

**UCSF Children's Hospital**

**Pediatric Antimicrobial Dosing Guideline for Infants And Children > 1 Month Of Age**

*Approved by the Antibiotic Advisory Subcommittee and the Pharmacy and Therapeutics Committee (11/98) Rev 4/2011  
Department of Pharmaceutical Services*

| <b>DRUG</b>   | <b>Creatinine Clearance<br/>≥50ml/min/1.73m<sup>2</sup></b><br><br><b>OR</b><br><b>Renal Function ≥ 50% of<br/>Normal</b>                                 | <b>Creatinine Clearance<br/>10-50ml/min/1.73m<sup>2</sup></b><br><br><b>OR</b><br><b>Renal Function = 10-50% of<br/>Normal</b>   | <b>Creatinine Clearance<br/>≤10ml/min/1.73m<sup>2</sup></b><br><b>(ESRD not on dialysis)</b><br><b>OR</b><br><b>Renal Function ≤10% of<br/>Normal</b> | <b>MAXIMUM<br/>DAILY DOSE</b>                           |
|---|---|--|---|---|
| <b>Acyclovir IV</b>   | <b>Non-CNS HSV infection:</b><br>5-10 mg/kg/dose q8h  | <u>25-50% of normal clearance</u><br>5-10 mg/kg/dose q12h<br><br><u>10-25% of normal clearance</u><br>5-10 mg/kg/dose q24h   | 2.5-5 mg/kg/dose q24h   |   |
|   | <b>Herpes Zoster</b><br>10-20 mg/kg/dose q8h<br>or 500 mg/m <sup>2</sup> /dose q8h<br>(immunocompromised host)  | <u>25-50% of normal clearance</u><br>10-20 mg/kg/dose q12h<br>or 500 mg/m <sup>2</sup> /dose q12h<br>(immunocompromised host)<br><u>10-25% of normal clearance</u><br>10-20 mg/kg/dose q24h<br>OR 500 mg/m <sup>2</sup> /dose q24h<br>(immunocompromised host) | 5-10 mg/kg/dose q24h<br>or 250 mg/m <sup>2</sup> /dose q24h<br>(immunocompromised host)   |   |
|   | <b>HSV encephalitis,<br/>all neonatal infections:</b><br>20mg/kg/dose q8h or<br>500 mg/m <sup>2</sup> /dose q8h<br>(immunocompromised host)               | <u>25-50% of normal clearance</u><br>20mg/kg/dose q12h<br>or 500 mg/m <sup>2</sup> /dose q12h<br>(immunocompromised host)<br><u>10-25% of normal clearance</u><br>20mg/kg/dose q24h<br>or 500 mg/m <sup>2</sup> /dose q24h<br>(immunocompromised host)         | 10mg/kg/dose q24h<br>or 250 mg/m <sup>2</sup> /dose q24h<br>(immunocompromised host)  |   |
| <b>Amphotericin B<br/>Liposomal</b><br>(AmBisome®;<br>per ID approval<br>except for<br>Heme-Onc)                      | <u>Invasive yeast infections</u><br>3mg/kg/dose IV q24h<br><u>Invasive mold infections</u><br>5mg/kg/dose IV q24h   | No change<br><br>No change<br>Dosage reductions in renal disease are not necessary. However, due to the nephrotoxic potential of the drug, reducing the dose or holding the drug in the setting of a rising serum creatinine may be warranted.                 |   |   |
| <b>Ampicillin IV</b>  | 50mg/kg/dose q6h<br><b>Meningitis:</b><br>100mg/kg/dose q6h   | 25mg/kg/dose q6h<br><br>50mg/kg/dose q6h   | 25mg/kg/dose q8-12h<br><br>25mg/kg/dose q8-12h  | 2gm q4h   |
| <b>Ampicillin/<br/>Sulbactam</b><br>(Unasyn®)   | 50 mg ampicillin/kg/dose q6h  | 25 mg ampicillin/kg/dose q6h   | 25 mg ampicillin/kg/dose<br>q8-12h  | 3 gm ampicillin q6h                                     |
| <b>Caspofungin</b><br>(per ID<br>approval)  | LD 70mg/m <sup>2</sup> x1<br>Then 50mg/m <sup>2</sup> q24h  | No change  | No change   | 70 mg   |
| <b>Cefazolin</b>  | 25 mg/kg/dose q8h   | 25 mg/kg/dose q12h   | 25 mg/kg/dose q24h  | 2gm q8h   |
| <b>Cefepime</b>   | 50mg/kg/dose q12h   | <u>&gt;30% of normal clearance</u><br>50mg/kg/dose q12h<br><u>10-30% of normal clearance</u><br>25mg/kg/dose q24h  | 12.5mg/kg/dose q24h   | 2gm q12h  |
|   | <b>Febrile neutropenia:</b><br>50mg/kg/dose q8h<br><br><b>Cystic Fibrosis:</b><br>50mg/kg/dose q8h  | <u>&gt;30% of normal clearance</u><br>50mg/kg/dose q12h<br><u>10-30% of normal clearance</u><br>50mg/kg/dose q24h<br><br>Not documented  | 25mg/kg/dose q24h<br><br>Not documented   | 2gm q8h<br><br><b>Cystic Fibrosis:</b><br>2gm q8h       |
| <b>Cefotaxime</b>   | 50mg/kg/dose q8h  | 50mg/kg/dose q8h-12h   | 25 mg/kg/dose q12h  | 2gm q6h   |
|   | <b>Meningitis:</b><br>50mg/kg/dose q6h  | 50mg/kg/dose q8h   | 50mg/kg/dose q12h   | 2gm q6h   |
| <b>Ceftazidime</b>  | 50mg/kg/dose q8h  | 50mg/kg/dose q12h  | 50mg/kg q24-48h   | 2gm q8h   |
|   | <b>Cystic fibrosis:</b><br>50mg/kg/dose q8h<br><br><i>Burkholderia cepacia</i> co-<br>infected with<br><i>Pseudomonas aeruginosa:</i><br>75mg/kg/dose q8h | Not documented   | Not documented  | <b>Cystic fibrosis:</b><br>2gm q8h<br><br>Max: 3 gm q8h |
| <b>Ceftriaxone</b>  | 50mg/kg/dose q24h<br><b>Meningitis:</b><br>50mg/kg/dose q12h  | No change<br><br>No change   | No change<br><br>No change  | 1 gm q24h<br><b>Meningitis</b><br>2gm q12h              |
| <b>Cefuroxime IV</b>  | 50mg/kg/dose q8h  | 50mg/kg/dose q12h  | 50mg/kg/day q24h  | 1.5gm q8h   |
| <b>Ciprofloxacin<br/>IV</b>   | <u>&gt;30% of normal clearance</u><br>15mg/kg/dose q12h   | <u>10-30% of normal clearance</u><br>7.5 mg/kg/dose q12h   | 7.5mg/kg/dose q12h  | 400mg q12h  |
|   | <b>Cystic fibrosis:</b><br>15 mg/kg/dose q12h   | Not documented   | Not documented  | <b>Cystic fibrosis:</b><br>600mg q12h                   |
| <b>Clindamycin IV</b>   | 10 mg/kg/dose IV q8h  | No change  | No change   | 900mg q8h   |
| <b>Erythromycin<br/>IV</b>  | 5-10mg/kg/dose q6h  | No change  | No change   | 1gm q6h   |
| <b>Ertapenem</b>  | 15 mg/kg/dose q12h<br>≥ 13 years old: 1 gram daily  | <u>≤ 30ml/min/1.73m<sup>2</sup></u><br>Decrease dose 50%   |   | 1 gm q24h   |
| <b>Fluconazole<br/>IV/PO</b><br>(All patients who<br>are able to<br>tolerate PO<br>should receive<br>PO fluconazole.) | 6-12mg/kg/dose q24h   | 3-6mg/kg/dose q24h   | 3-6mg/kg/dose q24h  | 400mg q24h  |
|   | <b>Fungal prophylaxis:</b><br>3mg/kg/dose q24h  | No change  | No change   |   |
| <b>Ganciclovir IV</b>   | <u>&gt;80% of normal clearance</u><br>5mg/kg/dose q12h  | <u>25-50% of normal clearance</u><br>2.5mg/kg/dose q24h  | 1.25mg/kg/dose q24h   |   |
|   | <u>79-50% of normal clearance</u><br>2.5mg/kg/dose q12h   | <u>10-25% of normal clearance</u><br>1.25mg/kg/dose q24h   |   |   |
| <b>Gentamicin</b>   | 2.5mg/kg/dose q8h<br><br>**consult with pharmacist for<br>dose adjustment/level<br>assessment**   | 2.5mg/kg/dose q12h   | 2.5mg/kg/dose q24h  |   |
| <b>Imipenem</b>   | 20 mg/kg/dose q6h   | 10 mg/kg/dose q6-8h  | 10 mg/kg/dose q12h  | 1gm q6h   |
| <b>Linezolid<br/>IV/PO</b><br>(per ID<br>approval)  | < 5 yo: 10mg/kg/dose q8h<br>> 5 yo: 10mg/kg/dose q12h   | No change  | No change   | 600 mg q 12h  |
| <b>Meropenem</b><br>(Indicated for<br>suspected<br>meningitis or<br>history of<br>seizures)                           | 20mg/kg/dose q8h  | <u>25-50% of normal clearance</u><br>20mg/kg/dose q12h<br><u>10-25% of normal clearance</u><br>10mg/kg/dose q12h   | 10mg/kg/dose q24h   | 1gm q8h   |
|   | <b>Meningitis:</b><br>40mg/kg/dose q8h  | <u>25-50% of normal clearance</u><br>40mg/kg/dose q12h<br><u>10-25% of normal clearance</u><br>20mg/kg/dose q12h   | 20mg/kg/dose q24h   | <b>Meningitis:</b><br>2gm q8h                           |
| <b>Metronidazole<br/>IV/PO</b>  | 10mg/kg/dose q8h  | No change  | 10mg/kg/dose q12h   | 500mg q6h   |
| <b>Nafcillin</b>  | 25-50mg/kg/dose q6h   | No change  | No change   | 2gm q4h   |
| <b>Penicillin G<br/>IV</b>  | 100,000 - 250,000<br>units/kg/day+q4-6h   | 70,000-160,000<br>units/kg/day+q8h   | 50,000-125,000<br>units/kg/day+q12h   | 4 million units q4h                                     |
|   | <b>Severe Infection:</b><br>250,000-400,000<br>units/kg/day+q4-6h   | 160,000-260,000<br>units/kg/day+q8h  | 125,000-200,000<br>units/kg/day+q8h   |   |
| <b>Piperacillin/<br/>Tazobactam</b><br>(Zosyn®)   | 80mg piperacillin/kg/dose<br>q6h-8h   | 80mg piperacillin/kg/dose q8h  | 80mg piperacillin/kg/dose<br>q12h   | 4.5gm q6h   |
|   | <b>Cystic fibrosis:</b><br>100mg piperacillin/kg/dose<br>q6h  | Not documented   | Not documented  | 4.5gm q6h   |
| <b>Rifampin<br/>IV/PO</b>   | 5-10mg/kg/dose daily-bid  | No change  | No change   | 600mg qday  |

|  |  |   |  |                                      |
|--|--|---|--|--------------------------------------|
| <b>Tobramycin</b>  | see gentamicin<br><br><b>Cystic fibrosis:</b><br>Once daily dosing:<br>10mg/kg/dose q24h   | see gentamicin<br><br>Not documented  | see gentamicin<br><br>Not documented   |                                      |
| <b>TMP/SMX</b><br>(Septra®)<br>When switching to oral therapy, consider that a single-strength tablet has 80mg of TMP, a double-strength tablet 160mg of TMP, oral suspension has 40 mg TMP per 5 ml | <b>Mild to moderate systemic bacterial infection:</b><br>5mg/kg/dose TMP q12h<br><br><b>Serious systemic bacterial infection:</b><br>5mg/kg/dose TMP q6-8h<br><br><b>Pneumocystis carinii pneumonia prophylaxis:</b><br>2.5mg/kg/dose TMP q12h three days per week.                              | 2.5mg/kg/dose TMP q12h<br><br>5mg/kg/dose TMP q8-12h<br><br>2.5mg/kg/dose TMP q12h three days per week  | 2.5-5mg/kg/dose TMP q24h<br><br>5mg/kg/dose TMP q12-24h<br><br>2.5mg/kg/dose TMP q24h three days per week. | <b>Prophylaxis:</b><br>160mg TMP bid |
| <b>Vancomycin</b>  | 15mg/kg/dose q6h<br><br><b>CNS/Osteo/Serious Infections:</b><br>20 mg/kg/dose q6h<br><br>**Peak levels are not recommended. Trough levels ( $\leq$ 30 min before next dose) should be 5-20 mg/L depending on the severity of infection. Specifically, 15-20 for meningitis, sepsis and pneumonia | 15mg/kg/dose q8-12h<br><br>20 mg/kg/dose q8h  | 15mg/kg/dose q12-24h<br><br>20 mg/kg/dose q12h   | 1 gram IV q8h<br><br>1 gram IV q6h   |
| <b>Voriconazole IV/PO</b><br>(per ID approval; except for Heme-Onc)<br><br>PO should be used when possible, as oral bioavailability > 95%.   | <b>Presumed/Empiric infection</b><br>LD = 6mg/kg q12h x 2 doses<br>MD = 4mg/kg* q12h<br><br><b>Documented infections</b><br>LD = 7mg/kg q12h x 2 doses<br>MD = 5-7mg/kg* q12h<br><br>*Higher doses may be required based on therapeutic drug monitoring (consultation with Pedi-ID recommended)  | No change<br><br>The use of IV should be avoided in patients with CrCl<50 mL/min due to the accumulation of the IV vehicle and is contraindicated in ESRD | No change  |                                      |

### Estimate of Creatinine Clearance using Schwartz's equation:

CL<sub>Cr</sub> = K x L/Scr (Creatinine clearance in ml/minute/1.73m<sup>2</sup>)

K = Constant of proportionality that is age specific

| Age                                    | K     |
|--|-------|
| Preterm infants up to 1 year           | 0.33  |
| Full-term infants up to 1 year         | 0.45  |
| 1-12 years                             | 0.55  |
| 13-21 years female                     | 0.55  |
| 13-21 years male                       | 0.7   |
| 1-16 years with Chronic Kidney Disease | 0.413 |

L = Length or height in cm

Scr = Serum creatinine concentration in mg/dL

### Normal Serum Creatinine Concentrations at Different Ages

| Age                          | Average Serum Creatinine (mg/dL) | Range (mg/dL) |
|------------------------------|----------------------------------|---------------|
| Premature (<34 weeks GA)     |                                  |               |
| <2 weeks old                 | 0.9                              | 0.7-1.4       |
| ≥2 weeks old                 | 0.8                              | 0.7-0.9       |
| Term neonates (>34 weeks GA) |                                  |               |
| <2 weeks old                 | 0.5                              | 0.4-0.6       |
| ≥2 weeks old                 | 0.4                              | 0.3-0.5       |
| 2 weeks-5 years              | 0.4                              | 0.2-0.5       |
| 5-10 years                   | 0.6                              | 0.3-1.0       |
| >10 years                    | 0.9                              | 0.6-1.4       |

Reference – available upon request

For information regarding the dosing of antimicrobial agents in the setting of dialysis or hepatic failure, contact Infectious Diseases Pharmacy for further assistance. ID Pharmacy 443-9421. Pediatric ID Fellow 443-2384

### UCSF PEDIATRIC SUSCEPTIBILITY DATA 2010

N/A-testing NOT APPLICABLE to organism. PIP-piperacillin, CZOL-cefazolin, CTRX-ceftriaxone, CTAZ-ceftazidime, CFPM-cefepime, GEN-gentamicin, TOB-tobramycin, T/S-trimethoprim/sulfamethoxazole, CIP-ciprofloxacin, MER- meropenem, P/T-piperacillin-tazobactam, PCN-penicillin, NAF-naftillin, ERY-erythromycin, CLIN-clindamycin, DOX-doxycycline, VANC-vancomycin, AMP-ampicillin

### Total isolates include Floor Isolates and ICU Isolates from UCSF and Mt. Zion Hospitals (Does not include Outpatient) Gram-negative isolates (% strains susceptible, tested from all sites)

| Organism                 | Total isolates | CZOL | CTRX | CTAZ | CFPM | GEN | TOB | T/S | CIP | P/T | MER |
|--------------------------|----------------|------|------|------|------|-----|-----|-----|-----|-----|-----|
| Citrobacter freundii     | 8              | N/A  | 63   | 63   | 100  | 75  | 88  | 50  | 100 | 75  | 100 |
| Enterobacter aerogenes   | 3              | 33   | 67   | 67   | 100  | 100 | 100 | 100 | 100 | 67  | 100 |
| Enterobacter cloacae     | 19             | N/A  | 68   | 63   | 95   | 89  | 89  | 63  | 100 | 72  | 100 |
| Escherichia coli*        | 62             | 82   | 89   | 92   | 98   | 82  | 81  | 53  | 85  | 94  | 100 |
| EColi-URINE              | 42             | 83   | 90   | 95   | 98   | 88  | 86  | 64  | 88  | 95  | 100 |
| EColi-NON URINE          | 21             | 76   | 86   | 86   | 100  | 71  | 71  | 29  | 81  | 86  | 100 |
| Klebsiella oxytoca       | 15             | 93   | 100  | 100  | 100  | 100 | 100 | 87  | 100 | 93  | 100 |
| Klebsiella pneumoniae    | 35             | 86   | 94   | 91   | 97   | 94  | 97  | 83  | 100 | 97  | 100 |
| Proteus mirabilis        | 3              | 100  | 100  | 100  | 100  | 100 | 100 | 100 | 100 | 100 | 100 |
| Pseudomonas aeruginosa** | 28             | N/A  | N/A  | 96   | 97   | 90  | 100 | N/A | 97  | 100 | 100 |
| PICU+ICN                 | 13             | N/A  | N/A  | 100  | 92   | 85  | 100 | N/A | 92  | 100 | 100 |
| Non-ICU/ICN              | 16             | N/A  | N/A  | 94   | 100  | 94  | 100 | N/A | 100 | 100 | 100 |
| Serratia marcescens      | 12             | N/A  | 83   | 100  | 100  | 100 | 91  | 92  | 100 | 83  | 92  |

\*\*Pseudomonas aeruginosa isolates do not include isolates from cystic fibrosis patients

- ◆ Anaerobes Routine antimicrobial susceptibility testing is not performed; results are not reproducible. The *B fragilis* group universally produces β-lactamase.
- ◆ Enterobacter spp Known to possess inducible cephalosporinase; resistance can emerge during cephalosporin therapy
- ◆ \*Escherichia coli Outpatient cefazolin/cephalexin susceptibility is 93%. Outpatient TMP/SMX susceptibility is 73%. Outpatient ciprofloxacin susceptibility is 93%. Nitrofurantoin susceptibility is 99% and should only be used for uncomplicated UTIs in patients with CrCl >60 mL/min.
- ◆ Haemophilus influenzae National incidence of β-lactamase production is 37%.
- ◆ Stenotrophomonas maltophilia Routine antimicrobial susceptibility testing is performed on sterile sites and cystic fibrosis isolates. TMP/SMX is the most active agent versus this organism.

### Total isolates include Floor Isolates and ICU Isolates from UCSF and Mt. Zion Hospitals (Does not include Outpatient)

### Gram-positive isolates (% strains susceptible, tested from all sites)

| Organism                   | Total Isolates | PCN       | NAF | ERY | CLIN | CIP | DOX | T/S | VANC |
|----------------------------|----------------|-----------|-----|-----|------|-----|-----|-----|------|
| Staphylococcus aureus*     | 129            | 10        | 74  | 48  | 75   | 76  | 89  | 95  | 100  |
| MRSA                       | 33             |           |     | 15  | 72   | 50  | 88  | 94  |      |
| MSSA                       | 96             |           |     | 60  | 76   | 50  | 89  | 95  |      |
| Staphylococcus epidermidis | 68             | 3         | 19  | 18  | 40   | 65  | 89  | 54  | 100  |
| Streptococcus pneumoniae†  | 9              | See below | N/A | 88  | N/A  | N/A | 100 | N/A | 100  |

† Does not include Mt. Zion strains

- ◆ \*Staphylococcus aureus Outpatient Nafcillin susceptibility is 77% (Nafcillin resistance predicts cephalosporin resistance).
- ◆ Enterococcus spp. *Enterococcus faecium* can be multi-drug resistant. Check vancomycin susceptibilities for all isolates from sterile sites. The addition of gentamicin (1 mg/kg Q8h) is required for bactericidal activity in serious systemic enterococcal infections. Of 23 enterococcal bacteremias in 2010, 13 were due to *Enterococcus faecium*, and 7 isolates were vancomycin resistant.
- ◆ †Streptococcus pneumoniae 11% (1/9 isolates) were PCN non-susceptible. 4/4 isolates were susceptible to CTRX. All isolates were susceptible to levofloxacin.  
**NOTE: For the treatment of meningitis, pending susceptibilities VANC empirically should be added to the regimen since failures (due to highly resistant isolates) have been reported with ALL third generation cephalosporins.**