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PHARMACY & HEALTH CARE

Learning Objectives

At the completion of study, the student will:

- be familiar with the overall history of pharmacy from ancient times through today.
- have an overall understanding of the pharmacy profession and the settings and economic environment in which it operates.
- have a general understanding of how computers are used in pharmacy.

Chapter Outline

ORIGINS

In earliest times, medicine was based in magic and religion.

Like many ancient peoples, Sumerians living between the Tigris and Euphrates rivers around 4,000 B.C. believed that demons were the cause of illness. They studied the stars and the intestines of animals for clues to the supernatural causes of man's condition and fate. In many cultures, physicians were priests, and sometimes considered gods or demi-gods. The Egyptian Imhotep, for example, born around 3,000 B.C., was a priest and adviser to pharaohs and was the first physician known by name. After his death, he was named a demi-god and eventually a god: the Egyptian god of medicine.

The supernatural approach to treating illness gradually gave way to a more scientific approach, based on observation and experimentation.

Around 400 B.C., the Greek physician Hippocrates developed a more scientific approach which has guided Western medicine for much of the time since. He promoted the idea of diagnosing illness based on careful observation of the patient's condition, not supernatural or other external elements. He also wrote the oath which physicians recited for centuries and still honor today: the Hippocratic Oath. From Hippocrates and others following in his footsteps, an approach to medicine in which natural causes were examined scientifically gradually grew to become the dominant approach to treating human illness.

MEDICAL MYTH

Pandora's Box

As punishment for Prometheus's theft of fire for mankind, the Greek god Zeus created Pandora and had her collect "gifts" for man from the gods. These gifts were really punishments that included disease and pestilence. They were released upon the world when Pandora opened her box.

synthetic with chemicals, combining simpler chemicals into more complex compounds, creating a new chemical not found in nature as a result.

The Greek god of Medicine

The ancient Greek Aesculapius was said to have been such an extraordinary physician that he could keep his patients from dying and even raise the dead. This skill angered Pluto, the god of the underworld, because it reduced the number of his subjects. At Pluto's request, Zeus killed Aesculapius with a lightning bolt, then named him the god of medicine. Aesculapius' daughter, Panacea, became the goddess of medicinal herbs.

NATURE'S MEDICINE

Besides looking to the supernatural, ancient man also looked to the natural world for medical answers.

Early man understood that plants and other natural materials had the power to treat or relieve illness. The ancient Sumerians used about 250 natural medicines derived from plants, many of which are still used today. Around 3000 B.C., the Chinese Emperor Shen Nung is said to have begun eating plants and other natural materials to determine which were poisonous and which were beneficial. One of the first known practitioners of "trial and error" drug testing, he is believed to have established 365 "herbs" that could be used in health treatments. Over the centuries, this number was gradually expanded by various Chinese physicians into the thousands. Herbal medicine remains a major component of Chinese medicine today.

Through the ages, people have used drugs to treat illnesses and other physical conditions.

Ancient cultures around the world used medicines made from natural sources, many of which contained drugs that we still use today. Over the past two centuries, however, science found ways to create **synthetic** drugs, which often have advantages in cost, effect, and availability. Some of these man-made drugs replaced natural drugs and others were for entirely new uses. Today, while we still rely on many drugs derived from natural sources, we use more than twice as many synthetically produced drugs as naturally produced ones. As a result, the number of illnesses and physical conditions that can be treated with drugs is constantly increasing.

A Treatment for Malaria

Malaria had long been one of the most deadly diseases in world history, until medicine made from the bark of a Peruvian tree, the Cinchona, was discovered. The medicine was quinine, popularly called "Jesuit's powder" for the Spanish priests that sent it to Europe from the New World. Its use along with preventive measures aimed at eradicating the cause of malaria brought the deadly disease under control.

The First Anesthetic

Long before Spanish explorers noticed it, the Indians of the Andes chewed coca leaves for their medicinal effects, which included increased endurance. The active ingredient in the leaves was cocaine, which in 1884 was shown to be the first effective local anesthetic by Carl Koller, a Viennese surgeon. This discovery revolutionized surgery and dentistry, since previously anesthesia was administered on a general basis—that is, to the whole body. Eventually, because of its harmful properties when abused, a man-made substitute was developed, called procaine or Novocain®.

Nature's Aspirin

The ancient Greek physicians Hippocrates and Dioscorides both wrote about the pain relieving ability of the bark of a white willow tree that grew in the Mediterranean. In the 1800's, more than 2,000 years after Hippocrates' time, the active ingredient in the willow bark, salicylic acid, was derived by chemists. However, because of difficulties in taking salicylic acid internally, acetylsalicylic acid, popularly known as aspirin, was developed and it eventually became the most widely used drug in the world.

MEDICINE THROUGH THE AGES

— A TIMELINE —

4000 B.C.

Ancient **Sumerians** studied the stars and animal intestines to divine man's fate and physical condition.

3000 B.C.

The **Egyptian Imhotep,** born around 3,000 B.C., was a priest and adviser to pharaohs and the first physician known by name. After his death, he was named a demi-god and eventually a god: the Egyptian god of medicine.

500 B.C.

The **Greek Alcmaeon,** a student of Pythagorus, saw diseases as a result of a loss of the body's natural equilibrium, rather than the work of the gods.

3000 B.C.

The **Chinese Emperor Shen Nung** is said to have begun tasting plants and other natural materials to determine which were poisonous and which were beneficial. One of the first known practitioners of "trial and error" drug testing, he is credited with establishing hundreds of herbal medicines.

1500 B.C.

The most complete record of ancient Egyptian medicine and pharmacology, called the **Papyrus Ebers,** dates back to 1500 B.C. This 1100 page scroll document includes about 800 prescriptions using 700 drugs, mostly derived from plants.

600 B.C.

A cult following **Aesculapius, the Greek god of Medicine,** established centers where medicine was practiced. These early clinics became training grounds for the great Greek physicians of later years.

400 B.C.

A number of medical documents are written by different Greek physicians under the name **Hippocrates.** The works avoid the supernatural and religious and represent an approach to medicine that is grounded in scientific reasoning and close observation of the patient. They contain writings about the conduct of physicians, including the famous Hippocratic oath.

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pharmacology the study of drugs—their properties, uses, application, and effects (from the Greek *pharmakon:* drug, and *logos:* word or thought).

pharmacognosy derived from the Greek words "pharmakon" or drug and "gnosis" or knowledge; the study of physical, chemical, biochemical and biological properties of drugs as well as the search for new drugs from natural sources.

100 B.C.

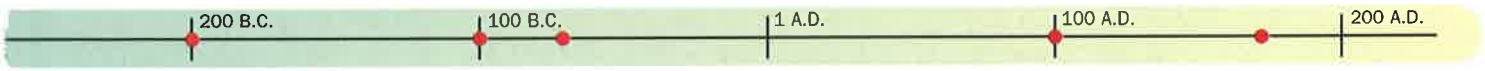
King Mithridates of Pontos practiced an early form of immunization by taking small amounts of poisons so that he could build his tolerance of them. It is said that he was so successful at this that when he eventually decided to kill himself through poisoning, he was unable to, and had to be killed by someone else. The potion Mithridates developed, Mithridaticum, was believed to be good at promoting health and was used for fifteen hundred years.

77 B.C.

Dioscorides, a Greek physician working in the Roman Legion, wrote the **De Materia Medica**, five books that described over 600 plants and their healing properties. His work was the main influence for Western pharmaceutics for over sixteen hundred years. One of the remedies he described was made from the bark of a type of willow tree, the active ingredient of which was salicylic acid, the natural drug on which acetylsalicylic acid (aspirin) is based. He also described how to get opium from poppies.

162 A.D.

The Greek physician **Galen** went to Rome and became the greatest name in Western medicine since Hippocrates both through his practice and extensive writings, nearly 100 of which survive. He believed there were four "humours" in man which needed to be in balance for good health, and he advocated "bleeding" to assist that balance. He also believed in the vigorous application of a scientific approach to medicine and his emphasis on education, observation, and logic formed the cornerstone for Western medicine.



200 B.C.

The first official Chinese "herbal," the **Shen Nung Pen Tsao**, listing 365 herbs for use in health treatments, is believed to have been published. This can be considered an early Chinese forerunner to the FDA approved drug list.

100 A.D.

The **Indian physician Charaka** wrote the **Charaka Samhita**, the first great book of Indian medicine, which among other things described over 500 herbal drugs that had been known and used in India for many centuries.

Note: since the use of drugs goes so far back in history, we use many terms based on Greek or Latin words.

pharmacopeia an authoritative listing of drugs and issues related to their use.

pharmaceutical of or about drugs; also, a drug product.

panacea a cure-all (from the Greek *panakeia*, same meaning).

materia medica generally pharmacology, but also refers to the drugs in use (from the Latin materia, matter, and medica, medical).

MEDICINE THROUGH THE AGES

— A TIMELINE —

900 A.D.

The **Persian Rhazes** wrote one of the most popular textbooks of medicine in the Middle Ages, the **Book of Medicine Dedicated to Mansur**. A man of science, Rhazes was also an alchemist who believed he could turn lesser metal into gold. When he failed to do this, the Caliph ordered him beaten over the head with his own chemistry book until either his head or the book broke. Apparently, it was a tie. Rhazes lost sight in one eye but lived to continue his work.

1500 A.D.

When the Spanish found them, the **Indians of Mexico** had a well established pharmacology that included more than 1,200 drugs and was clearly the result of many hundreds of years of medical practice. One plant, the sarsaparilla, became very popular in Europe for its use on kidney and bladder ailments and can be found to this day in many medicinal teas.

1580 A.D.

In China, **Li Shi Zhen** completed the **Pen Tsao Kang Mu**, a compilation of nearly 2,000 drugs for use in treating illness and other conditions.

1630 A.D.

Jesuits sent **quinine** back to Europe in the early sixteen hundreds. Also called Jesuit's powder, it was the first drug to be used successfully in the treatment of the dreaded disease malaria.

1000 A.D.

Perhaps the greatest Islamic physician was **Avicenna**. His writings dominated medical thinking in Europe for centuries. He wrote a five volume encyclopedia, one of which was devoted to natural medications and another to compounding drugs from individual medications.

1500 A.D.

In the early fifteen hundreds, a Swiss alchemist who went by the name of **Paracelsus** rejected the "humoural" philosophy of Galen and all previous medical teaching other than Hippocrates. Though he had many critics, he is generally credited with firmly establishing the use of chemistry to create medicinal drugs. Included in his work is the first published recipe for the addictive drug laudanum, which became a popular though tragically abused drug for the next three hundred years.

1721 A.D.

Dr. Zabdiel Boylston becomes the first person in what is now the United States to administer a **smallpox vaccine**. Much of the Boston population was initially extremely suspicious. After several months, however, 249 people were eventually inoculated, six of whom died. This compared with 844 deaths among the 5,980 people who contracted the disease naturally.

1796

Edward Jenner successfully uses a vaccine from the milder cowpox disease to inoculate against smallpox.

antitoxin a substance that acts against a toxin in the body; also, a vaccine containing antitoxins, used to fight disease.

antibiotic a substance which harms or kills microorganisms like bacteria and fungi.

hormones chemicals produced by the body that regulate body functions and processes.

human genome the complete set of genetic material contained in a human cell.

1785 A.D.

The **British Physician, William Withering**, publishes his study of the **foxglove** plant and the drug it contained, **digitalis**, which became widely used in treating heart disease. Foxglove had been used since ancient times in various remedies but Withering described a process for creating the drug from the dried leaves of the plant and established a dosage approach.

1803

The German pharmacist **Frederich Serturner** extracts morphine from opium.

1846

In Boston, the first publicized operation using **general anesthesia** is performed. Ether is the anaesthetic.

1899

Acetylsalicylic acid, popularly known as **aspirin,** is developed because of difficulties in using salicylic acid, a drug contained in certain willow trees that had long been used in the external treatment of various conditions.

1921

In Toronto, Canada, **Frederick Banting** and **Charles Best** show that an extract of the hormone, **insulin,** will lower blood sugar in dogs and so may be useful in the treatment of the terrible disease diabetes. The biochemist James B. Collip then develops an extract of insulin pure enough to test on humans. The first human trial in January, 1922 proves successful and dramatically changes the prospects for all diabetics.

1957

Albert Sabin develops an **oral polio vaccine** using a weakened live virus that could be taken orally rather than by injection. However, because of risk of an associated disease from the live virus, only the injectable form of the vaccine is used to inoculate children after January 2000.

1960

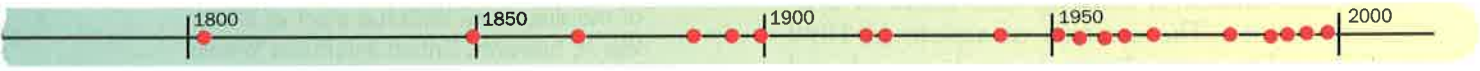
The **birth control pill** is introduced.

1981

First documented cases of **AIDS.**

1987

AZT becomes the first drug approved by the FDA for AIDS treatment.



1864

Louis Pasteur's experiments show that microorganisms cause food spoilage, and that heat can be used to kill them and preserve the food. Though others had proposed principles of **"germ theory"** previously, Pasteur's work is instrumental in it becoming widely accepted.

1884

In 1884, **Carl Koller,** a Viennese surgeon, discovers that cocaine, the active ingredient in coca leaves, was useful as a local anesthetic in eye surgery, and cocaine is established as the **first local anesthetic**.

1890

Effective **antitoxins** are developed for diptheria and tetanus, giving a major boost to the development of medicines that fight infectious disease.

1928

In Britain, **Alexander Fleming** discovers a fungus which produces a chemical that kills bacteria. He names the chemical, **penicillin.** It is the first antibiotic drug.

1943

Russell Marker is able to create the **hormone progesterone,** the first reliable birth control drug, from a species of Mexican yam.

1951

James Watson and **Francis Crick** identify the structure of **DNA**, the basic component within the cell that contains the organism's genetic code.

1955

Dr. Jonas Salk succeeds in developing a refined **injectable polio vaccine** from killed polio virus. (In 1954 polio had killed more than 13,000 and crippled more than 18,000 Americans.)

1988

The **Human Genome Project** is begun with the goal of mapping the entire DNA sequence in the human genome, This information will provide a better understanding of hereditary diseases and allow the development of new treatments for them.

1989

Amgen, a **biotechnology** company that develops products based on advances in cellular and molecular biology, introduces its first product, Epogen, an anemia treatment for dialysis patients.

1996

HAART (Highly Active Anti-Retroviral Therapy) is introduced for AIDS treatment. Made up of a combination of one protease inhibitor and usually two antiretroviral drugs, it proves extremely effective in slowing HIV progress and is partially responsible for a 47% decrease in the AIDS death rate in 1997.

THE 20TH CENTURY

The average life span in the United States increased by over twenty years in the Twentieth Century.

In 1900, the average American lived only into their early fifties. By 2000, the average life expectancy at birth in the United States had risen to 77 years, and as of 2007 it was 77.9 years. Similar changes were seen throughout the industrialized world and to a lesser extent in developing countries. The growth of hospitals, advances in the treatment of disease, improved medical technology, better understanding of nutrition and health, and the rapid increase in the number of effective drugs and vaccines have all contributed to this profound change in improved life experience.

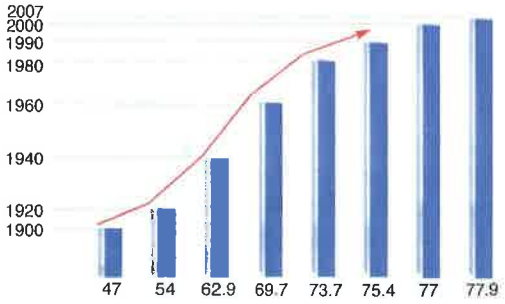
A major factor in the increased health and life expectancy seen in this century was the dramatic growth in pharmaceutical medicine.

Since the eighteenth century, there was a growing interest and success in creating man-made or synthetic medicines. The creation of aspirin in 1899 was followed by more pharmaceutical research and discoveries that spurred the growth of a worldwide industry committed to creating medicines for virtually every illness and condition. The discovery of the antibiotic penicillin was followed shortly by a World War in which its mass production was seen as critical to Allied success. This and other war-related drug needs stimulated the U.S. pharmaceutical industry to dramatically boost its capacity and production. Ever since, pharmaceutical research and development in the U.S. has grown substantially, making it the world's leading producer of medical pharmaceuticals.

LIVING LONGER

The Age of Antibiotics

In World War I, more soldiers died from infections than the wounds themselves. Although penicillin was discovered as an antibiotic in 1928, it was difficult to produce and for years not much was made of the discovery. With the start of World War II, however, British scientists looked again at penicillin and established that it was effective in fighting infections. Already under attack from Germany and unable to develop mass production methods for penicillin, the British sought help in the United States. In 1942, the Pfizer pharmaceutical company was able to develop a method for mass production of the drug, and by D-Day the Allied army was well stocked with it. Its use saved many thousands of lives during the war and revolutionized the pharmaceutical industry. A period of intense research and discovery in the field of antibiotics began, and many new antibiotics were developed which have dramatically contributed to improved health and increased life expectancy.



Living Longer

Improved pharmaceutical products have had a major effect on the life span of Americans and others in the twentieth century. In the U.S., the life span increased about 64% in the last century, with much of the increase due to the discovery and use of disease fighting drugs.

Source: National Center of Health Statistics

THE DRUG INDUSTRY

With the increasing availability of powerful drugs, their regulation became more important than ever.

Leaders and governments have long sought to regulate the use of medicinal drugs because of their effect on the population's health. The explosive growth of pharmaceuticals in the twentieth century made governments throughout the world keenly aware of the importance of setting and maintaining standards for their distribution and use.

In the United States, drug regulation is performed by the Food and Drug Administration.

FDA activity is a major factor in the nation's public health and safety. Before a drug can be marketed, it must be shown through testing that it is safe and effective for its intended use. Once marketed, the FDA monitors drugs to make sure they work as intended, and that there are no serious negative (adverse) effects from their use. If drugs that are marketed are found to have significant adverse effects, the FDA can recall them (take them off the market).

The discovery of new drugs requires a major investment of time, research, and development.

The pharmaceutical industry employs thousands of scientists and devotes about one-sixth of its income to research and development. Bringing a new drug to market is a long and difficult process in which the vast majority of research does not produce a successful drug. Thousands of chemical combinations must be tried in order to find one that might work as hoped. Once a potentially useful drug is created, it must undergo an extensive testing and approval process before it can be made available to the public. In the United States, the length of time from the beginning of development through testing and to ultimate FDA approval is often more than ten years.

Patenting Discoveries

As with other scientific and technological areas, patenting new discoveries is an important part of the pharmaceutical development process since it protects against illegal copying of the discovery. The company holding the patent is then able to control the marketing of the product and use this as a way to recover their original investment. Since patenting generally occurs long before a drug is approved, however, a company generally has only about ten years of patent protection left in which to market their product without competition from direct copies called "generic" versions. For more information, see the section on New Drug Approval and Marketed Drugs in Chapter 3.

It's in the Genes

One of the most exciting areas of pharmaceutical research is performed by molecular biologists studying human genes. While antibiotics are the answer for many infectious diseases, many other diseases which seemed based on heredity are effectively untreatable. The study of the human genome has shown that many diseases are related to genetic defects. This has led to the creation of new drugs that can successfully treat many diseases previously considered untreatable. As a result, the field of biotechnology has become the most dynamic area of pharmaceutical research and development.

PHARMACY TODAY

A "prescription" drug is one that has been ordered or "prescribed" by a physician or other licensed prescriber to treat a patient.

Though physicians occasionally give patients the actual medication, in most cases the individual who dispenses the prescribed medication to the patient is a pharmacist. Pharmacists at the more than 50,000 community pharmacies account for approximately half of the distribution of prescription drugs in the United States. The rest reach consumers primarily through hospitals, mass merchandisers, food stores, mail order pharmacies, clinics, and nursing home—all of which employ pharmacists for the dispensing of medications.

The pharmacist has consistently been rated as one of the most highly trusted professionals in the U.S.

The sheer number of available drugs, their different names and costs, multiple prescriptions from different physicians, and the involvement of third-party insurers are among the many factors which make using prescription drugs a complex area for consumers. As a result, they rely on pharmacists to provide information and advice on prescription and over-the-counter medications in easy to understand language. They also routinely ask the pharmacist to make recommendations about less expensive generic substitutes for a prescribed drug.

In 1990, the U.S. Congress required pharmacists to provide counseling services to Medicaid patients in the Omnibus Budget Reconciliation Act (OBRA).

Since then, a number of states have begun requiring this for all patients, and it is generally considered a fundamental service for pharmacists to provide.

Between 1997 and 2007 the number of prescriptions filled in the United States increased by 72% while the number of pharmacists employed increased by approximately 15%.

To help with this increasingly complex environment, pharmacists use powerful computerized tools and specially-trained assistants. Computers put customer profiles, product, inventory, pricing, and other essential information within easy access. Pharmacy technicians perform many tasks that pharmacists once performed.

THE PHARMACIST

A Trusted Profession

Pharmacists consistently rank as one of the mostly highly trusted and ethical professions in the United States, according to Gallup Polls. In 2008, the top five professions were:

1. Nurses
2. Pharmacists
3. Medical Doctors
4. Police Officers
5. Clergy

Education

To become a pharmacist, an individual must have earned a Doctor of Pharmacy degree from an accredited college of pharmacy (of which there are about 93 in the U.S.), pass a state licensing exam (in some states), and perform experiential training under a licensed pharmacist. Once licensed, the pharmacist must receive continuing education to maintain their license. Pharmacists seeking to teach, do research, or work in hospitals often must have postdoctoral training in the form of residency and fellowship training. Three out of five pharmacists work in community pharmacies; one out of four in hospitals.

PHARMACY SETTINGS

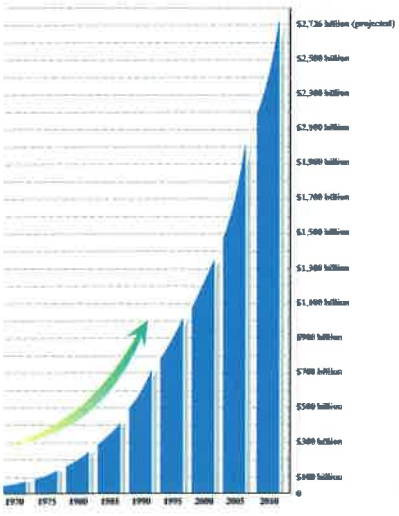
Most pharmacists and pharmacy technicians work in either a community pharmacy or hospital setting, with community pharmacy being the area of greatest employment (about half of all pharmacists and technicians). However, there are a number of other environments where significant employment can be found. The primary environments for pharmacist and technician employment are:

- **community pharmacies:** the area of greatest employment.
- **hospitals:** the next greatest area of employment.
- **mail order operations:** pharmacy businesses that provide drugs by mail to patients—a fast growing area.
- **long-term care:** residence facilities that provide care on a long-term rather than acute or short-term basis.
- **managed care:** care that is managed by an insurer, such as Kaiser Permanente.
- **home care:** care provided to patients in their home, often by a hospital or by a home care agency working with a home care pharmacy.

ECONOMIC TRENDS

Between 1970 and 2000, total health care costs in the United States increased by over 1,500 percent to $1.353 trillion dollars. By 2010 costs are projected to increase to $2.726 trillion.

As a result of these escalating costs, there have been increasing efforts by government, industry, and consumers to find ways to control the costs of care. Though drugs represent only a small fraction of overall health care expenses, they have also been included in these efforts.



- A result of the managed care movement is that the majority of prescriptions are now paid by private third parties such as HMO's and other insurance companies, instead of directly by consumers.
- Along with this is a trend toward the use of closed "formularies," lists of drugs which are approved for use. These lists rely substantially on substituting generic drugs in place of more expensive brands that may be prescribed by the physician.
- Another cost-cutting trend is the increasing use of "therapeutic substitution" in which a chemically different drug that performs a similar function is substituted, usually because it is less expensive.

Source for illustration and data: U.S. Statistical Abstract

COMPUTERS IN PHARMACY

Pharmacies use powerful computerized tools that help productivity.

Computerized pharmacy management systems put customer profiles, product, inventory, pricing, and other essential information within easy access. They also automate elements like label printing, inventory management, stock reordering, and billing. As a result, pharmacies and pharmacists dispense more prescriptions and information than ever before.

Pharmacy computer systems may be developed by the user to meet specific needs, purchased ready-made, or provided by a drug wholesaler.

Wholesalers provide inventory management systems to their customers as part of their service. The wholesaler actually owns the system. It is primarily designed for placing orders with the wholesaler, though it may also contain various other elements. Large pharmacy chains have the business volume to justify the expense of developing comprehensive systems that are tailored to their needs. Smaller operations usually buy a commercially available system. Whatever the operation, a computerized pharmacy management system is an indispensable productivity tool.

Although each pharmacy computer system has its own specific features, many general principles of computer usage apply to all systems.

The most important element is stated in the classic computer axiom: garbage in, garbage out. That is, the information produced by the computer is only as good as the information that is entered into it. This means special care has to be taken when entering information (generally called data) to make sure it is correct. A simple mistake in data entry can result in the wrong medication being given to the wrong patient or any number of other serious problems.

Keyboard skills: Considering how much data entry is required, being able to type at least forty-five words per minute is an important skill.

Computer knowledge: Many systems use personal computers or similar custom hardware, so familiarity with using computers is important.

A SAMPLE COMPUTER SYSTEM

Patient Profile

Allows complete information about patients, including prescribers, insurer, and medication history, and medical history, including allergies; identifies drug interactions for patients taking multiple medications.

Billing

Checks policies of third parties such as HMOs and insurers; authorizes third party transactions and credit cards electronically.

Management Reporting

Forecasting, financial analysis.

SELF TEST

MATCH THE TERMS

the answer key begins on page 511

1. antibiotic k
2. antitoxin g
3. data l
4. hormones d
5. human genome j
6. materia medica f
7. panacea d
8. pharmaceutical c
9. pharmacognosy k
10. pharmacology e
11. pharmacopeia b
12. synthetic a

a. combining simpler chemicals into more complex ones, creating a new chemical not found in nature.
b. an authoritative listing of drugs and issues related to their use.
c. of or about drugs; also, a drug product.
d. a cure-all.
e. the study of drug properties, uses, application, and effects.
f. generally pharmacology, but also refers to the drugs in use.
g. a substance that acts against a toxin in the body.
h. a substance which harms or kills microorganisms like bacteria and fungi.
i. chemicals produced by the body that regulate body functions and processes.
j. the complete set of genetic material contained in a human cell.
k. the study of physical, chemical, biochemical and biological properties of drugs as well as the search for new drugs from natural sources.
l. information that is entered into and stored in a computer system.

CHOOSE THE BEST ANSWER

the answer key begins on page 511

1. The first physician known by name was
   a. Prometheus.
   b. Hippocrates.
   c. Imhotep.
   d. Aesculapius.

2. Hippocrates approach to medicine was based on
   a. superstition.
   b. careful observation.
   c. astrology.
   d. animal behavior.

3. The ancient Greek goddess of Medicinal Herbs was
   a. Pandora.
   b. Panacea.
   c. Hippocrates.
   d. Euphrates.

4. Derived from the bark of the Peruvian tree, "Jesuit's powder," used along with preventive measures, helps keep this disease under control.
   a. smallpox
   b. malaria
   c. polio
   d. tuberculosis

REVIEW

24. The area of greatest employment for pharmacists is
    a. hospitals.
    b. mail order operations.
    c. community pharmacies.
    d. managed care.

25. The pharmacy technician may find the greatest employment opportunities in
    a. the hospital setting.
    b. the community setting.
    c. home health care.
    d. mail order operations.

26. In managed care, care is managed by a(an)
    a. patient.
    b. physician.
    c. pharmacist.
    d. insurer.

27. Lists of drugs approved for use by managed care organizations are called
    a. OBRA.
    b. mail order operations.
    c. HMOs.
    d. formularies.

28. Information that is entered and stored into a computer, such as a patient's name, is called
    a. product.
    b. inventory.
    c. data.
    d. billing.

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THE PHARMACY TECHNICIAN

Learning Objectives

At the completion of study, the student will:

- be familiar with the overall aspects of the pharmacy technician job and the general role of the pharmacy technician in relation to the pharmacist.
- know what personal standards are expected of the pharmacy technician.
- understand the overall scope of HIPAA regulations as they relate to interactions between health care providers and patients as well as the patient's health information.
- understand the range of training programs and what agencies establish training and certification regulations, and what organization accredits training programs.
- know what technicians must do in order to receive certification and how often it must be renewed.

Chapter Outline

PHARMACY TECHNICIAN

In health care, "technicians" are individuals who are given a basic level of training designed to help them perform specific tasks.

This training often is provided at community and technical colleges or even on the job. By comparison, health care "professionals" such as physicians and pharmacists receive more extensive and advanced levels of education.

To perform their duties, pharmacists today rely upon the assistance of trained support staff called pharmacy technicians.

Technicians perform essential tasks that do not require the pharmacist's skill or expertise. They work under the direct supervision of a licensed pharmacist who is legally responsible for their performance.

Pharmacy technicians perform such tasks as filling prescriptions, packaging doses, performing inventory control, and keeping records.

Having technicians perform these tasks gives the pharmacist more time for activities which require a greater level of expertise, such as counseling patients. As the job of the pharmacist has become more complex, the need for pharmacy technicians has increased. As a result, pharmacy technician is a rapidly growing occupation offering many opportunities. As of 2008, there were about 326,300 pharmacy technicians employed in the United States and it is estimated this number will grow by at least 31% through 2018.

Like pharmacists, most pharmacy technicians are employed in community pharmacies and hospitals.

However, they are also employed by or in clinics, home care, long term care, mail order prescription pharmacies, nuclear pharmacies, internet pharmacies, pharmaceutical wholesalers, the Federal Government, and various other settings. Depending upon the specific setting and job, they may perform at different levels of specialization and skill. An introductory level technician job at a pharmacy requires general skills. In various hospital and other environments, there are specialized technician jobs which require more advanced skills developed from additional education, training and experience. Compensation for these specialized positions is greater than it is for entry level positions.

receiving prescriptions

using computers

inventory control

taking patient information

filling prescriptions

The Pharmacy Technician

The activities on these pages may be part of a pharmacy technician's job responsibilities. However, **specific responsibilities and tasks for pharmacy technicians differ by setting and are described in writing by each employer** through job descriptions, policy and procedure manuals, and other documents. What individuals may and may not do in their jobs is often referred to as their "scope of practice." The pharmacist's scope of practice is of course much greater than the technician's. As part of their job requirement, all technicians are required to know specifically what tasks they may and may not perform, as well as which tasks must be performed by the pharmacist.

compounding

ordering

working with a team of health care professionals

PERSONAL STANDARDS

There are personal standards for pharmacy technicians.

Employers may specify these standards as part of the job requirement. Many, though not all, are outlined on these pages. There are standards for behavior, skill, health, hygiene, and appearance. Anyone seeking to become a pharmacy technician should consider how they compare in each of these areas and what they must do to excel in them.

The pharmacy technician is a member of a team, the patient's health care team.

For this team to succeed, all its members, including the technician, must work together for the welfare of the patient. If a member of the team fails to perform as required, including the technician, there can be serious consequences for the patient. Anyone wishing to become a pharmacy technician must be able to work cooperatively with others, communicate effectively, perform as expected, and act responsibly. The patient's welfare depends upon it.

Respect for the Patient

The patient's welfare is the most important consideration in health care. To ensure this, various government laws and professional standards guarantee basic patient rights and require health care providers to explain them to patients.

The 1996 **Health Insurance Portability and Accountability Act** made health care providers responsible for the privacy and security of all identifiable patient health information (also called Protected Health Information or PHI), in any form, whether it is electronic, on paper or orally communicated. Among other things, this means that computer files must be protected; any electronic transmission of health information, including claims and billing, must be done via HIPAA-compliant electronic data interchange (EDI); there can be no discussion of patient information within earshot of others; no casual discussion with anyone, including a patient's family members or friends, of a patient or patient information; directing patients to a private area when discussing medications or other personal health issues; making sure files and documents are securely stored where no unauthorized person can access them.

THE TECHNICIAN: A PERSONAL INVENTORY

Technicians should have these personal qualities:

✔ **Dependable**

The patient, the pharmacist, and the patient's health care team will depend upon you performing your job as required, including showing up on time for scheduled work hours. You must do what you are required to do, whether anyone is observing you or not.

✔ **Detail Oriented**

Patients must receive medications exactly as they have been prescribed. Drugs, whether prescription or over the counter, can be dangerous if misused, and mistakes by pharmacy technicians can be life-threatening.

✔ **Trustworthy**

You will be entrusted with confidential patient information, dangerous substances, and perishable products. In addition, many drugs are very expensive and you will be trusted to handle them appropriately.

inventory to make an accounting of items on hand; also, with people, to assess characteristics, skills, qualities, etc.

confidentiality the requirement of health care providers to keep all patient information private among the patient, the patient's insurer, and the providers directly involved in the patient's care.

Technicians must follow these personal guidelines:

✔ Health

You must maintain good physical and mental health. If you become physically or mentally run-down, you increase the chance of making serious mistakes.

✔ Hygiene

Practice good hygiene. You will interact closely with others. Poor hygiene may hurt your ability to be effective. You will also be expected to perform in infection free conditions and poor hygiene can violate this requirement.

✔ Appearance

Your uniform and personal clothing should be neat, clean, and functional. Shoes should be comfortable. Clothes should allow the freedom of movement necessary to perform your duties. Hair should be well-groomed and pulled back if long. Fingernails should be neat and trim.

Technicians must be capable and competent in the following skill areas:

✔ Mathematics and Problem Solving

You will routinely perform mathematical calculations in filling prescriptions and other activities.

✔ Language and Terminology

You must learn the specific pharmaceutical terminology and medical abbreviations (e.g., QID, QS) that will be used on your job.

✔ Computer Skills

You will regularly use computers for entering patient information, maintaining inventory, filling prescriptions, and so on.

✔ Interpersonal Skills

You will interact with patients/customers, your supervisor, co-workers, physicians, and others. You must be able to communicate, cooperate, and work effectively.

℞ There are legal aspects to many of these standards. Failing to follow them can hurt your job performance and result in legal violations.

TRAINING & COMPETENCY

Training and *competency* requirements for pharmacy technicians differ from setting to setting.

Technician training is generally based on job requirements for the specific workplace, particular skills involved, any applicable professional standards, and state regulations. Specific training and certification requirements are set by each state's board of pharmacy. Regulations vary considerably but almost all states require some form of technician training.

An example of a model curriculum for technician training is that of The American Society of Health-System Pharmacists (ASHP).

The ASHP is the leading association for pharmacists practicing in hospitals, and other health care systems. Their curriculum provides a national standard for developing technician competency. It can be adapted to different pharmacy settings and the specific needs of an individual training program. Training programs that meet ASHP standards can receive accreditation from it in recognition of having done so. The ASHP curriculum is also endorsed by the Pharmacy Technician Educator's Council (PTEC).

Your training program will prepare you to do your job.

The ASHP maintains a directory of over 250 schools and training institutions that offer technician training programs; most of these programs have been accredited by the ASHP and the remainder have applied for accreditation. These programs are found in community, technical, and career colleges, as well in on-the-job settings such as community pharmacies, hospitals and other institutional settings.

Your employer will monitor and document your competency.

Your employer is legally responsible for your performance and therefore your competency. In addition to monitoring this on a daily basis, you will receive regularly scheduled performance reviews. The frequency of performance reviews will vary by employer and be indicated in your job description or other employee information. Through these reviews and other means, your employer will document your competency to perform your job.

TRAINING

Training Program

Depending upon your setting, you will receive training in some or all of the following areas:

- drug laws
- terminology
- prescriptions
- calculations
- drug routes and forms
- drug dosage and activity
- infection control
- compounding
- preparing IV admixtures
- biopharmaceutics
- drug classifications
- inventory management
- pharmacy literature

An important part of training is exposure to actual workplace settings. Many technicians receive this in the form of on-the-job training from their employer or as internships through community colleges or other training programs.

competent being qualified and capable.

COMPETENCY

Testing

Demonstration of competency during training will generally be through written tests and practical demonstrations. In on-the-job training or internships, your performance will be directly judged by the supervising pharmacist.

Continuing Education

Pharmacy is a dynamic field that changes constantly. There are always new drugs, treatments, methods and other developments. As a result, continuing education is a critical element in maintaining competency for pharmacy technicians. In order to perform your job as required, you must continually learn new information. Ultimately, this will make your job more interesting and you more effective.

Performance

After you have qualified as competent, your employer will continue to monitor and document your performance and competency throughout your employment. These files may include:

- performance reviews,
- complaints,
- comments by your supervisor and and other appropriate personnel.

Most jobs also have a probation period during which time the pharmacy technician is expected to learn certain skill sets. If competency is not met, the technician may receive an extended probation period or be dismissed from the job.

For information regarding ASHP accredited programs, contact:

The American Society of Health-System Pharmacists
7272 Wisconsin Ave.
Bethesda, MD 20814
301-657-3000
http://www.ashp.org

CERTIFICATION

Since there is no federal standard for training or competency, a valuable career step for pharmacy technicians is getting national *certification*.

To receive certification in most states, technicians must pass a standardized national examination, such as the Pharmacy Technician Certification Exam (PTCE) offered by the Pharmacy Technician Certification Board (PTCB), the Exam for the Certification of Pharmacy Technicians (ExCPT) given by the Institute for the Certification of Pharmacy Technicians (ICPT), or another exam approved by their state board. These exams test the technician's knowledge and competency in basic pharmacy functions and activity areas. While certification is mainly voluntary, as of January, 2010 the PTCB had certified over 363,000 pharmacy technicians.

Certification is a mark of achievement that employers, colleagues, and others will recognize.

If you pass a national certification examination, you will be able to use the CPhT designation after your name. This designation stands for Certified Pharmacy Technician. Beyond verifying your competence as a technician, this indicates that you have a high level of knowledge and skill and can be given greater responsibilities. This in turn means that you may earn more, and will probably cost your employer less time and money for training. Studies have also shown that certified technicians have lower turnover, higher morale, greater productivity, and make fewer errors. Some employers may pay for the cost of a certification exam (if successfully completed) and/or provide training assistance for a certification exam.

Certification must be renewed every two years.

Because pharmacy is a constantly changing field, maintaining skills and competence requires continuing education. In order to renew their certification every two years, CPhTs must meet requirements of 20 contact hours of pharmacy-related continuing education, including at least one hour in pharmacy law. Up to ten contact hours of continuing education can occur at the CPhT's practice site under the supervision of a registered pharmacist, and these hours can be customized to fit the specific needs of the CPhT.

PTCE AND ExCPT

Both exams are certified by the National Commission for Certifying Agencies (NCCA), last two hours, and are administered in a computerized testing environment. To take either exam, candidates must have completed high school or have a GED, and have never been convicted of a felony.

The Pharmacy Technician Certification Exam (PTCE) contains 90 multiple choice questions and tests these areas:

- assisting the pharmacist in serving patients (66% of the exam);
- maintaining medication and inventory control systems (22% of the exam);
- participating in the administration and management of pharmacy practice (12% of the exam).

In addition to the requirements stated above, candidates for the PTCE must have never been convicted of a pharmacy or drug-related misdemeanor . To pass the exam, candidates must score at least 650 out of a possible 900.

The Exam for the Certification of Pharmacy Technicians (ExCPT) contains 110 multiple choice questions and tests these areas:

- regulations and technician duties (~25% of the exam);
- drugs and drug products (~23% of the exam);
- dispensing process (~52% of the exam).

In addition to the requirements stated above for both tests, candidates for the ExCPT must be at least 18 years old.

certification a legal proof or document that an individual meets certain objective standards, usually provided by a neutral professional organization.

SELF TEST

MATCH THE TERMS

the answer key begins on page 511

1. certification ___
2. competent ___
3. confidentiality ___
4. inventory ___
5. personal inventory ___
6. professionals ___
7. scope of practice ___
8. technicians ___

a. what individuals may and may not do in their jobs.
b. to assess one's personal characteristics, skills, qualities, etc.
c. the requirement of health care providers to keep all patient information private among the patient, the patient's insurer, and the providers directly involved in the patient's care.
d. being qualified and capable to perform a task or job.
e. a legal proof or document that an individual meets certain objective standards, usually provided by a neutral professional organization.
f. individuals who are given a basic level of training designed to help them perform specific tasks.
g. individuals who receive extensive and advanced levels of education before being allowed to practice, such as physicians and pharmacists.
h. to make an accounting of items on hand.

CHOOSE THE BEST ANSWER

the answer key begins on page 511

1. _____ are individuals who are given a basic level of training designed to help them perform specific tasks.
   a. LPNs
   b. DOs
   c. Professionals
   d. Technicians

2. In pharmacy, technicians perform essential tasks that do not require _____ skill or expertise.
   a. the clerk's
   b. the pharmacist's
   c. scientific
   d. mathematical

3. Specialized technician jobs in hospitals have _____ compensation than entry level positions.
   a. less
   b. about the same
   c. greater

4. Specific responsibilities and tasks for pharmacy technicians differ by setting and are described in writing by each
   a. technician.
   b. local police department.
   c. employer.
   d. state board of pharmacy.

5. The pharmacy technician can do the following functions except
   a. take patient information.
   b. fill prescription orders.
   c. compound prescription orders.
   d. advise patients on medications.

6. What individuals may and may not do on their jobs is referred to as their
   a. job responsibilities.
   b. scope of practice.
   c. opinion.
   d. employee guidelines.

REVIEW

7. The term that describes making an accounting of items on hand is a/an
   a. policy.
   b. inventory.
   c. ordering.
   d. re-ordering.

8. The Health Insurance Portability and Accountability Act of 1996
   a. governs how often insurance companies can merge with each other.
   b. makes insurers accountable to patients for reimbursement of approved medical costs.
   c. is a set of general rather than legal guidelines regarding the privacy of patient health information.
   d. requires health care providers to be responsible for the privacy and security of a patient's protected health information.

9. Under HIPAA, PHI stands for
   a. Personal Health Information.
   b. Protected Health Information.
   c. Professional Health Information.
   d. Programmed Health Information.

10. Pharmacy technicians should be detail oriented. This means
    a. patients must receive medications exactly as they have been prescribed.
    b. an incorrect strength will always be detected by the pharmacist.
    c. technicians do not need to be careful because the pharmacist is supposed to find and correct all technician errors.

11. Good hygiene is important for pharmacy technicians because of the interactions with other persons and the expectation of performing in _____ conditions.
    a. warm
    b. cold
    c. infection free
    d. sunny

12. Pharmacy technicians must be capable and competent in mathematics and problem solving because
    a. all medications that are available on prescription cannot lead to overdose death.
    b. pharmacists always check their work.
    c. all medications come pre-mixed and prepackaged.
    d. mathematical calculations are routinely used.

13. Pharmacy technicians must be capable and competent with computer skills because
    a. pharmacists will check their data entry.
    b. pharmacists do all of the computer work.
    c. pharmacists should operate the computer.
    d. technicians regularly use computers.

14. Pharmacy technicians must be capable and competent in the area of interpersonal skills. This means
    a. they must be able to communicate, cooperate, and work effectively.
    b. they must socialize with their co-workers.
    c. the pharmacist should obtain all confidential information from the patient.
    d. they must make friends with every patient.

15. Training and certification requirements for pharmacy technicians are set by
    a. each state's board of pharmacy.
    b. the ASHP
    c. the PTCB.
    d. the federal government.

16. The _____ is the leading association for pharmacists practicing in hospitals and other health care systems.
    a. ASHP
    b. PTCB
    c. PTEC
    d. APhA

17._____ typically monitor and document competency of pharmacy technicians.
a. Employers
b. Technicians
c. Pharmacists
d. PTCB

18. Any complaints received regarding an employee's employment
a. are discarded after two weeks.
b. are discarded after one year.
c. are discarded within one week after the complaint was received.
d. may be kept in the employee's performance/personnel file.

19. Training that occurs in actual workplace settings is called
a. performance-based training.
b. on-the-job training.
c. community college training.
d. certified training.

20._____ is another term for being qualified and capable.
a. Realistic
b. Competent
c. Professional
d. Technical

21. In the United States, two organizations that performs pharmacy technician certification are the
a. APhA and ASHP.
b. PTCB and ICPT.
c. ASHP and PTEC.
d. PTEC and APhA.

22. The Pharmacy Technician Certification Exam (PTCE) tests:
a. 66% on assisting the pharmacist in serving patients, 22% on maintaining medications and inventory control systems, and 12% on participating in pharmacy administration and management.
b. 22% on assisting the pharmacist in serving patients, 66% on maintaining medications and inventory control systems, and 12% on participating in pharmacy administration and management.
c. 12% on assisting the pharmacist in serving patients, 66% on maintaining medications and inventory control systems, and 22% on participating in pharmacy administration and management.
d. 12% on assisting the pharmacist in serving patients, 22% on maintaining medications and inventory control systems, and 66% on participating in pharmacy administration and management.

23. To take the PTCE exam, candidates
a. need only submit an application form.
b. must be working at a pharmacy.
c. need to have completed an ASHP accredited training program.
d. must have a high school diploma or GED by the application deadline and have never been convicted of a felony or a pharmacy or drug-related misdemeanor.

24. Certification must be renewed every
a. three years.
b. year.
c. two years.
d. four years.

REVIEW

25. After passing a pharmacy technician national certification exam, pharmacy technicians may use the following designation after their name:
    a. PT
    b. RPhT
    c. CPhT
    d. none of the above

26. CPhTs need _____ of continuing education every _____ years to renew certification.
    a. 30 hours, 2
    b. 10 hours, 1
    c. 30 hours, 3
    d. 20 hours, 2

27. Continuing education for CPhTs must contain _____ in pharmacy law every _____ years.
    a. one hour, one
    b. two hours, one
    c. one hour, two
    d. two hours, two