

# ANTIBIOGRAM

EMPIRIC ANTIBIOTICS OF CHOICE FOR COMMON CLINICAL ENTITIES based on Community Hospital Antibiotic Formulary

Site of Infection	Common Causative Organism	Empiric Antibiotic Treatment	Alternative Antibiotic Choices - Comments
<b>Skin or Soft Tissue</b>	<b>Uncomplicated, "Spontaneous" Cellulitis</b> Strep - Group A , B or C Staph aureus (role of MRSA unknown)	IV: Cefazolin PO: Cephalexin	Vancomycin (if MRSA suspected) * Vancomycin goal AUC/MIC 400-600 mcg*hr/mL
	<b>Complicated Cellulitis</b> 2° to diabetic vascular or pressure ulcer; trauma or surgery - polymicrobial	IV: Amp/Sulbactam +/- Vancomycin or Pip/Tazo +/- Vancomycin	Levofloxacin + Metronidazole +/- Vancomycin
	<b>Necrotizing Fasciitis</b> Staph Aureus, β-hemolytic strep, GNRs, anaerobes including Clostridia	Pip/Tazo plus Vancomycin plus Clindamycin	Vancomycin + Meropenem (ID or Intensivist only)
	<b>Skin Abscess</b> MRSA, MSSA	IV: Vancomycin, PO: Sulfamethoxazole/TMP or Doxycycline May use cephalexin for MSSA	PO: Linezolid <i>Drainage of abscess is the most important therapy</i>
<b>Bone and Joint</b>	<b>Osteomyelitis, acute</b> Staph aureus (hematogenous)	Vancomycin *	* Vancomycin goal AUC/MIC 400-600 mcg*hr/mL for bone and joint infection
	<b>Septic Arthritis</b> Staph aureus, Strep species, GNR, Neisseria	Vancomycin * Add Ceftriaxone if GC is suspected	Consider addition of Rifampin if prosthetic joint
<b>CNS</b>	<b>Bacterial Meningitis - Community Acquired</b> S. pneumoniae, N. meningitis	Ceftriaxone High dose (2g q12h) plus Vancomycin* (add Ampicillin (if patient is >65 years old or immuno-compromised))	* Vancomycin goal AUC/MIC 400-600 mcg*hr/mL for CNS infections
	<b>Post-Neurosurgical</b> Pseudomonas, Staph aureus and Epidermidis, GNR	Vancomycin* plus Ceftazidime	Vancomycin + Meropenem (ID and intensivist only) if resistant GNR
<b>Upper Respiratory</b>	<b>Sinusitis</b> Viruses, S. pneumoniae, H. influenzae, Moraxella	PO: Amox/Clavulanate or Levofloxacin	No antibiotics indicated for acute rhinosinusitis
	<b>Pharyngitis</b> Group A strep	PO: Penicillin, or Amoxicillin, or Azithromycin	

Site of Infection	Common Causative Organism	Empiric Antibiotic Treatment	Alternative Antibiotic Choices - Comments
<b>Pneumonia</b>	<b>Community Acquired (CAP)</b> S.pneumoniae, Mycoplasma, H. influenzae, Legionella, Moraxella catarrhalis. Less common - Staph aureus, virus, GNRs	Outpatients: PO Azithromycin or Levofloxacin 750mg daily	Assess for and document risk for GNR pneumonia (esp pseudomonas): Alcoholism, bronchiectasis, structural lung disease, immune compromise, tracheostomy, etc.
	<b>Hospitalized patients with CAP</b>	Non-ICU patients Ceftriaxone (1g q24h) plus Azithromycin (500mg daily) Or Levofloxacin alone (750mg daily)	Assess risk for Staph aureus: post-influenza or necrotizing pneumonia
	<b>ICU patients with CAP</b>	Azithromycin plus Ceftriaxone or Pip-Tazo plus (Levofloxacin or ciprofloxacin) +/- (Vancomycin* or Linezolid (ID or intensivist only)	Desired Vancomycin trough level for pneumonia - 15-20mcg/ml
	<b>Aspiration pneumonia</b> Mixed oral flora, Anaerobes, S. aureus, GNR in hospital acquired aspiration	Ceftriaxone 1g q24h plus Metronidazole 500mg q12h Or Amp/Sulbactam alone	Pip/tazo plus Vancomycin for hospital acquired aspiration Levofloxacin plus metronidazole if beta-lactam allergy
	<b>Hospital Associated (HAP) and Ventilator Associated (VAP)</b> CAP organisms. + GNRs, MRSA	Pip/Tazo (+/-) Levofloxacin (750mg daily) or Aminoglycoside (+/-) Linezolid (ID, Intensivist only) or Vancomycin* (Trough goal 15-20mcg/ml)	Pip/tazo (3.375g or 4.5g q8h 4 hr infusion Assess for MDRO including ESBL, may need carbapenem (Meropenem - ID, Intensivist only))
<b>Genito-urinary infection</b>	<b>Cystitis</b> E. coli, Staph saprophyticus	PO: Sulfamethox/trimethoprim (Septra-DS) (bid) or Cephalexin 500mg q12h	Alternative Nitrofurantoin (Macrobid) 100mg BID <i>Check for resistance to Sulfa or cephalosporin</i>
	<b>Uncomplicated Pyelonephritis</b> E. coli, Proteus, other GNRs	PO: Ciprofloxacin 500mg bid IV/IM: Ceftriaxone 1g q24h	
	<b>Complicated Pyelonephritis</b> Resistant GNR, Enterococci	Ceftriaxone 1g q24h or Pip/Tazo	Ertapenem or Meropenem (ID or intensivist only) if MDRO suspected
	<b>Prostatitis - Acute</b> GNRs, GC  <b>Prostatitis - Chronic</b> GNRs, Staph aureus	Ciprofloxacin* (+/-) Ceftriaxone if GC suspected	* GC commonly resistant to quinolones
<b>Abdominal</b>	<b>Cholangitis, Diverticulitis, Bowel Perforation, etc</b> Enteric GNR (Klebsiella, E. coli, Proteus) +/- Enterococci, anaerobes	Pip/Tazo alone or Ceftriaxone plus Metronidazole	Levofloxacin (750mg) plus Metronidazole or Aztreonam plus Metronidazole +/- Vancomycin
	<b>Hospitalized patient or prior antibiotic use:</b> Above bacteria plus Pseudomonas and Candida.	Pip/Tazo +/- Fluconazole or Ceftazidime plus Metronidazole +/- Fluconazole	Aztreonam plus Metronidazole Consider carbapenem if MDRO suspected
	<b>C. difficile colitis</b>	Metronidazole PO 500mg TID or 500mg IV q8h	Vancomycin PO Liquid 125mg PO q6h

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<b>SEPSIS Syndrome</b>	GNR, Staph aureus	Pip/Tazo plus Vancomycin (may add Aminoglycoside or Levofloxacin 750mg)	Ceftazidime plus Vancomycin Aztreonam plus Vancomycin (may add Aminoglycoside or Levofloxacin) Add metronidazole if bowel source
<b>Acute Native Valve Endocarditis</b>	Strep viridans (30-40%), Enterococcus (5-15%), Staph aureus (20-35%)	Vancomycin* (+/-) Gentamicin (1mg/kg q8h) (+/-) Ceftriaxone (2g q24h)	Begin antibiotics after cultures unless patient is acutely ill or in heart failure
<b>Prosthetic Valve Endocarditis</b>	Staph aureus or Staph epidermidis	Vancomycin plus Gentamicin plus Rifampin	ID Consult strongly advised
<b>Febrile Neutropenia</b>	GNRs, Pseudomonas, Staph aureus, Strep viridans	Pip/Tazo (+/-) Aminoglycoside Or Ceftazidime (2g q8h) (+/-) Aminoglycoside Add Vancomycin if line associated infection suspected	Meropenem (ID or intensivist) (+/-) Vancomycin Low risk patients PO Cipro plus Amox/Clav (Augmentin)

SUGGESTED DURATION OF ANTIMICROBIAL THERAPY FOR COMMON INFECTIONS	
Infection	Duration
Pneumonia CAP HCAP VAP or infections due to pseudomonas or other NFGNR	~ 5 days 7 days 10-14 days
Complicated intra-abdominal infection	4-7 days (with source control)
Urinary tract infection Uncomplicated cystitis in female UTI in males Pyelonephritis	- 3-5 days 10-14 days 10-14 days
Cellulitis - Skin, soft tissue infection Diabetic foot infection	5-10 days 7-21 days depending on severity of infection

### CLINICAL PEARLS

1. IV and PO formulations are equally bioavailable for Fluconazole, Levofloxacin, Ciprofloxacin, Metronidazole, Azithromycin. Use PO formulations when possible.
2. Avoid redundant anaerobic coverage, no need for Metronidazole for patients on Piperacillin/Tazobactam or Ampicillin/Sulbactam unless you are also treating *C. difficile*.
3. Generally there is no need to “double cover” *pseudomonas* infection while awaiting complete susceptibility information except in neutropenic patients or in patients with suspected resistance.

### CONTRIBUTORS

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OUTPATIENT ANTIBIOGRAM 2019 - URINE SOURCE ONLY

Gram Negative -  
Urine Only

	Aminoglycosides				Beta lactams/Beta lactam inhibitor				Carbapenems			Cephalosporin Class					Fluoroquinolones		Folate Pathway inhibitor	Fosfomycin	Monobactams	Nitrofurans
	Tetracycline	Amikacin	Gentamicin	Tobramycin	Amoxicillin + Clavulanate	Ampicillin	Ampicillin + Sulbactam	Piperacillin + Tazobactam	Ertapenem	Imipenem	Meropenem	Cefazolin	Cefazolin Urine	Cefepime	Ceftazidime	Ceftriaxone	Ciprofloxacin	Levofloxacin	Trimethoprim + Sulfamethoxazole	Fosfomycin	Aztreonam	Nitrofurantoin
Citrobacter freundii complex [47 Isolates]			96	98			83	100	98	100				79	78	98	100	89				96
Citrobacter koseri [39 Isolates]			100	100	97		95	97	100	100	85			97	97	92	100	97				46
Enterobacter cloacae complex [34 Isolates]			100	100			82	100		100				82	79	88	97	94				26
Escherichia coli [1,273 Isolates]	100	100	94	93	89	61	65	97	100	100	100		94	100	98	98	79	80	76	100	100	98
Escherichia coli, ESBL [98 Isolates]			67	55					97	99	99					24	26	51	96			95
Klebsiella aerogenes [18 Isolates]			100	100				78	100		100			78	78	100	100	83				22
Klebsiella oxytoca/Raoultella ornithinolytica [49 Isolates]			98	98	98		55	98	100	100	100	39		98	98	96	100	94				84
Klebsiella pneumoniae [169 Isolates]			99	99	98		83	98	100	100	100		96	99	99	98	98	98		100		42
Klebsiella pneumoniae ESBL [5 Isolates]			60	60					100	100	100					40	80	20				20
Klebsiella variicola [20 Isolates]			100	100	100		100	100	100	100	100			100	100	100	100	95				65
Morganella morganii [26 Isolates]			88	88			19	96	100		100			92	92	69	85	85				
Proteus mirabilis [125 Isolates]			90	88	96	82	90	99	100	100		90		98	98	90	92	86				
Pseudomonas aeruginosa [77 Isolates]		100	90	99				96		87	95		96	96	100	74	74				80	

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COMMENTS:

1. Data are obtained from MIC and disk diffusion testing methods.
2. Isolate counts are in parenthesis to the right of the organism name.
3. Inpatient MRSA (methicillin resistant *Staph aureus*): In 2019, 290 of 789 (36.76%) inpatient *Staph aureus* isolates were MRSA. Prior years were as follows: 2018 - 39.4%, 2017 - 37.8%, 2016 - 41.3%, 2015 - 35.6%, 2014 - 52.5%.
4. ESBL (extended spectrum beta lactamases): In 2019, 355 of 4292 (8.27%) *E coli* isolates (combined inpatient and outpatient) produced ESBL. Prior years as follows: 2018 - 8.3%, 2017 - 7.5%, 2016 - 8.1%, 2015 - 8.3%, 2014 - 6.8%, 2013 - 5%.
5. Penicillan Resistant *Streptococcus pneumoniae*: In 2019, 1 of 34 (2.94%) *Streptococcus pneumoniae* isolates (combined inpatient and outpatient) were Penicillan resistant.

OUTPATIENT ANTIBIOGRAM 2019 - URINE SOURCE ONLY

Gram Positive -  
Urine Only

				Aminoglycosides	Ansamycins	Beta lactams/Beta lactam inhibitor			Cephalosporin Class	Fluoroquinolones		Folate Pathway inhibitor	Glycopeptides	Lipopeptides	Nitrofurans	Oxazolidinones	
	Doxycycline	Penicillin	Tetracycline	Gentamicin		Rifampin	Amoxicillin + Clavulanate	Ampicillin		Ampicillin + Subbactam	Oxacillin						Cefazolin
Enterococcus faecalis [321 Isolates]		100	22	50			100	100			100	90		100	100	100	99
Enterococcus faecium [5 Isolates]			60				80					80		80	100		80
Methicillin Resistant Staphylococcus aureus [16 Isolates]			50	63	94							31	100	100	100	100	100
Staphylococcus aureus [57 Isolates]			98	100	100				100	100		82	98	100	100	100	100
Staphylococcus epidermidis [86 Isolates]	100		82	98	95	100			21	24		63		99	100	100	95
Staphylococcus haemolyticus [38 Isolates]			76	74	97				42	42		53		100	100	100	100
Staphylococcus lugdunensis [3 Isolates]			100	100	100				100	100		100		100	100	100	100

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Non-Urine Only

	Aminoglycosides			Beta lactams/Beta lactam inhibitor			Carbapenems			Cephalosporin Class				Fluoroquinolones		Folate Pathway inhibitor	Monobactams	
	Amikacin	Gentamicin	Tobramycin	Amoxicillin + Clavulanate	Ampicillin	Ampicillin + Sulbactam	Piperacillin + Tazobactam	Ertapenem	Imipenem	Meropenem	Cefazolin	Cefepime	Ceftazidime	Ceftriaxone	Ciprofloxacin	Levofloxacin	Trimethoprim + Sulfamethoxazole	Aztreonam
Citrobacter freundii complex [3 Isolates]		100	100				100	100	100	100			100	100	100	100	100	
Enterobacter cloacae complex [13 Isolates]		100	100				100	100		100			100	100	100	100	92	
Escherichia coli [25 Isolates]	100	96	96	84	48	52	92	100	100	100	80		100	100	76	76	80	100
Escherichia coli, ESBL [4 Isolates]								100	100	100								
Klebsiella aerogenes [3 Isolates]	100	100	100				67	100		100			67	67	100	100	100	100
Klebsiella oxytoca/Raoultella ornithinolytica [4 Isolates]	100	100	100	100		75	100	100	100	100	25		100	100	100	100	75	100
Klebsiella pneumoniae [3 Isolates]		100	100	100		100	100	100	100	100	100		100	100	100	100	100	
Morganella morganii [3 Isolates]		67	67			33	100	67		100			100	67	67	100	67	
Proteus mirabilis [17 Isolates]	100	94	94	100	82	100	100	100					100	94	94	94	76	100
Pseudomonas aeruginosa [44 Isolates]	100	89	100				93		89	100		92	93		84	82		82

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	Penicillin	Tetracycline	Gentamicin	Gentamicin Synergy Screen		Rifampin	Ampicillin	Oxacillin	Penicillin (meningitis)	Penicillin (oral)	Cefazolin	Ceftaroline	Ceftriaxone							
Enterococcus faecalis [21 Isolates]				95		100									100		100		100	
Methicillin Resistant Staphylococcus aureus [37 Isolates]		78	89		97					100			30	92	100	49	100	14	100	
Staphylococcus aureus [67 Isolates]		96	99		100	100			100				85	96	100	73	100	63	100	
Staphylococcus epidermidis [2 Isolates]		100	100		100								100		100	50	100		100	
Staphylococcus lugdunensis [13 Isolates]		100	100		100	100			100				100		100	85	100	85	100	
Streptococcus pneumoniae [3 Isolates]	100						50	50			100	100	67		100	67		67		

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