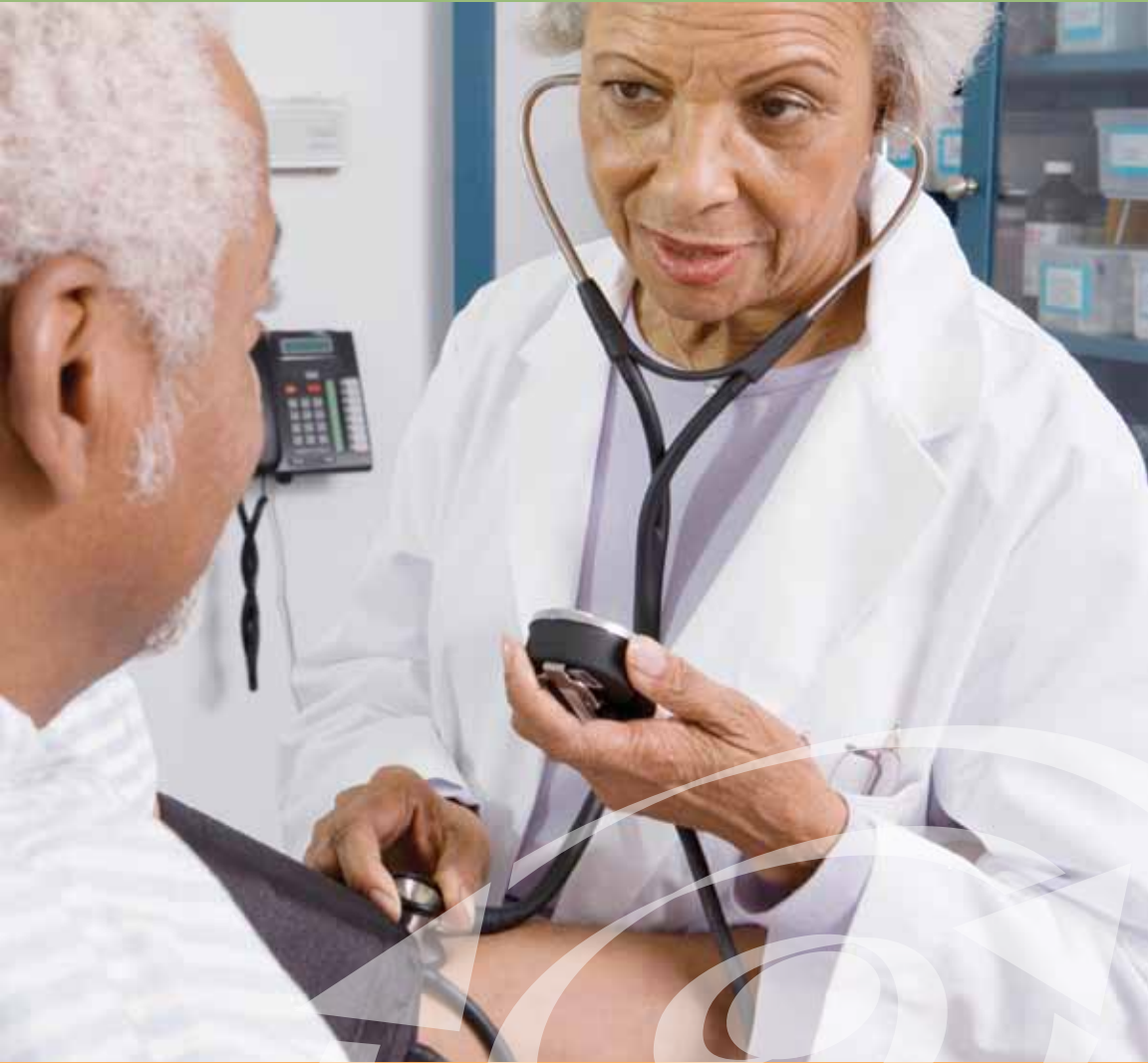




Effective Health Care Program

# Choosing Medicines for High Blood Pressure

A Review of the Research on ACEIs, ARBs, and DRIs



Agency for Healthcare Research and Quality  
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## Is This Information Right for Me?

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### Yes, if:

- Your doctor says you have high blood pressure.
- Your doctor asked you to consider taking one or more of these medicines:
  - Angiotensin-converting enzyme inhibitors (ACEIs).
  - Angiotensin II receptor blockers/antagonists (ARBs).
  - Direct renin inhibitor (DRI). Currently, there is only 1 DRI, a drug called aliskiren.

Some people are more likely to be given an ACEI, ARB, or a DRI for their high blood pressure. These include people who also have type 2 diabetes, congestive heart failure, or kidney disease.

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### No, if:

- Your blood pressure is not high enough for a doctor to suggest taking medicine to control it.
  - Your doctor suggests you take other medicines for your high blood pressure that are not ACEIs, ARBs, or DRI.
  - You are under 18. The research was only done with adults.
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### What does this summary cover?

You will learn what research says about three types of medicine for high blood pressure, how well they work, how they compare to each other, and their side effects. This information can help you talk with your doctor as you decide which ACEI, ARB, or DRI is best for you.

## Where does the information come from?

The information comes from a report that looked at 110 studies on these medicines. The review was conducted by a research team at Duke University and paid for by the Agency for Healthcare Research and Quality, a Federal government research agency. You can read the full report at [www.effectivehealthcare.ahrq.gov/acearbhbpcfm](http://www.effectivehealthcare.ahrq.gov/acearbhbpcfm).

Names of ACEIs, ARBs, and DRI		
Type	Drug Name (Brand Name)	Available in Generic?
ACEI	Benazepril (Lotensin <sup>®</sup> )	Yes
	Captopril (Capoten <sup>®</sup> )	Yes
	Enalapril (Vasotec <sup>®</sup> )	Yes
	Fosinopril (Monopril <sup>®</sup> )	Yes
	Lisinopril (Prinivil <sup>®</sup> or Zestril <sup>®</sup> )	Yes
	Moexipril (Univasc <sup>®</sup> )	Yes
	Perindopril (Aceon <sup>®</sup> )	Yes
	Quinapril (Accupril <sup>®</sup> )	Yes
	Ramipril (Altace <sup>®</sup> )	Yes
	Trandolapril (Mavik <sup>®</sup> )	Yes
ARB	Candesartan (Atacand <sup>®</sup> )	No
	Eprosartan (Teveten <sup>®</sup> )	No
	Irbesartan (Avapro <sup>®</sup> )	No
	Losartan (Cozaar <sup>®</sup> )	Yes
	Olmesartan medoxomil (Benicar <sup>®</sup> )*	No
	Telemisartan (Micardis <sup>®</sup> )	No
DRI	Valsartan (Diovan <sup>®</sup> )	No
	Aliskiren (Tekturna <sup>®</sup> )	No

\* This ARB was not included in any of the studies.

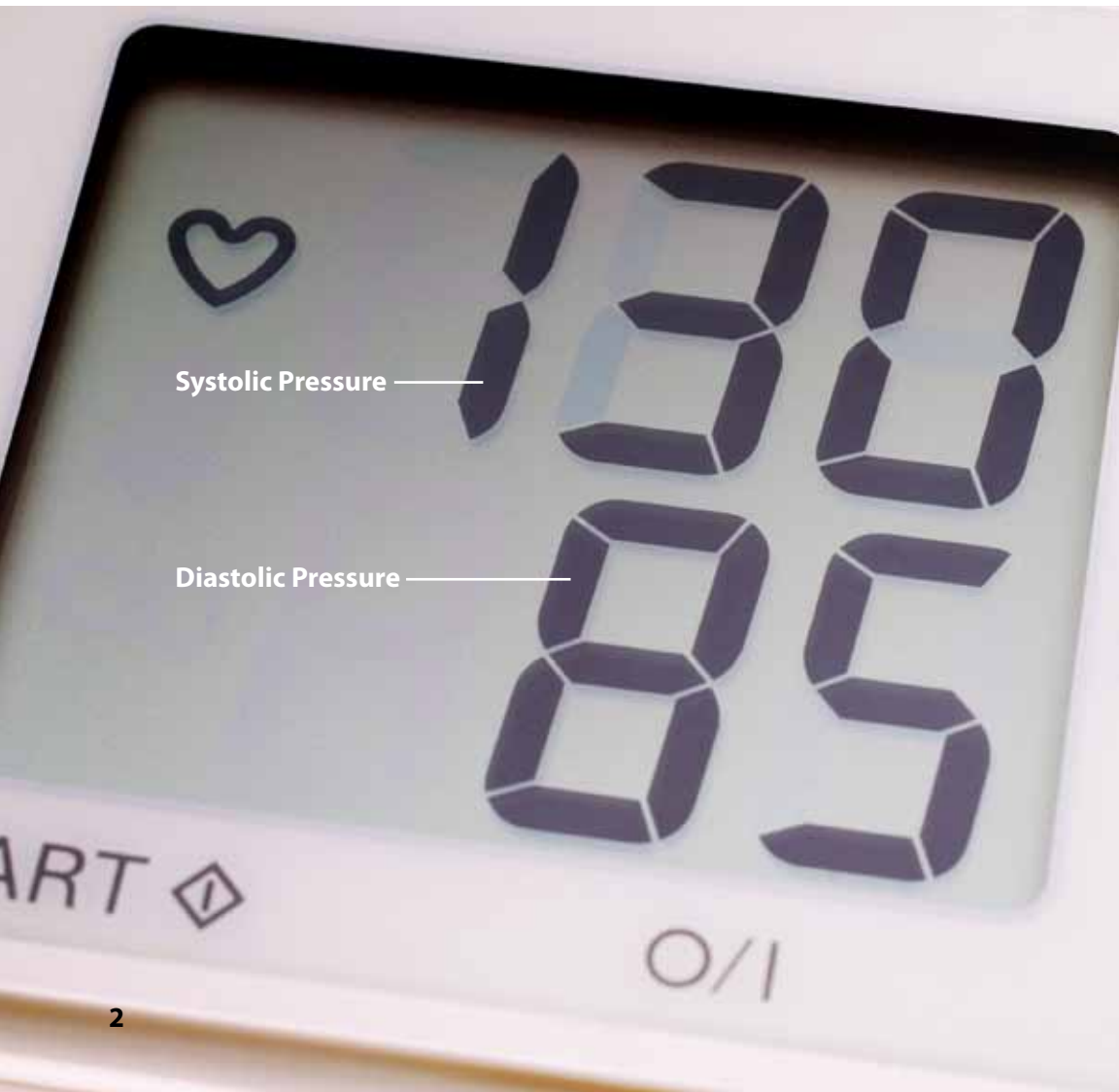


## About Your Condition

### What is high blood pressure?

“Blood pressure” is the force of blood in your arteries as the heart pumps blood. This pressure is measured by two numbers:

- The top number, or “systolic” pressure, is the force when the heart beats.
- The bottom number, or “diastolic” pressure, is the force when the heart relaxes between beats.
- These numbers are usually given together.



Your blood pressure rises and falls a small amount during the day, but doctors can tell from several readings over time if your average blood pressure is higher than normal. Normal blood pressure is less than 120/80. This means that the force of blood when your heart beats is 120, and the force is 80 when your heart is between beats.

High blood pressure, or “hypertension,” usually refers to blood pressure that is 140/90 or higher.

### **How common is high blood pressure?**

High blood pressure is one of the most common health problems in America. Although people of all ages can have high blood pressure, it is more common in people who are over 65 years old. The National Center for Health Statistics states that African Americans get high blood pressure more often, and at an earlier age, than other races. More African American women than men have the condition. High blood pressure is more common for people who are overweight, eat salty foods, drink a lot of alcohol, smoke tobacco, or do not exercise regularly.

### **Why treat high blood pressure?**

High blood pressure makes the heart work too hard, can cause narrowing of the arteries, and can lead to heart disease, heart attack, kidney disease, and stroke.

### **Where can I learn more about high blood pressure?**

To get more general information about the condition of high blood pressure, you can read *Your Guide to Lowering High Blood Pressure* at [www.nhlbi.nih.gov/hbp/](http://www.nhlbi.nih.gov/hbp/). That guide is published by the National Heart, Lung, and Blood Institute.

### How is high blood pressure treated?

In addition to exercising, eating a healthy diet, quitting smoking, and drinking less alcohol, your doctor may want you to take one or more medicines to help control your blood pressure.

Many medicines help treat high blood pressure. Each type works differently to lower blood pressure.

### ACEIs, ARBs, and DRI

Three types of high blood pressure medicine work in a similar way: They work on the “renin angiotensin” system. This system raises your blood pressure.

- Angiotensin-converting enzyme inhibitors (ACEIs)
- Angiotensin II receptor blockers/antagonists (ARBs)
- Direct renin inhibitor (DRI)

Some people are more likely to be given an ACEI, ARB, or DRI. These include people who have type 2 diabetes, congestive heart failure, or kidney disease.

Each of these medicines are taken as pills. They require a prescription from your doctor. Many come in a generic form, which costs less.

### Which is better?

The research review on these drugs found that:

- All ACEIs and ARBs help lower blood pressure about the same amount.
- All ACEIs and ARBs protect the kidneys about the same amount.
- ACEIs and ARBs do not have any effect – good or bad – on blood sugar levels or cholesterol (fat) in your blood.
- DRIs are new medications so there is not yet enough research on how they compare to ACEIs and ARBs.

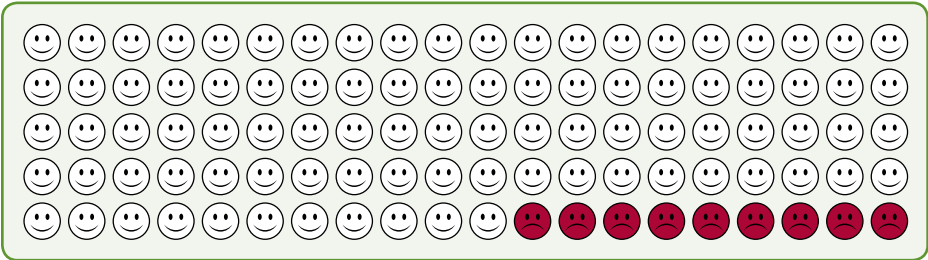




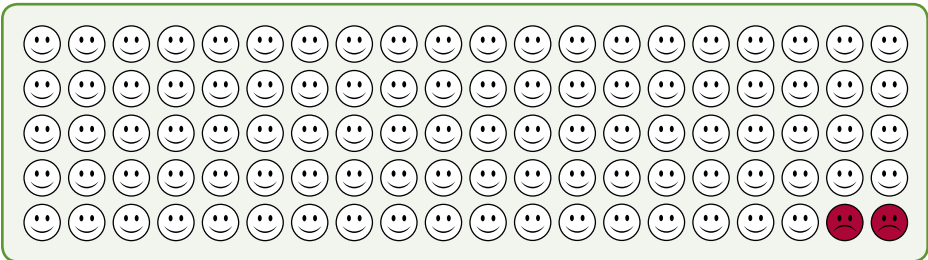
## What are the side effects of these medicines?

- The most common side effects from these medicines are a dry cough, headache, and dizziness. All three types of medicine cause about the same amount of headaches and dizziness.
- People who take ACEIs are more likely to get a dry cough than people who take ARBs.

About 9 out of 100 people taking an ACEI get a dry cough.



About 2 out of 100 people taking an ARB get a dry cough.



- Although it is very rare, ACEIs, ARBs, and DRI can cause sudden swelling of the tongue, lips, throat, hands, or feet. This is called “angioedema” (pronounced an-gee-o-uh-DEE-mah). If this happens, call your doctor right away. This could be an emergency.

ACEIs, ARBs, and DRIs can cause serious birth defects. If you are or think you may become pregnant, tell your doctor and ask what you should do.





## Making a Decision

You and your doctor can decide together which ACEI, ARB, or DRI might be best for you. Talk about:

- What research says about the benefits and side effects of these medicines.
- How blood pressure medicine could affect other conditions you may have such as heart disease or diabetes.
- The costs of the medicines.
- How the side effects might affect your daily life.
- How these medicines may interact with other medicines you are taking or certain foods.

For the medicine to work, it is important to take it every day. Talk with your doctor or nurse about what time is best to take your medicine, and other ways to remember to take it every day.



## What are the costs?

The amount you will have to pay will depend on:

- Whether you take a generic or a brand-name medicine.
- How much medicine you need to take.
- Your insurance plan copay.

ACEIs				
Generic Drug Name	Brand Name	Dose for High Blood Pressure <sup>1</sup>	Price for 1-Month Supply	
			Generic <sup>2</sup>	Brand <sup>3</sup>
Benazepril	Lotensin®	10 mg daily	\$30	\$65
		20 mg daily	\$50	\$65
		40 mg daily	\$40	\$65
Captopril	Capoten®	25 mg twice a day	\$55	\$130
		50 mg twice a day	\$80	\$170
Enalapril	Vasotec®	5 mg daily	\$45	\$90
		10 mg daily	\$50	\$100
		20 mg daily	\$65	\$140
		20 mg twice a day	\$135	\$280
Fosinopril	Monopril®	10 mg daily	\$80	\$55
Lisinopril	Prinivil®; Zestril®	10 mg daily	\$30	\$40; \$50
		20 mg daily	\$40	\$40; \$50
		40 mg daily	\$50	\$80; \$75
Moexipril	Univasc®	7.5 mg daily	\$45	\$75
		15 mg daily	\$50	\$80
		15 mg twice a day	\$100	\$160
Perindopril	Aceon®	2 mg daily	\$60	\$70
		4 mg daily	\$70	\$80
		8 mg daily	\$85	\$100
Quinapril	Accupril®	10 mg daily	\$40	\$60
		20 mg daily	\$40	\$60
Ramipril	Altace®	2.5 mg daily	\$55	\$80
		5 mg daily	\$60	\$85
		10 mg daily	\$70	\$100
Trandolapril	Mavik®	1 mg daily	\$35	\$50
		2 mg daily	\$35	\$50

<sup>1</sup> Doses are similar to those used in the research studies. <sup>2</sup> Median average wholesale price for generic from *Red Book: Pharmacy's Fundamental Reference*, 2011. <sup>3</sup> Average wholesale price for brand, rounded to the nearest \$5, from *Red Book: Pharmacy's Fundamental Reference*, 2011.

ARBs				
Generic Drug Name	Brand Name	Dose for High Blood Pressure <sup>1</sup>	Price for 1-Month Supply	
			Generic <sup>2</sup>	Brand <sup>3</sup>
Candesartan	Atacand <sup>®</sup>	4 mg daily	NA	\$80
		8 mg daily		\$80
		16 mg daily		\$80
Eprosartan	Teveten <sup>®</sup>	400 mg daily	NA	\$100
		600 mg daily		\$115
		400 mg twice a day		\$195
Irbesartan	Avapro <sup>®</sup>	150 mg daily	NA	\$95
		300 mg daily		\$115
Losartan	Cozaar <sup>®</sup>	25 mg daily	\$50	\$65
		50 mg daily	\$70	\$85
		100 mg daily	\$95	\$115
Olmesartan	Benicar <sup>®</sup>	20 mg daily	NA	\$90
		40 mg daily		\$125
Telmisartan	Micardis <sup>®</sup>	20 mg daily	NA	\$110
		40 mg daily		\$110
		80 mg daily		\$110
Valsartan	Diovan <sup>®</sup>	80 mg daily	NA	\$90
		160 mg daily		\$100
DRIs				
Aliskiren	Tekturna <sup>®</sup>	150 mg daily	NA	\$100
		300 mg daily		\$120

<sup>1</sup> Doses are similar to those used in the research studies. <sup>2</sup> Median average wholesale price for generic from *Red Book: Pharmacy's Fundamental Reference*, 2011. <sup>3</sup> Average wholesale price for brand, rounded to the nearest \$5, from *Red Book: Pharmacy's Fundamental Reference*, 2011. Abbreviations: NA = not available





### **What else can I do to lower my blood pressure?**

You can do other things to control your blood pressure in addition to taking medicine:

- Lose weight.
- Exercise regularly.
- Drink less alcohol.
- Do not smoke.

Ask your doctor or nurse to help you start making changes.





## Ask your doctor

- How will this medicine affect my work and daily life?
- How will we know the medicine is lowering my blood pressure?
- When should I tell you if I get a side effect from the medicine, and what can we do about it?
- Will this medicine affect other medicines I take?
- Are there foods I should not eat while on this medicine?
- Could I choose an ACEI, ARB, or DRI that fits my budget, or are there reasons I should take a certain one?

### Write other questions here:

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### Write the answers here:

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## Source

The information comes from the report *Angiotensin-Converting Enzyme Inhibitors (ACEIs), Angiotensin II Receptor Antagonists (ARBs), and Direct Renin Inhibitors for Treating Essential Hypertension: An Update*. It was produced by the Duke University Evidence-based Practice Center with funding by the Agency for Healthcare Research and Quality (AHRQ). For a copy of the report or for more information about AHRQ and the Effective Health Care Program, go to [www.effectivehealthcare.ahrq.gov/acearbhbpcfm](http://www.effectivehealthcare.ahrq.gov/acearbhbpcfm). Additional information came from the MedlinePlus® Web site, a service of the U.S. National Library of Medicine and the National Institutes of Health. This site is available at [www.nlm.nih.gov/medlineplus](http://www.nlm.nih.gov/medlineplus).

This summary guide was prepared by the John M. Eisenberg Center for Clinical Decisions and Communications Science at Baylor College of Medicine, Houston, TX.

