6.10: Antihypertensives

Many different medication classifications are used to treat hypertension. It is important to understand the different mechanisms of action for different classes of antihypertensives because patients are often on a combination of medications that work synergistically to manage blood pressure. These medications are also discussed in the “Autonomic Nervous System” chapter, with more information provided regarding the specific receptors they affect.

Alpha-2 Agonist

Clonidine is an Alpha-2 agonist. You can read more information about Alpha-2 agonists in the “Autonomic Nervous System” chapter.

Mechanism of Action

Clonidine stimulates the alpha-adrenergic receptors, resulting in vasodilation and decreased blood pressure, thus decreasing peripheral resistance, increased blood flow to the kidneys, and decreased afterload.

Indications for Use

Clonidine is used to treat hypertension and ADHD.

Nursing Considerations Across the Lifespan

Monitor BP and pulse rate. Dosage is usually adjusted to patient’s blood pressure because it can cause hypotension, bradycardia, and sedation. Rebound hypertension may occur if stopped abruptly.[1]

Patient Teaching & Education
Patients should be compliant with medication therapy and take the medication at the same time each day. They should be careful not to take more than the prescribed dose within a 24-hour period. Do not abruptly cease medication as rebound hypertension might occur. Medications may cause orthostatic changes so individuals should change positions slowly. Additionally, medications may cause dry mouth and dry eyes. Individuals should also avoid the use of alcohol and other CNS depressants while taking these medications. [2]

Now let’s take a closer look at the medication grid for clonidine in Table 6.10a. [3]

<table>
<thead>
<tr>
<th>Class</th>
<th>Prototype</th>
<th>Administration Considerations</th>
<th>Therapeutic Effects</th>
<th>Adverse Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha-2 Agonist</td>
<td>clonidine</td>
<td>Monitor blood pressure and pulse rate frequently</td>
<td>Treat hypertension or ADHD</td>
<td>Hypotension</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dosage is usually adjusted to patient’s BP and tolerance</td>
<td></td>
<td>Bradycardia</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sedation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Rebound HTN if stopped abruptly</td>
</tr>
</tbody>
</table>

**Beta-1 Antagonist**

**Metoprolol** is a selective Beta-1 blocker. You can read more information about Beta-1 antagonists in the “Autonomic Nervous System” chapter.

**Mechanism of Action**

Metoprolol primarily blocks Beta-1 receptors in the heart, causing decreased heart rate and decreased blood pressure. However, higher doses can also block Beta-2 receptors in the lungs, causing bronchoconstriction.

**Indications for Use**

Metoprolol is commonly used to treat high blood pressure, chest pain due to poor blood flow to the heart, and several heart conditions involving an abnormally fast heart rate. It is used as an early intervention during myocardial infarction (MI) to reduce workload of the heart.

**Nursing Considerations Across the Lifespan**

ER formulations should not be crushed. Assess patient’s apical pulse rate before administering; if it is less than 60 beats/minute, withhold the drug and call the prescriber immediately, unless other parameters are provided. In diabetic patients, monitor glucose level closely because the drug masks common signs and symptoms of hypoglycemia.

**Adverse Effects**
The most serious potential adverse effects are shortness of breath, bradycardia, and worsening heart failure. Other adverse effects include fatigue, dizziness, depression, insomnia, nightmares, GI upset, erectile dysfunction, dyspnea, and wheezing. Black Box Warning: When stopping therapy, taper dosage over 1 to 2 weeks because abrupt discontinuation may cause chest pain or MI.\(^4\)

**Patient Teaching & Education**

Patients should be compliant with medication therapy and take the medication at the same time each day. Do not abruptly cease medication as arrhythmias, hypertension, or ischemia may develop. Patients and families should be instructed to check pulse and blood pressure and report abnormalities to the healthcare provider. Additionally, these medications may cause side effects of dizziness and cold sensitivity.\(^5\)

Now let’s take a closer look at the medication grid for metoprolol in Table 6.10b.\(^6\)

**Table 6:10b Medication Grid for Metoprolol**

<table>
<thead>
<tr>
<th>Class</th>
<th>Prototype – generic</th>
<th>Administration Considerations</th>
<th>Therapeutic Effects</th>
<th>Adverse Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta-1 Antagonist</td>
<td>Selective B blocker: metoprolol</td>
<td>Do not crush ER formulations&lt;br&gt;Always assess apical HR and if less than 60, do not administer and call the prescriber unless other parameters are provided&lt;br&gt;Monitor blood sugar in diabetic patients because drug can mask symptoms of hypoglycemia</td>
<td>Decreases blood pressure or controls rapid heart rate</td>
<td>Most serious: hypotension, bradycardia, and worsening HF&lt;br&gt;Other: CNS: fatigue, dizziness, depression, insomnia, nightmares&lt;br&gt;GI upset&lt;br&gt;GU: erectile dysfunction&lt;br&gt;Respiratory: dyspnea and wheezing</td>
</tr>
</tbody>
</table>

**ACE Inhibitor (Angiotensin Converting Enzyme)**

Captopril is an example of an ACE (angiotensin converting enzyme) inhibitor.

**Mechanism of Action**

https://med.libretexts.org/Bookshelves/Nursing/Nursing_Pharmacology_(OpenRN)/06%3A_Cardiovascular_and_Renal_Syste...
This medication blocks the conversion of Angiotensin I to Angiotensin II in the renin-angiotensin-aldosterone system. This will lead to vasodilation and sodium and water excretion by blocking aldosterone. See more information about the renin-angiotensin-aldosterone system in the “Review of Basic Concepts” section of this chapter.

**Indications for Use**

Captopril is used to treat hypertension and heart failure. This medication also helps reduce diabetic nephropathy.

**Nursing Considerations Across the Lifespan**

Do not administer to patients who are pregnant. Use with caution with patients who have diabetes.

Avoid use with other medications that increase potassium. This medication may increase risk for lithium toxicity.

**Adverse/Side Effects**

Black Box Warning: Patients who become pregnant should discontinue this medication due to the risk of fetal harm or fetal death.

Patients taking this medication may experience hypotension, cough, hyperkalemia, increased risk for infection, angioedema, anaphylactoid reactions, or proteinuria. Patients who experience increased facial swelling or difficulty swallowing or breathing should seek emergency medical attention. Report a persistent cough or angioedema to the health care provider. [7]

**Patient Teaching & Education**

Medications should be taken as directed. Patients taking ACE inhibitors should be cautioned to avoid salt substitutes or foods high in potassium. Additionally, the medication may alter the sense of taste, but this generally resolves within 2-3 months of medication therapy.

Patients taking ACE inhibitors may also experience a persistent cough throughout the duration of medication therapy. [8]

Now let’s take a closer look at the medication grid for captopril in Table 6.10c.

### Table 6:10c Captopril 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>ACE Inhibitor</td>
<td>captopril</td>
<td>Black Box Warning: Do not use while pregnant</td>
<td>Decrease blood pressure</td>
<td>Hypotension</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitor blood pressure</td>
<td>Decrease fluid volume status</td>
<td>Cough</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Report cough</td>
<td></td>
<td>Hyperkalemia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Assess for facial swelling or</td>
<td></td>
<td>Neutropenia or</td>
</tr>
</tbody>
</table>

[7][8]
Angiotensin II Receptor Blocker (ARB)

Losartan is an example of an Angiotensin II receptor blocker, also referred to as an ARB. ARBs are similar to ACE inhibitors in that they act on the renin-angiotensin-aldosterone system (RAAS). However, the difference is that they block Angiotensin II and cause vasodilation and decreased peripheral resistance, but are not likely to cause the cough that ACE inhibitors can.

**Mechanism of Action**

Losartan blocks Angiotensin II in the renin-angiotensin-aldosterone system to produce vasodilation.

**Indications for Use**

ARB is used for treatment of hypertension and to prevent nephropathy in diabetic patients.

**Nursing Considerations Across the Lifespan**

Do not administer to patients who are pregnant. It is not recommended for children under 6. Anticipate dosage adjustment with hepatic impairment. This drug can cause renal impairment and hyperkalemia.

**Adverse/Side Effects**

Black Box Warning: Patients who become pregnant should discontinue this medication due to the risk of fetal harm or fetal death.

Patients taking this medication may experience hypotension, dizziness, increased risk for infection, angioedema, or proteinuria. Patients who experience increased facial swelling or difficulty swallowing or breathing should seek emergency medical attention.

**Patient Teaching & Education**

Medications should be taken as directed at the same time each day. Patients should not discontinue therapy unless directed to by their healthcare provider. Patients should be careful to avoid salt substitutes and foods with high levels of potassium. ARBs may cause orthostatic changes and patients should be cautioned to change positions slowly.\(^{10}\)
Now let’s take a closer look at the medication grid for losartan in Table 6.10d.

Table 6.10d Medication Grid for Losartan

<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>ARB</td>
<td>losartan (Cozaar)</td>
<td>Black Box Warning: Do not use while pregnant</td>
<td>Decrease blood pressure</td>
<td>Hypotension and dizziness, Hyperkalemia, Proteinuria</td>
</tr>
</tbody>
</table>

Critical Thinking Activity 6.10

A male 65-year-old patient has the following medications ordered: metoprolol succinate 100 mg daily, lisinopril 5 mg daily, verapamil ER 100 mg daily, and hydrochlorothiazide 25 mg daily. He has a history of hyperlipidemia, hypertension, and coronary artery disease. The patient asks the nurse, “Why do I have to take so many medications?”

1. What is the class and mechanism of action of each of these medications?
2. What is the nurse’s best response to the patient’s question?

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

Vasodilator

Hydralazine is an example of a direct vasodilator.

Mechanism of Action

Hydralazine’s direct mechanism of action is unknown, but it causes vasodilation via direct relaxation of vascular smooth muscle. Peripheral vasodilation results in a reduction of blood pressure and decreased vascular resistance, resulting in increased cardiac output.
Indications for Use

Vasodilators are used to treat hypertension.

Nursing Considerations Across the Lifespan

Use with caution in patients with coronary artery disease, mitral valve rheumatic heart disease, and cerebral vascular accidents.

This medication should only be used in pregnancy if the benefits outweigh the risks due to lack of safety studies.

Adverse/Side Effects

Patients should be monitored for infection and are at risk of developing systemic lupus erythematosus (SLE). SLE is a chronic disease that causes inflammation in connective tissues. The signs and symptoms of SLE vary among affected individuals and can involve many organs and systems, including the skin, joints, kidneys, lungs, central nervous system, and blood-forming (hematopoietic) system. A characteristic sign of SLE is a flat, red rash across the cheeks and bridge of the nose. This rash is called a “butterfly rash” because of its shape.

Hypotension, palpitations, angina, tremors, numbness, tingling, disorientation, nasal congestion, headache, nausea, vomiting, and diarrhea are effects associated with hydralazine. [12]

Patient Teaching & Education

Patients should remain compliant with the therapeutic dosing regimen, even if symptoms resolve. 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 be instructed to monitor their weight and assess for fluid retention in the feet and ankles. Additionally, the medication can cause side effects of orthostatic hypotension and drowsiness. [13]

Now let's take a closer look at the medication grid on hydralazine in Table 6.10e. [14]

Table 6:10e Medication grid for Hydralazine

<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>Vasodilator</td>
<td>hydralazine (Apresoline)</td>
<td>Monitor blood pressure Obtain complete blood count (CBC) and antibody titers prior to beginning this medication Report signs and symptoms of infection</td>
<td>Reduce blood pressure</td>
<td>Systemic lupus erythematosus (SLE) Hypotension, palpitations, and angina Tremors, numbness, tingling, and</td>
</tr>
</tbody>
</table>

https://med.libretexts.org/Bookshelves/Nursing/Nursing_Pharmacology_(OpenRN)/06%3A_Cardiovascular_and_Renal_Syste...
| **disorientation** |  |
| **Nasal congestion** |  |
| **Headache, nausea, vomiting, and diarrhea** |  |

1. This work is a derivative of Daily Med by [U.S. National Library of Medicine](https://med.libretexts.org/Bookshelves/Nursing/Nursing_Pharmacology_(OpenRN)/06%3A_Cardiovascular_and_Renal_Syste...) in the public domain.
2. uCentral from Unbound Medicine. [https://www.unboundmedicine.com/ucentral](https://www.unboundmedicine.com/ucentral)
3. This work is a derivative of Daily Med by [U.S. National Library of Medicine](https://med.libretexts.org/Bookshelves/Nursing/Nursing_Pharmacology_(OpenRN)/06%3A_Cardiovascular_and_Renal_Syste...) in the public domain.
4. This work is a derivative of Daily Med by [U.S. National Library of Medicine](https://med.libretexts.org/Bookshelves/Nursing/Nursing_Pharmacology_(OpenRN)/06%3A_Cardiovascular_and_Renal_Syste...) in the public domain.
5. uCentral from Unbound Medicine. [https://www.unboundmedicine.com/ucentral](https://www.unboundmedicine.com/ucentral)
6. This work is a derivative of Daily Med by [U.S. National Library of Medicine](https://med.libretexts.org/Bookshelves/Nursing/Nursing_Pharmacology_(OpenRN)/06%3A_Cardiovascular_and_Renal_Syste...) in the public domain.
7. This work is a derivative of Daily Med by [U.S. National Library of Medicine](https://med.libretexts.org/Bookshelves/Nursing/Nursing_Pharmacology_(OpenRN)/06%3A_Cardiovascular_and_Renal_Syste...) in the public domain.
8. uCentral from Unbound Medicine. [https://www.unboundmedicine.com/ucentral](https://www.unboundmedicine.com/ucentral)
9. This work is a derivative of Daily Med by [U.S. National Library of Medicine](https://med.libretexts.org/Bookshelves/Nursing/Nursing_Pharmacology_(OpenRN)/06%3A_Cardiovascular_and_Renal_Syste...) in the public domain.
10. uCentral from Unbound Medicine. [https://www.unboundmedicine.com/ucentral](https://www.unboundmedicine.com/ucentral)
11. This work is a derivative of Daily Med by [U.S. National Library of Medicine](https://med.libretexts.org/Bookshelves/Nursing/Nursing_Pharmacology_(OpenRN)/06%3A_Cardiovascular_and_Renal_Syste...) in the public domain.
12. This work is a derivative of Daily Med by [U.S. National Library of Medicine](https://med.libretexts.org/Bookshelves/Nursing/Nursing_Pharmacology_(OpenRN)/06%3A_Cardiovascular_and_Renal_Syste...) in the public domain.
13. uCentral from Unbound Medicine. [https://www.unboundmedicine.com/ucentral](https://www.unboundmedicine.com/ucentral)
14. This work is a derivative of Daily Med by [U.S. National Library of Medicine](https://med.libretexts.org/Bookshelves/Nursing/Nursing_Pharmacology_(OpenRN)/06%3A_Cardiovascular_and_Renal_Syste...) in the public domain.