



Antibiogram pocket guide

January 2014-December 2014



Provided by the
Antimicrobial Stewardship Subcommittee

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Antibiogram Interpretation

- Antibiograms are designed to serve only as a **guideline** to help in the empiric choice of antibiotics
- A higher percent susceptibility does NOT necessarily indicate the preferred antibiotic for a specific patient or disease state
 - Use of broad spectrum agents, such as meropenem, piperacillin-tazobactam, or cefepime, when a more narrow agent is appropriate can lead to the development of multidrug resistant organisms as well as superinfections like C. difficile.**
 - The most narrow spectrum, safe and effective agent possible for a specific patient should be used at all times.**
- Antibiogram data is **NOT** a substitute for microbiological data on individual patients
- Cultures from appropriate sources should be obtained, whenever possible, prior to starting antimicrobials.**

Reading Tips

- Organisms are separated into Gram positive and Gram negative and are located in the 1st column
- Antibiotics are listed across the top of the table
- Locate the organism in the 1st column, then move across to the antibiotic of interest
 - The number listed below the antibiotic represents the percentage of organisms susceptible to that drug
 - The number in the parentheses is the number of bacterial isolates tested for that antibiotic

Example: E. coli and ciprofloxacin: % susceptible is 72 and the number of isolates tested is 2407. This means there is a 28% chance that your patient has E.coli resistant to ciprofloxacin. That's nearly one in every three patients. **For this reason, empiric therapy with a fluoroquinolone for infections likely to be caused by E. coli is not recommended.**

Pharmacodynamic dosing recommendations for select antimicrobials

| Drug | Renal function (CrCl)* | Pharmacodynamic Dose |
|--|------------------------|------------------------------|
| Fluoroquinolones-Pharmacodynamic dosing for <i>severe</i> infections | | |
| Ciprofloxacin | ≥ 50 mL/min | 400mg IV q8h 750mg PO BID |
| | 30-49 mL/min | 400mg IV q8h 500mg PO BID |
| | 5-29 mL/min | 400mg IV q24h 500mg PO daily |
| | HD/CRRT | 400mg IV q24h 500mg PO daily |
| Levofloxacin | ≥ 50 mL/min | 750mg daily |
| | 20-49 mL/min | 750mg q48h |
| | 10-19 mL/min | 750mg x1, then 500mg q48h |
| | HD/CRRT | 750mg x1, then 500mg q48h |

Beta-Lactam – Pharmacodynamic Dosing

| | | |
|---|------------------|----------------|
| Cefepime (dosing targeting Pseudomonas) | ≥ 50 mL/min | 1g IV q6h |
| | 30-49 mL/min | 1g IV q8h |
| | 15-29 mL/min | 1g IV q12h |
| | <15, HD, PD CRRT | 1g IV q24h |
| Piperacillin-tazobactam (4 hour infusion) | ≥21 mL/min | 3.375g IV q8h |
| | <20, HD, PD CRRT | 3.375g IV q12h |
| | | 3.375g IV q8h |
| | | |
| Meropenem (do not use this dosing for meningitis) | ≥ 50 mL/min | 500mg IV q6h |
| | 26-49 mL/min | 500 mg IV q8h |
| | 10-25 mL/min | 500mg IV q12h |
| | <10 | 500mg IV q24h |

*CrCl as estimated by the Cockcroft-Gault equation;
 $CrCl = (140 - \text{age}) \times \text{IBW} / (\text{Scr} \times 72)$ (x 0.85 for females)

Antimicrobials that do NOT require renal adjustments

| | |
|----------------|-----------------|
| Amphotericin B | Oxacillin |
| Azithromycin | Oral vancomycin |
| Ceftriaxone | Rifampin |
| Clarithromycin | Linezolid |
| Clindamycin | Micafungin |
| Erythromycin | Tigecycline |
| Isoniazid | Voriconazole |



Antibiogram January – December 2014

| Gram positive organisms, % (# of isolates tested) | Ampicillin | Ceftriaxone | Ciprofloxacin | Clindamycin | Gentamicin | Gentamicin 500 (synergy) | Levofloxacin | Nitrofurantoin | Oxacillin | TMP/SMX | Tetracycline | Vancomycin |
|---|------------|------------------|---------------|-------------|------------|--------------------------|--------------|----------------|-----------|----------|--------------|------------|
| Enterococcus faecalis (all) | 100 (609) | | 66 (609) | | | 68 (607) | 66 (609) | 99 (608) | | | 20 (609) | 95 (608) |
| Enterococcus faecium (all) | 12 (125) | | 6 (125) | | | 86 (125) | 5 (125) | 7 (125) | | | 16 (125) | 29 (125) |
| Staphylococcus aureus (all) | | | 58(1114) | 83 (912) | 97 (1114) | | 58 (1114) | 99 (1114) | 51 (1113) | 98(1114) | 94 (1114) | 100 (1110) |
| Staphylococcus epidermidis | | | 36 (233) | 60 (219) | 75 (247) | | 36 (233) | 100 (233) | 32 (231) | | 90 (242) | 99 (232) |
| Streptococcus pneumoniae | | 100 (39) CNS | | | | | 97 (39) | | | 84 (38) | | 100 (39) |
| | | 100 (39) Non-CNS | | | | | | | | | | |

*Staphylococcus aureus resistance to oxacillin is used to infer whether an organism is MRSA (methicillin resistant) or MSSA (methicillin sensitive). The SMMC antibiogram indicates a 49% MRSA rate.

†Approximately 71% of all E. faecium and 5% of E. faecalis isolates were resistant to vancomycin (VRE). However, 83% of isolates reported are of the more sensitive E. faecalis species.

‡Different MIC breakpoints for susceptibility exist for ceftriaxone with regards to S. pneumonia depending on whether the isolate is from a non-CNS or CNS source.

| Gram negative organisms, % (# of isolates) | Amikacin | Ampicillin | Cefazolin | Cefepime | Ceftriaxone | Ciprofloxacin | Gentamicin | Meropenem | Nitrofurantoin | Piperacillin-tazobactam | TMP/SMX | |
|--|------------|------------|-----------|-----------|-------------|---------------|------------|-----------|----------------|-------------------------|-----------|--|
| Acinetobacter baumannii | | | | 56 (34) | 9 (34) | 47 (34) | 74 (34) | 56 (34) | | | 65 (34) | |
| Citrobacter freundii complex | | | | 100 (60) | 83 (60) | 90 (60) | 97 (60) | | 92 (60) | | | |
| Enterobacter aerogenes | | | | 100 (69) | 83 (69) | 93 (69) | 100 (69) | | 7 (69) | | 100 (69) | |
| Enterobacter cloacae | 99 (127) | | | 99 (127) | 86 (127) | 93 (127) | 100 (127) | | 28 (127) | | 87 (127) | |
| Escherichia coli | 100 (2406) | 54 (2406) | 88 (2406) | 93 (2406) | 92 (2406) | 72 (2407) | 90 (2407) | 100(256) | 91 (2407) | 96 (2071) | 75 (2404) | |
| Klebsiella oxytoca | 100 (97) | | 78 (97) | 97 (97) | 97 (97) | 100 (97) | 99 (97) | | 65 (97) | | 97 (97) | |
| Klebsiella pneumoniae | 95 (679) | | 85 (679) | 87 (679) | 86 (679) | 87 (679) | 94 (679) | 95 (82) | 19 (679) | 86 (588) | 83 (678) | |
| Morganella morganii | 98 (42) | | | 98 (42) | 90 (42) | 74 (42) | 88 (42) | | | 97 (34) | 79 (42) | |
| Proteus mirabilis | 100 (524) | 72 (524) | 73 (524) | 74 (524) | 73 (524) | 55 (518) | 79 (524) | 100 (54) | | 100 (453) | 68 (518) | |
| Pseudomonas aeruginosa | 99 (599) | | | 94 (600) | | 79 (584) | 92 (599) | 62 (34) | | 100 (552) | | |
| Serratia marcescens | | | | 100 (55) | 100 (55) | 98 (55) | 100 (55) | | | | | |

§Approximately 7% of Klebsiella spp. and 7% of E. coli isolates were extended spectrum β-lactamase (ESBL) producing organisms.

Suggested Empiric Antimicrobial Therapy by Site of Infection

| Site | Pathogens | Preferred Therapy/Alternative | | Comments |
|---|--|--|--|---|
| BONE | | | | |
| Acute osteomyelitis | S. aureus (MSSA & MRSA) | Vancomycin | | Bone/tissue biopsy strongly encouraged prior to starting antibiotics |
| Vertebral osteomyelitis +/- epidural abscess | S. aureus (other Gram negative/positives possible) | Vancomycin | ID Consult Advised | Bone/tissue biopsy strongly recommended |
| Chronic osteomeylitis | Polymicrobial | - | - | Empiric therapy not recommended; obtain bone biopsy |
| CNS | | | | |
| Meningitis-bacterial | S. pneumonia, N. meningitidis, Listeria monocytogenes* | Vancomycin + ceftriaxone +/- ampicillin | Vancomycin + chloramphenicol +/- trimethorprim-sulfamethoxazole for severe PCN allergy | Also recommended: dexamethasone 10mg IV q6h x4 days (prior to first dose of antibiotic) *Ampicillin or trimethoprim-sulfamethoxazole are added to cover for L. monocytogenes, especially in high risk patients (>50yo, alcoholics, pregnant, impaired cellular immunity) |
| Meningitis/ventriculitis- post neurosurgery, head trauma or due to infected ventriculo-peritoneal shunt | S. pneumonia, S. aureus, Pseudomonas, coliforms, diphtheroids, P. acnes | Vancomycin + Cefepime | | Remove shunt |
| GALLBLADDER | | | | |
| Cholecystitis, cholangitis, biliary sepsis, or common duct obstruction | Enterobacteriaceae, bacteroides† | Uncomplicated: Cefazolin +/- metronidazole Complicated: Piperacillin-tazobactam | Mild-Moderate: ciprofloxacin +/- metronidazole Severe: ID Consult Advised | †Anaerobic coverage generally not required for mild to moderate cholecystitis |
| GASTROINTESTINAL | | | | |
| C. difficile colitis | C. difficile | Mild-moderate: metronidazole po Severe: vancomycin po | | Vancomycin dose: 125mg po QID (see IDSA 2010 guidelines and ACG's 2013 guidelines) |
| Diverticulitis, perirectal abscess, peritonitis | Uncomplicated: | Ceftriaxone + metronidazole | Ciprofloxacin + metronidazole | |
| | Enterobacteriaceae, bacteroides Severe/complicated: Enterobacteriaceae, bacteroides, Gram negative resistance | Piperacillin-tazobactam | Aztreonam + metronidazole | |
| Appendectomy (no perforation) | - | None | None | Surgical prophylaxis only |
| Appendectomy + perforation | Enterobacteriaceae, bacteroides | Cefazolin + metronidazole | Ciprofloxacin + metronidazole | |
| Pancreatitis- acute | Non-infections | None | None | No antibiotics necessary |
| Pancreatitis-infected pseudocyst, abscess | Enterobacteriaceae, bacteroides, S. aureus, anaerobes | Piperacillin-tazobactam | | Strongly recommend aspiration for definitive microbiological diagnosis |
| Peritonitis-primary (SBP) | S. pneumoniae, K. pneumoniae, E.coli | Ceftriaxone | Ciprofloxacin | |
| Peritonitis – peritoneal dialysis related | S. aureus, S. epidermidis, Gram negatives, candida spp. | Vancomycin + cefepime | Vancomycin + aztreonam | Consider intraperitoneal therapy. See ISPD Guidelines. Peritoneal Dialysis International 2010;30:393-423 |
| JOINT | | | | |
| Septic joint | STD risk: N. gonorrhoeae, S. aureus, Streptococci | Ceftriaxone +/- vancomycin | Consult ID | Early joint aspiration for culture and cell count strongly recommended. |
| | Low STD risk: S. aureus (MRSA/ MSSA) Streptococci, Gram-negative bacilli | Vancomycin AND ceftriaxone | | Send blood cultures prior to starting antibiotics |
| Prosthetic joint infection | S. aureus (MRSA/MSSA), S. epidermidis, Streptococci | Vancomycin | Consult ID | |

| Site | Pathogens | Preferred Therapy/Alternative | | Comments |
|--|--|--|------------------------------------|--|
| KIDNEY, BLADDER, AND PROSTATE | | | | See Antimicrobial Stewardship site on the St. Mary intranet for St. Mary specific guidelines |
| Cystitis, urethritis | E.coli, Enterobacteriaceae, S. saprophyticus | Nitrofurantoin | Ceftriaxone | Asymptomatic-No treatment Consider testing for gonorrhea, chlamydia, trichomonas especially in the presence of an unremarkable UA |
| Complicated UTI –community associated (including sepsis of GU origin) | E.coli, Enterobacteriaceae | Ceftriaxone | Gentamicin x1 + ciprofloxacin‡ | Asymptomatic-No treatment ‡25-30% E.coli resistance to quinolone |
| Complicated UTI –healthcare associated (including sepsis of GU origin) | Pseudomonas, Enterobacteriaceae, Drug resistant Gram negative bacilli | Piperacillin-tazobactam | Cefepime | Asymptomatic-No treatment |
| Candiduria-catheter related | Candida spp. | Asymptomatic: no treatment, remove catheter Symptomatic: fluconazole, remove catheter | Micafungin | Asymptomatic-No treatment Candida is often a colonizer. Do not treat unless highly suspicious for infection |
| Pyelonephritis-acute uncomplicated | E.coli, Enterobacteriaceae | Ceftriaxone | Gentamicin x1 dose + ciprofloxacin | |
| Prostatitis | Enterobacteriaceae | Ciprofloxacin | Trimethoprim-Sulfamethoxazole | Consider a one time dose of gentamicin 5mg/kg in addition until cultures return |
| LUNG | | | | |
| Pneumonia- community acquired | S. pneumoniae, H. influenzae, Mycoplasma, Chlamydia pneumonia, Legionella, viruses | Ceftriaxone + azithromycin | Levofloxacin | |
| Pneumonia - healthcare associated | S. pneumoniae, MSSA, MRSA, Gram negatives | Cefepime + vancomycin | Aztreonam + vancomycin | |
| Pneumonia – aspiration (community acquired) | Bacteroides, Peptostreptococcus, viridans streptococci, fusobacterium | Ampicillin-sulbactam | Ceftriaxone +/- metronidazole | |
| SKIN | | | | |
| Cellulitis (non-purulent) | Group A, B,C,G streptococcus, MSSA | Cefazolin § | Clindamycin | § S. aureus is generally considered uncommon; use vancomycin if patient is at high risk for MRSA (i.e. IVDA, abscess) |
| Furuncle or other purulent skin soft tissue infection | Group A, B,C,G streptococcus, MSSA, MRSA | PO: Trimethoprim-Sulfamethoxazole, Doxycycline, OR Clindamycin Severe: Vancomycin IV | | |
| Diabetic foot ulcer | Mild to moderate: | Cefazolin +/- metronidazole | | |
| | Severe/limb threatening: | Piperacillin-tazobactam +/- vancomycin | Clindamycin + ciprofloxacin | |

Improving Antimicrobial Use

