IREDELL HEALTH SYSTEM

Renal Dosing Program	
Approved by: Laura Rollings, PharmD, BCPS, BCGP Randi Raynor, PharmD, MBA, BCPS	Last Revised/Reviewed Date: 01/2023
Antimicrobial Stewardship Committee P&T Committee	Date: 01/2023 Date: 02/2023

Purpose:
To ensure the proper adjustment of renally-eliminated medications for patients with renal dysfunction.

Policy:
Pharmacists will renally dose adjust agents detailed in the attached addendum for all adult patients according to current guidelines as outlined in the attached Appendices. ICS (Infusion Care Services) patients will be included in this protocol.

Accurate estimation of creatinine clearance and glomerular filtration rate from the Cockcroft-Gault and Schwartz equations require serum creatinine concentration to be at steady state. Acute changes in renal function render the Cockcroft-Gault and Schwartz equations unreliable, as serum creatinine is a delayed indicator of renal function. The pharmacist shall use their clinical judgement regarding these changes and communicate their recommendations with the provider.

Procedure:
1. Upon receipt of an order for one of these medications that requires renal dosing, the pharmacist will review the patient's chart for the following:
    a. Patient's age, height, weight, and calculated ideal body weight.
    b. Serum creatinine (SCr) result
        a. If not resulted in the previous 24 hours, a pharmacist may order a baseline serum creatinine. It is acceptable to utilize results documented from a provider's office if resulted within the previous 24 hours. These results must be a part of patient's chart.
    c. Calculated creatinine clearance (CrCl)
    d. Indication for use of the medication
2. The pharmacist will determine if a dosage adjustment is indicated based on the information obtained in section # 1.
3. If indicated, the pharmacist will enter an order with the correct dosage based on current guidelines.
4. The pharmacist will document the intervention.
5. The pharmacist will order a repeat SCr every three days (if not previously ordered). If there is a change in creatinine clearance, the pharmacist will re-evaluate the dosage and adjust if indicated according to current guidelines and document the intervention This process will be repeated every three days or more frequently if needed. For patients transferred to HB-SNF, the frequency of SCr monitoring may be reduced to weekly. For ICS patients, a pharmacist may order a repeat SCr weekly unless otherwise specified by provider.

6. If there is a question regarding the dosage adjustment, the pharmacist will contact the physician.

INITIAL EFFECTIVE DATE: 02/2012
DATES REVISIONS EFFECTIVE: 12/2014, 02/2018, 02/2019, 04/2021, 02/2022, 10/2022, 02/2023
DATES REVIEWED (no changes):

Appendix A: Renal Adjusted Medications

Generic + Route (Brand) Indications	**Usual Adult Dose Comments**	**Renal Dose Adjustments**
acyclovir IV (Zovirax) • Herpes Zoster • HSV encephalitis	**10 mg/kg q8h** Actual weight, use IBW for obese patients (BMI >30)	**CrCl > 50: No adjustment necessary** CrCl 25 – 50: 10 mg/kg q12h CrCl 10 – 24.5: 10 mg/kg q24h CrCl < 10: 5 mg/kg q24h HD/PD: 2.5 – 5 mg/kg q24h
acyclovir IV (Zovirax) • Herpes Simplex	**5 mg/kg q8h** Actual weight, use IBW for obese patients (BMI >30)	**CrCl > 50: No adjustment necessary** CrCl 25 – 50: 5 mg/kg q12h CrCl 10 – 24.5: 5 mg/kg q24h CrCl < 10: 2.5 mg/kg q24h HD/PD: 2.5 – 5 mg/kg q24h
acyclovir PO (Zovirax)	**200 – 800 mg 5x/day**	**CrCl > 25: No adjustment necessary** CrCl 10 – 25: 200 – 800 mg q8h CrCl < 10: 200 mg q12h HD: 200 mg Q12h PD: 600 – 800 mg daily
allopurinol PO (Zyloprim)	**100 – 800 mg/day** Doses >300 mg should be given in divided doses. Higher doses should not be adjusted in patients who are suspected to be or are currently in tumor lysis syndrome (TLS).	**CrCl > 20: No adjustment necessary** CrCl 10 – 20: 200 mg daily CrCl 3 – 10: ≤ 100 mg daily CrCl < 3: ≤ 100 mg/dose at extended intervals *Dose evaluation to occur only upon order entry.
amantadine PO (Symmetrel) • Non-Parkinson's	**100 mg q12h**	**CrCl > 50: No adjustment necessary** CrCl 30 – 50: 200 mg x1, then 100 mg Q24h CrCl 15 – 29: 200 mg x1, then 100 mg q48h CrCl <15: 200 mg q7 days HD/PD: 200 mg q7 days
amoxicillin PO 775 mg ER tabs	**775 mg q24h**	**CrCl > 30: No adjustment necessary** CrCl < 30: Avoid Use
amoxicillin PO 250 – 875 mg *IR formulations*	**250 – 500 mg q8h OR 500 – 875 mg q12h** Do not use 875 mg tablet for CrCl < 30	**CrCl > 30: No adjustment necessary** CrCl 10 – 30: 250 – 1000 mg q12h CrCl < 10: 250 – 500 mg q12 – 24h HD/PD: 250 – 500 mg q12 – 24h
amoxicillin-clavulanate PO (Augmentin XR) *1,000 mg ER tablet*	**2,000 mg q12h**	**CrCl > 30: No adjustment necessary** CrCl < 30: Avoid Use

	Note: 1,000 mg XR tab is not interchangeable with 2 x 500 mg tabs	
amoxicillin-clavulanate PO (Augmentin) *250 – 875 mg* *IR formulations*	**500 mg q8 – 12h** **OR** **875 mg q12h** Do not use 875 mg tablet for CrCl < 30	**CrCl > 30: No adjustment necessary** CrCl 10 – 30: 250 – 500 mg q12h CrCl < 10: 250 mg q12 – 24h HD: 250 – 500 mg q12 – 24h PD: 250 – 500 mg q12h
amphotericin B liposomal IV (AmBisome)	**3 – 6 mg/kg q24h** Actual weight	**No adjustment necessary**
ampicillin IV • Endocarditis	**2 gm q4h** IV only, MAX 12 gm/day	**CrCl > 50: No adjustment necessary** CrCl 30 - < 50: 2 gm q6h CrCl 15 - < 30: 2 gm q8h CrCl < 15/HD/PD: 2 gm q12h
ampicillin IV/IM • Other infections	**1 – 2 gm q4 – 6h**	**CrCl > 50: No adjustment necessary** CrCl 30 - < 50: 1 - 2 gm q8h CrCl 15 - < 30: 1 - 2 gm q12h CrCl < 15/HD/PD: 1 - 2 gm q24h
ampicillin – sulbactam (Unasyn) IV/IM	**1.5 – 3 gm q6 – 8h**	**CrCl > 30: No adjustment necessary** CrCl 15 – 29: 1.5 – 3 gm q12h CrCl 5 – 14: 1.5 – 3 gm q24h
anidulafungin IV (Eraxis)	**Refer to Lexicomp or other reference**	**No adjustment necessary**
azithromycin IV (Zithromax)	**500 mg daily**	**No adjustment necessary**
azithromycin PO (Zithromax)	**250 – 500 mg daily** (500 – 1,000 mg single dose for specific indications)	**No adjustment necessary**
aztreonam IV/IM (Azactam)	**1 – 2 gm q6 – 12h** MAX 12 gm/day	**CrCl > 30: No adjustment necessary** CrCl 10 – 30: 50% of dose, same interval CrCl < 10 OR HD/PD: same dose q24h
baricitinib PO (Olumiant) • COVID-19 infection	**4 mg once daily**	**eGFR ≥ 60: no adjustment necessary** eGFR 30 – <60: 2 mg once daily eGFR 15 - <30: 1 mg once daily eGFR < 15: use is not recommended
caspofungin IV (Cancidas)	**70 mg x1 then 50 mg/day**	**No adjustment necessary**
cefazolin IV/IM (Ancef)	**250 mg – 2 gm q6 – 8h**	**CrCl > 50: 1-2 gm q8h** CrCl 30 – 50: 1 -2 gm q8 – 12h CrCl 10 – 29: 1 gm q12h CrCl <10 OR HD: 1 gm q24h OR 2 gm 3x/week with dialysis PD: 1 gm q24h
cefdinir PO (Omnicef)	**300 mg BID**	**CrCl ≥ 30: No adjustment necessary** CrCl < 30: 300 mg daily HD: 300 mg q48h at the end of HD session
cefepime IV (Maxipime) • Sepsis • Febrile Neutropenia • Pseudomonas	**2 gm q8h** ONLY for severe infections	**See Appendix B**
cefepime IV (Maxipime) • Other infections	**1 – 2 gm Q8 – 12h**	**See Appendix B**
cefotaxime IV (Claforan)	**2 gm q4h**	**See Appendix C**
cefoxitin IV/IM (Mefoxin)	**1 – 2 gm q6 – 8h**	**CrCl > 50: No adjustment necessary**

		CrCl 30 – 50: 1 - 2 gm q8 – 12h CrCl 10 – 29: 1 – 2 gm q12 – 24h CrCl 5 – 9: 0.5 – 1 gm q12h – 24h CrCl <5: 0.5 – 1 gm q24 – 48 h
ceftaroline IV/IM (Teflaro)	**600 mg q8 - 12h** Restricted to ID only	**CrCl > 50: No adjustment necessary** CrCl 31 - 50: 400 mg q8 - 12h CrCl 15 - 30: 300 mg q8 - 12h CrCl < 15: 200 mg q8 - 12h HD: 200 mg q8 - 12h
cefTAZidime IV (Fortaz)	**1-2 gm q8h** 2 gm for meningitis, severe infections	**CrCl > 50: No adjustment necessary** CrCl 31-50: 1-2 gm q12h CrCl 16-30: 1-2 gm q24h CrCl <15: 0.5-1 gm q24h HD/PD: 1 gm q24h OR 3x/week post HD
cefTRIAXone IV/IM (Rocephin)	**1-2 gm q24h**	**No adjustment necessary**
cefuroxime IV/IM (Zinacef)	**0.75-1.5 gm q8-12h**	**CrCl ≥ 30: No dosage adjustment necessary** CrCl 10 to 30: 0.75-1.5 gm every 12 hours CrCl < 10, HD/PD: 0.75-1.5 gm every 24 hours
cefuroxime PO (Ceftin)	**250-500 mg q12h**	**CrCl > 30: No dosage adjustment necessary** CrCl 10 to 30: 250 mg q24h CrCl<10, HD/PD: 250 mg q48h
cephalexin PO (Keflex)	**250-500 mg q6h**	**CrCl > 60: No adjustment necessary** CrCl 10-59: 500 mg q8h CrCl <10 or HD/PD: 500 mg q12h
ciprofloxacin IV (Cipro)	**200-400 mg q8-12h** q8h for pseudomonas	**CrCl >30: no adjustment necessary** CrCl <30: 200-400 mg q12-24h HD/PD: 200-40 mg q24h
ciprofloxacin PO (Cipro)	**250-750 mg q12h**	**CrCl >50: no adjustment necessary** CrCl 30-50: 250 mg-500 mg q12h CrCl <30: 500 mg q24h HD/PD: 250-500 mg q24h
clarithromycin PO (Biaxin) *XL tabs*	**500-1000 mg q24h**	**CrCl > 30: No adjustment necessary** CrCl < 30: decrease dose by 50%
clarithromycin PO (Biaxin) *IR tabs*	**250-500 mg q12h**	**CrCl > 30: No adjustment necessary** CrCl < 30: decrease dose by 50%
clindamycin IV/IM (Cleocin)	**600-900 mg q6-8h**	**No adjustment necessary**
clindamycin PO (Cleocin)	**150-450 mg q6-8h**	**No adjustment necessary**
DAPTOmycin IV (Cubicin)	**4-6 mg/kg q24h** Actual body weight Restricted to ID only	**CrCl ≥ 30: No adjustment necessary** CrCl < 30: 4-6 mg/kg q48h
dicloxacillin PO	**250-500 mg q6-8h**	**NO adjustment necessary**
doxycycline IV/PO (Vibramycin)	**100 mg q12h**	**NO adjustment necessary**
ertapenem IV/IM (Invanz)	**1 gm q24h**	**CrCl > 30: No adjustment necessary** CrCl ≤ 30: 500 mg q24h HD: 500mg q24h
famotidine IV/PO (Pepcid)	**40 mg q24h or 20 mg q12h**	**IV Adjustments:** **CrCl >50: 20 mg BID** CrCl <50: 20 mg daily **PO Adjustments:** **CrCl >60: 20 mg daily or BID** CrCl 30-60: 10-20 mg daily CrCl <30: 10mg daily or 20mg QOD
fidaxomicin PO (Dificid)	**200 mg BID x 10 days**	**No adjustment necessary**

	Restricted to ID only	
fluconazole IV/PO (Diflucan)	**100-800 mg q24h**	**CrCl > 50: No adjustment necessary** CrCl ≤ 50: 50% of usual dose q24h HD: same loading dose, then 50% q24h
ketorolac IV/IM (Toradol)	**15-30 mg q6h, 15 mg dose for pts ≥ 65 yrs** Max 120 mg/day (max 60 mg/day with renal impairment) Single doses of ketorolac > 30 mg are discouraged due to increased risk for nephrotoxicity.	**IV/IM:** **eGFR >50mL/min/1.73m2 = no adjustment needed** eGFR <50mL/min/1.73m2 = 7.5-15mg q6h eGFR <30mL/min/1.73m2 = avoid using all NSAIDS eGFR <10mL/min/1.73m2 = contraindicated
ketorolac PO (Toradol)		**eGFR >50mL/min/1.73m2 = no adjustment needed** eGFR <50mL/min/1.73m2 = 10mg q4-6h (max 40mg) eGFR <30mL/min/1.73m2 = avoid using all NSAIDS eGFR <10mL/min/1.73m2 = contraindicated
levoFLOXacin PO/IV (Levaquin) • Healthcare-associated pneumonia (HAP) (7-14 days) • Community-acquires pneumonia (CAP) (5 days) • Cellulitis • Severe Infection	**750 mg q24h**	**See Appendix D**
levoFLOXacin PO/IV (Levaquin) • Community-acquires pneumonia (CAP) (7-14 days) • Other infections	**500 mg q24h**	**See Appendix D**
levoFLOXacin PO/IV (Levaquin) • Uncomplicated UTI	**250 mg q24h**	**See Appendix D**
linezolid IV/PO (Zyvox)	**400-600 mg q12h**	**No adjustment necessary**
meperidine IM/IV (Demerol) • Analgesia	**25-150 mg q1-4h prn**	**Avoid use in renal impairment**
meperidine IM/IV (Demerol) • Post-op shivering	**25-50 mg x1**	**Avoid use in renal impairment**
meropenem IV (Merrem)	**Refer to *Meropenem (Merrem) Alternative Dosing Substitution in Adult Patients* policy**	
metoclopramide IV/PO (Reglan)	**Refer to Lexicomp or other reference**	**No distinction between IV/PO or indication.** **CrCl >60: No adjustment necessary** CrCl 11-59: administer 50% of usual total daily dose CrCl <11, HD, PD: administer 33% or less of total daily dose
metroNIDAZOLE IV/PO (Flagyl)	**250-1,000 mg q8h**	**No adjustment necessary**
micafungin IV (Mycamine)	**100-150 mg q24h**	**No adjustment necessary**
nafcillin IV	**1-2 gm q4-6h** max 12 gm per day	**No adjustment necessary**

nitrofurantoin PO (Macrodantin/Furadantin)	**50-100 mg q6h**	**CrCl ≥ 30: No adjustment necessary** CrCl < 30: Contraindicated
nitrofurantoin PO (Macrobid)	**100 mg BID**	**CrCl ≥ 30: No adjustment necessary** CrCl < 30: Contraindicated
oseltamivir PO (Tamiflu) • Prophylaxis	**75 mg q24h** x 10 days	**CrCl > 60: No adjustment necessary** CrCl 30 - 60: 30 mg q24h CrCl ≤ 30: 30 mg q48h CrCl ≤ 10: 30 mg once weekly HD: 30 mg x1, then 30 mg after every other session
oseltamivir PO (Tamiflu) • Treatment	**75 mg q12h** x 5 days (start within 48 hrs of onset)	**CrCl > 60: No adjustment necessary** CrCl 30 - 60: 75 mg x1, then 30 mg q12h CrCl ≤ 30: 30 mg q24h CrCl ≤ 10: 30 mg q48h HD: 30 mg x1, then 30 mg after every session
penicillin G potassium	**1-6 million units q4h**	**GFR >50: No dosage adjustment necessary** GFR 10-50: Administer 75% of the normal dose GFR <10: Administer 20-50% of the normal dose HD/PD: See lexicomp
piperacillin-tazobactam IV (Zosyn) • Extended Interval Dosing	**Refer to *Zosyn Extended Dosing Interval* policy**	
piperacillin-tazobactam IV (Zosyn) • Traditional Dosing	**3.375 gm q6h OR 4.5 gm q6-8h** 30 minute infusion	**For HAP:** **CrCl >40: 4.5 gm q6h** CrCl 20-39: 4.5 g q8h or 3.375 g q6h CrCl <20: 4.5 g q12h or 2.25 g q6h HD/PD: 4.5 g q12h or 2.25 g q8h
rifAMPin IV/PO	**300-600 mg daily**	**No adjustment necessary**
sulfamethoxazole-trimethoprim IV (Bactrim/Septra)	**8-20 mg/kg/day (TMP component) divided q6-12h** Actual Body Weight	**CrCl > 30: No adjustment necessary** CrCl 15 - 30: Reduce to 50% of usual dose CrCl <15/HD/PD: Reduce to 25-50% of usual dose
sulfamethoxazole-trimethoprim PO (Bactrim/Septra)	**1-2 DS tablets q12-24h**	**CrCl > 30: No adjustment necessary** CrCl 15 - 30: Reduce to 50% of usual dose CrCl <15/HD/PD: Reduce to 25-50% of usual dose or 3x/week
valACYclovir PO (Valtrex)	**Refer to Lexicomp or other reference**	**See Appendix E**
valGANciclovir PO (Valcyte) • Maintenance therapy of CMV or transplant patient	**900 mg daily**	**CrCl ≥ 60: No adjustment necessary** CrCl 40 - 59: 450 mg daily CrCl 25 - 39: 450 mg QOD CrCl 10 - 24: 450 mg twice weekly CrCl < 10: Avoid use
valGANciclovir PO (Valcyte) • Induction	**900 mg 1 – 2x daily**	**CrCl ≥ 60: No adjustment necessary** CrCl 40 - 59: 450 mg BID CrCl 25 - 39: 450 mg daily CrCl 10 - 24: 450 mg QOD CrCl < 10: Avoid use
voriconazole IV (Vfend)	**6 mg/kg q12h x 2 doses, then 3-4 mg/kg q12h**	**No adjustment necessary**
voriconazole PO (Vfend)	**Wt ≥ 40 kg: 200 mg q12h** **Wt < 40 kg: 100 mg q12h**	**No adjustment necessary**

Appendix B:

Cefepime Dosing Adjustments in Altered Kidney Function				
CrCl (mL/minute)	**Dose**			
> 60 (Usual Recommended Dose)	1 gm q12h	2 gm q12h	1 gm q6h	2 gm q8h
30 – 60	1 gm q24h	1 gm q12h	1 gm q8h	2 gm q12h
11 – 29	500 mg q24h	1 gm q24h	1 gm q12h	1 gm q12h or 2gm q24h
< 11 or HD	250 mg q24h	500 mg q24h	1 gm q24h	1 gm q24h

Appendix C:

Cefotaxime Dosing Adjustments in Altered Kidney Function			
CrCl (mL/minute)	**If usual indication-specific dose is 2 gm q4h**	**If usual indication-specific dose is 1 - 2 gm q6h**	**If usual indication-specific dose is 1 - 2 gm q8h**
> 50	No adjustment necessary	No adjustment necessary	No adjustment necessary
> 10 - 50	2 gm q6-8h	1-2 gm q8h	1-2 gm q12h
≤ 10	2 gm q12h	1-2 gm q12h	1-2 gm q24h
HD (3x weekly)	2 gm q12h	1-2 gm q12h	1-2 gm q24h
PD	2 gm q12h	1-2 gm q12h	1-2 gm q24h

Appendix D:

Levofloxacin Dose Adjustments in Altered Kidney Function			
CrCl (mL/minute)	**If usual recommended dose is 250 mg q24h**	**If usual recommended dose is 500 mg q24h**	**If usual recommended dose is 750 mg q24h**
≥ 50	No adjustment necessary	No adjustment necessary	No adjustment necessary
20 to < 50	No adjustment necessary	500 mg x1 then 250 mg q24h	750 mg q48h
< 20	250 mg q48h (unless indication is uncomplicated UTI, where no adjustment is necessary)	500 mg x1 then 250 mg q48h	750 mg x1 then 500 mg q48h

HD, intermittent (3x/week)	250 mg q48h	500 mg x1, then EITHER 250 mg q48h OR 125 mg q24h	750 mg x1, then EITHER 500 mg q48h OR 250 mg q24h

Appendix E:

Valacyclovir Dose Adjustments for Kidney Impairment					
CrCl (mL/min)	If usual recommended dose is 500 mg q24h	If usual recommended dose is 1 g q24h or 500 mg q12h	If usual recommended dose is 1 g q12h	If usual recommended dose is 1 g q8h	If usual recommended dose is 2 g q12h for 2 doses
≥ 50	No adjustment necessary	No adjustment necessary	No adjustment necessary	No adjustment necessary	No adjustment necessary
30 to < 50	No adjustment necessary	No adjustment necessary	No adjustment necessary	1 g q12h	1 g q12 x 2 doses
10 to <30	500 mg q48h	500 mg q24h	1 g q24h	1 g q24h	500 mg q12h x 2 doses
<10	500 mg q48h	500 mg q24h	500 mg q24h	500 mg q24h	500 mg as a single dose