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Review

Neonatal transport in the Northern Region of Portugal: from past to present

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Abstract

The authors aim to provide a description of the beginning of neonatal transport in Portugal and remember all professionals, doctors and nurses who voluntarily dedicated themselves to this cause for more than two decades with great commitment.

Neonatal transport is essential and a valid alternative to the best transport for the newborn – the mother's womb. It is part of a perinatal regionalization program to ensure that newborns are born in facilities with a care level definition that is consistent with expected pregnancy outcomes. In Portugal, it dates back to three decades ago, thanks to the institution of the Neonatal Transport System, in the context of regionalization of perinatal health care in the country, and was organized on a voluntary basis up to 2011. During this period neonatologists and nurses trained in neonatal intensive care worked extra hours in the neonatal transport. Since 2011, a team specialized in intensive pediatric care replaced the previous one.

Nowadays there is no reliable evidence from randomized trials to support or refute the effects of specialist neonatal transport teams for neonatal retrieval on infant morbidity and mortality. Continuous and regular education, training and practice are essential key elements in the success and outcome of high risk newborns.

Further development is required to optimize the use of available resources, to develop benchmarking to ensure a high quality sustainable service and to provide us with answers on effectiveness and clinical outcomes.

Keywords

Neonatal transport, high risk infant, perinatal regionalization, neonatal intensive care.

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Introduction

Although patient transport existed since ancient times, transport medicine is a relatively new area within pediatrics. It was only in 1995 that a section in transport medicine was officially established at the American Academy of Pediatrics [1]. In some countries like the United Kingdom, France, Italy, the United States of America and Australia, the transport of seriously ill children has been fully organized for over two decades [2-7].

Transport can be carried out by personnel working in the Pediatric Intensive Care Unit (PICU) and that are freed from their functions in order to carry out the transport, or by personnel that are on standby at home and are called in case of necessity, or by personnel that are in dedicated hospital exclusively for the transport. All these models have obviously advantages and disadvantages in terms of effectiveness, cost and profitability of the staff.

In Portugal, transport of the high risk newborn dates back to three decades ago, thanks to the institution of the Neonatal Transport System, in the context of regionalization of perinatal health care in the country. It started to operate in 1987 in the South (Lisbon), and in 1988 in the North (Porto) and Center (Coimbra) of Portugal.

In Lisbon, neonatal transport is done by neonatologists or pediatricians working in Neonatal Intensive Care Unit (NICU) or PICU, by integrating intensive pediatric and neonatal transport. It has also recently been organized in Algarve between two hospitals (Portimão and Faro).

In Coimbra, neonatal transport is centralized in a pediatric hospital. The pediatrician working in the transport serves as the second pediatrician in the polyvalent intensive care unit, 24 hours a day.

In Porto, between 1988 and 2011, the transport of the newborn used to be done by neonatologists and nurses having experience in intensive care who worked extra hours. Since 2011, an organized pediatric transport (newborn and child) called "Pediatric Interhospital Transport" is in place. Pediatricians and nurses trained in intensive neonatal and pediatric care integrate this service.

The aim of this study is to describe the evolution observed in the neonatal transport organization in the Northern Region of Portugal, since its beginning in 1988.

Neonatal Transport System in the Northern Region of Portugal

Neonatal transport is part of a regionalization program in all countries. The geographic rectangular area of Portugal, with its division into three zones (North – Porto, Center – Coimbra, and South – Lisbon), facilitated the regionalization and the transport headquarters.

In all country the network of perinatal healthcare works as follows: 1) level II hospitals transfer mothers or newborn to level III hospitals in their area whenever needed; 2) very low birth weight (VLBW) infants are born in level III hospitals; 3) all transfers of pregnant women and newborns are carried out according to the geographical area, the pathology (medical, cardiac and surgical) and the availability of places. In the Northern Region there are five NICUs (one receives the cardiac newborns and two the surgical ones). The existence of a good coordination between level II and level III hospitals allows organizing the transport of the newborns back to level II hospital when intensive care in a level III NICU is no more needed [8, 9].

Neonatal transport is essential and a valid alternative to the best transport for the newborn, the mother's womb.

In 1987, the regionalization of perinatal healthcare starts to be organized in Portugal, and since 1988 neonatal transport also was part of the process. A subsidiary service of the National Institute for Medical Emergency ("Instituto Nacional de Emergência Médica", INEM) called "INEM – newborn transport" was available exclusively for the transport of sick newborns between NICUs across the country, whenever *in uterus* transport was unavailable. The ambulance was a traveling NICU. For long distances the air transport was used [8, 9].

In September 1988, an agreement protocol was signed between the Hospital São João (Porto) and the INEM and, in the same year, the first guidelines for transport of the high risk newborn were written for the transport to start in October 1988. The largest number of doctors and nurses who collaborated in this subsystem belonged to the NICU of the Hospital São João, but doctors and nurses of other four Northern hospitals also collaborated.

Until 1993, some incidents were reported, some of them related to the poor quality of access to

hospitals and frequent breakdowns of ambulances. Lack of pediatricians or physicians with experience in pediatrics was still a frequent reason for transfer of newborns at risk. During 1993 and early 1994, problems of this transport emerged with increasing frequency, in addition to the insufficient number of doctors. This was due to the disproportion between the entrance and the exit of the doctors of the central hospitals, reflecting on the discontinuance of medical schedules.

In June 1994, an agreement was signed between the INEM and five central hospitals in Northern Portugal, in order to reactivate the high risk newborn transport system.

New standards for the transport of newborn were prepared, namely the schedule for all five hospitals involved, the transport instructions, such as indications and contraindications to the transport, and the coordination.

On request for transport, it was the INEM medical service responsibility to ensure the position of the patient, through telephone contact with hospitals. The exception was the absence of the transport team for being absent from service. In this case it would be the scheduled hospital which would handle the subsequent organization of transport.

From October 1989 to March 2011 all neonatal transports were done by a pediatrician and a nurse, recruited amongst NICUs staff and trained in neonatal intensive care, doing an extra voluntary work.

During this period, the transport team had a mission to train professionals in the hospital of origin with improvement of healthcare for newborns, allowing a good stabilization and decreasing complications during transport.

Before transport, the team showed the newborn to the mother and left her a photograph of him/her.

The father and other family members could follow the ambulance in their own car. These aspects, at the time (last years of eighties of the 20th century) were the equivalent of family-centered care (FCC), which is widely common today.

Although neonatologists work in Portugal on the basis of national needs and clinical consensus, there are few national transport protocols. Comparing the neonatal transport in the three regions (North, Center and South) in the country, we observed some differences: in the South, it is carried out by neonatologists and/or pediatricians working in NICUs or PICUs, by integrating intensive neonatal and pediatric transport; in the Center, it is centralized in the single pediatric hospital in Coimbra, and it is done mainly by pediatricians corresponding to the second pediatrician working in the PICU. In Porto, between 1988 and 2011, the transport of the newborn used to be done by neonatologists and nurses having experience in intensive care who worked extra hours. Since 2011, an organized pediatric and neonatal transport is in place. Pediatricians and nurses trained in intensive neonatal and pediatric care integrate this service. In conclusion, in Portugal there is not a national pediatric (and neonatal) transport program.

Neonatal transfers in the Northern Region of Portugal

A retrospective analysis of all neonatal transports in the Northern Region of Portugal from October 1988 to March 2011 shows that 7,714 transports were conducted during this 23 years period with a yearly average of 351 transports. The majority were ground transports.

Hospital São João received 28% of transfers. It was also the most requesting hospital (24%) due to the fact that it was a referral center for neonatal cardiac and surgical pathologies. In order to receive the newborns with these pathologies, it was sometimes necessary to transfer patients without surgical conditions. The request for transport was mainly for medical diseases, prematurity and respiratory distress syndrome being the most frequent conditions (26%). Both surgical and cardiac newborns correspond to 50% of all transfers.

Mechanical ventilation was necessary during the transport in 66% of cases. Twenty percent of the transports were retro transfers.

In recent years, namely since April 2011, a specific transport for both newborn and child is in place, done by another group of pediatricians and nurses trained in intensive neonatal and pediatric care. They are part of an independent Division of the Pediatric Department (Interhospital Pediatric Transport Division) and they work in Hospital São João (in NICU during the night and in PICU during the day) if there is no request of transports. In the NICU of Hospital São João the second pediatrician working all nights is the pediatrician of pediatric transport.

Aspects to improve neonatal transport in the near future

Nowadays, important aspects to improve are to promote the elaboration of clinical protocols and

to adopt a severity score to monitor the quality of care during the transport.

The paradigm of pathologies needing transport changed worldwide in the last years according to the new therapeutic options.

The ambulances are secure and medicalized, being actually a NICU during the neonatal transport. Nowadays it is a challenge for all teams to optimize management and treatments during transport.

Inhaled nitric oxide (iNO) therapy during the transport of neonates with persistent pulmonary hypertension (PPH) or severe hypoxic respiratory failure is more and more necessary, as earlier initiation of iNO may decrease length of hospital stay in surviving neonates with PPH not requiring extracorporeal membrane oxygenation (ECMO) [10].

In neonates with hypoxic-ischemic encephalopathy (HIE), it is mandatory to use active hypothermia during transport to referral centers, to maximize the neuroprotective effect. Hypothermia must be initiated as soon as possible after birth. Many infants who would benefit from therapeutic hypothermia are not always born at centers that offer therapeutic hypothermia and are thus transported to a tertiary care NICU. The neonatal transport team plays a significant role in the management of these critically ill infants [11-13].

Newborn infants requiring ECMO and transported by an experienced ECMO team have outcomes very similar to newborns who undergo ECMO but are not transported. It has been previously reported that interhospital ECMO transport is feasible and can be accomplished safely. ECMO centers must consider developing interhospital ECMO capabilities to better serve patients in different geographic regions [14-16].

FCC during acute neonatal transport must be optimized. Parents were always active participants in the care of their infants, even during the transport process, consistent with the concepts of providing FCC. In a recent study approximately 40% of parents felt they had received adequate information about their infants' care during the transport but 40% cited separation [17].

The integration of FCC core concepts during an acute neonatal transport has been shown to be increasingly important to parents and may facilitate communication and help them become active participants in their infants' care. During this 23 years period of high risk newborn transport by the neonatal team, it was our practice to show the baby to the mother, father and family if they were in the hospital. A photo of the newborn was offered to the parents before the separation, as mentioned before. These simple attitudes are very positive in perinatal healthcare and should be reinforced [17].

Conclusion

Neonatal transport in Portugal began over three decades ago, as part of the overall regionalization program of the country, and was organized on a voluntary basis until 2011. During this period neonatologists and nurses trained in neonatal intensive care worked extra hours in the Neonatal Transport System. Since 2011, a team specialized in intensive pediatric care replaced the previous one. This well-organized new transport system will contribute to improve and to maintain the quality of pediatric transport.

The transport of a newborn infant involving risks and limitations can be compensated if this is done by qualified personnel using the equipment adapted for this purpose.

As in all other clinical specialties, continuous and regular education, training and practice are essential keys in the success and outcome of these high risk newborns.

Is has recently been shown that there is no reliable evidence from randomized trials to support or refute the effects of specialist neonatal transport teams for neonatal retrieval on infant morbidity and mortality [18].

Further development is required to optimize the use of available resources and to develop benchmarking, to ensure a high quality sustainable service and to provide us with answers on effectiveness and clinical outcomes. The adoption of FCC during acute neonatal transport must be a standard of care.

Declaration of interest

The Authors declare that there is no conflict of interest.

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