2016-2017 UCLA Health
ADULT ANTI-INFECTIVE DOSING GUIDELINES

Approved by the Antimicrobial Subcommittee & the Pharmacy and Therapeutics Committee 9/2016. Department of Pharmaceutical Services.

For assistance in antimicrobial dosing and selection, contact the Antimicrobial Stewardship Pharmacist 310-267-7567. For diagnosis and management recommendations or formal consultation, contact the ID consult service: RRUMC general ID service pager 98771, RRUMC transplant ID service pager 93424, SMH ID service pager 96002. For antimicrobial treatment guidelines visit http://www.asp.mednet.ucla.edu

Doses are those recommended for systemic infections commonly treated with these agents.
Abbreviations: **IV-PO**=high oral bioavailability – consider initiating with/switching to oral therapy when patient tolerating orals; **LD** = loading dose, **MD** = maintenance dose, **PHD** = post HD
Recommended dosing weights: **IBW** = ideal body weight, **TBW** = total body weight, **ABW** = adjusted body weight
Dialysis: HD=intermittent (high-flux) hemodialysis. CRRT=continuous renal replacement therapy (assumes an ultrafiltration rate of 2L/h with CVVHD, dialysate flow rate of 1L/h with CVVHDF, residual native GFR <10mL/min).

Drug	CrCl >50 mL/min	CrCl 10 - 50 mL/min	CrCl <10 mL/min (ESRD not on HD)	Dialysis (HD or CRRT)
Acyclovir[IBW]	*Herpes simplex infections* 5 mg/kg/dose IV Q8h	5 mg/kg/dose IV Q12 - 24h	2.5 mg/kg IV Q24h	**HD:** 2.5mg/kg IV x1 now then 2.5 mg/kg IV QPM (give PHD on HD days) **CRRT:** 5mg/kg Q24h
	HSV encephalitis/Varicella zoster 10 mg/kg/dose IV Q8h	10 mg/kg/dose IV Q12 - 24h	5 mg/kg IV Q24h	**HD:** 5mg/kg IV x1 now then 5 mg/kg IV QPM (give PHD on HD days) **CRRT:** 5-10mg/kg IV Q12h -24h
Amikacin[IBW*] *Use ABW for obese patients (BMI ≥ 30 kg/m^2) *Aminoglycoside dosing & monitoring per pharmacy available. Order in CareConnect.*	***Extended interval dosing (preferred)*** > 60 mL/min: 15-20 mg/kg/dose IV Q24h 40 - 60 mL/min: 10-15 mg/kg/dose IV Q36h 20 - 40 mL/min: 10-15 mg/kg/dose IV Q48h < 20 mL/min: Call pharmacy Extended dosing allows for high peak to MIC ratios potentially improving efficacy and reducing the risk of nephro- and ototoxicity. An extended-interval level drawn between 6-14 hours (after the start of the infusion) is recommended any time after the first dose. Peak levels are not necessary and trough levels should be undetectable. Call pharmacy for assessment of aminoglycoside levels.			
	Traditional dosing > 60 mL/min: 7.5 mg/kg/dose IV Q12h 40 - 60 mL/min: 5-7.5 mg/kg/dose IV Q12-Q24h 20 - 40 mL/min: 5 mg/kg/dose IV Q24h-Q48h < 20 mL/min: 2.5-5 mg/kg/dose IV Q48h-Q72h Target amikacin levels: PEAK = 25-35 mg/L and TROUGH = < 5 mg/L. Peak levels should be drawn ½ hour following a ½ hour infusion. Trough levels should be obtained prior to the fourth dose of the regimen.			**HD:** 5 - 7.5 mg/kg IV PHD **CRRT:** 10 mg/kg IV x1, then 5 - 7.5mg/kg IV Q24-48h
Liposomal Amphotericin B (AmBisome)[TBW]	3-5 mg/kg/dose IV Q24h	No Change Dose adjustment is unnecessary for pre-existing renal dysfunction however, decreased renal function caused by amphotericin may warrant dose adjustment (e.g. dose reduction or q48h dosing)		
Ampicillin	Meningitis or endovascular infection 2 g IV Q4h	2 g IV Q6h-Q8h	2 g IV Q12h	**HD:** 1-2g IV Q12-24h **CRRT:** 1-2g IV Q8-12h
	Uncomplicated Infection 1-2 g IV Q6h	1 g IV Q6h-Q8h	1 g IV Q12h	
Ampicillin/sulbactam	3 g IV Q6h	3 g IV Q8h	3 g IV Q12h	**HD:** 3g IV Q12-24h **CRRT:** 3g IV Q8-12h
Aztreonam	2 g IV Q6-8h	1 g IV Q8h	500 g IV Q8h	**HD:** 1g IV x1 now then 500mg IV Q12h **CRRT:** 1-2g IV Q8-12h
Caspofungin Hepatic dysfunction- Child- Pugh class B/C:70mg LD, then 35mg IV daily	LD=70 mg x1, then 50 mg Q24h Increase maintenance dose to 70mg when given *with* phenytoin, rifampin, carbamazapine, dexamethasone, nevirapine, efavirenz	No Change	No Change	No Change
Cefazolin	Gram Negative or Complicated Gram Positive 2 g IV Q8h Uncomplicated Gram Positive 1 – 2 g IV Q8h	1 - 2 g IV Q12h	1 g IV Q24h	**HD:** 1g IV Q24h **CRRT:** 2g IV Q12h
Cefepime	>60 mL/min: 1g IV Q8h Febrile neutropenia, meningitis, *Pseudomonas*, critically ill: 2g IV Q8h	30-60 mL/min: 1g IV Q12h; 2 g IV Q12h 10-30 mL/min: 1g IV Q24h; 2 g IV Q24h	<10 mL/min: 500mg IV Q24h; 1 g IV Q24h	**HD:** 1g IV Q24h **CRRT:** 2g IV Q12h
Ceftriaxone	1 g IV Q24h Meningitis 2 g IV Q12h Endocarditis & Osteomyelitis 2 g IV Q24h	No Change	No Change	No Change
Ciprofloxacin[IV-PO]	>60mL/min: 400mg IV Q12h; 500-750mg PO Q12h *Pseudomonas*, critically ill: 400mg IV Q8h; 750mg PO Q12h	30-60 mL/min: No Change; No Change 10-30 mL/min: 200-400mg IV Q12h; 250-500mg PO Q12h	<10 mL/min: 200mg IV Q12h; 250mg PO Q12h	**HD**: 400mg IV Q24h/500mg PO Q24h **CRRT:** 400mg IV Q12h
Clindamycin	600 - 900 mg IV Q8h 300 - 450 mg PO Q8h	No Change	No Change	No Change
Colistin[IBW] Dosed in mg of base activity (CBA) **ID CONSULT REQUIRED (HS1444)	≥ 50 mL/min LD: 5 mg/kg IV x1, then 2.5 mg/kg/dose IV Q12h	20-50 mL/min LD: 5mg/kg IV x1, then 2.5mg/kg/dose IV Q24h	< 20 mL/min LD: 5mg/kg IV x1, then 2.5mg/kg/dose IV Q48h	**HD**: 5mg/kg IV x1, then 30 mg IV Q12h **CRRT:** 5 mg/kg IV x1, then 100 mg IV Q12h
Daptomycin[TBW] Not effective in treatment of pneumonia	4-8 mg/kg IV Q24h Dose depends on indication & pathogen	<30 ml/min 4-8 mg/kg IV Q48h		**HD:** 4-8 mg/kg IV Q48h **CRRT:** 4-8 mg/kg IV Q48h
Doxycycline[IV-PO]	100 mg IV/PO Q12h	No Change	No Change	No Change
Ertapenem	1g IV Q24h	<30 ml/min 500 mg IV Q24h		**HD:** 500mg IV Q24h **CRRT:**500mg IV Q24h
Ethambutol[IBW]	15 - 20 mg/kg PO Q24h	<30 ml/min 15-25 mg/kg PO 3x/week		**HD:** 15-25mg/kg PO 3x/week (PHD) **CRRT:** 15-25mg/kg PO 3x/week
Fluconazole[IV-PO]	100 - 400 mg IV/PO Q24h Oropharyngeal Candidiasis: 100mg daily Esophageal Candidiasis: 200mg daily Severe Infections : 400mg daily	50 - 200 mg IV/PO Q24h	50 -100 mg IV/PO Q24h	**HD:** 200 mg IV/PO daily **CRRT:** 400 – 800 mg IV/PO Q24h
Ganciclovir[ABW] **Induction**	> 70 mL/min: 5 mg/kg/dose IV Q12h 50 - 69 mL/min: 2.5 mg/kg/dose IV Q12h	25-49 mL/min: 2.5mg/kg/dose IV Q24h 10-24 mL/min: 1.25 mg/kg/dose IV Q24h	< 10 mL/min: 1.25 mg/kg/dose IV 3x/week	**HD:** 1.25mg/kg IV PHD only **CRRT:** 2.5-5 mg/kg IV Q24h
Ganciclovir[ABW] **Maintenance**	> 70 mL/min: 5 mg/kg/dose IV Q24h 50 - 69 mL/min: 2.5 mg/kg/dose IV Q24h	25-49 mL/min: 1.25 mg/kg/dose IV Q24h 10-24 mL/min: 0.625 mg/kg/dose IV Q24h	< 10 mL/min: 0.625 mg/kg/dose IV 3x/week	
Gentamicin[IBW*] *Use ABW for obese patients (BMI ≥ 30 kg/m^2) *Aminoglycoside dosing & monitoring per pharmacy available. Order in CareConnect.*	***Extended interval dosing (preferred)*** > 60 mL/min: 5-7 mg/kg IV Q24h 40 - 60 mL/min: 5-7 mg/kg IV Q36h 20 - 39 mL/min: 5-7 mg/kg IV Q48h < 20 mL/min: Call pharmacy Extended dosing allows for high peak to MIC ratios potentially improving efficacy and reducing the risk of nephro- and ototoxicity. An extended-interval level drawn between 6-14 hours (after the start of the infusion) is recommended anytime after the first dose. Peak levels are not necessary and trough levels should be undetectable. Call pharmacy for assessment of aminoglycoside levels.			
	Traditional dosing > 60 mL/min: 1-2 mg/kg/dose IV Q8h-Q12h 40 - 60 mL/min: 1.2-1.5 mg/kg/dose IV Q12h-Q24h 20 - 39 mL/min: 1.5 mg/kg/dose IV Q24-Q48h < 20 mL/min: 1-1.5 mg/kg/dose IV Q48h-Q72h Target gentamicin and tobramycin levels: PEAK = 5-10 mg/L and TROUGH = < 1 mg/L. Peak levels should be drawn ½ hour following a ½ hour infusion. Trough levels should be obtained prior to the fourth dose of the regimen. Traditional dosing is the preferred method for Gram-positive synergy dosing in infective endocarditis. For patients with CrCl > 60 ml/min for whom synergy dosing is required, recommend 1 mg/kg/dose IV Q8h. Gram-positive synergy PEAK = 3-4 mcg/mL and TROUGH = undetectable.			**HD:** 3 mg/kg IV x1, then 1-3 mg/kg IV PHD **CRRT:** 5 mg/kg IV x1, then 3–5 mg/kg IV Q24-48h

Drug	CrCl >50 mL/min	CrCl 10 - 50 mL/min	CrCl <10 mL/min (ESRD not on HD)	Dialysis (HD or CRRT)
Isoniazid	300 mg PO Q24h	No Change	No Change	No Change
Levofloxacin IV-PO	Urinary tract infections 250-500mg IV/PO Q24h	500mg x1, then 250mg IV/PO Q24h	500mg x1, then 250mg IV/PO Q48h	**HD:** 500mg x1, then 250mg Q48h **CRRT:** 750mg x1, then 250mg-500mg Q24h
	Non-urinary tract infections 750mg IV/PO Q24h	750mg x1, then 750mg IV/PO Q48h	750mg x1, then 500mg IV/PO Q48h	
Linezolid IV-PO	600mg IV/PO Q12h	No Change	No Change	No Change
Meropenem	> 50mL/min 1 g IV Q8h	25 - 50 mL/min: 1g IV Q12h 10-25 mL/min: 0.5g IV Q12h	< 10 mL/min 0.5 g IV Q24h	**HD:** 500mg IV x1 now then 500mg QPM (give post HD on HD days) **CRRT:** 1g IV Q8-12h* *Recommend 1g Q8h for CVVHD ultrafiltration rates exceeding 2L/hr
	Meningitis 2g IV Q8h	2g IV Q12h 1g IV Q12h	1g IV Q24h	
Metronidazole IV-PO	500 mg IV/PO Q8h	500 mg IV/PO Q8h	500 mg IV/PO Q12h ESRD not on HD	500 mg IV/PO Q8h
Oxacillin [1]Administered as a **continuous infusion** over 24 hours	12g IV Q24h[1]	No Change	No Change	No Change
Penicillin G [1]Administered as a **continuous infusion** over 24 hours	18-24 MU IV Q24h[1]	8-16 MU IV Q24h[1]	8-12 MU IV Q24h[1]	**HD:** 8-12 MU IV Q24h **CRRT:** 8-16 MU IV Q24h[1]
Piperacillin/ tazobactam [1]Administered as an **extended infusion** over 4 hours	≥20 mL/min 3.375g IV x1 bolus, then 3.375g IV Q8h[1]		< 20 mL/min 3.375g IV x1 bolus, then 3.375g IV Q12h[1]	**HD:** 3.375g IV x1 bolus, then 3.375g IV Q12h[1] **CRRT:** 3.375g IV x1 bolus, then 3.375g IV Q8h[1]
Posaconazole Solution must be administered with high-fat meal or nutritional shake e.g. Ensure **Formulation dependent dosing:** [1]Solution [2]Enteric coated tablet/Intravenous	Treatment of invasive fungal infections 400 mg PO Q12h[1] or 200 mg PO Q6h[1] Neutropenia/GVHD prophylaxis 200 mg PO Q8h[1] or 300 mg PO/IV q12h x2 doses, then 300 mg PO/IV daily[2]	No Change	No Change	No Change
Pyrazinamide IBW	20 - 25 mg/kg/day PO Q24h	<30 ml/min 25-35 mg/kg 3x/week		**HD**: 25-35 mg/kg three 3x/week PHD **CRRT**: 25-35 mg/kg 3x/week
Rifampin IV-PO Known to interact with many medications- review of concurrent medications strongly recommended	Mycobacterial infections 600 mg IV/PO Q24h	No Change	No Change	No Change
	Endocarditis 300 mg IV/PO Q8h			
	Prosthetic device infections 450 mg IV/PO Q12h			
Tobramycin	See Gentamicin			
TMP/SMX IV-PO, ABW* When switching to oral therapy, consider that a single-strength tablet has 80mg of TMP, a double-strength tablet 160mg of TMP. *May consider TBW for serious infections	Systemic GNR infections 10 mg TMP/kg/day IV divided Q6 - 12h *Pneumocystis pneumonia, Stenotrophomonas maltophilia* 15 - 20 mg TMP/kg/day IV divided Q6 - 12h	5 - 7.5 mg TMP/kg/day IV divided Q12 - 24h 10 - 15 mg TMP/kg/day IV divided Q12 - 24h	2.5 - 5.0 mg TMP/kg IV Q24h 5 - 10 mg TMP/kg IV Q24h	**HD:** 2.5-5mg TMP/kg/day Q24h **CRRT:** 5-7.5mg TMP/kg/day divided Q12-24h
Vancomycin TBW Round dose to nearest 250mg increment Maximum: 2 gram/dose *Vancomycin dosing & monitoring per pharmacy available. Order in CareConnect.*	>60mL/min Uncomplicated Infections[1] 10-15mg/kg IV Q12h Serious Infections[2] Consider *loading dose* of 25mg/kg IV x1followed by 15-20mg/kg IV Q8-12h	40-60 mL/min: 10-15mg/kg IV Q12h-Q24h 20-40mL/min: 5-10mg/kg IV Q24h 10-20 mL/min: 5-10mg/kg IV Q24h-Q48h	<10 mL/min 10-15mg/kg IV loading dose x1, then redoes according to levels	**HD:** 15-20mg/kg loading dose x1 followed by 0.5-1g PHD only **CRRT:** 10-15mg/kg IV Q24h
Trough levels should be obtained within 30 minutes before the 4th dose for a new regimen or dose change. Vancomycin troughs are not recommended if anticipated duration of therapy is ≤ 3 days. [1]For uncomplicated infections, the target trough is 10-15 mcg/mL. [2]For serious infections due to MRSA (i.e. CNS infections, endocarditis, pneumonia, bacteremia, or osteomyelitis), target trough is 15-20 mcg/mL, ID consult recommended.				
Voriconazole IV-PO,ABW	400 mg PO Q12h x 2 doses, then 200 mg PO Q12h[1]	No Change[2]	No Change[2]	No Change[2]
PO should be used when possible, as oral bioavailability >95%. IV dose: LD=6 mg/kg/dose Q12h x 2 doses, then 4mg/kg/dose (ABW) Q12h.[1]In obese patients consider using a weight-based PO regimen (4mg/kg Q12h) using ABW, consult ID/ID-pharmacy for assistance.[2] Use of the IV formulation should be avoided if possible in patients with CrCl < 50 mL/min due to accumulation and renal toxicity. Voriconazole may require dose adjustment in hepatic dysfunction and has numerous drug interactions. For patients taking PO, administer on an empty stomach.				

UCLA HEALTH SYSTEM ADULT INPATIENT ABBREVIATED SUSCEPTIBILITY DATA 2016

See UCLA Guidebook for complete antibiogram: http://www.asp.mednet.ucla.edu/pages/anti-suscep-summ

N/A-testing NOT APPLICABLE to organism (e.g. intrinsic resistance), **AMIK**- amikacin, **AMP** – ampicillin, **A/S**- ampicillin/sulbactam, **CIP**-ciprofloxacin, **CLIN**-clindamycin, **CZOL**-cefazolin **CTRX**-ceftriaxone, **CFPM**-cefepime, **DAPTO**- daptomycin, **DOX**-doxycycline, **ERT**- ertapenem, **ERY**-erythromycin, **GEN**-gentamicin, **LIN**- linezolid **MER** -meropenem, **OX**- oxacillin, **PCN**-penicillin **P/T**-piperacillin-tazobactam, **RIF**- rifampin, **TOB**-tobramycin, **T/S**-trimethoprim/sulfamethoxazole, **VANC**-vancomycin

Gram-negative isolates, non-urine isolates

Organism	Location	No. Isolates	AMP	A/S	P/T	CZOL	CTRX	CFPM	ERT	MER	AMIK	GENT	TOB	CIP	T/S
Enterobacter cloacae	IP[1]	33	R[3]	R	76	R	See note[4]	85	88	97	99	94	94	94	88
	ICU[2]	64	R	R	67	R	-	88	95	98	98	97	97	98	91
Escherichia coli	IP	106	33	43	90	49	65	75	97	99	96	73	72	45	43
	ICU	92	20	31	77	33	65	69	95	99	96	71	71	46	46
Klebsiella pneumoniae	IP	84	R	58	80	56	70	75	85	87	89	80	75	74	69
	ICU	111	R	68	83	68	80	83	91	91	91	88	86	82	77
Proteus mirabilis	IP	17[5]	71	88	99	24	88	94	99	99	99	88	94	53	71
	ICU	18[5]	78	78	99	44	99	99	99	99	99	89	89	61	61
Pseudomonas aeruginosa	IP	96	R	R	77	R	R	84	R	78	95	93	94	63	R
	ICU	114	R	R	72	R	R	78	R	68	92	90	93	68	R
Acinetobacter baumannii	All locations	49	R	69	49	R	-	63	R	71	74	65	69	63	67

[1] IP -- inpatient
[2] ICU – intensive care unit
[3] R – intrinsic resistance
[4] not appropriate for treatment of serious *E. cloaceae* infections
[5] calculated from fewer than the standard recommendation of 30 isolates

Gram-positive isolates, non-urine isolates

Organism	Location	No. Isolates	AMP	OX	PCN	CIP	CLIN	DAPTO	ERY	LIN	T/S	VANC	CTRX
Staphylococcus aureus	ALL	1479	-	71[1]	<10	66	73	99	54	99	98	99	-
Coagulase-negative staphylococcus	ALL	448	-	48	<10	48	61	99	39	99	63	99	-
Streptococcus pneumoniae	ALL	29[7]	[2]	-	See note[3]	See note[4]	86	-	55	-	79	100	See note[5]
Enterococcus spp.	ALL	450	75	-	-	53	R	99	-	99	R	100	R
Enterococcus faecalis	ALL	82	99	-	-	62	R	99	-	99	R	98	R
Enterococcus faecium[6]	ALL	108	8	-	-	5	R	97	-	99	R	19	R

[1] *Staphylococcus* resistant to oxacillin are resistant to cefazolin, cephalexin, ceftriaxone and all other beta-lactams, except ceftaroline.
[2] 97% of isolates are susceptible to amoxicillin.
[3] In patients with meningitis, 52% of isolates are penicillin-resistant. In patients without meningitis, 5% of isolates are penicillin-resistant.
[4] 99% of isolates are susceptible to levofloxacin. Levofloxacin should be used instead of ciprofloxacin to treat *S. pneumoniae*.
[5] In patients with meningitis, 89% of isolates are susceptible to ceftriaxone. In patient without meningitis, 99% of isolates are susceptible to ceftriaxone. **NOTE**: For the treatment of meningitis, pending susceptibilities, VANC should be empirically added to the regimen since failures due to highly resistant isolates have been reported with ceftriaxone and cefotaxime.
[6] 58% of enterococcal bloodstream were caused by *E. faecium*: 85% of these were vancomycin resistant.
[7] Calculated from fewer than the standard recommendation of 30 isolates.