

Welcome to *Live...from the Heart!*

In these classroom activities, your students will enter a cardiology training program at Advocate Christ Medical Center, based in Oak Lawn. These lessons will prepare students for their field trip — real or virtual — to the Museum of Science and Industry, where they will view live, open-heart surgery performed by surgeons at Advocate Christ Medical Center.

In this series of lessons, students follow their first patient, Bill Harvey, through the process of patient consultation, diagnosis, treatment and follow-up. They will assess Mr. Harvey's risk factors for heart disease, review heart anatomy and circulation, interpret a variety of diagnostic tests, recommend treatment for Mr. Harvey and follow him through open-heart surgery.

At the end of the unit, students will write a final Grand Rounds Report to summarize important information from Mr. Harvey's file. They will also create a health education pamphlet, poster, video or display for their school community, demonstrating what they have learned about the heart, heart disease and how young adults can keep their hearts healthy.

Throughout the lessons, students will use information from previous lessons and will need all of their work available to them. As such, obtain file folders so that your students can track their work.

Below is an overview of the lessons. We strongly recommend teaching lessons 1, 2, 3 and 4 before watching the open-heart surgery. After the field trip, extend your students' learning by completing lessons 5 and 6.

Lesson 1: Presenting the Patient

Students receive Bill Harvey's patient file. As a class, they construct a KWL (Know, Want to Know, Learned) chart for heart disease using their background knowledge and patient information. Next, they examine the risk factors and preventive measures related to heart disease. **Extension Activity: Nutritional Analysis**

Lesson 2: Let's Circulate

Students review the circulatory system, including the importance of double circulation. They learn about blood vessels—arteries, veins and capillaries. As a class, they simulate blood flow and the concept of double circulation. **Extension Activity: Explore Your Pulse and Heartbeat**

Lesson 2: The Heart Has Needs, Too!

Students review the flow of blood through the heart. Next, they learn the function of the coronary arteries and what happens when these arteries become blocked. They look at angiograms to determine the amount of blockage that Mr. Harvey has in his coronary arteries.

Lesson 3: Let's Treat It!

Students look at three treatments for coronary artery disease. Based on Mr. Harvey's symptoms and tests, the students recommend a treatment for Mr. Harvey.

Lesson 4: Let's Educate!

Students create a health pamphlet, video, poster or display to educate their school community about the heart and heart disease.

Lesson 6: Topics for Further Study

Students research important people, events, inventions and advancements in the history of heart surgery, as well as investigate current and future technologies used in the treatment of heart conditions.

Final Report: Grand Rounds

Students complete their Final Report for Grand Rounds at Advocate Christ Medical Center. This report draws on information learned from each lesson and from the viewing of open-heart surgery. This report can be used as a way to assess what students have learned from the *Live...from the Heart* unit.



LIVE FROM
THE HEART

Teachers, here is what you need to know about the live experience...

Your students are going to watch live surgery—a coronary artery bypass graft. But you're going to prepare them first, so they're not scared or nervous, and they learn as much as they can from this exciting opportunity. And we'll help prepare you, so you are not nervous, and you learn as much as you can from this exciting opportunity.



The Museum of Science and Industry and Advocate Christ Medical Center present "Live...from the Heart"

The live experience consists of three components:

- ♥ An introduction to the surgical team and the preparation processes related to surgery—delivered via prepared videos (not live)
- ♥ The broadcast of the live surgery
- ♥ An Investigation Journal, which students complete while watching the surgery

The audience for *Live...from the Heart* will be both at the Museum and also in classrooms around the country. Each week, the Museum offers this program simultaneously to one on-site class (at the Museum) and two classrooms around the country with videoconferencing capabilities. The three classrooms will participate in exactly the same program at exactly the same time. Each class will be able to talk to and see the surgical team from Advocate Christ Medical Center in Oak Lawn (as well as each other).

Here's how the *Live...from the Heart* day will go if you're traveling to the Museum or if you're dialing into the program from a remote location.

If you're traveling to the Museum...

This kit includes lesson plans, ancillary materials for the lessons and reproducible student activity sheets. These lesson plans are for use before and after the videoconference. We recommend that you do all three pre-visit lessons with your class in order to prepare them best for the live surgery.

On the day of your scheduled program, you should arrive at the Museum of Science and Industry no later than 8:45 a.m. You'll enter the Group Center where a Museum staff person will walk your group to the e-Suite, the Museum's distance learning center, where *Live...from the Heart* will take place.

In the e-Suite, the "Junior Heart Docs" (your students) will watch a short 10-minute video introducing the Advocate Christ Medical Center surgical team and demonstrating how the patient and the surgical room are prepared for surgery. You wouldn't believe how much work everyone does before the surgery even begins!

continued...

LIVE FROM
THE HEART

At 9:15 a.m., we'll connect to Advocate Christ Medical Center to watch the surgery. The surgeons must stick to a rigid schedule, so the surgery will start whether we're ready or not. That's why it's so important that you arrive at the Museum by 8:45 a.m. CST.

Throughout the surgery, your students will work in an Investigation Journal, which will track the key learning goals of the surgery. As students watch the surgery and engage in conversation with their peers and with the surgical team, they will use their Investigation Journal to sketch pictures and record questions and answers.

After the surgery is completed, your students will watch a quick video of what happens to a patient in the recovery room, as well as what happens to the room after the surgery is finished. (The room is as good as new within minutes—and ready for another surgery!)

After the program is over, your students will get to keep their Investigation Journals. We encourage your group to visit *YOU! The Experience*, which features a 13-foot Giant Heart that can beat in time with your own.

When you return to your classroom, you can use one or more of the post-visit lesson plans to round out the experience.

If you're dialing in from a remote location...

If you are using your videoconferencing equipment to participate in *Live...from the Heart* instead of visiting the Museum, then you're not alone. We host two off-site classes each week, so you'll be in good company!

You will receive a CD that includes lesson plans, ancillary materials for the lessons and reproducible student activity sheets. These lesson plans are for use before and after the videoconference. We recommend that you do all three pre-visit lessons with your class in order to prepare them best for the live surgery. In addition, the kit includes 35 Investigation Journals for use during the videoconference. Hang onto the Investigation Journals; we'll explain how to use them during the videoconference.

Two weeks before your scheduled program, you should test your videoconferencing equipment to make sure all systems are working. If you have a problem that you think won't be resolved in time for the *Live...from the Heart* videoconference, please call us at (773) 684-1414, ext. 6782, to let us know.

On the day of your scheduled program, connect to the Museum no later than 9:00 a.m. Be sure you have distributed your Investigation Journals so that the "Junior Heart Docs" are ready for surgery.



Highly trained surgeons at
Advocate Christ Medical Center
perform surgery on the heart

continued...

LIVE FROM
THE HEART

When *Live...from the Heart* begins, the students will watch a short video introducing the surgical team and demonstrating how the patient and the surgical room are prepared for surgery. You wouldn't believe how much work everyone does before the surgery even begins!

At 9:15 a.m., we'll connect to Advocate Christ Medical Center in Oak Lawn to see the surgery. The surgeons must stick to a rigid schedule, so the surgery will start whether we're ready or not.

Throughout the surgery, your students will work in an Investigation Journal, which will track the key learning goals of the surgery. As students watch the surgery and engage in conversation with their peers and with the surgical team, they will use their Investigation Journal to take notes about the patient and procedure, as well as and record questions and answers.

After the surgery is complete, your students will watch a quick video of what happens to a patient in the recovery room, as well as what happens to the room after the surgery is finished. (The room is as good as new within minutes—and ready for another surgery!)

After the program is over, you can use one or more of the post-conference lesson plans to round out the experience.

How to facilitate the remote or on-site experience...

Maybe you've never facilitated a videoconference before. Maybe you've never even participated in a videoconference before. Fine by us. We get a lot of classes that are new to videoconferencing, but they soon get hooked on it.

Good facilitation in a videoconference is not that different from good facilitation—or good teaching—in a regular classroom. As the conference is underway, you want to be sure that students have equal access to the Advocate Christ Medical Center surgical team and that there isn't one student dominating the conversation the whole time. Your role is to serve as a kind of mediator, vetting out students' questions and working with Museum educators to translate, when necessary, conversation between your students and the surgical team.

Trained Museum educators will be there during the conference leading the facilitation. You'll follow our lead and co-facilitate the experience with us. The key is for you to be involved throughout the morning, and we will help you do this.



The Advocate Christ
Medical Center surgical team
works together in the OR



museum of
science+industry
chicago

Purpose

- ♥ Examine risk factors for heart disease
- ♥ Formulate questions about heart disease
- ♥ Understand the diagnostic process

Time Frame

45–50 minutes

What Students Do In This Activity

Students read Bill Harvey's patient file. Using information in the file, as well as background knowledge, the class constructs a KWL (Know, Want to Know, Learned) chart for heart disease. Next, students examine the risk factors and control measures for heart disease. Finally, in an extension to the lesson, students look at the specific nutritional risk factor for Bill Harvey.

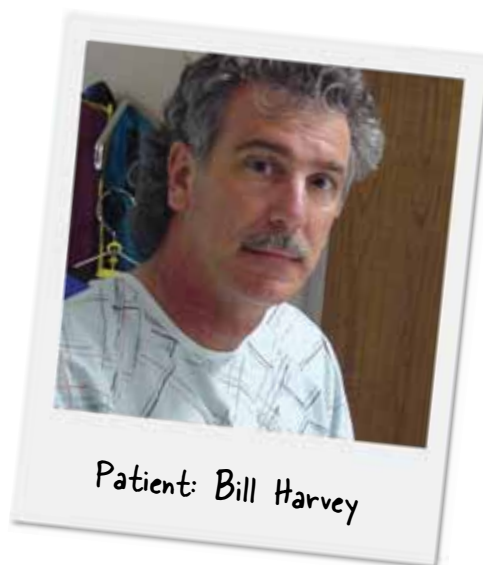
Background

Coronary artery disease (CAD) is the number one killer in the United States, accounting for over 500,000 deaths per year. In most people, CAD begins in young adulthood and gradually develops throughout a person's life.

The patient, Bill Harvey, exhibits many controllable and uncontrollable risk factors for heart disease.

Materials

- ♥ Large sheet of paper for KWL chart (post on the wall for duration of unit)
- ♥ Copies of the **Lesson 1 Student Pages** for each group of students
- ♥ Patient file folders (manila folders) for each student
- ♥ Markers



Sample KWL Chart

Heart Disease		
K What we know about Heart Disease	W What we want to know about Heart Disease	L What we have learned about Heart Disease

Controllable Risk Factors:

- ♥ Smoking (and secondhand smoke)
- ♥ Obesity
- ♥ Lack of exercise
- ♥ High cholesterol
- ♥ Stress
- ♥ High blood pressure (hypertension)
- ♥ Managing diabetes

Uncontrollable Risk Factors:

- ♥ Age
- ♥ Family history
- ♥ Diabetes
- ♥ Sex



Procedure

Part A: Assessing the Patient

1. Distribute copies of the **Lesson 1 Student Pages** to the students.
2. Introduce students to the unit by explaining that they will be assessing, diagnosing and treating a patient named Bill Harvey, who has come to the cardiologist complaining of chest pain. Explain that during the unit they will have the opportunity to watch live, open-heart surgery.
3. In small groups, students will read the **Patient Chart**, highlighting and noting in the margin important information that may be contributing to Bill Harvey's condition.
4. Lead the class to create a KWL (Know, Want to Know, Learned) chart. Using butcher paper that can be saved for the duration of the unit, divide the page into three columns. Title the first column **"What We Know About Heart Disease."** Ask students to brainstorm, and then write down what they know about heart disease in their small groups. Next, solicit ideas from the groups about what they "know" and write this information in the first column.
5. In small groups, the class will next make a list of what they would like to learn about heart disease during this unit. Title the second column of the KWL chart **"What We Want to Know About Heart Disease."** Ask the students to contribute their ideas to the large group, and then record the ideas in the second column. Questions you can ask to get the students thinking might include: At what age is heart disease most prevalent? Are males at greater risk of heart disease than females? How is heart disease treated? Can heart disease be cured? Tell students that these are some of the questions they will examine in the Live...from the Heart unit.
6. Post the KWL chart in the classroom. Throughout the unit, return to the KWL chart and add any relevant questions or information. Students will complete the **"What We Have Learned About Heart Disease"** section for the culminating activity.
7. Students complete Part A by answering the four questions on page 1-3 of the lesson.

Notes:





Lesson 1: Presenting the Patient

Part B: Risk Factors

1. Based on the KWL chart and notes from the cardiologist and nurse, students will highlight and record any risk factors that may contribute to Mr. Harvey's heart disease.
2. Using the **Coronary Artery Disease Risk Factors Reference Sheet**, as well as the **Patient Chart** and the **notes from the nurse and the cardiologist**, students will identify three factors that influence Mr. Harvey's condition, and then they will write him a memo explaining how to control these risk factors.
3. As a class, discuss the risk factors for heart disease and how they can be controlled.

Part C: Extension Activities (recommended as homework)

1. **Mr. Harvey's Diet**
On the worksheet **Mr. Harvey's Diet**, students measure the amount of calories and fat Mr. Harvey eats in a typical day and make recommendations to improve the healthfulness of his diet.
2. **Risk Factors**
Students explore more closely the risk factors related to heart disease by creating note cards or flash cards. Example:

SMOKING:

- increases heart rate by as much as 30% within the first 10 minutes of smoking
- increases blood pressure by causing the blood vessels to constrict, which forces the heart to work harder to deliver blood to the rest of the body, including the heart
- reduces the ability of the blood to carry oxygen
- damages the lining of the arteries and allows for plaque to accumulate
- increases "bad," or low-density lipoprotein (LDL), cholesterol, which is another risk factor for heart disease
- secondhand smoke also causes these effects, so even if you are not the one who is lighting up, you could be damaging your heart

3. **I Want to Know**
Students may research one or more of the questions identified in the **"What We Want to Know About Heart Disease"** column. When they are finished with their research, they can write a memo to the cardiologist detailing their findings.

Notes:





Lesson 1: Presenting the Patient

Name _____

Date _____

Part A: Assessing the Patient

Highlight and make notes in the margin of important information that may be contributing to Mr. Harvey's condition.

Patient Name: Bill Harvey	
Reason for Consultation: Chest pain	
Background: Mr. Harvey, a 63-year-old male with no prior cardiac history, has been experiencing shortness of breath and tightness in his chest for the last six months. Over the course of the last month, he noticed the pain was more intense, occurred more often and that it was accompanied by a burning sensation in his chest. Yesterday, dizziness accompanied his chest pain, and he decided it was time for a visit to the cardiologist.	
Gender: Male	Weight: 200 lbs.
Age: 63	Temperature: 98.2° F
Height: 5'10"	Employment: Supervisor of a factory assembly line
Family History: Father died at 62 of a sudden heart attack. Mother is 83 and is still living. Paternal grandfather died at 55 of heart disease. Paternal grandmother died at 92 from complications due to diabetes. Maternal grandfather died at 70 of natural causes. Maternal grandmother died at 93 in household accident.	
Diet: Patient reports a "moderately healthy diet with weakness for fast foods."	
Unhealthy Habits: Patient smoked one pack of cigarettes a day for 30 years; he quit six months ago, when he began experiencing shortness of breath. Patient denies alcohol use.	
Exercise: Patient played football in high school, but he has not exercised regularly since then; he coached football until six months ago, when he began feeling short of breath on the field.	
Stress: Patient reports feeling "under a lot of pressure" on the job and in his coaching responsibilities.	



Notes:



Note from the Nurse:

To: Live...from the Heart Students
 From: Nancy Jeffrey, R.N.
 Re: Preliminary Test Results

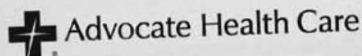
Mr. Harvey was fairly calm but seemed worried about his symptoms. I told him I would be taking his blood pressure with an arm cuff, and that I would then take some blood in order to determine his cholesterol level.

Here are his test results, along with normal ranges to use as comparisons:

Test	Result	Normal Range
Cholesterol	260 mg/dL	<200 mg/dL*
Blood pressure	160/90 mm Hg*	<140/90 mm Hg**
Pulse	90 bpm**; regular rhythm	60–100 bpm***; regular rhythm
Weight	200 lbs.	150–175 lbs.

Nancy Jeffrey, R.N.

*mg/dL = milligrams per decaliter
 **mm Hg = millimeters of mercury
 ***bpm = beats per minute



Note from the Cardiologist:

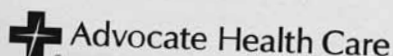
To: Live...from the Heart Students
 From: Marc Silver, M.D.
 Re: Further Testing

From the initial consultation and preliminary tests conducted on the patient, it appears Mr. Harvey is experiencing heart trouble. Before making a diagnosis, I recommend conducting further tests. Mr. Harvey should have an angiography test today.

After reviewing the results of his angiogram, you will have more information with which to accurately diagnose Mr. Harvey's problem. Send him to the lab technician, Sharon Gray, in the Catheterization Lab on the third floor of the Medical Center.

We will discuss the case again when Mr. Harvey's test results return.

Dr. Marc Silver, Cardiologist



Notes:





Lesson 1: Presenting the Patient

Answer the following questions to prepare you for your next appointment with Mr. Harvey.

1. After reading Mr. Harvey's patient file, what symptoms indicate that something might be wrong with him?

2. Based on his patient chart, what might be contributing to his condition?

3. What conclusions can you make from Nurse Jeffrey's notes?


4. What do you still need to learn about Mr. Harvey to diagnose and treat him?



Lesson 1: Presenting the Patient

CORONARY ARTERY DISEASE RISK FACTORS REFERENCE SHEET

Risk Factor	Explanation	Control
High Blood Pressure	Each heartbeat creates pressure against the artery wall. High blood pressure creates a strain on the artery wall. It cannot be cured, but it can be controlled.	Reduce salt consumption, take the prescribed medication, exercise regularly and quit smoking.
Diabetes	The body must produce enough insulin to break down glucose (sugar). Diabetes is the result of the inability of the body to produce enough insulin, which causes glucose to accumulate in the blood.	Follow a doctor-recommended diet and take the prescribed medications.
Smoking	Nicotine in cigarettes is a stimulant that causes blood vessels to narrow. Consequently, blood pressure rises and the heart beats faster. Carbon monoxide contained in cigarettes enters the blood faster than oxygen. This reduces the ability of the blood to carry oxygen.	Quit smoking.
Cholesterol and Fat	A diet high in cholesterol and fat can lead to fatty deposits on the arterial walls, which restrict blood and oxygen flow to the heart.	Decrease red meat consumption, increase fish and poultry consumption, restrict egg consumption to two eggs per week and choose low-fat dairy products.
Obesity	A 20% increase over a person's ideal body weight is considered obese. Extra weight forces the heart to work harder in order to supply blood to the excess pounds. It also increases the risk of diabetes and high blood pressure.	Develop good eating habits, consider a physician-directed diet plan and increase physical activity.
Poor Exercise	The heart, like any other muscle, needs to be exercised regularly so it can function properly.	Begin walking, swimming, bicycling or any other exercise that strengthens the heart muscle, starting slowly and gradually increasing efforts.
Stress	There are two types of stress: emotional and physical. Too much of either type causes the heart to beat faster, the blood vessels to narrow and blood and oxygen flow to be restricted.	Eliminate or minimize the causes of stress. Try to react differently to stressful events.
Heredity	Heart disease can be hereditary. If your parents or grandparents had heart disease, there is a greater possibility that you will also develop it.	Cannot be controlled. Avoid copying any bad parental habits, such as smoking, poor diet or unhealthy eating or exercise habits.
Age	Coronary artery disease is a gradual process. Usually it affects people in their middle or later years.	Cannot be controlled. Start to eliminate and control as many of the risk factors as early as possible. It is never too late to begin taking care of yourself.
Sex	Typically, coronary artery disease affects men at an earlier age than women. However, women are developing coronary artery disease more frequently due to an increase in smoking habits and stress.	Cannot be controlled. Eliminate or control as many of the other risk factors as possible.



Advocate Health Care

SUBJECT: How to Control Risk Factors for Coronary Artery Disease

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



Lesson | Extension: Presenting the Patient

Nutrition is related to heart disease. Use the information on the **Nutrition Reference Sheet** to answer the following questions. Then, compile the information to educate Mr. Harvey about nutrition.

1. What is the daily allowance of fat and calories recommended for Mr. Harvey, who is 63 years old and does not exercise on a regular basis?

2. Use the table to calculate the **total** amount of calories and fat Mr. Harvey consumed today for breakfast and lunch.

	FOOD	CALORIES	FAT
BREAKFAST			
LUNCH			
TOTAL			

3. Did Mr. Harvey already exceed the recommended amount of calories today? If so, by how many? If not, how many calories can he consume for dinner?

4. Did Mr. Harvey already exceed the recommended amount of fat grams today? If so, by how many grams?

5. Using Danny's Donuts' and Burger World's nutritional information, suggest alternative breakfast, lunch, and dinner menus for Bill Harvey. Be sure to stay within the recommended daily allowance for calories and fat grams.

	FOOD	CALORIES	FAT
BREAKFAST			
LUNCH			
DINNER			
TOTAL			



Lesson 1: Presenting the Patient

NUTRITION REFERENCE SHEET

Recommended Daily Allowance (RDA) Chart

	Calories	Fat grams
Active men, teen boys	2,800	< 93
Most women, older adults	1,600	< 53
Most children, teen girls, active women and most men	2,200	< 73

*Excerpted from Mayo Clinic Heart Book, Second Edition

Fast-Food Facts

Danny's Donuts	Calories	Fat grams
Donut—chocolate crème-filled	240	9
Donut—chocolate frosted	340	15
Donut—glazed	180	8
Donut—vanilla frosted	210	9
Bagel—blueberry	340	3
Bagel—plain	340	3
Biscuit—plain	280	14
Biscuit—egg and cheese	380	22
Biscuit—sausage, egg and cheese	590	42
Croissant—plain	290	18
Coffee cake	710	29
English muffin—ham, egg and cheese	320	12
Muffin—blueberry	490	17
Coffee with cream and sugar	90	6
Burger World	Calories	Fat grams
Hamburger	260	9
Cheeseburger	320	13
Quarter-pound hamburger	420	21
Quarter-pound cheeseburger	530	30
Big Burger Boy sandwich	560	31
Grilled chicken sandwich	440	20
Chicken nuggets (6)	290	17
Garden salad (no dressing)	35	0
Fat-free Vinaigrette dressing	50	0
Ranch dressing	230	21
Fries (small)	210	10
Fries (large)	450	22
Fries (super-size)	540	26
Coke (large)	310	0

Find nutritional information for America's favorite fast-food restaurants at www.fatcalories.com.



Lesson 1: Presenting the Patient

Part B: Risk Factors


Note from the Cardiologist:

To: Live...from the Heart Students
From: Marc Silver, M.D.
Re: Heart Disease Risk Factors

It appears that Mr. Harvey is having some trouble with his heart. It is important that Mr. Harvey learn about heart disease—or coronary artery disease—risk factors and how these can be controlled, modified or eliminated to slow the development of the disease.

Using the reference chart at the back of this lesson as a guideline, pick three risk factors that you think are influencing Mr. Harvey's condition, and then write him a letter explaining the risk factors and how they can be controlled.

Dr. Marc Silver, Cardiologist

 Advocate Health Care



Risk Factor 1: _____

Risk Factor 2: _____

Risk Factor 3: _____

Purpose

- ♥ Know that the heart and blood vessels make up the circulatory system
- ♥ Understand that the heart works as a “double pump” to supply the cells of the body with oxygen and nutrients
- ♥ Differentiate between arteries and veins and understand their role in circulation
- ♥ Demonstrate how blood is pumped through the circulatory system

Time Frame

45–50 minutes

What Students Do In This Activity

Students investigate how blood flows throughout the body and through the heart. They simulate the concept of “double circulation” and explain why it is important. Students learn about the blood vessels—arteries, capillaries and veins—that serve as the transport system for nutrients and oxygen.

Background

Every cell in the body needs a constant supply of fresh blood in order to stay alive. The circulatory system transports oxygen and nutrients to the cells of the body and removes wastes such as carbon dioxide. The heart serves as a “double pump” for the circulatory system, receiving deoxygenated blood from the body, pumping it to the lungs to be oxygenated, receiving oxygenated blood from the lungs and then pumping it to the rest of the body.

There are two types of blood vessels: arteries and veins. The arteries carry the blood away from the heart to the cells of the body, and the veins return the deoxygenated blood to the heart. Arteries branch into smaller vessels called arterioles, which branch into even smaller vessels called capillaries. It is in the capillaries that the exchange of gases (oxygen and carbon dioxide) and nutrients takes place. The blood then moves into small veins called venules, which merge into larger veins until they finally join the vena cava, which feeds blood into the heart. This completes the “double circle” of the circulatory system.

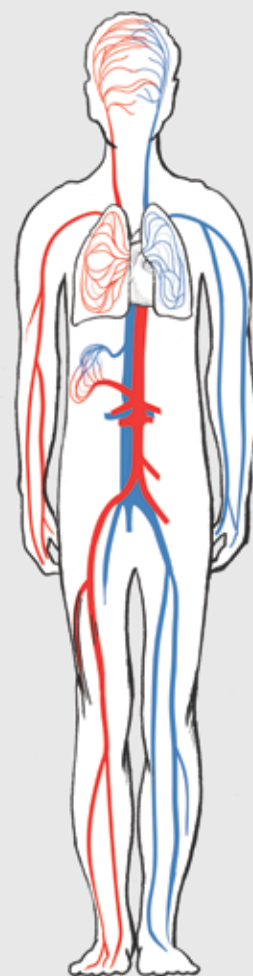
Student Misconception: Many students believe that blood carried by the veins is actually blue. In diagrams, the color blue is used to signify that the blood carried by the veins has a decreased supply of oxygen. The blood's actual color in the veins is a dark, bluish-red. Red is used for the arteries to indicate that they transport blood that is rich with oxygen.

Materials

- ♥ Red and blue markers
- ♥ Circulation cards
- ♥ Tennis balls (2 or 3)
- ♥ Red and blue colored pencils
- ♥ Human Circulatory System image
- ♥ Tape

Circulation:

The heart serves as a “double pump” for the circulatory system, receiving deoxygenated blood from the body, pumping it to the lungs to be oxygenated, receiving oxygenated blood from the lungs and then pumping it to the rest of the body.



Mnemonic Device:

“a” from “arteries” = “away from the heart”

Teaching Points

- ♥ The blood flows throughout the body through a network of arteries and veins called the circulatory system.
- ♥ The heart serves as the “double pump” of the circulatory system. The left side of the heart pumps the blood throughout the body and the right side of the heart pumps blood to the lungs.
- ♥ The right side of the heart pumps deoxygenated blood to the lungs, where it receives fresh oxygen.
- ♥ The left side of the heart receives this newly oxygenated blood from the lungs and pumps it through the aorta to the rest of the body.
- ♥ As the blood moves through the arteries, the arteries branch off into smaller vessels called arterioles and then into even smaller vessels called capillaries. It is in the capillaries that the transfer of nutrients and gas between the blood and the body tissues takes place.
- ♥ The blood begins its trip back to the heart through small veins called venules, which merge into larger veins until they finally join the vena cava, which empties into the right side of the heart.

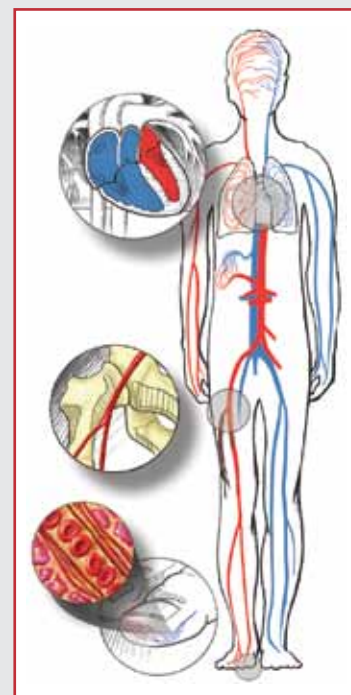
Part B: “Double Circle” Activity (15 min.)

1. Divide the class into two groups.
2. Give each group a card that describes a location of blood flowing through the circulatory system.
 - ♥ Right side of the heart (right atrium, right ventricle)
 - ♥ Arteries from the heart to the lungs (pulmonary arteries)
 - ♥ Capillaries of the lungs (gas exchange)
 - ♥ Veins from the lungs to the heart (pulmonary veins)
 - ♥ Left side of the heart (left atrium, left ventricle)
 - ♥ Aorta
 - ♥ Arteries
 - ♥ Arterioles
 - ♥ Capillaries of the body (gas exchange)
 - ♥ Venules
 - ♥ Veins
 - ♥ Vena cava

Capillaries of the Lungs
(Gas Exchange)

Veins from the Lungs
to the Heart
(Pulmonary Veins)

Notes:

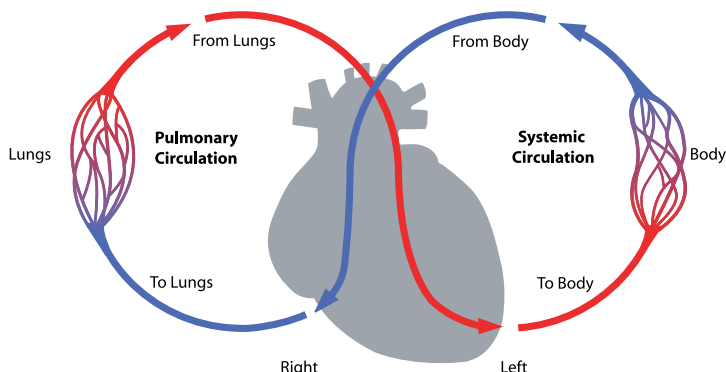


Overview of the
Circulatory System

Procedure

Part A: Instruction About Circulatory System

1. Ask the students the following questions, using guiding question to lead students to the answers if needed:
 - **What does almost every living cell in your body need to survive?**
Oxygen and nutrients, food, fuel, glucose, etc.
 - **How are oxygen and nutrients transported to the cells of your body?**
Through the blood in the circulatory system, via capillaries, etc.
 - **How do you think blood gets all the way to your toes and back to your heart?** Through blood vessels in the circulatory system
 - **What part does the heart play in this process?**
It is the pump that powers the circulatory system; it serves as a “double pump,” sending blood to the lungs and out to the rest of the body
2. Use the **Human Circulatory System image** to guide instruction about the circulatory system.
3. Use a blue marker to flow the flow of blood from the heart through the arteries to the lungs. *Mention the students that this is the only artery in the human body that carries unoxygenated blood.*
4. With a blue and red marker, shade the lungs to illustrate that there is an exchange of gases and nutrients between the blood and the lung capillaries.
5. Take the red marker to trace the route out of the lungs and back to the heart.
6. Continue to use the red marker to show the oxygenated blood leaving the heart and traveling to the rest of the body via arteries.
7. Use a red and blue marker show the blood passing oxygen and nutrients to the body through its capillaries
8. From the body capillaries, use a blue marker to illustrate the unoxygenated blood traveling back to the heart.



Human Circulatory System

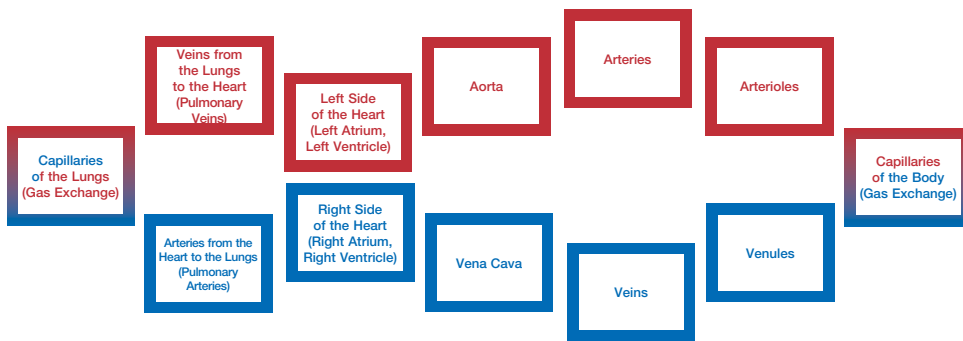
Arteries vs. Veins

Arteries have thicker walls and tend to have narrower lumens (inner open spaces). They have to constrict and dilate to control how much blood flows to different parts of the body, and they must bear the powerful force generated by the heart. Because of the large amount of muscle in their walls, they are usually round when cut in cross-section.

Veins have thinner walls and tend to have wider lumens (inner open spaces). They have to store blood, and need muscle to push the blood back to the heart. Because the walls are collapsible, they may change shape depending on the surrounding tissue conditions. Most veins have one-way valves to prevent blood from flowing backwards.

Remind students that the right and left sides of the heart seem opposite to us because we label the heart taking the perspective of the body we are looking at. The idea is similar to looking into a mirror.

- Ask students to position themselves using their cards to form a “double circle” (or figure eight), representing the correct flow of blood from the heart to the lungs, back to the heart, out to the body and back to the heart.
- Remind students that both oxygenated and deoxygenated blood is pumped throughout the body at all times. The capillary cards are both red and blue, denoting an exchange of oxygen and carbon dioxide.
- After the students form their “double circle,” they should pass around the red blood cells (tennis ball), reading their part of the body when they receive the ball. This will reinforce the flow of blood through the circulatory system. The class will then tape their cards to the board in a “double circle” to show the correct order of blood flow throughout the body.



Completed “Double Circle” Representing Circulation

Hands-on Demonstration (optional)

Have students squeeze the tennis ball a few times. This exercise demonstrates how hard your heart works with every heartbeat. An average adult heart beats (squeezes) about 70–80 times in one minute. If something is wrong with your heart, the heart muscle has to work extra hard to supply your cells with the proper nutrients. This additional work puts stress on your heart and may cause problems for your heart and the rest of your body.

Part C: Blood Flow Through the Heart

- Have students read the note from Dr. Silver
- Ask students to take a few minutes to write notes and draw pictures that they would use to explain the circulatory system and its importance to patient Bill Harvey.
- With a partner, have one student pretend to be Bill Harvey, while the other explains the circulatory system and its importance. After four minutes, have the partners switch roles.

Part D: Extension Activity (recommended as homework)

Explore Your Pulse and Heartbeat

In the activity, students take their pulse, calculate their target heart rate and figure out how many times their heart might beat in a lifetime.

Notes:





Lesson 2: Let's Circulate!

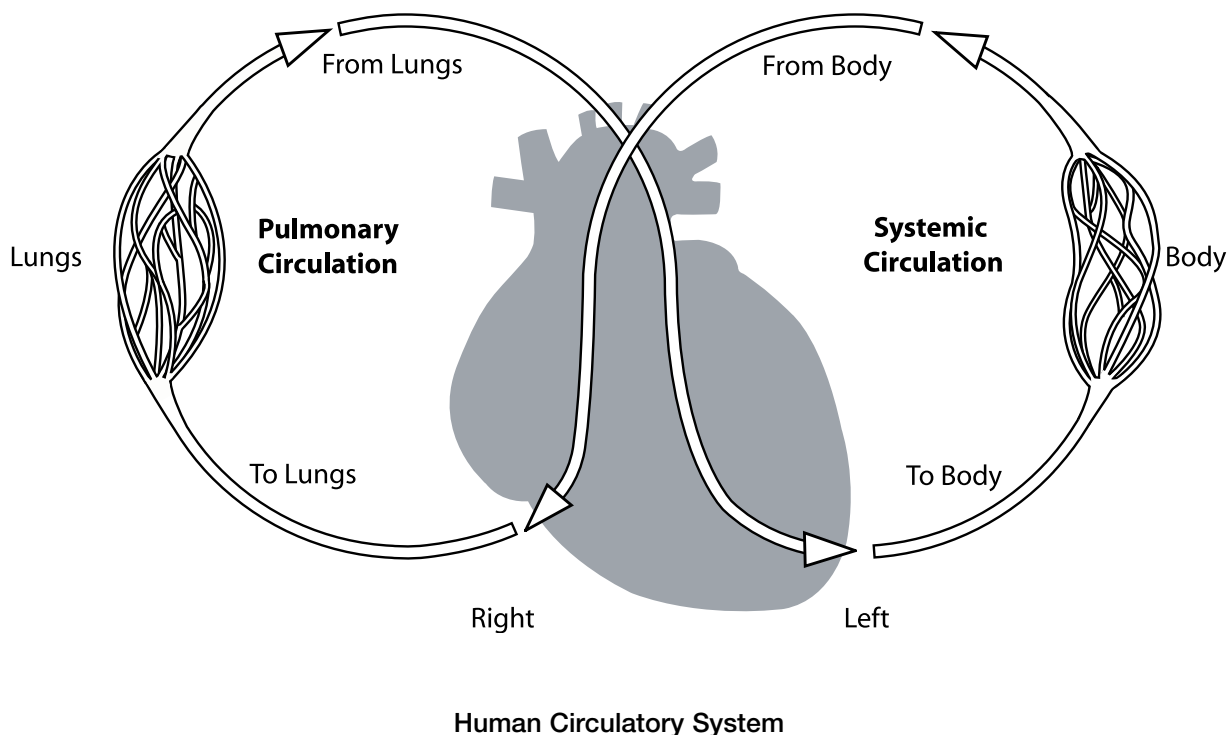
Name _____

Date _____

Part A: The Circulatory System

The circulatory system transports oxygen and nutrients to the cells of the body and removes wastes (such as carbon dioxide). The heart serves as a “double pump” for the circulatory system, receiving deoxygenated blood from the body, pumping it to the lungs to be oxygenated, and then receiving oxygenated blood from the lungs and pumping it to the rest of the body.

Trace the flow of blood through the body. Use a *red colored pencil* to denote oxygenated blood and a *blue colored pencil* to signify deoxygenated blood.



Notes on the Circulatory System

Part B: "Double Circle" Activity

There are two types of blood vessels: arteries and veins. The arteries carry blood away from the heart to the cells of the body, and the veins return blood to the heart. The aorta is the main artery of the body. Arteries branch into smaller vessels called arterioles, which branch into even smaller vessels called capillaries. It is in the capillaries where the exchange of gases (oxygen and carbon dioxide) and nutrients takes place. The blood then moves into small veins called venules, which merge into larger veins, until they finally join the vena cava, which feeds blood back into the heart. This completes the "double circle" of the circulatory system.

1. Your teacher will give you a circulation card.
2. Use your cards to position yourselves to form a "double circle" (or figure eight) representing the correct flow of blood from the heart to the lungs, back to the heart, out to the body and back to the heart.
3. Make sure that both oxygenated and deoxygenated blood is pumped throughout the body at all times.
4. After forming a "double circle," pass around the red blood cells (tennis ball), reading your part of the body when you receive the ball.
5. Finally, tape your cards on the board in a "double circle," showing the correct flow of blood through the body.

Part C: Blood Flow Through the Heart

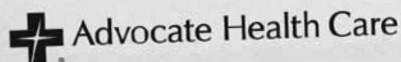
To: Live...from the Heart Students
 From: Marc Silver, M.D.
 Re: How Blood Travels Through the Body

The heart is a vital organ that pumps blood and oxygen to all the body cells.

It is important that you can describe how the blood flows through the body. Write notes and draw diagrams to explain the flow of blood through the heart and circulatory system.

Next, find a colleague (or partner) with whom you will practice explaining this concept to Mr. Harvey.

Dr. Marc Silver, Cardiologist



Arteries vs. Veins

Arteries have thicker walls and tend to have narrower lumens (inner open spaces). They have to constrict and dilate to control how much blood flows to different parts of the body, and they must bear the powerful force generated by the heart. Because of the large amount of muscle in their walls, they are usually round when cut in cross-section.

Veins have thinner walls and tend to have wider lumens (inner open spaces). They have to store blood, and need muscle to push the blood back to the heart. Because the walls are collapsible, they may change shape depending on the surrounding tissue conditions. Most veins have one-way valves to prevent blood from flowing backwards.

Part D: Explore Your Pulse and Heartbeat

Your heart has a big job. It serves as the pump that sends blood to all parts of your body. You can feel this pumping when you take your pulse. Your wrist (radial artery) and the side of your throat (carotid artery) are two places to easily feel your pulse.

Here's what to do:

1. Place your second and third fingers on the side of your throat or on your wrist until you feel your pulse.
2. Predict how many times your heart will beat in one minute. Write this number, which represents your resting heart rate, in the space below. Look at a clock with a second hand and count how many times your heart beats in 15 seconds. Multiply this number by four to get the number of beats per minute (bpm). Compare your actual heart rate with your predicted heart rate.

Predicted resting heart rate

Actual resting heart rate

3. Predict what your heart rate will be during exercise. Write the number in the space below. Now, run in place or do jumping jacks for one minute. When you are finished, measure your heart rate again for 15 seconds and multiply by four. Record it on the chart. How did your heart rate during exercise compare with your resting heart rate?

	Predicted Heart Rate	Actual Heart Rate
Before Exercise		
During Exercise		

4. Record your resting heart rate on the table. Calculate the number of beats per hour, day, year and lifetime for an active adult, a sedentary adult, Mr. Harvey, and yourself based on a 77-year life span.

	Resting Heart Rate	Beats per Hour (x 60)	Beats per Day (x 24)	Beats per Year (x 365)	Beats per Lifetime (x 77)
Active Adult*	60 bpm				
Sedentary Adult*	110 bpm				
Mr. Harvey*	90 bpm				
Me					

*Younger people usually have resting heart rates of 90–120 bpm, because they have higher metabolisms. Women tend to have slightly higher heart rates than men.

In a lifetime, how many fewer times does the active adult's heart beat than the sedentary adult's heart? _____

Did You Know?



Taking Your Pulse

Heart rates vary from person to person based on age, degree of physical activity and other factors. Generally, a person who is in good physical shape will have a lower heart rate. A lower heart rate means that your heart has to work less to circulate blood throughout your body. Over the course of many years, a person with a lower heart rate places a lot less stress on their heart than someone with a higher heart rate.



- ### Notes:

Day	Type of Exercise	Minutes of Activity	Heart Rate During Exercise

Purpose

- ♥ Identify the main arteries and chambers of the heart
- ♥ Demonstrate blood flow through the heart
- ♥ Summarize the process of coronary artery blockage
- ♥ Analyze angiograms and identify areas of arterial blockage
- ♥ Predict the consequences of a blocked artery

Time Frame

45–50 minutes

What Students Do In This Activity

Students will review the parts of the heart and trace the flow of blood through the chambers of the heart. They will learn the function of the coronary arteries, as well as what happens when these arteries become blocked. Students will look at angiograms to determine the amount of blockage Mr. Harvey has in his coronary artery.

Background

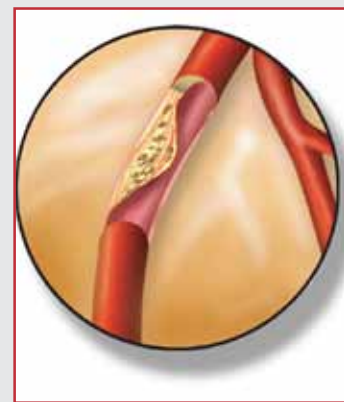
In this lesson, students study the anatomy of the heart by using a diagnostic tool called angiography, a special type of X-ray that shows the arteries of the heart. Angiography involves inserting a catheter, or flexible tube, into a large artery in the patient's leg and threading it up to the aorta. A special fluid called contrast dye is injected into the aorta, and then the X-ray machine captures pictures (angiograms) of the dye in the arteries. By examining the pictures, a cardiologist can tell if there is a blockage in any of the arteries that supply the heart with blood.

In a person with coronary artery disease, the arteries become clogged with plaque, which consists of deposits of cells, fats and cholesterol. If plaque buildup becomes severe, blood flow to the heart is compromised and the heart may become permanently damaged.

Materials

- ♥ Student pages for Lesson 2
- ♥ Angiogram images for patients A, B, C and Mr. Harvey (one set for each student group)
- ♥ Medical image of leg muscle and heart muscle
- ♥ Medical image of labeled heart with arteries
- ♥ Medical image of blocked arteries

Notes:

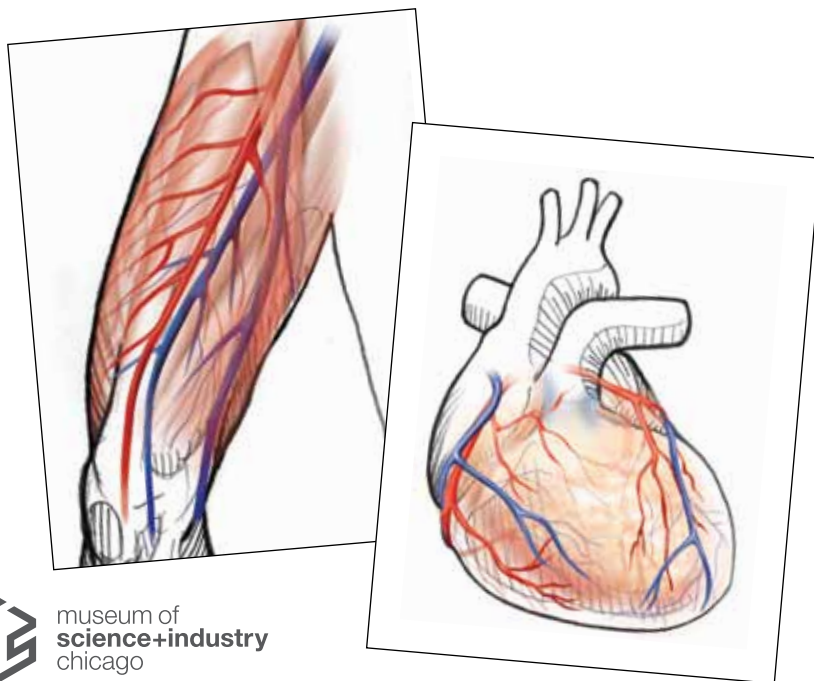


Procedure

As students follow along on their worksheets using blue and red colored pencils, use image of labeled heart to review the path of blood flow through the heart. *Note: Remind students that right and left will be on opposite sides than they are used to.*

Show the medical images of the leg and heart muscle to the class. To review the main function of the circulatory system, have the students look at the arteries that surround the leg muscle and ask them:

- 1. What does the leg muscle need in order to do its job?**
Oxygen, food and nutrients are necessary. Waste and carbon dioxide must be carried away.
- 2. How does the leg muscle receive the oxygen and nutrients it needs and get rid of the wastes it does not need?**
The blood travels from the heart and through the arteries to bring oxygen and nutrients to the muscle. The veins then carry waste, including carbon dioxide, away from the muscle and back to the heart.
- 3. Why do you think the heart needs more arteries than a leg muscle?**
The heart is a muscle that requires a constant flow of blood in order to do its job of pumping.
- 4. What is the job of the coronary arteries?**
The coronary arteries provide the heart with the oxygen and nutrients necessary to do its job.



Notes:



Lesson 3: The Heart Has Needs, Too!

Part C: What Is Heart Disease, and Why Is It Harmful? (10 min.)

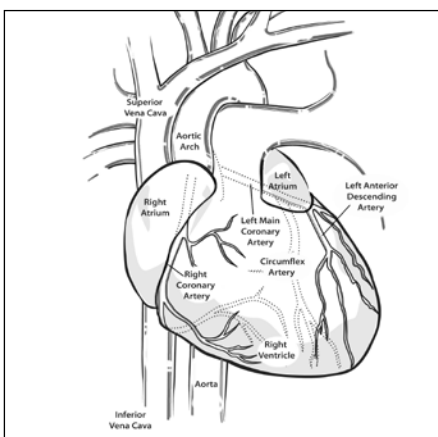
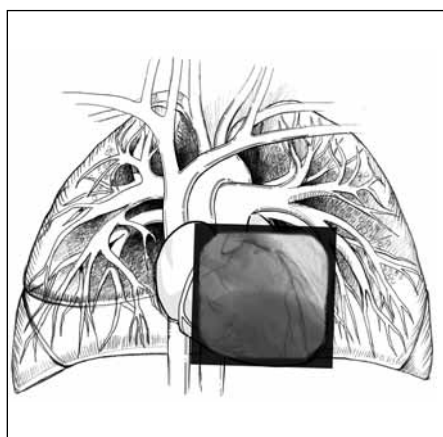
Students will learn about blockages and blood flow through the arteries. Show students images of arteries with no blockage, 40 percent blockage and 95 percent blockage. They will then answer the following questions on their activity sheets:

1. **How can you tell if the arteries are blocked?**
Look inside the body, perform tests, take an X-ray, check blood pressure. The patient may experience symptoms like chest pain and shortness of breath.
2. **What are some ways that doctors can look inside the body to see if the arteries are blocked?**
They can use a special type of X-ray called angiography, which takes pictures of the arteries of the heart.



Part D: Diagnosing Heart Disease (10 min.)

1. Students will read about angiography, a special type of X-ray cardiologists use to take a close look at the arteries of the heart.
2. Students will look at an image of an angiogram layered over a diagram of the heart and shade the area of the heart that would receive less blood if there were a blockage in one of the left coronary arteries.



Notes:



Lesson 3: The Heart Has Needs, Too!

Part E: Reading Mr. Harvey's Angiogram (10 min.)

As they complete the worksheets, give each group of students the transparency of Bill Harvey's angiogram, as well as the angiograms for patients A, B and C. Students will try to interpret Mr. Harvey's angiogram to determine the percentage of blockage in his artery, and then answer questions to prepare for a meeting with Mr. Harvey.



Mr. Harvey's Angiogram

Patient	Blockage	Artery	Condition Affected	Treatment
A	None	None	Patient is healthy	None needed
B	40%	Left main coronary artery	Patient is developing coronary artery disease	Lifestyle change and medication
C	95%	Left main coronary artery	Patient has coronary artery disease	Invasive treatment
Mr. Harvey	95%	Left main coronary artery	Patient has coronary artery disease	Invasive treatment

Students should determine that Mr. Harvey has a 95 percent blockage in one of his left coronary arteries. If this artery were to become completely blocked, the left side of his heart would be damaged.

Notes:





Lesson 3: The Heart Has Needs, Too!

Name _____


Date _____

Note from the Cardiologist:

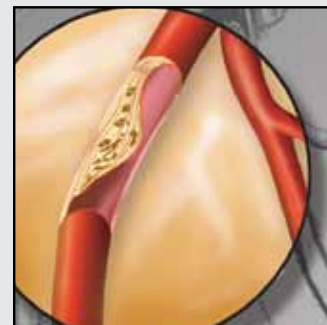
To: Live...from the Heart Students
From: Marc Silver, M.D.
Re: A Look Inside the Heart

Now that you have reviewed circulation and explored its importance to the body, let's take a closer look at Mr. Harvey's heart to more accurately determine what is wrong with it. We'll look at images of blocked arteries, and then I will introduce you to a special diagnostic tool that cardiologists use to look inside the heart.

Dr. Marc Silver, Cardiologist

 Advocate Health Care

Notes:



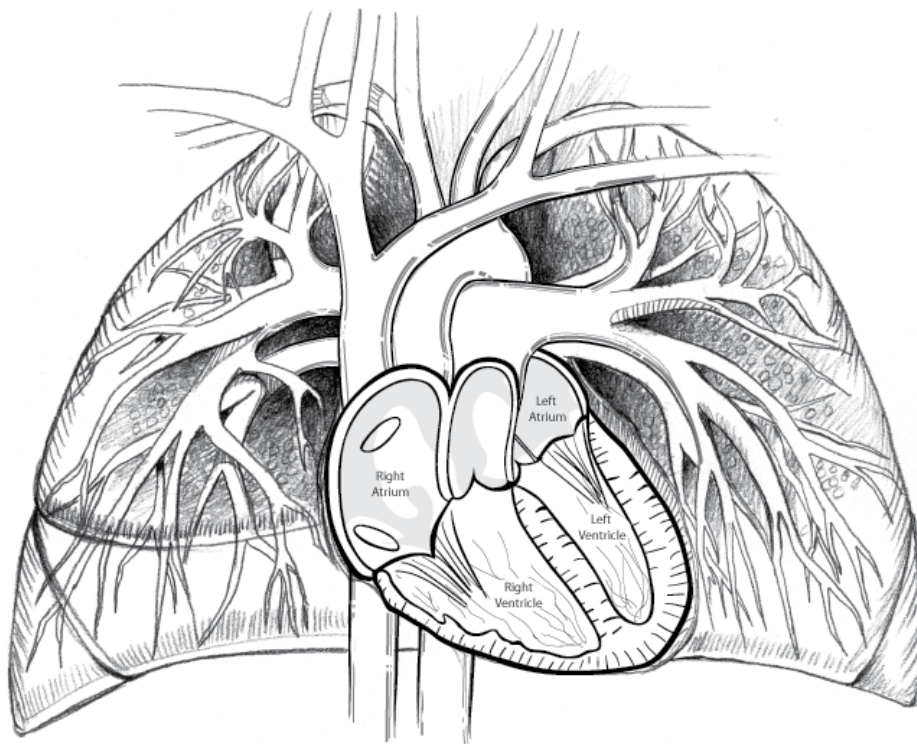
Blockage



Angiography

Part A: Flow of Blood Through the Heart

Read the steps below, and then number the part of the heart diagram that matches each step of blood flow. Use a red colored pencil to show oxygenated blood flowing through the heart, and a blue colored pencil to show where deoxygenated blood flows through the heart.



1. The right atrium receives deoxygenated blood from the body via a network of veins.
2. A one-way valve provides a pathway for venous blood to flow from the right atrium to the right ventricle.
3. The right ventricle pumps the blood to the lungs.
4. While in the lungs, the blood collects a new supply of oxygen.
5. Freshly oxygenated blood flows to the left atrium through another one-way valve.
6. The blood enters the left ventricle. The thick muscular wall of the left ventricle enables it to perform the major pumping action of the heart.
7. Oxygenated blood is pumped from the left ventricle through the aortic valve and out to the body.
8. The blood is distributed to the entire body via a network of arteries that originate from the aorta.

Notes:



The heart needs blood just like all other body parts. The heart is similar to any other muscle in the body. For example, when you run, arteries continually supply the leg muscles with blood. In fact, because the heart is a muscle that is working every minute of your life, it needs even more oxygen and nutrients than most other muscles. Two arteries branching off the aorta deliver blood directly to the heart muscle. These arteries are called **coronary arteries**.

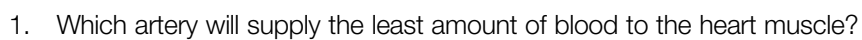


Why do you think the system of coronary arteries surrounding the heart is so extensive?

Notes:

[illegible]

In a person with coronary artery disease, the arteries are narrowed by a layer of plaque, which consists of deposits of cells, fat and cholesterol. As more plaque accumulates, the amount of blood reaching the heart muscle is reduced. The heart muscle can suffer damage from lack of blood and oxygen. It may not beat as strongly, it may beat irregularly or it may stop beating altogether.

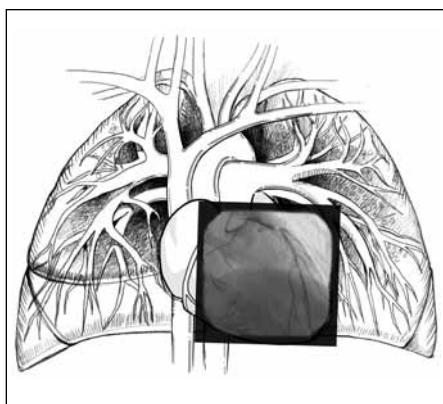


2. Which artery will supply the most amount of blood to the heart muscle?

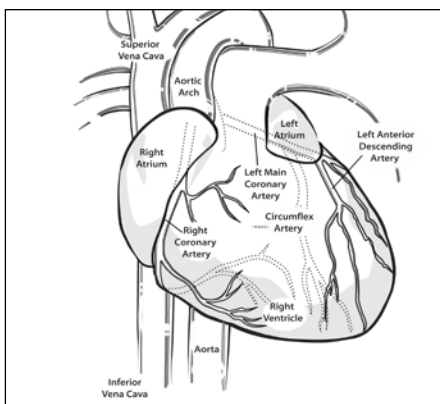
Notes:

Part D: Diagnosing Heart Disease

When a doctor suspects that a patient has heart disease, he or she may use a diagnostic tool called angiography. Angiography is a special type of X-ray that allows a close look at the arteries of the heart. A catheter, or flexible tube, is inserted into a large artery in the patient's leg and is threaded up to the aorta. A special fluid called contrast dye is injected into the aorta, and then the X-ray machine captures pictures (angiograms) of dye in the arteries. The doctor can then tell if there is a blockage in any of the arteries that supply blood to the heart muscle.



Look at an angiogram layered over a diagram of the heart.



Shade the area of the heart that would receive less blood if there were a blockage in the left main coronary artery.

Notes:



Part E: Reading Mr. Harvey's Angiogram

Note from the Cardiologist:

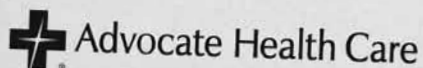
To: Live...from the Heart Students
 From: Marc Silver, M.D.
 Re: Analyzing Angiograms

You are now familiar with the coronary arteries, plaque, heart disease and angiography. Look at Mr. Harvey's angiogram and determine the percentage of blockage. Verify your answer with the three angiograms, in which the percentage of blockage has already been determined.

Patient	Blockage	Artery Affected	Condition	Treatment
A	None	None	Patient is healthy	None needed
B	40%	Left main coronary artery	Patient is developing coronary artery disease	Lifestyle change and medication
C	95%	Left main coronary artery	Patient has coronary artery disease	Invasive treatment
Mr. Harvey				

Your next job is to meet with Mr. Harvey to discuss the results of his angiography. Take a few minutes to answer the questions on the next page to prepare for your meeting.

Dr. Marc Silver, Cardiologist



Notes:





Lesson 3: The Heart Has Needs, Too!

1. What are the coronary arteries? Why are they important?

2. What is the result of Mr. Harvey's angiography?

3. What would happen if Mr. Harvey's left coronary artery became 100 percent blocked?

4. What part of his heart would this blockage directly affect?

Did You Know?



Coronary artery disease is caused by atherosclerosis (hardening of the arteries). Atherosclerosis occurs when plaque (a fatty substance) forms in the wall of an artery and reduces blood flow to the heart muscle. As plaque builds up, the artery narrows and can become blocked. As a result, the heart doesn't get enough of the oxygen-rich blood it needs.

Purpose

- ♥ Analyze current treatments for coronary artery disease
- ♥ Recommend a treatment option for the patient after analyzing symptoms and risk factors
- ♥ Formulate questions to ask a surgical team while watching a live broadcast of open-heart surgery

Time Frame

45–50 minutes

What Students Do In This Activity

In this lesson, students look at three treatments for coronary artery disease, ranging from least invasive to most invasive. Based on Mr. Harvey's symptoms and diagnostic tests, students make a recommendation for Mr. Harvey's treatment and write a letter to the cardiologist outlining the rationale for their choice. Students also explore current areas of research in the treatment of heart disease.

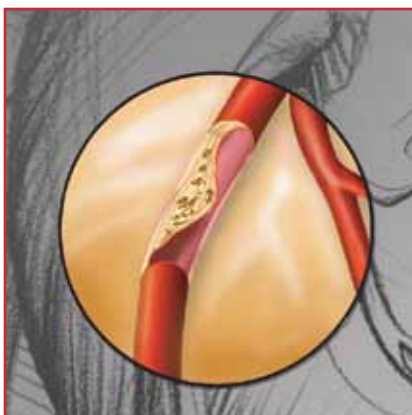
Background

In Part B, students will explore current research in heart disease treatment. Here is an example of current research at Advocate Christ Medical Center:

One of the disadvantages of an angioplasty and stent is that scar tissue can form around the stent, causing the artery to become narrowed again. Current research shows that drug-coated stents can prevent scar tissue from forming and, therefore, can prevent re-narrowing of the artery.

Materials

- ♥ Copies of **Lesson 3 Student Pages**
- ♥ Internet access
- ♥ Treatment images



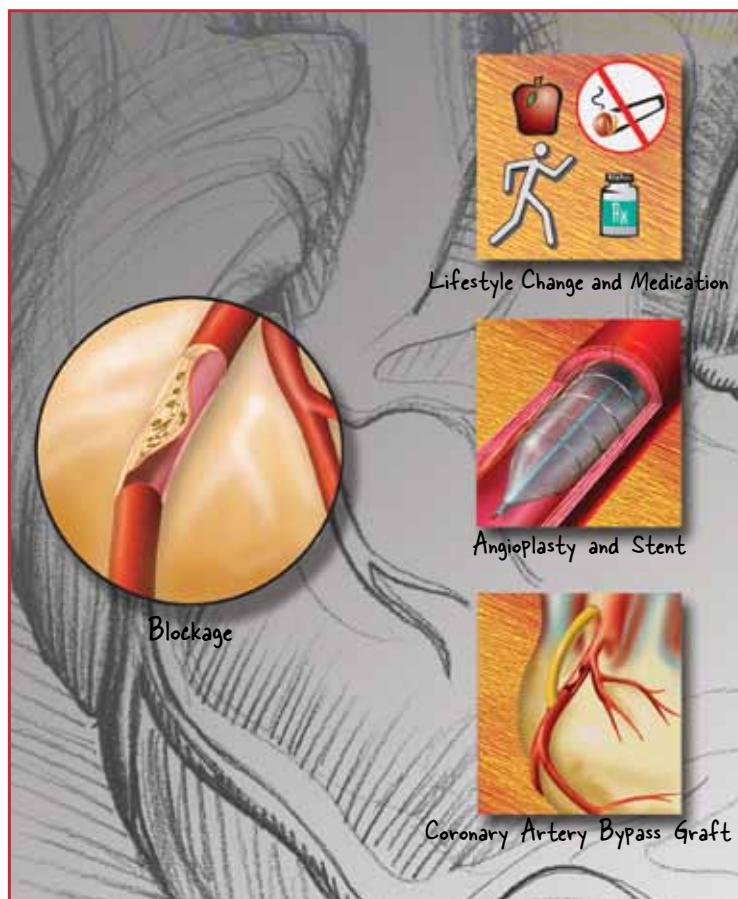
Notes:



Procedure

Part A: Analyzing Treatments (20–25 min.)

1. As a class, in partners or in small groups, students will read through the three treatment options for heart disease. Students will also look at the disadvantages of each treatment, which show that none are perfect. Based on the condition of Mr. Harvey's heart, students will pick the treatment that they think will most benefit Mr. Harvey.
2. The class will discuss the treatment recommended by each group.
3. Explain that the cardiologist, in fact, recommended coronary artery bypass surgery for Mr. Harvey.



Part B: Using the Web...Going Beyond (25 min.)

1. Students will access the Advocate Health web site (www.advocatehealth.com) to explore current research in heart disease treatment.
2. Students will report on three advances in current heart disease treatment research.

Notes:



Name _____

Date _____

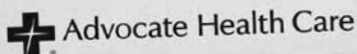
Note from the Cardiologist:

To: Live...from the Heart Students
 From: Marc Silver, M.D.
 Re: Possible Treatments

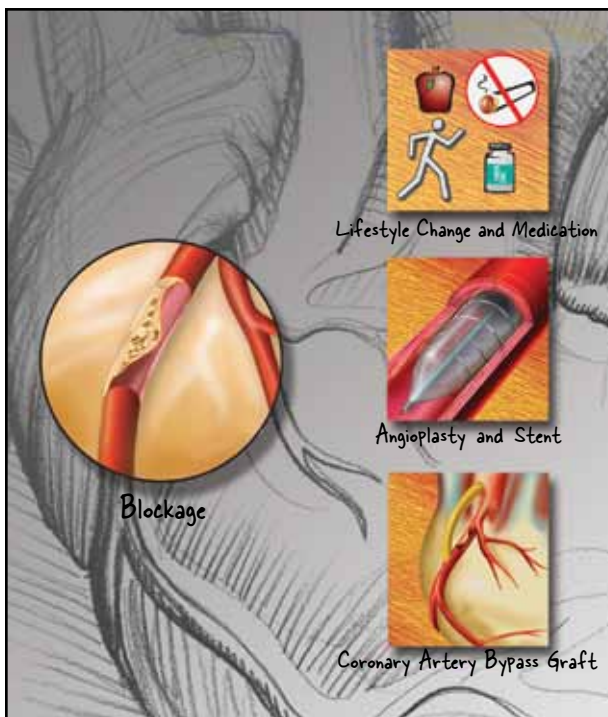
It is time to examine possible treatments for coronary artery disease. The following are three treatments that range from least invasive to most invasive: lifestyle change and medication, angioplasty and stent, and coronary artery bypass surgery.

After analyzing the three options, you will recommend a treatment for Mr. Harvey. When recommending a treatment, be sure to consider both the advantages and disadvantages of the treatment. Health professionals at Advocate Christ Medical Center continue to research and improve heart disease treatments. Part of your training will involve exploring current areas of research in treatment for heart disease and choosing an area that interests you for future study.

Dr. Marc Silver, Cardiologist




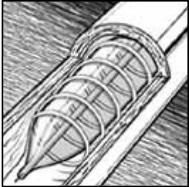

Notes:



Part A: Analyzing Treatments

Review the medical notes regarding different heart disease treatments.

Treatments for Coronary Artery Disease

Treatment	Patient Conditions	Description	Disadvantage
<p>Lifestyle change and medication</p> 	<p>Blood flow is temporarily blocked.</p> <p>Blockage is less than 70%.</p> <p>Patient has angina, or pain in the chest, that goes away after a few minutes.</p>	<p>Exercise three times a week, stop smoking and lower the amount of fat in the diet. Prescribe medications that open blood vessels, lower heart rate and blood pressure, decrease blood cholesterol, dissolve clots and prevent future clots from forming.</p>	<p>Effective only if coronary artery disease is detected before it becomes severe.</p>
<p>Angioplasty and stent</p> 	<p>Blockage is in a single vessel and can easily be reached.</p> <p>Patient has angina, or pain in the chest, that does not respond to medication.</p>	<p>A catheter, or flexible tube, is inserted into a narrowed artery. A tiny balloon at the tip of the catheter is inflated to widen the vessel. A stent, a wire-mesh tube, is then inserted. The stent, which remains in the artery permanently, prevents further closing or narrowing of the artery.</p>	<p>Scar tissue may form and push through the wire mesh of the stent, causing re-blockage of the artery. Patients may require repeat treatments to keep the artery clean.</p>
<p>Coronary artery bypass graft</p> 	<p>Blockage is greater than 90% in the left main artery, the vessel that supplies the most blood to the main section of the heart muscle.</p> <p>Blockages occur in three or more arteries.</p> <p>Patient has severe angina, or chest pain, that does not respond to medication.</p> <p>Patient has had repeated angioplasties, all of which result in re-narrowing of the artery after the procedure.</p>	<p>Bypass surgery creates a detour to re-route the blood around the blockage, using blood vessels from other parts of the body.</p>	<p>The sternum in the chest is sawed open to allow the surgeon access to the heart. During the procedures, the patient relies on a heart-lung machine to perform the functions of the heart and lungs. Sending the blood through the heart-lung machine can cause damage to the cells of the body, which may result in complications, such as loss of brain function.</p>

4. You will be attending a coronary artery bypass graft procedure performed at Advocate Christ Medical Center. Think about questions you would like to ask the surgical team as you watch the bypass surgery.

♥ Go to **www.livefromtheheart.org** to prepare for your visit to live surgery.



Purpose

- ♥ Demonstrate what has been learned in the Live...from the Heart unit
- ♥ Highlight what young adults should know about heart disease risk and prevention

Time Frame

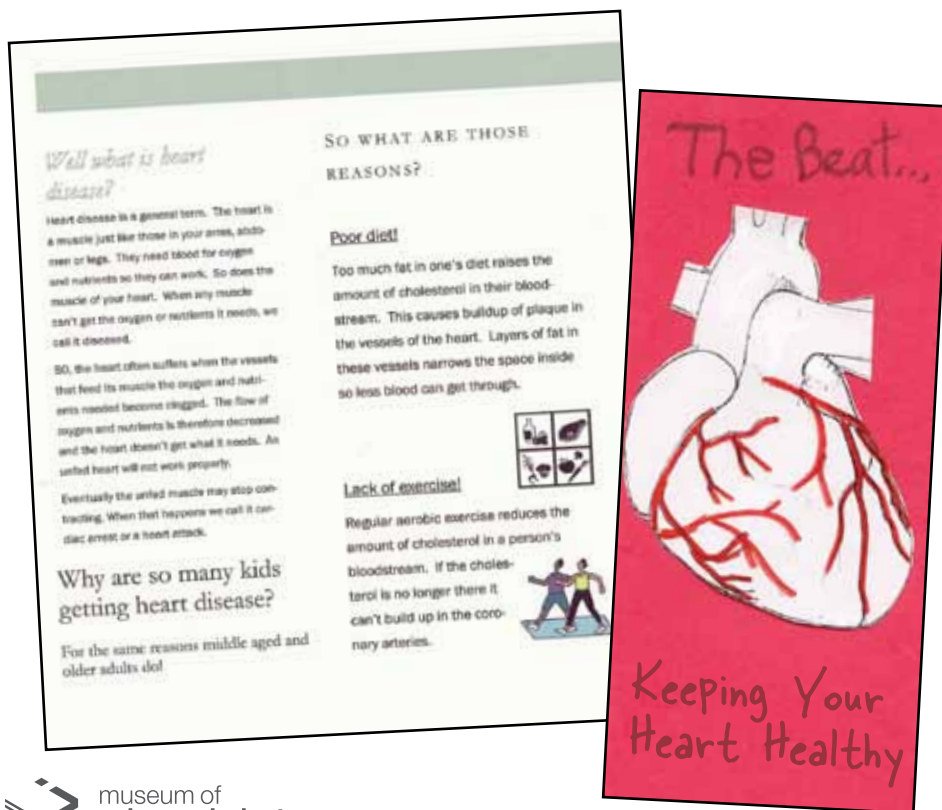
2-3 hours

What Students Do In This Activity

In this lesson, students create a community health pamphlet, poster, video or display to educate students their age about heart disease.

Materials

- ♥ Copies of the **Lesson 5 Student Pages**
- ♥ Internet access
- ♥ Access to other information sources, such as magazines, newspapers, books and encyclopedias
- ♥ Paper
- ♥ Colored pencils, crayons or markers
- ♥ Tape, glue and scissors
- ♥ Computer with publishing software (optional)



Notes:



Lesson 5: Let's Educate!

Procedure

Part A: Review (20 min.)

1. Refer to **Lesson 1**, in which the class completed the “**What We Know About Heart Disease**” and “**What We Want to Know About Heart Disease**” columns of the KWL chart. As a class, complete the “**What We Have Learned About Heart Disease**” column. Discuss and document what the students have learned about heart disease from the previous classroom activities, as well as from the live broadcast of heart surgery.

Note: If you did not do *Lesson 1*, you can simply discuss what students have learned about heart disease and either use an overhead or the board to make a list of what has been learned.

2. Ask students to generate a list of topics they think students their own age should know about heart disease. Guide the discussion to include the following topics: how the heart works, risk factors for heart disease, preventive measures, symptoms of heart disease, diagnosis, and treatments.

Part B: Explain Assignment (5 min.)

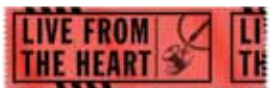
1. Distribute **Lesson 4 Student Pages** and read the instructions to the class. Students will design a pamphlet, poster, video or display to educate fellow students about the basics of heart disease. Their pamphlet will also cover in greater depth three topics that interest the student about heart disease or heart health (symptoms of heart disease, healthy lifestyle decisions, risk factors, etc.) The pamphlet will include illustrations.
2. Explain the grading criteria. (See Suggested Grading Rubric on page 4-3.)
3. To wrap up the lesson and unit, choose several finished products and have the students present the information to their class or other classes.

Ideas for Extending the Activity

You may wish to hold a health fair in which students give presentations on heart health and disseminate their pamphlets. Pamphlets and posters can be displayed throughout the school (on bulletin boards, in the library or in the main office), distributed to other classes or sent home to families.

Notes:





Lesson 5: Let's Educate!

Suggested Grading Rubric

Creativity	0	1	2	3	4	5
Neatness or Organization	0	1	2	3	4	5
General explanation of heart disease	0	2	4	6	8	10
Three topics						
Topic one	0	1	2	3	4	5
Topic two	0	1	2	3	4	5
Topic three	0	1	2	3	4	5
Illustrations (at least three)	0	1	2	3	4	5
Resources (at least three)	0	1	2	3	4	5

Points Earned _____ / 50 Points Possible



Lesson 5: Let's Educate!

Suggested Grading Rubric

Creativity	0	1	2	3	4	5
Neatness or Organization	0	1	2	3	4	5
General explanation of heart disease	0	2	4	6	8	10
Three topics						
Topic one	0	1	2	3	4	5
Topic two	0	1	2	3	4	5
Topic three	0	1	2	3	4	5
Illustrations (at least three)	0	1	2	3	4	5
Resources (at least three)	0	1	2	3	4	5

Points Earned _____ / 50 Points Possible



Lesson 5: Let's Educate!

Name _____

Date _____

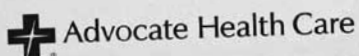
Note from the Community Health and Wellness Coordinator:

To: Live...from the Heart Students
From: Nancy Mabbott, Community Health
and Wellness Coordinator
Re: Community Health Education

Now that you know so much about heart disease and its causes, your next job is to educate your community. Design a pamphlet, poster, video or display to teach students your age about heart disease so that they can make healthy lifestyle choices for their future.

Remember, most heart disease starts in your teens, so this is an important time to make heart-healthy choices.

Nancy Mabbott



Notes:



Your final product should:

- ♥ Provide a general explanation of heart disease. (10 points)
- ♥ Focus on at least three topics that you think students your age should learn about heart disease. (18 points)
- ♥ Contain at least three illustrations of the major topics. (6 points)
- ♥ **Be creative!** You want people to be interested in this information. Learning to prevent heart disease now may save their lives. (5 points)
- ♥ Draw from at least three different resources, such as the Internet, books, magazines, newspapers or encyclopedias. (6 points)
- ♥ Be neat and organized. (5 points)

Possible Topics

The following topics are only suggestions. You also may come up with your own ideas.

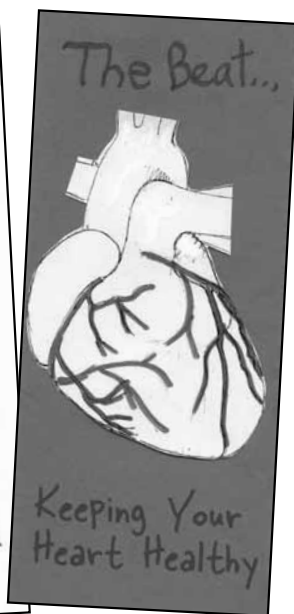
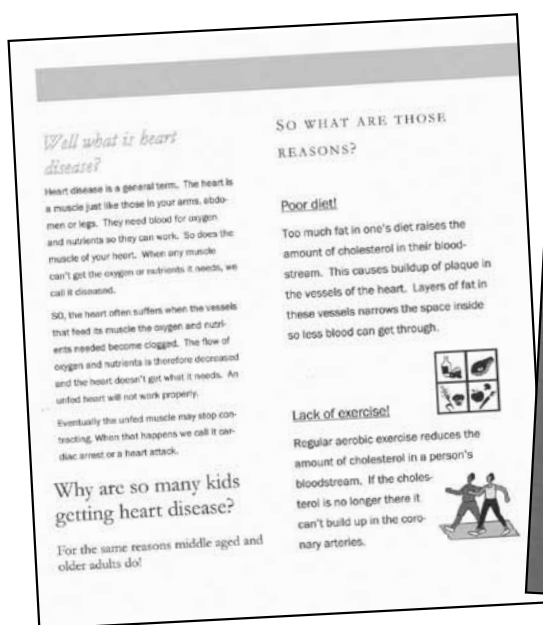
- ♥ How the heart works
- ♥ Risk factors for heart disease
- ♥ Preventive measures
- ♥ Symptoms of heart disease
- ♥ Diagnosis of heart disease
- ♥ Treatment options
- ♥ Tips for teenagers and their families on heart-healthy living

Grading Rubric

Creativity	0	1	2	3	4	5	
Neatness or Organization	0	1	2	3	4	5	
General explanation of heart disease	0	2	4	6	8	10	
Three topics							
Topic one	0	1	2	3	4	5	6
Topic two	0	1	2	3	4	5	6
Topic three	0	1	2	3	4	5	6
Illustrations (at least three)	0	1	2	3	4	5	6
Resources (at least three)	0	1	2	3	4	5	6

Points Earned _____ / 50 Points Possible

Notes:





Lesson 6: Topics for Further Study

Purpose

- ♥ Utilize various resources to research developments in heart surgery, including past, present and future
- ♥ Write a short report on one or more of the suggested research topics

Time Frame

2–3 hours

What Students Do In This Activity

Students research important developments in the history of heart surgery as well as look forward at current cutting-edge research in the treatment of heart disease.

Materials

- ♥ Copies of **Lesson 6 Student Pages**
- ♥ Internet access and access to other resources, such as books, magazines, newspapers and encyclopedias

Procedure

Part A: Research

1. Pairs or small groups of students will spend one or two class periods researching important people, events and topics related to heart surgery.
2. Students will take notes to prepare for their report or presentation.

Part B: Write

Students will write short reports on a topic of their choice. Class presentations are recommended.

Notes:





Lesson 6: Topics for Further Study

Name _____

Date _____

Part A: Research

In this activity, you will research important developments in the history of heart surgery as well as look forward at current cutting-edge research in the treatment of heart disease.

Below is a list of topics to guide your research:

Artificial heart
William Harvey
Joseph Lister and antisepsis
Heart transplants
Heart-lung machine
Extracorporeal circulation
Robotic surgery
Nanotechnology
Angiogenesis
Stem cell research
Closed-heart surgery
Off-pump surgery
Xenotransplantation
Angiography
Anesthesia
Gene therapy
Dr. Christian Barnard
William Roentgen and x-rays
Dr. Walter Lillehei
Dr. Dwight Harken
Dr. Michael DeBakey
Women and heart disease

Visit the Educator Resources section of our website www.livefromtheheart.org for a good list of web sites where you can start your research. Also use search engines like www.google.com and enter any of the keywords above.

Part B: Write and Report

Write a short report on the topic of your choice.

Notes:



Purpose

- ♥ Utilize various materials to build a model of bypass surgery

Time Frame

2 hours

What Students Do In This Activity

Students will use a variety of materials to create a model that explains bypass surgery to a patient. They will then sketch their model and explain how their model demonstrates CABG surgery.

Materials

- ♥ Copies of the **Lesson 7 Student Pages**
- ♥ Pieces of clear plastic tubing
- ♥ Something to “block” tubing (hot glue gun, Crisco, etc.)
- ♥ T-connectors
- ♥ Stoppers
- ♥ Funnels, beakers or graduated cylinders with measurement marks
- ♥ Water
- ♥ Clay
- ♥ Other materials from home



Notes:



Procedure

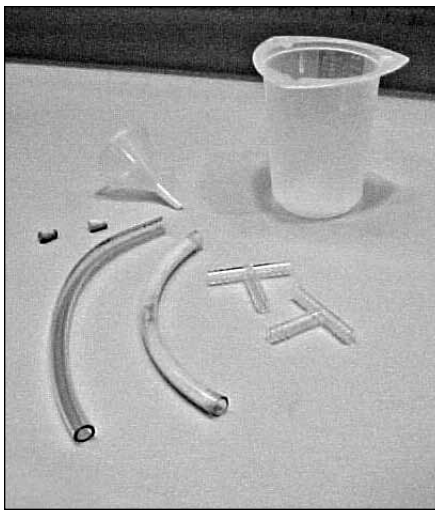
1. Students will build their models using the materials available or materials they have brought from home.
2. Students will sketch their models and answer the questions on Student 7-1.
3. Students will explain their models to the class.

Name _____

Date _____

Suggested Materials:

- ♥ Pieces of clear plastic tubing
- ♥ Something to "block" tubing (hot glue gun, Crisco, etc.)
- ♥ T-connectors
- ♥ Stoppers
- ♥ Funnels, beakers or graduated cylinders with measurement marks
- ♥ Water
- ♥ Clay
- ♥ Other materials from home



Using the materials provided, your team should design a model that will explain coronary artery bypass graft (CABG) surgery to a patient who may need the surgery.

Sketch your model.

1. How does your model demonstrate CABG surgery?

2. Coronary artery bypass graft surgery bypasses blocked arteries in the heart. How would you explain the benefits to a patient?

3. Coronary artery bypass surgery significantly increases the rate of blood flow to the heart. How might the patient feel as a result of having such dramatic increase of blood to the heart?

Notes

Did You Know?

The increase of blood flow to the heart after CABG surgery is about the volume of one soda can per minute.



Purpose

- ♥ Summarize what has been learned in the *Live...from the Heart* unit

Time Frame

1-2 hours

What Students Do In This Activity

Students will create a Grand Rounds Report for Bill Harvey summarizing what has been learned in the *Live...from the Heart* unit. Cardiology staff participates in Grand Rounds to stay informed of changes in the practice of cardiovascular medicine. At these presentations, cardiologists present case studies and discuss symptoms, risk factors and cutting-edge treatments.

Materials

- ♥ Copies of Lesson 8 Student Pages
- ♥ Work that has been completed to date for the unit

Procedure

1. Introduce the Ground Rounds Report.
2. Students may work on report in class or at home.



Patient # 567294462
Bill Harvey

567294462 Bill Harvey



Lesson 8: Grand Rounds Report

Name_____

Date_____

Cardiology staff participates in Grand Rounds to stay informed of changes in the practice of cardiovascular medicine. At these presentations, cardiologists present case studies and discuss symptoms, risk factors and cutting-edge treatments. Create a Grand Rounds Report for Bill Harvey summarizing what has been learned in the Live...from the Heart unit.

Part A: Pre-Operation Section

Name of report:

Patient name:

Intake date:

Complaint:

Description of patient:

Main risk factors the patient presents:

Risk Factor	How Risk Factor Was Determined

Angiography results:

Recommended treatment:

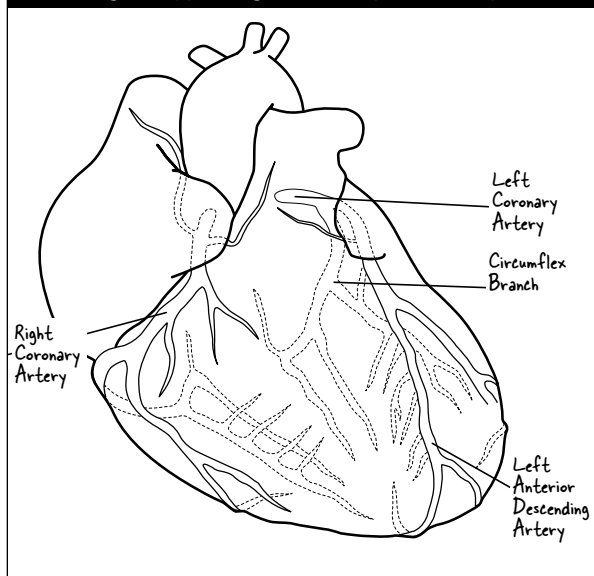
Purpose of treatment:

Treatment conducted on patient:

Part B: Post-Operation Section

Description of the procedure:

Drawing of bypass grafts completed on patient:



Observations and points of interest from the live surgery:

Post-surgery recommendations to patient on controlling risk for further development of heart disease:

Area of research in heart disease treatment that I would like to pursue:



Glossary

angiography—an x-ray study that uses dye injected into arteries to study blood circulation

artery—a blood vessel that carries blood away from the heart to the body

atherosclerosis/arteriosclerosis—commonly called “hardening of the arteries”; a variety of conditions caused by fatty or calcium deposits in the artery walls causing them to thicken

blood pressure—pressure of blood against the walls of a blood vessel or heart chamber

bypass—an alternative passage created surgically to divert the flow of blood around a blockage

cannula—a flexible tube that is inserted into the body

capillaries—tiny blood vessels between arteries and veins that distribute oxygen-rich blood to the body

cardiac—pertaining to the heart

cardiac catheterization—a diagnostic procedure in which a tiny, hollow tube (catheter) is inserted into an artery or vein in order to evaluate the heart and blood vessels

cardiology—the clinical study and practice of treating the heart

cardiovascular (CV)—pertaining to the heart and blood vessel (circulatory) system

catheter—a small, thin tube; may refer to a tube used during a cardiac catheterization procedure to inject dye, obtain blood samples and measure pressures inside the heart

cholesterol—a substance normally made by the body, but also found in foods from animal sources, like beef, eggs and butter. Too much cholesterol in the body can lead to narrowing and blockage of the arteries, especially those that feed the heart and keep it healthy. Ideally, blood cholesterol levels should be less than 200mg/dL

coronary arteries—two arteries that come from the aorta to provide blood to the heart muscle

exercise electrocardiogram (ECG or EKG)—a test to assess the cardiac rhythm and function by having the patient exercise on a treadmill or bicycle

graft—to transplant or implant (living tissue, for example) surgically into a bodily part to replace a damaged part or compensate for a defect

heart attack (also called **myocardial infarction**)—occurs when one or more regions of the heart muscle experience a severe or prolonged decrease in oxygen supply caused by a blocked blood flow to the heart muscle

ischemia—decreased flow of oxygenated blood to an organ due to obstruction in an artery

left atrium—the upper left chamber of the heart. It receives oxygen-rich (red) blood from the lungs via the four pulmonary veins, and then sends this blood to the left ventricle

left ventricle—the lower left chamber of the heart. It receives oxygen-rich (red) blood from the left atrium and pumps it into the aorta, which takes the blood to the body. The left ventricle must be strong and muscular in order to pump enough blood to the body to meet its requirements

lipid—a fatty substance in the blood

open heart surgery—surgery that involves opening the chest and heart while a heart-lung machine performs for the heart and lungs during the operation

plaque—deposits of fat or other substances attached to the artery wall

pulmonary—pertaining to the lungs and respiratory system

pulmonary artery—the blood vessel connecting the right ventricle to the lungs, allowing oxygen-poor (blue) blood to receive oxygen

pulmonary vein—the vessel that carries oxygenated blood from the lungs to the left side of the heart

right atrium—the upper right chamber of the heart, which receives oxygen-poor (blue) blood from the body and sends it to the right ventricle

right ventricle—the lower right chamber of the heart, which receives oxygen-poor (blue) blood from the right atrium and sends it to the pulmonary artery

risk factor—a condition, element or activity that may adversely affect the heart

saturated fat—fat that is found in foods from animal meats and skin, dairy products and some vegetables. Saturated fats are usually solid at room temperature

vein—a blood vessel that carries blood from the body back to the heart