6.9: Diuretics

Diuretics are used to decrease blood pressure and to decrease symptoms of fluid overload such as edema. There are many classifications of diuretics. We will discuss loop, thiazide, and potassium-sparing diuretics. Other diuretics, such as osmotic diuretics, are used to decrease fluid from cerebrospinal fluid and the brain.

Diuretics cause diuresis (increased urine flow) by inhibiting sodium and water reabsorption from the kidney tubules. By eliminating excess water, blood volume and blood pressure, as well as preload, are decreased.

Diuretics are often used in combination with other antihypertensive agents to reduce a patient's blood pressure.

Furosemide

**Mechanism of Action**

Loop diuretics inhibit absorption of sodium and chloride in the loop of henle and proximal and distal tubules, thus causing fluid loss, along with sodium, potassium, calcium, and magnesium losses. Loop diuretics are very potent diuretics and are used when a patient has an exacerbation of fluid overload.

**Indications for Use**

Furosemide is used to treat patients with edema and is also used to treat hypertension. IV furosemide is used to urgently treat pulmonary edema.

**Nursing Considerations Across the Lifespan**

The onset of diuresis following oral administration is within 1 hour. The peak effect occurs within the first or second hour.
The duration of diuretic effect is 6 to 8 hours. When possible, loop diuretics should be administered in the morning, and evening doses should be avoided (unless urgent) so that sleep is not disturbed.

Nurses should continually monitor for dehydration and electrolyte imbalances that can occur with excessive diuresis, such as dryness of mouth, thirst, weakness, lethargy, drowsiness, restlessness, muscle pains or cramps, muscular fatigue, hypotension, oliguria, tachycardia, arrhythmia, or gastrointestinal disturbances such as nausea and vomiting.

Use cautiously in the geriatric population who have decreased renal function. Kidney function should be monitored closely for all patients because this is a potent medication that works within the kidney tubules.

Monitor the patient closely for hypokalemia if furosemide is used concomitantly with digoxin. Hypokalemia may increase the risk of digoxin toxicity.

**Adverse/Side Effects**

Adverse effects include dehydration, hypotension, and electrolyte imbalances such as hypokalemia. Health care providers may add potassium to a patient's scheduled medication list to decrease risk of hypokalemia. If using IV route, the administration must be given slowly to reduce the risk of the patient developing ototoxicity.

**Patient Teaching & Education**

Advise patients to change position slowly as they may experience orthostatic changes. Patients should also report weight gain of more than three pounds in a day to their healthcare provider. Patients should also be encouraged to enjoy potassium-rich foods during loop diuretic drug therapy.

Now let's take a closer look at the medication grid for furosemide in Table 6.9a.

<table>
<thead>
<tr>
<th>Class/Subclass</th>
<th>Prototype-generic</th>
<th>Administration Considerations</th>
<th>Therapeutic Effects</th>
<th>Adverse/Side Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loop diuretic</td>
<td>furosemide</td>
<td>Assess blood pressure</td>
<td>Based on indication; decreased blood pressure or edema</td>
<td>Dehydration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitor electrolytes</td>
<td></td>
<td>Electrolyte depletion (especially potassium)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(potassium)</td>
<td></td>
<td>Ototoxicity with rapid IV infusion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Promote potassium-rich diet</td>
<td></td>
<td>Renal impairment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Assess renal function</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Assess for dehydration,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>intake and output</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitor weight</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[1] https://med.libretexts.org/Bookshelves/Nursing/Nursing_Pharmacology_(OpenRN)/06%3A_Cardiovascular_and_Renal_Syste...

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[2] [3]
Mrs. Smith is a 79-year-old widow who has lived alone for the past 5 years. Three years ago she was hospitalized for an MI, which resulted in heart failure. She is compliant with her medications, which include digoxin (Lanoxin) 0.125 mg daily, furosemide (Lasix) 40 mg daily, and potassium (K-Dur) 20 mEq daily.

Recently Mrs. Smith ran out of her potassium and thought that because it was "just a supplement," it would be OK to go without it until the next time she went to town to fill the prescription. She has not taken her potassium for a week.

Today she comes into the clinic with generalized weakness, fatigue, nausea, and diarrhea. Her BP is 104/62, pulse 98 bpm and slightly irregular, RR 20, and temp 97.2 F. Blood is drawn and shows serum sodium level of 150 mEq/L, digoxin level of 2.6ng/ml and potassium level of 3.2 mEq/L.

1. What assessments should a nurse do before and after administering a diuretic?

2. What are the signs and symptoms of digoxin toxicity? What can happen to a patient who has toxic levels of digoxin?

3. What is the normal range for serum potassium level?

4. What classification of medication is furosemide (Lasix)?

5. Is dehydration a risk for patients on furosemide (Lasix)? Why or why not?

6. How would you assess for dehydration?

7. What electrolyte imbalance(s) can occur in patients taking furosemide (Lasix)?

8. What relationship exists between this patient’s furosemide, digoxin, and potassium levels?

Note: Answers to the Critical Thinking activities can be found in the "Answer Key" sections at the end of the book.

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**Hydrochlorothiazide**

**Mechanism of Action**
Thiazide diuretics work near the distal tubule to promote the excretion of sodium and water, thus causing diuresis. They are not effective for immediate diuresis.

**Indications for Use**

Hydrochlorothiazide diuretics are used to manage hypertension and edema.

**Nursing Considerations Across the Lifespan**

Thiazide diuretics are contraindicated for patients who have anuria or hypersensitivity.

After oral use, diuresis begins within 2 hours, peaks in about 4 hours, and lasts about 6 to 12 hours.

Use with caution in severe renal disease.

**Adverse/Side Effects**

Patients who are taking thiazide diuretics should be monitored for electrolyte depletion, dehydration, weakness, hypotension, renal impairment, and hypersensitivities.

**Patient Teaching & Education**

Patients should be instructed to take these medications at the same time each day and notify their healthcare provider if they experience significant changes in weight. Thiazide diuretics may cause orthostatic changes so individuals should change positions slowly. Additionally, some patients may note increased photosensitivity so protective measures should be taken. Patients should monitor their blood pressure and comply with interventions to reduce hypertension.

Now let’s take a closer look at the medication grid for hydrochlorothiazide in Table 6.9b.

### Table 6:9b Hydrochlorothiazide Medication Grid

<table>
<thead>
<tr>
<th>Class/Subclass</th>
<th>Prototype-generic</th>
<th>Administration Considerations</th>
<th>Therapeutic Effects</th>
<th>Adverse/Side Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thiazide diuretics</td>
<td>hydrochlorothiazide</td>
<td>Assess blood pressure, Monitor electrolytes (potassium), Promote potassium-rich diet, Assess renal function</td>
<td>Decrease blood pressure, Decrease edema</td>
<td>Electrolyte depletion, Dehydration and weakness, Hypotension, Renal impairment, Hypersensitivity (vasculitis, respiratory distress, photosensitivity, rash)</td>
</tr>
</tbody>
</table>
Assess for dehydration, intake and output
Monitor weight

Spironolactone

Spironolactone is a potassium sparing diuretic that is used as a mild diuretic or in combination with another diuretic.

Mechanism of Action

Spironolactone acts primarily through competitive binding of receptors at the aldosterone-dependent sodium-potassium exchange site in the distal convoluted renal tubule. Spironolactone causes increased amounts of sodium and water to be excreted, while potassium is retained.

Indications for Use

Spironolactone is used to treat hypertension and to control edema for patients with heart failure or liver dysfunction.

Nursing Considerations Across the Lifespan

This medication may cause hyperkalemia. Monitor urine output and report if less than 30 ml/hour. Use cautiously with patients who have renal impairment due to increased risk for hyperkalemia. Use cautiously in patients with liver impairment. Administer in the morning to avoid nocturia.

Adverse/Side Effects

Hyperkalemia, hyperglycemia, hyperuricemia, dehydration, hypotension, renal impairment, hypersensitivity, and gynecomastia. This medication may increase risk for lithium toxicity. [7]

Patient Teaching & Education

Patients should be instructed to take these medications at the same time each day and notify their healthcare provider if they experience significant changes in weight. Diuretics may cause orthostatic changes so individuals should change positions slowly. Patients should be advised to avoid salt substitutes and foods that contain high levels of potassium. [8]

Table 6:9c Spironolactone Medication Grid

<table>
<thead>
<tr>
<th>Class/Prototype</th>
<th>Administration</th>
<th>Therapeutic Effects</th>
<th>Adverse/Side Effects</th>
</tr>
</thead>
</table>

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<table>
<thead>
<tr>
<th>Subclass</th>
<th>generic</th>
<th>Considerations</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Potassium Sparing diuretics</strong></td>
<td>spironolactone</td>
<td>Assess blood pressure</td>
<td>Decrease blood pressure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitor electrolytes (potassium)</td>
<td>Decrease edema</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Assess renal function</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Assess for dehydration, intake and output</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitor weight</td>
<td>Hyperkalemia, hyperglycemia, hyperuricemia</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dehydration</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hypotension</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Renal impairment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hypersensitivity (vasculitis, fever, anaphylactic reactions, rash)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Gynecomastia</td>
</tr>
</tbody>
</table>

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