

ตารางที่ 4 Pharmacokinetics and Dosing Guidelines for Selected Drugs Used in Patients with Decreased Renal Function

Generic Name	Protein Binding (%)	Vd (liter/kg)	T _{1/2} (hr) ^b	Dose with > 50% of Normal Renal Function	Dose with 10-50% of Normal Renal Function	Dose with <10% of Normal Renal Function	Effect of Dialysis
Acyclovir	15	0.7	1.9-3.8	Infant: 5-10 mg/kg i.v. q 8 hr Child: 250-500 mg/m ² i.v. q 8 hr	Infant: 5-10 mg/kg q 12-24 hr Child: 250-500 mg/m ² q 12-24 hr	Infant: 5-10 mg/kg q 24 h Child: 250-500 mg/m ² q 24 h	HD: yes PD: no
Amikacin	< 5	< 5 years = 0.5 > 5 years = 0.25	1.4-7.1	Neonate: 10 mg/kg i.v. q 12-24 hr Infant/child: 10 mg/kg i.v. q 8 hr	Neonate: 10 mg/kg q 24-36 hr Infant/child: 10 mg/kg q 12-24 hr	Neonate: 5 mg/kg q 24/48 h Infant/child: 5 mg/kg q 24-48 h	HD: yes PD: no
Amphotericin B	90-95	4	5-82	0.3-1.0 mg/kg i.v. q 24 hr	No change	0.3-1.0 mg/kg q 24-48 (to minimize azotemia)	HD: no PD: no
Ampicillin	29	0.3	2.2-6.4	Neonate: 100-200 mg/kg/day i.v. ÷ q 8-12 hr Infant/child: 100-200 mg/kg/day i.v. ÷ q 4-6 hr	Neonate: 100 mg/kg/day ÷ q 6-8 h Infant/child: 100 mg/kg/day ÷ q 6-8 h	Neonate: 100 mg/kg/day ÷ q 12 h Infant/child: 100 mg/kg/day ÷ q 12 h	HD: yes (mod) PD: no
Amrinone	35/49	1.2	3.6-22	Neonate: 0.75 mg/kg i.v. bolus followed by 3-5 µg/kg/min Neonate: 0.75 mg/kg i.v. bolus followed by 5-10 µg/kg/min	No change	Decreased dose By 25-50%	HD: NA PD: NA
Aztreonam	50-60	0.15-0.38	1.3-9.9	Neonate: 60-120 mg/kg/day i.v. ÷ q 8-12 hr Infant/child: 90-120 mg/kg/day i.v. ÷ q 6-8 hr	Reduce daily dose by 50%; ÷ q 8-12 hr	Reduce daily Dose by 75%; ÷ q 12-24 hr	HD: yes (mod) PD: no
Captopril	30	0.7	1-2	Neonate: 0.1-0.25 mg/kg/dose p.o. q 8-24 hr titrated to 0.5 mg/kg/dose p.o. q 6 hr Infant/child: 0.5 mg/kg/dose p.o. q 6 hr titrated to max of 6 mg/kg/day ÷ q 6 hr	No change	Decrease daily dose by 25%; ÷ q 8 hr; titrate to effect	HD: yes (sl) PD: no
Cefaclor	22-25	0.14-0.33	0.5-1	Infant/child: 20-40 mg/kg/day p.o. ÷ q 8-12 hr; max of 2 g/day	No change	Decrease daily dose by 25-50%; ÷ q 8-12 hr	HD: yes (mod) PD: NA
Cefazolin	94-92%	0.19	3-5	Neonate: 40-60 mg/kg/day i.v. ÷ 8-12 hr Infant/child: 50-100 mg/kg/day i.v. ÷ q 8 hr	No change	Decrease daily dose by 25-50%; ÷ q 8-12 hr	HD: yes (mod) PD: no
Cefixime	69	0.6-1.1	3-4	Infant/child: 8 mg/kg/day p.o. ÷ q 12-24 hr; max of 400 mg/day	Decrease daily dose by 25%; give q 24 hr	Decrease daily dose by 50%; give q 24 hr	HD: no PD: no

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Cefotaxime	38	0.22-0.36	2-5.7	Neonate: 100-150 mg/kg/day i.v. ÷ q 8-12 hr Infant/child: 100-200 mg/kg i.v. ÷ q 6-8 hr	Decrease daily dose by 25%; ÷ q 8-12 hr	Decrease daily dose by 50%; ÷ q 12 hr	HD: yes (mod) PD: no
Ceftazidime	20-30	0.2-0.3	1-4.7	Neonate: 100-150 mg/kg/day i.v. ÷ q 8-12 hr Infant/child: 100-150 mg/kg/day i.v. ÷ q 8 hr	Decrease daily dose by 33%; ÷ q 12 hr	Decrease daily dose by 66%; ÷ q 24 hr	HD: yes PD: yes
Ceftizoxime	17-25	0.2-0.4		Infant/child: 100-150 mg/kg/day i.v. ÷ q 8 hr	Decrease daily dose by 33%; ÷ q 12 hr	Decrease daily dose by 66%; give q 24 hr	HD: yes (mod) PD: no
Ceftriaxone	83-96	0.1	5.2-8.4	Neonate: 50-75 mg/kg/day i.v. q 24 hr Infant/child: 50-100 mg/kg/day i.v. ÷ q 12-24 hr	No change	No change	HD: no PD: no
Chloramphenicol	60	0.8-0.9	1.6-15	Neonate: 25-50 mg/kg/day i.v. ÷ q 12-24 hr Infant/child: 75-100 mg/kg/day i.v. ÷ q 6 hr	No change	No change; monitor levels	HD: yes (sl) PD: no
Cimetidine	20	0.9-1.1	1.4-3.6	Neonate: 5-10 mg/kg/day i.v. ÷ q 8-12 hr Infant: 10-20 mg/kg/day i.v. ÷ q 6-12 hr Child: 20-40 mg/kg/day i.v. q 6 hr	Decrease daily dose by 25%; ÷ q 8-12 hr	Decrease daily dose by 50%; ÷ q 12-24 hr	HD: yes (sl) PD: no
Clavulanic acid	22	0.13-0.38	1-3	Dose products containing clavulanic acid at 6 hr intervals	Increase interval to q 8 hr	Increase interval to q 12-24 hr	HD: yes PD: NA
Clindamycin	94	0.6	2-4.7	Neonate: 10-20 mg/kg/day i.v. ÷ 8-12 hr Infant/child: 25-40 mg/kg/day i.v. ÷ q 6-8 hr	No change	No change	HD: no PD: no
Digoxin ^d	20-30	5-8	12-76	Neonate: 15-35 µg/kg i.v. LD followed by MD 5-10 µg/kg/day i.v. ÷ q 12 hr Infant: 25-35 µg/kg/day i.v. LD followed By 8-10 µg/kg/day i.v. ÷ q 12 hr Child: 15-35 µg/kg/day i.v. LD followed By 5-8 µg/kg/day i.v. ÷ q 12-24 hr Note: p.o. maintenance doses should be 25% higher than i.v. doses	Decrease daily dose by 50%; give q 24 hr	Decrease daily dose by 75%; give q 24 hr	HD: no PD: no
Enalapril	50-60%	1	11-24	Infant/child: 0.1-0.5 mg/kg/day p.o. ÷ q 12-24 hr	Decrease daily dose by 25%; give q 24 hr	Decrease daily dose by 50%; give q 24 hr	HD: yes (sl) PD: NA

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Flucytosin ^d	2-4	0.6-0.7	3.4-34	Child: 50-150 mg/kg/day p.o. ÷ q 6 hr	Decrease daily dose by 50%; ÷ q 12 hr	Decrease daily dose by 75%; give q 24 hr	HD: yes PD: yes
Furosemide	99	0.11	1.5-19	Neonate: 1-2 mg/kg/dose i.v. q 12-24 hr Infant/child: 10 mg/kg/dose i.v. q 6-12 hr	No change	No change	HD: no PD: NA
Ganciclovir	1-2	0.5-0.6	1.7-5.8	Infant/child: 10 mg/kg/day i.v. ÷ q 12 hr	For 25-50% normal RF give 5 mg/kg/day ÷ q 12 hr	For < 25% of normal RF give 1.25 mg/kg q 24 hr	HD: yes PD: NA
Gentamicin ^d	< 5	< 5 yrs = 0.5 > 5 yrs = 0.25	1.8-13.9	Neonate: 2.5 mg/kg/dose i.v. q 12 hr Infant/child: 2.5 mg/kg/dose i.v. q 8 hr	Neonate: 2.5 mg/kg/dose q 24-36 hr Infant/child: 2.5 mg/kg/dose q 12-24 hr	Neonate: 2.5 mg/kg/dose q 36-48 hr Infant/child: 2.5 mg/kg/dose q 24 h	HD: yes PD: yes
Hydrochlorothiazide	64	0.83	6-8	Infant: 2-3 mg/kg/day p.o. ÷ bid Child: 2 mg/kg/day p.o. ÷ bid	No change	Avoid	HD: no PD: NA
Imipenem	10-20	0.23-0.42	1-6	Child: 60-100 mg/kg/day i.v. ÷ q 6 hr	Decrease daily dose by 50-65%; ÷ q 6-8 hr	< 20% of normal RF decrease daily dose by 75%; ÷ q 12 hr	HD: yes (mod) PD: NA
Meperidine	58	4.4	2-7	Child: 0.8-1.5 mg/kg/dose i.v. q 3-4 hr	Decrease daily dose by 25%; ÷ q 6 hr	Decrease daily dose by 50%; ÷ q 8 hr	HD: NA PD: NA
Metronidazole	8-20	0.9	6-25	Neonate: 7.5-15 mg/kg/day i.v. ÷ q 12-24 hr Infant/child: 30 mg/kg/day i.v. ÷ q 6 hr	No change	Decrease daily dose by 25%; ÷ q 8 hr	HD: yes PD: no
Morphine	35	3.3	2-6	Infant/child: 0.1-0.2 mg/kg/day i.v. q 4 hr p.r.n.	Decrease daily dose by 25%	Decrease daily dose by 50%	HD: no PD: NA
Nafcillin	85-90	0.35	3.2-5.9	Neonate: 50-100 mg/kg/day i.v. ÷ 8-12 hr Infant/child: 100-150 mg/kg/day i.v. ÷ q 6-8 hr	No change	No change	HD: no PD: NA
Penicillin G	60	0.9-2.1	0.5-4.9	Neonate: 50-100,000 units/kg/day i.v. ÷ q 6-12 hr Infant/child: 100-250,000 units/kg/day i.v. ÷ q 4-6 hr	Decrease daily dose by 25%; ÷ q 6-8 hr	Decrease daily dose by 50%; ÷ q 8-12 hr	HD: yes (mod) PD: NA
Phenobarbital ^d	43-60	0.4-1	20-500	Neonate: 3-5 mg/kg qd Infant/child: 5-10 mg/kg ÷ b.i.d.	No change	No change	HD: yes PD: yes

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Generic Name	Protein Binding (%)	Vd (liter/kg)	T _{1/2} (hr) ^b	Dose with > 50% of Normal Renal Function ^d	Dose with 10-50% of Normal Renal Function	Dose with <10% of Normal Renal Function	Effect of Dialysis
Phenytoin ^d	71-90 (decreased in renal failure)	0.7-1 (increased in renal failure)	10-105	Neonate: 5 mg/kg/day ÷ 12 hr	No change	No change	HD: no PD: no
Piperacillin	16-22	0.2-0.47	0.8-3.6	Neonate: 100-200 mg/kg/day i.v. ÷ q 12 hr Infant/child: 200-300 mg/kg/day i.v. ÷ q 4-6 hr; max of 24 g/day	Decrease daily dose by 25%; ÷ q 8 hr	Decrease daily dose by 50%; ÷ q 12 hr	HD: yes (mod) PD: NA
Ranitidine	15	0.8-1.1	1.8-2.5	Child: 3-6 mg/kg/day ÷ q 6-8 hr; max 400 mg/day	Decrease daily dose by 25%; ÷ q 8 hr	Decrease daily dose by 50%; ÷ q 12 hr intervals	HD: yes (sl) PD: no
Sulfamethoxazole	50-70	0.14-0.36	10-23.3	Neonate: avoid Infant/child: 50-60 mg/kg/day ÷ q 12 hr	Decrease daily dose by 50%; ÷ q 12-24 hr	Decrease daily dose by 75%; ÷ q 24 hr intervals	HD: yes (sl/mod) PD: no
Theophylline ^{d,e}	32-65	0.5-0.7	3.7-20	Neonate (apnea): 2-4 mg/kg/day p.o. ÷ 8-12 hr Bronchospasm Neonate: 4-6 mg/kg/day p.o. ÷ q 8-12 hr Infant: 10-18 mg/kg/day p.o. ÷ q 6-8 hr Child: 20-24 mg/kg/day p.o. ÷ q 6 hr Adolescent: 13 mg/kg/day p.o. ÷ q 6 hr	Decrease daily dose by 50%	No recommendation	HD: yes (mod) PD: no
Ticarcillin	45-65	0.14-0.22	2.2-5.6	Neonate: 150-300 mg/kg/day i.v. ÷ q 8-12 hr Infant/child: 200-300 mg/kg/dose i.v. q 4-6 hr	Decrease daily dose by 50%; ÷ q 8 hr	Decrease daily dose by 50-75%; ÷ q 12 hr	HD: yes (mod) PD: no
Tobramycin	< 10	< 5 years = 0.5 > 5 years = 0.25	1.8-9.8	Neonate: 2.5 mg/kg/dose i.v. ÷ q 12-18 hr Infant/child: 2.5 mg/kg/dose i.v. q 8 hr	Neonate: 2.5 mg/kg/dose i.v. ÷ q 18-24 hr Infant/child: 2.5 mg/kg/dose i.v. q 12 hr	Neonate: 2.5 mg/kg/dose i.v. ÷ q 24-48 hr Infant/child: 2.5 mg/kg/dose i.v. q 24-36 hr	HD: yes PD: yes
Trimethoprim	40-70	1-2	14-24.6	Neonate: avoid Infant/child: 6-10 mg/kg/day p.o. ÷ q 12 hr	Decrease daily dose by 50%; ÷ q 12 hr intervals	Decrease daily dose by 50%; ÷ q 24 hr	HD: yes (sl/mod) PD: no
Vancomycin ^d	10-55	0.5-0.7	4.1-6.7	Neonate: 15-20 mg/kg/day i.v. ÷ q 12-24 hr Infant/child: 40 mg/kg/day i.v. ÷ q 6 hr	Neonate: decrease daily dose by 50% ÷ q 24-36 hr Infant/child: 10 mg/kg/dose; give q 8-12 hr	Neonate: decrease daily dose by 50% give at 48 hr intervals Infant/child: 10 mg/kg/dose; give q 24-36 hr	HD: no PD: no HiFlux: yes (mod)

^aAbbreviations: Vd, volume of distribution; HD, hemodialysis; PD, peritoneal dialysis; mod, 20-50% removed by dialysis; sl, 5-20% removed by dialysis; NA, information not available.

^bHalf-lives are based on normal renal function of all pediatric age ranges. Data on the half-lives of the drugs in the presence of abnormal renal function are not available. However, half-lives of the drugs in adults with decreased renal function may be used to extrapolate the half-life of a drug in a pediatric patient with renal dysfunction.

^cDosage should not exceed the maximum adult dosage.

^dSerum levels should be monitored to ensure efficacy and avoid toxicity.

^eDose equivalent for aminophylline = (0.8) (theophylline dose).