Original Research Article

Study of indications, complications and outcomes of neonatal transport by a skilled team

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ABSTRACT

Background: A skilled transport team is an essential requirement for safe and effective neonatal transport. The transport team of this level III NICU in Chennai performs a considerable number of transports every year and a need was felt to study the indications, complications and outcomes of transport.

Methods: Prospective Descriptive study of neonatal transports conducted 18 months Patients were divided into 2 main groups based on transport Duration: Short (≤1hr) and Long (>1hr) transport groups. TRIPS (Transport risk index of physiologic stability) score, a risk- weighted validated neonatal transport was used as a practical system for assessing infant transport care

Results: During the study period 210 transports were performed from 12 cities and towns. 60% transports were of short duration. Respiratory causes were the most common indications (43.8%) followed by CNS causes (19.5%). 44.3%(93) patients required ventilation during the transport process. Overall, there was improvement in mean TRIPS 2 score compared to TRIPS 1 in all groups of patients (Short, Prolonged, Survivors and Non-survivors). Total mortality of transported group was 31 patients (14.8%). (Including 02 patients who died enroute). There were non-significant differences in 7 day mortality (7.6% vs 8.4%) and total mortality (13.9% vs 13.4%) between the groups. Complications that occurred during transport included hyperglycemia, prolonged CFT, hypothermia, accidental extubation enroute, hypoglycemia, hyperthermia, Hypotension, and persistent Hypoxia.

Conclusions: It appears, that overall, duration of transport does not adversely affect outcome. Transport Team should be able to intubate and ventilate the baby and diagnose and manage complications like hypothermia, shock and hypoglycemia at referring hospital and enroute.

Keywords: Complications, Indications, Neonatal transport, Outcomes, Skilled team

INTRODUCTION

Neonatal transport is the process of moving a neonate from one setting or facility to another to allow the provision of a level of care and/or type of service that is not available in the former.[1] The ethos of neonatal transport medicine is to keep the infant stable and, preferably, improve the clinical status of the infant. Transferring critically ill neonates without specialized staff results in greater morbidity and mortality, hence the requirement of a skilled and well equipped transport team.[2] In developing countries, the problem of transporting small and sick neonates is compounded by several practical constraints like scarce facilities, costly medical care, poor financial resources of families and poor availability of organized transport services. As a result, most of the neonates reach the hospital in a critical state; the mortality risks among these neonates being 5-

fold than amongst those delivered in hospitals or referred in a stable condition.[3,4,5]

The present study was carried out at a level III NICU of Chennai (Tamil Nadu, South India) catering to out-born babies. The NICU has a skilled transport team for transporting babies from various hospitals in Chennai and other towns and cities. This unit performs a considerable number of transports every year and a need was felt to study the indications, complications, outcomes and other issues and if possible, make changes to improve transport.

METHODS

Prospective Descriptive study of neonatal transports conducted by NICU team from 01 June 2011-30 November 2012 (18 months). Objectives were to study (i)Indications for transport, (ii)Complications in Neonates during transportation and (iii)Outcomes (especially mortality) of transport and to determine if any difference exists in mortality outcomes of short duration (≤1 hr) versus prolonged duration (>1 hr) neonatal transports.

Inclusion criteria

All transports from referring hospital in and out of Chennai by neonatal transport team of neonatal unit.

Exclusion criteria

- Intra-hospital transports,
- Transports to other hospitals,
- Transports for postoperative care after eye surgery (As the patients have generally been found to be stable),
- Transports outside the hospital for investigations (e.g. MRI).

NICU admission criteria

- Babies ≤1 month age,
- Beyond 1 month age: babies <3.5 kg may be admitted at discretion of neonatologist.

Data was collected from doctors who performed the transport, the casesheet and from relatives and entered in the proforma, which was used in data analysis. The patients' course was followed and entered in the proforma. Patients were divided into 2 main groups based on transport Duration: Short (≤1hr) and Long (>1hr) transport groups. Cut-off duration of 1 hour was made to ensure uniformity of division of study groups. Purposive sampling (Judgement sampling) technique was applied in this study and study was approved by the Institutional Ethical Committee.

TRIPS Score

Lee et al, from Canadian Neonatal network created the TRIPS (Transport risk index of physiologic stability) score, a risk- weighted validated neonatal transport, as a practical system for assessing infant transport care (2001). TRIPS comprises 4 empirically weighted items (temperature, blood pressure, respiratory status, and response to noxious stimuli).

Data analysis

Patient characteristics were analysed using SPSS software. Baseline characteristics were given in percentages. Quantitative data were given in Mean and SD. Student t-test were applied to detect any significant differences in birth-weights and admission weights of short and prolonged transports. Paired t-test was applied to detect any significant difference between mean of TRIPS score at onset and end of transport. Students t-test were applied to detect any significant difference in mean TRIPS scores between the 2 groups of transport (short and prolonged transport) and also between survivors and non-survivors. Mann-Whitney test was used to detect any significant difference in mortality between the 2 groups of transport (Short and prolonged transport): within 24 hrs, within 7 days and overall mortality. p-values of <0.05 were considered to be significant.

RESULTS

During the study period 210 transports were performed (14.42% of total admissions) from 12 cities & towns (61.4% were from Chennai followed by Chengleput (25.2%) and Nellore (3.3%). All transports were by the hospital ambulances except for one air transport (Via commercial passenger airline from Madurai). 10.5% cases were delivery calls. In 18.1% cases, baby already had undergone ≥1 transport previously. 60% transports were of short duration (≤1hr return journey). Rest 40% were long duration transport (>1hr). Only 33.8% of transports involved female neonates (Male:Female ratio 1.96:1). Average age (At beginning of transfer) was 5.22 days (Range: 16 min- 77 days).

Mean gestational age of transported babies was 36.25 wks (range 26-41wks). Preterm formed 46.2% of transported patients (50% of short transports vs 40.48% of prolonged transports) with 3.8% of transports were of babies of ≤28 wks gestation. Mean Birth-weight of transported neonates was 2.535 kg (range: 700 gm - 4.75 kg). Mean birth-weight of short transport group: 2.496 kg and Mean birth-weight of long transport: 2.594 kg (Statistically non-significant difference [p=0.364]).

Mean stabilization time overall was 51.63 min, longer in long compared to short transports (69.75min vs 39.56min).

Indication for transport

As a group, respiratory causes were the most common indications (43.8%) followed by CNS causes (19.5%). 8(3.8%) babies were shifted for mechanical ventilation. 7(3.3%) were shifted for perceived requirement for HFV

or iNO. Main indication for delivery calls was Prematurity (63.6%). Mean stabilization time overall was 51.63 min.

Respiratory support

The 44.3%(93) patients required ventilation during the transport process including 1.4%(3 cases) that were intubated and ventilated during transport. 35% of Short duration transports were ventilated in transport compared to 58.33% of Long duration transports. 19 babies were intubated and ventilated at referring hospital by transport team, ET was changed in 9 patients. 3 babies were intubated and ventilated enroute. 4 patients had Accidental extubation enroute (An additional 2 patients were found to have been extubated on completion of transport). In 2 cases, surfactant was administered by transport team at referring hospital. Additionally, 24 babies were (11.4%) intubated & ventilated at the referral hospital (KKCTH). After admission in referral hospital, 15(7.1%), 24(11.4%) and 2(0.5%) patients were administered HFOV, iNO and ECMO respectively.

Procedures

Performed by transport team include Intubation 35(16.7%), Fluid resuscitation 14(6.7%), Umbilical line insertion 4(1.9%), ICD placement 1(0.5%). 2 babies received CPR for cardiac arrest (at referring hospital) and 9 babies were administered anticonvulsant for ongoing seizures by transport team. 14(6.66%) of transported patients underwent surgery at referral hospital.

Ambulance equipment and issues

Delay in onward journey due to ambulance breakdown occurred in 3 cases while Medical Equipment problem occurred in 3% transports.

Social Issues

In 4 cases, transport requested by family after death of 1 twin. In 4 cases, transport was cancelled due to death of patient before the team reached the hospital.

Table 1 gives analysis of complications faced by the transport team.

TRIPS score was used as an objective assessment of patient's clinical status. TRIPS 1 was TRIPS score at onset of transport and TRIPS 2 was the score at end of transport (Best possible score is zero and worst possible score is 64). Mean TRIPS 1(12.07) was significantly higher than mean TRIPS 2(11.32) (p=0.007). Mean TRIPS 1 was significantly more in prolonged (14.96) compared to short duration (10.11) transport (p=0.001) and also significantly more in non-survivors (20.27) compared to survivors (10.09) (p=0.000). Mean TRIPS 2 score was significantly more in prolonged (14.01) compared to short duration (9.57) transport (p=0.001) and

in non-survivors (21.88) compared to survivors (9.13) (p=0.000). Overall, there was improvement in mean TRIPS 2 score compared to TRIPS 1 in all groups of patients (Short, Prolonged, Survivors and Non-survivors).

Table 1: Complications in Transported Patients.

Parameter	At referring hospital	At end of transport	Newly developed during transport
Hypothermia	18.6%	8.6%	1.9%
Hyperthermia	1.4%	2.9%	1.43%
Hypotension	6.3%	3.4%	1.4%
Central Cyanosis	6.2%	1.4%	-
Prolonged CFT	33.3%	18.6%	5.7%
Hypoxia	14.8%	5.2%	1%
Hypoglycemia	10.5%	3.8%	1.5%
Hyperglycemia	14.8%	13.8%	8.6%
Shock	38.1%	8.1%	0.5

Mortality

Total mortality of transported group: 31 patients (14.8%). (Including 02 patients who died enroute). 59.3% of mortality was in Short transport group vs 40.7% in prolonged transport group. 33.3% deaths occurred within 24 hrs and 59.3% within 7 days. Mortality within 24 hours was proportionally more in long duration transport group (6.3%) vs short transport group (3.36%) (p=0.331). Mortality in 7 days was more in short duration transport group (8.4%) vs long transport group (7.6%) (p=0.668). Total Mortality in Short transport group was 13.4% vs 13.9% in Long transport group. (p=0.812). In all 3 groups, the difference was statistically non-significant (p=0.331, 0.668 and 0.812 respectively). The most common diseases amongst non-survivors were: Persistent pulmonary hypertension of newborn (32.3%), Hyaline Membrane Disease (12.9%), Severe Birth asphyxia/HIE (12.9%) and Sepsis (9.7%). Of the 2 patients who died enroute, one patient was transported for MAS with severe PPHN, while the other was transported for Prematurity, HMD with Shock.

DISCUSSION

Prematurity in the present study (46.2%) was similar to studies by Sehgal and Singh and more than that by Mir.[8,9,10] The mean stabilization time (51.63min) was more than in transports studied by Kumar where average time spent on stabilization was 38 min, but less than that reported by Leslie in Nottingham where average Stabilizing time was 105 min.[11,12] 52.4% of all transported patients were ventilated at some point. This is important in planning requirements for ventilators in NICUs having transport facility. Kronick[13] performed a 2-year review of neonatal transports and found that over 80% of neonates that were transported received some form of assisted ventilation, and transport teams

performed intubation and initiated ventilation in 34.7% and 38% of transported infants, respectively. A Cumulative Total of 77 clinical and metabolic complications occurred during transport in 210 patients transported. Lim and Ratnavel studied 346 emergency neonatal transfers over 6 months by London Neonatal Transfer Service and found that 36.1% transfers had at least one adverse event.[14]

Overall, during transport, there was improvement in various parameters including Hypothermia, hypoxemia, Hypotension, Hypoglycemia and Hyperglycemia. Complications that occurred during transport included hyperglycemia, prolonged CFT, hypothermia, accidental extubation enroute, hypoglycemia, hyperthermia, Hypotension, and persistent Hypoxia. There was reduction (i.e. improvement) in mean TRIPS scores at end of transport compared to onset of transport, showing an overall objective improvement in patient condition during transport. Mean TRIPS scores (Both at onset and end of transport) were significantly higher in long duration compared to short-duration transports and also in non-survivors compared to survivors. There were non-significant differences in 7 day mortality (7.6% vs 8.4%) and total mortality (13.9% vs 13.4%) between the groups (Long vs short transport respectively). Hence it appears, that overall, duration of transport does not adversely affect outcome. This is similar to the results of a study by Kumar in Hyderabad.[11,15,16]

It is recommended all neonatal transports must be performed by a skilled team to reduce transport complication and improve neonatal outcomes. Team should be able to intubate and ventilate the baby and diagnose and manage complications like hypothermia, shock and hypoglycemia at referring hospital and enroute.

REFERENCES

1. Fernandes CJ. Neonatal Transport. In: Cloherty JP, Eichenwald EC, Hansen AR, Stark AR, eds. Manual of Neonatal Care. 7th Ed. Philadelphia: Lippincott Williams & Wilkins; 2012: 192-202.
2. Cornette L. Contemporary neonatal transport: problems and solutions. Archives of Disease in Childhood-Fetal and Neonatal Edition. 2004 May 1;89(3):F212-4.
3. Bang AT, Bang RA, Reddy HM. Home-based neonatal care: summary and applications of the field trial in rural Gadchiroli, India (1993 to 2003). J Perinatol. 2005 Mar 18;25(S1):S108.
4. Bang AT, Bang RA, Baitule SB, Reddy MH, Deshmukh MD. Effect of home-based neonatal care and management of sepsis on neonatal mortality: field trial in rural India. Lancet. 1999 Dec 4;354(9194):1955-61.
5. Kler N, Soni A, Gupta N. Neonatal Transport. In: Choudhury P, Bagga A, Chugh K, Ramji S, Gupta P. Principles of pediatric and neonatal emergencies. 3rd ed. New Delhi: Jaypee Brothers medical publishers; 2011:632-641.
6. Lee SK, Zupancic JA, Pendray M, Thiessen P, Schmidt B, Whyte R, et al. Transport risk index of physiologic stability: a practical system for assessing infant transport care. J Pediatrics. 2001 Aug 1;139(2):220-6.
7. Lee SK, Zupancic JA, Sale J, Pendray M, Whyte R, Brabyn D, et al. Cost-effectiveness and choice of infant transport systems. Med Care. 2002 Aug 1:705-16.
8. Sehgal A, Roy MS, Dubey NK, Jyothi MC. Factors contributing to outcome in newborns delivered out of hospital and referred to a teaching institution. Indian pediatrics. 2001 Nov 1;38:1289-94.
9. Singh H, Singh D, Jain BK. Transport of referred sick neonates: How far from ideal?. Indian pediatrics. 1996 Oct;33:851-3.
10. Mir NA, Javied S. Transport of sick neonates: practical considerations. Indian pediatrics. 1989 Aug;26(8):755-64.
11. Kumar PP, Kumar CD, Shaik F, Yadav S, Dusa S, Venkatlakshmi A. Transported neonates by a specialist team-how STABLE are they. The Indian Journal of Pediatrics. 2011 Jul 1;78(7):860-2.
12. Leslie AJ, Stephenson TJ. Audit of neonatal intensive care transport–closing the loop. Acta paediatrica. 1997 Nov;86(11):1253-6.
13. Kristin M, Gary P. Transport of the Ventilated Infant. In: Goldsmith JP, Karotk in EH, eds. Assisted ventilation of the neonate. 5th ed. St. Louis: Elsevier Saunders; 2011: 531-541.
14. Lim MT, Ratnavel N. A prospective review of adverse events during interhospital transfers of neonates by a dedicated neonatal transfer service. Pediatric Critical Care Medicine. 2008 May 1;9(3):289-93.
15. Kumar PP, Kumar CD, Shaik FA, Ghanta SB, Venkatalakshmi A. Prolonged neonatal interhospital transport on road: Relevance for developing countries. The Indian Journal of Pediatrics. 2010 Feb 1;77(2):151-4.
16. Kumar PP, Kumar CD, Venkatlakshmi A. Long distance neonatal transport-the need of the hour. Indian pediatrics. 2008 Nov 1;45(11):920.

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