16. History of Women in Medicine and Healthcare

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Abstract: In a global context, documentary sources confirm the most ancient references to women's intellectual qualities and, in particular, to their performance in the field of health. Even in times when their education was proscribed and they were considered "animals of another species", devoid of soul, records of everyday life showed their natural aptitude for issues related to health, sometimes being selected for the treatment of the wounded and the indigent. At all times, there have been worthy representatives of female intellectuality who have known how to impose themselves on the culture of different periods of history. Some were a direct natural product of the environment in which they lived. Others, cohabiting in a stagnant space and time, were able to gather qualities and skills and assert themselves in an unusual but recognized way among their peers. Freedom of thought combined with freedom of action were indispensable achievements for their training and consequent professional and social affirmation. Opposed to specific examples from the past is the exponential number of women that have huge success today in the fields of science and health. Chronologically, and representative of each period of universal history, different personalities are remembered in this chapter, and their existence is contextualized in an effort to perpetuate their names and their testimonies in the present and in future societies.

1. Introduction

Over the centuries and in different cultures, different responsibilities have been attributed to gender. Men have been considered unquestionably superior in the intellectual field, as a natural right. Women have been universally denied education and culture. In 1746, in the "True Method of Studying," the prestigious Portuguese theologian, professor, and writer, Luís António Verney (1713–1792), warned of the need for instruction and development of one's intellectual abilities (Rúber 1956a). He contests the views of many by stating that "They are not of any other species when it comes to the soul; and the difference in sex is not related to the difference in understanding" (Rúber 1956b). For many, women were considered to be different species and harmful to the nation. He was convinced of the advantages of educated women in government and home happiness. In 1879, José Joaquim Barbosa de Araújo Júnior, the finalist of the Medicine and Surgery course at the Porto Medical–Surgical School, praised women's education, intellectual capacity, and access to higher education courses, especially medicine (Júnior 1879).

2. Antiquity

Let us focus on Egyptian and Greek civilizations, which are rich in information in this field. In Ancient Egypt, medicine was the responsibility of the priest caste. As women enjoyed equal rights, the priestesses were part of the divine service and assisted the sick (Lipinska 1900a). Their testimony was more limited than in Greece, as we will now explain. In Homer's works, there is no reference to the treatment of the sick by medical priests but by laic doctors, which does not mean that they did not exist (Castiglioni 1941).

Medical priests who evoked their gods practiced medicine in Asclepius' temples for centuries. They had unusual knowledge, based on a centuries-old oral and written tradition and the experience acquired through the observation and guidance of many patients. Women were part of the divine service, and medical care was the responsibility of both sexes. These priestesses were numerous and highly respected (Diepgen 1932). The records indicate that those most consulted in situations of illness were Juno of Argus, Poliade, the priestess of Minerva, priestesses of the temple of Apollo at Amyclae, and Pythia of the temple of Apollo at Delphi. Anyté (3rd century BC), the priestess of the temple of Aesculapius in Epidaurus, verified the oracles of the god of medicine (Lipinska 1900a). Before entering the temple of Aesculapius, the patient underwent bodily purification and sacrifices and subsequently spent the night at the temple for incubation. The Asclepiades were responsible for interpreting patients' dreams and providing subsequent treatment (Diepgen 1932).

In Greek mythology, goddesses such as Médée, Angitia, and Oenone dedicated themselves to medicine (Lipinska 1900a). Progressively, the development of Greek Philosophical Schools deprived priests of their supremacy in medicine. Among them, women were the most capable in this field. Aristotle (384-322 BC) and Plato (428/427–348/347 BC) recognized women's natural appetites for medicine and philosophy. In the *Corpus Hipocraticum*, there is a clear separation of names and responsibilities between midwives and female doctors. For the Greek physician, Sorano of Ephesus (1st/2nd century), representative of the Methodical School of Medicine, the female doctor should be "versée dans toutes les parties de la médecine, pour donner des prescriptions médicales, chirurgicales et pharmaceutiques, pour juger bien les choses observées et savoir apprécier les rapports de tous les phénomènes relatifs" (Lipinska 1900b). In Gineceos, places for the exclusive use of women, no doctors were admitted, and care was left to female doctors.

Regardless of their place of birth, Greek women were intellectually proficient and knowledgeable in the arts, letters, and science. During the Roman rule, there were numerous female doctors. It is possible that Greater Greece (Southern Italy), occupied by Doriens, played a dominant role. Later, the School of Salerno emerged, and Greek and female doctors who settled in Rome prepared themselves there. The writings of Pliny (23-79 AD) contained the first information about female doctors: Olympias, Salpé, Sotira, and Lais (Lipinska 1900a).

Galen of Pergamum (129–216) talks about several female doctors and presents fragments of their writings: Eléphantis, Engérasie, Antiochis, Samithra, Xanita, and Maia. Several female medical writers distinguished themselves over time, including Origénie, Métrodora, and Aspasie. The first reference to the rules for using the Podalic version is attributed to the latter (Lipinska 1900a).

The granting of Roman citizenship by Gaius Julius Caesar (100-44 BC), the Emperor of Rome, to educated foreigners encouraged their arrival and settlement, as happened with Greek and female doctors. The liberal spirit of Greek law penetrated Roman law. The rigor of the traditional Roman family that conditioned women's freedom was definitively broken. Several authors discussed female doctors in Rome. The earliest writer was Scribonius Largus (c.1-c.50). Doctor Octavius Horatianus (4th century) dedicated the third book of his body of works to the female doctor Victoria (Salvina), demonstrating equal treatment between peers, synonymous with the recognition of her value. In Chapter V, *De Conceptione* states: "You sais tres bien, you le sais même mieux que moi, vu ta clientèle spéciale, combien il est important, dans notre profession, de posséder des connaissances sur ce point-là;et, combien de

gratitude et de renommée acquiert um médecin, si, en suivant ses conseils, une femme sterile conçoit" (Lipinska 1900a). In his fourth book, he mentions another female doctor, Léoparda, regarding the treatment she recommends for dropsy patients. They have been immortalized by poets. Particularly abundant are the references to female doctors in funerary epigraphy observed in Italy, France, and the Iberian Peninsula, where the precision of the document attests to their existence (*iatromaiai*, *medicae*) and the presence of midwives (obstetrics). Among the women who embraced Christianity, some dedicated themselves to medicine: Theodosia, the mother of Saint Procopius; Saint Nikerates of Constantinople; and Saint Fabíola, the founder of the first hospital in Italy (Ossie, 380) (Lipinska 1900a).

3. Middle Ages

In Christianity, God was credited with the appearance of illness and its cure. Health professionals are agents of God who register medical practice as an exercise in Christian charitable activities. The Low Middle Ages saw the fusion of classical, Christian, and Germanic traditions, synonymous with the existence of medicine oriented toward empirical practice. There was no organized professional body or systematic medical education, nor was there a clear distinction between learned and popular practice in diagnosis, prognosis, and therapy. A written medical tradition persisted within monastic and cathedral libraries, cultivated by the clergy outside and within the Church in institutions providing care for the sick and indigent under the direction of religious or laic people (Loudon 1997). One of the most notable medieval female personalities, Saint Ildegard of Bingen (1098–1179), lived within one of these institutions. Although she was not canonized, she was the founder of the Benedictine convent of Rupertsberg, a supporter of scholasticism, associated with a greater general culture but possessing an independent spirit and superior intelligence, and stimulated by coexistence and correspondence with the great thinkers of the time and by a refined sense of observation. She is knowledgeable about medicinal plants and their therapeutic properties. She was a notable encyclopedist with an unusual culture and was endowed with a visionary and prophetic spirit. The historians, Godofredo and Teodorico, confirmed that the sick were cured when they approached her. Science was a divine revelation for her, as was the cure for various diseases. Among her works are "*Causae et Curae*," which includes books on cosmology, theology, physics, botany, and medicine; "*Physica*," which includes several books on the healing powers of plants, the properties of animals, stones, metals, and poisons; and "*Scivias*," which includes the testimony of her visionary character and conceptions about the soul. In her writings, she highlights exact ideas about knowledge that was still poorly understood at the time, such as information on blood circulation, universal gravitation, the brain as the regulatory center of life, and the interference of nerves and the spinal cord in vital phenomena (Rúber 1956a; Lipinska 1900a; Costa and Costa 2019).

At the end of the 11th century, the predominance of classical and intellectual traditions resulted from a confluence of multiple factors. Constantine, the African, converted to Christianity and became a monk at the Monastery of Monte Cassino, where for three decades, he translated countless Latin medical works into Arabic and originally Greek, prompting the development of many translators of the theoretical medical system in Antiquity. The relevance of these works came from their dissemination and application in the School of Salerno, south of Cassino, with strong

relations with the Monastery, whose origins date back to medieval times but whose secular nature and respect for different creeds and knowledge favored and granted privileges to women in the study and practice of medicine. Throughout history, it has been recorded as one of the most notable medieval scientific institutions (Castiglioni 1941; Diepgen 1932; Loudon 1997). It was up to the Salernitan masters to subject Constantine's translations to intense study and select a set of fundamental texts—the "*Articella*" or "*Ars Medica*"—for teaching medical students at this prestigious school. Doctors' names did not stand out, as there was scientific cooperation. There were several female students in Salerno and many female doctors whose knowledge of and dedication to medicine were also recorded. The historians Mazza, Castelamala, and Toppi talk about some of these female doctor writers: Abella, author of the writings *De Atrabile* and *De Natura Seminis Humani*; Mercuriade, *De Crisibus, De Febri Pestilenti, De Curatione Vulnerum*, and *De Unguentis*; and Rebecca Guarna, *De Febribus, De Urinis* and *De Embryone* (Lipinska 1900a). In the Royal Neapolitan Archives, there is a document dated September 10, 1321, passed on by Charles, Duke of Calabria, which granted Françoise permission to practice surgery after receiving a public certificate from the School of Salerno: It stated that she had undergone solid training in surgery and examination before a committee of doctors and surgeons.

It is also said that in the 15th century, Constance Calenda, daughter of the Dean of the Faculty of Medicine at the University of Salerno and later of Naples, received the insignia of graduation in medicine (Lipinska 1900a). However, the most striking female figure in medieval medicine was Trotula. Historians of medicine are divided as to the real existence of Trotula, the "*matron sapiens*" and "*mulier sapientíssima*," who, according to some, lived in Salerno in the 11th century before Constantine arrived at Monte Cassino and belonged to a noble family and the medical college of Salerno. Trotula was a product of an environment that cultivates freedom of thought and action and is a feminine medical symbol of Salerno. Several manuscripts are attributed to her, such as "*De Passionibus Mulierum*," which was dedicated to women before, during, and after childbirth, and the first description of an episiorrhaphy, secondary to a perineal laceration. Cited by several writers and poets of her time, it appears in the "*Thesaurus Pauperum*" written by Pedro Hispano (1215–1277), Pope John XXI of Portugal (Hispano 2008). In fact, the Salerno School knew how to privilege the role of women in medicine, irrespective of whether Trotula was real or a symbol of medicine and female intellectuality in Salerno (Rúber 1956a; Lipinska 1900a; Costa and Costa 2019).

Universities or general studies emerged in the 12th century when groups of cathedral masters gained legal recognition for their corporate status. Within medical schools, there is a concern about defining their intellectual world and differentiating it from natural philosophy. The basis of the study was the written word according to Hippocrates, Aristotle, Galen, and Arabic-speaking authors. The dissection of the human cadaver began to gain value, and traditional manual surgery struggled to gain scientific status. The support of a secular society, which recognized the importance of scholasticism on the path to truth, favored the spread of academic medicine during the High Middle Ages. Meanwhile, in Western cities, concerns about public health issues grew, municipal governments hired professionals with academic training, and hospitals had salaried doctors and surgeons, asserting the secularization and weakening of the clergy in university teaching and healthcare practice and the exclusion of women (Castiglioni 1941; Loudon 1997). In the 14th century, the Church

excommunicated several female doctors from practicing medicine. It should be remembered that Jacobe Félice, a noble doctor, was condemned by the Paris Faculty of Medicine despite the laudatory testimonies of all her patients, who even attested to the abandonment to which they were subjected by the certified doctors who followed them (Lipinska 1900a). However, there was a tolerance for empirical practitioners out of civic interest, which included women who mostly had less medical knowledge, although some had clear familiarity with this field. Female doctors acquire medical science knowledge through practice. They learned alongside a doctor, studied books, and exercised as much as possible. After a few years, their knowledge and experience were attested, and they were considered master doctors or surgeons.

In the 13th and 14th centuries, Plague and Syphilis drastically affected the health of the population and the medieval medical care system. The establishment of hospitals, regulation of public health, and creation of new institutions to protect professional practices were encouraged. With the support of the nobility, universities, and municipalities, it was possible to develop a legal structure that promoted teaching and clinical practice until the 18th century. First, in Italy and then in England, the institutionalization of a certified professional elite that aspired to control the practices of different healthcare providers emerged (Castiglioni 1941; Loudon 1997; Poulet et al. 1977).

4. 16th Century

The 16th century saw a return to the study of original classical texts: the taste for direct observation of phenomena stimulated by the discovery of the new world and the rapid spread of knowledge with the introduction of the art of printing; the interest in the systematic study of cadavers, with consequent advances in surgery, and in *Materia Medica*; and the emergence of new medical systems in opposition to humoral theory, as advocated by Paracelsus (1493–1541).

In 16th-century Europe, the first healthcare was provided at home by the women of the house, who followed many of the doctors' prescriptions at the time in preparing food, drinks, and medicinal compounds. Documentary records noted prudence, discernment, and dedication as being among the qualities of these women. The most notable examples are noblewomen and companions who treated family and friends out of social group duties, religious duties, or intellectual affirmation. They had specialized experience, mainly in rural areas, particularly after the introduction of printing art and the consequent widespread dissemination of knowledge (Castiglioni 1941; Diepgen 1932; Loudon 1997). Many, given their proximity to practitioners such as surgeons, barbers, and apothecaries, exercised certain rights because they claimed to have this knowledge. Some, such as Lady Grace Mildmay (1552–1620), author of one of the first autobiographies in English, compiler of recipes and medical documents, and a health service practitioner, even organized libraries of medical books and compiled recipes. There seems to have been a matrilineal matrix of female literacy within her family, which included reading the Bible, playing the lute, singing psalms, drawing, embroidering, and studying medical texts and plants. In her medical and surgical practice, there is a reflection of official knowledge, although it is unknown whether this resulted from readings by the most considered authors or from their direct guidance. Her clinical practice provides metaphors for spiritual meditation. They were a natural extension of God's work and the works of charity in the service of healing. God gave her the ability to become a doctor and choose the right treatment. She associated diseases with the original sin. She worked with

humility and deference from the university-trained professionals. She had vast medical knowledge based on galenic medicine, which considered the balance of humor responsible for the state of spiritual, moral, and physical health, and practiced allopathic therapy involving medicinal plants, chemicals, and minerals. Her writings highlighted her clinical experience and brought together several clinical stories with the respective identification of the patient, symptoms, and nosological interpretations (Hellwarth 1999).

In domestic medicine, other professionals have also emerged, including midwives, doctors, and surgeons. In the largest population centers, since the mid-15th century, municipal councils have instituted formal licenses and supervision of midwives' practices, ensuring minimum levels of competence and moral character required to occupy positions created by civil and ecclesiastical authorities. Simultaneously, the number of unlicensed and informally trained midwives has increased.

At the time, another traditional place of clinical activity was the emergence of new headquarters for healthcare, urban hospitals, and charitable institutions that focused more on treating patients than confining them. There are leprosariums and hospitals for patients with this type of illness. Meanwhile, churches and sanctuaries were the centers of healthcare (Castiglioni 1941; Diepgen 1932; Loudon 1997).

In the Renaissance, there was greater complexity and quality in the organization of healthcare, given the established public health measures, the professionalization and specialization of clinical practice, and the organizational preference for certified people.

Among official medicine practitioners, there was a persistent refusal to accept the admission of women to medical schools and clinical practice, with a particular emphasis on older women. Regulations excluding women from assisting patients have also increased. In this century, female doctors practically disappeared from France, but female surgeons belonging to the Corporation of Surgeons persisted, though they were overlooked by their peers, who were also considered inferior to doctors and artisans. Meanwhile, there was centralization of all jobs for men, even those in the Middle Ages belonging to the female sphere. In 1484, Charles VIII (1470–1498) of France prohibited the practice of surgery by women, except for surgeons' widows, a situation definitively prohibited by the parliament in the 18th century.

The fight by German universities against the inclusion of women in higher education was not as intense as that in France, and there was greater tolerance from the authorities for the professional practice of women doctors. During this period, Anne Sophi, the Princess of Denmark, stood out, as she had great knowledge of languages, botany, and medicine. She created several botanical gardens, where she prepared medicines for the poor, and a pharmacy in Dresden. Eléonore, the Princess of Wurtemberg, also dominated therapy at the time and inspired the publication of a manual. Eléonore de Troppau and Jagerndorf (1600) wrote a prescription for all diseases. In 16th-century England, women possessed linguistic and literary knowledge and experienced great erudition. Some even read ancient doctors' works (Lipinska 1900a).

5. 17th Century

From the presentation of blood circulation in 1628 by William Harvey (1578–1657) to the formulation of microbial theory by Louis Pasteur (1822–1895), there have been important developments in medicine, given the increasing number of

certified professionals, the development of medical theory and practice following research conducted in the field of exact sciences and anatomy, and the environmental changes associated with population growth and subsequent urbanization. These were challenging times for women in healthcare and as alternative practitioners (Castiglioni 1941; Diepgen 1932).

In the 17th century, the common domain continued to be the use of more skilled family members, friends, and neighbors. The wives of religious and noble people visited the needy and sick and provided advice, food, and medical treatment. Patients had accepted traditional practices such as bloodletting, purging, uroscopy, or the use of therapies. However, there was a growing interest in new medicines such as chinchona, chocolate, coffee, and tea. The press was the vehicle for information on different medical topics such as new medicines and the skills of different practitioners, and knowledge spread given the use of vernacular. The century was dominated by supporters of Iatrophysics and Iatrochemistry in the interpretation of human physiology and pathology and by the introduction of the inductive method by Bacon of Verulam (1561–1626). Universities that required religious admission tests from students were more traditional than those that did not and proposed more practical teaching based on experience. Women were prohibited from university training; however, in an episodic manner, some were certified in clinical practice (Castiglioni 1941; Diepgen 1932; Loudon 1997).

In many trades, women were involved in their husbands' work, training their apprentices. In the Company of London Barbers, widows were allowed to continue their husbands' trade throughout the century. The same did not occur for surgeons' widows (Young 1890).

In this century, there was a devaluation of female education in France and their interest in science and medicine. German historians and bibliographers cite several women with profound knowledge of medicine: Barbe Weintraubin (manual), Elisabeth Marguerite Keil (obstetrics manual), Margarite Sibylle von Loeser (memorized Sennert's treatise, therapeutic experiences), and Christine Régine Hellwig (poet and pianist with medical experience). In Bern, Switzerland, Marie de Colinet (c.1560-after 1638) learned surgery and the art of childbirth with her husband, the prestigious surgeon Fabricius Hildanus (1560–1634), known as the father of German surgery. In *Opera*, Fabricius (1646) describes many of the successful medical and surgical acts of his wife and apprentice, who would become a distinguished surgeon and midwife. It reports a case of the extraction of a metallic body from the eye using a magnetic stone, the performance of one cesarean section, and the application of heat to stimulate labor. In England, Lady Halkett (1622–1679), the daughter of a Scottish nobleman, began studying medicine and surgery at a young age to help the poor. Patients sought services from all parts of the country and continents. She also stood out in the battle of Dunbar in the accompanying wounded war, receiving the king's thanks for her patriotism and competence. It is worth mentioning "A choice manual or rare secrets in physick and chirurgery" (1670), the work of Elisabeth, Countess of Kent, which had three editions and a translation into German (Lipinska 1900a; Evenden 1998).

6. 18th Century

In the 18th century, reason was valued as an instrument for achieving truth. It was a time when medical systems were in opposition to the materialism of the

previous century. The art of printing is particularly relevant among certified and non-certified professionals, as it constitutes an important vehicle for information about the work carried out and clinical practices. As the number of hospitals increases, patient admission control becomes more dependent on health professionals, who create better learning conditions. Privilege is given to the nosological classification of diseases, their anatomo-clinical study, the control of epidemics, military medicine, and public hygiene as governmental ideas (Castiglioni 1941; Diepgen 1932; Guthrie 1947). Particular attention was paid to minimizing the high neonatal and infant mortality by educating mothers and midwives and building orphanages. Invaluable efforts were made by Angélique du Coudray (1712–1794), a midwife commissioned by Louis XV (1710–1774) of France, to teach the art of childbirth throughout the kingdom. She came from a prestigious family of doctors. After three years of training with a qualified midwife, she took exams at the *École de Chirurgie* in Paris and passed. In the following years, within this institution, there were strong constraints on the training of women, who were dominated by surgeons. The Paris Faculty of Medicine and qualified doctors, not surgeons, recognized the importance of training midwives and those aspiring to this practice. She was the head of midwives at *Hôtel Dieu* in Paris and the author of the illustrated book *Abrégé de l'art des accouchements*, published in 1759, the year in which she received the king's invitation to, with her intervention, contribute to reducing the high rate of neonatal mortality. Between 1760 and 1783, she traveled throughout the country, teaching courses with the support of a life-size obstetric model, the first of its kind capable of facilitating the understanding of the mechanism of childbirth and the nature of the necessary maneuvers (Cody 2001; Gelbart 1998).

The number of universities continued to increase, and existing ones were being reformed to provide experimental education; however, they continued to prohibit access to women, although this was occasionally seen as outdated.

Dorothea Christiane Leporin (1715–1762) stood out as the first doctor to train in Germany. She had the opportunity to take the same preparatory studies for the medicine course as her brother because her father, the progressive doctor Christian Leporin, recognized his daughter's intellectuality and the advantages of her training. To enter the University of Halle with her brother, she had to receive authorization (4–1741) from King Frederick II of Prussia (1712–1786). She delayed her entry to marry widower Johann Christian Erxleben, the father of five children. The union has four descendants. Large family members delayed entry for a few years. For economic reasons, she successfully began clinical activities in her hometown of Quedlimbourg before completing the course. On 12 June 1754, she received her diploma after defending her dissertation entitled "Concerning the Swift and Pleasant but, for that Reason, Less Than Full Cure of Illness" published in Latin and German. In some respects, her recommendations are current. For the remainder of her life, she practiced medicine (Howard 2007; Poeter 2008).

Another important reference in this century was Regina Salomée Halpir (1718–1763), the first doctor in the Grand Duchy of Lithuania. In her 1760 memoirs, there are clear testimonies about her connection to her family, her love for traveling, and her dedication to medicine. She is known by various names, some associated with her childhood and others with her three husbands. Born in Navahrudak, in the Grand Duchy of Lithuania, she married Dr. Jacob Halpir, a Lutheran German optician, at the age of 14 years. She lived in Constantinople, the Ottoman Empire, and provided assistance and learned

clinical practice with her husband. After his death, she traveled through Europe and rescued prisoners from the Austro–Russian–Turkish war (1735–1739). One of them, Professor Pilstein, became her second husband, who, at the invitation of Michel Radziwill (1702–1762), became a doctor in Nesvizh. Halpir remained in St. Petersburg to free Turkish prisoners from war. She attended the Imperial Court during the time of Anna Ivanovna (1693–1740). Returning to Poland, she separated from her second partner, whom she accuses of adultery and attempted poisoning. Later, she had a relationship with a Polish nobleman who accused her of having an interest in her personal fortune. She decided to return to Constantinople and assumed the role of doctor in the Harem of Sultan Mustafa III (1717–1774). She was a Christian who had never received a formal medical education but practiced successfully in several Turkish, Polish, and Austrian cities (Lovejoy 1957; Baudouin 1901).

During this century, several doctors, including Anna Morandi Manzolini, Maria Mastellari, and Maria Dalle Donne, trained at the University of Bologna. Anna Morandi (1716–1774) married painter Jean Manzolini in 1740, who received geometry and anatomy lessons from Master Hercule Lelli. He received an order to produce a series of anatomical preparations in wax from Pope Benedict XIV (1675–1758) and associated Manzolli with the project. Later, they stopped collaborating and Manzolli decided to introduce his wife to the art. Anna studied anatomy deeply, practiced the dissection of corpses, decorated her home with many of her wax preparations, and executed them with extraordinary skill and detail. She was the first to represent structures as small as blood vessels and nerves in wax. Priority was given to identifying the precise termination point of the oblique muscles of the eye. Her husband died in 1755, and the following year Anna was appointed Lecturer in Anatomy at the University of Bologna. Subsequently, she was a member of the Clémentine Academy (1758), the Foligno Literary Society (1760), and the Florence Drawing Academy (1761). Her value was known internationally; therefore, she was invited to join different universities, which she kindly refused by sending boxes with her preparations and respective explanations. After her husband's death, she offered books, preparations, and instruments to Count and Senator Ranuzzi. Later, the Senate of Bologna decreed the delivery of the preparations to the Anatomy Museum at the University of Bologna (Lipinska 1900a; Pazzini 1947).

Mastellari received a degree in 1799. Dalle Donne (1777–1842) received hers in the same year. She was authorized to direct a school of midwives in 1801 and, given her competence, Napoleon Bonaparte (1769–1821) created the chair of obstetrics for her. In May 1829, she joined Benedettini Accademici Pensionati in Bologna (Lipinska 1900a). Maria Petraccini (1759–1791) studied Medicine at the Universities of Florence and Ferrara, where she attended an anatomical course. She was also a professor of anatomy at another university. Her daughter, Zaffire Peretti, obtained a doctoral degree and became a professor of Anatomy at this University (Lipinska 1900a; Pazzini 1947).

In France, three women were prominent: Bihéron, D' Arconville, and Necker. First, it is enough to remember the session of 6 March 1771, of the Royal Academy of Sciences, which was attended by the prince of Sweden, the future Gustav III, in which D'Alembert's speech and the memories of Macquer, Sage, and Lavoisier followed Bihéron's anatomical demonstrations, delighting the future monarch. Bihéron came from a humble family and was, from an early age, inspired to pursue anatomical knowledge. Therefore, she observed dissections in different amphitheaters and

studied hard from books, especially those related to corpses. The demonstrations were clear and precise. Her value was not properly appreciated by her peers but was recognized by Jessieu and Villoison in Paris and by Hunter and Hewson in London. The Russian ambassador bought her preparations for Empress Catherine II (1729–1796). The second prominent woman was Geneviève-Charlotte d'Arconville (1720–1805), a prestigious anatomist and author of several documents on anatomy, physiology, histology, and pathology. Of these, the "*Essai pour servive d' l' histoire de la putréfaction*" (1766) stands out; it brings together her experiments with animal, vegetable, and mineral substances capable of delaying or accelerating decomposition. In 1759, she edited the translation of Alexandre Monro's *Treatise on Osteology* by Dr. Sue, which she enriched with anatomical drawings, notes, and a preface. Although she was aware that it was necessary to study nature, she recognized that her drawings, faithfully copied from corpses, could well be their representation. Third, Necker was a pioneer of hospital reform in France and a precursor of legal medicine in the country. In 1779, she founded a small hospital with 120 beds to serve as a test bed for the reforms she considered relevant. In her writing "*Hospice de Charité, institution, règles et usages de cette maison*," she brings together information such as human and material resources, methodology, accounting, and results. These surprising results serve as a model for the lessons of humanity and the economics they represent. In 1790, she published the work "*Inhumations précipitées*," where she called for the detailed examination of signs of death, the creation of funeral surgeon-inspectors, and infrastructures for storage in hospitals and different towns (Lipinska 1900a).

In England, in the first half of the century, Catherine Bowler, a female surgeon and an expert in the treatment of hernias and hydroceles, stood out. Jeanne Stephens introduced her medical invention for the treatment of urological lithiasis, a secret purchased by parliament in 1740 for GBP 5000. Lady Montague, ambassador to Constantinople, where she became familiar with the smallpox inoculation technique and aware of the benefits for humanity, was a staunch promoter of the method in her time (Lipinska 1900a).

7. 19th Century

The first half of the 19th century saw the individualization of several medical specialties and new nosological entities. The invention of the stethoscope by René Laennec (1781–1826), providing immediate auscultation, opened horizons in cardiopulmonary disease studies and their consequent individualization. Since Marie François Bichat (1771–1802), injuries to the basic tissues that make up different organs have been known to cause diseases. The importance of relating these findings to disease symptoms has been recognized. The study of the human body, whether sick or cadaveric, is important. Jean Dominique Larrey (1766–1842), chief physician of Napoleon's Grand Army, introduced field units for first aid, immediate surgical interventions, and refrigeration as an anesthetic in cases of amputation. The introduction of statistics in the numerical analysis of clinical cases constitutes a precious instrument for the evaluation of therapeutic results and, consequently, in decision-making in all areas of health. It was the time of affirmation of new medical treatments, such as homeopathy, medicinal waters, and those resulting from laboratory research such as those developed by François Magendie (1783–1855), Claude Bernard (1813–1878), and Justus von Liebig (1803–1873). Cellular theory was defended by Mathias Schleiden (1804–1881) and Theodore Schwann (1810–1882),

and cellular pathology was defended by Rudolf Virchow (1821–1902). Bernard's great contribution was the introduction of the concept of constancy of the "internal environment" through the intervention of self-regulatory mechanisms such as the nervous and hormonal systems. Since the end of the 18th century, there has been a demographic revolution with rapid population growth and migration to cities associated with growing industrialization.

In general, the poor hygiene and sanitary conditions of homes and city spaces favor the outbreak and maintenance of various infectious diseases associated with high morbidity and mortality. Governments are becoming increasingly responsible for maintaining the health of the population (Castiglioni 1941; Diepgen 1932; Loudon 1997; Guthrie 1947; Pazzini 1947). Even at a time when microbes were unknown etiopathogenic agents, two figures stood out for the marked reduction in hospital morbidity and mortality rates by systematically introducing hygiene measures into the services for which they were responsible: Ignaz Semmelweis (1818–1865) and Florence Nightingale (1820–1910). Semmelweis' hygiene measures, implemented in the labor ward, led to a marked reduction in mortality from puerperal fever. Florence Nightingale came from a wealthy British family, and her name was associated with her homeland in Italy. During her childhood in England, she was educated in history, mathematics, classical literature, philosophy, and language. She aspired to become a nurse, even against the advice of her family, at the Kaiserswerth Institute in Dusseldorf, Germany, and began her education in this field. From April 1853 to October 1854, she was superintendent at the Institute for the Care of Sick Women on Upper Harley Street, London. That month, in the company of a group of nurses prepared by her and some Catholic nuns, she left for the main British base under siege in the fields of Scutari in the Ottoman Empire, where she carried out important humanitarian services for two years, with the restructuring of hospital services. She is credited with the systematic introduction of thermometry in clinical practice. She valued the graphical presentation of statistical data to corroborate her decisions.

Government measures, combined with her intervention and those of her working group, significantly reduced morbidity and mortality during wartime and were a model of inspiration for hospitals during peacetime. Still, during her presence in Crimea, in honor of her dedication and work, the Nightingale Fund was created, which allowed for the inauguration of the Nightingale Training School at Saint Thomas Hospital (9-7-1860), the school of reference names in nursing. Linda Richards was considered the first to be certified in the USA. Nightingale's work "*Notes on Nursing*" (1859) is considered a classic nursing guide, published at a time when women professionals were not properly valued. Simultaneously, it describes the necessary conditions for the operation of home nursing services for poor patients. She has been awarded the Royal Red Cross (1883), Order of Saint John (1904), and Order of Merit (1907) (Strachey 1918; Bostridge 2009).

The second half of the 19th century saw the birth of different surgical specialties, given advances in the field of anesthesia, physical methods of hemostasis, and the introduction of asepsis and antisepsis. Parallel to the introduction of different types of anesthesia, there has been a progressive transformation of the equipment used in the specialty. Relative to the physical methods of hemostasis, the introduction and progressive adaptation of hemostatic forceps constituted an advance that contributed to a reduction in peri- and postoperative morbidity and mortality. Louis Pasteur (1822–1895) debunked the theory of spontaneous generation, identifying microbes as

etiopathogenic agents of some diseases and advocating heat asepsis. Joseph Lister (1827–1912), who is considered the father of modern surgery, introduced carbolic acid as an antiseptic after experimenting with others in the air and the operating field in the preparation of sutures, compresses, bandages, and surgical instruments, with excellent results (Ricon Ferraz 1996; Ricon Ferraz 2010). Advances in microbiology have been associated with the growing appreciation of laboratory research, such as the production of vaccines and serum. Roentgen (1845–1923) discovered X-rays and demonstrated the feasibility of studying the internal structures of the human body.

During the 19th century and the beginning of the 20th century, women with medical degrees continued to gain prevalence, as confirmed by the note below, which identifies the first degree in each country, the date, and the alma mater. At the University of Zurich, 11 of the first graduates from the following countries graduated in chronological order as follows: Germany, Switzerland, Poland, and Georgia. In the same year, Hungary, Serbia, and Moldova recorded having graduates. Later, graduates from the Czech Republic, Lithuania, Croatia, and Ukraine followed. At the University of Paris, it was first implemented in the United Kingdom, France, Bulgaria, Romania, and Greece. At the University of Bern, there were two in the same year from Colombia and Scotland, and later from Belgium and Estonia. At the Women's Medical College of Pennsylvania, there were graduates from the USA, Canada, and India, including USA natives and Syrians. The *Escuela Nacional de la Medicina de México* saw graduates from Mexico and Nicaragua. The remaining 24 institutions noted only one first-class medical graduate:

- EUA, New York Geneva College, 1849, Elizabeth Blackwell (National Women's History Museum 2024);
- EUA, Boston New England Female Medical College, 1864, Rebecca Lee Crumpler, 1st African American (National Library of Medicine n.d.);
- Russia, University of Zurich, 1867, Nadezhda Suslova (University of Zurich 2017);
- UK, Paris Faculty of Medicine, 1870, Elizabeth Garrett Anderson (University of London 2024);
- Germany, University of Zurich, 1870, Emilie Lehmus (Ogilvie and Harvey 2003);
- Switzerland, University of Zurich, 1874, Marie Heim-Vogtlin (Hommage 2024);
- France, Paris Faculty of Medicine, 1875, Madeleine Brès, 1st French (BIU Santé 2024);
- Canada, Women's Medical College of Pennsylvania, EUA, 1875, Jennie Kidd Trout (Museum of Health Care 2024);
- Colombia, University of Bern, 1877, Ana Galvis Hotz (Fernández-Cano et al. 2016);
- Italy, University of Florence, 1877, Ernestina Papper (Odessa Journal 2024);
- Scotland, University de Bern, 1877, Sophia Jex-Blake (Undiscovered Scotland 2024);
- Poland, University of Zurich, 1877, Anna Tomazewicz-Dobrska (Unless-Women 2024);
- Finland, University of Helsinki, 1878, Rosina Heikel (YLE 2011);
- Bulgaria, Paris Faculty of Medicine, 1878, Anastasia Golovina (Infinite Women 2024);
- Georgia, University of Zurich, 1878, Pelagia Natsvlishvii (Georgia Today 2021);
- Hungary, University of Zurich, 1879, Vilma Hugonnai; 1897 medical practice (Daily News Hungary 2017);

- Holland, University of Groningen, 1879, Aletta Jacobs (Institute for Gender Equality 2024);
- Belgium, University of Bern, 1879, Isala Van Diest (The Brussels Times 2024);
- Serbia, University of Zurich, 1879, Draga Ljocic-Milosevic (Biographies.net n.d. "Draga Ljocic Milosevic" 2024);
- Spain, University of Barcelona, 1879, Dolors Aleu i Riera (Societat Catalana de Biologia 2024);
- Moldova, University of Zurich, 1879, Maria Baltaga-Savitski (Biblioteca USMF 2018);
- South Africa, London School of Medicine for Women, 1880, Jane Elizabeth Waterston (MDDUS 2022);
- Czech Republic, 1880, University of Zurich, 1880, Bohuslava Kecková (Tahirović and Fuchs 2019);
- Sweden, Karolinska Institute, 1884, Karolina Widerstrom (Svenskt Kvinnobiografiskt Lexikon 2024);
- Romania, University of Paris, 1884, Maria Cutarida-Cratunescu (Prabook 2024);
- Japan, Koju-in Medical School, 1885, Ginko Ogino (National Diet Library 2024; Pixstory n.d.);
- China, Women's Medical College of New York, 1885, Kin Yamei (Roberts 2018);
- Denmark, Kobenhavns University, 1886, Nielsine Nielsen (Danmarkshistorien.dk 2024);
- India, Women's Medical College of Pennsylvania, EUA, 1886, Anandibai Gopalrao Joshi (India Today 2020);
- Chile, *Escuela de Medicina de la Universid de Chile*, 1886, Eloísa Diaz (British Chilean Chamber of Commerce 2024);
- Mexico, *Escuela Nacional de Medicina de México*, 1887, Matilde Montoya (Secretaría de Salud de México 2024);
- EUA, Woman's Medical College of Pennsylvania, 1889, 1st native doctor, Susan La Flesche Picotte (Changing the Face of Medicine n.d.);
- Cuba, *Universidad De La Habana*, 1889, Laura Martinez de Carvajal (EcuRed n.d.);
- Argentina, *Faculdad de Ciencias Médicas de la UBA*, 1889, Cecilia Grierson (Museo Roca 2024);
- Australia, University of Trinity College, Toronto, Canadá, 1890, Emma Constance Stone (Russel 2006);
- Syria, Women's Medical College of Pennsylvania, 1890, Sabat Islambouli (MedWorld 2024);
- Ireland, Royal University of Irland, 1890, Eleanora Fleury (PeoplePill 2024);
- Portugal, 1891, *Escola Médico-Cirúrgica do Porto*, Aurélia Morais Sarmento, Laurinda Morais Sarmento, Maria Paes Moreira 1891, *Escola Médico-Cirúrgica de Lisboa* Amélia Cardia e Elisa Andrade (Santos 2018; Santos 1991);
- Lithuania, University of Zurich, 1892, Barbora Burbaitè-Eidukevicienė (LRT English 2024);
- Norway, Frederiks University in Oslo, 1893, Marie Spangberg Holth (Tidsskrift for Den Norske Legeforening 2003);
- Croatia, University of Zurich, Milica Sviglin Cavov, 1893, first to be banned from practicing in the country; University of Zurich, Karola Maier Milobar, 1900, first authorized in 1906 (Zuskin et al. 2006);

- Ukraine (Austro–Hungarian Empire), University of Zürich, 1894, Sofia Okunevska-Moraczewska (Ferry 2023);
- Greece, Medical School of Paris, 1894, Maria Kalapothakes (Geropeppa et al. 2019);
- Democratic Republic of Congo, Women's Medical College of Philadelphia, 1895, Louise Celia Fleming (Moss 1996);
- Austria, *Universitat Wien*, 1897, Gabriele Possanner (Universität Wien 2024);
- Peru, San Marcos National University, 1899, Laura Esther Rodriguez Dulanto (Diaz 2007);
- Belgium, University of Ghent, 1900, Bertha De Vriese (UGentMemorie 2024);
- Corea, Women's Medical College of Baltimore, 1900, Esther Park (Korea.net Honorary Reporters 2023);
- Estonia, University of Bern, 1904, Selma Feldbach (Laidla 2022);
- Ecuador, *Universidad del Azuay—Cuenca*, 1919, Matilde Hidalgo Navarro de Procel (Estrada 2021);
- Nicaragua, National Autonomous University of Mexico, 1927, Concepción Palacios Herrera (ENEL Nicaragua 2024).

The remarkable stories of some of these women are remembered here as testimonies to the challenges and current resources, including their perseverance and determination to become doctors despite legal, social, and cultural constraints and, often, the limitations imposed by their family responsibilities.

In the first half of the 19th century, Marie Josephine Mathilde Durocher (1809–1893) graduated from the Arts of Childbirth and was the first full female member of the Imperial Academy of Medicine of Brazil in 1871. Although she was not a doctor, the recognition of her professional prestige among doctors and patients warrants this reminder. Born in Paris at the age of seven, she arrived in Rio de Janeiro with her mother, who opened a farm and a women's goods store. She married a French merchant who was murdered because of a criminal's mistake. She had two children. She enrolled in the Midwifery Course at the Faculty of Medicine of Rio de Janeiro (1808), which she completed in 1834, receiving private classes from the Court doctor, Joaquim Cândido Soares de Meireles (1797–1868), who would become president of that Academy. In 1866, she was appointed Midwife of the Imperial Household and assisted free slave women and their children. Although gynecology is prohibited for non-physicians, superior recognition of their competence explains the continuity of their practice. She also authored several medicolegal reports. As a member of the Imperial Academy of Medicine, she participated in several working committees in debates on the topics under analysis, namely public health policies, and was the author of more than 20 texts published in the association's journal, some with outstanding historical interest (Silva 2023).

Elizabeth Blackwell (1821–1910) was the first doctor in the United States to train and practice. In 1849, she graduated from Geneva Medical College in NY, USA. Her inaugural thesis, dedicated to typhoid fever and published in the *Buffalo Medical Journal and Monthly Review* (1849), was the first medical article published by a medical student in the USA. Her entry was favored by all male students. Previously, she was admitted to other medical schools and was rejected because of gender discrimination. She was the first member of the UK General Medical Council (GMC) Medical Register. In 1857, she founded the New York Infirmary for Women and Children. She highlighted the importance of female education and played a prominent role in the American

Civil War by creating a medical school for women at the Infirmary and organizing nurses' services. In 1874, Sophia Jex-Blake (1840–1912), the first woman to graduate in medicine in Scotland, opened the London School of Medicine for Women with the primary objective of preparing candidates for the Apothecaries Hall certification exam. Blackwell was an example of a stimulus for the medical training of other women and a leading social reformer in both countries (Silber 2005; Atwater 2016).

Although Mary Edwards Walker (1832–1919) was not the country's first graduate, her story deserves to be remembered. She studied at the first free school in Oswego, New York, which was created by her parents, and later at the Falley Seminary in Fulton, New York. She worked as a teacher in Minetto, New York. When she had some savings, she decided to enter Syracuse Medical College, graduating in 1855; she was the second woman to graduate from this institution after Elizabeth Blackwell. As there were no women in this position, she was a volunteer surgeon in the US Union Army. She served in the first battle of Bull Run, Manassas (1861), and at the Patent Office Hospital in Washington, DC. She founded the Women's Relief Organization to support the families of those injured in the war. She was an unpaid field surgeon on the Union's front lines and the first woman in the US Army. In 1862, she applied to the War Department to be a spy but was refused. In September of the following year, she was hired as an Assistant Surgeon by the Army of the Cumberland, becoming the first woman to be hired by the US Army. She was later appointed assistant surgeon at the 52nd Ohio Infantry Center. She often crossed battle lines and treated civilians and soldiers. She was captured by the Confederate troops and imprisoned from April to August 1864. She defended women's rights, abolitionists, and suffragists. Later, she was the supervisor of a woman's prison in Louisville and the head of an orphanage in Tennessee. She was the only woman to be awarded the highest US military decoration, the Medal of Honor, by President Andrew Johnson (1808–1875) (Pennington et al. 2003; Tsui 2006).

Sophie Jex-Blake (1840–1912) was the first female doctor to practice in Scotland and one of the first in the United Kingdom. She studied at home and in private schools before enrolling at Queen's College in London, contrary to her parents' wishes. She traveled to the USA in the summer of 1865 to update herself on issues related to women's education. During her stay at the New England Hospital for Women and Children, she lived and formed friendships with Dr. Lucy Ellen Sewall (1837–1890), one of the first doctors in the country. She belonged to the Edinburgh Seven Group, the first group of seven women to begin their medical studies at a British university in 1869. On November 18, 1870, on the day of the anatomy exam, the Surgeons' Hall Riot occurred, a landmark in public awareness of the issue of women in medicine. A crowd insulted and attacked medical students traveling to conduct the assessment. In 1873, the Court of Session of the Scottish Supreme Court validated universities' right to refuse to train women. She founded the London School of Medicine for Women (1874). The Medical Act of 1876 mandated equal treatment regardless of sex. The first establishment to grant licenses for women's clinical practice was the Kings and Queens College of Physicians and, later, the Irish College of Physicians, a situation that provided opportunities for some students. However, Sophia Jex-Blake first applied for exams at the University of Bern and obtained her degree in January 1877. Four months later, she could finally register with the GMC, and was the third in the country to do so. Qualified to practice, she settled in 1878 in Manor Place, Edinburgh, becoming the first female doctor in the city,

and opened a clinic elsewhere to treat poor patients. Later, she opened the Edinburgh Hospital and Dispensary for Women, the first Scottish hospital run by women. She helped create the Edinburgh School of Medicine for Women (1886–1892) with Leith Hospital as its affiliated hospital. Elsie Inglis (1864–1917) and Ross Cadell's sisters were the first students at this institution. The former, together with her father, went on to create the Edinburgh College of Medicine for Women (1889–1916) when she became incompatible with Sophia Jex-Blake. Of the Edinburgh Seven, five, including Sophy, graduated abroad in the 1870s in Bern or Paris, three in the United Kingdom, one in Bombay, India, and one in Japan (Roberts 1993; Roberts 2004).

Elizabeth Garrett Anderson (1836–1917), the daughter of a successful businessman, obtained her first education at the Boarding School for Ladies in Blackheath. She joined the Society for Promoting the Employment of Women, a group responsible for valuing the medical careers of women and promoting Elizabeth Blackwell's lectures in London on "medicine as a profession for ladies," as this was someone with with whom Anderson had a close relationship. At Middlesex Hospital, she learned preparatory subjects for medical training from the hospital apothecary as a nurse. She attended private Anatomy and Physiology classes to obtain a certificate of achievement. The male students' objection to her presence in medical school (1861) led her to leave the hospital; however, she received certificates of merit from Chemistry and Materia Medica. After multiple failed attempts at entering medical schools in the United Kingdom, she joined the Society of Apothecaries in 1862. She continued her studies with private lessons at St. Andrews, Edinburgh, and London. In 1865, she was granted a license to practice Medicine by this Society, the first of its kind in England. Unable to practice in a hospital, she dedicated herself to private practice. In 1870, she received her degree in Medicine from the Faculty of Medicine of the University of Paris and, in that year, was elected to the first London School Board and assumed the role of visiting doctor at the East London Hospital for Children, as she declined to dedicate herself to her private clinic. Anderson was the first female physician to hold a university degree in France. The first woman of French nationality was Madeleine Brès (1842–1921) in 1875. She was a co-founder and director of the London School of Medicine from 1883 to 1902, and a lecturer at the New Hospital for Women, the only English hospital that offered courses to women. She was a member of the British Medical Association (1873) and president of its East Anglian Branch. She was a member of the Central Committee of the National Society for Women's Suffrages in 1889. Her name is attributed to the secondary and higher education schools, archives, and health institutions that she founded (Kelly 2017; Ogilvie 1986).

Madeleine Alexandrine Brès (1842–1921) was a self-taught woman who decided to study Medicine at the Faculty of Medicine in Paris and requested an audience from the director of this faculty, Charles A. Wurtz (1817–1884), who recommended that she obtain a prior baccalaureate in Arts and Sciences. After completing three years of training, she resumed her request, accepted only after favorable deliberation by the Council of Ministers. She was 26 years old and had three children. She started the medical course in 1869. When she entered the Faculty, women studying medicine included the Englishwoman, Elizabeth G. Anderson; the Russian, Catherine Gontcharoff; and the American, Mary Putnam. At the time, faculty members were divided by their convictions about admitting women. Wurtz, Sappey, Broca, Landouzy, and Verneuil were in favor. Charcot considered feminine "nature" to be an obstacle for physical, aesthetic, psychic, and sensitivity reasons. Many male students protected and expressed consider-

ation for their colleagues, as is evident from the dedication and acknowledgments of their dissertations. Brès worked for seven years in the Chemistry Laboratory under the direction of Professor Wurtz. For five years, she was guided by Broca, who advised her on a temporary internship at the Hospital de la Pitié in Paris. These two professors praised her exemplary behavior, dedication to studying, and zeal in the hospital, which earned the respect of all the students. The quality of her work gave the faculty the confidence to accept other female candidates. In 1871, she requested authorization from the Director of Public Assistance to conduct internal and external examinations, which were not granted. After that, female students sent several petitions requesting the same rights as male students. The Council for the Surveillance of Administration of Public Assistance opened externships and internships for women in 1881 and 1885, respectively. She completed the course with merit in 1875 after defending her dissertation, entitled "L'Hygiene de la Femme et de l'Enfant," which was dedicated to Broca. She was the first French doctor to obtain a university degree in her country. She provided training in Hygiene and Childcare to daycare center managers, and, at the request of the Minister of the Interior, she traveled to Switzerland to learn about developments in the organization and development of daycare centers. She oversaw the magazine "L' Hygiène de la Femme et de L' Enfant" (1883) (Schultze 1888; Pigeard-Micault n.d.).

The career of Mary Putnam (1842–1906), although she was not among the first graduates, deserves attention. Putman completed her studies at the New York College of Pharmacy in 1863. In the following year, she completed Woman's Medical College in Philadelphia. Arriving in Paris in 1866, she followed the hospital practice of a friend of her father, Dr. Hippolyte Herard (1819–1913), who introduced her to the medical world at that time. In 1867/68, she obtained authorization to study at the Library of the Medical Faculty. In November 1867, she officially requested enrolment at the faculty but was denied because of the opposition of the Public Instruction Council and several professors, as they considered it contrary to moral and social conditions. In favor of Putnam, Director Wurtz warned about the recent admission of Madeleine Brès through ministerial determination. At the end of the school year (1868), she requested direct admission to the minister position. On 23 July 1871, she completed her graduation with the defense of her dissertation "De la graisse neutre et des acides gras," becoming the second woman to hold a medical degree in this Faculty, after Elizabeth Anderson (1870) (Bowman 2001).

The University of Zurich was among the favorites for women who aspired to be medically trained with certification and the possibility of clinical practice. Therefore, it seemed interesting to learn about the decisions by the teaching staff in this context, the number of female students enrolled, and their origins. On 5 May 1865, the Senate of the University of Zurich decided that it was time to regularize the situation of female students and choose whether, in the future, they would be admitted to all courses as a formal right or just as a special favor, subject to the opinions of teachers. In 1864, a young Russian woman asked the chancellor of the university for permission to attend anatomy and microscopy courses and received no objection. Before 1867, she was absent from the university. The same did not happen with another young Russian woman who entered college six months later and showed solid preparatory knowledge, zeal, and perseverance, winning her teachers' esteem. To take the exams, she needed to be enrolled; thus, she asked the chancellor to obtain this mandatory formality, which happened, and to obtain her degree from the Faculty of Medicine of this University. In the following years, the turnout was not considerable: the end

of 1867 saw a turnout of two English women; in 1868, a Swiss and an American; in 1869, 9 Russian women registered; in 1870, a German and an Austrian; while in 1871, 17 Russian women enrolled. In this year, of the 63 students at the university, 12 attended the Faculty of Philosophy, and 51 attended the Faculty of Medicine: 44 Russian, 1 English, 3 Swiss, and 3 German. In 1872, the Faculty of Medicine at the University of Zürich had 208 students, a quarter of whom were female. Of the graduates, six would go on to have successful medical careers: one was the wife of a doctor from St. Petersburg; another established herself in the same city and with a vast clientele; the third was the first doctor at the London New Hospital for Women, directed by Elizabeth Anderson; the fourth would direct the Birmingham Hospital for Women; the fifth was an American doctor at the children's hospital in Boston; and the last was an assistant at the Zurich Hospital Medical Clinic (Variétés. Les femmes de l'Université de Zurich 1872).

Lehmus (1857–1928) completed her studies in Paris to become a professor of language. She taught Marienstift in The Furth. She studied medicine at the University of Zürich, and she completed her studies in 1870. She was the first German woman to receive a degree from a Swiss university. She completed an internship in gynecology and obstetrics in Dresden with Franz von Winckel (1837–1911). Together with a fellow student, she opened a clinic for women in Berlin-Mitte and, later, in 1881, the first "Poliklinik fur Frauen" in Berlin, which offered medical services to women and children at low cost or even free of charge. She stopped practicing in 1900 for health reasons (Ogilvie and Harvey 2003).

Because the history of the first Portuguese doctors was unknown internationally, this memory seemed pertinent to us. Aurélia Morais Sarmento (1869–?) and Laurinda Morais Sarmento (1867–?) were two of the first five trained in Medicine and Surgery at the Medical–Surgical Schools of Porto and Lisbon in 1891 and possibly the first sisters, at an international level, to graduate from medicine in the same year. They were the daughters of Rita Cássia Oliveira Moraes and Anselmo Evaristo Morais Sarmento, business owner of Typography "*Imprensa Portuguesa*" and journalist director of the periodicals "*Gazeta Literária do Porto*," "*A Actualidade*" and, later, "*A Ideia Nova-diário democrático*." They were influenced by their paternal family and imbued with a strong liberal spirit, for whom education was a relevant factor, regardless of sex. Their close relationships with professionals and friends of their fathers, namely, renowned national writers and historians, were also important. Aurélia and Laurinda had two sisters, Guilhermina (1870–?), and Rita (1872–?), and a brother. Joaquim. Rita Mores Sarmento became the first Civil Engineer in Portugal in 1894, and her brother graduated in law.

Aurélia and Laurinda entered the Polytechnic Academy in the 1885–86 academic year to take the preparatory exams required for access to medicine courses. That year, they passed General Physics, General Inorganic Chemistry, and General Organic and Biological Chemistry. In September 1866, they enrolled in the Medicine and Surgery course at the Porto Medical–Surgical School after passing preparatory studies in Botany and Zoology. They attended classes and underwent all the examinations on the same day. In 1891, they completed the course with the defense of a dissertation: Aurélia, "*Hygiene da Primeira Infância*" and Laurinda, "Breves considerações sobre a Hygiene do Vestuário Feminino," both published by *Imprensa Portuguesa*. After completing the course, they opened a private medical office in the city center on the same street where the family lived to address the health of women and children

with a permanent birth service. Laurinda abandoned clinical practice shortly after marrying a colleague. In 1900, Aurélia married a prestigious opera singer and music teacher based in Porto, Júlio Gustavo Romanoff Salvini, the son of the Polish Gustavo Romanoff Salvini, who is linked to the imperial Romanov family (Russia). Their marriage produced three children. In the "*Maximiano Lemos*" Museum of the History of Medicine at the Faculty of Medicine of the University of Porto, gynecological examination chairs and instruments were used by Aurélia Moraes Sarmento (Santos 2018, 1991).

In the second half of the 19th century and the early years of the following one, the eminent scientist Marie Curie (1867–1934) stood out. Born in Warsaw, Poland, she was the first woman to be awarded a Nobel Prize (Physics, 1903), shared with Pierre Curie (1859–1906) and Henri Becquerel (1852–1908). She was the first and only person to receive two Nobel Prizes in different scientific fields (Physics, 1903, and Chemistry, 1911). Marie Curie was the first female professor at the Sorbonne University in Paris, France, and the first woman to be interred in the Pantheon of Paris in 1955. Although she was not a medical professional, her discoveries and actions had an invaluable influence on the development of Medicine (Curie 2001; Pasachoff 1996).

In her homeland, she completed her pre-university studies, taught, and worked as a governess to raise funds to attend the University of Paris. Her gender prevented her from entering the University of Warsaw. At the University of Paris, she completed degrees in Physics (1893) and Mathematics (1894). There, she met Professor Pierre Curie of the École Supérieure de Physique et Chimie Industrielles de Paris, whom she married in 1895. They shared interests in scientific research. With his collaboration, she developed techniques for isolating radioactive isotopes and discovered two new chemical elements (1898), polonium and radium. These findings initiated the study of radioactivity and its potential for destroying neoplastic cells (Curie 2001; Pasachoff 1996).

Marie Curie progressively documented her studies in various scientific articles, confirming her pioneering work. During World War I, she established mobile radiography units for field hospitals. She led the Radium Institute, now known as Institut Curie, created by the Pasteur Institute and the University of Paris. She traveled throughout Europe and the United States, giving lectures, raising funds for research, and inspiring different scientific communities to follow her example (Curie 2001; Pasachoff 1996).

Marie Curie was a member of the French Academy of Medicine, the International Committee on Intellectual Cooperation of the League of Nations, the International Committee on Atomic Weights, and the first woman member of the Royal Danish Academy of Sciences, among other prominent international associations. She was an honorary member of prestigious scientific societies of her time and was repeatedly awarded the title of Doctor Honoris Causa. She received numerous prizes and other distinctions. The curie, symbol Ci, a unit of radioactivity, was named in honor of the scientific couple. She passed away in Paris on July 4, 1934, due to aplastic anemia resulting from constant exposure to radioactive agents. (Curie 2001; Pasachoff 1996).

8. 20th and 21st Centuries

The advent of the 20th century introduced new scientific and technological advances in Health Sciences associated with better preventive, diagnostic, and treatment results. Highlights include health literacy, improvements in public health and basic

sanitation, healthier lifestyle changes, cancer screening programs, global prevention of emerging infectious diseases, outbreaks and disease control measures, sexually transmitted diseases, the prevention of cardiovascular diseases thanks to surgical and pharmacological advances, the development of maternal and child health programs, the prevention of child malnutrition, the implementation of preventive approaches based on scientific evidence, and the prevention of smoking and obesity.

Following developments observed in the previous century, we are witnessing an increase in vaccine production. Simultaneously, the implementation of mass vaccination programs has made it possible to control and eradicate infectious diseases.

In 1921, the discovery of insulin by Frederick Banting (1891–1941) and Charles Best (1899–1978) made survival and a better quality of life possible for type 1 diabetics. The discovery of penicillin (1928) by Alexander Fleming (1881–1955) marked the beginning of the antibiotic era, which led to a clear reduction in morbidity and mortality associated with bacterial diseases, particularly in the postoperative period. Many medications have been introduced for different purposes, such as controlling high blood pressure, psychiatric disorders, and autoimmune diseases. Hormone replacement therapy has improved the quality of life in many patients. The introduction of different forms of birth control has been revolutionary. The technological development of implantable medical devices, such as pacemakers, cochlear implants, and joint prostheses, has enabled the resolution of chronic situations. Lasers have revolutionized surgery because of their precision and ability to reduce tissue damage. The introduction and evolution of radiation therapies, more recently, with modulated beams, have made it possible to reduce malignant neoplastic processes with less damage to healthy tissues.

The discovery and development of other imaging techniques, such as computed tomography and magnetic resonance imaging, positron emission tomography, functional magnetic resonance imaging, and image-guided biopsies, have constituted powerful means of clinical diagnosis, as have diagnostic techniques in the field of Nuclear Medicine. Advances in drugs, techniques, and equipment for anesthesiology have continued. Minimally invasive medicine has favored the diagnosis and treatment of different clinical situations with fewer complications and shorter recovery times.

Organ transplantation stems from intense multidisciplinary efforts. The first successful kidney transplant occurred in 1945. This practice began to save patients and guarantee an improved quality of life. Research in Regenerative Medicine has opened new avenues for the knowledge and treatment of degenerative diseases. Innovative techniques introduced in plastic and reconstructive surgery have guaranteed surprising functional and aesthetic results in cases of congenital and traumatic pathologies. Overall, all specialties showed scientific, technical, and technological developments before they were observed.

James Watson (1928–) and Francis Crick (1916–2004) identified the double-helix structure of DNA (1953) and created the foundations of modern genetics, which is fundamental for the knowledge and treatment of diseases in this field. In 2001, the complete sequencing of human DNA provided better knowledge of certain diseases. Gene therapy has become a reality with an inexhaustible potential. Meanwhile, the discovery of RNA and its function in genetic regulation raised new challenges in the field of Molecular Biology. Preimplantation screening, prenatal screening, and ultrasound have opened new avenues in maternal–fetal medicine. Medically

assisted reproduction and gamete conservation techniques have enabled many cases of marital infertility.

Robotic surgery, which is a less invasive and more precise procedure, has better results and longer recovery times. Three-dimensional printing technology in medicine supports scientific research and is a promising reality from a clinical perspective, given the personalized functional results obtained. Telecommunications and digital technologies have made telemedicine possible, resulting in consultations, guidance, and discussions of peer-to-peer medical and surgical cases necessary in urgent situations or remote locations. Artificial Intelligence has invaded healthcare services, promoting easier access to information and reducing decision-making time (Duin and Sutcliffe 1992; Sournia 1995). Throughout the 20th century, there has been exponential growth in the number of women trained in medicine worldwide.

We selected the lives and work of some people we consider to be representative who conducted exhaustive research work in the laboratory or in hospital practice to resolve clinical situations, with the consequent introduction of surgical techniques or innovative diagnostic means, including doctors such as Mr. Brooke Taussig and Virginia Apgar. Transversal to the different biographies is the progression in academic career, teaching, management positions in health units, the presidency of scientific associations, and honorary distinctions.

Beyond a widespread awareness of the relevance of technology in developing countries, some works ensured better medical care services. The noted quote by Mae Jamison, the first African American female doctor, NASA astronaut, and the first African American to travel to space, makes perfect sense: "People always think of technology as something having silicon in it. However, the pencil is a technology. Language is a form of technology. Technology is a tool used to accomplish a particular task, and when one talks about appropriate technology in developing countries, it may mean anything from fire to solar electricity" (Creasman 1997).

Still, with Mae Jamison, research horizons went beyond the limits of planet Earth toward space, seeking a better understanding of life under the action of new stimuli to allow us to better prepare ourselves for hypothetical future demands. Ursula von der Leyen is a doctor (and economist) who holds the highest position in the European Commission. Considering the adversities observed during her mandate given the COVID-19 pandemic, she valued the importance of the union of member states: "We should not hide away from our inconsistencies and imperfections (. . .). But imperfect as it might be, our Union is both beautifully unique and uniquely beautiful" (Von der Leyen 2021). In young people, she reaffirmed her greatest hope: "Our Union will be stronger if it is more like our next generation: reflective, determined and caring. Grounded in values and bold in actions" (Von der Leyen 2021).

Mr. Brooke Taussig (1898–1986) completed her pre-graduate studies in 1917 at Radcliffe College and subsequently at the University of California, Berkeley, where she obtained a B.A. degree in 1921. She continued her training at the Harvard Medical School and the University of Boston, and later at the Johns Hopkins University School of Medicine in the field of cardiology (1927). From 1930 to 1963, she was the director of the Children's Heart Clinic at the Johns Hopkins Hospital Pediatric Unit, The Harriet Lane Home. She dedicated herself to the study of anoxemia or "blue baby" syndrome using a new radiological technique, fluoroscopy, and, in 1941, she proposed corrective surgery to her fellow Hopkins surgeons Alfred Blalock and Vivien Thomas. After extensive research, on November 9, 1944, this surgery

was performed for the first time on a child with this pathology, and this technique was later performed worldwide. A paper describing the first instance of its use was published in the *Journal of the American Medical Association*. She continued her studies on congenital heart defects and published, in 1947, the study "Congenital Malformations of the Heart." She was the first female president of the American Heart Association (1965). She was awarded several awards by President Lyndon Johnson (1964), including the Albert Lasker Award (1954) and the Medal of Liberty (Van Robays 2016; Stevenson 1977).

Virginia Apgar (1909–1974) graduated from Westfield High School (1925) and entered Mount Holyoke College (1929). In 1933, she graduated from the College of Physicians and Surgeons at Columbia University. She completed her residency during surgery in 1937. Her director, Allen Whipple, encouraged her differentiation in anesthesiology, the training she acquired at the University of Wisconsin–Madison and Bellevue Hospital in New York. In 1938, she was appointed director of the new anesthesia wing of the College of Physicians and Surgeons at Columbia University. In 1949, she was appointed full professor at this university. In 1952, Apgar introduced the first clinical method to assess the health status of newborns, which constitutes a standardized practice in all hospitals worldwide, known by the name of the prestigious researcher and clinician. She received a master's degree in public health from the Johns Hopkins School of Hygiene and Public Health (1959). From 1959 to 1974, she worked with a non-profit foundation, the March of the Dimes Foundation, to improve the health status of pregnant women and newborns, assuming the roles of vice presidency and director of the program for the prevention and treatment of birth defects (1967). She was a spokesperson for vaccination against rubella during the 1964–65 epidemic and promoted testing of pregnant women with the RH blood group to prevent isoimmunization. She was a lecturer (1965–1971) and professor of Pediatrics (1971–1974) at the Cornell University School of Medicine, where she taught Teratology. In 1973, she was a lecturer in Medical Genetics at the Johns Hopkins School of Public Health. In 1973, she was named the Woman of the Year in Science by the *Ladies' Home Journal*. She was awarded several awards and an honorary doctorate (Amschler 1999).

Mae Carol Jemison (1956–) graduated from Chicago's Morgan Park High School in 1973 and entered Stanford University at the age of 16 when she was the leader of the Black Collective, the Black Students Union. She graduated with degrees in Chemical Engineering (B.S. degree) and African and African American Studies (B.A. degree) in 1977. She studied Medicine at Cornell Medical School and complemented her training in Cuba by developing a project for the American Medical Student Association in Thailand in a refugee camp as a member of the Flying Doctors in East Africa. She completed her course in 1981 (M.D. degree) and residency at the Los Angeles County-USC Medical Center. She worked with the Peace Corps and served as a medical officer to oversee the health of the center's volunteers in Liberia and Sierra Leone (1983–1985) and the Centers for Disease Control in research on various vaccines. In 1987, she was the first African American woman accepted into NASA's astronaut training program. In 1992, she became the first African American woman to go to space. She traveled on the Space Shuttle Endeavor, on the American and Japanese mission STS-47, totaling 190 h in space, and conducted several experiments, including the autogenic feedback training exercise, NASA's Fluid Therapy System,

bone cell research, and induction of ovulation, fertilization, and development in frogs from tadpoles to zero gravity.

After leaving NASA in 1993, she founded the Jemison Group, Inc., which developed a satellite telecommunications system (ALAFIYA) to promote medical care in developing countries. She also founded the Dorothy Jemison Foundation for Excellence and, as a professor, partook in an environmental studies program at Dartmouth University directed by the Jemison Institute for Technological Advancement in Developing Countries (1995–2002). In 1999, she founded BioSentient Corp. and obtained a license to commercialize the AFTE. In 2018, she collaborated with Bayer Crop Science and the National 4-H Council to raise young people's awareness of agricultural science. She is a member of the faculty at Cornell University and Dartmouth College. She is a member of the American Medical Association, American Chemical Society, Association for Space Explorers, and the American Association for the Advancement of Science. She has received several honorary doctorates and distinctions, such as the National Women's Hall of Fame (1993), International Space Hall of Fame (2004), Buzz Aldrin Space Pioneer Award (2017), and Sylvanus Thayer Award from the United States Military Academy (2021) (Creasman 1997; Hine 1994).

Ursula von der Leyen (1958–) was the daughter of Ernst Albrecht (1930–2014), Prime Minister of the state of Lower Saxony, from 1976 to 1990. She attended the European School of Brussels I (1964–1971) and received secondary education in Lehrte. She studied Economics at the Universities of Gottingen and Munster (1977–1980) and the London School of Economics (1978–1979). She attended the Faculty of Medicine in Hanover between 1980 and 1987. She was an assistant doctor at the Maternity Hospital of the University of Hanover between 1988 and 1992, specializing in women's health. She lived in Stanford, California between 1992 and 96, where she rededicated herself to economics. From 1998 to 2002, she worked as a researcher in the epidemiology department of the Hannover Faculty of Medicine.

From a political perspective, it is worth highlighting her appointments as the Federal Minister of Family, Elderly, Women, and Youth by Angela Merkel in her first and second terms (2005 and 2009); the Minister of Labor and Social Solidarity (2009–2013); the Minister of Defense, appointed by the German Chancellor (2013–?); and 13th President of the European Commission (2019–2024).

She married Heiko von der Leyen, a doctor, university professor, and the manager of a biomedical engineering company. They were parents of seven children. She was considered to be one of the 100 most influential personalities worldwide by *Times* magazine in 2020 and 2022 and the most influential woman by *Forbes* in 2022. She was awarded several distinctions such as the Grand Cross of The Order for Merits to Lithuania (2017), Commander of the National Order of Mali (2016), Order of Prince Yaroslav the Wise, first class (2022), and an honorary doctorate from Ben-Gurion University of the Negev (2022) (Von der Leyen 2021; Von der Leyen 2020; Von der Leyen 2022; Forbes 2022).

9. Conclusions

At all times, there has been evidence of the recognition of women's intellectuality and the advantages of investing in their education, although, in some periods, there has been strong opposition to its implementation. Women and their health are inseparable ancestral partners in all stages of human development. Regardless of the secular, religious, or spiritual environment in which it has evolved, humanism

is a transversal secular characteristic. We learn, for example, that this exhibition of the lives and work of so many women is an exercise in health literacy, strong encouragement, tribute, and collective recognition.

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