

# The National Neonatal Transport Programme (NNTP) 2004-2009

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## Abstract

A retrospective analysis of all National Neonatal Transport Programme (NNTP) transport data from 2004-2009 was performed. 1621 transports were conducted during this period with a yearly average of 271. The majority (96%) were ground transports. 1118 (69%) were forward transfers. Of the 446 (27.5%) retrotransfers, 411 (91%) were to tertiary centres. When transported, 592 infants (36.5%) were <48 hours old and 770 (47.5%) were <1 week old. 902 transports (55%) involved infants <32 wks birth-gestation and 720 (44%) involved infants weighing <1500gms. Transport for management of patent ductus arteriosus accounted for 357 (22%). The average mobilisation time was 34 minutes. 54% of transports were completed after scheduled service hours. The NNTP currently transports similar numbers of critically ill infants during its 8hr service compared with neonatal transport services that operate 24hr services. Performing PDA ligations in a tertiary neonatal unit would significantly reduce the number of neonatal transports required annually.

## Introduction

The National Neonatal Transport Programme (NNTP) was approved by the Department of Health and Children (DOHC) in 1998 and the first patient transported in 2001. Although initially expected to facilitate 150 neonatal transports annually, this figure has been greatly exceeded. Because of budgetary restraints at the time, the NNTP was only funded to handle transports between the hours of 09.00-17.00 seven days a week, 365 days a year. The transport team is comprised of a neonatal registrar, a neonatal nurse and a dedicated National Ambulance Service driver. The clinical teams are drawn on a weekly rotating basis from each of the three Dublin Maternity Hospitals. The NNTP has a dedicated ambulance specifically designed for the transfer of critically ill neonates. Bespoke transport incubator modules incorporate ventilators with disposable humidity systems and provide a number of ventilatory options, including SIMV. Equipment to provide inhaled Nitric Oxide (iNO), blood gas analysis and end tidal CO<sub>2</sub> monitoring is routinely available. While the majority of transports are by road, occasionally, urgent and/or remote transports necessitate air transport. A service level agreement governing the emergency inter-hospital air transfer of neonates within the island of Ireland was established between the Irish Air Corp and the Health Service Executive in 2006.

The NNTP air module meets International and European aviation standards and integrates into the Irish Air Corps helicopters, the NNTP's dedicated ambulances and other frontline national ambulances providing a seamless service from transporting centre to receiving centre. Initial contact with the NNTP is facilitated through the use of a single 'hotline' number. NNTP documentation is standardized to facilitate optimum inter-hospital communication and allowing for on-going audit and quality improvement. The NNTP website provides information about the programme including a daily updated status of neonatal bed availability to facilitate the sourcing of tertiary beds.

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## Methods

Standardised documentation forms designed to collect all relevant demographic and clinical information are used on all NNTP transports. These forms incorporate transport flowcharts which capture the time and the status of the infant at each stage of the transport process. They also include a review section to facilitate on-going audit. A duplicate copy of this information is returned to the NNTP after completion of the transport and relevant details are entered into a computer database. Eligibility criteria for transport by the NNTP include all neonates who, in the first 6 weeks of life (post-term), require critical care transfer by a specialised neonatal doctor and nurse. This study involved a retrospective analysis of all infants transported by the NNTP between 2004-2009 inclusive and the aim was to review the clinical activity of the NNTP during that time.

Figure 1

## Results

Over the last nine years the National Neonatal Transport Programme (NNTP) has transported almost 2200 babies, a figure that greatly exceeded initially projected numbers (Figure 1).<sup>1,3</sup> On average, 271 babies per year were transferred for the period 2004-2009 peaking at 319 in 2007. The majority of NNTP transports 1548 (95.5%) were by road with air transports accounting for 73 (4.5%) (Mean 12 air transports per year). From 2004-2009, 687 (42%) of all NNTP transports occurred between centres in the greater Dublin region, 880 (54%) involved centres outside the Dublin region transferring neonates to or from Dublin and the remaining 54 (4%) involved transports between centres outside Dublin (including Northern Ireland and abroad). In all, 1118 (69%) of transports were 'forward' transfers to tertiary centres and 446 (27.5%) were 'retro transfers' (but still requiring intensive care) to referring centres. The remaining 57 (3.5%) of transports were not completed for a variety of reasons most notably the non-availability of a tertiary centre bed after the team had been mobilised. Of the 69% of 'forward' transfers, 816 (73%) were to tertiary paediatric centres and 302 (27%) were to tertiary neonatal centres. Of the retro transfers, 366 (82%) were from tertiary paediatric centres and 80 (18%) were from tertiary neonatal centres.

Figure 2: Percentage of Transports 2004-2009 by Gestational Age at Birth (n=1621)

Figure 2 demonstrates the breakdown of infants transferred according to their gestational age at birth. Figure 3 demonstrates the breakdown of transports according to the weight of the baby at the time of transport. In 2004-2009, 591 (36.5%) of NNTP transports occurred within the first 48 hours of birth, 177 (11%) between 48 hours and 1 week of age, 631 (39%) between 1-6 weeks of age and 222 (13.5%) over 6 weeks of age. When transported, 1377 (85%) of infants required assisted ventilation: 1260 (78% ventilated and 117 (7%) on CPAP. 138 (8.5%) required prostaglandin of which 87(63%) were ventilated. 46 (3%) received inhaled Nitric Oxide (iNO) and 255 (16%) required inotropic support. To date, there has been no death on transport. On five occasions, between 2004-2009, the infant was deemed too unstable to transfer and died in the referring hospital after the arrival of the transport team. The principle reasons for transfer are shown in Figure 4.

Figure 3: Percentage of Transports 2004-2009 by Current Weight on Transfer (n=1621)

The single greatest reason for neonatal transport was for assessment and/or ligation of a PDA (patent ductus arteriosus). In the past six years, 355 infants were transferred either to or from the single paediatric centre that performs cardiac assessments/surgery in this country accounting for 22% of all transports occurring during this time period. A further 235 (14.5%) required transfer for assessment/treatment of congenital heart disease (CHD). Premature infants requiring tertiary care accounted for 149 (9%) and infants with necrotizing enterocolitis 136 (8%) of transports respectively. The NNTP transport guidelines aim for a mobilisation time of 45 minutes. The average mobilisation time for ground transports is 34 minutes. For air transports, the average time was 59 minutes in 2004 but has reduced to 39 minutes in 2007-2009. With routine availability of iNO therapy on transport in 2006, the mobilisation time for transports where iNO use is anticipated has reduced from 81 minutes in 2005 to 43 minutes since 2006-2009. The median time on transport (from the time of accepting the call until team returns to base) is 5 hours and 10 minutes (range 25 minutes to 28 hours).

Figure 4: Principle Reasons for NNTP Transfer 2004-2009

Of all calls received requesting transport, 616 (38%) occur within the first hour of service (09.00-10.00hrs) suggesting many centres are waiting overnight to transfer critically ill babies. NNTP teams spend an average of 32 hours a week on transport. Of the 10,042 hours spent on transports, 3,050 (30%) were outside scheduled service hours. In all, 584 (36%) of transports complete after 17.00 hours and a further 300 (18.5%) are not completed until after 21.00 hours.

#### Discussion

The centralisation and regionalisation of neonatal care in association with a dedicated transport service has become standard of care in the developed world. Research shows that dedicated neonatal transport teams involving high volume activity are associated with reduced morbidities and improved patient outcomes. The introduction of a National Neonatal Transport Programme in Ireland is no exception. In 2004, Mullane et al. reported that babies transported in the first year of the programme arrived in better clinical condition when compared to historical controls despite being of a lower mean gestational age and birthweight.

The NNTP is unique in that it offers a single national service that covers the entire landmass of the Republic of Ireland. In Scotland a national 24 hour a day service was established in 2002. It has a similar population to Ireland, covers a slightly larger land area and has three separate teams on call on any given day. For a one year period in 2005-2006, this service undertook 387 emergency neonatal transports and 53% of transports occurred outside normal working hours. The Acute Neonatal Transport Service (ANTS) in Cambridge, England, serves an area one third the size of Ireland but similar population. For the financial year 2004-2005, it completed 267 emergency transports. It operates from 08.00 to 22.00 daily. Australia's largest neonatal transport provider, the Victorian Newborn Emergency Transport Service (NETS), serves a population of 5 million and an area three times that of Ireland. Neonatal transports account for approximately 1,100 of 2,600 transports per year but one third of these were non-urgent. This service is quite different from the Irish setting. Vast and sparsely populated areas are covered and long distances exist between hospitals equipped to provide specialised neonatal care explaining the high number of emergency neonatal transports undertaken. Assessing the volume of transports undertaken by the NNTP supports the original decision of the DOHC to establish a single national service. The NNTP is currently transporting a similar number of critically ill neonates during 8 hours of service compared to other transport services that operate 24 hours a day.

While establishing a national service was a progressive step, the biggest challenge facing the NNTP today is the lack of a 24hr service. A recent attempt to define the unmet need for transports outside the scheduled hours was fraught by the lack of reliable national data. A review of transports to the three Dublin Maternity Hospitals in 2007 found that 25% of infants born <1500g who required transfer to these centres within the first 72 hours of life were transferred by the referring hospital because of non-availability of the NNTP (personal communication). Of 442 live born infants weighing 500-1500g reported to the Vermont Oxford Database in 2005, 10% of these infants were classified as outborn requiring transfer to one of the eight tertiary centres submitting information to the database. Unfortunately, this data at best is incomplete pertaining only to premature infants. Published data from Britain have reported a need for 9 neonatal transfers per thousand live births in the densely populated area of Southeast England of which 4.4 per thousand livebirths are of a critical nature. Similar levels of demand were found in the UK in Trent (total transfers: 12 per 1,000 livebirths, urgent transfers: 4.2 per 1,000 livebirths). With a birth rate of approximately 70,000 in Ireland, it is estimated that the unmet need is in the order of 50 critical transports a year. This is likely a conservative estimate as it does not take into account that the majority of tertiary neonatal care and all tertiary neonatal cardiac and surgical care are provided in stand-alone facilities. This unmet need, the fact that one third of the hours spent by the NNTP on transport are outside scheduled hours and the significant pressure placed on referring units at night denuded of vital frontline staff underline why this service needs to be funded for 24 hours a day.

Almost one quarter of all transports involves an infant being transferred to or from one centre for PDA ligation. One way to significantly reduce neonatal transfers would be to allow this operation to be performed on-site in a neonatal unit, as is done in many centres worldwide. It would also help alleviate the pressure on tertiary paediatric ICU beds resulting in unnecessary delays in surgery. The National Neonatal Transport Programme is now well established. It is comparable to other services around the world in terms of size, service provision and outcomes. The service needs to and must move to 24 hours a day. Once that is achieved, greater flexibility in terms of team composition, team location, nurse-led transports, retro-transfers and non-emergency transports will be possible.

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