RENAL FUNCTION-BASED DOSE ADJUSTMENTS IN ADULTS BY PHARMACISTS

Agent	Usual Dose	Renal Dose (Based on CrCl ml/min unless otherwise indicated)	Hemodialysis
Acyclovir (PO) (Zovirax)	Genital herpes active tx: 200 mg 5 times per day *Or* 400 mg TID Genital herpes suppression/ prophylaxis: 400 mg BID Herpes Zoster active tx: 800 mg 5 times per day	Genital herpes active tx: ≥ 10: no change < 10: 200 mg q12h Genital herpes suppression/prophylaxis: ≥ 10: no change < 10: 200 mg q12h Herpes Zoster active tx: > 25: no change 10-25: 800 mg q8h < 10: 800 mg q12h	Dose as for CrCl<10mL/min On dialysis days dose after dialysis
Acyclovir (IV) (Zovirax) *Use IBW if actual body weight is <120% of IBW; Dose based on AdjBW when actual body weight is >120% of IBW*	5-10 mg/kg q8h *Use 10 mg/kg dose for CNS infection*	> 50: no change 25-50: 5-10 mg/kg q12h 10-24: 5-10 mg/kg q24h < 10: 2.5-5 mg/kg q24h	2.5-5 mg/kg q24h On dialysis days dose after dialysis
Allopurinol (PO) (Zyloprim)	100-300 mg daily - BID (Max 800 mg/day)	> 20: no change 10-20: 200 mg q24h < 10: 100 mg q24h	100 mg on alternative days On dialysis days dose after dialysis
Amantadine (PO) (Symmetrel)	100 mg BID	> 50: no change 30-50: 200 mg x 1, then 100 mg q24h 15-29: 200 mg x 1, then 100 mg q48h < 15: 200 mg q7days	200 mg q7 days
Amoxicillin (PO) (Amoxil)	875 mg q12h *Or* 250-500 mg q8-12h	**GFR** > 30: no change **GFR** 10-30: 250-500 mg q12h **GFR** < 10: 250-500 mg q24h *875 mg or ER tabs not recommended for **GFR** < 30ml/min*	250-500mg q24h On dialysis days dose after dialysis

Amoxicillin/Clavulanate (PO) (Augmentin) *Dosing based on amoxicillin component*	875mg q12h *Or* 250 - 500mg q8h	> 30: no change 10-30: 250-500mg 12h < 10: 250-500mg q24h *875mg not recommended for CrCl < 30ml/min*	250-500mg q24h On dialysis days dose after dialysis
Ampicillin (IV)	1-2 g q4-6h *Use 2 g q4h for meningitis, endocarditis,severe, or life-threatening infections*[1]	> 50: no change 10-50: 1-2 g q6-12h < 10: 1-2 g q12-24h	1-2 g q12-24h On dialysis days dose after dialysis
Ampicillin/Sulbactam (IV) (Unasyn)	1.5-3 g q6h	> 29: no change 15-29: 1.5-3 g q12h < 15: 1.5-3 g q24h	1.5-3 g q24h On dialysis days dose after dialysis
Apixaban (PO) (Eliquis) *Dose reduction necessary when co-administered with drugs that are strong dual inhibitors of CYP3A4 and P-gp*[2] *Avoid concomitant use with strong dual inducers of CYP3A4 and P-gp*[3]	A-fib: 5 mg BID DVT/PE Treatment: 10 mg BID x 7 days, then 5 mg BID Reduction in risk of recurrence of DVT/PE: 2.5 mg BID *(following **at least 6 months** of treatment for DVT/PE)*	A-fib: No change unless patient has ***any two*** of following: Age ≥ 80 years, body weight ≤ 60 kg, or SCr ≥ 1.5 mg/dL; Then 2.5 mg BID DVT/PE Treatment: No change Reduction in risk of recurrence of DVT/PE: No change *Of note, patients with SCr > 2.5 mg/dl or CrCl < 25 mL/min were excluded from clinical trials*	A-fib: 2.5 mg BID[4] DVT/PE Treatment: No change *(warfarin preferred)* Reduction in risk of recurrence of DVT/PE: No change *Nephrology Consult Recommended*
Aztreonam (IV) (Azactam)	1-2 g q8h *Use 2 g q8h for severe, life-threatening, or Pseudomonal infection*[1]	> 30: no change 10-30: 1-2 g x 1, then 500mg – 1 g q8h < 10: 1-2 g x 1, then 250-500 mg q8h	1-2 g x 1, then 250-500 mg q8h
Cefazolin (IV) (Ancef)	1-2 g q8h *Use 2g dose for severe infection*[1] *or weight > 80kg*	> 34: No change 11-34: 1-2 g q12h < 11: 1-2 g q24h	1-2 g q 24h On dialysis days dose after dialysis

Cefdinir (Omnicef)	300 mg q 12 h OR 600 mg daily (based on indication)	< 30: 300 mg daily	300 mg every other day and 300 mg at the end of each hemodialysis session (with subsequent doses given every other day)
Ceftazidime (IV) (Fortaz)	1-2 g q8h *Use 2 g dose for weight > 80 kg* *Use 2 g q8h for febrile neutropenia, severe, or Pseudomonal infection*[1]	> 50: no change 31-50: 1-2 g q12h 16-30: 1-2 g q24h < 16: 500mg-1 g q24h	500mg-1 g q24h On dialysis days dose after dialysis
Cefuroxime (PO) (Ceftin)	250-500 mg q12h	> 29: no change 10-29: 250-500 mg q24h <10: 250 mg q24h	250 mg q24h On dialysis days dose after dialysis
Cefuroxime (IV) (Zinacef)	750 mg -1.5 g q8h	>20: no change 10-20: 750 mg -1.5 g q12h < 10: 750 mg-1.5 g q24h	750 mg q24h On dialysis days dose after dialysis
Cephalexin (PO) (Keflex)	250-500 mg q6h (Max 4 g/day)	> 59: no change 30-59: max 1 g/day 15-29: 250 mg q8-12h < 15: 250 mg q24h	500 mg q24h On dialysis days dose after dialysis
Ciprofloxacin (PO) (Cipro)	Usual Dose: 500 -750 mg q12h Uncomplicated UTI: 250mg q12h	> 50: no change 30 -50: 250 -500 mg q12h < 30: 250-500 mg q24h	250 -500 mg q 24h On dialysis days dose after dialysis
Ciprofloxacin (IV) (Cipro)	200 -400 mg q12h	≥ 30: no change < 30: 200 -400 mg q24h	200 -400 mg q24h On dialysis days dose after dialysis
Dabigatran (PO) (Pradaxa) *CrCl calculation used ABW in studies* *Avoid concurrent use with P-gp inducers*[5]	A-fib: 150 mg BID DVT/PE (treatment or prophylaxis of recurrent): 150 mg BID *(after 5-10 days of parenteral anticoagulation)*	A-fib: 30-50 *and dronedarone or ketoconazole*[6]: 75 mg BID < 30: *Avoid concurrent use with P-gp inhibitors*[7] 15-30: 75 mg BID <15:no recommendations[8] DVT/PE (treatment or prophylaxis of recurrent): < 50: *Avoid concurrent use with P-gp inhibitors*[7] >30 :150 mg BID ≤30:no recommendations[8]	No recommendations

Duloxetine (PO) (Cymbalta)	20-120 mg daily	< 30: Not recommended for use[8]	Not recommended for use
Enoxaparin (SQ) (Lovenox)	Prophylactic dose: 30 mg SQ q12h or 40 mg SQ q24h Treatment dose: 1 mg/kg SQ q12h or 1.5 mg/kg SQ q24h	Prophylactic dose: < 30: 30 mg SQ q24h Treatment dose: < 30: 1 mg/kg SQ q24h	Not FDA approved for use in dialysis patients *Unfractionated Heparin preferred agent*
Ertapenem (IV) (Invanz)	1 g daily	> 30: No change ≤ 30: 500 mg daily	500mg daily On dialysis days dose after dialysis
Famotidine (IV/PO) (Pepcid)	20mg q12h	<50: 20 mg q24h	20 mg q24h On dialysis days dose after dialysis
Fluconazole (IV/PO) (Diflucan)	Usual Dose: 200-800mg x 1 for loading dose, then 100-400 mg q24h Severe (i.e. meningitis) or resistant fungal infections: 800 mg q24h	>50: no change ≤ 50: 100-400 mg x 1 for loading dose, then 50% usual dose q24h	100-400 mg x 1 for loading dose; then 100-200mg q24h On dialysis days dose after dialysis
Gabapentin (PO) (Neurontin)	300-1200 mg TID	> 59: no change 30-59: 200-700 mg BID 15-29: 200-700 mg q24h <15: 100-300 mg q24h *Use judgment when assessing chronic therapy in setting of chronic stable renal dysfunction*	100-300 mg daily post-HD
Glyburide (PO) (Diabeta) *(conventional, non-micronized formulation)*	1.25-20 mg daily	< 50: Not recommended for use[8]	Not recommended for use

Ketorolac (IM/ IV/PO) (Toradol) *Maximum combined duration of treatment (for parenteral and oral) is 5 days*	<u>Single dose:</u> 60 mg **IM** x1 30 mg **IV** x1 20 mg **PO** x 1 <u>Multiple-dose:</u> **IM/IV**: 30 mg q6h (prn; Max 120mg/day) **PO**: 10 mg q4-6h (prn; Max 40mg/day)	<u>Single dose (≥ 65yo, <50kg, or CrCl < 50):</u> 30 mg **IM** x1 15 mg **IV** x 1 10 mg **PO** x 1 <u>Multiple-dose (≥ 65yo, <50kg, or CrCl<50):</u> **IM/IV**: 15 mg q6h (prn; Max 60mg/day) **PO**: no change	Not recommended for use
Levofloxacin (IV/PO) (Levaquin)	<u>Bronchitis:</u> 500 mg q24h <u>Pneumonia or Sinusitis:</u> 750 mg q24h	<u>Bronchitis:</u> > 49: no change 20-49: 500 mg x1, then 250 mg q24h < 20: 500 mg x1, then 250 mg q48h <u>Pneumonia or Sinusitis:</u> > 49: no change 20-49: 750 mg x1. then 750 mg q48h < 20: 750 mg x 1, then 500 mg q48h	<u>Bronchitis</u>: 500 mg x1, then 250 mg q48h <u>Pneumonia or Sinusitis:</u> 750 mg x 1, then 500mg q48h On dialysis days dose after dialysis
Memantine (PO) (Namenda)	10 mg BID	< 30: 5 mg BID	
Meropenem (IV) (Merrem)	1 g q8h *Use 2 g q8h for meningitis*	>50: no change 26-50: usual dose q12h 10-25: 1/2 usual dose q12h <10: 1/2 usual dose q24h	1/2 usual dose q24h On dialysis days dose after dialysis
Metformin (PO) (Glucophage)	500mg - 1 g q12-24h *Or* 850 mg daily	**eGFR** > 45: No change **eGFR** 30-45: Do not initiate therapy. If **eGFR** falls to < 45 during therapy: reduce dose by 50% (1 gm/day) **eGFR**<30: Contraindicated[8]	Contraindicated

Metoclopramide (IV/PO) (Reglan)	10 mg q6h	≥ 40: no change <40: 5 mg q6h	5 mg q12h
Nitrofurantoin (PO) (Macrobid) (Macrodantin)	**Macrobid** UTI treatment: 100 mg q12h **Macrodantin** UTI prophylaxis: 50-100 mg q24h UTI treatment: 50-100 mg q6h	≥ 30: no change <30: contraindicated[8]	Contraindicated
Oseltamivir (PO) (Tamiflu)	Influenza prophylaxis: 75 mg q24h x 7-10 days Influenza treatment: 75 mg BID x 5 days	Influenza prophylaxis: > 60: no change 31-60: 30 mg q24h 11-30: 30 mg q48h < 11: not recommended unless on HD[8] Influenza treatment: > 60: no change 31-60: 30 mg BID 11-30: 30 mg q24h < 11: not recommended unless on HD[8]	Influenza prophylaxis: 30 mg after *every other* HD session for total 7-10 days Influenza treatment: 30 mg three times a week after HD for total 5 days (*assumes 3 HD sessions in 5 day period*)
Penicillin VK (PO)	250-500 mg q6h	≥ 10: no change <10: 250-500 mg q8h	250-500 mg q8h On dialysis days dose after dialysis
Piperacillin/Tazobactam (IV) (Zosyn)	3.375 g q8h EID *Extended Infusion Dosing (EID) over 4 hours*	≥ 20: no change < 20: 3.375 g q12h EID	3.375 g q12h EID
Pregabalin (PO) (Lyrica)	150-600 mg/day divided BID-TID	> 60: no change 30-60: 75-300 mg/day BID-TID 15-29: 25-150 mg/day daily-BID <15: 25-75 mg daily *Please see Micromedex renal dosing chart*	25-75 mg daily On dialysis days dose after dialysis

		Use judgment when assessing chronic therapy in setting of chronic stable renal dysfunction	
Rivaroxaban (PO) (Xarelto) *CrCl calculation used ABW in studies* *Avoid concomitant use with strong dual inhibitors of CYP3A4 and P-gp*[9] *Avoid concomitant use with strong dual inducers of CYP3A4 and P-gp*[10]	A-fib: 20 mg daily DVT/PE treatment: 15 mg BID x 21 days, then 20 mg daily Ortho Post-op DVT Prophylaxis: 10 mg daily	A-fib: < 80: *Avoid concomitant use with dual P-gp and strong/moderate CYP3A4 inhibitors*[11] >50: No Change 15-50: 15 mg daily <15: Avoid Use[8] Ortho Post-op DVT Prophylaxis & DVT/PE treatment: < 80: *Avoid concomitant use with dual P-gp and strong/moderate CYP3A4 inhibitors*[11] ≥ 30: No Change <30: Avoid Use [8]	Avoid Use
Saxagliptin (PO) (Onglyza)	2.5 - 5 mg daily	eGFR ≥ 45: no change eGFR < 45: 2.5 mg daily	2.5 mg daily On dialysis days dose after dialysis
Sitagliptin (PO) (Januvia)	100 mg daily	eGFR ≥45: No dosage adjustment necessary. eGFR ≥30 to <45: 50 mg once daily eGFR <30: 25 mg once daily	25 mg daily May be administered without regard to timing of dialysis
Sulfamethoxazole/ Trimethoprim (SMX/TMP) (PO) (Bactrim) *Single Strength (SS)=*	Non-PCP Infection: *SSTI / joint:* 1-2 DS q12h *UTI:* 1 DS q12h PCP prophylaxis:	Non –PCP infection: >30: no change 15-30: 1 SS q12h *Or* 1 DS q24h <15: Not recommended[8], Use 1 SS q24h if use is necessary PCP prophylaxis:	Non-PCP Infection: Not recommended; Use 1 SS q24h if use is necessary PCP prophylaxis:

400 mg SMX/80 mg TMP *Double Strength (DS) = 800mg SMX/160 mg TMP*	1 DS 3 times/week *Or* 1 SS - DS q24h <u>PCP treatment:</u> 2 DS q8h	> 30: no change 15-30: 1 SS 3 times/week *Or* ½ - 1 SS q24h <15: 1 SS 3 times/week *Or* ½ SS q24h <u>PCP treatment:</u> > 30: no change 10-30: 2 DS q12h < 10: 1 DS q12	1 SS 3 times/week <u>PCP treatment:</u> 2 DS q24h On dialysis days dose after dialysis
Sulfamethoxazole/ Trimethoprim (SMX/TMP) (IV) *Dosing based on TMP component* *Use ABW if BMI < 30* *Use AdBW if BMI ≥ 30*	<u>Mild/Moderate Infections:</u> 10 mg/kg/day divided q6-12h <u>Severe Infections (meningitis/PCP/Steno-trophomonas):</u> 15-20 mg/kg/day divided q6-8h	<u>Mild/Moderate Infections:</u> > 30: no change 15-30: 2.5 mg/kg q12h <15: Not recommended[8], use 2.5 mg/kg q24h if use is necessary <u>Severe Infections (meningitis/PCP/Steno-trophomonas):</u> > 30: no change 15-30: 5mg/kg q12h <15: 5mg/kg q24h	<u>Mild/Moderate Infection:</u> Not recommended Use 2.5 - 5 mg/kg q24h if use is necessary <u>Severe Infections (meningitis/PCP/Steno-trophomonas):</u> 5 -10 mg/kg q24h On dialysis days dose after dialysis
Tramadol (PO) (Ultram)	50-100 mg q4-6h (Max 400 mg/day)	≥ 30: no change <30: 50-100 mg q12h (Max 200 mg/day) *Do not use extended release formulation if CrCl < 30*	50-100 mg q12h (Max 200 mg/day)
Trimethoprim (PO)	100 mg q12h *Or* 200 mg q24h	> 30: no change 15-30: 50 mg q 12h <15: Not recommended [8]	100 mg q24h On dialysis days dose after dialysis
Valacyclovir (PO) (Valtrex)	<u>Herpes Zoster:</u> 1 g q8h x 7 days	<u>Herpes zoster:</u> > 49: no change 30-49: 1 g q12h 10-29: 1 g q24h <10: 500 mg q24h	500 mg q24h On dialysis days dose after dialysis

	Initial HSV (genital): 1 g q12h x 7-10 days Recurrent HSV (genital): 500 mg q12h x 3 days *Or* 1 g q24h x 5 days	Initial HSV (genital): > 29: no change 10-29: 1 g q24h <10: 500 mg q24h Recurrent HSV (genital): ≥ 30: no change < 30: 500 mg q24h	
Valacyclovir (PO) (Valtrex) continued…	Initial & Recurrent HSV (genital) – HIV infection: 1 g q12h x 5-10 days Chronic suppression HSV (genital): 1 g q24h *Or* 500mg q24h *(if ≤ 9 recurrences/year*) Chronic suppression HSV (genital) – HIV infection: 500 mg q12h	Initial & Recurrent HSV (genital) – HIV infection: > 29: no change 10-29: 1 g q24h <10: 500 mg q24h Chronic Suppression HSV (genital): ≥ 30: no change < 30: 500mg q24h Or 500mg q48h (*if ≤ 9 recurrences/year*) Chronic suppression HSV (genital) – HIV infection: ≥ 30: no change < 30: 500mg q24h	

[1] Examples of severe, life-threatening infections include but is not limited to the following: endocarditis/endovascular, febrile neutropenia, meningitis, nosocomial pneumonia, osteomyelitis, prosthetic joint infections, pseudomonal infection, and sepsis/septic shock.

[2] In patients taking apixaban and drugs that are strong dual *inhibitors* of CYP3A4 and P-gp (e.g., clarithromycin, itraconazole, ketoconazole, ritonavir), dose reductions are necessary:

- For patients taking 5mg or 10mg twice daily, reduce the dose by 50%
- For patients already taking 2.5mg twice daily, avoid coadministration

[3] Avoid concomitant use of apixaban with strong dual *inducers* of CYP3A4 and P-gp (e.g., carbamezapine, fosphenytoin, phenytoin, primidone, rifampin, St. John's Wort) as such drugs will decrease exposure to apixaban and increase risk of thrombotic events.

[4] Link to useful article about apixaban pharmaocokinetics at steady state in hemodialysis patients ..\Clinical\Apixaban in ESRD and Afib.pdf

[5] Concomitant use of dabigatran with P-gp *inducers* (e.g., carbamezapine, fosphenytoin, rifampin, phenytoin, St. John's Wort) reduces exposure to dabigatran and should generally be avoided.

[6] In patients on dabigatran for Afib with moderate renal impairment (CrCl 30-50 mL/min), reduce the dose of dabigatran to 75 mg twice daily when administered concomitantly with either dronedarone or systemic ketoconazole only. The use of the P-gp *inhibitors* amiodarone, clarithromycin, quinidine and ticagrelor does not require a dosage adjustment for moderate renal impairment.

[7] In patients on dabigatran for Afib with CrCl < 30 mL/min or for treatment/prevention of recurrent DVT/PE with CrCl < 50 mL/min, the concomitant use of P-gp *inhibitors* (e.g., amiodarone, clarithromycin, cyclosporine, dronedarone, itraconazole, ketoconazole, lovastatin, quinidine, ranolazine, ritonavir, simvastatin, ticagrelor, verapamil) should be avoided.

[8] Agents that are contraindicated, not recommended, or should be avoided in impaired renal function will NOT be automatically discontinued; pharmacists will consult with the provider prior to making dosage adjustments in these specific cases.

[9] Avoid concomitant use of rivaroxaban and with strong dual *inhibitors* of CYP3A4 and P-gp (e.g., clarithromycin, conivaptan, itraconazole, ketoconazole, ritonavir)

[10] Avoid concomitant use of rivaroxaban with strong dual *inducers* of CYP3A4 and P-gp (e.g., carbamezapine, fosphenytoin, oxcarbazeoine, phenytoin, primidone, rifampin, St. John's Wort) as such drugs will decrease exposure to rivaroxaban and increase risk of thrombotic events.

[11] Rivaroxaban should not be used in patients with CrCl < 80 mL/min who are receiving concomitant dual P-gp and moderate CYP3A4 *inhibitors* (e.g., includes all drugs listed in footnote 9 and abiraterone acetate, diltiazem, dronedarone, erythromycin, verapamil) unless the benefits of use outweighs the potential bleeding risk.

ENDORSEMENTS:
Safe Medication Management Committee, 01/24
Pharmacy and Therapeutics Committee, 02/24