

## Characteristics of Commonly Monitored Drugs

Drug Class	Drug	Average Half-Life (Hrs)	Protein Binding %	Therapeutic Range	Toxic Range	Optimal Specimen Collection	Comments
<b>Anti Convulsants</b>	Carbamazepine (Tegretol)	15-24	75	4-12 mcg/mL	>15 mcg/mL	Pre-dose, consistent time of day after steady state.	Co-administration with Erythromycin, phenytoin, Valproic acid reduces the blood concentration. Consider monitoring the active metabolite epoxide in patients receiving concurrent valproic acid and lamotrigine and in patients exhibiting toxicity with low parent drug concentrations. Half-life is variable due to autoinduction which is usually complete 3-5 weeks after initiation.
	Ethosuximide (Zarontin)	30-60	0	40-100 mcg/mL	>200 mcg/mL	Pre-dose, consistent time of day after steady state.	Carbamazepine, Phenobarbital, Phenytoin and primidone reduces the blood concentration.
	Phenobarbital (Luminal)	70-100	40-60	15-40 mcg/mL	>60 mcg/mL	Pre-dose, consistent time of day after steady state.	Valproic acid and Salicylates increase serum levels.
	Phenytoin (Dilantin)	6-60 (adult) 7-29 (Child)	90	10-20 mcg/mL	>40 mcg/mL	Pre-Dose (Oral Dosing) 1-4 hr post I.V. Loading dose.	Highly bound to albumin and its binding can be affected by the concentration of albumin as well as presence of other acidic drugs that bind to albumin such as valproic acid, salicylates, phenylbutazone, and sulfonyleureas.
	Primidone (Mysoline)	3-8	19	5-12 mcg/mL	>24 mcg/mL	Pre-dose, consistent time of day after steady state.	Measure the metabolite of Primidone, Phenobarbital concurrently with the parent drug.
	Valproic Acid (Depakene)	9-18 (adult) 7-13 (child)	90	50-100 mcg/mL	>200 mcg/mL	Pre-dose, consistent time of day after steady state.	An unusual feature of this drug is that once plasma concentration reaches approximately 75 mcg/mL, the free fraction increases rapidly if the dose is increased. Free portion of the drug rapidly metabolizes, therefore total plasma concentrations increases little with increasing dose.

Drug Class	Drug	Average Half-Life (Hrs)	Protein Binding %	Therapeutic Range	Toxic Range	Optimal Specimen Collection	Comments
Cardioactive Drugs	Digoxin (Lanoxin)	36-48	23	0.8-2.0 ng/mL	>2.5 ng/mL	8-12 hr post-dose	Drug Concentrations be determined after the patient reaches steady state and at least 8 hours after the last dose. The serum concentration of digoxin does not correlate with the pharmacological activity until the post distribution period (at least 8-12 hours after the last dose). Levels of 0.5-1.0 mcg/mL suggested for CHF and levels above 1.0 for CHF has no additional benefit.
	Lidocaine (Xylocaine)	1.5-2	60-80	1.5-5 mcg/ml	>6 mcg/ml	>30 min post I.V. dose (5-10 hr after start of drug administration.	Routine monitoring is not recommended. It is recommended when propanolol is co administered or toxicity is suspected. Dose adjustment and drug level monitoring recommended for hepatic impairment. Consider alternative therapy in severe hepatic dysfunction.
	Procainamide (Pronestyl)	2.5-4.7	15-20	4-10 mcg/ml	>10 mcg/ml	For oral therapy 1 hr prior to next dose after Steady State. For IV infusion, draw 6-12 hours after infusion has started.	NAPA exhibits genetic polymorphism. Patients who are slow acylators are at risk of developing Lupus like symptoms while on procainamide therapy. Hemolysis may occur in pts with G6PD deficiency.
	NAPA	6 to 8	15-20	15-25 mcg/ml	>30 mcg/mL (Proc + NAPA)	Metabolite of Procainamide	
	Quinidine (Duraquin)		6 to 8	80-88	2-5 mcg/ml	>6 mcg/mL	1 hr prior to next dose after Steady State

Drug Class	Drug	Average Half-Life (Hrs)	Protein Binding %	Therapeutic Range	Toxic Range	Optimal Specimen Collection	Comments
Antibiotics	Amikacin (Amikin)	2-3	1-11	See Comments	Peak >35 mcg/ml Trough >10 mcg/mL	<p><b>Traditional Dosing:</b>  <b>Peak:</b> 30 min after 30 minute infusion of the 3rd dose (1 hr after the start of infusion).  <b>Trough:</b> 1 Hr before 3rd dose.  <b>Extended Interval dosing: Peak:</b> No need to monitor.  <b>Trough:</b> 1 Hr before dose.</p>	<p><b>Traditional dosing:</b>  Target Peaks: 15 mcg/ml for synergy against gram positive organisms. 20-40 mcg/ml for gram negative infections  Target Trough: &lt; 8 mcg/ml  <b>Extended interval dosing:</b>  8 Hr Level after first dose: divide by 2 and plot on Hartford Nomogram  If in range as above, monitor trough levels a minimum of twice weekly  Target Trough: &lt; 2 mcg/ml</p>
	Gentamicin (Garamycin)	2-3	0-30	See Comments	Peak >20 mcg/ml Trough >2.5 mcg/mL	<p><b>Traditional Dosing:</b>  <b>Peak:</b> 30 min after 30 minute infusion of the 3rd dose (1 hr after the start of infusion).  <b>Trough:</b> 1 Hr before 3rd dose.  <b>Extended Interval dosing: Peak:</b> No need to monitor.  <b>Trough:</b> 1 Hr before dose.</p>	<p><b>Traditional dosing:</b>  Target Peaks: 3-4 mcg/ml for synergy against gram positive organisms. 6-10 mcg/ml for gram negative infections  Target Trough: &lt; 1 mcg/ml for synergy and &lt; 2 mcg/ml for gram negative infections  <b>Extended interval dosing:</b>  8 Hr Level after first dose: plot on Hartford Nomogram  If in range as above, monitor trough levels a minimum of twice weekly  Target Trough: &lt; 0.5 mcg/ml</p>

Drug Class	Drug	Average Half-Life (Hrs)	Protein Binding %	Therapeutic Range	Toxic Range	Optimal Specimen Collection	Comments
	Tobramycin (Nebcin)	2-3	0-30	See Comments	Peak >20 mcg/ml Trough >2.5 mcg/mL	<b>Traditional Dosing:</b> <b>Peak:</b> 30 min after 30 minute infusion of the 3rd dose (1 hr after the start of infusion). <b>Trough:</b> 1 Hr before 3rd dose. <b>Extended Interval dosing:</b> <b>Peak:</b> No need to monitor. <b>Trough:</b> 1 Hr before dose.	<b>Traditional dosing:</b> Target Peaks: 3-4 mcg/ml for synergy against gram positive organisms. 6-10 mcg/ml for gram negative infections Target Trough: < 1 mcg/ml for synergy and < 2 mcg/ml for gram negative infections <b>Extended interval dosing:</b> 8 Hr Level after first dose: plot on Hartford Nomogram If in range as above, monitor trough levels a minimum of twice weekly Target Trough: < 0.5 mcg/ml
	Vancomycin (Vancocin)	4-6	10-55	See Comments	Peak >80 mcg/ml Trough >25 mcg/mL	<b>Peak:</b> Not Recommended. In rare cases (eg; meningitis) contact ID physician on call <b>Trough:</b> Immediately Prior to 3rd dose	<b>Target troughs</b> 15-20 mcg/ml - Pneumonia, Meningitis, Osteomyelitis, Bacteremia, and Endocarditis caused by <i>S. aureus</i> (i.e. MRSA) 10-15 mcg/ml - Skin/soft tissue infections, uncomplicated bacteremia (without <i>S. aureus</i> or endovascular source), other indications
<b>Psychotropics</b>	Lithium (Eskalith)	8-24	0	0.6-1.2 mmol/l	>2 mmol/l	12 Hr Post dose after steady state with careful attention to timing.	Lithium undergoes extended distribution phase. Therefore, specimens for monitoring should not be collected prior to the noted time. Specimens collected before distribution is complete yield inappropriate information which can not be used to establish dosing regimen.
	Amitriptyline (Elavil)	9-46	>90	95-250 ng/ml	>500 ng/ml	Predose after steady state; 10-12 hr after single daily dose, 4-6 hr after divided dose.	Range includes amitriptyline and its metabolite nortriptylene.
	Nortriptyline (Aventyl)	18-56	>90	50-150 ng/ml	>500 ng/ml	Predose after steady state; 10-12 hr after single daily dose, 4-6 hr after divided dose.	Metabolite of amitriptyline and may be given separately.

<b>Drug Class</b>	<b>Drug</b>	<b>Avearage Half-Life (Hrs)</b>	<b>Protein Binding %</b>	<b>Therapeutic Range</b>	<b>Toxic Range</b>	<b>Optimal Specimen Collection</b>	<b>Comments</b>
	Imipramine (Tofranil)	6-28	80-90	150-300 ng/ml	>400 ng/ml	Predose after steady state; 10-12 hr after single daily dose, 4-6 hr after devided dose.	Range includes imipramine and its metabolite desipramine.
	Desipramine (Norpramin)	12-28	>90	100-300 ng/ml	>400 ng/ml	Predose after steady state; 10-12 hr after single daily dose, 4-6 hr after devided dose.	Metabolite of imipramine and may be given separately.