



Selected Topics in Infectious Disease

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Objectives

- Review a recently published journal article and identify 2025 US Advisory Committee on Immunization Practices Recommendations for RSV vaccination in older adults.
- Identify when antibiotics should versus should not be used during respiratory season.
- Identify Beers Criteria recommendations related to antibiotic use in older adults.

Journal Article Review



Original Investigation | Infectious Diseases

Estimated Vaccine Effectiveness for Respiratory Syncytial Virus–Related Lower Respiratory Tract Disease

Sara Y. Tartof, PhD, MPH; Negar Aliabadi, MD, MS; Gabriella Goodwin, MS; Jeff Slezak, MS; Vennis Hong, MPH; Bradley Ackerson, MD; Qing Liu, MS; Sally Shaw, DrPH, MPH; Sabrina Welsh, MPH; Julie A. Stern, MPH; Banshri Kapadia, MS; Brigitte C. Spence, MPH; Joseph A. Lewnard, PhD; Gregg S. Davis, PhD, MPH; Michael Aragonés, MD; Michael Dutro, PharmD; Erica Chilson, PharmD; Elisa Gonzalez, MS; Robin Hubler, MS; Brandon Chia, BA; Luis Jodar, PhD; Bradford D. Gessner, MD; Elizabeth Begier, MD, MPH

Tartof SY, Aliabadi N, Goodwin G, et al. Estimated Vaccine Effectiveness for Respiratory Syncytial Virus–Related Lower Respiratory Tract Disease. JAMA Netw Open.2024;7(12):e2450832. doi:10.1001/jamanetworkopen.2024.50832

Pertinent Background Information

- Respiratory syncytial virus (RSV) infection is very common in older adults and results in a large number of ED visits and hospitalizations annually.
- 2025 US Advisory Committee on Immunization Practices (ACIP) Recommendations for RSV in older adults:
 - One dose of RSV vaccine recommended in adults aged 50-74 years who are at increased risk for severe RSV.
 - One dose of RSV vaccine recommended in all adults age 75 years and older.
- Older adults are historically underrepresented in clinical trials.

Tartof SY, Aliabadi N, Goodwin G, et al. Estimated Vaccine Effectiveness for Respiratory Syncytial Virus–Related Lower Respiratory Tract Disease. JAMA Netw Open.2024;7(12):e2450832. doi:10.1001/jamanetworkopen.2024.50832
<https://www.cdc.gov/vaccines/imz-schedules/adult-easyread.html>, <https://www.cdc.gov/mmwr/volumes/73/wr/mm7332e1.htm> accessed August 2025, accessed September 2025.

Research Question and Importance

- Research Question
 - Is RSVpreF effective in older adults for preventing RSV related ED visits and hospitalizations?
- Importance
 - Previous trials demonstrating vaccine efficacy for lower respiratory tract disease (LRTD) enrolled very few patients over the age of 75 with common comorbidities.
 - Vaccine efficacy for preventing ED visits and hospitalizations evidence is needed in the literature.

Tartof SY, Aliabadi N, Goodwin G, et al. Estimated Vaccine Effectiveness for Respiratory Syncytial Virus–Related Lower Respiratory Tract Disease. JAMA Netw Open. 2024;7(12):e2450832. doi:10.1001/jamanetworkopen.2024.50832



Methods: Study Setting and Design

- Setting
 - Kaiser Permanente Southern California (KPSC)
- Study Design
 - “test negative case-control study comparing the odds of RSVpreF (Abrysvo) receipt between RSV cases and test-negative controls at Kaiser Permanente Southern California (KPSC)”
 - Enhanced specimen testing

Tartof SY, Aliabadi N, Goodwin G, et al. Estimated Vaccine Effectiveness for Respiratory Syncytial Virus–Related Lower Respiratory Tract Disease. *JAMA Netw Open*. 2024;7(12):e2450832. doi:10.1001/jamanetworkopen.2024.50832



Study Setting and Design

- Patient Inclusion Criteria

- Age 60 or older
- ICD-10 code for lower respiratory tract disease (LRTD) hospitalization or ED visit tested for RSV via respiratory swab/molecular testing between November 2023-April 2024.
- Health plan member of KP for 1 year or more
- RSVpreF vaccine 21 days or more prior to LRTD encounter.

- Patient Exclusion Criteria

- Non-RSVpreF vaccine recipients
- RSV vaccination less than 21 days before the LRTD hospitalization/ED visit

Outcomes

- Cobas RP2 testing 14 or fewer days before or 3 or fewer days after LRTD encounter.
 - Cases: RSV Positive LRTD events
 - Controls:
 - Strict: LRTD events negative for RSV, HMPV, influenza, SARS-CoV-2 but positive for nonvaccine preventable disease
 - Broad: RSV-negative LRTD events, regardless of other identified causes.

Tartof SY, Aliabadi N, Goodwin G, et al. Estimated Vaccine Effectiveness for Respiratory Syncytial Virus–Related Lower Respiratory Tract Disease. JAMA Netw Open. 2024;7(12):e2450832. doi:10.1001/jamanetworkopen.2024.50832

Results

- 7047 LRTD events met inclusion criteria
 - Number of cases and controls was determined by strict or broad control group definitions.
- There were some statistically significant differences in baseline characteristics between groups when the case group was compared to the strict and/or broad analysis groups.



Results, continued

Analysis with strict controls (623 cases 804 controls), adjusted VE was 91% (95% CI, 59%-98%)

Analysis with broad controls (623 cases, 6424 controls), adjusted VE was 90% (95% CI, 59-97%)

VE against severe LRTD hospitalizations and ED visits was 89% (95% CI, 13 %-99%)

Strengths and Limitations

- Strengths
 - Approaches to analysis of data that minimized bias.
- Limitations
 - < 5% of those with LRTD events were vaccinated; several reasons provided for this
 - Not all LRTD events in ED or hospital were tested for RSV

Tartof SY, Aliabadi N, Goodwin G, et al. Estimated Vaccine Effectiveness for Respiratory Syncytial Virus–Related Lower Respiratory Tract Disease. JAMA Netw Open. 2024;7(12):e2450832. doi:10.1001/jamanetworkopen.2024.50832

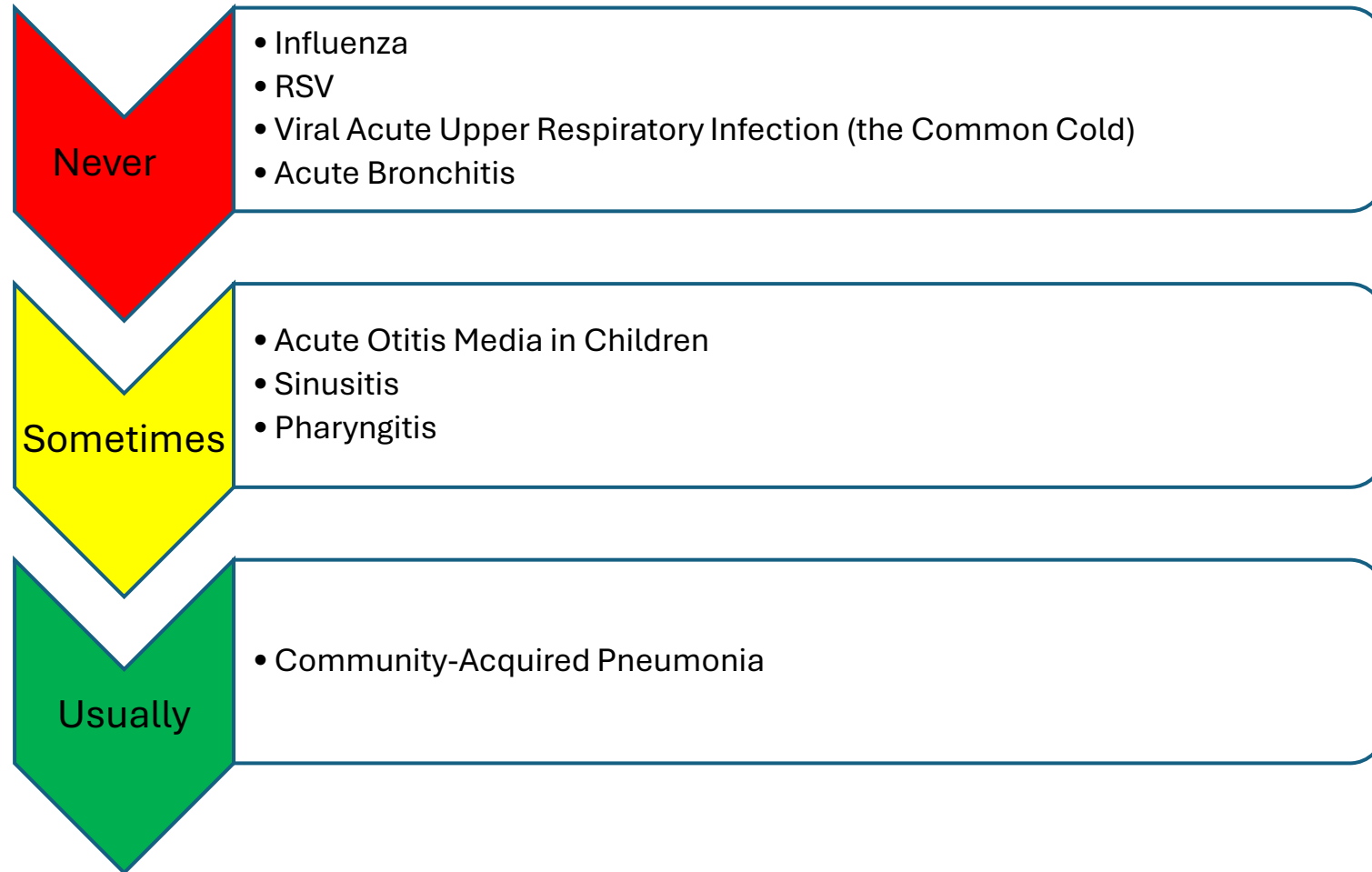
Respiratory Season: When we should vs. should not use antibiotics

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When are antibiotics needed?



Respiratory Syncytial Virus (RSV)

- RSV circulates in fall and spring
- Symptoms depend on age
 - Older children and adults: cold like symptoms
 - < 2 years old: fever, decreased appetite, progressive cough
 - Patient with bronchiolitis (inflammation and congestion in bronchioles)
 - RSV is a known cause
- Testing is available
 - Rapid antigen testing
 - Infants and children <2 years (80-90% sensitivity)
 - rRT-PCR
 - Older children and adults
 - Usually part of a panel that detects other respiratory viruses as well

RSV: Treatment

- NO antibiotics needed!
- Supportive care
 - Nasal bulb suctioning
 - Ibuprofen
 - Acetaminophen
 - Oral rehydration solution
- Follow up plan
 - Symptoms should peak around fifth day of illness, but if not improving by day 10 return to clinic.
- Prevention: Vaccine





Influenza

- 3-11% of the population has symptomatic influenza in a typical year
- UP to 960,000 hospitalizations
- 12,000-79,000 deaths per year
- Typically influenza is prevalent October-May

Vaccine is available for prevention!!!

Testing

- Rapid Direct Antigen
 - Highly specific
 - Not very sensitive
 - 10-15 minutes to run
 - Better at detecting influenza A than influenza B
- Rapid Molecular Assay
 - High sensitivity
 - High specificity
 - 15-30 minutes to run
 - Recommended for outpatient use
- Reverse-transcription polymerase chain reaction
 - High sensitivity
 - High specificity
 - Recommended for hospitalized patients
 - Can do a multiplex targeting many viruses



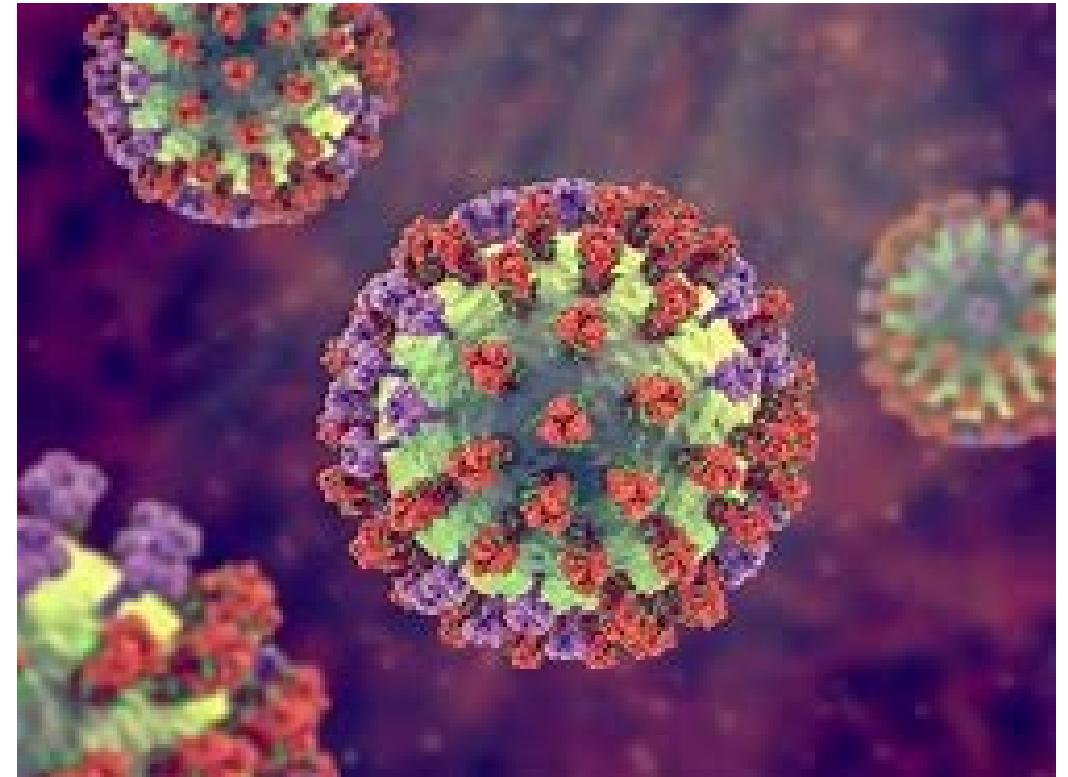
Influenza Treatment

- **No** antibiotics are recommended for uncomplicated influenza in absence of pneumonia
- Antiviral therapy may be used in high-risk groups
 - Patients with severe or progressive illness
 - Patients with chronic medical conditions or immunocompromise
 - Children <2 years
 - Adults $\geq$ 65 years
 - Pregnant women

Start Antiviral as early as possible and up to 5 days from symptom onset

Influenza Treatment

- Antivirals
 - Oseltamivir (must renal dose adjust)
 - Baloxavir
 - Zanamivir (Inhaled)
 - Peramivir (IV)
- Symptomatic treatment
 - Acetaminophen
 - NSAIDs
 - Nasal Decongestants
 - Oral Decongestants
 - Dextromethorphan or guaifenesin





Viral Upper Respiratory Illness

- Symptoms
 - Fever
 - Cough
 - Runny nose
 - Nasal congestion, postnasal drip
 - Sore throat
 - Headache
 - Myalgias
- Treatment
 - **NO** antibiotics
 - Symptomatic relief
 - Decongestants (pseudoephedrine)
 - Antihistamines (loratadine, cetirizine, fexofenadine)
 - Acetaminophen vs Non-steroidal anti-inflammatory meds (short term use)
- The 3rd most frequent diagnosis in office visits
- Over 200 viruses can cause the common cold

<https://www.cdc.gov/antibiotic-use/clinicians/adult-treatment-rec.html>

American Geriatrics Society Beers Criteria® Alternatives Panel, M. A. Steinman, T. P. Semla, K. M. Akgün, et al., “Alternative Treatments to Selected Medications in the 2023 American Geriatrics Society Beers Criteria®,” Journal of the American Geriatrics Society (2025): 1–21,

Acute Uncomplicated Bronchitis

- Pearl: Colored sputum does not indicate bacterial infection and most cases chest radiography is not indicated
- Symptoms: cough
- Treatment
 - **NO** antibiotics
 - Symptomatic therapy
 - Cough suppressants (dextromethorphan)
 - Antihistamines (loratadine, cetirizine, fexofenadine)
 - Decongestants (pseudoephedrine)



Acute RhinoSinusitis

- Caused by virus or bacteria
 - 90-98% are viral
 - Antibiotics are not guaranteed to help even if bacterial
- Symptoms
 - Fatigue
 - Headache
 - Decreased appetite
 - Congested nose
 - Facial/dental pain
- Symptomatic relief
 - Topical nasal steroids (mometasone, fluticasone, flunisolide, budesonide)
 - Nasal saline irrigation
 - Decongestants



Acute RhinoSinusitis

- Consider bacterial when:
 - Persistent symptoms without improvement > 10 days
 - Worsening symptoms, new onset fever, or worsening after improvement
 - Severe symptoms: fever $\geq 39^{\circ}\text{C}$, purulent nasal discharge for at least 3 days
- Common bacteria:
 - S. pneumoniae*
 - H. Influenzae*
 - Moraxella catarrhalis*
- Treatment (if bacterial)
 - Watchful waiting (must follow-up with patient)
 - First-line
 - Amoxicillin or amoxicillin/clavulanate
 - Second line
 - Doxycycline
 - Levofloxacin
 - Duration: 5-10 days

****Pearl-azithromycin is not recommended due to high levels of *Streptococcus pneumoniae* resistance****

Clinical Practice Guideline (Update): Adult Sinusitis - Richard M. Rosenfeld, Jay F. Piccirillo, Sujana S. Chandrasekhar, Itzhak Brook, Kaparaboina Ashok Kumar, Maggie Kramper, Richard R. Orlandi, James N. Palmer, Zara M. Patel, Anju Peters, Sandra A. Walsh, Maureen D. Corrigan, 2015

Respiratory Tract: Acute Bacterial Sinusitis

CLINICAL AND THERAPEUTIC ALGORITHM	RISK FACTORS	RECOMMENDED REGIMENS
1a. Antibiotics are indicated if the patient has <u>ANY</u> of the following: - Symptoms lasting ≥ 10 days without clinical improvement OR - Severe symptoms at onset lasting ≥ 3 days [Fever ($\geq 102^{\circ}\text{F}$), severe facial pain, or purulent discharge] OR - New onset fever, severe headache, or increase nasal discharge after 5-6 days following initial improvement	Presence of Risk Factors for Antibiotic Resistance: - Age > 65 - Antibiotics within last 30 days - Hospitalization within last 5 days - Immuno-compromised OR - Fever > 102°F with signs of systemic illness	Initial Empiric Antibiotic Therapy: Amoxicillin/clavulanate PO: CrCl > 30 ml/min: 2000/125 mg [‡] Q12H CrCl 10 – 29 ml/min: 875/125 mg Q12H CrCl < 10 ml/min: 2000/125 [‡] mg Q24H Alternatives*: Moxifloxacin 400 mg PO Q24H Treat for 7 to 10 days
1b. If the patient does not meet this criteria likely viral and self-limiting. May provide symptom relief. Reduce nasal symptoms: topical or nasal decongestants, intranasal corticosteroids, intranasal saline	None of the above risk factors for antibiotic resistance AND No fever or signs of systemic illness	No risk for Antibiotic Resistance: Amoxicillin/clavulanate PO: CrCl > 30 ml/min: 875/125 mg Q12H CrCl 10–29 ml/min: 500/125 mg Q12H CrCl < 10 ml/min: 875/125 mg Q24H Alternatives*: Doxycycline 100 mg PO Q12H Treat for 5 to 7 days
2. If no improvement after 3 to 5 days of antibiotic therapy switch to an alternative agent from a different antibiotic class		

CrCl= creatinine clearance; H= hour(s); PO= by mouth; Q= every

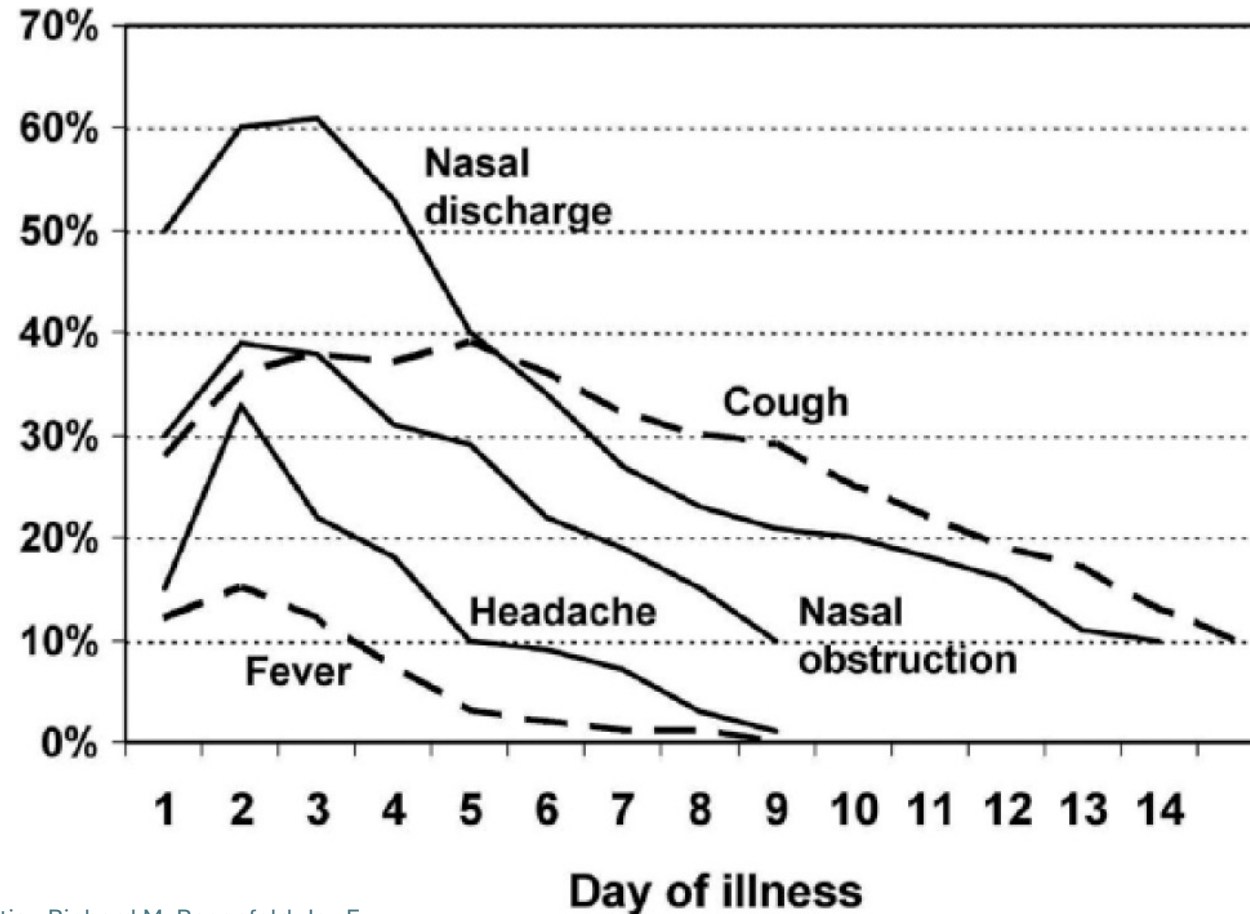
[‡] Pharmacy does not carry amoxicillin/clavulanate 2000/125 mg tablets. Order 875/125 mg tablets of amoxicillin/clavulanate **AND** 1000 mg tablets of amoxicillin (total amoxicillin/clavulanate = 1,875/125 mg per dose).

*Macrolides, trimethoprim-sulfamethoxazole, and 2nd or 3rd generation cephalosporins are not recommended due to increasing rates of antimicrobial resistance.

<https://web.uri.edu/wp-content/uploads/sites/1349/Sinusitis-2019-JD.pdf>

Acute RhinoSinusitis

Symptom prevalence by day for rhinovirus illness (data from Gwaltney 1967)



Pharyngitis

- Only 5-15% of adult sore throat cases are caused by Group A beta-hemolytic streptococcal (GAS) infection
- GAS infection is the **ONLY** common indication for antibiotic therapy for sore throat cases
- Symptoms
 - Fever
 - Tonsillar exudates
 - Tender lymph nodes
 - No cough



Pharyngitis

Testing

- Rapid Antigen Detection Test
 - Test patients who have two or more symptoms
 - Do not treat with antibiotics if have negative RADT

Patients who received inappropriate antibiotics for pharyngitis (sore throat) were significantly more likely to get a *C. diff* infection:

8x higher risk
(children)



3x higher risk
(adults)



<https://www.pewtrusts.org/en/research-and-analysis/data-visualizations/2023/inappropriate-antibiotic-prescribing-leads-to-increased-costs-complications>

<https://web.uri.edu/wp-content/uploads/sites/1349/Acute-Pharyngitis-2019-JD.pdf>

Shulman ST, Bisno AL, Clegg HW, et al. Clinical Practice Guidelines for the Diagnosis and Management of Group A Streptococcal Pharyngitis: 2012 Update by the Infectious Diseases Society America. Clin Infect Dis. 2012 Nov 15;55(10):1279-82.

Cooper RJ et al. Principles of appropriate antibiotic use for acute pharyngitis in adults: Background. Annals of Internal Medicine. 2001;134(6):509-17

CLASSIFICATION	CLINICAL PRESENTATION	RECOMMENDED REGIMENS	CLINICAL CONSIDERATIONS
Group A β -hemolytic streptococcus (GAS)	≥ 2 of the following: • Fever ($\geq 100.4^{\circ}$) • Tonsillar exudates • No cough • Tender anterior cervical lymphadenopathy (lymphadenitis) • Scarletiform rash	Amoxicillin 500 mg PO Q12H OR Penicillin VK 250 mg Q6H OR Penicillin 500 mg PO Q12H For 10 days <u>Penicillin Allergy</u> Non-anaphylactic allergy: Cephalexin 500 mg PO Q12H x 10 days OR Clindamycin 300 mg PO Q6H for 10 days OR Azithromycin 500 mg PO x 1 day, then 250 mg PO Q24H x 4 days	Clinical suspicion for GAS: Obtain throat swab OR order GAS rapid antigen detection test (RADT)* If culture is negative: No antibiotics AND consider supportive treatment (antipyretic OR analgesic)
Viral Pharyngitis	• Conjunctivitis • Coryza • Cough • Diarrhea • Hoarseness • Discrete ulcerative stomatitis • Viral exanthema	Supportive treatment (antipyretic OR analgesic)	

GAS= Group A β -hemolytic Streptococci; H= hour(s); PO= by mouth; Q= every; RADT= Rapid antigen detection test

*Throat swab culture sensitivity: 90-95%; RADT: sensitivity 70-90%, specificity 95%

Community Acquired Pneumonia

Can be viral or bacterial
Common bacteria include:

- Streptococcus pneumoniae
- Haemophilus influenzae
- Moraxella catarrhalis
- Staphylococcus aureus
- Klebsiella pneumoniae
- Atypical bacteria

Prevention is key!

Encourage pneumococcal, influenza, and COVID-19 vaccination to decrease risk of pneumonia!

TABLE 2

Initial Treatment Regimens for Outpatients with Community-Acquired Pneumonia

Patient factors	Antibiotic regimen*
No risk factors for methicillin-resistant <i>Staphylococcus aureus</i> or <i>Pseudomonas aeruginosa</i> † and No comorbidities listed below	Amoxicillin, 1,000 mg every 8 hours or Doxycycline, 100 mg every 12 hours or Macrolide if local pneumococcal resistance < 25%: Azithromycin (Zithromax), 500 mg on day 1, then 250 mg per day or Clarithromycin (Biaxin), 500 mg every 12 hours or Extended-release clarithromycin (Biaxin XL), 1,000 mg per day
Comorbidities: alcoholism; asplenia; diabetes mellitus; malignancy; or chronic heart, lung, liver, or kidney disease	Combination of: Amoxicillin/clavulanate (Augmentin), 500 mg/125 mg every 8 hours, 875 mg/125 mg every 12 hours, or 2,000 mg/125 mg every 12 hours or Cefpodoxime, 200 mg every 12 hours or Cefuroxime axetil, 500 mg every 12 hours PLUS Azithromycin, 500 mg on day 1, then 250 mg per day or Clarithromycin, 500 mg every 12 hours or Doxycycline, 100 mg every 12 hours or Extended-release clarithromycin, 1,000 mg per day OR Monotherapy with a respiratory fluoroquinolone: Gemifloxacin (Factive), 320 mg per day or Levofloxacin (Levaquin), 750 mg per day or Moxifloxacin (Avelox), 400 mg per day

*—Duration of therapy should be ≥ 5 days for all regimens, after which the patient's vital signs, ability to eat, and mentation should be evaluated to ensure recovery.

†—Risk factors include prior respiratory isolation of methicillin-resistant *S. aureus* or *P. aeruginosa*, or hospitalization and treatment with parenteral antibiotics within the past 90 days.

Adapted with permission from Metlay JP, Waterer GW, Long AC, et al. Diagnosis and treatment of adults with community-acquired pneumonia. An official clinical practice guideline of the American Thoracic Society and Infectious Diseases Society of America. Am J Respir Crit Care Med. 2019;200(7):e50.

TABLE 3

Treatment Regimens for Hospitalized Patients with Community-Acquired Pneumonia

Patient factors	Antibiotic regimen*	Patient factors	Antibiotic regimen*
Nonsevere pneumonia without risk factors for MRSA or <i>Pseudomonas aeruginosa</i> †	Combination of: Ampicillin/sulbactam (Unasyn), 1.5 to 3 g IV every 6 hours or Cefotaxime (Claforan), 1 to 2 g IV every 8 hours or Ceftaroline (Teflaro), 600 mg IV every 12 hours or Ceftriaxone (Rocephin), 1 to 2 g IV every day PLUS Azithromycin (Zithromax), 500 mg orally or IV every day or Clarithromycin (Biaxin), 500 mg orally every 12 hours OR Monotherapy with a respiratory fluoroquinolone: Levofloxacin (Levaquin), 750 mg orally or IV every day or Moxifloxacin (Avelox), 400 mg orally or IV every day	Severe pneumonia without risk factors for MRSA or <i>P. aeruginosa</i> †	Combination of: Ampicillin/sulbactam, 1.5 to 3 g IV every 6 hours or Cefotaxime, 1 to 2 g IV every 8 hours or Ceftaroline, 600 mg IV every 12 hours or Ceftriaxone, 1 to 2 g IV every day PLUS Azithromycin, 500 mg orally or IV every day or Clarithromycin, 500 mg orally every 12 hours or Levofloxacin, 750 mg orally or IV every day or Moxifloxacin, 400 mg orally or IV every day
Nonsevere pneumonia without risk factors for MRSA or <i>P. aeruginosa</i> † and Contraindications to macrolides and fluoroquinolones	Combination of: Ampicillin/sulbactam, 1.5 to 3 g IV every 6 hours or Cefotaxime, 1 to 2 g IV every 8 hours or Ceftaroline, 600 mg IV every 12 hours or Ceftriaxone, 1 to 2 g IV every day PLUS Doxycycline, 100 mg orally or IV every 12 hours	Severe pneumonia with locally validated risk factors for MRSA or <i>P. aeruginosa</i> †	For MRSA risk factors: Linezolid (Zyvox), 600 mg orally or IV every 12 hours or Vancomycin, 15 mg per kg IV every 12 hours (adjust based on levels) For <i>P. aeruginosa</i> risk factors: Aztreonam (Azactam), 2 g IV every 8 hours or Cefepime, 2 g IV every 8 hours or Ceftazidime (Fortaz), 2 g IV every 8 hours or Imipenem/cilastatin (Primaxin), 500 mg IV every 6 hours or Meropenem (Merrem IV), 1 g IV every 8 hours or Piperacillin/tazobactam (Zosyn), 4.5 g IV every 6 hours

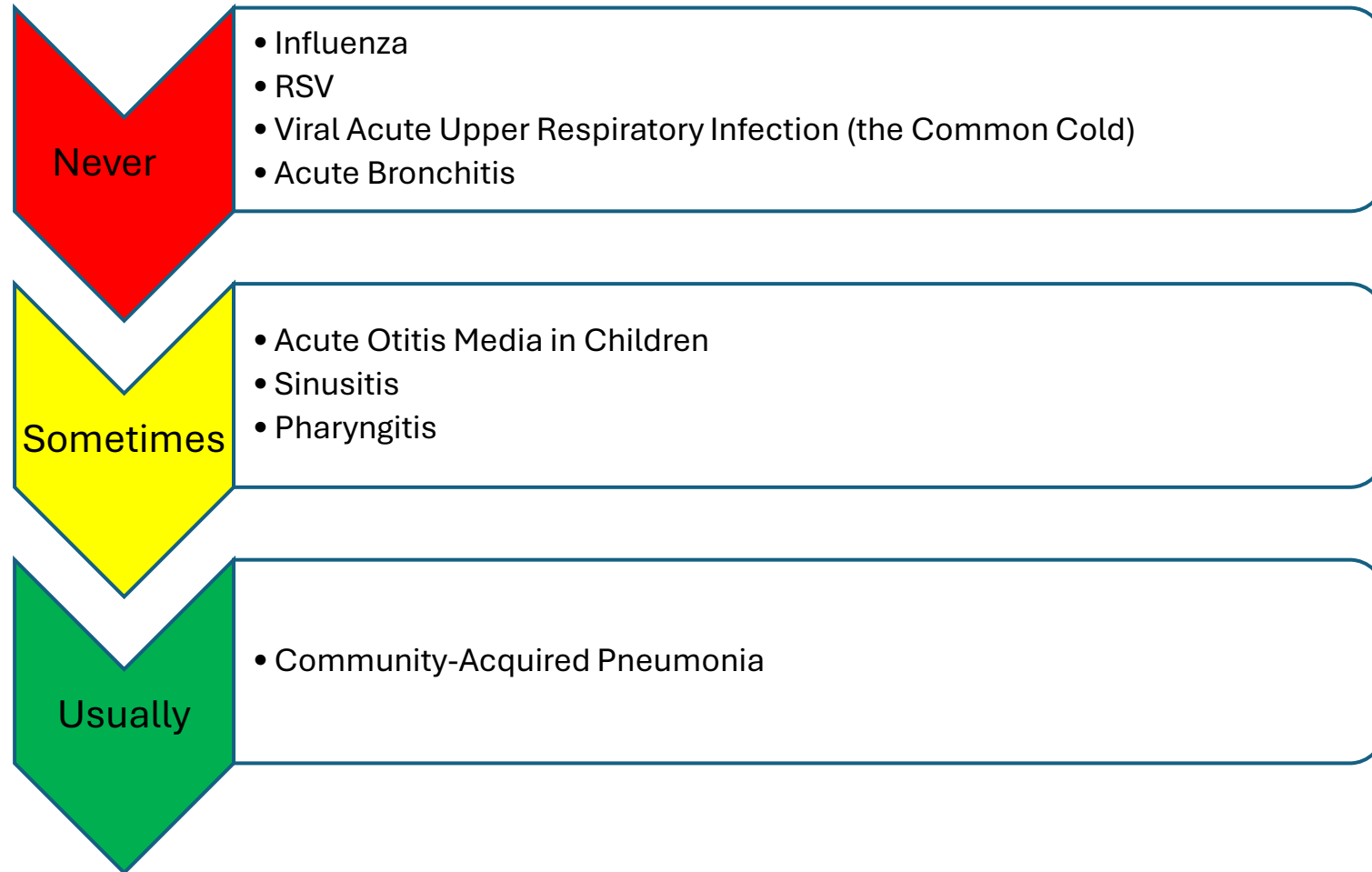
IV = intravenously; MRSA = methicillin-resistant *Staphylococcus aureus*.

*—Duration of therapy should be ≥ 5 days for all regimens, after which the patient's vital signs, ability to eat, and mentation should be evaluated to ensure recovery.

†—Risk factors include prior respiratory isolation of MRSA or *P. aeruginosa*, or hospitalization and treatment with parenteral antibiotics within the past 90 days.

Information from Metlay JP, Waterer GW, Long AC, et al. Diagnosis and treatment of adults with community-acquired pneumonia. An official clinical practice guideline of the American Thoracic Society and Infectious Diseases Society of America. Am J Respir Crit Care Med. 2019;200(7):e45-e67.

When are antibiotics needed?



2023 AGS Beers Criteria® and Antibiotic use



Organization of the 2023 AGS Beers Criteria®

5 Medication Categories/Table Titles:

1. Medications considered as potentially inappropriate (Table 2)
2. Medications potentially inappropriate in patients with certain diseases or syndromes (Table 3)
3. Medications to be used with caution (Table 4)
4. Potentially inappropriate drug-drug interactions (Table 5)
5. Medications whose dosages should be adjusted based on renal function (Table 6)

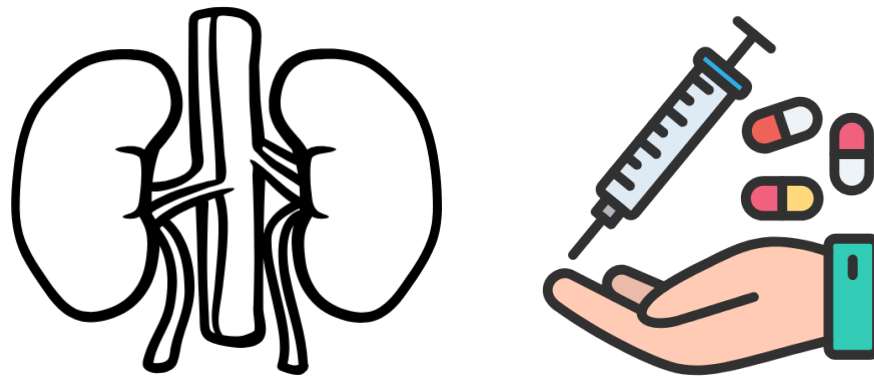
Quality of Evidence:

- High-Quality
- Moderate-Quality
- Low-Quality

Strength of Recommendation:

- Strong
- Weak

Many medications require dose adjustments in older patients due to declining renal function



Hajjar ER, Hersh LR, Gray SL. Prescribing in the Older Adult. In: DiPiro JT, Yee GC, Posey L, Haines ST, Nolin TD, Ellingrod V. eds. *Pharmacotherapy: A Pathophysiologic Approach*, 11e. McGraw Hill; 2020. Accessed October 18, 2021.

By the 2023 American Geriatrics Society Beers Criteria® Update Expert Panel. American Geriatrics Society 2023 updated AGS Beers Criteria® for potentially inappropriate medication use in older adults. *J Am Geriatr Soc*. 2023; 71(7): 2052-2081. doi:[10.1111/jgs.18372](https://doi.org/10.1111/jgs.18372)

Table 2: Potentially Inappropriate Medication

- Nitrofurantoin
 - Rationale
 - “Potential for pulmonary toxicity, hepatotoxicity, and peripheral neuropathy, especially with long-term use; safer alternatives available”
 - Recommendation
 - “Avoid in individuals with CrCl < 30 ml/min or for long-term suppression”
 - Strong recommendation, low quality of evidence.
 - According to Micromedex, use is contraindicated when CrCl < 60 ml/min.

Table 4: Potentially Inappropriate Medication, Use with Caution

- Trimethoprim-Sulfamethoxazole
 - Rationale:
 - “Increased risk of hyperkalemia when used concurrently with ACEI, ARB, or ARNI in presence of decreased CrCl”
 - Recommendation:
 - “Use with caution in patients on ACEI, ARB, or ARNI and decreased CrCl”
 - Strong recommendation, low quality of evidence.
 - According to Micromedex, when CrCl 15-30 ml/min, decrease the amount of each dose by 50%, do not use with CrCl < 15 ml/min.

Table 6: Medications that should be avoided or have their dosage reduced with varying levels of kidney function in older adults.

- **Ciprofloxacin**

- Rationale: “Increased risk of CNS effects (e.g. seizures, confusion) and tendon rupture”
- Recommendation: “Dosages used to treat common infections typically require reduction when CrCl < 30 ml/min.”

- **Nitrofurantoin**

- Rationale: “Potential for pulmonary toxicity, hepatotoxicity, and peripheral neuropathy, especially with long-term use”
- Recommendation: “Avoid in individuals with CrCl < 30 ml/min”

- **Trimethoprim-sulfamethoxazole**

- Rationale: “Increased risk of worsening kidney function and hyperkalemia; risk of hyperkalemia especially prominent with concurrent use of an ACE, ARB, or ARNI”
- Recommendation: “Reduce dosage if CrCl is 15-29 ml/min. Avoid if CrCl < 15 ml/min.”

CASE STUDY ONE

In which of the following patients should RSV vaccination be recommended according to the US Advisory Committee on Immunization Practices (ACIP)? Select as many as apply.

- A. 78 year old female who received a single RSV vaccination last year.
- B. 75 year old male who has never received an RSV vaccination.
- C. 62 year old male who is at severe risk for RSV infection.
- D. 70 year old female without increased risk for RSV infection.

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CASE STUDY TWO

Patient Name: George M.

Age: 80

Sex: M

Chief Complaint: “Facial pressure and nasal discharge for over a week”

HPI: Patient presents with a 10-day history of nasal congestion, thick yellow-green nasal discharge, and facial pressure, particularly over the maxillary sinuses. Symptoms began after a mild cold and worsened after initial improvement. He reports fatigue and mild headache but denies fever. He has tried saline nasal spray and OTC decongestants with minimal relief.

- **Past Medical History:**
Hypertension, osteoarthritis, mild chronic kidney disease (Stage 2), and seasonal allergic rhinitis.
- **Medications:**
Lisinopril 10 mg daily, acetaminophen PRN, loratadine PRN.
- **Allergies:**
NKDA.
- **Vital Signs:**
BP: 132/78 mmHg, HR: 72 bpm, Temp: 98.4°F, RR: 16, O2 Sat: 97% RA.
- **Physical Exam:**
 - **HEENT:**
Nasal mucosa erythematous and swollen. Purulent nasal discharge noted bilaterally. Tenderness over maxillary sinuses. No periorbital swelling. Throat mildly erythematous. Tympanic membranes intact.

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Hypertension, osteoarthritis, mild chronic kidney disease (Stage 2), and seasonal allergic rhinitis.
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Lisinopril 10 mg daily, acetaminophen PRN, loratadine PRN.
- **Allergies:**
NKDA.
- **Vital Signs:**
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- **Physical Exam:**
 - **HEENT:**
Nasal mucosa erythematous and swollen. Purulent nasal discharge noted bilaterally. Tenderness over maxillary sinuses. No periorbital swelling. Throat mildly erythematous. Tympanic membranes intact.

What is our primary diagnosis?

- A. Viral URI
- B. Allergic rhinitis
- C. Chronic sinusitis
- D. Acute bacterial rhinosinusitis

What is our treatment plan for George?

- A. Supportive care only (nasal saline irrigation and acetaminophen)
- B. Amoxicillin 500mg by mouth four times a day for 10 days
- C. Amoxicillin-clavulanate 875mg/125mg by mouth twice daily for 7 days and supportive care
- D. Azithromycin 500mg by mouth once daily for 7 days

CASE STUDY THREE

Patient Name: Mrs. L.

Age: 84

Sex: Female

Residence: Long-term care facility

Chief Concern: "She doesn't look right," per family report.

HPI: Mrs. L is an 84-year-old nursing home resident with a history of cognitive impairment, urinary incontinence, and frequent falls. Over the past two years, she has been treated for presumed urinary tract infections (UTIs) on eight occasions, receiving antibiotics six times. She was recently started on spironolactone for hypertension management. Today, her family reports that she "doesn't look right." However, nursing staff state she is at her baseline and not confused. The patient denies dysuria or abdominal pain but does report her usual frequent voiding. She is afebrile.

Past Medical History:

- Cognitive impairment (likely dementia)
- Recurrent UTIs
- Urinary incontinence
- History of falls
- Hypertension

Medications:

- Spironolactone (recently initiated)
- Lisinopril
- Acetaminophen PRN

Allergies: NKDA

Vital Signs:

Temp: 98.2°F, BP: 130/76 mmHg, HR: 68 bpm, RR: 16, O2 Sat: 97% RA

Physical Exam:

- Alert, oriented to person only
- No suprapubic or costovertebral angle tenderness
- No fever or chills
- Urine appears cloudy per staff report
- No new skin breakdown or signs of dehydration

CASE STUDY THREE

Patient Name: Mrs. L.

Age: 84

Sex: Female

Residence: Long-term care facility

Chief Concern: "She doesn't look right," per family report.

HPI: Mrs. L is an 84-year-old nursing home resident with a history of cognitive impairment, urinary incontinence, and frequent falls. Over the past two years, she has been treated for presumed urinary tract infections (UTIs) on eight occasions, receiving antibiotics six times. She was recently started on spironolactone for hypertension management. Today, her family reports that she "doesn't look right." However, nursing staff state she is at her baseline and not confused. The patient denies dysuria or abdominal pain but does report her usual frequent voiding. She is afebrile.

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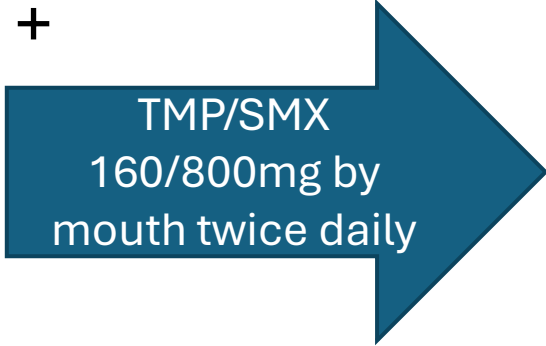
Labs:

- Urinalysis and urine culture ordered
- BMP ordered

CASE STUDY THREE

Urinalysis

- Leukocyte esterase +
- Nitrite +
- Neutrophils +
- Bacteria +



TMP/SMX
160/800mg by
mouth twice daily

Culture

- 1000 CFU/ml
- E.coli
 - Sensitive to all antibiotics except Ampicillin



CASE STUDY THREE

Remember the electrolyte panel that was ordered?

- Potassium elevated at 6
- Recently started on spironolactone

****Patient didn't have a UTI, had Hyperkalemia****

Drug interaction with TMP/SMX and spironolactone can cause hyperkalemia thus could have worsened her hyperkalemia!!!