Systems-Based Treatment Table[a]

System	Condition	Common Pathogens	Empiric Antibiotic Therapy	Antibiotic Duration	Notes	Key Resources
Bloodstream Infection in Nonneonates (***uncomplicated**) *****Defined by ≤3 days bacteremia in nonneutropenic host without complex source (eg, endocarditis, septic thrombophlebitis, osteomyelitis) or ongoing undrained purulent focus	Common sources include vascular catheter-associated infection, urinary tract infection, intra-abdominal infection, pneumonia, skin/soft tissue infection	***Staphylococcus aureus***	MSSA Cefazolin OR Oxacillin OR Nafcillin MRSA Vancomycin OR Linezolid OR Daptomycin OR Ceftaroline	14 days from first negative blood culture	Vascular catheter removal generally recommended for persistent hemodynamic instability or ongoing (≥3 days) bacteremia	RCTs for duration of gram-negative BSI: Yahav et al[1] von Dach et al[2] Molina et al[3] Observational studies: Sutton et al[4] Punjabi et al[5] Tamma et al[6] Heil et al[7] Mponponsuo et al[8] Tamma et al[9]
		Enterococcus faecalis	Ampicillin	7 days from first negative blood culture		
		Enterococcus faecium	Vancomycin OR Linezolid OR Daptomycin	7 days from first negative blood culture		

Systems-Based Treatment Table,[a] continued

System	Condition	Common Pathogens	Empiric Antibiotic Therapy	Antibiotic Duration	Notes	Key Resources
Bloodstream Infection in Nonneonates (***uncomplicated**) *****Defined by ≤3 days bacteremia in nonneutropenic host without complex source (eg, endocarditis, septic thrombophlebitis, osteomyelitis) or ongoing undrained purulent focus		**Enterobacterales** ***(eg, Escherichia coli, Klebsiella* species, *Enterobacter* species*)***	Choice depends on results of antibiotic susceptibility testing	7 days from first negative blood culture	Duration of therapy is regardless of whether vascular catheter is removed, and should not be extended solely based on presence of antibiotic resistance or retained vascular catheter Duration of therapy is based on duration of active therapy (ie, adequate dose and antibiotic susceptibility) Transition to oral antibiotics may be considered for uncomplicated gram-negative bacteremia if all of the following criteria are met: (1) susceptibility to an appropriate, highly available oral agent is demonstrated; (2) the patient is hemodynamically stable; (3) reasonable source control measures have occurred; (4) intestinal absorption is intact; and (5) there is confidence in patient adherence	
		Pseudomonas aeruginosa	Choice depends on results of antibiotic susceptibility testing	7 days from first negative blood culture		

Systems-Based Treatment Table,[a] continued

System	Condition	Common Pathogens	Empiric Antibiotic Therapy	Antibiotic Duration	Notes	Key Resources
		Coagulase-negative *Staphylococcus* (not including *Staphylococcus Lugdunensis*, which should be managed like *S aureus*)	Vancomycin OR Oxacillin (if susceptible)	5–7 days from first negative blood culture, OR observation following removal of foreign body source (eg, catheter)	A single positive culture absent hardware generally reflects skin contamination	
Bone/Joint	Osteomyelitis (acute, hematogenous)	***S aureus*** *Streptococcus pyogenes* *Kingella kingae*	Mild-Moderate Cefazolin OR Oxacillin OR Nafcillin Severe and low suspicion of MRSA Cefazolin OR Oxacillin OR Nafcillin Severe and high suspicion of MRSA Vancomycin	3–4 wk Chronic osteomyelitis typically requires more prolonged antibiotic treatment and may require consideration of alternate antibiotic choice	*Kingella* infection not effectively treated by clindamycin and not reliably susceptible to oxacillin/nafcillin Early switch to oral route recommended with clinical improvement, even for patients with transient bacteremia For empiric management of children with osteomyelitis and severe sepsis, combination therapy of vancomycin PLUS oxacillin/nafcillin can be considered	Woods et al[10]

Systems-Based Treatment Table,[a] continued

System	Condition	Common Pathogens	Empiric Antibiotic Therapy	Antibiotic Duration	Notes	Key Resources
Bone/Joint			OR Clindamycin OR Linezolid OR Daptomycin			
	Septic arthritis	***S aureus*** *S pyogenes* *K kingae*	Mild-Moderate Cefazolin OR Oxacillin OR Nafcillin Severe and low suspicion of MRSA Cefazolin OR Oxacillin OR Nafcillin Severe and high suspicion of MRSA Vancomycin OR Clindamycin OR Linezolid OR Daptomycin	2–3 wk	*Kingella* not effectively treated by clindamycin and not reliably susceptible to oxacillin/nafcillin Early switch to oral route recommended with clinical improvement, even for patients with transient bacteremia	Woods et al[11]

Systems-Based Treatment Table,[a] continued

System	Condition	Common Pathogens	Empiric Antibiotic Therapy	Antibiotic Duration	Notes	Key Resources
Central Nervous System	Meningitis (non-neonates)	*Streptococcus pneumoniae* *Neisseria meningitidis* *Haemophilus influenzae*	Ceftriaxone PLUS Vancomycin	These are empiric recommendations; specific choice and duration of antibiotic therapy should be guided by culture and susceptibility results *S pneumoniae:* 10–14 days *H influenzae*: 7–10 days *N meningitidis*: 5–7 days	Longer courses are necessary for patients with parenchymal brain infection (cerebritis, rhombencephalitis, brain abscess) Dexamethasone is beneficial for treatment of infants and children with Hib meningitis to diminish the risk of hearing loss, if administered before or concurrently with the first dose of antimicrobial agent(s) For all children with bacterial meningitis presumed to be caused by *S pneumoniae*, vancomycin should be administered in addition to ceftriaxone because of the possibility of resistant *S pneumoniae* Consider adding acyclovir for patients with concurrent encephalitis	*Streptococcus pneumoniae* (Pneumococcal) Infections, p 810 Meningococcal Infections, p 585 *Haemophilus influenzae* Infections, p 400

Systems-Based Treatment Table,[a] continued

System	Condition	Common Pathogens	Empiric Antibiotic Therapy	Antibiotic Duration	Notes	Key Resources
Ear, Nose, and Throat	Mastoiditis	***S pneumoniae*** ***S pyogenes*** ***S aureus*** *H influenzae* Also consider for chronic: Microaerophilic streptococci *Fusobacterium* *P aeruginosa*	Consider surgical drainage/excision Ampicillin-sulbactam OR Ceftriaxone (Allergy[b]: Clindamycin) If follows chronic AOM: Cefepime OR Levofloxacin Consider MRSA based on local prevalence	2–4 wk depending on adequate débridement, intracranial extension, extent of osteomyelitis, associated thrombosis	Transition to oral with clinical improvement Ampicillin-sulbactam may not be optimal for intracranial infections	*Haemophilus influenzae* Infections, p 400 *Fusobacterium* Infections, p 388 *Pseudomonas aeruginosa* Infections, p 697 *Staphylococcus aureus*, p 767 Group A Streptococcal Infections, p 785 Non-Group A or B Streptococcal and Enterococcal Infections, p 806 *Streptococcus pneumoniae* (Pneumococcal) Infections, p 810

Systems-Based Treatment Table,[a] continued

System	Condition	Common Pathogens	Empiric Antibiotic Therapy	Antibiotic Duration	Notes	Key Resources
Ear, Nose, and Throat	Acute sinusitis	***S pneumoniae*** *H influenzae* *Moraxella catarrhalis*	Amoxicillin OR Amoxicillin-clavulanate (Allergy[b]: Clindamycin OR Levofloxacin)	5–7 days	Diagnosis of acute bacterial sinusitis requires the presence of one of the following criteria: (1) persistent nasal discharge or daytime cough without evidence of clinical improvement for ≥10 days; consider watchful waiting in this scenario (2) worsening or new onset of nasal discharge, daytime cough, or fever after initial improvement (3) temperature ≥39°C with purulent nasal discharge and/or facial pain for at least 3 consecutive days	*Haemophilus influenzae* Infections, p 400 *Moraxella catarrhalis* Infections, p 604 *Streptococcus pneumoniae* (Pneumococcal) Infections, p 810 Chow et al[12] Wald et al[13]
	Acute otitis media	***S pneumoniae*** *H influenzae* *M catarrhalis*	Amoxicillin OR Amoxicillin-clavulanate[c] (Allergy: Cefdinir OR Cefpodoxime OR Cefuroxime OR Ceftriaxone for 1 (first occurrence) to 3 (treatment failure) days	>6 y: 5 days 2–5 y: 7 days <2 y or severe symptoms: 10 days	Consider observation without antibiotics for 48–72 hours for children 24 months or older without severe symptoms; if symptoms persist or worsen, use same antibiotic recommendations as for those receiving immediate therapy Consider *S aureus* and *Pseudomonas* infection for chronic otitis media	*Haemophilus influenzae* Infections, p 400 *Moraxella catarrhalis* Infections, p 604 *Streptococcus pneumoniae* (Pneumococcal) Infections, p 810 Lieberthal et al[14] Rosenfeld et al[15]

Systems-Based Treatment Table,[a] continued

System	Condition	Common Pathogens	Empiric Antibiotic Therapy	Antibiotic Duration	Notes	Key Resources
Ear, Nose, and Throat	Streptococcal pharyngitis	***S pyogenes***	First line: Penicillin OR Amoxicillin (Allergy[b]: Cephalexin OR Clindamycin OR Azithromycin)	10 days	Children with rhinorrhea, cough, hoarseness, or oral ulcers should not be tested or treated for GAS infection; testing also generally is not recommended for children <3 y Management of recurrent GAS pharyngitis and pharyngeal carriers is detailed in Group A Streptococcal Infections (p 785) Tetracyclines, TMP-SMX, and fluoroquinolones should not be used for treating GAS pharyngitis Return to school after afebrile and ≥12 h of antibiotic therapy	Group A Streptococcal Infections, p 785 Shulman et al[16]
	Retropharyngeal abscess	***S aureus*** ***S pyogenes*** **Anaerobes** *Streptococcus anginosus* *H influenzae* (often polymicrobial)	Mild-moderate: Ampicillin/sulbactam OR Clindamycin Severe: Ampicillin/sulbactam PLUS EITHER Vancomycin OR Linezolid	14 days	Longer duration of therapy may be required for complex infections with insufficient source control	

Systems-Based Treatment Table,[a] continued

System	Condition	Common Pathogens	Empiric Antibiotic Therapy	Antibiotic Duration	Notes	Key Resources
Genitourinary	UTI - pyelonephritis	***E coli*** *Klebsiella* species *Proteus* species *Enterobacter* species *Citrobacter* species *Enterococcus* species *Staphylococcus saprophyticus*	Cephalexin OR TMP-SMX OR Ampicillin PLUS Gentamicin OR Ceftriaxone OR Ciprofloxacin	7–10 days (hospitalized) 5–10 days (outpatient) 3–5 days (simple cystitis in adolescents) Longer durations may be required for complicated cases such as renal abscess without drainage	Drug selection should be based on local antibiogram or patient's prior urine isolates Initial short course of IV therapy (2–4 days) is as effective as longer courses of IV therapy Avoid nitrofurantoin for upper urinary tract infection or bacteremia	Mattoo et al[17] Gupta et al[18]
Intra-abdominal	Intra-abdominal infection	***E coli*** **Anaerobes** *Klebsiella* species (often polymicrobial)	Drainage <u>Mild-moderate:</u> Ceftriaxone PLUS Metronidazole <u>Severe or hospital onset:</u> Piperacillin-tazobactam OR Ciprofloxacin PLUS Metronidazole	4–7 days (from source control)	May need longer duration if insufficient source control Mild-moderate infection includes complicated appendicitis with rupture, absent sepsis	Mazuski et al[19]

Systems-Based Treatment Table,[a] continued

System	Condition	Common Pathogens	Empiric Antibiotic Therapy	Antibiotic Duration	Notes	Key Resources
Neonatal Fever (Term Neonates)	Suspected UTI	***E coli*** *Enterococcus* species GBS	Ampicillin PLUS Gentamicin	These are empiric recommendations; specific choice and duration of antibiotic therapy should be guided by culture results		
	Unclear source	**GBS** ***E coli*** HSV	Neonates 0–7 days of age: Ampicillin PLUS Gentamicin Neonates 8–28 days of age: Ampicillin PLUS Gentamicin OR Ampicillin PLUS Cefotaxime (Ceftazidime or Cefepime if Cefotaxime not available)	These are empiric recommendations; specific choice and duration of antibiotic therapy should be guided by culture results	Consider adding empiric acyclovir with surface, blood, and CSF HSV sampling for infants at increased risk of HSV, including the presence of skin vesicles, seizures, CSF pleocytosis with a negative Gram stain, leukopenia, hepatitis, thrombocytopenia, hypothermia, mucous membrane ulcers, or maternal history of genital HSV lesions or fever from 48 hours before to 48 hours after delivery. For further discussion of HSV, see Herpes Simplex (p 467).	

Systems-Based Treatment Table,[a] continued

System	Condition	Common Pathogens	Empiric Antibiotic Therapy	Antibiotic Duration	Notes	Key Resources
Neonatal Fever (Term Neonates)	Suspected meningitis	**GBS** ***E coli*** HSV	Neonates 0–7 days of age: Ampicillin PLUS Gentamicin (some experts will add a third or fourth generation cephalosporin if the cerebrospinal fluid gram stain shows gram-negative organisms) Neonates 8–28 days of age: Ampicillin PLUS Cefotaxime (Ceftazidime or Cefepime if Cefotaxime not available) (some experts will add an aminoglycoside if the cerebrospinal fluid Gram stain shows gram-negative organisms)	These are empiric recommendations; specific choice and duration of antibiotic therapy should be guided by culture results GBS: 14 days penicillin G *E coli*: 21 days of non-aminoglycoside antibiotic to which isolate is susceptible	Some experts suggest repeat lumbar puncture to document CSF sterility Consider adding empiric acyclovir with surface, blood, and CSF HSV sampling for infants at increased risk of HSV, including the presence of skin vesicles, seizures, CSF pleocytosis with a negative Gram stain, leukopenia, hepatitis, thrombocytopenia, hypothermia, mucous membrane ulcers, or maternal history of genital HSV lesions or fever from 48 hours before to 48 hours after delivery. For further discussion of HSV, see Herpes Simplex (p 467).	Puopolo et al[20] Puopolo et al[21]

Systems-Based Treatment Table,[a] continued

System	Condition	Common Pathogens	Empiric Antibiotic Therapy	Antibiotic Duration	Notes	Key Resources
Ophthalmologic	Preseptal cellulitis (ie, nonsinus origin)	***S pyogenes*** *S aureus*	Mild-moderate: Cefazolin OR Cephalexin (Allergy[b]: Clindamycin) Severe: Vancomycin OR Linezolid OR Ceftaroline OR Daptomycin	5–7 days	Switch to oral with 24 hours improvement in fever, swelling, and erythema Consider empiric MRSA coverage if high local MRSA rates	
	Orbital cellulitis	***S aureus*** ***S pneumoniae*** **Anaerobes** *S anginosus* *H influenzae* *M catarrhalis* *S pyogenes*	Surgical drainage (if abscess): Ampicillin/sulbactam (Allergy[b]: Clindamycin) Severe: Add Vancomycin OR Linezolid OR Ceftaroline OR Daptomycin	10–14 days May extend to 3–4 wk with extensive bone involvement and/or insufficient source control	Consider empiric MRSA coverage if high local MRSA rates	

Systems-Based Treatment Table,[a] continued

System	Condition	Common Pathogens	Empiric Antibiotic Therapy	Antibiotic Duration	Notes	Key Resources
Respiratory	Community-acquired pneumonia (CAP)	***S pneumoniae*** *Mycoplasma pneumoniae* *S pyogenes* *S aureus* *H influenzae* *M catarrhalis* Respiratory viruses, including influenza virus, adenovirus, parainfluenza virus, respiratory syncytial virus, coronaviruses, human metapneumovirus	Amoxicillin OR Ampicillin OR Penicillin for fully immunized patients in regions without high prevalence of PCN-resistant pneumococcus (Allergy[b]: Clindamycin OR Levofloxacin) Ceftriaxone for hospitalized patients in regions with high levels PCN-resistant pneumococcus Add macrolide if atypical pathogen (eg, *Mycoplasma* or *Chlamydia* species) suspected Add Vancomycin OR Clindamycin OR Linezolid if MRSA suspected	5 days for uncomplicated CAP with resolution of fever, tachypnea, and supplemental oxygen requirement May extend duration when complicated by empyema, necrotizing pneumonia, or pulmonary abscess	Respiratory viruses cause the majority of CAP, especially in young children; thus, antibiotic therapy may not be indicated for all patients Early switch to oral route encouraged when tolerated Transient *S pneumoniae* bacteremia in otherwise uncomplicated pneumonia does not warrant prolonged or IV antibiotic therapy Consider *S aureus* superinfection in patients with influenza	Bradley et al[22]

Systems-Based Treatment Table,[a] continued

System	Condition	Common Pathogens	Empiric Antibiotic Therapy	Antibiotic Duration	Notes	Key Resources
Skin and Soft Tissue Infections	Cellulitis (nonpurulent)	***S pyogenes*** *S aureus*	Mild-moderate: Cefazolin OR Oxacillin/nafcillin OR Cephalexin (Allergy[b]: Clindamycin OR TMP/SMX OR Doxycycline) Severe: Vancomycin OR Linezolid OR Ceftaroline OR Daptomycin Necrotizing fasciitis: Surgical débridement B-lactam PLUS Clindamycin (+/- Vancomycin)	5–7 days Tailor duration based on resolution of signs and symptoms	For bite wounds, see p 202 Necrotizing fasciitis may require gram-negative or anaerobic coverage in the correct clinical scenario For severe infections, consider coverage of MRSA based on local prevalence	*Staphylococcus aureus*, p 767 Group A Streptococcal Infections, p 785 *Bacteroides*, *Prevotella*, and Other Anaerobic Gram-Negative Bacilli Infections, p 261 Stevens et al[23]

Systems-Based Treatment Table,[a] continued

System	Condition	Common Pathogens	Empiric Antibiotic Therapy	Antibiotic Duration	Notes	Key Resources
Skin and Soft Tissue Infections	Purulent cellulitis/ Abscess	***S aureus***	Drainage Mild-moderate: Cefazolin/cephalexin OR TMP/SMX OR Clindamycin OR Doxycycline Consider MRSA based on local prevalence Severe: Vancomycin OR Linezolid OR Ceftaroline OR Daptomycin	5–7 days Tailor duration based on resolution of signs and symptoms Surgical drainage alone may be adequate for small, completely drained abscesses	Conversion to oral antibiotic therapy after transient[d] *S aureus* bacteremia with source control is appropriate but might warrant more prolonged therapy	*Staphylococcus aureus*, p 767 Stevens et al[23]

Systems-Based Treatment Table,[a] continued

System	Condition	Common Pathogens	Empiric Antibiotic Therapy	Antibiotic Duration	Notes	Key Resources
	Lymphadenitis	Acute/unilateral: ***S pyogenes*** ***S aureus*** Subacute/chronic: *Bartonella* species Nontuberculous mycobacteria (NTM)	For acute/unilateral lymphadenitis: Consider surgical drainage Cefazolin/ Cephalexin (Allergy[b]: Clindamycin) Consider MRSA based on local prevalence	5–7 days Tailor duration based on resolution of signs and symptoms	For management of NTM or *Bartonella* infection, please see those chapters (p 920 and p 263) Bacterial adenitis is typically unilateral; bilateral disease is typically viral in etiology	*Bartonella henselae* (Cat-Scratch Disease), p 263 *Staphylococcus aureus*, p 767 Group A Streptococcal Infections, p 785 Nontuberculous Mycobacteria, p 920

AAP indicates American Academy of Pediatrics; AOM, acute otitis media; CAP, community-acquired pneumonia; CSF, cerebrospinal fluid; GAS, group A *Streptococcus*; GBS, group B *Streptococcus*; HSV, herpes simplex virus; IV, intravenous; MRSA, methicillin-resistant *Staphylococcus aureus*; MSSA, methicillin-susceptible *Staphylococcus aureus*; NTM, nontuberculous mycobacteria; PCN, penicillin; TMP-SMX, trimethoprim-sulfamethoxazole; UTI, urinary tract infection.

Boldface indicates primary pathogen(s) targeted by empiric antibiotic therapy.

[a] Empiric antibiotic selection should be based on local antibiotic resistance prevalence.

[b] Antibiotic allergy includes anaphylaxis or cutaneous response (eg, hives) within 6 hours of drug exposure, or severe cutaneous reaction at any time (eg, Steven Johnson syndrome [SJS], toxic epidermal necrolysis [TEN], drug reaction w/eosinophilia and systemic symptoms [DRESS], erythema multiforme, or serum sickness like reaction). Isolated gastrointestinal tract symptoms, family history of drug allergy, or later-onset nonspecific maculopapular rash do not indicate IgE-mediated drug allergy (see **www.allergyparameters.org/published-practice-parameters-guidelines/alphabetical-listing/drug-allergy-download/**).

[c] Amoxicillin-clavulanate should be used if the patient has received amoxicillin treatment in last 30 days, has concurrent purulent conjunctivitis, or has a history of recurrent AOM unresponsive to amoxicillin.

[d] Oral antibiotics may be considered for bacteremia if bacteremia clears within 72 hours of source control and initiation of effective antibiotic therapy.

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