 13-valent pneumococcal conjugate vaccine; PPSV23: 23-valent pneumococcal polysaccharide vaccine.

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Graphic 122528 Version 1.0