

Diuretic Agents

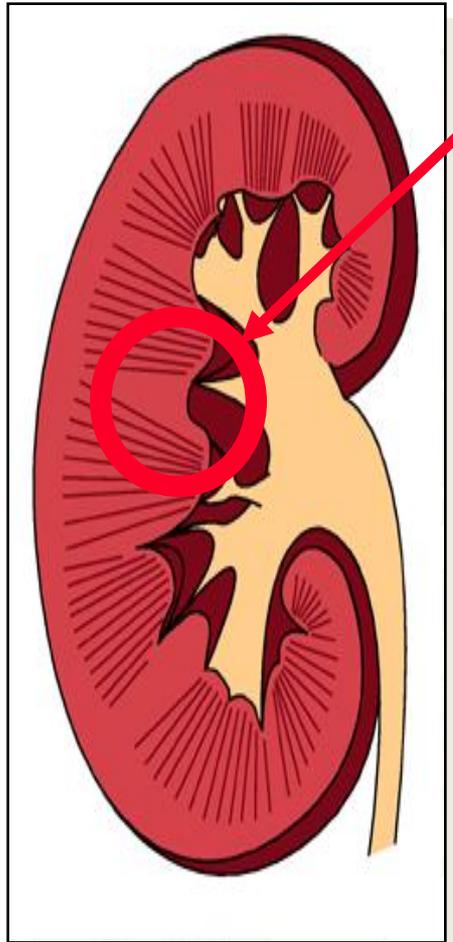
NAPNES Guidelines

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Diuretic Agents

- Drugs that accelerate the rate of urine formation.
- Result: removal of sodium and water
- Sodium
 - Where sodium goes, water follows.
 - 20 to 25% of all sodium is reabsorbed into the bloodstream in the loop of Henle, 5 to 10% in the distal tubules, and 3% in collecting ducts.
 - If it is not absorbed, it is excreted with the urine.

Diuretic Site of Action



proximal
tubule

loop of Henle

Distal
tubule

Collecting
duct

Diuretic Agents

- Types
 - Carbonic anhydrase inhibitors
 - Loop diuretics
 - Osmotic diuretics
 - Potassium-sparing diuretics
 - Thiazide and thiazide-like diuretics

Carbonic Anhydrase Inhibitors

(CAIs)

- acetazolamide (Diamox)
 - Most widely prescribed
 - Contraindicated in pts with sulfa hypersensitivity rxs
- methazolamide
- dichlorphenamide

Carbonic Anhydrase Inhibitors

- Mechanism of Action
 - The enzyme carbonic anhydrase helps to make H^+ ions available for exchange with sodium and water in the proximal tubules.
 - CAIs block the action of carbonic anhydrase, thus preventing the exchange of H^+ ions with sodium and water.
 - **Little sodium and water can be resorbed into the blood**
 - **Eliminated in urine**

Carbonic Anhydrase Inhibitors:

- Therapeutic Uses
 - Adjunct agents in the long-term management of open-angle glaucoma
 - Used with miotics to lower intraocular pressure before ocular surgery in certain cases
 - Also useful in the treatment of:
 - Glaucoma
 - Edema
 - Epilepsy
 - High-altitude sickness

Carbonic Anhydrase Inhibitors:

Side Effects:

Metabolic acidosis

Anorexia

Hematuria

Photosensitivity

Drowsiness

Paresthesias

Urticaria

Melena

Loop Diuretics

- bumetanide (Bumex)
- ethacrynic acid (Edecrin)
- furosemide (Lasix)
- Torsemide (Demadex)

Loop Diuretics:

- Mechanism of Action
 - Act directly on the ascending limb of the loop of Henle
 - inhibits sodium and chloride resorption
 - Increase renal prostaglandins
 - resulting in the dilation of blood vessels and reduced peripheral vascular resistance.

Loop Diuretics

- Drug Effects
 - Potent diuresis and subsequent loss of fluid
 - Decreased fluid volume causes:
 - Reduced BP
 - Reduced pulmonary vascular resistance
 - Reduced systemic vascular resistance
 - Reduced central venous pressure
 - Reduced left ventricular end-diastolic pressure
 - **Potassium depletion!**

Loop Diuretics:

- Therapeutic Uses
 - Edema associated with CHF or hepatic or renal disease
 - Control of hypertension

Loop Diuretics: Side Effects

<u>Body System</u>	<u>Effect</u>
CNS blurred	Dizziness, headache, tinnitus, vision
GI	Nausea, vomiting, diarrhea
Hematologic	Agranulocytosis, neutropenia, thrombocytopenia
Metabolic	Hypokalemia, hyperglycemia, hyperuricemia

Osmotic Diuretics

- mannitol (Resectisol, Osmitrol)
 - Most commonly used

Osmotic Diuretics:

- Mechanism of Action
 - Work in the proximal tubule
 - Nonabsorbable, producing an osmotic effect
 - Pull water into the blood vessels and nephrons from the surrounding tissues

Osmotic Diuretics:

- Drug Effects
 - Reduced cellular edema
 - Increased urine production
 - causing diuresis
 - Rapid excretion of water, sodium, and other electrolytes, as well as excretion of toxic substances from the kidney
 - Reduces excessive intraocular pressure

Osmotic Diuretics:

- Therapeutic Uses
 - Used in the treatment of patients in the early, oliguric phase of ARF
 - To promote the excretion of toxic substances
 - Reduction of intracranial pressure
 - Treatment of cerebral edema

Osmotic Diuretics:

- Side Effects
 - Convulsions
 - Thrombophlebitis
 - Pulmonary congestion
 - Others
 - Headaches
 - Chest pains
 - Tachycardia
 - Blurred vision
 - Chills and fever

Potassium-Sparing Diuretics

- amiloride (Midamor)
- spironolactone (Aldactone)
- triamterene (Dyrenium)

Potassium-Sparing Diuretics:

- Mechanism of Action
 - Work in collecting ducts and distal convoluted tubules
 - Interfere with sodium-potassium exchange
 - Competitively bind to aldosterone receptors
 - Block the resorption of sodium and water usually induced by aldosterone

Potassium-Sparing Diuretics:

- Drug Effects
 - Prevent potassium from being pumped into the tubule, thus preventing its secretion
 - Competitively block the aldosterone receptors and inhibit its action
 - Excretion of sodium and water is promoted

Potassium-Sparing Diuretics:

Therapeutic Uses

- spironolactone and triamterene
 - Hyperaldosteronism
 - Hypertension
 - Reversing the potassium loss caused by
 - potassium-losing drugs
- amiloride
 - Treatment of CHF

Potassium-Sparing Diuretics: Side Effects

<u>Body System</u>	<u>Effect</u>
CNS	Dizziness, headache
GI Cramps, nausea,	vomiting, diarrhea
Other	Urinary frequency, weakness **hyperkalemia

Potassium-Sparing Diuretics: Side Effects

- Spironolactone (Aldactone)
 - Gynecomastia
 - Amenorrhea
 - Irregular menses

Thiazide and Thiazide-Like Diuretics

- Thiazide
 - hydrochlorothiazide (Esidrix, HydroDIURIL)
 - chlorothiazide (Diuril)
 - trichlormethiazide (Metahydrin)
- Thiazide-like
 - chlorthalidone (Hygroton)
 - metolazone (Mykrox, Zaroxolyn)

Thiazide and Thiazide-Like Diuretics:

- Mechanism of Action
 - Inhibit tubular resorption of sodium and chloride ions
 - Action primarily in the ascending loop of Henle and early distal tubule
 - Result: water, sodium, and chloride are excreted
 - Dilate the arterioles by direct relaxation
 - ***Potassium is also excreted to a lesser extent***

Thiazide and Thiazide-Like Diuretics:

- Drug Effects
 - Lowered peripheral vascular resistance
 - Depletion of sodium and water

Thiazide and Thiazide-Like Diuretics:

- Therapeutic Uses
 - Hypertension (one of the most prescribed group of agents for this)
 - Edematous states
 - Idiopathic hypercalciuria
 - Diabetes insipidus
 - Adjunct agents in treatment of CHF, hepatic cirrhosis

Thiazide and Thiazide-Like Diuretics: Side Effects

<u>Body System</u>	<u>Effect</u>
CNS	Dizziness, headache, blurred vision, paresthesias, decreased libido
GI	Anorexia, nausea, vomiting, diarrhea
GU	Impotence
Integumentary	Urticaria, photosensitivity
Metabolic	Hypokalemia, glycosuria, hyperglycemia

Diuretic Agents: Nursing Implications

- Perform a thorough patient history and physical examination.
- Assess baseline fluid volume status, intake and output, serum electrolyte values, weight, and vital signs.
- Assess for disorders that may contraindicate the use of, or necessitate cautious use of, these agents.

Diuretic Agents: Nursing Implications

- Instruct patients to take in the morning as much as possible to avoid interference with sleep patterns.
- Monitor serum potassium levels during therapy.
- Potassium supplements are usually not recommended when potassium levels exceed 3.0 mEq/L.

Diuretic Agents: Nursing Implications

- Teach patients to maintain proper nutritional and fluid volume status.
- Teach patients to eat more potassium-rich foods when taking any but the potassium-sparing agents.
- Foods high in potassium include bananas, oranges, dates, raisins, plums, fresh vegetables, potatoes, meat, and fish.

Diuretic Agents: Nursing Implications

- Patients taking diuretics along with a digitalis preparation should be taught to monitor for digitalis toxicity.
- Diabetic patients who are taking thiazide and/or loop diuretics should be told to monitor blood glucose and watch for elevated levels.

Diuretic Agents: Nursing Implications

- Teach patients to change positions slowly, and to rise slowly after sitting or lying to prevent dizziness and possible fainting related to orthostatic hypotension.
- Encourage patients to keep a log of their daily weight.
- Encourage patients to return for follow-up visits and lab work.

Diuretic Agents: Nursing Implications

- Patients who have been ill with nausea, vomiting, and/or diarrhea should notify their physician as fluid loss may be dangerous.
- Signs and symptoms of hypokalemia include muscle weakness, constipation, irregular pulse rate, and overall feeling of lethargy.

Diuretic Agents: Nursing Implications

- Instruct patients to notify the physician immediately if they experience rapid heart rates or syncope (reflects hypotension or fluid loss).
- A weight gain of 2 or more pounds a day or 5 or more pounds a week should be reported immediately.

Diuretic Agents: Nursing Implications

Monitor for adverse effects:

- metabolic alkalosis, drowsiness, lethargy, hypokalemia, tachycardia, hypotension, leg cramps, restlessness, decreased mental alertness

Diuretic Agents: Nursing Implications

- Monitor for therapeutic effects:
 - Reduction in edema, fluid volume overload, CHF
 - Reduction of hypertension
 - Return to normal intraocular pressures