

NORTHEWESTERN MEDICINE PALOS HOSPITAL

SUGGESTED EMPIRIC ANTIMICROBIAL THERAPY, FOR INPATIENTS, BY SITE OF INFECTION

Empiric antimicrobial guidelines are based on the most likely organisms responsible for infection, Palos Hospital susceptibilities, and prevalence of resistant organisms. Therapy may need to be adjusted once pathogen identification and susceptibility are determined and should be discontinued if a non-infectious cause is identified.

Previous antimicrobial therapy may affect the susceptibility of organisms that subsequently cause infection. Close attention should be given to courses of antimicrobial therapy administered to patients in the recent past (i.e. past 3 months). In many cases, obtaining the appropriate specimen(s) for culture before antibiotics are started is critical to successful outcomes of an infectious disease. Alterations in empiric antimicrobial therapy may be required per clinical judgement. Infectious Disease consultation is available. In the setting of sepsis, please refer to the sepsis order set.

INFECTION SITE	COMMON PATHOGENS	PREFERRED THERAPY	COMMENTS
BONE			
Acute Osteomyelitis	<i>Staphylococcus aureus</i> (MSSA and MRSA)	Vancomycin	Bone/tissue biopsy is strongly recommended prior to starting antibiotics.
Long Bone status post internal fixation of fracture	<i>Staphylococcus aureus</i> (MRSA and MSSA) <i>Staphylococcus epidermidis</i> Gram-negatives (i.e. <i>Pseudomonas</i>)	Vancomycin + Cefepime	Bone/tissue biopsy is strongly recommended prior to starting antibiotics.
Sternum, post-operative	<i>Staphylococcus aureus</i> (MRSA and MSSA) <i>Staphylococcus epidermidis</i>	Vancomycin	Bone/tissue biopsy is strongly recommended prior to starting antibiotics.
Vertebral osteomyelitis +/- epidural abscess	<i>Staphylococcus aureus</i> (MRSA and MSSA) <i>Staphylococcus epidermidis</i>	Vancomycin + Ceftriaxone <i>Pseudomonas</i> risk: Vancomycin + Cefepime	Obtain blood cultures in non-surgery associated cases. Bone/tissue biopsy is strongly recommended.
CARDIOVASCULAR			
Cardiovascular Implantable Electronic Device Infections	Coagulase negative <i>staphylococci</i> <i>Staphylococcus aureus</i> (MRSA and MSSA) <i>Corynebacterium</i>	Based on the severity of infection and patient clinical condition.	Two sets of blood cultures prior to therapy initiation are recommended. Pocket infection: site tissue culture has higher sensitivity than swab of pocket.

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CARDIOVASCULAR			
Endocarditis	<p><u>Native valve</u> <i>Viridans Streptococci</i> <i>Streptococci bovis</i> <i>Enterococcus sp.</i></p> <p><u>Native valve and history of IV drug use</u> <i>Viridans Streptococci, Streptococci bovis</i> <i>Enterococcus spp.</i> <i>Staphylococcus aureus (MRSA and MSSA)</i></p> <p><u>Prosthetic valve</u> Coagulase negative <i>staphylococci</i> <i>Staphylococcus aureus (MRSA and MSSA)</i></p>	Refer to the guidelines.	ID consult recommended. Refer to AHA guidelines: https://www.idsociety.org/practice-guideline/endocarditis-management/
CENTRAL NERVOUS SYSTEM			
Brain abscess	<p><i>Streptococcus pneumoniae</i> <i>Streptococcus spp.</i> <i>Bacteroides spp.</i> <i>Enterobacteriaceae</i> <i>Staphylococcus aureus (MRSA and MSSA)</i></p>	Vancomycin + Ceftriaxone + Metronidazole +/- Ampicillin*	Biopsy recommended for microbiology and pathology diagnosis. * Ampicillin is given to cover <i>Listeria monocytogenes</i> . <i>Listeria</i> risk factors: age >50yrs, alcoholic patients, pregnant patients, patients with impaired immunity.
Encephalitis	<p><i>Herpes Simplex virus (HSV)</i> <i>Varicella Zoster Virus (VZV)</i> Arboviruses, non-infectious causes</p>	Acyclovir 10mg/kg IV	Obtain blood cultures. Refer to IDSA Encephalitis Guidelines

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CENTRAL NERVOUS SYSTEM			
Meningitis (acute bacterial)	<p><u>Greater than 50 years of age</u> <i>Streptococcus pneumoniae</i> <i>Neisseria meningitidis</i> <i>Listeria monocytogenes</i>*</p> <p><u>2-50 years of age</u> <i>Neisseria meningitidis</i> <i>Streptococcus pneumoniae</i></p> <p><u>1 month to less than 2 years of age</u> <i>Neisseria meningitidis</i> <i>Streptococcus pneumoniae</i> <i>Streptococcus agalactiae</i> <i>H. influenza, E. Coli</i></p> <p><u>Less than 1 month of age</u> <i>Streptococcus agalactiae</i> <i>E. Coli</i> <i>Listeria monocytogenes</i>*</p>	<p><u>>50 years of age</u> Vancomycin + Ceftriaxone (Q12h) + ampicillin*</p> <p><u>2 -50 years of age</u> Vancomycin + Ceftriaxone (Q12h)</p> <p><u>1 to less than 2 years of age</u> Vancomycin + Ceftriaxone (Q12h)</p> <p><u>Less than 1 month of age</u> Ampicillin + Gentamicin</p>	<p>If acute bacterial meningitis is suspected, empiric antibiotics are indicated prior to LP.</p> <p>If <i>pneumococcal</i> meningitis is suspected, administer dexamethasone before or with the first dose of antibiotics.</p> <p>* Ampicillin is given to cover <i>Listeria monocytogenes</i>.</p> <p><i>Listeria</i> risk factors: age >50yrs, alcoholic patients, pregnant patients, patients with impaired immunity.</p>
Meningitis (post-surgical)	<p><i>Staphylococcus aureus</i> (MRSA and MSSA) <i>Staphylococcus epidermidis</i> Gram-negatives (i.e. <i>Pseudomonas</i>)</p>	<p>Vancomycin + Cefepime</p>	<p>Refer to IDSA Health Care Associated Ventriculitis and Meningitis Guidelines</p>

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CENTRAL NERVOUS SYSTEM			
Prophylaxis for <i>Neisseria meningitidis</i> contacts		Ciprofloxacin or Rifampin or Ceftriaxone IM	Ceftriaxone IM is preferred in pregnancy.
GASTROINTESTINAL			
Post appendectomy	n/a	None	Surgical prophylaxis
Post appendectomy with perforation	Enterobacteriaceae <i>Bacteroides spp.</i>	Piperacillin/tazobactam	
Cholecystitis	Enterobacteriaceae	Piperacillin/tazobactam	
Cholecystitis following biliary anastomosis	Enterobacteriaceae Anaerobes	Piperacillin/tazobactam +/- Vancomycin (MRSA risk or Health care associated**)	**Health Care Associated: prior gall bladder instrumentation, admitted longer than 48 hours, hospitalized in the past 90 days. Refer to IDSA Intra-abdominal infection guidelines .
Cholecystitis (health-care associated**) Biliary sepsis Common duct obstruction	Enterobacteriaceae Anaerobes <i>Enterococcus spp.</i> (immune compromised)	Piperacillin/tazobactam +/- Vancomycin (MRSA risk or Health care associated)	**Health Care Associated: prior gall bladder instrumentation, admitted longer than 48 hours, hospitalized in the past 90 days. Refer to IDSA Intra-abdominal infection guidelines .
Diverticulitis Perirectal abscess Peritonitis Community acquired ⁺	Enterobacteriaceae <i>Bacteroides spp.</i>	Piperacillin/tazobactam	⁺ Community acquired: Admitted less than 48h, not hospitalized in the past 90 days.

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GASTROINTESTINAL			
Diverticulitis Perirectal abscess Peritonitis Health care associated** / severely ill	<i>Enterobacteriaceae</i> <i>Bacteroides spp.</i>	Piperacillin/tazobactam +/- Vancomycin**	**Health Care Associated: admitted longer than 48 hours, hospitalized in the past 90 days. ** Empiric Enterococcus coverage recommended for patients with post- operative infection, received previous cephalosporins, immune compromised patients, and those with prosthetic intravascular material, port or peritoneal dialysis catheter.
Acute pancreatitis: non-necrotizing	Non-infectious	No antibiotics	
Acute pancreatitis: Necrotizing, infected pseudocyst, abscess	<i>Enterobacteriaceae</i> <i>Enterococcus spp.</i> <i>Staphylococcus aureus</i> <i>Staphylococcus epidermidis</i> <i>Anaerobes, Candida sp.</i>	Piperacillin/tazobactam	Aspiration for culture and microbiological diagnosis and therapy recommended. Due to penetration of piperacillin/tazobactam into pancreatic necrosis, carbapenem therapy is not indicated unless history of resistant organisms.
Peritonitis – spontaneous bacterial peritonitis (SBP)	<i>Streptococcus pneumoniae</i> <i>K. pneumoniae</i> <i>E. Coli</i>	Ceftriaxone	

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GASTROINTESTINAL			
Peritonitis – peritoneal dialysis related	<i>Staphylococcus aureus</i> <i>Staphylococcus epidermidis</i> Gram negatives	Vancomycin + Gentamicin OR Ceftriaxone	Avoid gentamicin in elderly (>75 years) or in patients with impaired renal function not on dialysis (<30mL/min) if possible.
JOINT			
Prosthetic joint infection	<i>Staphylococcus aureus</i> (MRSA and MSSA) <i>Staphylococcus epidermidis</i> <i>Streptococcus sp.</i>	Vancomycin	Joint fluid culture is strongly recommended prior to starting antibiotics. Consider adding piperacillin/tazobactam if patient has a history of revisions to the joint and previous antibiotic treatment.
Septic joint/arthritis Sexually transmitted infection (STI) risk	<i>Neisseria gonorrhoeae</i> <i>Staphylococcus aureus</i> <i>Streptococcus spp.</i>	Ceftriaxone +/- Vancomycin	Joint fluid culture is strongly recommended prior to starting antibiotics.
Septic joint/arthritis No STI risk	<i>Staphylococcus aureus</i> (MRSA and MSSA) <i>Streptococcus spp.</i> Gram negatives	Vancomycin + Ceftriaxone	Joint fluid culture is strongly recommended prior to starting antibiotics.
KIDNEY, BLADDER, AND PROSTATE			
Asymptomatic bacteriuria	<i>E. Coli</i> Enterobacteriaceae <i>Enterococcus spp.</i>	No treatment recommended unless: Pregnant, undergoing urological procedure with anticipated mucosal bleeding	Refer to IDSA Asymptomatic Bacteriuria guidelines

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KIDNEY, BLADDER, AND PROSTATE			
Cystitis	<i>E. Coli</i> Enterobacteriaceae <i>Staphylococcus saprophyticus</i>	Nitrofurantoin PO x 5 days (if CrCl \geq 30mL/min) OR Cephalexin 500mg PO x 3-5 days OR Cefazolin IV x 3 days (if unable to take oral)	Refer to IDSA Uncomplicated Cystitis/Pyelonephritis guidelines.
Complicated UTI/Catheters	<i>E. Coli</i> Enterobacteriaceae <i>Enterococcus spp.</i> <i>Pseudomonas spp.</i>	Ceftriaxone OR Gentamicin If concern for <i>Pseudomonas</i> : Gentamicin or Cefepime	Avoid gentamicin in elderly (>75 years) or in patients with impaired renal function not on dialysis (<30mL/min) if possible. Refer to IDSA CAUTI guidelines.
Pyelonephritis – acute uncomplicated	<i>E. Coli</i> Enterobacteriaceae	Ceftriaxone OR Gentamicin	Avoid gentamicin in elderly (>75 years) or in patients with impaired renal function not on dialysis (<30mL/min) if possible
Pyelonephritis – complicated (obstruction, post-instrumentation, male)	Enterobacteriaceae <i>Enterococcus spp.</i>	Piperacillin/tazobactam	
Perinephric abscess	Enterobacteriaceae	Piperacillin/tazobactam	Drainage of larger abscesses recommended.
Prostatitis	Enterobacteriaceae	Ceftriaxone	

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LUNG			
Acute exacerbation of chronic bronchitis	Viral <i>C. pneumoniae</i> <i>M. Pneumoniae</i>	<u>Mild to moderate</u> Consider no antibiotic therapy <u>Severe or Hospitalized</u> Amoxicillin/clavulanate 875mg OR Azithromycin ^{&} OR Doxycycline ^{&}	The role of antimicrobial therapy is debated. & Reserve IV for patients unable to take oral.
Pneumonia – Community Acquired (CAP) The category of HCAP is no longer recommended. Recent studies demonstrated that previous identified risk factors (nursing home, dialysis, home wound care) do not predict high prevalence of resistant organisms. More importantly, significant use of broad-spectrum agents has not resulted in apparent improved patient outcomes.	<i>Streptococcus pneumoniae</i> <i>H. influenzae</i> <i>M. pneumoniae</i> <i>C. pneumoniae</i> <i>L. pneumophila</i> Viral	<u>Non-ICU</u> Ceftriaxone + Azithromycin ^{&} 5-day course If MRSA risk: obtain MRSA nasal swab, initiate vancomycin only IF positive <u>ICU or if Pseudomonas risk</u> Cefepime + Azithromycin ^{&} OR Doxycycline ^{&} + If MRSA risk: Vancomycin Obtain MRSA nasal swab, initiate therapy and de-escalate therapy if negative	Refer to ATS/IDSA CAP guidelines . & Reserve IV for patients unable to take oral. <u>MRSA and Pseudomonas risks:</u> <ul style="list-style-type: none"> Hospitalization in the past 90 days AND received IV antibiotics Prior respiratory culture for MRSA or Pseudomonas Pretreatment blood and sputum cultures are recommended for patients with severe disease and those empirically treated for MRSA or <i>Pseudomonas</i> .

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Pneumonia – Hospital Acquired (HAP) (pneumonia that develops more than 48hour after admission)	<i>Staphylococcus aureus (MRSA and MSSA)</i> <i>Pseudomonas aeruginosa</i> <i>Gran negative bacilli</i>	Cefepime OR piperacillin/tazobactam (aspiration concern) +/- Vancomycin (MRSA risk)	<u>MRSA risks:</u> <ul style="list-style-type: none"> • Hospitalization in the past 90 days AND received IV antibiotics • Prior respiratory culture for MRSA or Pseudomonas <p>Blood and sputum cultures are recommended for patients with severe disease and those empirically treated for MRSA or <i>Pseudomonas</i>. Obtain MRSA nasal swab, if not already done.</p>
Pneumonia – Ventilator Associated (VAP)	<i>Staphylococcus aureus (MRSA and MSSA)</i> <i>Pseudomonas aeruginosa</i> <i>Gran negative bacilli</i>	Cefepime OR piperacillin/tazobactam (aspiration concern) +/- Vancomycin (MRSA risk)	<u>MRSA risks:</u> <ul style="list-style-type: none"> • Hospitalization in the past 90 days AND received IV antibiotics • Prior respiratory culture for MRSA or Pseudomonas <p>Blood and sputum cultures are recommended for patients with severe disease and those empirically treated for MRSA or <i>Pseudomonas</i>. Obtain MRSA nasal swab, if not already done.</p>

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SKIN			
Bite wound (animal or human)	<p><u>Animal bite:</u> <i>Pasteurella multocida, Fusobacterium, Capnocytophaga</i></p> <p><u>Human bite:</u> <i>Viridans streptococci</i> <i>Streptococcus spp.</i> <i>Corynebacterium spp.</i> <i>Staphylococcus aureus</i> <i>Eikenella spp.</i> <i>Bacteroides spp.</i> <i>Peptostreptococci spp.</i> <i>Fusobacterium spp.</i> <i>Prevotella spp.</i></p>	Amoxicillin/Clavulanate OR Ampicillin/Sulbactam	<p>More specific treatment is dependent on animal involved.</p> <p>Evaluate need for tetanus and/or rabies vaccination.</p>
Boils (furunculosis) or cutaneous abscess	<i>Staphylococcus aureus (MRSA and MSSA)</i>	Trimethoprim-sulfamethoxazole OR Doxycycline	<p>Hot packs and incision and drainage serve as primary therapy.</p> <p>Refer to IDSA skin and soft tissue infection guidelines</p>
Cellulitis: NON-PURULENT / NON-SUPPURATIVE (no open wound or infected ulcer)	<p>Group A <i>Streptococcal spp.</i> Group B, C, G <i>Streptococcal spp.</i> <i>Note: Staphylococcus aureus is uncommon in absence of abscess, necrosis or purulence.</i></p>	Cefazolin	Refer to IDSA skin and soft tissue infection guidelines

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SKIN			
Cellulitis: PURULENT / SUPPURATIVE (purulent drainage or exudate)	<i>Staphylococcus aureus</i> (MRSA and MSSA) MRSA risk factors: Cellulitis associated with penetrating trauma, MRSA infection elsewhere or MRSA nasal colonization, purulent drainage).	<u>Mild to Moderate</u> Incision and drainage Trimethoprim-sulfamethoxazole OR Doxycycline <u>Severe</u> Incision and drainage Cefazolin (If MSSA suspected) OR Vancomycin (if MRSA suspected)	Culture is indicated prior to antibiotic administration.
Cellulitis – IV catheter related	<i>Coagulase negative Staphylococcal spp.</i> <i>Staphylococcus aureus</i> (MRSA and MSSA)	Remove catheter, if feasible Vancomycin	
Cellulitis – chronic ulcer (non-purulent)	<i>Staphylococcus aureus</i>	Cefazolin	

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SKIN			
Chronic ulcer with abscess (Including diabetic foot ulcer)	Polymicrobial <i>Streptococcus spp.</i> <i>Enterococcus spp.</i> Enterobacteriaceae <i>Pseudomonas spp.</i> <i>Bacteroides spp.</i> <i>Staphylococcus aureus</i> (MRSA and MSSA)	Wound care Piperacillin/tazobactam OR Ampicillin/sulbactam +/- Vancomycin OR trimethoprim/sulfamethoxazole if MRSA suspected	If exposed bone, consider bone biopsy prior to antibiotic administration. If no signs of systemic illness, soft tissue abscess or local cellulitis, consider wound care alone.
Diabetic foot ulcer (no evidence of infection or exposed bone)	Skin flora	Antibiotics are not recommended	
Necrotizing fasciitis	Group A <i>Streptococcal spp.</i> Group C, G <i>Streptococcal spp.</i> <i>Clostridial spp.</i> <i>Staphylococcus aureus</i> Polymicrobial	Piperacillin/tazobactam + Clindamycin + Vancomycin	Clindamycin added to decrease toxin production of Group A strep. Refer to IDSA skin and soft tissue infection guidelines

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