

The evolution of neuro-critical care in Mexico

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SUMMARY

Neurointensivism is a discipline of critical care medicine which was born in the second half of the 20th Century as a response to the need to provide a better standard of medical care to patients who suffer from neurological disease. In Latin America, and specially in Mexico, the birth and spread of a neurointensivist medical culture has been a great catalyst for the recognition and implementation of Neurological Intensive Care Units and thus improving the provision of care to neurological patients. We describe historical aspects and evolution of neurocritical care in Latin America, specially in Mexico.

Key words: Neuro-ICU, neurointensive care, Mexico, critical care history, Latin-American medicine.

RESUMEN

El neurointensivismo es una disciplina de la medicina crítica que se inició en la segunda mitad del siglo XX para ofrecer un mejor nivel de atención médica a los enfermos con padecimientos neurológicos. En América Latina, especialmente en México, el inicio y diseminación de la cultura médica del neurointensivismo ha contribuido significativamente al reconocimiento y la implementación de Unidades de Cuidados Intensivos Neurológicos, lo que permite, actualmente, ofrecer un mejor cuidado del paciente neurológico. Describimos los aspectos históricos y la evolución del cuidado neurocrítico en Latinoamérica, especialmente en México.

Palabras clave: Neuro-UCI, cuidado neurointensivismo, historia cuidado intensivo, medicina latinoamericana.

INTRODUCTION

Neurological intensive care, which was born of practical needs, has gradually evolved into a specialty of nervous system –oriented therapies based on clinical physiology. The true forerunners of neurological intensive care units (neuro-ICUs) were poliomyelitis wards that arose during the mid 20th century European epidemics, such as Spalding and Cramptom's respiratory-polio unit, at the Radcliffe Infirmary, Ibsen's in Copenhagen, and similar services in German and French hospitals. These areas designed for specialized nursing care and for overseeing of iron lungs evolved into modern respiratory intensive care units (ICUs)

but also established the principles on which neuro-ICUs are designed⁽¹⁾.

Founded as result of the polio epidemics of the 1950s, pulmonary critical care units grew rapidly in the United States, encouraged by commercial and federal reimbursement practices. The availability of funds for equipment was matched by technologic advances in medicine that led to advances in physiologic monitoring, many of which made their way into critical care units. The next three decades witnessed the dissemination of technology to many hospitals, both large and small, teaching and non-teaching⁽²⁾. As medical intensive care advanced, and neurosurgical operative volumes increased, a premium on ICU beds made it

difficult to find room for patients with acute brain, spinal or neuromuscular disease, and special rooms, by necessity, appeared on large neurological and neurosurgical services^(2,3). Modern neuro-ICU programmes have matured quickly from the first devoted units in the mid-1970 to a rapidly growing number in the 1990s⁽⁴⁻⁵⁾.

The field of neurology in South America began to emerge towards the end of the nineteenth century, following the birth of the specialty in Europe. There was a consistent and long-standing admiration for European training, which led to the development of the discipline in South America. The first steps, in Argentina, Brazil, Uruguay, Chile and Peru, took place almost simultaneously with European countries. The first department of Neurology at the Hospital San Roque de Buenos Aires was created in 1885 and headed by José María Ramos Mejía, who then took over as Professor of Neurology at the University of Buenos Aires School of Medicine in 1887. The first institute of neurology in Latin America, the Instituto Neurológico de Montevideo, was founded in 1926 under Américo Ricaldoni's direction⁽⁶⁾. In Mexico, the first modern intensive therapy suite was founded by Dr. Clemente Robles, who contributed greatly to surgery on a national level, in 1954. Development of neurocritical care in Latin America has been slow compared to other developed countries, especially in Mexico it began only in 1962⁽⁷⁾. The historical evolution of critical care units, including Neuro-ICUs in developed countries has been described previously. However, the history of how these critical care units, especially Neuro-ICUs, began, suffered adaptations, and continue to function in developing countries, specifically in Latin-America has never been published in the medical or social literature. We describe historical aspects and evolution of neurocritical care in Latin America, specially in Mexico.

PRE-POLIOMYELITIS ERA

In the 14th century, Bishop Don Vasco de Quiroga and Fray Bernadino Álvarez founded, in Mexico City, the Hospital of the Convalescent and the Hospital of the Natural, in which there was a special room for recovering patients. However, intensive care units (ICUs) were born in 1799 during Napoleon Bonaparte's campaign in Egypt; they were designed by Baron Dominique Jean Larrey, who is one of the most important figures in the history of surgery and whom Napoleon cited in his will, as «the most virtuous man he had ever known»⁽⁸⁾.

Larrey also thought of mobile ambulances and they were first used in 1793 during the campaign of the Rhine. At that time, medical help arrived at the end of the military action and the results were disastrous: the injured soldiers bled to death, became shocked or developed infections because the

wait could be very long. Baron Larrey used ambulances to quickly withdraw the wounded from the battlefield in the clamor of battle. Larrey equipped the ambulances with medical supplies and trained staff who could take care of the injured during their transportation to rearguard stations where they were further treated before they were referred to military hospitals. Among other actions, he ordered to concentrate all the badly wounded in a particular place where they received special attention; he himself treated them and practiced the necessary surgeries. Thus, it was Baron Larrey who conceived of consecutive and gradual care⁽⁸⁾.

In 1922, Walter Dandy, in the John Hopkins Hospital in Baltimore, reserved three beds to take care of their neurosurgery patients⁽⁹⁾. However, the first modern intensive care unit was planned, organized and implemented by the great neurosurgeon Dwight E. Harken and the nurse Edith Heide-man in the Peter Brigham Hospital in Boston, in 1951. Several months later, a similar unit was opened elsewhere in Massachusetts. Both units were designed to take care of patients who had undergone major cardiac surgery, but they were quickly expanded and used for other types of highly dependent postsurgical patients. In 1955, a unit was opened in Denmark to meet the formidable physiological challenges posed by new medical advances: extracorporeal circulation, cardiac arrest deliberately induced with the use of cardiologic solutions, hypothermia, the determination of acid-base balance, continuous cardiac monitoring, the application of breathing support, defibrillators and pacemakers. Twelve years after the initiative of Harken other specialists, such as anesthesiologists and traumatologists, became interested in these new possibilities and units for shock or burns treatment, and respiratory support multiplied⁽¹⁰⁾.

In Mexico, the oldest records of units of this type are from San Luís Potosí, in 1890 and 1899. In 1890 Dr. Miguel Otero y Arce presented his project for the military hospital for that state; a specific room for special postoperative patients can be seen in his plans. At first sight it may seem that the room was intended for officers, since the planning included two rooms for officers, but this was not the case. Although there is no record that Dr. Otero's ideas were carried out, there is evidence that the plans exist. In 1899 a sanatorium planned and built by Dr. Gustavo Pachenstecher from San Luis Potosi was solemnly opened, Dr. Pachenstecher was one of the Fathers of modern Mexican surgery who also introduced asepsis, performed the first middle meningeal ligature in the country, and was author of many other contributions⁽¹¹⁾.

The chronicler of the local medical magazine, *El Progreso Médico* (1899), describes in an article the facilities of the hospital and points out that there was a room for anesthesia, another for surgeries of infected cases, another for surgeries of clean cases, and mentions what is the pivot and object of

the matter of this report: there was another room for seriously ill patients which communicated with the area occupied by the nurses. In this way, seriously ill patients were concentrated in a special place and were under direct and close surveillance⁽¹²⁾.

POST-POLIOMYELITIS ERA

The first wave of Intensive Care Units in Latin America were founded at the end of the 1960's and the early 1970's. The first of these was founded in 1956 in Argentina; it was equipped with cutting edge technology in order to offer intensive care handling and was managed by intensivist medical doctors^(13,4).

In Mexico, the first modern intensive care suite was founded in 1954 by Dr. Clemente Robles, who contributed greatly to the Mexican surgery. Only three years later Harken opened his. This second unit was located in the National Institute of Cardiology of Mexico and was designed for cardiac surgical patients. Dr. Robles obtained the collaboration of Dr. Demetrio Sodi who commissioned Dr. José Roberto Monroy, member of his team, to be in charge of the electrocardiographic monitoring both transoperatively and postoperatively. Drs. Limon and Rubio, from the Hemodynamics Department, were assigned for the dosage of gases, acid-base balance and pressure monitoring. An *ad hoc* place with six beds for postsurgery control of serious surgical patients was built⁽⁷⁾. When in 1962, Don Clemente Robles assumed the Direction of the General Hospital of Mexico, he organized a great intensive care unit for seriously ill patients of internal medicine, diabetes, coronary, neurological or surgical patients. This unit was initially managed by Dr. Marcelo del Raso and subsequently by Dr. Héctor Rivera Reyes; thus, Dr. Clemente Robles was the initiator in Mexico of the intensive care units both medical and surgical⁽⁷⁾. In 1962, Dr. Benavidez sent nurses Beatriz Guerrero and Hilde Rhode to Washington to take training courses in intensive care; they were the first nurses in the country to have this preparation⁽¹⁵⁾. In 1966, Dr. Manuel Manzanilla Jr. organized one of these units in the Hospital Darío Fernández from the Institute of Security and Social Services of the State Workers, and José Roberto Monroy founded another unit in the French Hospital. Dr. Patricio H. Benavidez, who became the Director of the General Hospital of Mexico after Dr. Clemente Robles, organized the first unit of in Mexico, and for many years it was the only one in the country⁽¹⁶⁾.

The first coronary unit from the National Institute of Cardiology of Mexico was founded in 1969 by Dr. Antonio Estandía Cano, and the surgical intensive care unit of the Spanish Hospital of Mexico was founded in 1969 by Dr. Alberto Villazon Sahún⁽¹⁷⁾. The second intermediate care unit was organized by Álvarez Cordero from the General

Hospital of the National Medical Center of the Mexican Institute of Social Security, in 1970⁽¹⁶⁾.

Since the 70s, these units have multiplied in the hospitals of Mexico City and the country; now they even have their own specialized magazine, The Society of Critical Medicine was organized, and a Council of intensive care units was founded in 1986, which joined other councils from other countries, was formed, all these are fruits of the seed sown by Clemente Robles in 1954 at the National Institute of Cardiology⁽¹³⁾. Consequence of the wish to join efforts national and internationally, emerged the idea to create an international society of critical care, that included all the American countries, together with Spain and Portugal. The Constitutive Committee of the Federation was realized in Mexico City on September 24, 1976, with the presence of Delegates accredited how representatives of the Critical Care Societies from Argentina, Bolivia, Brazil, Canada, Colombia, Spain, United State, Mexico, Peru, Portugal and Venezuela. Delegates observing were from Chile, Ecuador, Panama and Uruguay. The foundation was formalized although a Constitutional Statement, in Mexico City, on September 12, 1980, being the Public Notary, García Diego. This document was recorded as Constitutional Statement No. 38 Vol 554 Folia 70 No. 21244 and signed by the doctors Alberto Villazón Sahagún and Sergio Rangel Castillo, with a period of duration of ninety nine years⁽¹⁸⁾.

Critical medicine is perhaps the youngest of all the medical specialties; it can be said that it was born in the 50s as a result of the need to provide ventilating support to people affected by an epidemic of polio in some European countries and the United States of America. It has had an important development in aspects such as personalized attention to the patient, the knowledge of the physiopathology of the patient in critical condition, and ethics, and it has been benefited with the advances in technology, molecular biology, and monitoring of treatment^(13,4). These units have also developed in Latin America and it can be said that currently there are critical care units throughout the region^(13,4). The neurological critical care units were born from the model of the general intensive care units⁽¹⁴⁾.

The National Institute for Neurology and Neurosurgery «Manuel Velasco Suárez» (INNNMVS) in Mexico was opened in February 1964. Its creation was an initiative of a group of medical doctors from the neurological service of the Juárez Hospital of Mexico, who were headed by Dr. Manuel Velasco Suárez. In the project all the specialties of neuroscience –neurosurgery, neurology, neuro-radiology, psychiatry, rehabilitation, and basic sciences– were combined in one place in order to have a comprehensive approach to the patient with neurological diseases. This was a revolutionary concept at the time and was a major scale project for the Mexico City; today, the INNNMVS has become one of

the world's leading institutes for the management of neurological diseases⁽¹⁹⁾. Its foundation is the result of a deep respect and love for life, of the craving desire of putting the medical science to the service of men, and provide quality of life «from the miracle of its dawn to the twilight of its existence», according to the words of Dr. Manuel Velasco Suárez⁽²⁰⁾.

The neuro-ICUs in Mexico were born with the foundation of the Institute, in 1964. Patients in post-surgical recovery, with postoperative complications and neurological conditions were handled in this unit. Initially, this was a mixed intensive care unit that took care of neurological and neurosurgical patients and was directed by physicians specialized in neurosurgery; in 1989, its direction was posted to intensivist medical doctors and in the 90s the training of medical specialists in neurointensivism started⁽²⁰⁾. However, the first neurological care units with an academic mission were opened in 1970 in the Massachusetts General Hospital, The Johns Hopkins Hospital and Columbia; there care units of medullar and central spinal cord injury were developed. At the same time, units for intensive neurological care appeared in Miami. In 1978, in Cleveland, a course on intensive care was organized for the American Academy of Neurology; the certification of general critical care began in 1987 through the American Council of Internal Medicine and the American Council of Anesthesiology. A group of specialists of the American Academy of Neurology has expressed the same interest, but their attempts to create an identity through the examination/certification of the subspecialists in neurocritical care have failed. In the 80s, the number of neurological intensive care units and the courses of neurocritical care increased substantially, and the ictus units appeared in the middle of the 80s as an extension of the neurological intensive care units. Also, in the middle of the 1980s in Europe, the units for the attention of neurological problems began⁽²¹⁾. In Latinoamerica, Mexico is pioneer in the installation of academic programs, certified process and recertified in critical care⁽¹⁸⁾. Also, Mexico started an exclusive Postgraduate course of the Neurocritical care, dedicated to intensivist and neurologist interested in this kind of medical attention⁽²⁰⁾.

NEUROINTENSIVISM IN MEXICO, CURRENT STATE

Numerous research works on the SNC have been done since the 90s and consequently, the neurological intensive care units have been better equipped and now they have more diagnostic tools as the electrophysiological studies, neuroimaging studies, Doppler ultrasound and cerebral angiographies. Attention to cases of subarachnoid hemorrhage, epilepsy, Guillain Barré syndrome, myasthenia gravis, CNS

infections of fimic, viral or bacterial etiologies is provided in these units^(20,21).

It is in the 20th century when a breakthrough in health technology and intensive care occurs. This care allows extending the life of critical patients who otherwise would die⁽²²⁾. On the one hand, these scientific and technological developments extend the life itself and, on the other, they modify the limits between life and death, and alter the way of dying, as the moribund may not be accompanied by his family. With the birth of the intensive therapy, death becomes even more scientific and technical and it is desecrated even more of its social and cultural character. In this second stage, lonely death is added to secularized death: today's man dies in hospitals, far from their beloved ones. This second process deepens and reinforces the medicalization of death. Today, the intensive care units try to overcome this negative aspect of care through the creation of multidisciplinary groups and support networks constituted by intensivists, thanatologists, nurses, social workers, and psychologists who accompany the patient's family in this difficult and painful experience (mourning). This allows the proximity of the family with the patient and this helps preventing the death alone, the cold death, the hospital death. For decades, man feared not knowing; now, man fears knowing too much, fears the knowledge, the infrastructure which waits in hospitals, pending the obsolescence of time and the limits that the man himself has established^(22,23).

In the early 1990s, Mexico showed clear signs of having entered a transitional stage in the health of its population. When compared with 1940 or even 1970, Mexico in the 1990s exhibited mortality patterns that more closely approximated those found in developed societies⁽²⁴⁾. Advances in medicine and increasing health knowledge have increased the life expectancy by 30 years in the second half of the century. While the health of Mexicans has increased in the last four generations, there are millions of citizens who still do not have regular access to health care services. Mexico has adopted a pluralistic health care system. It consists of a combination of public and private health insurance programs⁽²⁵⁻²⁷⁾. According to the Panamerican Health Organization, the expenditure in health for year how proportion of the gross domestic product of Mexico between 2000 and 2004 was between 5.6 and 6.5%, otherwise in Canada and United States was of 13%⁽²⁸⁾. This Health system provides only health insurance to 40% of the population who are privately employed⁽²⁵⁻²⁷⁾. This condition reflect the difficult situation of our region to get sufficient resources, that permit give the medical services that need the population, especially, the higher cost medical services, like as, the Neuro-critical care. An example of this situation, is the lower number of the critical care beds in Latino America comparing with the developed countries. Still, when Mexico is the countries

that have the highest number of the critical care beds in Latino America, 1:000 habitants⁽¹⁸⁾.

The cost of health care in Mexico has escalated during the last two decades due to two recent financial crises in 1999⁽²⁹⁾ and 2008. However, critical care has grown significantly in Latin America. This growth was caused by the increase in the number of patients requiring this specialized care for whom excellent outcomes are achieved with the indisputable development of critical care. There is an increasing interest for the application of systems ensuring quality medical care, a reason why some countries have decided to make critical care part of their legislation⁽¹⁸⁾. In relation to this last aspect, on December 12, 2003, the Federal Diary of Mexico published the project of Official Norm Mexican PROY-NOM-206-SSA1-2002, about the regulation of the Health Services, which established the criteria of functioning and medical assistance in the Emergency Services of the hospitals, including the intensive and intermediate care⁽³⁰⁾.

NEURO-ICUS, A CURRENT NECESSITY

Since 1980, pioneering neurointensivists like Dr. Allan Roppen and Dr. Daniel Hanley demonstrated that critically ill neurology patients have unique needs that are best addressed by medical neurologist with specialized expertise in the natural history, pathophysiology, monitoring methods, and interventions demanded by their acute illnesses⁽³¹⁾. Today, the problems encountered in caring for critical ill neurological and neurosurgical patients often are complex and include stroke, head injury, subarachnoid hemorrhage, CNS infections, Guillain-Barré, myasthenia, and status epilepticus, all of which require combined medical and neurological skills to manage⁽³²⁻³⁴⁾.

Stroke Units were conceived to care for large numbers of stroke patients efficiently and with higher quality that can be accomplished on general wards^(35,36). Clinical trials and meta-analysis have consistently demonstrated the effectiveness of Stroke Unit services for hospitalized stroke patients⁽³⁷⁾. In patients hospitalized with stroke, care in organized stroke units reduces mortality more than alternative forms of care. Also, such units reduce risk for dependence by 10% to 14% without increasing length of hospital stay⁽³⁸⁾. These outcomes are similar to other neurological and neu-

rosurgical conditions, like status epilepticus, Guillain Barré, myasthenia, etc., where the introduction of a neurocritical care team, including a full-time neurointensivist who coordinated care, is related with significantly reduction in-hospital mortality and length of stay without changes in readmission rates or long-term mortality⁽³⁹⁾. Unfortunately, the implementation of the formal Stroke Units in Latin America is limited for multiple factors, including financial and health politics local in each country, including Mexico⁽⁴⁰⁾. Even, when in our country in 2005, the cerebrovascular disease occupied the third place as cause of death, corresponding to 5.6% of the all the causes of the death, equivalents to 27,396 deaths⁽⁴¹⁾. This is the reason, which the current National Health Plan 2007-2012, will try to impulse a integral policy to the preservation and control of overweight, obesity, diabetes and cardiovascular risk. Also, build and consolidate the National System of High specialty medical attention⁽⁴²⁾.

CONCLUSIONS

The advent of the intensive care units has been a great contribution of the 20th century, with them, it has been possible to provide a multidisciplinary handling of the patients in critical condition, many of whom may have died if they had not had received this type of attention. However, the creation of general or multipurpose units was not enough; therefore, in the decade of the 60s and 70s the foundation of critical units with different specialties began, i.e. units for intensive pediatric, breathing, cardiac, neurological, and burned care were created. In our country, the neurointensivism has been strengthened and this has improved the handling within and outside our institution. We have emphasized the aspect of the management of the critical patient due to the importance of SNC. It is, therefore, of great importance to have the appropriate multidisciplinary work team and the neuromonitoring just next to the patient's bed to be able to dynamically adjust the therapeutic measures; this will allow us to restore the patient's health, reduce the degree of sequels or invalidity, or prevent his death after he has suffered an injury of the central nervous system.

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