6.7: Cardiac Glycosides

Digoxin

Digoxin is a cardiac glycoside medication that has been used for centuries to treat heart failure. It has three effects on heart muscle: positive inotropic action (increases contractility, stroke volume and, thus, cardiac output), negative chronotropic action (decreases heart rate), and negative dromotropic action (decrease conduction of cardiac cells).\(^1\)

**Mechanism of Action**

Digoxin works by inhibiting the sodium and potassium pump, which results in an increase in intracellular sodium and an influx of calcium into cardiac cells, causing the cardiac muscle fibers to contract more efficiently and increase cardiac output.\(^2\)

**Indications for Use**

This medication is used as second-line treatment for patients who have heart failure or atrial fibrillation. Due to the risk for digoxin toxicity, the clinical use of digoxin has decreased and alternative, safer medications are being used.

**Nursing Considerations Across the Lifespan**

Apical pulse should be taken for a full minute before administration of this medication. If the apical pulse is less than 60, the dose should be withheld and the prescribing provider notified.

Serum digoxin levels should be monitored, with a normal therapeutic range from 0.8 to 2 ng/mL.
Serum potassium levels should also be closely monitored for patients on digoxin because hypokalemia increases the effect of digoxin and can result in digoxin toxicity. Normal potassium level is 3.5 to 5.0 mEq/L, and a result less than 3.5 should be immediately reported to the provider.

Nurses should closely monitor signs of digoxin toxicity. Geriatric patients have an increased risk for developing digoxin toxicity. Digibind is used to treat digoxin toxicity.

**Adverse/Side Effects**

Overdose or accumulation of digoxin causes digoxin toxicity. Signs and symptoms of digoxin toxicity are bradycardia (heart rate less than 60), nausea, vomiting, visual changes (halos), and arrhythmias. Cardiotoxicity is a serious adverse effect with ventricular dysrhythmias. Toxicity of this medication typically occurs at greater than 2 ng/mL, but some patients may have signs and symptoms at lower levels. Pediatric patients typically present with bradycardia or arrhythmias if toxicity is occurring.

Decreased renal function, hypokalemia, hypercalcemia, and hypomagnesemia may increase risk for digoxin toxicity.

Common side effects include GI symptoms, headache, weakness, dizziness, anxiety, depression, delirium, and hallucination.\(^3\)

**Patient Teaching & Education**

The patient should be instructed to follow the prescribed dosing regimen and take medications at the same time each day. The patient should be cautious not to double up on medication doses. Additionally, the patient should consult the healthcare provider if two or more doses of medication are missed for follow-up instruction.

Patients should receive education regarding pulse rate monitoring and report any pulse rate less than 60. If the patient experiences signs of digoxin toxicity, this should be reported to the provider immediately. The medication should be stored in its original container and care should be taken not to mix the medication with other medications.\(^4\)

Now let’s take a closer look at the medication grid for digoxin in Table 6.7a.\(^5\)

<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>Cardiac glycosides</td>
<td>digoxin</td>
<td>Assess apical heart rate</td>
<td>Increased cardiac output</td>
<td>Digoxin toxicity; early signs include nausea, vomiting, and diarrhea</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Assess serum digoxin and potassium levels</td>
<td></td>
<td>Bradycardia and arrhythmias</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Assess for signs and symptoms of digoxin toxicity</td>
<td></td>
<td>Headache, weakness, dizziness, and mental changes such as anxiety or hallucinations</td>
</tr>
</tbody>
</table>

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\(^3\) Common side effects include GI symptoms, headache, weakness, dizziness, anxiety, depression, delirium, and hallucination.

\(^4\) Patients should be instructed to follow the prescribed dosing regimen and take medications at the same time each day. The patient should be cautious not to double up on medication doses. Additionally, the patient should consult the healthcare provider if two or more doses of medication are missed for follow-up instruction.

\(^5\) Patients should receive education regarding pulse rate monitoring and report any pulse rate less than 60. If the patient experiences signs of digoxin toxicity, this should be reported to the provider immediately. The medication should be stored in its original container and care should be taken not to mix the medication with other medications.
Critical Thinking Activities 6.7a

1. Why should a nurse assess the apical pulse for 1 full minute before administering digoxin?
2. How does a nurse evaluate if digoxin is effective?
3. Why must the nurse monitor serum potassium levels as well as digoxin levels?
4. A nurse enters a patient’s room and the patient complains “My vision seems strange and I feel nauseated.” What is the nurse’s next best action?

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

Digibind

Digibind is used to treat digoxin toxicity.

**Mechanism of Action**

Digibind binds to digoxin molecules, reducing free digoxin.

**Indications for Use**

This medication is the antidote for digoxin. Digibind will be administered when a patient is experiencing life-threatening digoxin toxicity.

**Nursing Considerations Across the Lifespan**
There are no contraindications when using digibind.

**Adverse/Side Effects**

The most common effects a patient may experience are to have worsening heart failure, worsening atrial fibrillation, and hypokalemia.\(^5\)

**Patient Teaching & Education**

The patient should report any signs of worsening heart failure, atrial fibrillation, or hypokalemia immediately to the healthcare provider.\(^7\)

Now let's take a closer look at the medication grid for digibind in Table 5.6b.\(^8\)

### Table 5.6b Medication Grid for Digibind

<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>Antidote</td>
<td>digoxin immune fab (Digibind)</td>
<td>Give when patients are experiencing life-threatening digoxin toxicity</td>
<td>Reduce free digoxin</td>
<td>Worsening heart failure</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Worsening atrial fibrillation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Hypokalemia</td>
</tr>
</tbody>
</table>

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4. uCentral from Unbound Medicine. [https://www.unboundmedicine.com/ucentral](https://www.unboundmedicine.com/ucentral) \(^4\)
5. This work is a derivative of Daily Med by U.S. National Library of Medicine in the public domain. \(^5\)
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