

SCIENTIFIC DECISION-MAKING

CALCULATING CORONARY ARTERY DISEASE RISK



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 injuries 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.

© 2014 Baylor College of Medicine. All rights reserved.
ISBN: 978-1-888997-84-2

BioEdSM

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

Authors: Nancy P. Moreno, PhD, Ronald L. McNeel, DrPH, Barbara Z. Tharp, MS, Gregory L. Vogt, EdD, and James P. Denk, MA

Editor: James P. Denk, MA

Designer: Martha S. Young, BFA

ACKNOWLEDGMENTS

This project at Baylor College of Medicine has benefited from the vision and expertise of scientists and educators in a wide range of specialties. Our heartfelt appreciation goes to William A. Thomson, PhD, Professor and Director of the Center for Educational Outreach, and C. Michael Fordis, MD, Senior Associate Dean and Director of the Center for Collaborative and Interactive Technologies at Baylor College of Medicine, who have lent their support and expertise to the project.

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.

CONTACT

Center for Educational Outreach, Baylor College of Medicine
One Baylor Plaza, BCM411, Houston, Texas 77030

713-798-8200 • 800-798-8244

edoutreach@bcm.edu | www.bioedonline.org | www.bcm.edu



CALCULATING CORONARY ARTERY DISEASE RISK

Overview

Students learn about risk factors for coronary artery disease (CAD) and heart attack, strategies for lowering those risks, and the importance of doing so. They use an interactive online tool from the American Heart Association to calculate the cardiovascular health score for Arturo, Brian and Angela, the three fictitious characters being followed through the unit.

Reduce Risk for Heart Disease

1. Be active.
2. Control cholesterol.
3. Eat better.
4. Manage blood pressure.
5. Maintain a normal weight.
6. Lose weight if needed.
7. Reduce blood sugar.
8. Stop smoking.

Heart Scores

A Heart Score of 10 means a person has the lowest possible risk of developing heart disease and stroke. The information below explains the scores for each character (see "Character Info," sidebar, page 41).

Arturo, Brian and Angela, are in the emergency room. By now, students will have surmised that all three may be experiencing some type of heart-related crisis. One condition that may have contributed the three patients' current health problems is coronary artery disease (CAD). As students discovered in Activity 2, risk is the possibility of damage, injury or other harm. It often is represented as the probability of a negative outcome. Students learned that in the United States, a person has a one-in-six lifetime risk of dying from heart-related illness.

Not everyone has the same risk for CAD or a heart attack, so it is important to understand (1) behaviors that increase the risk for developing heart disease, and (2) which behaviors or other factors can be modified to decrease the risk. Three important risk factors for developing heart disease cannot be modified: gender (sex), age, and heredity (family history and genetics). You cannot control the genes you inherit, and the chances for heart attack increase with age.

However, we can control, to more or less extent, many health factors that influence risk for heart disease. Personal choices about diet, exercise and smoking can affect cholesterol levels, blood pressure, body weight and blood sugar levels. In fact, smoking and diabetes (uncontrolled blood sugar) rank among the most important factors known to increase risk for heart attack. Teenage smoking causes immediate and long-term cardiovascular damage, and smoking into adulthood dramatically increases a person's chances of dying prematurely. Diabetes interacts with other risk factors, such as high blood pressure, to cause additional harm to the heart and circulatory system. By understanding our personal risks and making lifestyle decisions to lower risks that may be modified, we can take steps, even at an early age, to reduce the chances for CAD or a heart attack.

MATERIALS

Teacher

- Interactive white board or video projector and computer
- Internet access
- Access to computer lab or individual computers (one per student)
- Copies of "Risky Business" activity sheet (one per student)
- Copies of "Heart Disease and Risk Factors" (enough for a classroom set, to be added to each team's reference folder when the activity is completed)
- Copies of "Patient Information Sheet" (enough for a classroom set, to be added to each team's reference folder when the activity is completed)

Per Student

- Access to a computer and the Internet
- "Personal Data Sheet" completed in the activity, "Heart: Basic Measurements"
- Copy of "Risky Business" activity sheet
- Copy of "Heart Disease and Risk Factors"
- Copy of the "Patient Information Sheet"

Character Info

ARTURO is a 56-year-old male with a rather unhealthy lifestyle that includes a high fat/high calorie diet and limited exercise. He is severely overweight, but has never had a cardiac event. If Arturo had diabetes, his Heart Score would decrease almost two-fold.

Diabetes is a MAJOR risk factor for heart disease. In combination with other risk factors, it can cause harmful changes to the heart, resulting in earlier and more severe cardiovascular problems. Treatments, such as heart bypass surgery or angioplasty to unblock arteries, are less successful in persons with diabetes.

BRIAN is a 40-year-old male under a great deal of stress. He also smokes cigarettes. When students change Brian's values from "smoker" to "nonsmoker," they will notice that his new Heart Score increases, and that his risk of coronary artery disease drops two-fold.

Smoking is a MAJOR risk factor for heart disease and heart attack, and in combination with other risk factors, it greatly increases the risk of cardiovascular problems. The 2012 Report of the United States Surgeon General describes tobacco use among youth ages 12–17 as epidemic. Ninety percent of all smokers begin before age 18. Tobacco use by youth causes immediate and long-term damage. Among youth who continue to smoke, one in three will die prematurely.

ANGELA is an active 35-year-old woman with a healthy lifestyle. However, she has high blood pressure (hypertension). This may be genetic, as her family has a history of cardiovascular disease. Controlling her blood pressure gives Angela an almost perfect Heart Score.

SETUP

Be sure students have their "Personal Data Sheets" from the previous activity. Each student also will require access to his/her own computer, either in a computer lab or the classroom. Students will work individually unless there is a need to share computers.

Write the Internet address for My Life Check - Life's Simple 7 Success Plan on the board or overhead (http://mylifecheck.heart.org/AssessmentTools2/main_en_US.html). It also is possible to access My Life Check - Life's Simple 7 Success Plan by clicking the "Get Your Assessment" tab at the top of home page for My Life Check (<http://mylifecheck.heart.org>). This pathway will require each user to register.

In a computer lab setting, the first class to conduct the activity should bookmark the link for the classes that follow. If bookmarked, have the students title the bookmark "Heart Score." At the end of the activity, have students return the reference materials.

PROCEDURE

1. Begin by asking students, *Do you think we can change our risks for certain diseases?* Allow time for student comments. Alternately, create a T-chart on the board and list risk factors that students believe CAN and CANNOT be changed. Ask, *Do you think lifestyle decisions may have made Arturo, Brian or Angela more or less likely to have medical problems?* Have students name some of the risk factors for Arturo, Brian, and Angela. Tell students that they are going to learn how these factors impact each character.
2. Make the article, "Heart Disease and Risk Factors," available for students in the reference folder or notebook. You may want to review this material with the class.
3. Use a interactive white board or computer and projector to access the Internet and demonstrate the American Heart Association's My Life Check - Life's Simple 7 Success Plan web site (http://mylifecheck.heart.org/AssessmentTools2/main_en_US.html). As an example, you may want to work through Arturo's case with students.
4. Provide each student with a copy of the "Patient Information Sheet" and "Risky Business" activity sheet. Explain that the "Patient Information Sheet" includes some of the results from blood tests conducted on each patient while he or she was in the emergency room. As you work through the My Life Check process for Arturo, have students provide the answers for each question. Even if you conduct this as a demonstration, have each student record the scores for Arturo in Table 1.
5. Students should work independently to answer all questions on the "Risky Business" activity sheet.
6. As a final step, have students enter as much of information as possible to compute their own Heart Scores. They can find their blood pressure measurements on their "Personal Data Sheets." Students should not guess at other information, such as cholesterol. Unless they know the values, students should leave those spaces blank.
7. Discuss students' answers on the "Risky Business," sheet. A summary of the risk factors for each character is given in "Character Info" to the left.

EXTENSIONS OR HOMEWORK

Have students visit the Healthy Eating Plate online to learn what constitutes a healthy diet (<http://www.hsph.harvard.edu/nutritionsource/what-should-you-eat/pyramid/>). Direct students to work in pairs to create menus for meals that would meet the Healthy Eating Plate guidelines.

Source material for "Heart Disease and Risk Factors Reference" (p. 44):
Agency for Healthcare Research and Quality
American Heart Association
National Heart Lung and Blood Institute (NHLBI). 2012 Report of the Surgeon General. (United States)

RISKY BUSINESS

STUDENT NAME _____

1. We left Arturo, Brian and Angela on the way to their way to the emergency room. You will determine if each patient suffered a heart attack in a later activity. In this activity, we are going to use information gathered at the hospital to calculate the current life time risk of a heart attack for each patient.
2. Using a computer with Internet access, go to the American Heart Association's My Life Check® Life's Simple 7™ Success Plan at web link: http://mylifecheck.heart.org/AssessmentTools2/main_en_US.html
3. Once you are at the web site, select "Get started." On the "Terms and Conditions Agreement" screen, select "Yes" at the bottom of the box.
4. Screen 1 of 8 indicates the seven areas for health measurement in this plan. Once you have familiarized yourself with this screen, select "Next."

Find Arturo's Score

5. Using the data on the "Patient Information Sheet," answer the questions for "Arturo" as requested in the computer program. Complete Screens 2 through 4.
6. Use Screens 5 and 6 to calculate Arturo's current level of health for each of the seven health measurements.
7. Use Screen 7 to calculate the current Heart Score for Arturo. Record this score in the line labeled, "Current Health Information" in Table 1, below.

Note. The best possible Heart Score is 10. This means that you have the greatest potential for a heart healthy life and the lowest possible risk of developing heart disease and stroke.

TABLE 1.

Heart Score
Current Health Information
With Younger Age
With Diabetes

8. How would being younger affect Arturo's Heart Score? Select the "Previous" button at the bottom of Screen 7 and continue doing this until you reach Screen 2. Change his age to 20 and step forward to obtain his "younger" Heart Score from Screen 7.
9. Record this new Heart Score next to "With Younger Age" in Table 1.
10. What is the effect of age in determining the Heart Score? Write a short answer on the back of this sheet.
11. How would having diabetes affect Arturo's Heart Score? Select the "Previous" button at the bottom of Screen 7,

and continue doing this until you reach Screen 2. Change his age back to 56 and change his diabetes status to "Yes." Step forward to Screen 4 and change his fasting blood sugar to 140. Continue to see his new Heart Score and enter the number in the second row of Table 1.

12. How does having diabetes affect the Heart Score? Write a short answer on the back of this sheet.

Find Brian's Score

13. Select "Previous" until you are back at Screen 2. Enter Brian's risk factor data from the Patient Information Sheet. Enter his calculated Heart Score in Table 2.

TABLE 2.

Heart Score
Current Health Information
With Smoking Risk Removed

14. Brian was identified as a smoker. Select "Previous" to access Screen 4 and remove the smoking risk. Record Brian's new Heart Score in Table 2.
15. How does smoking affect Brian's Heart Score? Write a short answer on the back of this sheet.

Find Angela's Score

16. Select "Previous" until you are back at Screen 2. Enter Angela's risk factor data from the "Patient Information Sheet." Enter her Heart Score into Table 3.

TABLE 3.

Heart Score
Current Health Information
With Controlled Blood Pressure

17. Go back and change Angela's blood pressure readings to a normal value of 105/75 mm Hg. Enter her new Heart Score in Table 3.
18. How does having a normal blood pressure reading affect Angela's Heart Score?
19. Select "Previous" until you are back at Screen 2. Now, compute your own Heart Score. Enter as much information as possible to obtain your Heart Score. Summarize the information you entered on a separate sheet of paper, and write your Heart Score on the sheet. Bring your **personal** Heart Score information with you to your next class.

PATIENT INFORMATION

RISK FACTOR	ARTURO	BRIAN	ANGELA
1. Gender	Male	Male	Female
2. Age	56	40	35
3. Race/Ethnicity	Hispanic	White	Black
4. Height	5'9"	5'10"	5'5"
5. Zip code (outside of US)	NA	NA	NA
6. Previous heart or blood vessel disease events, conditions or procedures	No	No	No
7. Diabetes	No	No	No
8. Weight	260	195	120
9. Physical exercise			
Moderate activity	0	100	140
Vigorous Activity	0	0	0
10. Cups of fruit daily	1	2	2
11. Cups of vegetables daily	2.5	3	3
12. Servings of fish weekly: ≥ 2	No	No	Yes
13. Whole grains daily: ≥ 3 oz	No	No	Yes
14. Sugar beverages weekly: < 36 oz	No	No	No
15. Sodium (salt) daily: $< 1,500$ mg	No	No	Yes
16. Systolic blood pressure	135	165	160
17. Diastolic blood pressure	95	105	105
18. Total blood cholesterol	320	247	105
19. Fasting Glucose (sugar)	85	65	70
20. Smoking	No	Yes	No

NA = Not applicable

HEART DISEASE AND RISK FACTORS

REFERENCE

When discussing health, risk factors are conditions or behaviors that increase the likelihood of developing a disease. Some risk factors can be controlled, but others cannot. Not everyone has the same risk for coronary artery disease (CAD) or a heart attack. It is important to know behaviors that increase or decrease the risk for developing heart disease.

The three main risk factors for heart disease that cannot be modified are gender (sex), age, and heredity (family history and genetics). You cannot control the genes you inherit, or the reality that risk for heart attack increase with age. In fact, 82% of people who die from CAD are 65 or older. Men's risk of a heart attack increases during middle age; women's risk rises noticeably after 55 years of age. But even then, a woman's risk is lower than a man's. People of African American, Mexican American, American Indian, and native Hawaiian descent are at higher risk for heart disease than members of other groups. And individuals whose parent or parents had heart disease are more likely to than others to develop CAD.

The inability to change our age or heredity makes it even more important to manage risk factors over which we have some control. Personal choices about diet, exercise and smoking can affect cholesterol levels, blood pressure, body weight and blood sugar levels, all important factors related to the risk for heart attack. By understanding our risks and making decisions to lower risks that may be modified, we can take steps, even at an early age, to reduce the chances for CAD or heart attack.

Smoking is a major risk factor in men and women, and combined with other risk factors, it greatly increases the chance of cardiovascular problems. Smokers are 2–4 times more likely than non-smokers to develop CAD or have a heart attack. Further, constant exposure to other people's cigarette smoke (secondhand smoke) increases the risk of heart disease in the nonsmoker. The *2012 Report of the United States Surgeon General* describes tobacco use among youth ages 12–17 as epidemic, and 90% of all smokers begin before age 18. Tobacco use causes immediate and long-term damage, including CAD. Among young people who continue to smoke, one in three will die prematurely. Among youth who continue to smoke, one in three will die prematurely from smoking. Smoking harms nearly every organ in the body and is one of the main preventable causes of death and disease in the United States.

High total cholesterol and “bad” LDL cholesterol are associated with increased risk for heart disease. Total cholesterol values typically should not be higher than 200 mg/dL. LDL cholesterol is the main source of cholesterol that builds up in the walls of the arteries and causes CAD. Foods high in saturated fats are high in cholesterol; we can reduce the risk for CAD by limited these foods. “Good” HDL cholesterol lowers the risk for heart disease by helping to (1) remove LDL cholesterol from the bloodstream, (2) prevent formation of plaque in the arteries, and (3) remove

plaque that already has collected on artery walls. Higher HDL values are associated with lower risk of heart disease. Regular, vigorous exercise is a great way to increase HDL cholesterol levels.

Blood pressure is the force of the blood against the walls of the arteries. When it stays elevated over time, it is called high blood pressure. This condition increases the heart's workload, and strains the heart, blood vessels and kidneys. High blood pressure has been associated with heart attack, stroke and kidney failure. Because it usually has no warning signs or symptoms, high blood pressure is especially dangerous and sometimes is referred to as the silent killer. When combined with other risk factors, such as obesity, diabetes, high cholesterol, or smoking, high blood pressure can increase the risk of a heart attack several fold.

In the last 30 years, obesity has tripled among people aged 12–19 years. Excess body fat, especially around the waist, increases the risk of a heart attack, even in the absence of other risk factors. Quite simply, the heart must work harder to supply nutrients and oxygen to the extra body mass. Losing just 10 pounds lowers the risk of a heart attack. Even in young people, overweight or obesity increases the risk of developing heart disease, high blood pressure, type 2 diabetes, gallstones, breathing problems and certain cancers.

Physical inactivity is a risk factor that almost anyone can change. Regular exercise, such as 30 minutes of walking per day, helps to prevent heart and blood vessel disease, and it actually strengthens the heart. The combination of regular exercise and a healthy diet is one of the best defenses against heart disease, because it helps control risk factors like high cholesterol, high blood pressure and diabetes.

Diabetes (uncontrolled high blood sugar) is a major risk factor for heart and blood vessel disease. In combination with other risk factors, it can harm the heart and cause more severe cardiovascular problems, and at a younger age. Surgical treatments for heart disease, such as bypass surgery or angioplasty, are less successful in persons with diabetes. In fact, people with diabetes have the same risk for future heart problems as do individuals who have had a heart attack. Sixty-five percent of diabetes patients die from some form of heart or blood vessel disease, so it is important for people with diabetes to work closely with healthcare providers to manage and control blood sugar levels through a program of diet and exercise.

There are three kinds of diabetes. Type 1 diabetes is inherited and usually is diagnosed in children or teenagers. Type 2 diabetes, the most common form, can develop at any age. Being overweight and inactive increases the risk for type 2 diabetes. A third form of diabetes, gestational diabetes, develops in some women during pregnancy. It usually goes away after the baby is born, but it does increase a woman's risk of developing type 2 diabetes later in life.