

# *History of Medicine*

## *Innovations in Surgery and Reproductive Health*

### *Teacher's Guide*

**Grade Level:** 9–12

**Curriculum Focus:** Health

**Lesson Duration:** Three class periods

#### **Program Description**

The reproductive years bring with them a host of potential risks and rewards. This episode covers early innovations in the fight against venereal diseases like syphilis as well as the modern scourge of AIDS. We look into the development of oral contraception and its social consequences. We also see how technology developed in the military, like the sonogram, has found practical application in monitoring the fetus during pregnancy. Finally, military medicine, including amputation and the development of anesthesia, are discussed in the context of treating young men.

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#### **Onscreen Questions**

Part 1, “The New Era of Reproductive Health” and “A Closer View of Pregnancy”

- Why were Paul Ehrlich’s experiments important for medicine?
- How has the microscope contributed to science?

Part 2, “Safer Surgery,” “From Stitching to Walking” and “Grasping Thought”

- How has anesthesia made modern surgery possible?
  - Why is making prosthetic hands a technological challenge?
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#### **Lesson Plan**

##### *Student Objectives*

- Detail significant innovations in surgery and reproductive health.
- Describe important concepts regarding disease prevention and control, personal health, advancements in medical technology, and sexual reproduction.
- Identify information about a medical innovation that would be important for a patient to know.

##### *Materials*

- *History of Medicine: Innovations in Surgery and Reproductive Health* video and VCR, or DVD and DVD player
- Computer with Internet access

## Procedures

1. After watching the video, ask students to review some of the innovations in surgery and reproductive health featured in the video. Make a list on the board, including:
  - Development of birth control pills to prevent pregnancies
  - Discovery of chemotherapy, the process of using chemicals to kill microbes and treat diseases
  - Identification of HIV, the virus that causes AIDS
  - The development of AIDS tests and treatments
  - Use of sonograms, especially for examining the developing fetus
  - Discovery of the human sperm and egg
  - Use of anesthesia in surgery
  - Use of sterilization, rubber gloves, and other hygienic practices in operating rooms
  - Method of amputation in which blood vessels are closed off
  - Understanding of human anatomy
  - Development of and advances in prosthetics or artificial limbs (such as the fluid hand)
2. Next, divide the class into five groups. Assign each group one of the following situations:
  - Patient considering the pill and other forms of birth control
  - Patient getting a sonogram during pregnancy
  - Patient considering getting an HIV test
  - Patient worried about anesthesia before surgery
  - Patient considering a prosthesis
3. Explain that their assignment is to research their assigned topic and determine what information the patient would need to know. Then they can present their findings in one of two ways: They may write and illustrate a medical brochure with relevant information, or write and perform a mock conversation between the patient and his or her doctor.
4. To begin, have students determine the type of doctor the patient would visit, such as a gynecologist, obstetrician, general practitioner, surgeon, anesthesiologist, or orthopedic specialist. Next, brainstorm a list of questions the patient might have about their topic. Encourage them to imagine themselves in the patient's shoes. Below are a list of sample questions for each topic:

### **Birth Control and the Pill**

- What is "the pill"? How does it work?
- What are some other types of birth control?

- Does the pill protect you from sexually transmitted infections?
- Who should and shouldn't take the pill?
- How often should you take the pill?

### **Sonograms During Pregnancy**

- What is a sonogram? What are different names for a sonogram?
- What are different reasons for sonograms?
- How do I prepare for the test?
- How does the procedure work? What will it feel like?
- What will the sonogram look like?
- What might I be able to see (at different stages of fetal development)? What won't I see in sonogram?
- What are some abnormal results a sonogram might show?

### **HIV Test**

- What is the difference between HIV and AIDS? If I have HIV, does that mean I have AIDS?
- How is HIV transmitted?
- Who should get tested?
- What are some symptoms that you've been infected?
- What can you do if you test positive for HIV? What are possible treatments?
- How can you protect yourself from contracting HIV?

### **Anesthesia**

- What is anesthesia?
- Why is anesthesia used during surgery? How does it keep you from feeling pain?
- What are different types of anesthesia? When are they used?
- How will you be monitored when you're under anesthesia?
- How is the anesthesia administered? Who will do it?
- What are possible side effects?

### Prosthetics

- What are some different reasons for lost limbs?
  - What are different kinds of prosthetics?
  - What do different artificial limbs look like?
  - How does the prosthesis stay on?
  - How do you learn to use a prosthesis? What kinds of things can a person do with a prosthesis?
  - What are some recent innovations in prosthetics? What advances in prosthetics might we see in the future?
5. Give students two class periods to complete their research and their final assignment. The Web sites below provide a good starting point for each topic:

### Birth Control

- Discovery Health: Birth Control  
<http://health.discovery.com/encyclopedias/illnesses.html?article=2001>
- Birth Control Methods  
[http://www.webmd.com/hw/birth\\_control/hw237877.asp](http://www.webmd.com/hw/birth_control/hw237877.asp)
- How the Pill Works  
[http://www.pbs.org/wgbh/amex/pill/sfeature/sf\\_cycle.html](http://www.pbs.org/wgbh/amex/pill/sfeature/sf_cycle.html)
- Birth Control: What You Need to Know  
[http://kidshealth.com/teen/sexual\\_health/contraception/contraception.html](http://kidshealth.com/teen/sexual_health/contraception/contraception.html)

### Sonograms

- All About Ultrasounds  
<http://health.discovery.com/centers/pregnancy/americanbaby/ultrasounds.html>
- Pregnancy Ultrasound  
<http://www.nlm.nih.gov/medlineplus/ency/article/003778.htm>
- Radiology Info: Obstetric Ultrasounds  
[http://www.radiologyinfo.org/content/obstetric\\_ultrasound.htm](http://www.radiologyinfo.org/content/obstetric_ultrasound.htm)
- Ultrasounds  
<http://www.medicinenet.com/ultrasound/article.htm>
- Pregnancy Month by Month  
<http://pregnancy.about.com/od/fetus/ss/ninemonths.htm>

## HIV/AIDS

- Discovery Health: HIV/AIDS  
<http://health.discovery.com/centers/sex/sexpedia/hivnaids.html>  
<http://health.discovery.com/tools/blausen/conditions/aid.html>
- HIV/AIDS  
[http://www.webmd.com/hw/hiv\\_aids/hw151445.asp?z=1624\\_00000\\_0000\\_rl\\_06](http://www.webmd.com/hw/hiv_aids/hw151445.asp?z=1624_00000_0000_rl_06)
- TeensHealth: AIDS  
[http://kidshealth.com/teen/diseases\\_conditions/sexual\\_health/AIDS.html](http://kidshealth.com/teen/diseases_conditions/sexual_health/AIDS.html)
- HIV  
[http://www.medicinenet.com/human\\_immunodeficiency\\_virus\\_hiv\\_aids/article.htm](http://www.medicinenet.com/human_immunodeficiency_virus_hiv_aids/article.htm)

## Surgery/Anesthesia

- Discovery Health: Anesthesia  
<http://health.discovery.com/encyclopedias/illnesses.html?article=2948&page=1>
- Anesthesia  
[http://www.webmd.com/hw/pain\\_management/tp17799.asp](http://www.webmd.com/hw/pain_management/tp17799.asp)
- Anesthesia: Options and Considerations  
<http://www.mayoclinic.com/health/anesthesia/SC00026>

## Prosthetics

- Artificial Limb  
[http://en.wikipedia.org/wiki/Artificial\\_limb](http://en.wikipedia.org/wiki/Artificial_limb)
- Prosthetic FAQs for the New Amputee  
[http://www.amputee-coalition.org/fact\\_sheets/prosfaq.html](http://www.amputee-coalition.org/fact_sheets/prosfaq.html)
- BMJ (British Medical Journal): Artificial limbs  
<http://bmj.bmjournals.com/cgi/content/full/323/7315/732>
- Amputees (Links about Amputations and Prosthetics)  
<http://www.nlm.nih.gov/medlineplus/amputees.html>
- Technology and the Human Hand: The State of the Art in Artificial Hands, Hooks, and Prehensors  
[http://www.amputee-coalition.org/inmotion/nov\\_dec\\_02/handl.html](http://www.amputee-coalition.org/inmotion/nov_dec_02/handl.html)
- Advances in Arm Prosthetics  
[http://www.amputee-coalition.org/first\\_step/firststepv2\\_s2a11.html](http://www.amputee-coalition.org/first_step/firststepv2_s2a11.html)

- Manuals for Amputees  
<http://www.oandp.com/resources/patientinfo/manuals/index.htm>
  - Orthotics and Prosthetics: Amputee FAQ  
<http://www.superioroandp.com/amputee-patient-information/amputee-faq.htm>
6. Have students present their brochures or perform their conversations for the class. After each presentation, give students an opportunity to ask their own questions. What else might a patient want to know?
  7. To conclude the lesson, ask students to choose one of the innovations featured above, such as the AIDS test, sonograms, or prosthetics. Have them write a short essay describing how this scientific innovation and society have influenced each other. For example, how did societal events or challenges inspire this innovation? How did this innovation change the way people think about themselves?

### *Assessment*

Use the following three-point rubric to evaluate students' work during this lesson.

- 3 points: Students gave detailed descriptions of surgical and reproductive health innovations, demonstrated a clear understanding of concepts regarding disease prevention and control, personal health, advancements in technology, or sexual reproduction: and created a complete and factually accurate brochure or mock doctor-patient conversation about their assigned topic, answering all essential questions a patient might have.
- 2 points: Students gave somewhat detailed descriptions of surgical and reproductive health innovations, demonstrated some understanding of concepts regarding disease prevention and control, personal health, advancements in technology, or sexual reproduction: and created a mostly complete and factually accurate brochure or mock doctor-patient conversation about their assigned topic, answering all essential questions a patient might have.
- 1 point: Students did not give detailed descriptions of surgical and reproductive health innovations, demonstrated little understanding of concepts regarding disease prevention and control, personal health, advancements in technology, or sexual reproduction: and created an incomplete and factually inaccurate brochure or mock doctor-patient conversation about their assigned topic.

### *Vocabulary*

#### **AIDS (acquired immunodeficiency syndrome)**

*Definition:* The final, life-threatening stage of infection with human immunodeficiency virus (HIV)

*Context:* There are a growing number of drugs that can delay or prevent HIV from damaging the immune system so badly that a person develops AIDS.

**anatomy**

*Definition:* The structure of an organism's body parts

*Context:* His surgical achievements would have been inconceivable without precise knowledge of anatomy.

**anesthesia**

*Definition:* Induced loss of sensation in the body, with or without loss of consciousness

*Context:* Anesthesia makes long and complicated operations possible.

**conception**

*Definition:* The fertilization of an egg by a sperm at the beginning of pregnancy

*Context:* In the early 1930s chemists in Berlin discovered how to prevent conception in rabbits.

**fetus**

*Definition:* A developing, unborn human after eight weeks of gestation

*Context:* Sonograms allow doctors to view the developing fetus.

**hormone**

*Definition:* A chemical secreted by the body that has a specific effect on activities occurring in other parts of the body

*Context:* The hormones in birth control pills affect a woman's body in the same way as pregnancy, causing her to stop ovulating.

**orthopedics**

*Definition:* The branch of medicine concerned with disorders of the bones, joints, ligaments, or muscles

*Context:* The achievements in orthopedics after World War One later benefited many accident victims.

**prosthesis**

*Definition:* An artificial device used to replace a missing part of the body.

*Context:* If a person loses a limb, a prosthesis can help restore some functions.

**sonogram**

*Definition:* An image produced from ultrasound used to examine or measure internal structures

*Context:* In the United States, having a sonogram is routine for pregnant women.

*Academic Standards*

**Mid-continent Research for Education and Learning (McREL)**

McREL's Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education addresses 14 content areas. To view the standards and benchmarks, visit

<http://www.mcrel.org/compendium/browse.asp>.



This lesson plan addresses the following national standards:

- Science—Life Sciences: Understands the principles of heredity and related concepts; Understands the structure and function of cells and organisms
- Health: Knows essential concepts about the prevention and control of disease; Understands the fundamental concepts of growth and development; Knows the availability and effective use of health services, products, and information

### National Academy of Sciences

The National Academy of Sciences provides guidelines for teaching science in grades K-12 to promote scientific literacy. To view the standards, visit this Web site:

<http://books.nap.edu/html/nses/html/overview.html#content>

This lesson plan addresses the following national standards:

- Science and Technology
  - Science in Personal and Social Perspectives
  - History and Nature of Science
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### Support Materials

Develop custom worksheets, educational puzzles, online quizzes, and more with the free teaching tools offered on the Discoveryschool.com Web site. Create and print support materials, or save them to a Custom Classroom account for future use. To learn more, visit

- <http://school.discovery.com/teachingtools/teachingtools.html>
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### DVD Content

This program is available in an interactive DVD format. The following information and activities are specific to the DVD version.

#### *How To Use the DVD*

The DVD starting screen has the following options:

**Play Video**— This plays the video from start to finish. There are no programmed stops, except by using a remote control. With a computer, depending on the particular software player, a pause button is included with the other video controls.

**Video Index**— Here the video is divided into sections indicated by video thumbnail icons; brief descriptions are noted for each one. Watching all parts in sequence is similar to watching the video from start to finish. Brief descriptions and total running times are noted for each part. To play a particular segment, press Enter on the remote for TV playback; on a computer, click once to highlight a thumbnail and read the accompanying text description and click again to start the video.



**Curriculum Units** – These are specially edited video segments pulled from different sections of the video (see below). These nonlinear segments align with key ideas in the unit of instruction. They include onscreen pre- and post-viewing questions, reproduced below in this Teacher's Guide. Total running times for these segments are noted. To play a particular segment, press Enter on the TV remote or click once on the Curriculum Unit title on a computer.

**Standards Link** – Selecting this option displays a single screen that lists the national academic standards the video addresses.

**Teacher Resources** – This screen gives the technical support number and Web site address.

## Video Index

### I. The New Era of Reproductive Health (11 min.)

A major breakthrough in reproductive medicine, the birth control pill prevents unwanted pregnancies, but it is ineffective against sexually transmitted infections. Learn about “the pill” and investigate the fight against AIDS.

### II. A Closer View of Pregnancy (8 min.)

Thanks to sonographic technology we can now see a baby while it is still in the womb. Examine the use of ultrasound and fetal development.

### III. From Stitching to Walking (7 min.)

Anesthesia and sterilization techniques have made modern surgery safe, effective, and relatively pain free. Take a closer look at anesthesia, sterilization, and the invention of surgical gloves.

### IV. Safer Surgery (10 min.)

Due to advances in prosthetics there is no longer any reason to consider amputees disabled. View the history of prosthetics, and learn why prosthetic hands are so difficult to design.

### V. Grasping Thought (9 min.)

Take a closer look at the important functions performed by a human hand, and examine the robotic hand being developed by NASA.

## CURRICULUM UNITS

### 1. Creating the Birth Control Pill

*Pre-viewing question*

Q: How would our society be different if there were no reliable methods of birth control?

A: Answers will vary.

*Post-viewing question*

Q: How do birth control pills work?

A: The hormones in the birth control pills send messages to the brain that the woman is pregnant. This stops the body from producing eggs.



## 2. Curing Syphilis: Using Chemotherapy to Treat Disease

*Pre-viewing question*

Q: What transmitted diseases and infections have sparked major epidemics throughout history?

A: Answers will vary.

*Post-viewing question*

Q: How do chemical treatments work?

A: Chemical treatment (chemotherapy) works by introducing a chemical that is attracted to a particular type of pathogen and then kills it without killing the patient.

## 3. HIV and AIDS

*Pre-viewing question*

Q: What do you know about HIV and AIDS?

A: Answers will vary.

*Post-viewing question*

Q: How does HIV lead to the collapse of the immune system?

A: The HIV virus attacks exactly those cells that are supposed to defend against it, the T-cells. By attacking the T-cells the virus breaks down the body's line of defense and is able to easily invade and collapse the entire immune system.

## 4. Early Uses of Ultrasound Technology

*Pre-viewing question*

Q: Have you ever seen an ultrasound image?

A: Answers will vary.

*Post-viewing question*

Q: What was sonography initially used for?

A: Sonographic technology was developed during World War II. High frequency sound waves were used to identify enemy ships and submarines. Following the war, the medical field began to use ultrasound technology to visualize inner organs and detect tumors. The procedure was also used to diagnose breast cancer.

## 5. The Origin of Human Life

*Pre-viewing question*

Q: Why was the development of the microscope important?

A: It gave scientists a chance to see things like cells for this first time. This opened up new fields of study that hadn't been possible before.

*Post-viewing question*

Q: How did most 17<sup>th</sup> and 18<sup>th</sup> century scientists think a fetus was formed?

A: They believed the complete child was contained in the sperm, and women were merely a vessel in which the fetus grew. That theory was disproved in 1826 with the discovery of the egg cell.

## 6. The Invention of Anesthesia

*Pre-viewing question*

Q: What important inventions and innovations in the history of surgery can you name?

A: Answers will vary.

*Post-viewing question*

Q: Why was the use of ether such an important medical discovery?

A: Answers will vary but should include that before anesthesia the agony of having surgery while conscious was so feared that many people did not get the treatment they needed.

## **7. Fighting Bacteria, Disease, and Infections**

*Pre-viewing question*

Q: Have you ever had an infection?

A: Answers will vary.

*Post-viewing question*

Q: What are some things that are done to lower the risk of infection in operating rooms?

A: Surgical doctors and nurses wash their hands before entering the operating room, wear surgical gloves, and use sterile instruments during the surgical procedure.

## **8. An Early History of Prosthetics and Amputation**

*Pre-viewing question*

Q: Why was amputation so common in many past wars?

A: Answers will vary, but should include that there was often little else military doctors could do; they didn't have the instruments necessary to reconstruct maimed limbs and there were no antibiotics to prevent infection at the wound site.

*Post-viewing question*

Q: How did Ambroise Paré change amputation surgery?

A: Before Paré, many amputees bled to death because the blood vessels didn't close after surgery. Paré pioneered a new procedure—sewing off blood vessels with a needle and thread. This saved many lives.

## **9. Anatomy**

*Pre-viewing question*

Q: In what ways do you think human anatomy differs from the anatomy of other animals?

A: Answers will vary.

*Post-viewing question*

Q: Why was Vesalius' book so revolutionary?

A: Until Vesalius published his *Fabrica*, knowledge about the human body had come mainly from studying the bodies of animals.

## **10. The Making of Prosthetic Hands**

*Pre-viewing question*

Q: What positive things can come out of wars?

A: Answers will vary but should include scientific and technological innovations.

*Post-viewing question*

Q: What do you think would be some pros and cons of having a prosthetic limb instead of a natural one?

A: Answers will vary.

## 11. Studying Lucy's Hands

*Pre-viewing question*

Q: What body parts do you think perform the most important functions?

A: Answers will vary.

*Post-viewing question*

Q: Why do scientists think that Lucy had the ability to throw stones?

A: Her hands appear to share some features with modern human hands. These features provide a little give at the base of the index finger, allowing it to be pulled over toward the thumb. This type of movement indicates that Lucy would have had the ability to throw stones and other objects with speed and precision.

## 12. NASA's Robotic Hand and the Future of Prosthetics

*Pre-viewing question*

Q: What are some functions performed by the human brain?

A: Answers will vary but may include memory; sense of touch, sight, and smell; the ability to produce and understand language; coordination of physical movements; control of breathing and heart rate; and control of motor skills.

*Post-viewing question*

Q: How do you think advanced robotics and prosthetics will affect our society in the future?

A: Answers will vary.