

Renal Dose Adjustment per Pharmacy

Description: Many medications require dosage adjustment based on renal function. Appropriately dosed medications are imperative to optimize patient outcomes and minimize adverse drug reactions. This policy describes the process in which a licensed pharmacist is authorized to order labs to monitor renal function and adjust dosing of a selected list of medications. The purpose of this policy is to ensure appropriate dosing of renally cleared medications by streamlining the process for ordering and interpreting labs, and adjusting medication doses by pharmacists.

Accountability: Pharmacists and practitioners caring for a patient initiated on a medication requiring dosage adjustment for renal dysfunction.

Policies and Procedures

1. Ordering serum creatinine (SCr) and estimating renal function:

- A. Upon receipt of an order for a medication that is eligible for dose adjustment per the P&T Committee approved protocol (see Table 1), the pharmacist will determine if the ordered dose and frequency is appropriate based on estimated creatinine clearance. If a SCr within the last 24 hours is not available, the pharmacist is allowed to order a basic metabolic panel (BMP) prior to initiation of therapy. If the medication is urgent, the pharmacist will enter a one-time order of the medication until the SCr is available.
- B. The patient's creatinine clearance (CrCl) will be calculated using the Cockcroft-Gault (CG) equation. This equation is chosen to estimate CrCl as renal dosing recommendations provided by drug manufacturers are based on the CG equation.¹⁻⁴

$$\text{CrCl (ml/min)} = [(140 - \text{age}) \times \text{weight (kg)}] / 72 \times \text{SCr}$$

Ideal Body Weight (IBW) – in kg:

Male: $50 \text{ kg} + 2.3 [\text{Height (in)} - 60]$

Female: $45.5 \text{ kg} + 2.3 [\text{Height (in)} - 60]$

Adjusted Body Weight (Adj.BW) – in kg

$\text{IBW} + 0.4 [\text{Actual Body Weight (kg)} - \text{IBW}]$

- Multiply CrCl result by 0.85 for females
- If actual weight is < IBW, use actual weight
- If actual weight is > IBW but < 120% of IBW, use IBW
- If actual weight is $\geq 120\%$ IBW, use Adj BW
- For patients ≥ 65 years with SCr < 0.8 mg/dL, round SCr to 0.8 mg/dL.

2. Assessing the need for renal dose adjustment:

- A. Appropriate dosing of the medication, unless otherwise noted (*), will be determined based on the most current version of
 1. Lexicomp® Drug Information Handbook⁵
 2. UCH Antimicrobial Stewardship Guidebook⁶
- B. If the ordered dose of the medication is not appropriate, the pharmacist is allowed to discontinue the current order and reorder the medication at the dose defined by the above

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references. The new order will be signed in the electronic health record (EHR) using the order mode “Per Protocol: No Co-Sign”

1. The pharmacist will then write a note in the progress section of the EHR so that the medical staff will be informed of the adjustment. The note will contain the following information:
 - Most recent SCr
 - Estimated CrCl (based on CG equation)
 - Dialysis status (if applicable)
 - Medication that was adjusted
 - Indication (applies only to medications with different dosing based on indication)
 - New dose, route, and frequency
 - C. If the medication is contraindicated based on renal function, the pharmacist is responsible for contacting the provider to suggest alternatives.
 - D. If the medication is not on the renal dosing list (see Table 1), the pharmacist is responsible for contacting the prescriber for approval if dosing adjustment is needed.
 - E. If the original ordered dose is not appropriate for the indication, the pharmacist must contact the provider to recommend alternative dosing.
3. Change in renal function during therapy:
- A. All eligible renally cleared medications (see Table 1) will be reviewed for appropriateness of dosing by a pharmacist at least every 72 hours.
 - B. The need for a SCr should be evaluated at least every 3-7 days for appropriate monitoring of patients on these medications. If this is not ordered by a physician, the pharmacist is allowed to order a SCr to estimate CrCl if applicable.
 - C. If a patient’s renal function changes during the hospital stay and requires subsequent dose adjustment of the medication, the pharmacist is permitted to make any necessary changes to the dose. Another progress note will be placed in the EHR to notify the provider about the adjustment.

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Table 1: Medications on the Renal Dose Adjustment per Pharmacy Protocol

Antimicrobials	Anticoagulants	Other
acyclovir	apixaban*	allopurinol
amoxicillin/clavulanate	dabigatran*	famotidine
ampicillin	dalteparin*	gabapentin
ampicillin/sulbactam	enoxaparin	ketorolac
aztreonam	fondaparinux*	metoclopramide
cefazolin	rivaroxaban*	ranitidine
cefepime		
ceftazidime		
cephalexin		
ciprofloxacin		
daptomycin		
ertapenem		
fluconazole		
levofloxacin		
meropenem		
piperacillin/tazobactam		
sulfamethoxazole/trimethoprim		
valacyclovir		
vancomycin		

*Per the University of Colorado Hospital policy, these agents are not recommended for patients with a CrCl < 30 ml/min since this population was not studied in the clinical trials.⁷

References:

1. Cockcroft, D.W., & Gault, M.H. (1976). Prediction of creatinine clearance from serum creatinine. *Nephron* (16), 31-41. (LOE 3)
2. Dowling, T.C., Matzke, G.R., Murphy, J.E., & Burckart, G. J. (2010). Evaluation of renal drug dosing: prescribing information and clinical pharmacist approaches. *Pharmacotherapy* (30): 776-86. (LOE 8)
3. National Kidney Disease Education Program. (2010, January). *Chronic kidney disease and drug dosing: Information for providers. NKDEP*. Retrieved from <http://www.nkdep.nih.gov/resources/ckd-drug-dosing-508.pdf>. Assessed on 07 May 2013. (LOE 8)
4. Food and Drug Administration. (2010, March). Guidance for industry: pharmacokinetics in patients with impaired renal function – study design, data analysis, and impact on dosing and labeling. *FDA*. Retrieved from <http://www.fda.gov/downloads/Drugs/GuidanceComplianceRegulatoryInformation/Guidances/UCM204959.pdf>. (LOE 8)
5. Lacy, C.F., Armstrong, L.L., Goldman, M.P., & Lance, L.L. (2013). *Drug information handbook*, 22nd ed. Hudson, OH: Lexi-Comp, Inc. (LOE 8)
6. Barron, M., Saveli, C., Barber, G., Goolsby, T., Go, A., Golightly, L...Pisney, L. (2013). *Antimicrobial stewardship guidebook*. Aurora, CO: University of Colorado Hospital. (LOE 8)
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