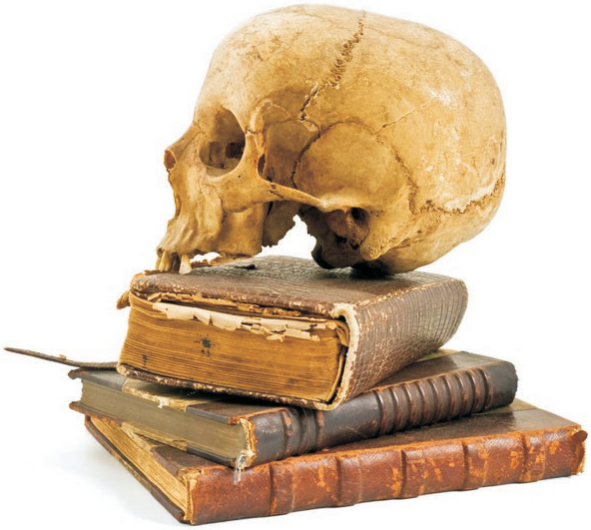
History of Healthcare and Health Science

HUMANS have been practicing medicine in one way or another for more than a million years. Many modern medical practices have roots in scientific discoveries dating back to antiquity. Advances in the mapping of the human genome, infection control, pharmacology, and surgery are prime examples. The past can, and still does, teach a great deal. To understand how modern medicine got to where it is now, it is important to read about the history of medicine.



Objective:

Discuss the evolution of healthcare in the medical field and how the past directly influences the present and future of medicine.

Key Terms:

accurate
antiseptic
asepsis
convents
discovery
dissection
exorcisms
Hippocrates
invention
microorganisms
monasteries
noninvasive
observation
pasteurization
predators
quackery
recipient
respiration
stethoscope
superstitious

Understanding the History of Healthcare and Health Science

Ancient Greece, as with Ancient Rome and Ancient Egypt, played an important part in medical history. The most famous of all Ancient Greek doctors was Hippocrates. By 1200

B.C., Ancient Greece was developing in all areas and their knowledge of medicine developed accordingly. Gods dominated the lives of the Greeks, and natural occurrences were explained away by using gods. This, however, did not occur in medicine where Ancient Greek physicians tried to find a natural explanation as to why someone became ill and died.

EVOLUTION OF HEALTHCARE IN THE MEDICAL FIELD

To understand where we are today, you must understand how healthcare has evolved.

Healthcare Development

Humans spent most of their time protecting themselves against **predators** (organisms or beings that prey, destroy, or devour) and finding food. They were **superstitious** (pertaining to a belief or practice usually resulting from ignorance or fear of the unknown) and believed that supernatural spirits caused illness. They thought illness and diseases were a punishment from the gods. **Exorcisms** (the act or process of forcing out evil spirits) were performed to rid the body of supernatural spirits.

Primitive humans used herbs and plants as medicine. For instance, digitalis is found in the dried powdered leaf of the foxglove plant. It is still used today to strengthen and slow the heartbeat. Quinine is found in the bark of the cinchona tree and is used to control fever and relieve muscle spasms. It helps in the prevention of malaria. In addition, belladonna and atropine were made from a poisonous nightshade plant and are used to relieve muscle spasms, especially gastrointestinal (GI) pain. Morphine was made from the opium poppy and is used as an analgesic and sedative to relieve severe pain.

Trephination or trephining was used as a surgical intervention where a hole was drilled, incised, or scraped into the skull using simple surgical tools. Trephination was used to treat health problems associated with intracranial diseases, epileptic seizures, migraines, and mental disorders by relieving pressure.

Ancient Medical Practices

Ancient medical practices may help you understand some of the roots of modern practices.

The Egyptians

The Egyptians (3000 BC to 300 BC) used priests as their physicians. Bloodletting or leeches were often used as a medical treatment. The Egyptians were the first to keep **accurate** (exact, correct, or precise) health records, but they were superstitious and called upon the gods to heal them. They used medicine to heal and learned the art of splinting fractures.

The Greeks

The Greeks (1200 BC to 200 BC) first studied causes of disease, and they believed illness was a result of natural causes. They were the first to observe the human body and the effects of disease, resulting in modern medical sciences. The Greeks kept records and understood the

importance of searching for new information. This helped reduce superstitious medical practices. The Greeks found that some diseases are caused by a lack of sanitation. **Hippocrates**, known as the father of medicine, based his knowledge of anatomy and physiology on observation of the external body. **Observation** is the act of watching. He also wrote the Hippocratic Oath as a standard of medical ethics that is still the basis and standard of today's medical ethics.

The Greeks also created and developed a new idea about the cause of disease: "the theory of the four humours." They believed the body was made up of four humours: yellow bile, black bile, blood, and phlegm. To be healthy, the humours had to be in balance. If a person had too much or too little of any one humour, he or she would become ill.

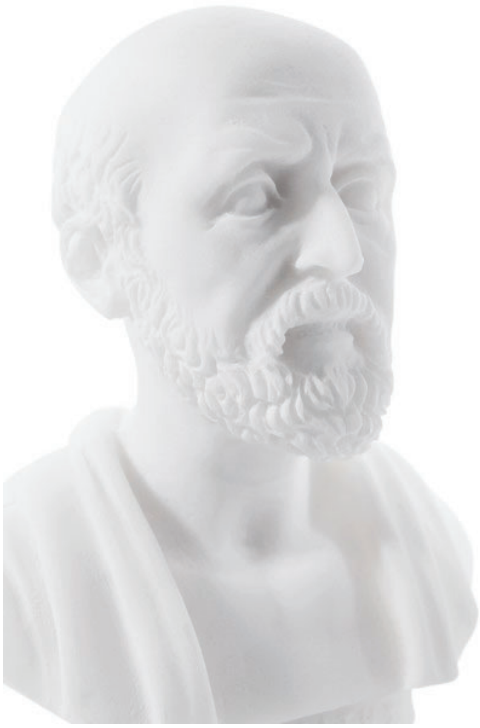


FIGURE 1. Hippocrates was an ancient Greek physician and is regarded as the father of medicine.

The Romans

The Romans learned about sanitation from the Greeks, and then they developed a sanitation system. They built the first public health and sanitation systems by building aqueducts and sewers to bring clean water to populated areas and to carry off waste, respectively. Romans were the first to organize medical care, sending medical equipment and physicians with their armies to care for wounded soldiers. In addition, Romans established the first hospitals as Roman physicians kept rooms in their houses for the ill, and the Roman government paid these physicians.

The Dark Ages and the Middle Ages

Then came the Dark Ages (A.D. 400 to 800) and Middle Ages (A.D. 800 to 1400). This era began after the fall of the Roman Empire. The Huns (nomads from the north) conquered the Roman Empire, and the study of medical science stopped. Emphasis was on saving the soul, and the study of medicine was prohibited. Medicine was only practiced in **convents** (establishments typically housing nuns) and **monasteries** (establishments typically housing monks or friars). Monks and priests treated patients with prayers. Yet sweeping epidemics caused millions of deaths during this period. Bubonic plague and the Black Death killed more than 60 million people. Other uncontrolled diseases included smallpox, diphtheria, syphilis, and tuberculosis.

The Renaissance

The Renaissance (A.D. 1350 to 1650) saw the rebirth of learning and the advent of scientific progress. Developments during this period influenced the future of medical science and included an acceptance of **dissection** (the act or process of dividing or taking apart) of the body for study. Dissection resulted in an increased understanding of anatomy and physiology

and the building of research universities and medical schools. A search for new ideas and the causes of disease occurred, replacing an unquestioning acceptance of disease as the will of the gods. The printing press allowed medical knowledge to be shared by publishing books and allowing access to the research knowledge.

In the 16th and 17th centuries, the cause of disease was still unknown, and many people died from infections. The desire to learn continued through these two centuries. Several outstanding scientists added new knowledge to the field of medical science.

- Leonardo da Vinci studied and recorded the anatomy of the body.
- William Harvey used the knowledge of anatomy to understand physiology. He described the circulation of blood and the pumping of the heart.
- Gabriele Fallopius discovered the fallopian tubes of the female anatomy.
- Bartolommeo Eustachio discovered the tube leading from the ear to the throat (eustachian tube).
- Antony van Leeuwenhoek invented the microscope and made some of the most important discoveries in the history of biology, including bacteria, sperm cells, and blood cells. In one experiment, he scraped his teeth and observed the microscopic bacteria that cause tooth decay. Yet **quackery** (the practice of pretending to cure diseases), mass deaths from childbed fever, and disease continued. The causes of infection and disease were still not understood.

The 18th Century

Lectures and medical education began. Students participated in laboratory classes and worked at patients' bedsides. When patients died, the bodies were dissected to observe the disease process. More medical discoveries were made, including:

- Rene Laennec invented the **stethoscope** (an instrument used to hear sounds inside the body).
- Joseph Priestley discovered the element oxygen. He observed that plants refresh air that has lost its oxygen, making it usable for **respiration** (the process of taking in oxygen and expelling carbon dioxide by way of the lungs and air passages).
- Benjamin Franklin invented bifocals and found that the common cold may be spread from person to person.
- Edward Jenner discovered a method of vaccination for smallpox. This finding saved millions of lives and led to public health immunization and preventive medicine practices.

The 19th and 20th Centuries

The organized advancement of medical science began in the 19th century and included many events, such as:

- Ignaz Semmelweis identified that the cause of childbed fever (puerperal fever) was a lack of hand washing and general cleanliness on the part of physicians. It was not uncommon

for physicians to dissect diseased bodies and then deliver babies without properly washing their hands.

- Louis Pasteur discovered tiny **microorganisms** (organisms so small they can only be seen through a microscope) were everywhere. He also discovered that **pasteurization** (the heating of milk) prevented the growth of bacteria in milk.
- Joseph Lister used carbolic acid on wounds to kill the germs. He was the first doctor to use an **antiseptic** (the substance that slows or stops the growth of microorganisms) during surgery.
- Ernst von Bergmann developed **asepsis** (a sterile condition, free from all germs) as a method to keep a surgical area germ-free before and during the procedure to decrease illness and death.
- Robert Koch discovered many disease-causing organisms and is considered the father of microbiology.
- Wilhelm Roentgen discovered X-rays in 1895.
- Paul Ehrlich discovered the effect of medicine on disease-causing microorganisms and discovered the chemical treatment for syphilis on his 606th experiment.

More Recent Discoveries

- Gerhard Domagk discovered sulfonamide compounds—the first medications effective in killing bacteria.
- Dmitri Ivanovski discovered that some diseases were not caused by bacteria but by something unseen with a microscope—a virus.
- Sigmund Freud discovered conscious and unconscious parts of the mind. His studies were the basis for modern psychology and psychiatry.
- Alexander Fleming found that penicillin killed life-threatening bacteria. This is one of the most important discoveries of the 20th century.
- Jonas Salk discovered that a dead polio virus would cause immunity to poliomyelitis.
- Albert Sabin discovered that a living polio virus was more effective against poliomyelitis.

Recent Inventions and Procedures

- Genetic research has the possibility of eliminating disabling diseases.
- There are transplants of organs from a donor to a **recipient** (the one who receives the organ).

FIGURE 2. Polio used to be common in the United States and caused severe illness in thousands of people each year before the polio vaccine was introduced in 1955.

FURTHER EXPLORATION...

ONLINE CONNECTION: STEM Career List

To know more about careers in health, visit http://www.sciencebuddies.org/science-engineering-careers#health. Browse through detailed information on more than 100 careers to discover what scientists really do and what it takes to prepare for these careers. Each career profile provides basic career information (e.g., salary, job outlook, and degree requirements). There are also videos featuring interviews with real scientists or on-the-job profiles. Select one career and carefully read through the information provided. Prepare a large poster/tabletop presentation on a career of your choice. The career should be supported with a summary of at least 500 words. Present your information in a way that highlights the career.

- Reattachments of severed body parts now occur.
- Computers aid in medical diagnosis, accurate record keeping, and research.
- There are **noninvasive** (not penetrating the skin) techniques for diagnosis.
- Fetal care advancements have new procedures.
- Alternative medicine and complementary medical practice (e.g., acupuncture, acupressure, herbal therapy, and healing touch) are being rediscovered and finding a greater acceptance by the medical profession.

THE PAST DIRECTLY INFLUENCES THE PRESENT AND FUTURE OF MEDICINE

To comprehend current medicine, you need to understand its history and the potential for changes in the future.

Influence of the Past on the Present and Future of Medicine

A **discovery** is something that already existed but had not been found. In contrast, an **invention** is a new product or process that solves a technical problem. One invention or discovery often leads to additional changes in medicine. Inventions need not provide a completely new solution; some good inventions are improvements on previous solutions.

Although van Leeuwenhoek was not the inventor of the microscope, he advanced its use more than anyone else. In 1668, van Leeuwenhoek started his biological study as a

FIGURE 3. Antony van Leeuwenhoek's microscopy methods were so finely tuned that after he discovered bacteria, this type of organism would not be observed again by any other scientist for more than 100 years.

hobby after seeing beautiful microscopic pictures while making a visit to London. In his lifetime, he became the father of microbiology and opened humankind to the world of microorganisms. He initiated the studies of bacteriology and protozoology and advanced parasitology. In addition, he accurately described many human cells, including red and white blood cells, sperm, and other human tissues.

Summary:

The practice of medicine was slowly developed. Medicine as it is commonly practiced today was developed during the 19th and 20th centuries. The new "scientific" medicine replaced the early ways and traditions of medicine, which were based mostly on herbalism and what many refer to as superstitions. Some of the earliest forms of medicine and medical practices in ancient cultures were the use of natural resources (e.g., plants, various bits of animals, and minerals). Several major scientific figures in the development of health science are Hippocrates, Andreas Vesalius, Louis Pasteur, and Joseph Lister. Many of our modern practices have roots in scientific discoveries from ancient times.

Checking Your Knowledge:

1. Discuss the evolution of healthcare in the medical field.
2. Explore how the past directly influences the present and future of medicine.
3. Describe how the Greeks and Romans changed medicine.
4. What did Ernst von Bergmann discover, and what was its significance?
5. What is the difference between a discovery and invention?

Expanding Your Knowledge:

At the U of M's Owen H. Wangensteen Historical Library of Biology and Medicine, historic medical devices help students, researchers, and visitors learn about changes in healthcare through the centuries—and larger lessons about societal changes. To find out how much you know about historical medical devices, select a Wangensteen Library artifact from the grid and choose the right answer: https://give.umn.edu/gifts-at-work/pop-quiz-how-much-do-you-know-about-history-of-medicine. Or pick a health topic you are interested in and complete a timeline documenting 15 advances that have occurred. Of the 15, which do you feel was the most significant?

Web Links:

Medical Archives

http://www.wakehealth.edu/Library/Collections/Dorothy-Carpenter-Medical-Archives-Exhibits.htm

Claude Moore Health Sciences Library

http://www.hsl.virginia.edu/historical/artifacts/antiqua

The National Library of Medicine

http://www.nlm.nih.gov/hmd/index.html