

# A look at the future after 35 years of history of neonatology of the Centro Hospitalar Universitário São João

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## Abstract

The authors aim to describe the 35 years of history of the neonatal unit of the São João University Hospital Center (*Centro Hospitalar Universitário São João*), Porto, Portugal, a level III-C hospital, analyzing the evolution of its health care and academic and scientific activities. This article also pays tribute to all people involved in the creation and evolution of the neonatal unit.

Since its opening in 1983, in a context of growth in the neonatology field, both nationally and internationally, many changes occurred. Some of these include the gradual increase in the number of admissions in the Neonatal Intensive Care Unit, a decrease in the mortality rate and morbidity, a constant modernization and specialization of the professional team and equipment, the general improvement in health care and a recent adoption of a new philosophy of care, a family-integrated approach. The neonatal unit actively contributes to the academic activity in the São João University Hospital Center (*Centro Hospitalar Universitário São João*) and in the Faculty of Medicine of the University of Porto (*Faculdade de Medicina da Universidade do Porto*) and also has an active scientific activity, with a progressive increase in the number of published papers, in national and international journals.

The authors believe that it is possible to work for a better present and future by looking at the past. The positive evolution observed over the years is encouraging to continue in the future. The recent creation of the University Medical Center between the Faculty of Medicine of the University of Porto and the São João University Hospital Center is also a good promise for a more interconnected work between health care and both the academic and scientific activities in neonatology.

## Keywords

History of medicine, Neonatal Intensive Care Unit, Faculty of Medicine of the University of Porto, newborn, neonatal health care, neonatal research.

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## Introduction

Since 1959, the São João University Hospital Center (*Centro Hospitalar Universitário São João*, CHUSJ), a level III-C hospital in Porto, city in Northern Portugal, has been co-located with the Faculty of Medicine of the University of Porto (*Faculdade de Medicina da Universidade do Porto*, FMUP) [1, 2].

The neonatal unit of the CHUSJ was created as a neonatal sector in the early 1980s, a decade that had seen a growth in neonatology, both nationally and internationally [1, 3].

Internationally, the growth in neonatology in the 1970s was made thanks to the creation of the first Neonatal Intensive Care Units (NICUs), the creation of new medical techniques for the newborns as well as an increase and diversification in health professionals in this field. This growth continued into the next decades [1].

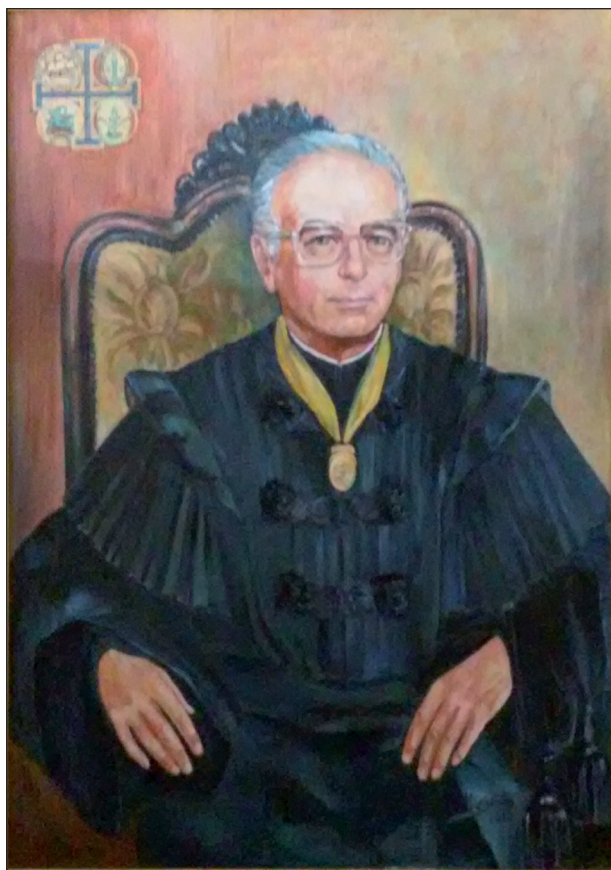
In Portugal, before the recognition of pediatrics as a specialty by the Portuguese Medical Association, neonatal care was under the responsibility of obstetricians. After their recognition in the 1970s, this responsibility was given to pediatricians. In the 1960s and 1970s, Portuguese neonatology saw a growth thanks to the work of some important pioneers like the Primary Health Care Management (*Direção Geral dos Cuidados de Saúde Primários*) and the Portuguese Pediatric Society (*Sociedade Portuguesa de Pediatria*) that worked in the improvement of the following factors: the development of maternal and neonatal

health care, the generalization of physicians careers in the country, the education of health professionals in maternal and neonatal care, and the acquisition of reanimation tools for neonates in the Portuguese health facilities. In the 1980s, the first neonatal sectors integrated into pediatric units were established in Portugal [1, 3].

When the CHUSJ was built, there was already a project for a place dedicated to neonatal care; but, until the creation of the neonatal sector, this care was given in the newborn nursery of the pediatric unit. Pediatric residents had their training in neonatal care in the phototherapy room and in the newborn nursery (**Fig. 1**). Some years later, the pediatric unit was in need of a specialized team in neonatal care and other pediatric specialties; so its director, Norberto Teixeira Santos, M.D., Ph.D. (1932-1999) (**Fig. 2**), worked on its reorganization. Consequently, in 1982, pediatric consultation was reorganized; and the neonatal consultation was created in this process. On 5 July 1983, the



**Figure 1.** Phototherapy device used in the phototherapy room.



**Figure 2.** Painting of Norberto Teixeira Santos.

neonatal sector opened thanks to the addition of a partially functioning NICU in the newly remodeled installations of the pediatric unit [1, 3].

FMUP and CHUSJ where the neonatal unit is included, being nowadays a part of the Maternal Pediatric Center (*Centro Materno Pediátrico*), have evolved since 1983, and the creation in 2015 of the University Medical Center FMUP-CHUSJ (*Centro Universitário de Medicina FMUP-CHUSJ*, CUME) is one of the examples of this evolution. CUME aims to strengthen the collaboration between FMUP and CHUSJ, which has already been existing since 1959, with an increase in the synergy between health care, scientific and academic activities of these two entities [4].

The aim of this study is to describe the history of the neonatal unit of CHUSJ between 1983 and 2018 and analyse its health care, academic and scientific activities. An analysis of these 35 years of history offers a look into the future of its activity.

## Methods

The books “*O Ensino da Pediatria na Escola Médica do Porto*” (The Teaching of Pediatrics in the Physician’s School of Porto) and “*50 Anos da*

*Pediatria do Hospital de São João*” (50 Years of Pediatrics in the Hospital São João) were primarily used for the description of the older events of the neonatal unit.

The authors also included some articles published by the neonatal unit between 2013 and 2018 as long as they had relevant information for this work.

Articles from the websites of some official entities were consulted to find important dates and information. The authors used the websites of the Portuguese Republic Diary [5], the Newborn Individualized Developmental Care and Assessment Program® (NIDCAP®) [6], CHUSJ [7], FMUP [8], FMUP library [9] and the Portuguese Medical Association [10].

The authors reviewed the annual reports of the neonatal unit of the CHUSJ [7], the data of Nelma Celeste Gonçalves, M.D. (1933) from the Portuguese Medical Association [10] and the curricula vitae of Rui Carrapato, M.D., Ph.D. (1946) [9], Hercília Guimarães, M.D., Ph.D. (1953) [7] and Fátima Clemente, M.D. (1964) [7].

## Neonatal unit history

The newly created neonatal sector on 5 July 1983 had 8 beds and 3 neonatal ventilators. It functioned with a small team of pediatricians and one of them, Nelma Celeste Gonçalves, was its first coordinator [1, 3, 10].

The addition of neonatal protocols in 1985 was an important step in the evolution of the neonatal sector. Rui Carrapato, a pediatrician that worked there at the time, implemented these and received his doctorate in 1987 thanks to his dissertation “*Carnitine metabolism of the newborn*” [1, 3, 9].

In 1986, the first two neonatologists of the NICU were appointed [3].

The transport of high-risk neonates in the North of Portugal by the National Institute for Medical Emergency (*Instituto Nacional de Emergência Médica*, INEM) was initiated in 1988. At the time, it was done with the collaboration of some NICUs in which some neonatologists and nurses were recruited and received neonatal intensive care training. In September 1988, the CHUSJ made an agreement protocol with INEM and the transport started in October of the same year. The headquarters of this transport were in the CHUSJ and most of its team members were from its NICU [1-3]. CHUSJ stopped being the headquarters of the transport of high-risk neonates in the North of Portugal in late 1998. After that, coordination was planned between the hospitals

of the region and the CHUSJ was the coordinator in the years of 1999, 2004 and 2009 [2, 3]. Since April 2011, the transport of high-risk neonates in the North of Portugal has been done by a new team composed of pediatricians and nurses that receive neonatal and pediatric intensive care training. They work in the NICU of the CHUSJ at night and in the Pediatric Intensive Care Unit during the day [2].

On 16 May 1991, the Portuguese state allowed 13 neonatologists to be employed in the neonatal sector [11], which, since October 1992, ensured the possibility of having the presence of a team of doctors 24 h a day [3].

On 27 March 1996, the pediatric unit was transformed into the pediatric department. Thus, the neonatal sector was transformed into the neonatal unit [1, 3]. Hercília Guimarães was named as the first director and currently still is. She took an apprenticeship in neonatal intensive care in the Hospital Antoine-Béclère in France between October 1989 and October 1990, has been a neonatologist since 1992 and was named Professor of FMUP in 1993 after she defended her dissertation entitled “*Evaluation of new drug therapies by inhaled administration for prevention of bronchopulmonary dysplasia*” [1, 3, 7]. From then until now, the neonatal unit has been divided into four sectors: the NICU, the perinatology sector, the neonatal consultation and the delivery room. In 1996, other events contributed to an improvement of the neonatal care of the CHUSJ and gave positive results in infectious rates, sequels and life quality

of the neonates. The parenteral nutrition started to be prepared in CHUSJ pharmacy in a sterile way. The hospital initiated screening of the retinopathy of prematurity and the ophthalmologic examination in all neonates and the neonatal unit started doing hearing and development evaluation. Finally, the NICU began to give respiratory and motor kinesiotherapy to all the admitted neonates [1, 3].

Recognizing the importance for the neonate’s family to receive psychological help, a psychologist was appointed to the NICU in 2000 [3].

In March 2003, the neonatal unit started the highly differentiated and specialized training of four of its professionals into the NIDCAP® program. The NIDCAP® program recognizes the dynamic relationship among the neonate, parents and health professionals promoting their development, the reduction of their stress and aiming to offer care for both the newborn and the family. It aims to optimize ambient factors that can affect the neonate’s development and includes as much as possible the neonate’s family thanks to a family-integrated approach [3, 12]. In March 2008, Fátima Clemente was the first neonatologist of the CHUSJ to receive the NIDCAP® program certification [3, 7]. On 1 April 2015, São João NIDCAP® training center was created (**Fig. 3**) [13].

Since 2005, the neonatal unit has provided transportation for the neonate after discharge to home [7].

Since 2006, there has been a project that offers preparation for the neonate’s discharge. It includes



**Figure 3.** Creation of the São João NIDCAP® center.

a phone contact with a nurse of the neonate's health center and the possibility of visits from a social worker [7].

On 1 June 2007, the neonatal, obstetrics and otorhinolaryngology units started a collaboration to do a universal hearing screening in all children [3].

Since 2010, the NICU has used Extracorporeal Membrane Oxygenation (ECMO) in neonates with severe respiratory and/or cardiac failure. It was applied for the first time in September 2010 [14, 15]. In the same year, the neonatal unit started evaluating feeding competences of neonates and initiated a project for injury treatment in the context of neonatal care [7].

In October 2011, the NICU introduced the use of hypothermia as a treatment in the perinatal hypoxic-ischemic encephalopathy for neonates that fulfill eligibility criteria [16].

On 11 March 2016, the CHUSJ was recognized as a referral center in the areas of congenital cardiopathies, metabolic diseases and oncologic diseases [17].

### Health care activity

The constant work, development and specialization of the professional team of the neonatal unit led to an improvement in the health care given to newborns. As described previously, this improvement was made thanks to the addition of new techniques, the participation of the neonatal unit in screenings for the newborn and the recent adoption of the philosophy of care to a family-integrated approach. There is some other evidence that shows the improvement of the care activity.

Being in a level III-C hospital, the neonatal unit receives a high number of neonates with severe pathology and had a gradual increase in the number of patients admitted to the NICU over the years (379 neonates in 2017). However, at the same time, it managed to gradually lower the mortality rate: the highest recorded was 23.7% in 1985 and in 2017 it was at 2.1% [3, 7].

After the adoption of new ventilation procedures that led to a decrease in the use of invasive mechanical ventilation and to an increase in the use of non-invasive mechanical ventilation, the NICU had a decrease in the prevalence of pneumothorax (2.4% to 0.9% between 2003 and 2014) and a decrease in the prevalence of bronchopulmonary dysplasia (9.7% in 1996-2005 to 6.1% in 2006-2015) [18, 19].

After the introduction of the use of inhaled nitric oxide in 2003 and ECMO in 2010, there was a decrease in the mortality of newborns with persistent pulmonary hypertension from 52% to 34.2% between 1996 and 2012. This value is higher than in other centers, probably due to the fact that the CHUSJ is a level III-C hospital, and thus receives neonates with severe pathologies [15].

In 2010, a new nosocomial infection preventive bundle was implemented [20, 21]. After this implementation, the density of nosocomial sepsis decreased to a value in accordance with other NICUs (8.6 per 1,000 patient days between 2007 and 2010 to 4.8 per 1,000 patient days between 2010 and 2013) and the central line-associated bloodstream infection (CLABSI) rate of the NICU decreased from 14.1/1,000 catheter days between 2007 and 2010, to 10.4/1,000 catheter days between 2010 and 2013 [21]. Despite the previous decrease, the CLABSI rate increased to 12.4/1,000 catheter days between 2014 and 2016 [22], which led to the reinforcement of infection control measures resulting in a decrease of the CLABSI rate to 3.0/1,000 catheter days in the first half of 2018 (unpublished data). This is a reminder for all members of the unit to rigorously follow the infection prevention protocols.

The neonatal unit shows good results in other fields. One study found that the survival rate for neonates with gastroschisis was 92.3% between 2002 and 2011, a value that is in accordance with the literature [23]. From 2005 to 2014, the neonates with cardiac arrhythmias had a mortality rate at discharge of 3%, 9% of the others had sequelae and these results were consistent with those of other authors [24].

The field of perinatal palliative care has also evolved in the unit in the recent years and is associated with a constant ethical concern. Therefore, parents of the neonates in this situation have the possibility to receive psychological and religious support and there is a perinatal palliative care program in the unit, the first implemented in a level III Portuguese NICU, in which they are integrated into the decision-making process [25, 26]. This practice is an integrated part of the newborn- and family-centered approach, adopted in the NICU [27].

### Academic activity

The neonatal unit offers pregraduate education. Many of its doctors were and are pediatric professors at FMUP, and in 2017 all neonatologists were teachers in the pregraduate education [3, 8].

The unit provides postgraduate activity since its creation in 1983. It regularly organizes scientific reunions and seminars with the goal of continuing the postgraduate training of its members and has been offering an annual education in the fields of infant health and pediatrics and mother health and obstetrics for nurses of these specialties since 1985. It provides the possibility to get a doctoral degree as done for the first time by Rui Carrapato in 1987. Since 1993, the CHUSJ has offered neonatology subspecialty training (*ciclo de estudos especiais em neonatologia*). Master's degrees can also be obtained in the neonatal unit and Madalena Ramos was the first to obtain it in 2001. Since 2004, some doctors of the unit have also participated in juries of doctorate and master's degrees. The unit also receives residents from pediatrics, cardiology, pediatric surgery and anesthesiology. It offers postgraduate neonatal intensive care training to pediatricians and other health professionals from national and international institutions. It namely receives resident nutritionists, psychologists, nurses and therapists [3, 7, 8].

The neonatal unit collaborated in the teaching of other faculties over the years [3]. In 2017, there were collaborations with the Faculty of Nutrition and Food Science of the University of Porto (*Faculdade de Ciências de Nutrição e Alimentação da Universidade do Porto*), the Nursing School of Porto (*Escola Superior de Enfermagem do Porto*), the Corporation for Polytechnic and University Teaching (*Cooperativa de Ensino Superior Politécnico e Universitário*) and the Catholic University (*Universidade Católica*) [7].

As already shown, the neonatal unit has been having an active role in the academic activity of the CHUSJ, FMUP and in the teaching of other entities. Consequently, the unit will surely continue its active academic activity in the future.

### Scientific activity

The neonatal unit has a diverse scientific activity. Its members presented scientific works in national and international conferences and reunions and participated in the organization of some of these [7].

The unit has published in national and international journals, with an improvement in the quantity and quality of its publications over the years [3]. In 2017, 24 studies were published [7].

The neonatal unit has been participating in networks of databases: the national database of very low birth weight neonates (birth weight < 1,500 g)

since January 1993, the database of perinatal deaths since 1996, the national database of congenital malformations since 1997, the database of neonatal meningitis since 2000 and the international Vermont Oxford Network Very Low Birth Weight Database from 2000 to 2013. These give the ability to analyze the care given to neonates and a means to compare the neonatal unit of the CHUSJ with others in the world to further improve maternal and child health indicators [1, 3].

The members of the neonatal unit have assumed some relevant offices. For example, some of its members are revisors of international and national journals, members of the direction of national and European societies and other groups. They also assume important roles in the CHUSJ and FMUP [7, 8].

The unit received research scholarships over the years, the first one being received in 2002 [3].

The neonatal unit and all the team worked to have a varied and relevant scientific activity both nationally and internationally. And, because of the participation in the above-described databases and in the academic activity, it will certainly continue to produce results that will be analyzed and published in the future.

### Conclusion

After 35 years of history, the neonatal unit of CHUSJ has seen an improvement in the health care given to newborns and in the academic and scientific activities. The recognition as a referral center in the areas of congenital cardiopathies, metabolic diseases and oncologic diseases is an example of this improvement.

Its establishment as a NIDCAP® training center is a step forward in the further development of neonatal care into a family-integrated approach as well as the creation of the perinatal palliative care program, showing the visionary philosophy of the neonatal unit.

The authors emphasize that the accurate integration of health care, scientific and academic activities will be an added value for the future.

### Declaration of interest

The Authors have no conflicts of interest to disclose.

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