BioEd℠

Teacher's Guide

Scientific Decision-making

Comparative Effectiveness Decision-making Tools

 ISBN: 978-1-888997-84-2

Baylor College of Medicine

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About the Project

Baylor College of Medicine

CENTER FOR EDUCATIONAL OUTREACH

The Scientific Decision-making curricular unit, produced as part of the project entitled AHRQ's Ischemic Heart Disease Products Translated for High School Populations, was funded by a grant (R18HS019248) from the Agency for Healthcare Research and Quality (AHRQ).
The project's goal is to develop—and evaluate the effectiveness of—high school-level teaching materials focusing on evidence-based decision-making using examples related to cardiovascular health.

Activities described in this book are intended for middle or high school students under direct supervision of adults. The authors, Baylor College of Medicine and AHRQ cannot be held responsible for any accidents or injures that may result from conduct of the activities, from not specifically following directions, or from ignoring cautions contained in the text. The opinions, findings and conclusions expressed in this publication are solely those of the authors and do not necessarily reflect the views of BCM or the sponsoring agency.

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BioEd℠ Teacher Resources from the Center for Educational Outreach at Baylor College of Medicine.

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We are especially grateful to the many classroom teachers in the Houston area who participated in the field tests of these materials and provided invaluable feedback.

All persons depicted in photographs throughout this guide are models and their images are used strictly for illustrative purposes only. The images are not intended to represent the model, nor any person living or deceased.

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Setup: 30 minutes | **Class:** One or two 45-minute class periods

Comparative Effectiveness Decision-making Tools

Overview

Students will use information from real patient decision aids to determine if a supplemental drug treatment is advisable for each of the three characters followed throughout the unit.

Modern healthcare often provides more than one option for treating disease or reducing risk for developing health problems. Increasingly, government agencies and private organizations are producing tools to help patients and their doctors collaborate on healthcare decisions that are based on the latest scientific information available and patient preferences. Sometimes, the best decision is not clear-cut. Potential benefits and side effects, cost, interactions among medications, and patient behaviors and beliefs all influence the decision-making process.

Comparative effectiveness research helps physicians and patients make better decisions by presenting evidence on the effectiveness, benefits and harms of different treatment options. The evidence is generated by research studies that compare different drugs, medical devices, tests or surgeries.

In this activity, students will learn about two medications shown to help some patients with stable ischemic heart disease (coronary artery disease), high blood pressure or a weakened left ventricle. Then, students will decide if the drugs might be suitable for Arturo, Brian and/or Angela.

Materials

Teacher

- Interactive white board or video projector and computer
- Internet access
- Copies of Part Three of the personal stories of Arturo, Brian and Angela (One set per team. Do not add to binder sections or folders until the activity is concluded.)
- Copies of the consumer guides, *ACE Inhibitors and ARBS to Protect Your Heart?* and *Choosing Medicines for High Blood Pressure* (one copy of each per student team, or a classroom set if teaching multiple classes)

Per Team of Students

- Binder or folder set with the personal stories of Arturo, Brian and Angela
- Copies of Part Three of the personal stories of Arturo, Brian and Angela (distribute at end of activity)
- Copies (print or digital) of the two decision-making consumer guides, *ACE Inhibitors and ARBS to Protect Your Heart* and *Choosing Medicines for High Blood Pressure*
- Copy of "Decision-making Guiding Questions" student sheet
- Three pieces of notebook paper on which to record decisions and reasons called for on the "Decision-making Guiding Questions" sheet (one page each for Arturo, Brian and Angela)

Setup

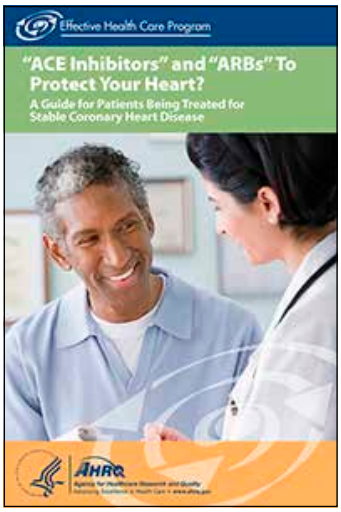
Make copies in advance. The two consumer guides, *ACE Inhibitors and ARBS to Protect Your Heart?* and *Choosing Medicines for High Blood Pressure*, may be printed, or students may use

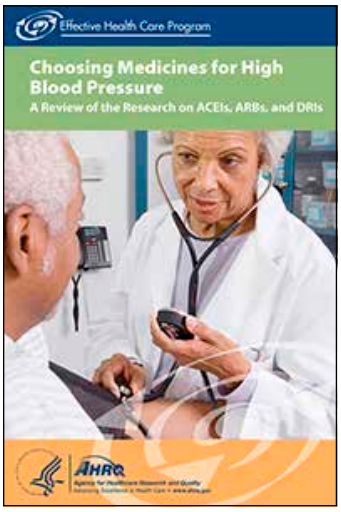
digital versions of the PDF documents on a computer or mobile device. The PDF versions can be found on the Effective Health Care Program website **(http://effectivehealthcare.ahrq.gov)**. Search by title once you have accessed the site.

Links to the PDF documents also can be found on the Scientific Decision-making resource page on BioEd Online **(http://www.bioedonline.org/lessons-and-more/resource-collections/scientific-decision-making/)**.

Have students work in teams of four. Place all reference materials in a central location prior to class.

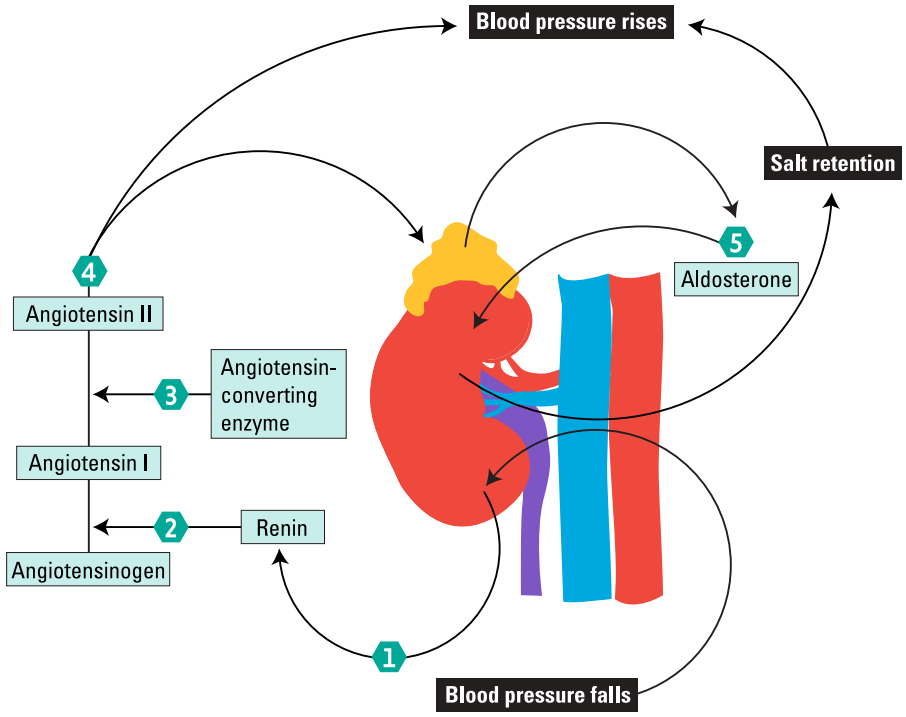
Effective Health Care Program





The Effective Health Care Program provides easy-to-read summaries and tools that can be used by consumers, doctors and policymakers **(http://www.effectivehealthcare.ahrq.gov/)**.

Medications for High Blood Pressure and Coronary Artery Disease (CAD)



Various hypertension and CAD medications work on different aspects of the cardiovascular system. Two common classes of medications work on the renin angiotensin system, which regulates blood volume and arterial pressure. The kidneys are the primary site of renin release.

One main product of the renin angiotensin system is angiotensin II, a hormone that causes blood vessels to constrict, and subsequently, an increase in blood pressure. Angiotensin II also stimulates secretion of the hormone, aldosterone, from the adrenal cortex. Aldosterone causes tubules of the kidneys to increase the levels at which sodium and water are reabsorbed into the blood. This leads to a higher volume of fluid in the body, which, in turn, elevates blood pressure.

Various medications lower blood pressure by blocking different parts of the renin angiotensin system. One class of medications prevents the enzyme, angiotensin converting enzyme (ACE), from converting the molecule, angiotensin I, into angiotensin II (see diagram,[6] step 3). Not surprisingly, these drugs are referred to as ACE inhibitors. Another class of medications, called angiotensin receptor blockers (ARBs), blocks the effects of the hormone, angiotensin, thereby preventing increases in blood pressure (occurs after step 4 in diagram).

Beta Blockers

Beta blockers are commonly prescribed for patients with high blood pressure. These drugs prevent stress hormones from bonding with receptors in the brain, heart, muscle tissues, eyes and vascular system, and reduce the intensity of the "fight or flight" reaction (which elevates blood pressure). Beta blockers lower arterial pressure by reducing the overall output of the heart from systolic compression, and also inhibit the release of renin from the kidneys.

Procedure

1. Prior to class, assign students the homework of reading the two consumer guides, *ACE Inhibitors and ARBS to Protect Your Heart?* and *Choosing Medicines for High Blood Pressure*. Alternately, have copies available in class for students to read as part of the lesson. See Setup for information on locating and downloading the guides.
2. Ask students if they have any questions about the information in the patient guides. Discuss the questions or post them on the board for follow-up later. Then ask, *Have any of you used materials like these guides, or helped a family member make a medical decision?*
3. Remind students about Arturo, Brian and Angela. Have volunteers present a brief overview and diagnosis of each case, from memory. [Arturo had appendicitis; Brian had a heart attack and two blocked arteries; Angela was pregnant and has high blood pressure.] Ask, *Do you think Arturo, Brian and Angela all have coronary heart disease, in addition to their immediate medical problems?*
4. Tell the class that all three characters will have medical follow-ups, during which they may receive prescriptions for one or more medication. Inform the class, *Now you will act as the personal physician for Arturo, Brian and Angela, and help them make a decision about one kind of medication.* Explain that physicians often take aggressive measures to reduce the risk for an initial or repeat heart attack in patients who have coronary artery disease or have had a heart attack. These measures may include drug treatments, lifestyle changes or even surgical procedures.
5. Tell students that they will be reviewing the medications described in the two patient guides. These medications, ACE Inhibitors and ARBs, are used to treat high blood pressure. They act on the hormone system that causes blood vessels to constrict and regulates fluid balance in the body. If you have advanced students, you may wish to explore regulation of blood pressure in greater depth [see "Medications for High Blood Pressure and Coronary Artery Disease (CAD)," page 2].
6. Instruct teams to use the consumer guides, *ACE Inhibitors and ARBs to Protect Your Heart* and *Choosing Medicines for High Blood Pressure*, to answer the questions on the "Decision-making Guiding Questions" student sheet for each patient.
7. Have student teams present their ideas for treatment options, and help the class come to consensus on the most appropriate medications for Arturo, Brian and Angela. Students should consider the following important points in their answers.
   - **Arturo** has high blood pressure, but no evidence of coronary artery disease, and no family history of coronary artery disease. He does not have congestive heart failure, diabetes or kidney disease, and did not have a heart attack. Thus, students should reach the conclusion that an ACE Inhibitor or ARB is not appropriate for Arturo at this time. Other blood pressure medications would be more suitable (have students refer to page 2 of both guides for further information).
   - **Brian** does have coronary artery disease and has had a heart attack. Even though his heart function does not appear to be damaged, students should conclude that an ACE Inhibitor or ARB might be advisable for Brian (in addition to other medications). Most physicians will prescribe an ACEI first, because it is less expensive and works as well as ARBs to reduce the risk of future heart attacks. However, ACEI drugs do cause a persistent cough in some patients, which warrants changing to an ARB.
   - **Angela** is pregnant and has high blood pressure, which might be a result of her pregnancy. She does not have coronary artery disease, congestive heart failure,

diabetes or kidney disease, and did not have a heart attack. Thus, students should conclude that ACE Inhibitors and ARBs are not appropriate for her treatment. In addition, many drugs are not prescribed for women who are pregnant.

8. Provide Part Three of each character's personal story to student groups, or project the stories for the class. If you have Internet access, show the video, Scientific Decision-making, Part Three **(http://www.bioedonline.org/lessons-and-more/resource-collections/scientific-decision-making/)**. If your school limits access to YouTube or Vimeo, download the video directly from BioEd Online.
9. Have students discuss the final outcomes for Arturo, Brian and Angela. and ask students the following.
   - *Did anything about these cases impress or surprise you?*
   - *How will the information you learned affect your own lifestyle decisions?*
   - *Have you learned anything that could help your family and friends?*
   - *Do you think you will share this information with them?*

Extensions or Homework

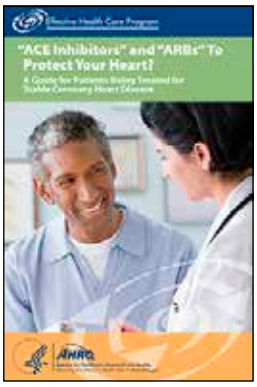
Show the online video, It's Time to Redesign Medical Data by Ted Goetz **(http://www.ted.com/talks/thomas_goetz_it_s_time_to_redesign_medical_data.html)**. Discuss the role of information in modern medicine, particularly the suggestions made in the video to reorganize medical data for consumers. Alternately, have students create their own colorful charts to make patient information, such as blood pressure readings, easier to understand and interpret. ■

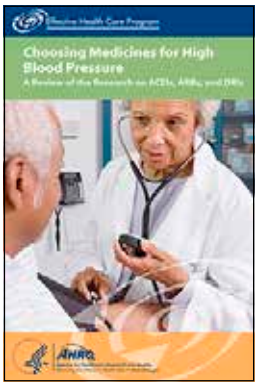
[6] Illustration from "Regulating Blood Pressure: The Renin-Antiostensin-Aldosterone System," The Merck Manual Home Health Handbook. (http://www.merckmanuals.com/home/heart_and_blood_vessel_disorders/high_blood_pressure/high_blood_pressure.html)

Decision-making Guiding Questions

Carefully read the two consumer guides, *ACE Inhibitors* (ACEI) *and ARBs to Protect Your Heart* and *Choosing Medicines for High Blood Pressure*. Both guides are designed to help patients make better decisions about medications.

Using information from the guides, your team must decide whether the medications described are appropriate for Arturo, Brian and Angela. On a separate sheet of paper, complete the steps below for each character.





1. Is either an ACE Inhibitor (ACEI) or ARB appropriate for this patient? Why? Answer the question Yes or No. To help you reach a decision, create a T-chart as shown below, listing reasons for or against using additional blood pressure drugs.

YES	NO
1.	1.
2.	2.
3.	3.

2. If you answered YES to question 1, decide whether an ACE Inhibitor or ARB is more appropriate. List the reasons that support your decision.

   Which is more appropriate, an ACE Inhibitor or ARB? _____
   List reasons to support your decision.

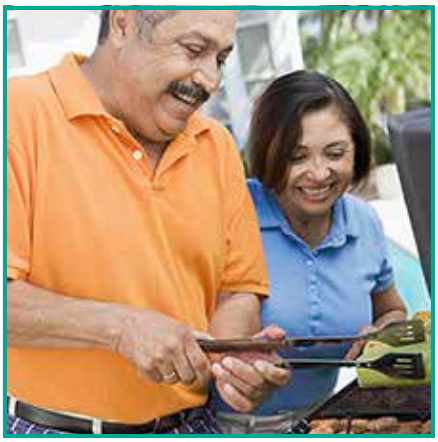
3. List the benefits and risks of the medication you have chosen (ACE Inhibitor or ARB) in a T-chart like the one below. Make the lists as long as necessary.

BENEFITS	RISKS
1.	1.
2.	2.
3.	3.

4. Do you have any other health-related or lifestyle recommendations for the patient? List your recommendations.

Personal Story: Arturo M.

Part 3



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The Next Two Days

Arturo was hospitalized for abdominal discomfort and underwent surgery to remove an infected appendix. His lab results indicated high total and LDL cholesterol. His blood pressure remained high during his stay in the hospital. He was discharged from the hospital 48 hours after his surgery. Healthcare professionals there recommended a variety of lifestyle changes, including a diet and exercise program. The physician prescribed medications and instructed Arturo to follow-up with his primary care physician in two weeks.

Visit to the Primary Care Doctor

Arturo's doctor recommended that he follow a diet low in fat, sodium and cholesterol. He also started Arturo on an exercise program to improve his fitness. The doctor prescribed a beta blocker (a kind of medicine to control blood pressure) and a cholesterol-lowering agent to help reduce Arturo's risk for a heart attack. His doctor did not prescribe an ACE Inhibitor or an ARB, because Arturo did not have congestive heart failure or kidney disease, and did not have a heart attack.

Six Months Later

When Arturo returned for a routine check-up six months later, he had lost 45 pounds and eight inches from his waist. He now watches his diet and exercises regularly with his wife, Patricia. His blood pressure is in the high-normal range. His cholesterol level is improving, but it's still higher than his physician would like. Arturo says these changes have increased his energy and desire to be involved in outdoor activities. ■

Personal Story: Brian L.

Part 3

© Andrey Shadrin

The Next Two Days

Brian was hospitalized for chest pain. It turns out he had blockages in two arteries in his heart. He had balloon angioplasty surgery to open the arteries where they had been blocked. Brian's recovery was uneventful. A follow-up blood test revealed elevated total and LDL cholesterol, and low HDL cholesterol. Brian was discharged from the hospital after three days. He was assigned to a cardiac rehabilitation program that would help him recover after the heart attack, reduce his risk for future heart problems, and start to implement healthy changes to his lifestyle. He received prescriptions for medicines to treat his hypertension and to prevent further plaque formation.

Visit to the Primary Care Doctor

Brian began his cardiac rehabilitation program, which includes a diet low in fat, salt and cholesterol; supervised exercise; enrollment in a smoking cessation program; and yoga (to help manage his stress). His primary care physician prescribed several medications, including aspirin, blood pressure medicine, and a cholesterol-lowering agent. The physician also prescribed an ACE Inhibitor (angiotensin converting enzyme inhibitor). However, Brian developed a persistent cough after taking the ACE Inhibitor for two weeks, so the doctor prescribed an ARB (angiotensin II receptor blocker) instead. ACE Inhibitors and ARBs work in different ways to lower blood pressure by preventing blood vessels from constricting.

Six Months Later

Six months after being admitted to the emergency room, Brian has lowered his blood pressure, total cholesterol and LDL cholesterol, and increased his level of "good" HDL cholesterol. He has managed to quit smoking, but still finds it hard to be around other people who are smoking. Brian was accepted to the hospital administration degree program he wanted, and he even has a new dog. In the end, he and his girlfriend broke up. But Brian is on his way to full recovery from his heart attack, and he has an optimistic outlook on life and his future. ■

Personal Story: Angela G.

Part 3

© Fancy

The Next Two Days

Angela was surprised to learn of her pregnancy, and pleased that her tests revealed no cardiac event or illness. She was discharged the next day from the hospital, with orders to follow-up with her primary care physician to monitor her elevated blood pressure and begin prenatal care. Prenatal care is special healthcare for pregnant women. It includes regular checkups, so that any problems can be spotted early.

Visit to the Primary Care Doctor

Angela keeps her appointment with her primary care physician and schedules a visit with an obstetrician. She learns that she is slightly more than two months pregnant. Her blood pressure is in the prehypertensive range (138/89 mm Hg), so the obstetrician places Angela on a low-sodium diet and a moderate exercise program for pregnant women. She wants to monitor Angela's blood pressure closely. Angela is placed on iron supplements for anemia, but no blood pressure medications are prescribed. Neither an ACE Inhibitor nor an ARB is prescribed, because Angela does not have coronary artery disease, congestive heart failure, diabetes or kidney disease, and did not have a heart attack. In addition, these medications typically should not be used during pregnancy or in women who are likely to become pregnant.

Six Months Later

Six months later, Angela's blood pressure remains in the prehypertensive range, but her doctor believes it is to linked to the pregnancy. Blood tests indicate that her iron-deficiency anemia is improving. Then, seven months after her visit to the emergency room, Angela and William become the proud parents of a healthy baby girl, named Elizabeth. Angela's blood pressure improves after childbirth, and her primary care physician continues to monitor her progress to see if diet and an exercise program can control Angela's blood pressure without medication. ■