Pediatric Empiric Antimicrobial Therapy Recommendations 2020-2021

POPULATION	COMMON PATHOGENS	TREATMENT OF CHOICE	ALTERNATIVE TREATMENT	COMMENTS
COMMUNITY-ACQUIRED PNEUMONIA (Inpatient Treatment)				
Age ≤ 4 weeks or Age > 4 weeks **and** postmenstrual age < 41 weeks	*Streptococcus agalactiae* Gram negatives (*E.coli, Klebsiella* species) *Listeria monocytogenes* – rare	ampicillin **plus** ceftazidime		***ID consult strongly recommended if unusual pathogens are suspected or identified.** ǂUse ceftriaxone with caution/consider alternative agent in patients with: - hyperbilirubinemia - receiving calcium containing IV products - Do not administer ceftriaxone and calcium simultaneously in same line De-escalation of antibiotics should be considered once results are available for lower respiratory tract cultures or the patient has clinically improved (afebrile x 24-48hr and tolerating PO). **Cefdinir is not a PO equivalent to ceftriaxone.** **Patients are considered fully immunized once 3 doses in the immunization series for Hib and PCV have been completed. However, completion of 2 doses is likely to provide adequate immunity to consider utilization of narrower antimicrobials. †Consult ID if one of the following applies: critical illness, evidence of lung necrosis, evidence of complicated pneumonia, antibiotic use within the last 3 months, or co-infection/recent influenza infection (due to increased likelihood of *S. aureus* or MDR *S. pneumoniae*). If nasal MRSA PCR is negative, may discontinue vancomycin. For additional information on treatment options for COVID-19, refer to the COVID-19 Information Center for Team Members and Physicians.
Age > 4 weeks **and** postmenstrual age ≥ 41 weeks	Viruses (RSV, parainfluenza, influenza, adenovirus, metapneumovirus) *S. pneumoniae* *H. influenzae* Consider *C. trachomatis* or *B. pertussis* in young infants Consider atypical organisms (*Mycoplasma pneumoniae* and *Chlamydophila pneumoniae*) in school-age children	****Non-ICU & Fully Immunized:** ampicillin (De-escalation: high-dose amoxicillin) **Non-ICU & Not Fully Immunized:** ceftriaxoneǂ (De-escalation: high-dose amoxicillin/clavulanate) **ICU or Complicated†:** ceftriaxoneǂ +/- clindamycin OR vancomycin If vancomycin initiated, order nasal MRSA PCR. Add azithromycin if *C. trachomatis, B. pertussis*, (young infants) or atypical organisms (school-age) are suspected **Influenza**: oseltamivir **Other Viruses:** No antimicrobials, supportive care only	PCN type I allergy (hives or anaphylaxis): No preferred regimen. Treatment should be individualized. Consult ID. PCN type IV allergy (rash): Ceftriaxone Oral transition should be individualized for patients who have a penicillin allergy.	
HOSPITAL-ACQUIRED AND VENTILATOR-ASSOCIATED PNEUMONIA				
All ages	Gram negatives (*P. aeruginosa, E. coli, Enterobacter, Klebsiella* species) *Staphylococcus aureus*	piperacillin/tazobactam **or** cefepime +/- vancomycin If vancomycin initiated, order nasal MRSA PCR.	Beta-lactam type I allergy (hives or anaphylaxis): cefepime +/- vancomycin	If critically ill, add tobramycin due to increasing *Pseudomonas aeruginosa* resistance to beta-lactams **ID consult strongly recommended.** Avoid the combination of piperacillin/tazobactam and vancomycin as this combination is associated with higher rates of acute kidney injury. If nasal MRSA PCR is negative, may discontinue vancomycin

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M E N I N G I T I S				
Age ≤ 4 weeks or Age > 4 weeks **and** postmenstrual age < 41 weeks	*Streptococcus agalactiae* Gram negatives (*E. coli, Klebsiella* species) *Listeria monocytogenes* - rare	ampicillin **plus** ceftazidime **plus** gentamicin		**ID consultation strongly recommended.** Add ampicillin for *Listeria* coverage in immunocompromised hosts. Add acyclovir for patients presenting with signs and symptoms of encephalitis such as seizure, changes in mental status, or focal neurological signs. Note: Obese patients should be dosed using ideal body weight.
Age > 4 weeks – 23 months **and** postmenstrual age ≥ 41 weeks	*S. pneumoniae, N. meningitidis, Streptococcus agalactiae, H. influenzae, E. coli*	ceftriaxone[≠] **plus** vancomycin		[≠]Use ceftriaxone with caution/consider alternative agent in patients with: - hyperbilirubinemia - receiving calcium containing IV products - Do not administer ceftriaxone and calcium simultaneously in same line
≥ 2 years	*S. pneumoniae, N. meningitidis*	ceftriaxone[≠] **plus** vancomycin		
U R I N A R Y T R A C T I N F E C T I O N				
Non – VUR	*E. coli*	cefazolin		**Neonates and infants are at increased risk for UTI complications (*i.e.* bacteremia, meningitis) and as such cefazolin is not indicated. Refer to appropriate recommendations for this patient population.**
VUR/Catheter-associated	*E. coli,* resistant Gram negatives	ceftriaxone***		***For patients with vesicoureteral reflux (VUR), broader antimicrobial may be needed based on patient history.
I N T R A V A S C U L A R L I N E I N F E C T I O N				
	S. aureus, CoNS, *Enterococcus* species, Gram negatives	vancomycin **plus ceftriaxone** **If pseudomonal coverage required,** cefepime		**ID consult is strongly encouraged.** ***S. aureus* bacteremia requires mandatory ID consultation.**
F E B R I L E N E U T R O P E N I A				
Oncology patients	Gram negatives (*P. aeruginosa*), Gram positive cocci	cefepime		Add vancomycin empirically if clinical suspicion for Gram positive infection is high. Add aminoglycoside or ciprofloxacin empirically if patient is in septic shock for second agent for Gram negative coverage.
C O M M U N I T Y - A C Q U I R E D I N T R A - A B D O M I N A L I N F E C T I O N				
Mild-moderate (uncomplicated appendicitis)	Gram negatives + anaerobes	cefazolin **plus** metronidazole	ciprofloxacin + metronidazole	**Consult ID for patients not responding to "treatment of choice."** Consider adding aminoglycoside empirically in select patients with septic shock.
Severe (e.g. complicated appendicitis)	Gram negatives + anaerobes	ceftriaxone **plus** metronidazole	ciprofloxacin + metronidazole	Refer to appendicitis pathway linked here for additional diagnostic information.
Sepsis syndrome (life-threatening)	Gram negatives + anaerobes + *Enterococcus* species	piperacillin/tazobactam	meropenem	

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These are general recommendations only and should not supersede clinical judgment. Patients must be evaluated individually. Appropriate alterations in therapy must be made when culture and sensitivity data are available.

SKIN/SOFT TISSUE INFECTION				
Purulent SSTI (e.g., furuncle, carbuncle, abscess)	*S. aureus* *Streptococcus* species	**Mild**: **I&D alone is sufficient; no culture necessary** **Moderate**: I&D + cefazolin or oxacillin If strong suspicion for MRSA, TMP/SMX or clindamycin **Severe:** I&D + vancomycin		**Definitions** **Mild**: No systemic signs or symptoms of infection **Moderate**: Systemic signs and/or symptoms of infection **Severe**: Failed I&D plus oral antimicrobials and systemic signs or symptoms of infection **Moderate**: TMP/SMX has excellent CA-MRSA coverage; If MSSA, cephalexin **Severe**: If MRSA, vancomycin may be de-escalated based on susceptibility; If MSSA, oxacillin OR cefazolin
Nonpurulent SSTI (e.g., cellulitis, erysipelas, necrotizing infection)	*Streptococcus* species, *S. aureus*	**Mild**: cephalexin OR clindamycin **Moderate**: cefazolin **Severe**: vancomycin, add ceftriaxone and clindamycin if necrotizing fasciitis		**Definitions** **Mild**: Typical cellulitis/erysipelas with no focus of purulence **Moderate**: Typical cellulitis/erysipelas with systemic signs and/or symptoms of infection. **Severe**: Failed oral antimicrobials or with systemic signs or symptoms of infection or immunocompromised, deep infection, hypotension, or organ dysfunction If necrotizing fasciitis, emergent surgical intervention and ID consult recommended
BONE/JOINT INFECTION				
<12 weeks ≥12 weeks	*S. aureus* *Streptococcus agalactiae* Gram negatives *S. aureus, S. pyogenes, Kingella*	oxacillin **plus** ceftazidime cefazolin **or** clindamycin**	clindamycin	**Hold antimicrobials until culture obtained (non-neonate and non-sepsis). Strongly recommend ID consult.** ****Antibiogram data do not support use of clindamycin at Park Ridge campus** Vancomycin should be used empirically in a critically ill patient.
SEPSIS (EXCLUDES NICU)				
Age ≤ 4 weeks or Age > 4 weeks **and** postmenstrual age < 41 weeks Age > 4 weeks **and** postmenstrual age ≥ 41 weeks (healthy children) Age > 4 weeks **and** postmenstrual age ≥ 41 weeks (high risk children)	*Streptococcus agalactiae* Gram negatives (*E.coli, Klebsiella* species), *Listeria monocytogenes* – rare Gram negatives (*E.coli, Klebsiella* species), *S. pneumoniae, Moraxella, H. influenzae, N. meningitidis, S. aureus, S. pyogenes* Gram negatives (*E.coli, Klebsiella* species, P. aeruginosa), *S. pneumoniae, Moraxella, H. influenzae, N. meningitidis, S. aureus, S. pyogenes*	ampicillin **plus** ceftazidime ceftriaxone[≠] +/- vancomycin cefepime +/- vancomycin	PCN type I allergy (hives or anaphylaxis): meropenem +/- vancomycin	Initiate IV antimicrobials when sepsis is a concern after cultures are drawn. Antimicrobials should be administered within 1 hour of suspicion of sepsis. If concern for *S. aureus* or severe sepsis/septic shock, add vancomycin. If concern for HSV, add acyclovir. If concern for abdominal source, add metronidazole or consider alternative therapy with piperacillin-tazobactam if non-meningitis source. If concern for Toxic Shock Syndrome, add clindamycin. [≠]Use ceftriaxone with caution/consider alternative agent in patients with: - hyperbilirubinemia - receiving calcium containing IV products - Do not administer ceftriaxone and calcium simultaneously in same line High risk children include: immunocompromised/suppressed, fever & neutropenia, short gut, central line, s/p transplant If age ≤ 8 weeks, LP indicated. Refer to febrile neonate pathway for additional diagnostic information. **Strongly recommend ID consult.**

MISCELLANEOUS				
Periorbital cellulitis with sinusitis	*S. pneumoniae, Moraxella, H. influenzae, S. aureus, S. pyogenes*	ampicillin/sulbactam Oral transition: amoxicillin/clavulanate	ceftriaxone **plus** clindamycin Oral transition should be individualized for patients who have a penicillin allergy.	**Strongly recommend ID consult.**
Orbital cellulitis	*S. aureus, S. pyogenes, H. influenza, S. pneumoniae*	ampicillin/sulbactam Severe: ceftriaxone **plus** vancomycin If concern for intracranial extension add metronidazole.	ceftriaxone **plus** clindamycin	**Strongly recommend ID consult**.
Peritonsillar abscess	*S. pyogenes, S. aureus, H. influenzae,* oral anaerobes	ampicillin/sulbactam Oral transition: amoxicillin/clavulanate	ceftriaxone **plus** clindamycin Oral transition should be individualized for patients who have a penicillin allergy.	Source control shortens duration of antimicrobial therapy
Lymphadenitis	*S. pyogenes, S. aureus*	Cefazolin or clindamycin**	Clindamycin	Source control shortens duration of antimicrobial therapy. ****Antibiogram data do not support use of clindamycin at Park Ridge campus**
Mastoiditis	*S. pneumoniae, S. aureus, H. influenzae, Moraxella*	Ceftriaxone Severe: ceftriaxone **plus** vancomycin		**Strongly recommend ID consult**. In patients with chronic acute otitis media or rapidly progressing severe disease, consider providing anti-Pseudomonal coverage with cefepime
Pelvic inflammatory disease	Usually polymicrobial *Neisseria gonorrhoeae, Chlamydia trachomatis, anaerobes, gram-negative rods, Streptococcus spp.*	Ceftriaxone plus metronidazole plus doxycycline	Gentamicin plus metronidazole plus doxycycline	Fluoroquinolones should be avoided due to high rates of gonococcal resistance
ADDITIONAL COMMENTS				
These are general recommendations only. Patients must be evaluated individually. Appropriate alterations in therapy must be made when culture and sensitivity data becomes available. NICU is excluded from this guideline. P&T Approval: 8/20/2020 Effective Date: 8/20/2020 Author: Pediatric Antimicrobial Stewardship Team				