

## **A Review of the Historical Formation of Modern Medicine: Definitions, Characteristics, and Contexts**

**Ali Shahriar Manteghi Fasaei<sup>1</sup>; Soroush Fathi<sup>2</sup>; Zahra Zare<sup>3</sup>**

1. *Ph.D. Student of Sociology, West Tehran Branch, Islamic Azad University, Tehran, Iran*
2. *Associate Professor of Sociology, West Tehran Branch, Islamic Azad University, Tehran, Iran*
3. *Assistant Professor of Sociology, East Tehran Branch, Islamic Azad University, Tehran, Iran*

---

**Received 16 April 2025**

**Accepted 2 June 2025**

---

**Abstract:** Modern medicine, as a structured discipline grounded in empirical and scientific methods, is the product of several centuries of transformation, rooted in the medical knowledge of ancient Greece and later enriched by developments during the Islamic Golden Age and the Renaissance. During the Middle Ages, despite scientific stagnation in the Western world, Muslim scholars and Iranian physicians preserved and expanded the foundations of medicine by translating and elaborating upon the works of Hippocrates, Galen, and other Greek physicians. Among them, Avicenna stands out; his seminal work *The Canon of Medicine* remains one of the most influential texts in medical history. With the advent of the Renaissance and scientific discoveries such as William Harvey's description of blood circulation and Antonie van Leeuwenhoek's observation of microorganisms, medicine began evolving toward a more scientific approach, increasingly relying on laboratory experimentation and anatomical dissection. The nineteenth century witnessed remarkable advancements in surgery, anesthesia, aseptic techniques, and epidemiology, bringing medicine closer to its contemporary form. In Iran, modern medicine began in the early 20th century (13th century SH) with the establishment of the Dar al-Fonun School by Mirza Taghi Khan Amir Kabir. The introduction of foreign physicians and modern medical education led to significant transformations in the national health system. Pioneering actions, such as the first modern surgery performed under anesthesia and the development of forensic pathology led by Jakob Eduard Polak, exemplify these changes. Modern medicine is the outcome of a multilayered process influenced not only by the influx of Western science and technology but also by political, social, and cultural reforms. Epidemics and emerging public health needs in both Iran and globally facilitated the acceptance and growth of this new form of medicine, significantly enhancing the societal role of physicians and medical institutions. This transformation—from traditional healing practices to science- and technology-based medicine—has paved the way for human health advancement and continues to shape the trajectory of global healthcare.

---

**Keywords:** Medicine, Modern Medicine, Technology, Medical Equipment.

---

### **Introduction**

The historical process of the formation and development of key concepts such as disease, medicine, treatment, and their respective domains—as well as the various inventions and discoveries from antiquity to the present—reveals that, like other areas of human society, medical structures and institutions have undergone fundamental transformations in nature, meaning, and form. The concept of medicine, particularly modern medicine, has evolved in direct response to the classification and understanding of diseases. Over time, this evolution has given rise to various medical specialties, institutional structures, and professional roles, each playing a vital part in shaping the dynamics of the physician–patient relationship. These foundational concepts—medicine, illness, and the interaction between doctor and patient—have themselves been deeply shaped and redefined by environmental, social, cultural, and economic conditions, resulting in essential changes both in form and function.

Modern medicine is the culmination of centuries of evolution in human knowledge and perspectives on health, illness, and healing. This trajectory began with mystical and religious beliefs and gradually transitioned—through successive stages—into an empirical, evidence-based science. Today, modern medicine stands as a vital branch of both the humanities and life sciences, representing a complex and

---

<sup>1</sup> Email: [asmanteghi@gmail.com](mailto:asmanteghi@gmail.com)

<sup>2</sup> Email: [fathi.soroush@gmail.com](mailto:fathi.soroush@gmail.com) (Corresponding Author)

<sup>3</sup> Email: [zahra.zare2006@gmail.com](mailto:zahra.zare2006@gmail.com)

long-standing historical process. Although it is now firmly grounded in scientific, experimental, and technological methodologies, it retains roots in ancient medical traditions and has been shaped by broad scientific, cultural, social, and technological developments. Understanding the historical trajectory of modern medicine provides important insights into today's medical advancements and highlights their critical role in improving human health and quality of life. Ancient civilizations—particularly those of Greece, Egypt, and India—laid the early foundations of medical thought. Hippocrates, the 5th-century BCE Greek physician known as the "Father of Medicine," introduced ethical and scientific principles in medical practice that still resonate today. Galen, a 2nd-century CE Greco-Roman physician, contributed significantly to the development of anatomy and physiology, though many of his theories were later revised in light of scientific progress. At that time, medicine was largely based on clinical observation and experience, with laboratory science still in its infancy.

With the rise of Islamic civilization, Muslim scholars such as Avicenna (Ibn Sina), Rhazes (al-Razi), and Jorjani played a key role in preserving and expanding upon Greek and Roman medical knowledge. Avicenna's *Canon of Medicine* served as a central medical text for centuries across the Islamic world and Europe. This era witnessed notable advances in pharmacology, surgery, and empirical medicine. The Renaissance, beginning in the 14th century, marked a turning point in medical history. Advances in human anatomy—led by figures like Andreas Vesalius—and the invention of the microscope by Antonie van Leeuwenhoek ushered in a new era of scientific inquiry. William Harvey's discovery of blood circulation in the 17th century revolutionized the understanding of human physiology. These breakthroughs moved medicine beyond traditional and philosophical confines toward a scientific and evidence-based paradigm. The 18th and 19th centuries are often considered the golden age of modern medical formation. During this period, the development of laboratory methods, the legalization of dissection, and the expansion of microbiological knowledge transformed medicine into a more precise and empirical science. The discoveries of microorganisms by Louis Pasteur and Robert Koch laid the foundation for the germ theory of disease and advanced preventive measures such as vaccination. Meanwhile, the use of anesthesia and the adoption of sterilization protocols significantly improved the safety and effectiveness of surgical procedures.

This period also witnessed a dramatic shift in the role of the physician. No longer merely a symptom-treater, the physician became a diagnostician and researcher, employing anatomical and laboratory data to gain a deeper understanding of disease and to provide more targeted treatments. These developments institutionalized medicine as a specialized scientific profession and led to the establishment of medical schools and research centers. In Iran, the emergence of modern medicine began in the late Qajar era. The founding of the *Dar al-Fonun* School by Mirza Taghi Khan Amir Kabir in the early 20th century (13th century SH) marked the beginning of formal modern medical education in the country. With the involvement of foreign physicians and instructors and the translation of Western scientific texts, the foundations of modern medicine were laid in Iran. Pioneering initiatives—such as the first surgery under anesthesia and the establishment of forensic medicine—demonstrated the depth of transformation in the Iranian healthcare system. The arrival of European-trained physicians, along with the founding of hospitals and medical faculties, accelerated the spread of modern medicine in Iran, gradually replacing traditional practices. This transformation was accompanied by social and cultural reforms, and the physician's role in society shifted toward that of a professional health expert.

### **Definition of Modern Medicine**

Modern medicine is a branch of medical science grounded in empirical knowledge, advanced technologies, and evidence-based approaches. Its primary objectives include the preservation and promotion of health, prevention of disease, accurate diagnosis, effective treatment, and rehabilitation of individuals affected by illness or injury. In modern medical practice, health and disease are understood through biological criteria and are managed using standardized tools and technologies such as laboratory testing, medical imaging, pharmaceutical drugs, and surgical procedures. This field relies heavily on the biomedical model, which interprets diseases in terms of biological and physiological processes within the human body. Consequently, medical interventions are primarily designed based on these biological foundations.

## **Foundations of Modern Medicine**

### **Roots of Medicine up to the Middle Ages**

The historical foundations of modern medicine can be traced through a series of developments and influences from ancient civilizations to the medieval period, during which medical thought evolved through a complex interplay of mythology, religion, observation, and early scientific reasoning.

- In ancient times, medicine was deeply intertwined with mythological and magical beliefs. Illness was often perceived as the result of divine will or supernatural forces.
- In ancient Greece, Hippocrates—often regarded as the "Father of Medicine"—distinguished medicine from superstition and emphasized clinical observation and logical reasoning. His works, along with those of Galen, laid the foundational framework for scientific medicine.
- During the Middle Ages, while medical knowledge in Western Europe experienced stagnation, the Islamic world—particularly Persia—witnessed a flourishing of medical scholarship. Greek medical texts were translated, expanded, and enhanced by scholars such as Rhazes (al-Razi) and Avicenna (Ibn Sina). Avicenna's *Canon of Medicine* remained a primary medical reference for centuries across both the Islamic world and Europe.

The roots of medicine prior to the Middle Ages encompass diverse contributions from several ancient civilizations and religious traditions:

- In ancient Mesopotamia, medicine had a predominantly religious character. Healing was practiced by various specialists such as herbalists, knife-surgeons, and exorcists, blending herbal knowledge, surgical procedures, and magical rituals.
- In ancient Greece, medicine began to shift toward a more rational and systematic form. Hippocrates and Galen pioneered classical medicine, introducing the theory of the four humors—blood, phlegm, black bile, and yellow bile. This theory deeply influenced medieval medical thought, where restoring humoral balance through techniques like bloodletting and cupping was considered essential.
- During the Islamic Golden Age, medical science advanced significantly. Muslim physicians such as Rhazes and Avicenna translated, preserved, and expanded upon Greek and Roman medical knowledge. Their work elevated the discipline and was institutionalized in hospitals and scientific centers throughout the Islamic world, playing a critical role in transmitting medical knowledge to Europe.
- In medieval Europe, medicine was heavily shaped by the Church and religious teachings. Monasteries functioned as centers of both education and healthcare, helping to preserve classical knowledge. Medicine during this era combined elements of classical learning with religious doctrine and magical beliefs. Practices such as medical astrology—based on the idea that celestial bodies influenced human health—were widely accepted.
- Medieval medical practitioners came from a variety of backgrounds, ranging from university-educated physicians to barber-surgeons and local healers, each contributing in their own way to healthcare. Herbal remedies and folk medicine also played a central role in treatment.
- Major challenges such as outbreaks of infectious diseases, most notably the Black Death, exposed the limitations of contemporary medical knowledge. Yet, this period also saw modest advancements in surgery and anatomy that would later serve as stepping stones toward modern medical science.

Thus, the development of medicine up to the Middle Ages was shaped by a confluence of ancient knowledge, Islamic scholarship, and cultural and religious beliefs—all of which laid the groundwork for the emergence of modern medicine.

### **Modern Medicine in Europe**

Beginning in the 16th century, modern medicine in Europe took shape amid the Scientific Revolution, marked by advances in human anatomy by Andreas Vesalius, the discovery of blood circulation by William Harvey, and the invention of the microscope. These breakthroughs reinforced a scientific

perspective on the human body and laid the foundation for a new era of medical knowledge. By the 18th century, medicine had evolved into a structured discipline grounded in clinical observation and laboratory experimentation. The human body became a subject of systematic study and classification, and diseases were categorized according to new scientific criteria. The rise of modern medicine in Europe began primarily during the Renaissance and early modern period, when the revival of knowledge and learning prompted a shift away from medieval traditions and toward empirical, science-based approaches. During this time, hospitals transformed from charitable institutions into professional medical centers. Physicians and surgeons increasingly collaborated within these institutions, contributing significantly to the advancement of medical knowledge.

Key milestones in the development of modern medicine in Europe include:

- **Advanced anatomy:** In the late 15th and early 16th centuries, Leonardo da Vinci conducted detailed dissections of human cadavers. In 1543, Andreas Vesalius published *De Humani Corporis Fabrica*, a foundational text in modern human anatomy.
- **Invention of the microscope:** Around 1590, Zacharias Janssen invented the microscope, enabling the observation of cells and microorganisms for the first time.
- **Discovery of blood circulation:** In 1628, William Harvey published a seminal work on the movement of blood in the body, laying the groundwork for future cardiovascular physiology.
- **Advances in anesthesia and surgery:** In the 19th century, the introduction of anesthesia and antiseptic surgical techniques by Joseph Lister revolutionized surgical safety and efficacy.
- **Germ theory of disease:** In the same century, Louis Pasteur and Robert Koch developed the germ theory, establishing the scientific basis for modern preventive and curative medicine.
- **Development of hospitals:** During the 18th and 19th centuries, hospitals evolved into centers of care, research, and education under the supervision of governments and scientific institutions. Institutions such as St. Thomas' Hospital in London played a pivotal role in medical education and research.

Thus, the emergence of modern medicine in Europe was the result of cumulative scientific, technological, and institutional changes that began with the Renaissance and became more systematic and evidence-based by the 18th and 19th centuries.

### The Nineteenth Century and the Birth of Modern Medicine

The 19th century marked a decisive transformation in the field of medicine. Physicians began to systematically analyze disease symptoms, and innovations such as anesthesia and aseptic techniques fundamentally altered surgical practices. Key scientific discoveries during this period included the identification of microorganisms, the development of vaccines, the discovery of X-rays, and the classification of blood groups. New statistical tools for analyzing medical data and testing hypotheses were also introduced by researchers such as Francis Galton and Karl Pearson, helping to shape the foundations of medical research. This century witnessed a significant consolidation of both the theoretical and practical foundations of modern medicine, driven by numerous advances in science, technology, and diagnostic and therapeutic methodologies:

- **Cell theory and biological structure:** In the early 19th century, Xavier Bichat demonstrated that organs are composed of simpler structural units—cells—which laid the groundwork for modern cell biology.
- **Anesthesia:** The introduction of anesthesia was a milestone in medical practice. In 1842, Crawford Long used ether for surgical anesthesia, and two years later, William Morton introduced nitrous oxide, making complex and pain-free surgeries possible.
- **Aseptic and antiseptic methods:** In 1869, Just Lucas-Championnière developed antiseptic techniques for treating wounds, and Ignaz Semmelweis demonstrated that handwashing by physicians significantly reduced postpartum mortality. These practices laid the foundation for modern infection control.

- **Germ theory of disease:** Louis Pasteur and Robert Koch's development of the germ theory provided the scientific basis for vaccination and infection treatment. Pasteur created the rabies vaccine, while Koch identified the tuberculosis bacillus.
- **Pharmaceutical advances:** Key discoveries included the extraction of morphine (1804), cocaine (1855), the synthesis of aspirin (1889), and the development of antiseptics and early antibiotics, all of which revolutionized disease treatment.
- **New diagnostic and therapeutic tools:** René Laennec invented the stethoscope; Thomas Allbutt introduced the short clinical thermometer; and significant progress was made in blood transfusion techniques.
- **Systematic symptom analysis and medical statistics:** Hospital-based physicians began studying symptoms more systematically, and English statisticians such as Galton and Pearson developed analytical tools for interpreting medical data.
- **Expansion of hospitals and medical education:** Hospitals became integrated centers for research, training, and specialized care, playing a central role in medical progress.

In sum, the 19th century represents a turning point in the emergence of modern medicine. By combining life sciences, new technologies, and scientific methodologies, medicine broke away from traditional frameworks and entered a new era of structured, empirical science.

### **From the Twentieth Century to the Present: Transformations in Modern Medicine**

The period from the twentieth century to the present has been one of rapid and transformative change in the history of modern medicine. This era has been shaped by groundbreaking scientific discoveries, advanced technologies, and fundamental shifts in therapeutic and care-related approaches.

#### **Scientific and Technological Advancements**

- **Discovery of insulin (1921):** The discovery of insulin by Frederick Banting and Charles Best revolutionized the treatment of diabetes, saving millions of lives worldwide.
- **Advances in medical genetics:** From the late 20th century onward, the rise of genetics significantly enhanced the understanding of diseases and enabled targeted treatments, paving the way for personalized medicine and gene therapy.
- **Medical imaging technologies:** The development of imaging tools such as X-rays, CT scans, MRI, and PET allowed for more accurate and non-invasive disease diagnosis.
- **Advanced and robotic surgeries:** The integration of high-precision surgical robots has reduced complications and accelerated recovery times for patients.
- **Electronic Health Records (EHRs):** The digitization of medical information through integrated EHR systems has improved the quality of care, enhanced data accessibility, and facilitated more coordinated medical services.
- **Emerging therapeutic technologies:** Innovations such as cell therapy, nanotechnology, tissue engineering, genome editing, mRNA vaccines, and biosensors have played a crucial role in treating chronic and complex diseases.

#### **Historical Events and Their Impact**

- **World wars:** World War I and II prompted rapid advances in medical techniques, including widespread use of X-rays, anesthesia, antisepsis, and antibiotics. Medical care for wounded soldiers and infection control significantly improved as a result.
- **Pandemics and epidemics:** The 1918 influenza pandemic spurred the development of epidemiological research and provided valuable experience in managing infectious diseases.

#### **Development of Health Systems and Medical Education**

- Hospitals evolved into specialized centers for research and education, playing a central role in the advancement of medicine.
- Medical education expanded, with greater emphasis on basic sciences, clinical training, and the integration of modern technologies. Specialization across various medical fields became more widespread.



### Future Outlook

- **Emerging technologies** such as neural implants, bionics, brain–machine interfaces, and optogenetics are shaping the future of medicine and are expected to be widely implemented in disease treatment by 2050.
- **Personalized medicine** and the integration of **artificial intelligence** in diagnostics and therapeutics are poised to significantly enhance the quality, precision, and efficiency of healthcare.

In summary, the period from the twentieth century to the present represents an era of unprecedented innovation and fundamental transformation in modern medicine. Fueled by scientific discoveries, cutting-edge technologies, and evolving care models, this era has dramatically improved human health and quality of life.

### Modern Medicine in Iran

The introduction of modern medicine to Iran began primarily during the Qajar era, particularly with the establishment of the *Dar al-Fonun* School in 1851 (1230 SH) under the initiative of Mirza Taghi Khan Amir Kabir. As the first modern medical education institution in Iran, *Dar al-Fonun* played a pivotal role in institutionalizing Western medical science. The school employed European physicians such as Jakob Eduard Polak (Austrian) and Dr. Focchetti (Italian), who taught medicine, surgery, and pharmacy based on European models. Polak was instrumental in laying the foundations of modern medical practice in Iran: in 1852, he performed the first modern surgery using ether as an anesthetic and introduced forensic dissection into the country.

At the time, Iranian physicians generally fell into three categories:

1. Traditional practitioners who opposed modern medicine,
2. Hybrid practitioners who drew from both traditional and modern sources, and
3. Fully trained modern physicians educated either at *Dar al-Fonun* or abroad.

*Dar al-Fonun* was a cornerstone in the transition from traditional to modern medical education and had a profound influence on Iranian intellectual and professional circles. In subsequent years, the School of Medicine and Pharmacy was separated from *Dar al-Fonun* and, in 1934 (1313 SH), became the Faculty of Medicine at the University of Tehran. Separate faculties for dentistry and pharmacy were soon established, and medical specialization expanded across various disciplines.

Modern medicine in Iran during the Qajar era faced numerous challenges, including the inadequacies of traditional practices and the arrival of new infectious diseases. These circumstances made the adoption of Western medicine and modern technologies increasingly necessary. Key achievements of this period included the introduction of smallpox vaccination and anatomically informed surgical practices.

In essence, the development of modern medicine in Iran was shaped by a dynamic interplay between traditional and Western medical paradigms. The efforts of educators at *Dar al-Fonun*, the contributions of foreign-trained Iranian physicians, state support, and broader social transformations collectively contributed to the gradual institutionalization of a modern healthcare system in Iran.

### Key Characteristics of Modern Medicine

#### Reliance on Science and Technology

Modern medicine is deeply rooted in the integration of basic sciences—such as biology, genetics, chemistry, and physics—with advanced technological innovations. This scientific and technological foundation plays a critical role in diagnostics, treatment, and patient care across multiple domains:

- **Advanced imaging technologies** such as MRI, CT scans, and PET scans provide precise and non-invasive visualization of internal structures, enabling earlier and more accurate diagnoses.
- **Artificial Intelligence (AI)** helps analyze vast volumes of medical data to detect complex patterns, improving diagnostic accuracy and enabling predictive modeling for treatment planning.

- **Robotic surgery systems** offer high precision, reduce complications, and enhance postoperative recovery, significantly improving patient outcomes.
- **Wearable smart sensors and portable medical devices** allow continuous monitoring of patients' vital signs, facilitating better management of chronic conditions—even outside clinical settings.
- **Virtual and augmented reality** tools are increasingly used in medical education and in the treatment of certain psychological disorders, enhancing both learning and therapeutic experiences.
- **3D printing** technologies are employed to produce customized prosthetics, anatomical models for surgical planning, and personalized pharmaceuticals.
- **Telemedicine** solutions leverage digital communication platforms to extend healthcare access to remote or underserved populations, ensuring continuity of care for individuals with limited mobility.

These innovations have enabled modern medicine to deliver care with greater precision, speed, and effectiveness—dramatically improving patient outcomes and overall quality of life.

### **Evidence-Based Approach**

Medical decision-making in modern practice is grounded in scientific evidence, clinical research, and statistical data. The use of statistical methods to test hypotheses and analyze medical data became increasingly common from the 19th century onward, laying the groundwork for what is now known as **Evidence-Based Medicine (EBM)**.

Evidence-Based Medicine is a clinical approach that involves the conscientious, explicit, and judicious use of the best available scientific evidence in making decisions about the care of individual patients. It integrates clinical expertise, patient values, and the most current, relevant research data to deliver the highest quality of care.

### **Core Principles and Components of EBM**

Evidence-Based Medicine rests on three fundamental pillars:

- **Scientific Evidence:** This includes high-quality clinical research that evaluates the accuracy of diagnostic tests, the effectiveness of treatments, and the outcomes of various medical interventions. Such evidence is continuously updated and subject to critical review, replacing outdated or less reliable data over time.
- **Clinical Expertise:** The physician's skill, experience, and judgment in diagnosing and managing diseases are vital. This includes the ability to weigh the risks and benefits of different treatment options based on individual patient contexts.
- **Patient Values and Preferences:** Patient concerns, expectations, cultural background, and individual values must be incorporated into clinical decisions to ensure personalized and ethical care.

### **Key Steps in the EBM Process**

1. **Formulating a focused clinical question** based on the patient's condition.
2. **Searching for the best available evidence** relevant to that question.
3. **Critically appraising the evidence** for its validity, reliability, and applicability.
4. **Integrating the evidence into clinical decision-making**, alongside patient values and clinical expertise.
5. **Evaluating the outcomes** and assessing the impact of the decision on patient health and well-being.

### Significance and Application

EBM helps healthcare providers make more accurate and effective treatment decisions, reduces medical errors, and improves the quality of care. It enables physicians to navigate conflicting research findings and select the most appropriate interventions based on systematic evaluation.

### Historical Background and Pioneers

The term *Evidence-Based Medicine* was introduced in the early 1990s by Canadian epidemiologist **Gordon Guyatt**. One of the foundational figures of this approach was **Professor Archibald Cochrane**, who emphasized the importance of reliable and critically evaluated evidence in clinical practice. His contributions laid the groundwork for systematic reviews and the development of EBM as a formal discipline.

### Relevant Institutions

The **Cochrane Collaboration** is an international, independent organization that conducts systematic reviews and generates high-quality, evidence-based medical data. With over 37,000 volunteer experts worldwide, the organization plays a key role in promoting transparency and reliability in healthcare decision-making. It is known for maintaining editorial independence from commercial and financial interests.

In conclusion, Evidence-Based Medicine provides a structured, scientific framework for applying the best available evidence to clinical decisions. It enhances treatment outcomes, supports personalized care, and ensures that healthcare practices evolve in alignment with the latest, most reliable research findings.

### Specialization

With the expansion of medical knowledge, numerous medical specialties and subspecialties have been developed, and healthcare services are now delivered at different levels (primary, secondary, and tertiary care). Specialization in medicine refers to the division of medical knowledge and skills into various branches and disciplines, each focusing on a specific part of the body, type of disease, or age group. This process began seriously in the 19th century as medical knowledge expanded and diseases became more complex, and gradually took on a formal structure. Today, specialization allows physicians, after completing general medical education, to train and work in specific fields such as internal medicine, surgery, cardiology, neurology, obstetrics and gynecology, pediatrics, dermatology, radiology, anesthesia, and many other disciplines. Each specialty includes subfields and subspecialties that deal with more specific and complex issues—for example, within internal medicine, there are specialties such as gastroenterology, nephrology, cardiology, and pulmonology. Specialization has led to more accurate diagnosis and treatment, improved the quality of medical services, and supported the advancement of technologies related to each field. It has also contributed to the formation of multidisciplinary teams and cooperation among different specialists in the treatment of complex diseases. However, in many countries, primary care is still provided by general practitioners, and patients are referred to specialized levels when necessary.

### Standardization

Biomedicine, as the dominant branch of modern medicine, defines diagnostic and treatment methods in a standardized manner and implements them in education and healthcare systems. Standardization in medicine and healthcare systems refers to the development and implementation of a set of guidelines, protocols, and defined criteria that describe how healthcare services should be provided to ensure their quality, safety, and effectiveness. These standards help physicians, nurses, and other healthcare workers deliver consistent and predictable care based on the best scientific evidence and reliable experience.

### Importance of Standardization in Healthcare Systems:

- **Ensuring quality of services:** Standards set clear expectations for how healthcare activities should be performed to achieve optimal outcomes for patients.
- **Reducing medical errors:** With clear guidelines, potential errors in diagnosis and treatment are reduced, and legal accountability in case of errors becomes more transparent.



- **Coordination and integration:** Standardization reduces variability in service delivery and increases coordination among healthcare providers.
- **Continuous monitoring and improvement:** Standards must be continuously reviewed and updated to keep pace with scientific and technological developments.

### Types and Applications of Standards

- **Explicit (written) standards:** These include procedures, protocols, clinical practice guidelines, and therapeutic algorithms, developed by governmental bodies, professional associations, or international organizations.
- **Implicit standards:** These are based on the expertise and experience of professionals in specific contexts, where variations in care delivery may exist.
- **ISO standards:** International standards that ensure healthcare services are delivered with quality, transparency, and safety, contributing to improved quality management and risk control.

### Standardization of Medical Equipment and Laboratories

- Development of clear protocols for assessing needs, selecting types, determining quantities, and ensuring the quality of medical equipment in various hospital departments and healthcare centers.
- Standardization of medical diagnostic laboratories according to the international **ISO 15189** standard, which guarantees reliable and accurate test results by adhering to proper management processes and quality control procedures.

Overall, standardization in medicine plays a key role in improving the quality, safety, and effectiveness of healthcare services. By creating well-defined frameworks, it facilitates the delivery of more coherent and reliable healthcare.

### Prevention and Health Promotion

Modern medicine, beyond treating illness, places emphasis on prevention and the preservation and enhancement of individual and community health. With advances in genetics, the approach has shifted from treatment-centered to health-centered.

**Prevention and health promotion** are two complementary strategies in health systems aimed at reducing disease incidence, improving quality of life, and increasing healthy life expectancy.

### Prevention

Prevention refers to avoiding the onset of diseases or slowing their progression. It is implemented at five levels:

1. **Primordial prevention:** Promoting health literacy and empowering individuals through health education to reduce the likelihood of disease occurrence.
2. **Primary prevention:** Measures such as vaccination and minimizing exposure to risk factors to prevent illness in healthy individuals.
3. **Secondary prevention:** Screening and early diagnosis in asymptomatic individuals to allow timely intervention and prevent disease progression.
4. **Tertiary prevention:** Rehabilitation and care to minimize complications of chronic diseases and assist in patient recovery.
5. **Quaternary prevention:** Reducing unnecessary diagnostic and therapeutic interventions to lower costs and avoid harm.

### Health Promotion

Health promotion is the process of enabling people to gain greater control over their health and its determinants. This process includes changes in attitudes, education, organizational support, and the creation of healthy environments. Health promotion emphasizes **prevention, health education, and protection**, and has gained a significant position in public health policy.

### Services and Activities

- **Preventive medicine and health promotion clinics** offer services such as health monitoring, medical education, mental health counseling, screening for common diseases, risk factor control (e.g., hypertension, obesity, diabetes), and addiction cessation counseling.
- **Health education** focuses on enhancing individuals' knowledge, attitudes, and healthy behaviors, contributing to disease prevention.
- **Workplace health promotion programs** are implemented to improve the physical, psychological, and social well-being of employees and include activities such as exercise, healthy eating, smoking cessation, and stress management.
- **The use of technology and continuous health monitoring** in clinics and medical centers is a modern approach aimed at early detection of diseases and risk factor control.

### Conclusion

The history of modern medicine reflects a continuous journey of scientific, cultural, and social efforts that began with ancient medical knowledge and evolved through scientific and technological advances into its current form. This transformation has not only improved methods for diagnosing and treating diseases but also highlighted the role of medicine in promoting public health and increasing human life expectancy. Understanding this historical trajectory underscores the importance of preserving and advancing medical knowledge and fostering scientific innovation for the future of human health. Modern medicine is the result of gradual transformations in perspective, knowledge, and technology. It has transitioned from tradition to science over the centuries. A defining characteristic of modern medicine is its reliance on evidence, experimentation, technology, and a multidisciplinary approach to health and disease.

The roots of modern medicine lie in the gradual evolution of medical knowledge from antiquity to the present. Initially grounded in magical and religious beliefs, illnesses were once attributed to supernatural forces. Advances in ancient Greece and the work of physicians such as Hippocrates and Galen moved medicine toward a more scientific foundation. During the Islamic era, scholars like Rhazes and Avicenna played key roles in preserving and expanding medical knowledge through translation and original contributions. Modern medicine in Europe began with the scientific revolution of the Renaissance and key developments such as Vesalius's anatomical studies, the invention of the microscope, and William Harvey's discovery of blood circulation. The 19th century marked a turning point, with the discovery of microbes, the development of anesthesia, antiseptic surgery, and pharmaceutical innovations transforming medicine into a structured and empirical science. In the 20th century, the discovery of insulin, advances in genetics, imaging technologies, and surgical techniques took modern medicine to new heights. In Iran, modern medicine began during the Qajar era with the establishment of *Dar al-Fonun* by Mirza Taghi Khan Amir Kabir. European physicians such as Jakob Eduard Polak played a crucial role in the teaching and development of modern medical practices. With the later establishment of the Tehran University Faculty of Medicine and the expansion of specialized schools, modern medicine became institutionalized in Iran and grew significantly after the Islamic Revolution.

Modern medicine is built upon principles such as specialization, reliance on science and technology, evidence-based practice, standardization of methods, and a focus on prevention and health promotion. This transformative process has shifted medicine from traditional belief systems to an advanced, technology-driven science that has significantly improved quality of life and health outcomes. In the 19th century, scientific advancements and the introduction of techniques such as anesthesia and antiseptic surgery ushered medicine into a new era. Key milestones of this period include the discovery of microbes, development of vaccines, invention of X-rays, and classification of blood types. In the 20th and 21st centuries, new technologies such as advanced imaging, medical genetics, innovative pharmaceuticals, and complex surgeries revolutionized medicine. Improvements in medical equipment, particularly in imaging and surgery, led to more accurate diagnoses, reduced errors, improved treatment outcomes, and greater patient satisfaction. Overall, modern medicine is a scientific, evidence-based, and technology-driven system that plays a central role in global health by aiming to enhance both health and quality of life.

**In Summary, the Key Features of Modern Medicine Are:**

- **Evidence-Based Medicine:** Clinical decisions are grounded in data and results from scientific research and clinical trials, rather than solely on experience or tradition.
- **Specialization and Subspecialization:** Medicine is divided into various disciplines, each addressing specific parts of the body or particular types of illnesses.
- **Extensive Use of Technology and Basic Sciences:** Modern medicine relies on biology, chemistry, physics, genetics, and technologies such as medical imaging (MRI, CT), molecular diagnostics, and advanced surgeries.
- **Reductionist and Systematic Approach:** Diseases are studied at microscopic and molecular levels, and treatments are designed based on precise understanding of these components.
- **Precision Diagnosis and Targeted Therapy:** With advances in genetics and precision medicine, treatments are personalized to the individual characteristics of each patient.
- **Standardization of Methods and Care:** Diagnostic, therapeutic, and care protocols are standardized and implemented across health systems to ensure service quality.
- **Evolving Concepts of Health and Illness:** In modern medicine, illness is defined as a distinct and positive state, and health is understood as the body's alignment with scientific norms—not merely the absence of pain or discomfort.
- **Emphasis on Education and Research:** Hospitals serve not only as treatment centers but also as institutions for medical education and research, contributing to scientific advancement through patient observation and study.
- **Focus on Prevention and Health Promotion:** Modern medicine emphasizes not only treatment but also the preservation of health, with a shift toward value-based and patient-centered care.
- **Challenges of Access and Equity:** Inequalities in access to advanced medical care and biological or cultural differences across societies remain significant challenges in modern healthcare.

These features distinguish modern medicine from traditional practices and have transformed it into one of the most advanced and complex fields of human knowledge.

**References**

1. A'thar Moin, & Akmal, K. A. (2009). Doctor–patient communication. *Daneshvar Medical Journal*, 85.
2. Asemani, O. (2013). A review of doctor–patient communication models and related challenges. *Ethics and History of Iranian Medicine*, 5(4), 36–50.
3. Barkan, S. (2025). *Health, Illness and Society: An Introduction to Medical Sociology* (S. Fathi & A. Shahriar Manteghi Fasaee, Trans.). Tehran: Arghavan Mehr Press.
4. Carel, H. (2023). *Illness* (E. Kiani Khah, Trans.). Tehran: Goman Press.
5. Ebrahimi, M., Sharafat, S., Vedadheer, A., & Eini Zeinab, H. (2021). Dehumanization in doctor–patient relations: An empirical and theoretical approach. *Iranian Journal of Sociology*, 22(4), 33–53.
6. Encyclopedia Britannica. (2009). *Medicine, history of*. In *Encyclopedia Britannica: Ultimate Reference Suite*. Chicago: Encyclopedia Britannica.
7. Foucault, M. (2011). *The Birth of the Clinic* (Y. Emami, Trans.). Tehran: Nashr-e Naghshe-o-Negar.
8. Foucault, M. (2023). *The Birth of Clinical Medicine: An Archaeology of the Medical Gaze* (F. Valiani, Trans.). Tehran: Nashr-e Mahi.
9. Jafari, F., Alizadeh, F., Zafarghandi, N., & Abyar, Z. (2011). Financial relationships in traditional medicine of Iran. *Daneshvar Medical Journal*, 96.
10. Khodabakhsh, M. R., & Mansouri, P. (2011). Empathy and its role in doctor–patient relations. *Ethics and History of Iranian Medicine*, 3.

11. Masoudnia, E. (2016). *Medical Sociology*. Tehran: University of Tehran Press.
12. Matin, P. (2013). *Foundations of Medical Anthropology*. Tehran: Farhameh Press.
13. Mohseni, M. (2022). *Medical Sociology*. Tehran: Tahouri Press.
14. Scambler, G., & Higgs, P. (2019). *Modernity, Medicine and Health* (M. Ala, Trans.). Tehran: Farhameh Press.
15. Shaf'ati, M., & Zahedi, M. J. (2012). A sociological explanation of doctor–patient relations: A qualitative study in Ahvaz. *Iranian Journal of Social Studies*, 8(1), 105–137.
16. Shaf'ati, M., & Zahedi, M. J. (2012). Biopsychosocial patterns of doctor–patient relationships: Beyond the biomedical model. *Journal of Bioethics*, 5(5), 151.
17. Sharafat, S., Vedadheer, A., Eini Zeinab, H., & Ebrahimi, M. (2023). A sociological study of doctor–patient relations in Iran. *Journal of Social Research in Iran*, 12(3), 429–446.
18. Smart, B. (2010). *Michel Foucault* (H. Chavoshian & L. Jowafshani, Trans.). Akhtaran Press.
19. Svenaeus, F. (2021). *Medical Hermeneutics and the Phenomenology of Health* (M. Akhlaghi Manesh, Trans.). Tehran: Farhameh Press.
20. Vedadheer, A., Alaei, M. H., & Alaei Kharaem, R. (2012). The role of lifeworld in rural–urban patient consultation: A qualitative study in Ardabil. *Journal of Rural Development*, 4(1), 71–84.
21. Zahedi, M., Mohammad Esmail, S., Bani Hashemi, S. M., & Sharifi, M. (2020). A cultural reflection on doctor–patient relations with emphasis on electronic health records. *Ethics and History of Iranian Medicine*, 13, 526–540.
22. Zarrdar Z., & Palizdar, S. (2021). Doctor–patient interaction in multicultural public hospitals in Tehran. *Journal of Cultural Relations*, 22(53), 71–94.