

SPECIAL FEATURE

Historical evidence for the origin of teaching hospital, medical school and the rise of academic medicine

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Historical progression and the development of current teaching hospitals, medical schools and biomedical research originated from the people of many civilizations and cultures. Greeks, Indians, Syriacs, Persians and Jews, assembled first in Gondi-Shapur during the Sasanian empire in Persia, and later in Baghdad during the Golden Age of Islam, ushering the birth of current academic medicine.

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Introduction

As Andrew C Miller¹ states, the academic medical center has a critical role in modern society. The accumulation of medical knowledge, its organization and its teaching are essential to ensure that the ever expanding base of scientific knowledge is passed on to future practitioners of medicine. Due to cultural bias and current regional political interests, even well intentioned historians, texts and teachers distort the true historical course of medical knowledge, its progression and practice.^{2–4} The origins of the academic medical center have been inaccurately described by many western medical history texts as occurring in Europe during the middle ages or early renaissance period. Even recently, Cruse⁵ referring briefly to ancient medicine in Greece and Alexandria, Egypt wrote, ‘After the Dark Ages (500 to 1050 AD), academic medicine was reestablished in Europe, especially at Salerno, Bologna, Padua, Paris, Montpellier, and Oxford’ however, Canon of Medicine by Ibn-Sina or Avicenna was also mentioned. Although 500 to 1050 AD may have been dark ages in Western Europe, it was a period of renaissance for the progress of science and medicine during Sasanian empire in Persia and subsequently during the

centuries of Islamic dominance. However, Miller¹ writes, ‘As a profession that seeks truth and knowledge in the world, we must acknowledge the influence of non-Westerners in the development of modern academic medicine’.

The following text will explore the contributions of Greeks, Persians, Indians, Syriacs and Jews assembled first in the city of Gondi-Shapur in the Persian empire (third to eighth century AD), then later in Baghdad and Spain (ninth to thirteen century AD). The innovative medical practice and teaching hospitals and writings of medical texts during these periods ushered in the birth of current teaching hospitals, medical schools and the rise of academic medicine.

Medical learning and practice in antiquity

Civilizations and cultures known to have provided the cornerstone for the development of medical knowledge are early Egyptians, Mesopotamians, Indians, Chinese, Greeks, Romans and Persians before the third century AD. However, there is little evidence in western teaching that their efforts were associated with the development of medical schools, teaching hospitals and the systematic medical training and verification of competence of trained physicians.

Hospital, medical school and academic medicine

The city of Gondi-Shapur and its academy in Persia during the Sasanian dynasty (226 to 652 AD) were the most important and pivotal city and era for the rise of academic medicine.^{6,7} The hospital or *bimarestan*, a Persian Pahlavi word for ‘a place for the sick,’ served as a stepping-stone for future advancements in medical care; hospital organization and structure; medical record keeping; physician and pharmacist licensure; and medical education. According to C Elgood,⁸ ‘to a very large extent the credit for whole hospital system must be given to Persia’. Thereafter, the hospitals in the Islamic world were established based on the Gondi-Shapur hospital model.⁹ Miller¹ states ‘The *bimarestans* of yore were similar in philosophy, structure and function to contemporary academic medical center, and served as a model for those to follow in Europe.’

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The Persian king, Shapur I (242 to 272 AD) founded the city of Gondi-Shapur or Jundishapur (the Citadel of Shapur).⁷ During the reign of Shapur II (309 to 379 AD) the academy of Gondi-Shapur was established comprising a university, a library and a teaching hospital. Gondi-Shapur became known as the 'city of Hippocrates' and the intellectual center of the Sasanian empire. Its library contained 400 000 books¹⁰ and on its portal was engraved, 'Knowledge and virtue are superior to sword and power'.⁹ The academy of Gondi-Shapur offered training in medicine, philosophy, theology and science. Scholars from other countries, one of whom was Diogenes, studied different fields including medicine at the university.¹⁰ Gondi-Shapur became a breeding ground for the union among great scientists from different civilizations. Indian, Syriac and Hellenistic medical texts, including those of Hippocratic and Galenic medicine, were translated into Pahlavi and practiced.

The next major progress forward in the development of academic medicine and medical centers occurred in Gondi-Shapur during the reign of the Persian king, Khosrow Anoushirvan (531 to 579 AD). He gathered the best minds and sources of knowledge of the day in Gondi-Shapur. The closure of Athenian schools by the Emperor Justinian and religious persecution resulted in a group of Nestorian Christians relocating from Edessa and Nisibis in Mesopotamia to Gondi-Shapur.¹¹ They translated Greek and Syriac texts to Pahlavi. The famous physician, Borzouyeh, was sent to India to recruit physicians and bring Indian texts to be translated from Sanskrit to Pahlavi.^{7,9} Thus, physician-philosophers and other academicians of Persian Zoroastrian and Jew, Greek, Indian and Nestorian Christian backgrounds resided and worked in Gondi-Shapur.

A Nestorian Christian, Bakhtiushu, became the dean of the medical school and the director of the hospital.^{7,12} Because of medical-philosophical dispute among physician-philosophers, in 610 AD, Khosrow II (590 to 628 AD) convened a medical symposium.¹³

In his book, *Ancient Persia*, Josef Wiesehofer¹³ writes 'In the twentieth year of the reign of Khosrow II the physicians of Jundishapur assembled for scientific symposium by order of the king. Their debates were recorded. This memorable session took place under the presidency of Jibril Durustabad, the physician-ordinary to Khosrow, in the presence of Sufista'i and his colleagues, together with Yuhanna and a large number of other medical men'. The great Persian poet Ferdowsi (940 to 1020 AD) in his book of *Shahnameh* or *The Epic of the Kings* verifies this historical event.^{10,13}

In Gondi-Shapur medical education was transformed from the traditional model of master and apprentice to a new model comprising medical students working in the hospital under direct supervision of medical faculty. There is evidence that the graduates had to pass an examination in order to practice as accredited Gondi-Shapur physicians.^{14,15} After the Arab conquest of Persia in

638 AD, Gondi-Shapur became the cradle of the Arabian School of Medicine.² For generations Bakhtiushu were the head of the hospital and medical school until the year 765 AD when Jirjis ibn Bakhtiushu, dean of the medical school in Gondi-Shapur, was summoned to Baghdad by the Abbasid Caliph al-Mansur to heal his disease.^{2,14-17} The academic tradition developed in Gondi-Shapur was gradually then transferred to Baghdad, the capital of Abbasid Caliphate, and later to Spain ushering in the birth of the 'Golden Age of Islamic Medicine'. The 'House of Wisdom' or 'Bayt ul-Hikma' was established in 832 AD by Abbasid Caliph al-Ma'mun to translate all medical and other texts from Greek, Persian, Syriac and others to Arabic.^{2,3} There the methods of Gondi-Shapur were emulated. Indeed, the House of Wisdom was staffed with graduates of the Academy of Gondi-Shapur. The death of the last known Gondi-Shapur hospital director, Sabur b. Sahl in 869 AD started the decline of Gondi-Shapur as the center of medical learning and practice.⁹

During the reign of Caliph Harun Al-Rashid (786 to 809 AD), Jibrail ibn Bakhtiushu, the son of Jirjis ibn Bakhtiushu, was commissioned to build the first *Bimarestan* in Baghdad.² A Persian alchemist-physician Zakariya Razi or Rhazes (865 to 925 AD) was trusted to build another hospital in the same city.¹⁷ Razi placed meat in several locations in the city and selected a site where there was less putrefaction of meat.^{18,19} Razi initiated the first residency system of teaching medical students such that he conducted clinical rounds in the hospital as well as outpatient clinics with his students.¹⁷ The medical students were responsible for writing daily progress notes in patients' medical records. Razi is best known for three major and influential medical texts: (1) *Kitab al-Hawi fi al-tibb* (*The Comprehensive Book on Medicine*); (2) *Liber ad Almansoris*; (3) *Kitab fi al-jadari wa-al-hasbab - De variolis et morbilis* (a scientific treatise on smallpox and measles). Razi also wrote the first treatise on pediatrics.²⁰ During the renaissance many editions of these texts were printed with commentaries by the prominent physicians of the day, such as Andreas Vesalius.¹⁹ Razi also carried out systematic animal experimentations with drugs before their administration to his patients, thus initiating basic medical experimentation and research. Although disputed by some, Razi's teacher for medicine was Ali Ibn Rabban al-Tabari (838 to 870 AD),¹⁷ a physician philosopher from the city of Merv in Persia whose father was a scholar Rabbi. He was the author of *Ferdows al-Hakameh or Paradise of Wisdom*.^{17,21} Other advances of the Gondi-Shapur School include anatomic dissection of primates by Yuhanna ibn Masawaih or Misue and encyclopedic texts in surgery (*Kitab al-Maliki*) and medicine (*Kamil al-Sana al-Tibbiya*) by Abbas al-Majusi or Haly Abbas.^{22,23} Haly Abbas expanded on Galen's description of human circulation and wrote an important chapter regarding the management of the body of the newborn baby.

Avicenna or Ibn-Sina (980 to 1037 AD), a prodigious child versed in Arabic, Latin and Greek, authored a massive text in

medicine: *Al-Qanun fi al-Tibb* or *Cannon of Medicine*.^{24–29} The first volume of this book contains four chapters on newborn infants including infant hygiene, the care of the newborn infant, breastfeeding, and the commencement of weaning and the diseases of infancy.^{30,31} Avicenna was one of most brilliant figures in the history of medicine. He has been called ‘the second teacher after Aristotle’.^{32,33} Avicenna was described as having the mind of Goethe and the genius of Leonardo da Vinci.³³ Dante acknowledged him in *La Divina Comedia* and Chaucer in *Canterbury Tales*. William Osler (1849–1919)²⁸ has described Avicenna as the ‘author of the most famous medical textbook ever written’. Manfred Ullmann³⁴ in his book of Islamic Medicine states, ‘For long the rule held that he who would be a good doctor must be a good Avicennist’. As Russell³⁵ stated, ‘the formative period of western intellectual tradition would be difficult to imagine without Avicenna’s influence on specific individuals in addition to his many-layered complex legacy in diverse areas’.

Nayernouri¹⁷ and Shoja²³ characterize a few physician-philosophers as the pillars of what became to be known as the ‘Golden Age of Islamic Medicine’. They are Misue, Al-Tabari, Razi, Ahmad Joveini Bukhari, Haly Abbas, al-Majusi, Avicenna and Esmā’il al-Jorjani. The ‘Golden Age of Islamic Medicine’ also included medical progress and writings in the western Islamic caliphate of Cordova, Spain. Physician-philosophers who made significant contributions to medicine were Abul-Qasim al-Zahrawi (Abulcasis) ibn abu’-Ala Zuhr (Avenzoar), Muhammad ibn Rushd (Averros) and Musa ibn Maimun (Maimonides). They also built the foundations of their medical knowledge from the Greeks, Persians, Syrians, Indians, Hebrew and Nestorian Christians. They transferred their knowledge to the western world initiating the birth of teaching hospitals, medical schools and medical research during pre- and renaissance period in Europe.

The role of translators

As it is noted above, Nestorian Christians started the translation of all texts from Greek to Syriac. Subsequently, due to active support by the Persian kings, many Greek, Syriac and Sanskrit texts were translated to Pahlavi. The best known translator of the early period of the sixth century AD was Sergius of Resh-Ayna, a physician of Gondi-Shapur, who translated the works of Galen.² This tradition of translating Greek and Syriac texts to Arabic was expanded further with the establishment of House of Wisdom in Baghdad. The head of the House of Wisdom was Hunayn Ibn Ishaq (Johannitius, 809 to 873 AD).^{2,18} Under his tenure, the collecting and purchasing of Greek texts from Byzantine and their translation to Arabic became the norm.² Arabic became the *lingua franca* of scientific writings by all physicians of different ethnicity living and working in the Islamic Empire. Contantinus Africanus of Monte Cassino, a Benedictine monastery in Italy, translated Arabic books including *Kitab al-Maliki* by al-Majusi into Latin. Razi’s

Comprehensive Book on Medicine (Al-Hawi) was translated into Latin in 1279 under the title *Liber Continens* by Faraj ben Salim, a physician of Sicilian-Jewish origin employed by Charles of Anjou. Gerard of Cremona translated Razi’s other textbook *Liber ad-Almansoris* into Latin in 1187 AD in Toledo, Spain.¹⁸ He also translated Avicenna’s *Canon of Medicine* into Latin. A Hebrew translation of *Canon of Medicine*, with illustrative pages, now preserved at the University of Bologna, was completed in 1279.³² This beautiful illustrative translation of *Canon of Medicine* is indicative of the role Jews played as translators in preservation and spread of medical knowledge to the West. The familiarity of the Jews with Syriac, Hebrew and Arabic gave them the opportunity and became instrumental in returning Greek, Persian, Syriac and Arabic works to the Christian Europe. The Jews were to be the repository of Greek, Roman, Persian, Syriac and Arabic learning. In the period of Islamic supremacy they acted as a bridge between the Muslim East and Christian West.³⁶

Conclusion

The origin of the teaching hospitals, medical schools and the rise of academic medicine are the cumulative contributions by the physician-philosophers of different epochs, religions and civilizations. During a pivotal epoch of human history they assembled in Gondi-Shapur in Persia, transforming medicine from magic and myth to scientific thoughts, thus ushering in the birth of teaching hospitals, medical schools and the rise of current academic medicine.

Conflict of interest

The author declares no conflict of interest.

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