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JUDICIOUS PRESCRIBING OF ANTIBIOTICS

- Many common infections are self-limited, and initial treatment should not include antibiotics.
- Educate patients about management of common infections and the harms of inappropriate use of antibiotics.
- Consider delaying an antibiotic prescription (see page 29) if watchful waiting is indicated.
- If antibiotics are indicated:
 - Prescribe the recommended dose and duration of the appropriate drug.
 - Adjust antibiotic therapy based on culture and antibiotic susceptibility test results.

Overuse of antibiotics is a growing public health concern, resulting in the emergence of microbial threats such as *Clostridium difficile*, methicillin-resistant *Staphylococcus aureus*, and drug-resistant gonorrhea (**Box 1**).¹ Each year in the US, at least 2 million people become infected with antibiotic-resistant organisms and at least 23,000 people die as a result.²

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During 2010-2011, more than 30% of antibiotic prescriptions in the US were written contrary to national guidelines from professional societies; **up to 50% of antibiotic prescriptions for acute respiratory infections were unnecessary.**³

Prescribing rates are higher for children younger than 10 years and adults older than 65 years of age.⁴

Primary care providers (PCPs) play a major role in diagnosing and managing infections, and are the main source of clinical information for patients. It is important that PCPs actively integrate antibiotic stewardship into their clinical practice⁵⁻⁸:

- Let patients know that your practice is committed to the appropriate use of antibiotics by placing educational posters in waiting rooms and examining rooms (**Resources**).
- Educate patients about management of common infections and the harms of inappropriate use of antibiotics.
- Consider delaying an antibiotic prescription (see page 29) if watchful waiting is indicated.



- If antibiotics are indicated:
 - Prescribe the recommended dose at the minimum duration required to treat a condition.
 - Narrow antibiotic therapy based on culture and antibiotic susceptibility test results.

DETERMINE WHETHER ANTIBIOTICS ARE INDICATED

Assess and manage common infections according to [Centers for Disease Control and Prevention guidelines \(Boxes 2-4\)](#).⁷⁻²⁸ See [Box 5](#)^{15,29,30} for guidance on managing soft-tissue infections.

BOX 1. MICROBIAL THREATS¹

Urgent threats: require urgent action

- *Clostridium difficile*
- Drug-resistant *Neisseria gonorrhoeae*
- Carbapenem-resistant Enterobacteriaceae

Serious threats: require prompt and sustained action to prevent the problem from growing

- Methicillin-resistant *Staphylococcus aureus*
- Extended-spectrum beta-lactamase-producing Enterobacteriaceae
- Multidrug-resistant *Acinetobacter*
- Drug-resistant *Campylobacter*
- Fluconazole-resistant *Candida*
- Vancomycin-resistant Enterococci
- Multidrug-resistant *Pseudomonas aeruginosa*
- Antibiotic-resistant non-typhoidal *Salmonella*
- Drug-resistant *Salmonella* Typhi
- Drug-resistant *Shigella*
- Drug-resistant *Streptococcus pneumoniae*
- Drug-resistant tuberculosis

See Centers for Disease Control and Prevention, [Antibiotic Resistance Threats in the United States](#), for more information.

BOX 2. COMMON VIRAL INFECTIONS: ANTIBIOTICS ARE NOT INDICATED^{7,9-14}

Clinical Features	Management
<p>Common cold or nonspecific URI: <i>At least 200 viruses can cause the common cold.</i></p> <ul style="list-style-type: none"> • Course of illness: usually 5-10 d • Symptoms peak within 2-3 d • Signs and symptom(s): <ul style="list-style-type: none"> ◦ Nasal discharge—changes in color and consistency through course of illness ◦ Postnasal drip ◦ Headache ◦ Myalgia ◦ Congestion ◦ Cough ◦ Fever 	<ul style="list-style-type: none"> • Symptomatic relief • No proven benefit and potential for harm from <ul style="list-style-type: none"> ◦ Inhaled corticosteroids ◦ Oral prednisolone^a ◦ Over-the-counter cough and cold medicines in children aged <6 years^b
<p>Bronchiolitis: <i>The most common lower respiratory infection in children aged <24 months. Most often caused by RSV</i></p> <ul style="list-style-type: none"> • Symptoms peak within 3-5 d • Signs and symptom(s): <ul style="list-style-type: none"> ◦ Rhinorrhea ◦ Cough ◦ Wheezing ◦ Tachypnea ◦ Increased respiratory effort • Routine laboratory tests and radiologic studies not recommended • Radiograph may be warranted in more severe cases.^c 	<ul style="list-style-type: none"> • Nasal suctioning is mainstay of therapy • No evidence to support routine deep suctioning of lower pharynx or larynx • No evidence to support corticosteroids, hypertonic saline, ribavirin, or chest physiotherapy

RSV, respiratory syncytial virus; URI, upper respiratory tract infection.

^aFor example, sepsis, venous thromboembolism, and fracture in adults.

^bFor example, serious adverse events and inadvertent fatal overdose.

^cFor example, severe respiratory effort, signs of an airway complication (such as pneumothorax), frequent recurrences, and lack of improvement.

Regularly visit [Get Smart: Outpatient Healthcare Professionals](#) for updated guidance.

BOX 3. RECOMMENDATIONS FOR MANAGING BACTERIAL INFECTIONS IN CHILDREN^{7,9,15-21}

Syndrome	Recommended Management	Duration
Acute rhinosinusitis: 90%-98% of cases are viral.		
<p>Bacterial diagnosis based on one of the following signs and symptoms:</p> <ul style="list-style-type: none"> • <i>Persistent</i> (>10 d), such as nasal discharge or daytime cough • <i>Worsening</i> or new-onset fever, daytime cough, or nasal discharge after initial improvement of a viral upper respiratory infection • <i>Severe:</i> fever $\geq 39^{\circ}\text{C}$, purulent nasal discharge for ≥ 3 consecutive d <p><i>Sinus radiographs not routinely recommended</i></p>	<p>Watchful waiting for ≥ 3 d may be offered for children with persistent symptoms. Prescribe antibiotic therapy for children with acute bacterial sinusitis with severe or worsening disease.</p> <p>First line</p> <ul style="list-style-type: none"> • Amoxicillin or amoxicillin/clavulanate <p>Type 1 (Immediate reaction) penicillin hypersensitivity^a</p> <ul style="list-style-type: none"> • Levofloxacin, moxifloxacin, cefdinir, cefuroxime, or cefpodoxime^a <p>Children who are vomiting or cannot tolerate oral medication^a</p> <ul style="list-style-type: none"> • Ceftriaxone IM; may switch to oral antibiotics if improving. 	10 d for beta-lactams
Acute otitis media (AOM): The most common childhood infection for which antibiotics are prescribed.		
<p>Definitive diagnosis requires either</p> <ul style="list-style-type: none"> • Moderate or severe bulging of tympanic membrane (TM) or new-onset otorrhea not due to otitis externa or • Mild bulging of the TM and recent onset of otalgia (holding, tugging, rubbing of the ear in a nonverbal child) or intense erythema of the TM <p><i>AOM should not be diagnosed in children without middle ear effusion.</i></p>	<p>Mild cases with unilateral symptoms in children aged 6-23 months or unilateral/bilateral symptoms in children aged >2 years</p> <ul style="list-style-type: none"> • Watchful waiting based on shared decision-making with caregiver may be appropriate. <p>First line</p> <ul style="list-style-type: none"> • Amoxicillin if child has not received amoxicillin in the past 30 d <p>Amoxicillin taken in the past 30 d, concurrent purulent conjunctivitis, or history of recurrent AOM unresponsive to amoxicillin^b</p> <ul style="list-style-type: none"> • Amoxicillin/clavulanate <p>Non-type 1 (delayed) penicillin hypersensitivity^b</p> <ul style="list-style-type: none"> • Cefdinir, cefuroxime, cefpodoxime, or ceftriaxone 	7-10 d
Bacterial pharyngitis, group A beta-hemolytic streptococcal (GAS): Rare in preschool-aged children		
<p>Diagnosis based on rapid antigen detection test (RADT)</p> <ul style="list-style-type: none"> • Perform RADT if there is sore throat plus 2 of the following: <ul style="list-style-type: none"> ◦ history of documented fever ◦ tonsillar exudates or swelling ◦ tender anterior cervical adenopathy ◦ absence of cough ◦ age 5-15 years. • Testing generally not done in children <3 years. (GAS rarely causes pharyngitis and rheumatic fever is uncommon.) • Throat culture should be performed for children and adolescents with negative RADT. 	<p>First line</p> <ul style="list-style-type: none"> • Amoxicillin, penicillin V <p>Type 1 (immediate reaction) penicillin hypersensitivity</p> <ul style="list-style-type: none"> • Clindamycin, clarithromycin, azithromycin <p>Non-type 1 (delayed reaction) penicillin hypersensitivity</p> <ul style="list-style-type: none"> • Cephalexin, cefadroxil, clindamycin, clarithromycin, or azithromycin 	10 d for beta-lactams
Urinary tract infections (UTIs): Affect 8% of girls and 2% of boys by age 7. E. coli accounts for ~85% of cases.		
<p>Diagnosis based on signs/symptoms and laboratory tests</p> <ul style="list-style-type: none"> • Infants: fever, strong smelling urine • Children: dysuria, frequency, or urgency • For a febrile infant not considered to be at low risk for a UTI: <ul style="list-style-type: none"> ◦ Option 1: obtain a urine specimen through catheterization or suprapubic aspiration for culture and urinalysis. ◦ Option 2: obtain a urine specimen through the most convenient means for urinalysis. If results suggest a UTI or nitrite test or microscopic analysis results positive for leukocytes or bacteria, urine specimen should be sent for culture. • Urine testing for all children 2-24 months with unexplained fever no longer recommended. 	<p>Initial antibiotic treatment^c</p> <ul style="list-style-type: none"> • Based on local antimicrobial susceptibility patterns. • Options include trimethoprim/sulfamethoxazole, amoxicillin/clavulanate, cefixime, cefpodoxime, cefprozil, or cephalexin. • Febrile infants aged 2-24 months with UTIs should undergo renal and bladder ultrasonography during or following their first UTI. Abnormal imaging results require further testing. • Antibiotic treatment of asymptomatic bacteriuria in children is not recommended. • Antibiotic prophylaxis to prevent recurrent UTIs is not recommended. 	7-14 d in children aged 2-24 months

^aSee American Academy of Pediatrics or the Infectious Diseases Society of America guidelines on acute rhinosinusitis for more information.

^bSee American Academy of Pediatrics guidelines on acute otitis media for more information on alternative antibiotic regimens.

^cSee American Academy of Pediatrics guidelines on urinary tract infection for further recommendations.

Regularly visit *Get Smart: Outpatient Healthcare Professionals for updated guidance.*

WHEN ANTIBIOTICS ARE NOT INDICATED

- Take time to explain the diagnosis and the reasons antibiotics are not indicated or needed (**Box 6**).^{1,6,31-38}
- Recommend symptomatic treatments (see [Print Materials for Healthcare Professionals](#) for the downloadable handout, Symptomatic Relief for Viral Illnesses).
- Explain the expected duration of symptoms and response to treatment.
- Give instructions to notify you if the expected response does not occur (**Box 7**).^{6,34}

WHEN ANTIBIOTICS OR WATCHFUL WAITING IS INDICATED

Prescribe the correct antibiotic regimen

Prescribe the correct antibiotic at the recommended dosage and duration (**Boxes 3 and 4**). Obtain a culture, when relevant, and adjust antibiotic therapy based on culture and antibiotic susceptibility test results. When culture and antibiotic susceptibility results are available, check whether the prescribed antibiotics are correct and necessary.

BOX 4. RECOMMENDATIONS FOR MANAGING BACTERIAL INFECTIONS IN ADULTS^{8,15,17,20,22-28}

Syndrome	Recommended Management	Duration
Acute rhinosinusitis: 90%-98% of cases are viral.		
Bacterial diagnosis based on one of the following: <ul style="list-style-type: none"> • Severe (>3-4 d): fever $\geq 102^{\circ}\text{F}$ (39°C) plus purulent nasal discharge or facial pain • Persistent (>10 d), such as nasal discharge or daytime cough • Worsening (3-4 d) or new-onset fever, daytime cough, or nasal discharge after initial improvement of a viral upper respiratory infection lasting 5-6 d <i>Sinus radiographs not routinely recommended</i>	Uncomplicated cases when follow-up is reliable <ul style="list-style-type: none"> • Watchful waiting First line <ul style="list-style-type: none"> • Amoxicillin or amoxicillin/clavulanate Penicillin hypersensitivity <ul style="list-style-type: none"> • Doxycycline, levofloxacin, or moxifloxacin <i>Macrolides (eg, azithromycin) not recommended due to high (40%) levels of resistance in Streptococcus pneumoniae</i>	5-7 d
Acute uncomplicated bronchitis: The most common diagnosis in patients presenting with cough. Antibiotics not indicated in >70% of cases. ^a		
<ul style="list-style-type: none"> • Rule out pneumonia—rare among otherwise healthy adults in the absence of abnormal vital signs^b and abnormal lung examination findings. • Colored sputum does not indicate bacterial infection. • For most cases, chest radiography is not indicated. 	Management is symptomatic, regardless of cough duration <ul style="list-style-type: none"> • Cough suppressants (codeine, dextromethorphan) • First-generation antihistamines (diphenhydramine) • Decongestants (phenylephrine) • Beta-agonists (albuterol) 	
Bacterial pharyngitis, group A beta-hemolytic streptococcal (GAS): Only 5%-10% of adult pharyngitis cases		
Diagnosis based on rapid antigen detection test (RADT) <ul style="list-style-type: none"> • Perform RADT if there is sore throat plus 2 of the following: <ul style="list-style-type: none"> o history of fever o tonsillar exudate o tender anterior cervical lymphadenopathy o absence of cough • Throat cultures are not routinely recommended if there is a positive rapid test. 	First line <ul style="list-style-type: none"> • Amoxicillin or penicillin V Penicillin hypersensitivity <ul style="list-style-type: none"> • Cephalexin, cefadroxil, clindamycin, or macrolides • GAS-antibiotic resistance to azithromycin and clindamycin is increasingly common. 	10 d for beta-lactams
Acute uncomplicated cystitis: Among the most common infections in women. Usually caused by <i>E. coli</i> .		
Diagnosis based on signs/symptoms and laboratory tests <ul style="list-style-type: none"> • Symptoms include dysuria, frequent urinary voiding of small volumes, urinary urgency. • Hematuria and suprapubic discomfort less common. • Nitrites and leukocyte esterase most accurate indicators of acute uncomplicated cystitis. 	First line for healthy adult nonpregnant, premenopausal women <ul style="list-style-type: none"> • Nitrofurantoin; cephalexin; trimethoprim/sulfamethoxazole (trimethoprim/sulfamethoxazole, where local <i>E. coli</i> resistance is >20%) • Reserve fluoroquinolones for situations in which other agents are not appropriate. 	3-5 d depending on antimicrobial used

^aAntibiotics are indicated in cases of pertussis, serious illness, age >65 years, and serious associated conditions.

For pertussis: erythromycin 14 d, azithromycin 5 d, or alternatives (trimethoprim/sulfamethoxazole 14 d or clarithromycin 14 d). For other bacterial causes, moxifloxacin, levofloxacin, azithromycin.

^bHeart rate ≥ 100 beats/min, respiratory rate ≥ 24 breaths/min, or oral temperature $\geq 38^{\circ}\text{C}$.

Regularly visit [Get Smart: Outpatient Healthcare Professionals](#) for updated guidance.

BOX 5. MANAGING UNCOMPLICATED SKIN AND SOFT TISSUE INFECTIONS^{15,29,30}

Presentation	Suspected Pathogen	Oral Antibiotic Management	Duration
Purulent drainage from wound or fluctuant lesion, often located in warm, moist areas where hair follicles present (groin, axilla, etc.)	<i>Staphylococcus aureus</i> (MRSA or MSSA) <i>Suspect MRSA if prior MRSA infection or high local community MRSA prevalence, as in Bronx County</i>	MRSA <ul style="list-style-type: none"> Bactrim™ DS 1-2 tabs (dosing depends on creatinine clearance and weight) Doxycycline 100 mg twice daily Clindamycin 300-600 mg every 6-8 h Linezolid 600 mg every 12 h (consider for more severe cases; generic is available but may not be covered by all insurance plans) MSSA <ul style="list-style-type: none"> Dicloxacillin 500 mg every 6 h Cephalexin 500 mg every 6-12 h (dosing frequency depends on creatinine clearance) Amoxicillin/clavulanate 500-875 mg/125 mg every 12 h (dosing depends on creatinine clearance) 	<ul style="list-style-type: none"> Uncomplicated infections: NO systemic symptoms (fever, hypotension, bacteremia, etc): 5-7 d may be adequate If drainage performed and lesion is discrete, patient may not require further antibiotics
Cellulitis or nonpurulent wound , well-demarcated area with warmth and induration; usually presents as unilateral leg induration and tenderness, lymphangitic streaking often present	Streptococci	<ul style="list-style-type: none"> Cephalexin 500 mg every 6-12 h (dosing frequency depends on creatinine clearance) Amoxicillin 500 mg every 8-12 h (dosing frequency depends on creatinine clearance) Amoxicillin/clavulanate 500-875 mg/125 mg every 12 h if mixed aerobic/anaerobic infection or bite wound (dose depends on creatinine clearance) 	<ul style="list-style-type: none"> Uncomplicated infections (no systemic illness): 5-7 d may be adequate

Table created by the Montefiore Health System Antimicrobial Stewardship Program.

Use delayed prescribing when possible

Nonsevere infections that are caused by viruses and likely to resolve spontaneously (eg, otitis media or sinusitis), can be managed by watchful waiting. Consider postdating a prescription if possible so the patient or parent can use it only if the symptoms worsen or don't improve within a certain time (**Resources—Patient Information**).⁶ Alternatively, the patient can check in via telephone or patient portals to access antibiotic prescriptions for conditions that are not improving on their own.⁶

WHEN TO CONSULT WITH AN INFECTIOUS DISEASE SPECIALIST

Consult an infectious disease specialist for further guidance if there are concerns that the patient has an infection with antibiotic-resistant bacteria or is not improving as expected.

SUMMARY

Antibiotic resistance is a growing public health threat that can be reduced through judicious prescribing. Prescribe antibiotics only when needed and educate patients about viral infections, the self-limited nature of many infections, the potential harms of inappropriate antibiotic use, and the appropriate use of antibiotics when they are indicated. ♦

**BOX 6. WHAT TO TELL PATIENTS AND PARENTS ABOUT ANTIBIOTICS: SAMPLE STATEMENTS^{1,6,31-38}**

- Antibiotics can cause stomach upset, diarrhea, headache, and allergic reactions such as hives, rashes, and difficulty breathing.
- Taking antibiotics increases the risk of getting an antibiotic-resistant infection later. These infections can be serious, such as severe, life-threatening diarrhea.
- Antibiotics cause 1 out of 5 emergency department visits for adverse drug events. They're the most common cause of prescription drug-related emergency department visits in children younger than age 18.
- Children younger than 2 who receive antibiotics have a greater risk for childhood obesity.
- Most upper respiratory symptoms, such as runny nose, sore throat, and cough, are caused by viruses, and antibiotics only work against bacteria and other germs, not viruses.
- Viral illnesses usually go away without treatment in a week or two. Antibiotics won't help you (or your child) get better or prevent others from getting sick.
- Green-colored mucus is NOT a sign that an antibiotic is needed. Mucus can change color as the body fights off an infection.
- Pain medicine, fever reducers, saline nasal spray or drops, warm compresses, liquids, and rest can help you or your child feel better. Honey can soothe a cough so your child can sleep (do NOT give honey to babies younger than one year of age).

BOX 7. WHAT TO TELL PATIENTS/PARENTS ABOUT THEIR ANTIBIOTIC THERAPY^{6,39}

- Use the antibiotic exactly as instructed.
- Let me know right away if you have a bothersome reaction.
- Never skip doses or stop taking an antibiotic early unless we've discussed it.
- Discard any leftover medicine. Mix it with coffee grounds or kitty litter and place in a sealed container marked "not recyclable—disposal only" before discarding in the trash.
- Never save antibiotics for the next time someone gets sick.
- Never take antibiotics prescribed for someone else.
- Call me if symptoms don't change as expected.

HOW TO ENSURE JUDICIOUS USE OF ANTIBIOTICS⁶⁻⁸

- Educate patients about common infections and the harms of inappropriate use of antibiotics.
- Take a careful allergy history, when relevant.
- Prescribe symptom-specific nonantibiotic therapy, and tell patients and parents what to expect.
- Use delayed prescribing (see page 29) when possible.
- If antibiotics are indicated:
 - Prescribe at the recommended dose and duration of the appropriate drug.
 - Adjust antibiotic therapy based on culture and antibiotic susceptibility test results.

RESOURCES FOR PROVIDERS

- Centers for Disease Control and Prevention. Get Smart: Know When Antibiotics Work: <https://www.cdc.gov/getsmart/community/materials-references/print-materials/hcp/index.html>
 - Guidelines
 - Continuing medical education
 - Antibiotic Stewardship commitment posters; Prescription pads: Taking Your Antibiotics Appropriately, Symptomatic Relief for Viral Illnesses, What is Delayed Prescribing?, What is Watchful Waiting?

Immunizations

- New York City Health Department. Immunizations:
 - Vaccines for Children Program (free vaccines for eligible children): www1.nyc.gov/site/doh/providers/nyc-med-cir/vaccines-for-children-program.page
 - List of low- to no-cost confidential clinics: <https://www1.nyc.gov/site/doh/services/immunization-clinics.page>

RESOURCES FOR PATIENTS

- Get Smart: Know When Antibiotics Work. Information for patients: <https://www.cdc.gov/getsmart/community/for-patients/index.html>
 - Common illnesses
 - Symptom relief

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