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Did You Know?

Chronic Kidney Disease (CKD) and Affected Medications

WHAT IS IT?

- The kidneys normally function to filter wastes, toxins and excess fluids from the blood into the urine.
- Chronic Kidney Disease (CKD) involves a gradual loss of kidney function that diminishes this filtering ability.
- CKD results in the body retaining excess fluids, electrolytes and toxins (including renally-eliminated medications) causing or exacerbating health conditions such as heart disease, stroke, and adverse drug events.

HOW IS IT CAUSED?

CKD occurs when a disease or condition impairs kidney function, worsening kidney damage over several months or years:

- Diabetes
- Hypertension
- Polycystic Kidney Disease
- Glomerular diseases
- Lupus
- Complications due to certain medications (i.e., NSAIDs)
- Other rare diseases and birth defects

SYMPTOMATOLOGY

- Unlike Acute Kidney Injury (AKI) that presents abruptly, CKD symptoms may be nonspecific and difficult to identify due to prolonged disease onset and slow progression that allows for ***compensation.***
    - The kidneys in early stages of CKD may compensate – adapt and overcome functional deficits – to maintain renal output until significant impairment has occurred.
    - Patients suffering early stages of CKD may not present recognizable symptoms during this period.
- Specific blood and urine test results may indicate CKD, including high blood creatinine levels and protein in the urine.
- ***Symptoms may include:***

- Fatigue/Weakness
- Headaches
- Insomnia
- Peripheral Swelling
- Loss of Appetite
- Muscle Cramping
- Changes in Urination
- Itching
- Shortness of Breath
- High Blood Pressure

RISK FACTORS

- Heart Disease
- Obesity
- Older Age
- Family History
- High Blood Pressure
- Diabetes
- Smoking

STAGING SYSTEM FOR CKD

Stage	Description	GFR mL/min/1.73m²	% of Kidney Function
1	Kidney damage with normal or increased GFR	≥ 90	100-90%
2	Kidney damage with a mild decrease in GFR	60 to 89	89-60%
3	Moderate decrease in GFR	30 to 59	59-30%
4	Severe decrease in GFR	15 to 29	29-15%
5	Kidney failure	< 15 (or dialysis)	< 15%

COMMON COMPLICATIONS

- Gout
- Heart disease
- Anemia
- High Potassium Levels
- Metabolic Acidosis
- Swelling (Edema) and Fluid Buildup
- Bone Disease
- High Phosphorus Levels

CHRONIC KIDNEY DISEASE AND MEDICATIONS

- CKD can affect the pharmacokinetics, especially elimination, of drugs primarily excreted in urine.
- Failure to account for CKD can cause drug dosing errors, adverse drug events and poor outcomes.
- Because renal function tends to worsen with age, it is especially important to take CrCl or GFR into consideration when dosing renally eliminated meds for elders.

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Did You Know?

Examples of Commonly Prescribed Drugs to Avoid or Requiring Renal Dose Adjustment in CKD*

Analgesics	Anticoagulants	Anticonvulsants	Antidiabetics	Antihyperlipidemics	Antihypertensives	Antimicrobials		GI Medications	Misc.
Codeine	Enoxaparin	Levetiracetam	Acarbose	Fluvastatin	Acebutalol	Acyclovir	Ertapenem	Famotidine	Allopurinol
Gabapentin	Fondaparinux	Gabapentin	Alogliptin	Lovastatin	Amiloride	Amoxicillin(+/- Clavulanate)	Erythromycin	Metoclopramide	Digoxin
Ketorolac	Rivaroxaban	Pregabalin	Glipizide	Pravastatin	Atenolol	Ampicillin	Fluconazole	Ranitidine	Fexofenadine
Meperidine	Apixaban	Topiramate	Glyburide	Rosuvastatin	Benazepril	Ampicillin/Sulbactam	Imipenem		Lithium
Morphine			Metformin	Simvastatin	Bisoprolol	Azithromycin	Itraconazole		
NSAIDS			Saxagliptin		Bumetanide	Cefazolin	Ketoconazole		
Pregabalin			Sitagliptan		Captopril	Cefepime	Levofloxacin		
Tramadol					Enalapril	Cefixime	Linezolid		
					Fosinopril	Cefotaxime	Meropenem		
					Furosemide	Ceftazidime	Miconazole		
					Lisinopril	Ceftriaxone	Moxifloxacin		
					Metolazone	Cefuroxime	Nafcillin		
					Nadolol	Cephalexin	Nitrofurantoin		
					Quinapril	Ciprofloxacin	Penicillin		
					Ramipril	Clarithromycin	Piperacillin(+/- Tazobactam)		
					Spironolactone	Clindamycin	Sulfamethoxazole /Trimethoprim		
					Torsemide	Daptomycin	Tetracycline		
					Triamterene	Dicloxacillin	Valacycovir		
						Doxycycline	Vancomycin		

This list is abridged for quick reference – it is NOT all-inclusive.

Health care professionals should reference the Prescribing Info (PI) accompanying a given drug product for the most comprehensive drug-specific information, including dosing recommendations in the presence of renal impairment. All treatment recommendations should ultimately be made using professional judgment by qualified health care professionals directly involved in the patient's care.