

## The Modern Hospital in Historical Context

Max E. Valentinuzzi, EE, PhD, *Life FIEEE* and Ron Leder, EE, PhD, *SMIEE*

**Abstract**—The evolution and development of hospitals in their historical context is quickly reviewed, starting first as simple shelters for the sick and indigent, waiting essentially for death, up to the relatively recent concept of true health centers where patients face a high probability of actual recovery and rehabilitation. Anesthesia, microbiology, asepsia, antibiotics, virology, radiology, transfusion and different biomedical engineering technologies, along with other basic sciences knowledge, led to the intensive care and emergency units introduced in the 1960's, leading to the specialty of critical care medicine and underlining the patient as the center of care.

*When the human being faces pain and suffering because of illness, it searches for relief everywhere and from anybody, in reality and from illusion, in the truth and also in lies, from witchery and magic, by praying and in faith. All this means hope, beliefs of many that few, very few, barely are able to understand.*

### Introduction

A hospital is an institution for health care providing patient treatment by specialized staff and equipment, and often but not always providing for longer-term patient stays. Today, hospitals are usually funded by the state, by health organizations (for profit or non-profit), health insurances or charities. Norfolk and Norwich University Hospital in Easter England, the Texas Medical Center in Houston, and the All India Institute of Medical Sciences constitute modern examples to recall among so many others the world over.

But not always was this so, in fact, the latter standing is rather recent. Domestic medicine appeared as the first line of defense against disease; relatives, friends, even neighbors, were called for help or advice. It was expanded by medicine men, diviners, witch smellers, shamans, herbalists, birth-attendants or midwives, bone-setters, barber-surgeons and healer-priests.

The Domus Dei or God's House was perhaps the first "hospital". Founded in Old Portsmouth by Peter de Rupibus, in 1212, as a hospice, to shelter and help pilgrims from overseas bound for the Holy Shrines at Canterbury, Chichester and Winchester. Originally it was a long, vaulted hall, divided on either side into bays to house patients, with the chapel at one end. In the hall, the aged, sick and homeless were tended by six brethren and six sisters.

Soon thereafter, in 1247, Bethlem Royal Hospital followed in London, popularly known as *Bedlam*. Bethlem is now the world's oldest institution caring for people with mental disorders.

The history of the Pitié and Salpêtrière hospitals encompasses the development of psychiatry, neurology, neuropathology, neurosurgery, neuroradiology, and neuroscience in France. La Pitié used to be a beggars' asylum. La Salpêtrière began in 1634 in an arsenal by that name because of the saltpeter (potassium nitrate) that was used to make gunpowder. The royal edict of 1656 ordered the confinement of the poor in the *Hôpital Général de la Ville de Paris*, that comprised 8 institutions, of which La Pitié and La Salpêtrière were among the most important. However, these hospitals had no obligation to care for the ill; they were only a shelter for the poor, the disabled, the insane, orphans, abandoned children, the destitute elderly and women of "easy virtue". In 1684, in addition to asylum, a prison was established for common female prisoners and prostitutes. It was there that Jean-Martin Charcot, for 30 years during the second half of the XIX century developed psychiatric methods, which influenced Sigmund Freud, and established a neurology school. It is there where the Medical School of the University of Paris VI functions, at the 91 and 105 *Boulevard de l'Hôpital*. The AIDS virus was discovered there and it is the place where Lady D died in August 1997.

Social complexity created opportunities for enterprising practitioners to peddle their goods and skills, sometimes their quacks, their charlatanism. The need to rationalize and theorize sickness became greater as patients demanded a name to their sufferings. In other words, the rise of complex societies created development and search until special housings or shelters, now named hospitals, were created as better places to isolate and eventually take care of the sick.

Herein, the modern hospital is intended to be placed within the historical frame of its development by posing and trying to answer four essential questions:

- 1) What is a hospital nowadays?
- 2) When did hospitals make their appearance?
- 3) What were hospitals until, say, the mid XIX<sup>th</sup> Century?
- 4) What kind of surgery was practiced and under what conditions?

Until around 1850, hospitals were places where the sick, mainly the indigent, waited for death, for it was a time when medical practice had a higher probability of producing harm than good, when pain and infection were not understood nor

MEV: *Universidad de Buenos Aires, Argentina, email maxvalentinuzzi@arnet.com.ar*; RL: *Universidad Nacional Autónoma de México, email rleder@ieee.org*.

there was any effective means to prevent them. It should be recalled that from the time of Alexander The Great, who died rather young in life, until Wolfgang Amadeus Mozart's death (in 1793), who also died rather young, 2,000 years elapsed, however, medical knowledge advanced not very significantly in terms of actual clinical results. Slowly but steadily, based on basic and clinical research as on technological development, too, new knowledge and tools became available, so that hospitals started to become true recovery and rehabilitation centers.

### **Conquering pain and infection**

Perhaps anesthesia led the list of contributions by starting to control pain in 1846, introduced by two dentists, Horace Wells and William Morton [1]. Microbiology, founded by Louis Pasteur around the 1860's by several striking and significant discoveries, followed thereafter, which immediately led Joseph Lister, in England (1865), to the concept of asepsis, as opposed to sepsis. Pasteur himself, in 1871, suggested to military physicians boiling surgical instruments and bandages to prevent infection, even designing an oven for that matter.

Florence Nightingale (1820–1910) –born in Florence, Italy, in the core of a British family– had a significant influence in hospital development through her pioneering activities as nurse, writer and statistician. In 1845 she decided to become a nurse despite anger of her family. Nightingale worked hard to educate herself in the art and science of nursing. Deeply caring for people in poverty, in 1844, she became the leading advocate to improving medical care in the infirmaries and, in 1853, Florence took the post of superintendent at the Institute for the Care of Sick Gentlewomen in London, a position she held until October 1854. Florence's most famous contribution came during the Crimean War. On October 1854, she and a staff of 38 women volunteer nurses, trained by Nightingale, were sent to Turkey, where the main British camp was based. They found wounded soldiers being badly cared for by overworked medical staff in the face of official indifference. Medicines were in short supply, hygiene was neglected, and infections were common. More soldiers died from typhus, cholera and dysentery, than from battle wounds. Death rates were sharply reduced (from 42% to less than 3%) after her linking sanitary conditions and healing became recognized and established. Florence insisted on adequate lighting, diet, hygiene, and activity. This experience influenced her later career, when she advocated sanitary conditions as of great importance. Consequently, she reduced deaths in the army during peacetime and turned attention to the sanitary design of hospitals.

The first official nurses' training program, the Nightingale School for Nurses, opened in 1860. The mission of the

school was to train nurses to work in hospitals, work with the poor, and to teach.

Nightingale wrote *Notes on Nursing* (published in 1860), a slim book that served as the cornerstone of the curriculum for nursing schools. It is considered a classic. She spent the rest of her life promoting the nursing profession and organizing it into its modern form. Besides, she was an advocate for the improvement of care and conditions in the military and civilian hospitals in Britain. By 1882, Nightingale nurses had an influential presence in the embryonic nursing profession. Some had become matrons at several leading hospitals: In London, St Mary's Hospital, Westminster Hospital, St Marylebone Workhouse Infirmary and the Hospital for Incurables at Putney; and throughout Britain, the Royal Victoria Hospital (Netley), Edinburgh Royal Infirmary; Cumberland Infirmary and Liverpool Royal Infirmary, as well as at Sydney Hospital in New South Wales, Australia. By 1896, Florence Nightingale was bedridden, however, she kept working in the field of hospital planning.

### **Looking inside the body**

On November 8, 1895, Wilhelm Konrad Röntgen, a German physics professor, discovered the X-rays (the X to indicate their unknown origin). Röntgen received the first Nobel Prize in Physics for his discovery and started the field of medical images. His wife's hand was the first X-rays picture ever obtained. It was, no doubt, a highly significant contribution to the emerging new hospital technologies. The scientific furor engendered by Roentgen's announcement can hardly be overestimated. In the ensuing year, 1,000 papers dealing with X-rays appeared [2]. The "Roentgen fever" in the European scientific community quickly became an American epidemic as well. Arthur Wright (Yale Physics Department), on January 27, 1896, 80 days after the discovery of the unknown rays, placed photographic paper beneath a cathode-ray tube showing the shadows of a pencil, a pair of scissors, and a quarter. In the meantime, another institution, Dartmouth, was making clinical history. Edwin Brant Frost, a professor of astronomy, who was familiar with cathode-ray tubes, was asked by his physician brother, G. D. Frost, to radiograph the fractured forearm of one of his patients. So, on February 3, 1896, that broken arm became the first clinical radiograph in the USA. The road to the radiology departments was being quickly opened and, simultaneously, the dangerous side of the rays begun to slowly show up in several sad mishaps, as for example the reported demise of Doctor Ernilio Tiraboschi, in Italy, who had practiced radiology for a few years without protection; leading to a now well-known dictum in radiology: *The smallest possible beam should strike the patient, and no rays should strike the observer.*

### **The elixir of life: blood**

Even though blood transfusion has a long history and can be traced back to 1492, when Pope Innocent VIII, in Rome, had an apoplectic stroke and received with crude methods an unsuccessful transfusion, the actual impact of the procedure became evident during World War I and soon it was applied routinely in the developing hospital environments, especially after complementary and highly significant contributions regarding anticoagulants and blood groups. The subject in itself represents a whole chapter in medical history showing remarkable and striking advances [3].

### **Hospitals and laws**

No doubt, the *Hospital Survey and Construction Act* (known as the *Hill-Burton Act*, after Senators Harold Burton of Ohio and Lister Hill of Alabama), passed in 1946, has a profound effect in the development of the modern hospital. This act was designed to provide federal grants and loans to improve the physical plant of the nation's hospital system. Money was allocated to the states to achieve 4.5 beds per 1,000 people. For the first time a quantitative relation was given as basic norm [4].

### **Engineering gets entangled with Medicine**

In the 1960's concern built up regarding electric hazards in hospitals, especially when the concept of microshock (as opposed to the common industrial or domestic macroshock) came to light. Long and hard was the road to reach the current level of medical knowledge, with contributions from its background sciences, including biomedical engineering, either by improving technology, theoretical models or processing algorithms. The concepts of Hospital Electrical Safety along with Bacteriological, Virological, Radiation and Mechanical Safety were clearly and unequivocally established [5].

New scientific knowledge brought a plethora of revolutionary areas such as organ transplantation, implants, rehabilitation engineering, molecular biology, genetics, fertilization techniques and the like, impossible to describe in a short overview like this short article. The modern hospital is centered around the patient as main objective to care for; special units emerged in the 1950's reaching nowadays high levels of advance, clinical engineering became a new and indispensable professional branch within the hospital environment, and such hospital is now, no doubt, a true high complexity health assistance organism where the patient enters with a high probability of good recovery, where the physician shares responsibilities with nurses and biomedical engineers alike.

### **Discussion and conclusions**

However, such current health bonanza is, in a sense, not fully true, for it dragged also second effects, some of them

painfully harsh. Costs increased tremendously, legal, ethical and even religious problems arose, the reach of medical services are still rather limited; still large population sectors, especially in Third World Countries, can not even dream of a computer tomography study, a cardiac pacemaker or a myoelectric limb prosthesis, and how many amputees of all ages after car accidents or war acts there are. To correct such situation is a real challenge, more social and political than technical or scientific, unless new developments brought down prices to extremely low levels and, even so, would the greedy human being permit them to be actually transferred to the actual medical good and service? [7, 8, 9].

Wide and far reach preventive medicine appears as another challenge, using fully non-invasive fast methods to assess health condition and to detect as early as possible any disease. Unfortunately, old pathologies are coming back and new unexpected ones seem to appear every year, as the recent dengue in some Latin American countries and porcine flu in many others.

A last and highly significant challenge is a more humane physician, that who develops a close rapport with the patient, calling him or her up to inquire for his/her recovery after a given therapy or just to know about his/her health after some time without news.

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