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## Project 4.4.1: Unblocking the Vessels

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### Introduction

*Heart disease* is a broad term used to refer to the range of diseases that can affect the heart. This may include diseases of the blood vessels, heart rhythm problems, heart infections, and problems in the heart a person is born with, called congenital heart defects. Many forms of heart disease can be treated, and even prevented, with lifestyle modifications. Unfortunately, advanced disease may need to be treated with medication or medical procedures.

In this activity you will explore what happens to the body when blood vessels fail to deliver oxygen to the tissues. You will investigate medical procedures used to treat blocked blood vessels and build a model to demonstrate one technique. Return to both Anna's medical history documents as well as her autopsy report and brainstorm how issues of the heart may have played a role in Anna's final demise.

### Equipment

- Computer with Internet access
- Assorted modeling supplies
- Pump model from Problem 4.3.3 (optional)
- Design Process Resource Sheet
- Activity 4.1.2 Autopsy Report Resource Sheet
- Project 4.2.1 Medical History resource sheet
- Unit 4 Career journals
- Biomedical Sciences Documentation Protocol
- PBS Course File

### Procedure

1. Visit the Public Broadcasting Service website for the science television show NOVA and examine the pictures of hearts following events called *myocardial infarctions*, or heart attacks. The site is available at: <http://www.pbs.org/wgbh/nova/heart/troubled.html>. In your NB, take notes on the appearance of the heart following a heart attack and describe how it differs from a healthy heart.
2. Answer Conclusion questions 1 and 2.
3. Refer to the Project 4.2.1 Medical History Resource Sheet. Note that due to her multiple instances of chest pain, the doctors decided to look at the blood flow in the coronary vessels. Doctors recorded X-ray images called *angiograms* to get a better picture of overall circulation. If doctors can find blocked vessels and open them before blood flow is diminished, they may be able to prevent incidents such as a heart attack.

4. Read the Society for Vascular Surgery article *Angiogram* available at <http://www.vascularweb.org/vascularhealth/pages/angiogram.aspx> or the Mayo Clinic article *Coronary Angiogram* available at <http://www.mayoclinic.com/health/coronary-angiogram/MY00541> to learn more about this test. Provide a brief description of how and why an angiogram is obtained in your NB.
5. Follow the link on the Medical History sheet to view a compilation of Anna's angiogram images. Note that dye is injected into the vessels and shows how blood moves through the arteries.
6. Use the Internet to find an image of how a blocked artery shows up on an angiogram. Include a sketch in your NB. Make sure to include an arrow that points out the blockage.
7. Refer to the Design Process Resource Sheet. Use this sheet as needed to complete the remaining steps of the activity.
8. Note that depending of the severity of the condition, a doctor may recommend various medical procedures to open a blocked vessel. Research each method listed below, and take notes in your NB. Design a way to model one procedure using materials you find at home or in your classroom. You can use your pump and vessel model from Problem 4.3.3, but it is not required. Begin with a vessel that is severely *occluded*, or blocked.
  - Angioplasty
  - Stent insertion
  - Coronary Artery Bypass Graft (CABG) surgery
9. Build your model. Imagine using this model to demonstrate the procedure to a heart patient. A local health organization will be offering an incentive to the most realistic and accurate model.
10. Demonstrate your procedure to the class. Take notes in your NB on procedures you did not build using the following chart.

TECHNIQUES	DESCRIPTION OF PROCEDURE	HOW IT TREATS BLOCKAGES	ADVANTAGES	DISADVANTAGES
Angioplasty				
Stent insertion				
Coronary artery bypass graft (CABG)				



3. Explain why a patient would most likely prefer their blocked vessels be treated by angioplasty and stents versus bypass surgery.

4. A person may experience a stroke, a rapid loss of brain function due to a decreased blood supply to the brain. Explain how a stroke can be linked to cholesterol and conditions such as atherosclerosis.