
HISTORICAL PERSPECTIVE

This chapter provides the reader with a brief overview of the advance of civilization as disclosed in the history of hospitals. A study of the past often reveals errors that can be avoided, customs that persist only because of tradition, and practices that have been superseded by others that are more effectual. The past can also bring to light some long-abandoned procedures, which can be revived to some advantage. The story of the birth and evolution of the hospital portrays the triumph of civilization over barbarism and the progress of civilization toward an ideal characterized by an interest in the welfare of the community.

EARLY HINDU AND EGYPTIAN HOSPITALS

Two ancient civilizations, India and Egypt, had crude hospitals. Hindu literature reveals that in the 6th century BC, Buddha appointed a physician for every 10 villages and built hospitals for the crippled and the poor. His son, Upatiso, built shelters for the diseased and for

pregnant women. These examples probably moved Buddha's devotees to erect similar hospitals. Historians agree that hospitals existed in Ceylon as early as 437 BC.

During his reign from 273 to 232 BC, King Asoka built hospitals that hold historical significance because of their similarities to the modern hospital. Attendants gave gentle care to the sick, provided patients with fresh fruits and vegetables, prepared their medicines, gave massages, and maintained their personal cleanliness. Hindu physicians, adept at surgery, were required to take daily baths, keep their hair and nails short, wear white clothes, and promise that they would respect the confidence of their patients. Although bedside care was outstanding for those times, medicine was only beginning to find its way.

Egyptian physicians were probably the first to use drugs such as alum, peppermint, castor oil, and opium. In surgery, anesthesia consisted of hitting the patient on the head with a wooden mallet to render the patient unconscious. Surgery was largely limited to fractures,

and medical treatment was usually given in the home. Therapy away from home was often available in temples, which functioned as hospitals.

GREEK AND ROMAN HOSPITALS

The term “hospital” derives from the Latin word *hospitalis*, which relates to guests and their treatment. The word reflects the early use of these institutions not merely as places of healing but as havens for the poor and weary travelers. Hospitals first appeared in Greece as *aesculapia*, named after the Greek god of medicine, Aesculapius. For many centuries, hospitals developed in association with religious institutions, such as the Hindu hospitals opened in Sri Lanka in the 5th century BC and the monastery-based European hospitals of the Middle Ages (5th century to 15th century). The Hotel-Dieu in Paris, a monastic hospital founded in 660, is still in operation today.

In early Greek and Roman civilization, when medical practices were rife with mysticism and superstitions, temples were also used as hospitals. Every sanctuary had a sacred altar before which the patient, dressed in white, was required to present gifts and offer prayers. If a patient was healed, the cure was credited to miracles and divine visitations.

Greek temples provided refuge for the sick. One of these sanctuaries, dedicated to Aesculapius, is said to have existed as early as 1134 BC at Titanus. Ruins attest to the existence of another, more famous Greek temple built several centuries later in the Hieron, or sacred grove, at Epidaurius. Here physicians ministered to the sick holistically in body and soul. They prescribed medications such as salt, honey, and water from a sacred spring. They gave patients hot and cold baths to promote speedy cures and encouraged long hours of sunshine and sea air, combined with pleasant vistas, as an important part of treatment. The temple hospitals housed libraries and rooms for visitors, attendants, priests, and physicians. The temple at Epidaurius even boasted what might be described as the site of the first

clinical records. The columns of the temple were inscribed with the names of patients, brief histories of their cases, and comments as to whether or not they were cured.

The aesculapia spread rapidly throughout the Roman Empire as well as through the Greek world. Although some hospitals were simply spas, others followed the therapy outlined by the leading physicians of the day. Hippocrates, for example, a physician born about 460 BC, advocated medical theories, which have startling similarity to those of the present day. He employed the principles of percussion and auscultation, wrote intelligently on fractures, performed numerous surgical operations, and described such conditions as epilepsy, tuberculosis, malaria, and ulcers. He also kept detailed clinical records of many of his patients. Physicians like Hippocrates not only cared for patients in the temples but also gave instruction to young medical students.

HOSPITALS OF THE EARLY CHRISTIAN ERA

Christianity and the doctrines preached by Jesus stressing the emotions of love and pity gave impetus to the establishment of hospitals, which, with the advance of Christianity, became integral parts of the church institution. These Christian hospitals replaced those of Greece and Rome and were devoted entirely to care of the sick, and they accommodated patients in buildings outside the church proper.

The decree of Constantine in 335 closed the aesculapia and stimulated the building of Christian hospitals. By the year 500, most large towns in the Roman empire had erected hospitals. Nursing, inspired by religion, was gentle and considerate. The medical precepts of Hippocrates, Antyllus, and other early Greek physicians soon began to be discarded because of their pagan origins. Instead, health care turned toward mysticism and theurgy (the working of a divine agency in human affairs) as sources of healing.

Hospitals rarely succeeded during the centuries leading to the Middle Ages; only a few

existed outside Italian cities. Occasional almshouses in Europe sheltered some of the sick, while inns along the Roman roads housed others.

MOHAMMEDAN HOSPITALS

The followers of Mohammed were almost as zealous as the Christians in caring for the sick. In Baghdad, Cairo, Damascus, Cordova, and many other cities under their control, luxurious hospital accommodations were frequently provided. Harun al-Rashid, the glamorous caliph (a title for a religious or civil ruler claiming succession from Muhammad) of Baghdad (786 to 809), built a system of hospitals. Medical care in these hospitals was free. About four centuries later, in 1160, a Jewish traveler reported that he had found as many as 60 dispensaries and infirmaries in Baghdad alone. The Persian physician Rhazes, who lived from about 850 to 923, was skilled in surgery. He was probably the first to use the intestines of sheep for suturing and cleansing patient wounds with alcohol.

Mohammedan physicians like Rhazes received much of their medical knowledge from the persecuted Christian sect known as the Nestorians. Nestorius, driven into the desert with his followers after having been appointed patriarch of Constantinople, took up the study of medicine. The school at Edessa in Mesopotamia, with its two large hospitals, eventually came under the control of the Nestorians in which they established a remarkable teaching institution. Eventually driven out of Mesopotamia by the orthodox bishop Cyrus, they fled to Persia, establishing the famous school at Gundishapur, which is conceded to be the true starting point of Mohammedan medicine. Gundishapur was home to the world's oldest known teaching hospital and also contained a library and a university. It was located in the present-day province of Khuzistan, in the southwest of Iran, not far from the Karun river.

Mohammedan medicine flourished up to about the 15th century. Mohammedan physi-

cians were acquainted with the possibilities of inhalation anesthesia. They instituted precautions against adulteration of drugs and developed a vast number of new drugs. Mohammedan countries also built asylums for the mentally ill a thousand years before such institutions appeared in Europe. The people of Islam made a brilliant start in medicine but never fulfilled the great promise that glowed in their early work in medical arts and hospitalization. Wars, politics, superstitions, and a nonprogressive philosophy stunted the growth of a system that had influenced the development of hospitals.

EARLY MILITARY HOSPITALS

Engraved on a limestone pillar dating back to the Sumerians (2920 BC) are pictures, which, among other military procedures, show the assemblage of the wounded. The book of Deuteronomy records that Moses laid down outstanding rules of military hygiene. Out of the urgency of care for the wounded in battle came much of the impetus for medical progress. Hippocrates is quoted as saying that "war is the only proper school for a surgeon." Under the Romans, surgery advanced largely because of experience gained through gladiatorial and military surgery.

MEDIEVAL HOSPITALS

Religion continued to dominate the establishment of hospitals during the Middle Ages. Although physicians cared for physical ailments to afford relief, they rarely attempted to cure the sick. Dissection of a human body would have been sacrilege because the body was created in the image of God.

Religion continued to be the most important factor in the establishment of hospitals during the Middle Ages. A number of religious orders created travelers' rests and infirmaries adjacent to monasteries that provided food and temporary shelter for weary travelers and pilgrims.

The hospital movement grew rapidly during the Crusades, which began in 1096. Military hospital orders sprang up, and accommodations for sick and exhausted crusaders were provided along all traveled roads. One body of crusaders organized the Hospitalers of the Order of St. John, which in 1099 established in the Holy Land a hospital capable of caring for 2000 patients. Knights of this order took personal charge of service to patients and often denied themselves so that the sick might have food and medical care.

Finally, an active period of hospital growth came during the late 12th and early 13th centuries. In 1198, Pope Innocent III urged that hospitals of the Holy Spirit be subscribed for by the citizenry of many towns. He set an example by founding a model hospital in Rome, known as Santo Spirito in Sassia. Built in 1204, it survived until 1922, when it was destroyed by fire. In Rome, nine other hospitals were founded shortly after completion of the one in Sassia. It is estimated that in Germany alone 155 towns had hospitals of the Holy Spirit during early medieval times.

Although most hospitals erected during the Middle Ages were associated with monasteries or founded by religious groups, a few cities, particularly in England, built municipal institutions. Like all hospitals of the period, the buildings were costly, often decorated with colorful tapestries and stained glass windows, but the interiors often consisted of large, drafty halls with beds lining each side.

With the spread of leprosy during the 12th and 13th centuries, lazar houses sprang up, supplying additional hospital facilities. Crude structures, lazar houses were usually built on the outskirts of towns and maintained for the segregation of lepers rather than for their treatment. Special groups of attendants, including members of the Order of St. Lazar, nursed the patients. The group represented an important social and hygienic movement because their actions served to check the spread of epidemics through isolation. The group is credited for virtually stamping out leprosy.

During the same period of hospital growth, three famous London institutions were established: St. Bartholomew's in 1137, St. Thomas's before 1207, and St. Mary of Bethlehem in 1247. St. Bartholomew's cared for the sick poor, but unlike like many hospitals of that day, it was well organized. St. Thomas's Hospital was founded by a woman, later canonized as St. Mary Overie. It burned in 1207, was rebuilt six years later, and constructed again on a new site in 1228. St. Mary of Bethlehem was the first English hospital to be used exclusively for the mentally ill.

The Hotel-Dieu of Paris was probably typical of the better hospitals of the Middle Ages. Built at the beginning of the 13th century, the hospital provided four principal rooms for patients in various stages of disease, as well as a room for convalescents and another for maternity patients. Illustrations by artists of the time show that two persons generally shared one bed. Heavy curtains sometimes hung from canopies over the bed to afford privacy, but this advantage was more than offset by the fact that the draperies, never washed, spread infection and prevented free ventilation. The institution was self-contained, maintaining a bakery, herb garden, and farm. Often, patients who had fully recovered remained at the hospital to work on the farm or in the garden for several days in appreciation for the care they had received.

THE "DARK AGE" OF HOSPITALS

Most hospitals during the Middle Ages, however, were not as efficiently managed as the Hotel-Dieu of Paris. Pictures and records prove that many hospitals commonly crowded several patients into one bed regardless of the type or seriousness of illness. A mildly ill patient might be placed in the same bed as an occupant suffering from a contagious disease. A notable exception to the general deterioration in medicine during this era was the effort of those monks who copied by hand and preserved the writings of Hippocrates and other ancient physicians.

The great Al-Mansur Hospital, built in Cairo in 1276, struck a contrast to the European institutions of the Middle Ages. It was equipped with separate wards for the more serious diseases and outpatient clinics. The handful of hospitals like Al-Mansur would lay the groundwork for hospital progress to come in later centuries.

HOSPITALS OF THE RENAISSANCE

During the revival of learning around the close of the 14th century, hundreds of medical hospitals in Western Europe received the new, more inquiring surgeons that the Renaissance produced. New drugs were developed, and anatomy became a recognized study. Ancient Greek writings were printed, and dissection was performed by such masters as Leonardo da Vinci, known as the originator of cross-sectional anatomy, and Vesalius. Hospitals also became more organized. Memoranda from 1569 describe the duties of the medical staff in the civil hospital of Padua, a city that was home to the most famous medical school during the 16th century. These read:

There shall be a doctor of physic upon whom rests the duty of visiting all the poor patients in the building, females as well as males; a doctor of surgery whose duty it is to apply ointments to all the poor people in the hospital who have wounds of any kind; and a barber who is competent to do, for the women as well as the men, all the other things that a good surgeon usually does.

The practice of surgery during the Renaissance became more scientific. Surgery was practiced by the long-robe surgeons, a small group who were educated in the universities and permitted to perform all types of operations, and by the short-robe surgeons, the barbers who in most communities were allowed only to leech and shave the patient, unless permission was granted to extend the scope of

treatment. Both groups were regarded as inferior to physicians.

In 1506, a band of long-robe surgeons organized the Royal College of Surgeons of Edinburgh. By 1540, both the long- and the short-robe surgeons in England joined to form the Company of Barber-Surgeons of London. In 1528, English physicians were organized by Thomas Linacre, physician to Henry VIII, as the Royal College of Physicians of England.

During the 16th century, Henry VIII of England ordered that hospitals associated with the Catholic church be given over to secular uses or destroyed. The sick were turned into the streets. Conditions in hospitals became so intolerable that the king was petitioned to return one or two buildings for the care of patients. Henry consented and restored St. Bartholomew's in 1544. Practically the only hope for the sick poor among outlying towns was to journey many miles to London.

The dearth of hospitals in England continued throughout the 17th century, when the medical school was developed. The French and the English quickly accepted what had originated in Italy: the first attempt to make medical instruction practical. St. Bartholomew's took the lead in education by establishing a medical library in 1667 and permitted apprentices to walk the wards for clinical teaching under experienced surgeons.

In 1634, an outstanding contribution was made to nursing by the founding of the order of the Daughters of Charity of St. Vincent de Paul. Originating at the Hotel-Dieu of Paris as a small group of village girls who were taught nursing by the nuns, the order grew rapidly and was transplanted to the United States by Mother Seton in 1809.

HOSPITALS OF THE 18TH CENTURY

During the 18th century, the building of hospitals revived partially. Because of poverty, at first the movement made slow progress in England, but a few hospitals were built and supported jointly by parishes. By 1732, there were 115 such institutions in England, some

of them a combination of almshouse and hospital.

The Royal College of Physicians established a dispensary where medical advice was given free and medicines were sold to the needy at cost. Controversies and lawsuits, however, brought an untimely end to this early clinic. Not discouraged by this experience, the Westminster Charitable Society created a similar dispensary in 1715. The same organization in 1719 founded Westminster Hospital, an infirmary built by voluntary subscription, in which the staff gave its services gratuitously. Ten years later, the Royal College of Physicians in Edinburgh opened the Royal Infirmary. London Hospital, another notable, had its origin in 1740. Admission of charity patients to the London Hospital was apparently by ticket because among its historical relics is an admission card.

Antony van Leeuwenhoek (1632 to 1723) succeeded in making some of the most important discoveries in the history of biology. Although Leeuwenhoek did not invent the first microscope, he was able to perfect it. Many of his discoveries included bacteria, free-living and parasitic microscopic protists, sperm cells, blood cells, and microscopic nematodes. His research opened up an entire world of microscopic life. Leeuwenhoek had a pronounced influence on the creation of the sciences of cytology, bacteriology, and pathology.

EARLY HOSPITALS IN THE UNITED STATES

Manhattan Island claims the first account of a hospital in the New World: a hospital that was used in 1663 for sick soldiers. Fifty years later, in Philadelphia, William Penn founded the first almshouse established in the American colonies. The Quakers supported the almshouse, which was open only to members of that faith. However, Philadelphia was rapidly growing and also in need of a public almshouse. Such an institution for the aged, the infirm, and the mentally ill was established in 1732. The institution later became

the historic Old Blockley, which in turn evolved into the Philadelphia General Hospital.

Philadelphia was the site of the first incorporated hospital in America, the Pennsylvania Hospital. Dr. Thomas Bond wanted to provide a place where Philadelphia physicians might treat their private patients. With the aid of Benjamin Franklin, Bond sought a charter for the Pennsylvania Hospital, which was granted by the crown in 1751. The first staff consisted of Dr. Phineas Bond, Dr. Lloyd Zachary, and the founder, Dr. Thomas Bond, all of whom gave their services without remuneration for three years.

Dr. John Jones, an American, published a book in 1775 charging that hospitals abroad were crowded far beyond capacity, that Hotel-Dieu of Paris frequently placed three to five patients in one bed—the convalescent with the dying and fracture cases with infectious cases. He estimated that one-fifth of the 22,000 patients cared for at Hotel-Dieu died each year. Wounds were washed daily with a sponge that was carried from patient to patient. The infection rate was said to be 100%. Mortality after amputation was as high as 60%. Jones's call to action had a positive effect on American health care.

As late as 1769, New York City, with nearly 300,000 inhabitants, was without hospitals. In 1771, a small group of citizens, Dr. Jones among them, formed the Society of the New York Hospital. The society purchased a five acre site and made plans for a model hospital, which fell into the hands of British troops during the Revolution.

During postwar reconstruction, the New York Hospital broadened its services. Under the supervision of Dr. Valentine Seaman, the hospital began providing instruction in nursing, and in 1779 it introduced vaccination in the United States and established an ambulance service.

Other early American hospitals of historic interest include the first psychiatric hospital in the New World, founded at Williamsburg, Virginia, in 1773, and a branch of federal hospitals created by passage of the US Marine

Hospital Service Act in 1798. Under this act, two marine hospitals were established in 1802, one in Boston and another in Norfolk, Virginia.

The Massachusetts General Hospital, which pioneered many improvements in medicine, originated in Boston. Its first patient, admitted in 1821, was a 30-year-old sailor.

In 1832, the Boston Lying-In Hospital opened its doors to women who were unable to afford in-home medical care. It was one of the nation's first maternity hospitals, made possible because of fundraising appeals to individuals and charitable organizations.

Surgeons of the day had sufficient knowledge of anatomy to lead them to perform many ordinary operations, and as a result more surgery was probably undertaken than during any previous era. While surgeons had sought to keep wounds clean, even using wine in an attempt to accomplish this purpose, 19th-century surgeons believed suppuration (the production and discharge of pus) to be desirable and encouraged it. Hospital wards were filled with discharging wounds. Nurses of that period are said to have used snuff to make conditions tolerable. Surgeons wore their operating coats for months without washing. The same bed linens served several patients. Pain, hemorrhage, infection, and gangrene infested the wards. Mortality from surgical operations rated as high as 90% to 100%.

LATE 19TH-CENTURY RENAISSANCE

Florence Nightingale, the famous English nurse, began her career by training at Kaiserswerth on the Rhine in a hospital and deaconess home established in 1836 by Theodor Fliedner and his wife. Florence Nightingale wrote disparagingly of her training there, particularly of the hygiene practiced. Returning to England, she put her own ideas of nursing into effect and rapidly acquired a reputation for efficient work.

By 1854, during the Crimean War, the English government, disturbed by reports of conditions among the sick and wounded soldiers, selected Florence Nightingale as the

one person capable of improving patient care. Upon her arrival at the military hospital in Crimea with a small band of nurses whom she had assembled, she found that the sick were lying on canvas sheets in the midst of dirt and vermin. She proceeded to establish order and cleanliness. She organized diet kitchens, a laundry service, and departments of supplies, often using her own funds to finance her projects. Ten days after her arrival, the newly established kitchens were feeding 1000 soldiers. Within three months, 10,000 soldiers were receiving clothing, food, and medicine.

As the field of nursing continued to progress, so did medicine. Crawford Long, for example, first used ether as an anesthetic in 1842 to remove a small tumor from the neck of a patient. He did not publish any accounts of his work until later, however, so the discovery is often attributed to W. T. G. Morgan, a dentist who developed sulfuric ether and arranged for the first hospital operation under anesthesia at Massachusetts General Hospital in 1846. Although not put to practical use immediately, ether soon took away some of the horror that hospitals had engendered in the public mind. Chloroform was first used as an anesthetic in 1847 for an obstetrical case in England by Sir James Simpson.

The year 1847 also brought about the founding of the American Medical Association (AMA) under the leadership of Dr. Nathan Smith Davis. The association, among its main objectives, strived to improve medical education, but most of the organization's tangible efforts in education began at the close of the century. The AMA was a strong advocate for establishing a code of ethics, promoting public health measures, and improving the status of medicine.

The culmination of Florence Nightingale's work came in 1860 after her return to England. There she founded the Nightingale School of Nursing at the St. Thomas Hospital. From this school, a group of 15 nurses graduated in 1863. They later became the pioneer

heads of training schools throughout the world.

In 1886, the Royal British Nurses' Association (RBNA) was formed. The RBNA worked toward establishing a standard of technical excellence in nursing. A charter granted to the RBNA in 1893 denied nurses a register, although it did agree to maintain a list of persons who could apply to have their name entered thereon as nurses.

The first formally organized American nursing schools were established in 1872 at the New England Hospital for Women and Children in Boston (Brigham and Women's Hospital), and then in 1873 at Bellevue, New Haven, and Massachusetts General Hospital. In 1884, Alice Fisher was appointed as the first head of the nurse training at Philadelphia Hospital's (renamed as the Philadelphia General Hospital in 1902) nurses' training school. She had the distinction of being the first Nightingale-trained nurse recruited to Philadelphia upon recommendation by Florence Nightingale.

Mrs. Bedford Fenwick, a nurse leader in the English nurse registration movement, traveled to Chicago in 1893 to arrange the English nursing exhibit. As part of the Congress on Hospitals and Dispensaries, a nursing section included papers on establishing standards in hospital training schools, the establishment of a nurses' association, and nurse registration. The group formulated plans to improve nursing curriculum and hospital administration in the first concerted attempt to improve hospitals through a national organization.

Progress in Infection Control

Ignaz Philipp Semmelweis of Vienna, Austria, unknowingly laid the foundation for Pasteur's later work. In 1847, at the Vienna Lying-in Hospital, Europe's largest teaching obstetrical department, he declared that the alarming number of deaths from puerperal fever was due to infection transmitted by students who came directly from the dissecting room to take care of maternity patients. Semmelweis noted

that Division 1 of the hospital was a medical student teaching service; Division 2 was utilized for midwife trainees. Maternal deaths for Division 1 averaged 10%; Division 2 averaged 3%. Medical students performed autopsies; midwives did not. As a result of these findings, an order was posted on May 15, 1847, requiring all students to scrub their hands in chlorinated lime until the cadaver smell was gone. The order was later revised to include hand washing between patients.

Semmelweis had the satisfaction of seeing the mortality rate in his obstetrical cases drop from 9.92% to 1.27% in little more than a year as a result of an aseptic technique that he devised. A few years later, Louis Pasteur demonstrated the scientific reason for Semmelweis's success when he proved that bacteria were produced by reproduction and not by spontaneous generation, as was then generally believed. From his work came the origin of modern bacteriology and clinical laboratories.

Also of great importance to hospitals and infection control was Bergmann's introduction of steam sterilization in 1886 and William Stewart Halstead's introduction of rubber gloves in 1890.

By the end of the century, Lister carried Pasteur's work a step further and showed that wound healing could be hastened by using antiseptics to destroy disease-bearing organisms and by preventing contaminated air from coming into contact with these wounds. Lister was not content with obtaining better results in his own surgical cases; he devoted his life to proving that suppuration is dangerous and that it should be prevented or reduced by use of antiseptics. Despite his successful work and eloquent pleas, his colleagues persisted in following their old methods. As time went on and antiseptics and the techniques of using them were improved, even the skeptical were impressed by the clinical results.

Discovery of Anesthesia

The discovery of anesthesia and the principle of antiseptics are to be regarded as two of the

most significant influences in the development of surgical procedures and the modern hospital. Anesthesia improved pain control, and hygiene practices which helped reduce the incidence of surgical site infections.

Modern Hospital Laboratory

The study of cytology originated during the middle of the 19th century and influenced the development of the modern hospital clinical laboratory. The cell theory was first advanced in 1839 by the German anatomist Theodor Schwann and was further developed by Jacob Henle, whose writings on microscopic anatomy appeared about 1850. Rudolph Virchow was the most eminent proponent of the cell theory. His studies in cellular pathology speeded research in the etiology of disease.

Changing Hospital Structure

With nursing, anesthesia, infection control, and cytology under way, a change in hospital structure began in the last quarter of the 19th century. Buildings of the Civil War days continued with as many as 25 to 50 beds in a ward, with little provision for segregation of patients. In New York City in 1871, construction of Roosevelt Hospital, built on the lines of a one-story pavilion with small wards, set the style for a new type of architecture that came to be known as the American plan. A noteworthy feature was ventilation by means of openings in the roof, a definite improvement upon earlier hospitals that were characterized by a lack of provision for ventilation. Dr. W. G. Wylie, writing in 1877, said he favored this type of building, but he advocated that it be a temporary structure only, to be destroyed when it became infected.

Changing Hospital Function

Promoted by the wealth of bacteriological discoveries, hospitals began to care for patients with communicable diseases. During the decade 1880 to 1890, the tubercle bacillus

was discovered; Pasteur vaccinated against anthrax; Koch isolated the cholera bacillus; diphtheria was first treated with antitoxin; the tetanus bacillus and the parasite of malarial fever were isolated; and inoculation for rabies was successful. Treatment of patients with some of the infections necessitated isolation, and hospitals were the logical place for observation of communicable diseases. Consequently, at the end of the century, in addition to their many surgical cases, hospitals were crowded with large numbers of patients suffering from scarlet fever, diphtheria, typhoid, and smallpox.

Discovery of the X-Ray

Wilhelm Konrad Roentgen's discovery of the X-ray in 1895 was a major scientific achievement. The first use of the X-ray symbolizes the beginning of the period that necessitated equipment so costly that the average practitioner could not afford to install it. The natural result was the founding of community hospitals in which physicians could jointly use such equipment. Nineteenth-century inventions also included the clinical thermometer, the laryngoscope, the Hermann Helmholtz ophthalmoscope, and innumerable other aids to accurate diagnosis.

20TH-CENTURY PROGRESS

The treatment of metabolic diseases, nutritional deficiencies, the importance of vitamins, and the therapy of glandular extracts played an important role in the advancement of medicine in the 20th century. As early as 1906, Gowland Hopkins began investigations of vitamins. Two years later, Carlos Finlay produced experimental rickets by means of a vitamin-deficient diet. This, in turn, was followed by Kurt Huldschinsky's discovery that rickets could be treated successfully with ultraviolet light. In quick succession came Casimir Funk's work with vitamins, Elmer McCollum's discovery of vitamins A and B, Joseph Goldberger's

work in the prevention of pellagra, and Harry Steenbock's irradiation of foods and oils. Other outstanding contributions to the science of nutrition include Frederick Banting's introduction of insulin in 1922, the studies in anemia carried out by George Hoyt Whipple and Frieda Robscheit-Robbins, and the Minot and Murphy liver extract.

Einthoven's invention of the electrocardiograph in 1903 marked the beginning of an era of diagnostic and therapeutic aids. Shortly after that invention came the first basal metabolism apparatus, then the Wassermann (August Von) test in 1906, followed by tests for pancreatic function, and the invention of the fluoroscopic screen followed in 1908. Subsequently, the introduction of blood tests and examinations of numerous body secretions required well-equipped and varied laboratories. Concurrent with this progress in the field of internal medicine was the introduction of radium for the treatment of malignant growths, increasing the use of the clinical laboratory for microscopic examination of pathological tissue, and developments in antibiotics. The result of these many new aids was the conquest of diseases formerly regarded as incurable, which in turn resulted in improved public confidence in hospitals.

The 20th century is also characterized by rapid growth in nursing education. The earlier schools were maintained almost entirely for the purpose of securing nursing service at a low cost. The nurses' duties were often menial, the hours long, and classroom and laboratory study almost entirely lacking. Nurses themselves had begun to organize for educational reforms. By 1910, training increasingly emphasized theoretical studies. This movement was largely due to the work of organizations such as the American Nurses Association and the National League for Nursing, along with the organization of the Committee on the Grading of Nursing Schools. In 1943, the US Cadet Nurse Corps was organized to spur enrollment of student nurses in nursing schools to help meet the shortages due to enlistment of graduate nurses for military service. As a result, ef-

orts increased to train practical nurses and nurses' aides to relieve the shortage of graduate nurses.

Reform in medical education began early in the century and was due almost wholly to the efforts of the Council on Medical Education and Hospitals, which was established in 1905 by the American Medical Association. Immediately after its organization, this council began inspection of medical schools. The council, by establishing standards and by grading the schools, brought about gradual elimination of most of the unethical, commercial, and unqualified institutions.

A great stimulus to the profession of hospital administration has been the work of the American Hospital Association. Organized in 1899 as the Association of Hospital Superintendents, it took its present name in 1907. Since its inception, the organization has concerned itself particularly with the problems of hospital management. As early as 1910, the association held educational programs for hospital chief executive officers and trustees.

The American College of Surgeons was founded in 1913 under the leadership of Dr. Franklin H. Martin, the first director general of the organization. One of the most dramatic of the achievements of the American College of Surgeons was the hospital standardization movement begun in 1918. The founders drew up what was known as the "minimum standard," a veritable constitution for hospitals, setting forth requirements for the proper care of the sick. An annual survey of all hospitals having 25 or more beds made the standard effective. In 1918, when the first survey was conducted, only 89 hospitals in the United States and Canada could meet the requirements.

The hospital standardization movement focused its efforts on the patient, with the goal of providing the patient with the best professional, scientific, and humanitarian care possible. The growth of this movement is remarkable, especially given that participation in the hospital standardization (now referred to as The Joint Commission) program is voluntary.

The years following 1929 will be remembered as a trying period in the history of hospitals. Due to critical economic conditions, many institutions found it difficult to keep their doors open. Lowered bed occupancy and increased charity load, coupled with steadily decreasing revenues from endowments and other sources of income, worked hardships on private institutions.

In the later half of the 20th century, competition among hospitals began to grow as for-profit hospital chains began to spring up and compete with nonprofit organizations. Advances in medical technology, such as CT, MRI, and PET scanners and robotic surgery, as well as an ever-growing list of new medications, have revolutionized the practice of medicine. Less-invasive surgical procedures and a trend toward care in outpatient settings have reduced the need for lengthy in-hospital stays.

HEALTH CARE AND HOSPITALS IN THE 21ST CENTURY

The challenges of health care are enormous and continue to test health care organizations. Some of today's health care challenges include exorbitant malpractice awards; skyrocketing insurance premiums; high expectations of society for miracle drugs and miracle cures; balancing fairly the mistakes of caregivers with the hundreds of thousands of successful events that occur each year across the nation; negative press that increases public fear; the ethical dilemmas of abortion and human cloning; the exponential growth of informa-

tion and medical technology; and the ever-increasing shortage of nurses, physicians, pharmacists, physical therapists, and the like. The ability to provide affordable access to health care services to even the insured is an ongoing challenge. There are nearly 47 million uninsured Americans (16% of the population), and the numbers continue to increase. Even those with insurance are often underinsured for catastrophic occurrences. In addition, with employer-based coverage declining, many working families are left with decreasing health benefits. Unfortunately, there is little evidence that the US Congress is able to reach any consensus for effectively addressing the issue. The greatest challenge of the 21st century requires that each member of society assume a more proactive role in his or her health care.

JUST A BEGINNING

The pinnacle of hospital evolution has not been reached nor has the final page of its colorful history been written. As long as there remains a humanitarian impulse, as long as a society feels compassion, love, and sympathy for its neighbors, there will be hospitals. In the past, hospitals changed as conditions changed. In the future, they will continue to change to meet the needs of their communities. Health care leaders of the 21st century must understand their roots and the historical value of knowing the past, have the vision to preserve the good, and the passion to create an even better health care system.

