

East African Medical Journal Vol. 95 No. 11 November 2018

ASSESSMENT OF CLINICIANS' KNOWLEDGE AND PRACTICES ON SAFE TRANSPORT OF NEWBORNS WITH SURGICAL CONDITIONS IN WESTERN KENYA

Peter Saula, School of Medicine, Moi University, P.O. Box 4606-30100, Eldoret, Kenya. Yeri Kombe, Centre for Public Health Research, KEMRI P.O. Box 54,840-00200, Nairobi, Kenya. Gideon Kikui, School of Public Health, Jomo Kenyatta University of Agriculture and Technology, P.O. Box 62,000-00200, Nairobi, Kenya.

Corresponding author: Peter Saula, Department of Surgery and Anaesthesiology, School of Medicine, Moi University P.O. Box 4606-30100, Eldoret, Kenya. Email: saulapw@yahoo.com

**ASSESSMENT OF CLINICIANS' KNOWLEDGE AND PRACTICES ON SAFE TRANSPORT OF NEWBORNS WITH SURGICAL CONDITIONS IN WESTERN KENYA**

P. Saula, Y. Kombe and G. Kikui

**ABSTRACT**

**Background:** Neonatal ill health poses a great burden on the development of individuals, communities and societies, hence the adoption of specific goals and targets to reduce infant mortality worldwide. Many of the conditions that result in perinatal deaths can be prevented or treated without sophisticated and expensive technology. Subsequently, the World Health Organization (WHO) continues to advance education of clinicians on simple but critical interventions for the newborn during the first days of life, and the role of safe transport of newborns with surgical conditions during their referral to a tertiary-level hospital for specialized surgical care is pivotal.

**Objective:** To assess the clinicians' knowledge and practices on safe transport of newborns with surgical conditions.

**Setting:** Newborn Units/Labour Wards of five county referral hospitals in Western Kenya, which refer newborns with surgical conditions to Moi Teaching and Referral Hospital (MTRH).

**Materials and Methods:** This was a cross-sectional descriptive study that was conducted on clinicians working in the Newborn Units/Labour Wards of 5 county referral hospitals. Interviewer-administered questionnaires were administered to assess their knowledge and practices on referral and safe transport of newborns with surgical conditions. Data on demographic characteristics, the clinicians' knowledge on and practices of the principles of transporting newborns with surgical conditions, was analyzed.

**Results:** Fifty clinicians, 10 from each of the 5 county referral hospitals were recruited into the study. Their mean age was  $32.8 \pm 8.6$  years, and the majority (34.0%) were nurses. Overall, the clinicians' knowledge on safe transport of newborns with surgical conditions was poor, with a median score of 50.0%

(IQR=25.0, 87.5). There was no association between the clinicians' knowledge scores on the principles of newborn transport, and the length of time that they had worked in their respective Newborn Units/Labour Wards ( $p=0.042$ ). On practices, only 11 (22.0%) clinicians had participated in the procedure of transporting newborns.

**Conclusions:** The clinicians' knowledge on, and practices of, safe transport of newborns with surgical conditions were poor.

## INTRODUCTION

Neonatal mortality, defined as deaths occurring within the first 28 days of life, accounts for over 40% of deaths in children under the age of 5 globally<sup>1</sup>. Reports by the World Health Organization (WHO) indicate the leading causes of neonatal mortality as prematurity, birth asphyxia, birth trauma, neonatal infections and congenital anomalies<sup>2</sup>. However, the burden of surgical disease in the newborn remains a silent but significant contributor to these deaths<sup>3</sup>.

The majority of births in the low- and middle-income countries (LMICs) occur in rural settings, often at home or in rural health centres<sup>4</sup>. These health facilities have minimal equipment and are often manned by health providers with limited formal training. Therefore, newborns with surgical conditions, born at home or in these health facilities, are often in need of referral and transport to a facility with a higher level of care. In North-Rift and Western regions of Kenya, specialized neonatal surgical care is only available at the MTRH, Eldoret.

Many neonatal deaths could be avoided or morbidity minimized if the ability to safely transfer a newborn with a surgical condition to a health facility with a higher level of care could be enhanced, and organized transport service, that would provide close to same level of newborn monitoring and quality of

care during transport as that in advanced care facility, is therefore a key concept<sup>5</sup>.

This study laid the groundwork for the implementation of a structured Standard Operating Procedure for transporting newborns with surgical conditions in 5 county referral hospitals that transfer newborns to the MTRH. The study aimed at establishing the knowledge and practices of the clinicians, who provide the initial care to these newborns, on safe transport of newborns with surgical conditions.

## MATERIALS AND METHODS

*Study Design and Study Population.* This was a cross-sectional descriptive study that laid the ground for a subsequent wider quasi-experimental study. The study population was all clinicians who were working in the Newborn Units/Labour Wards and providing initial care to the newborns with surgical conditions in the county referral hospitals before referring them to MTRH for specialized surgical care.

*Study Setting.* The study was conducted in the Newborn Units/Labour Wards of 5 county referral hospitals in western Kenya.

*Study Variables.* The variables included the socio-demographic characteristics of the clinicians, as well as their knowledge and practices on safe transport of newborns with surgical conditions.

*Sampling, Data Collection, and Data Analysis.* The 5 county referral hospitals were selected by simple random sampling from the over 20 county referral hospitals that refer newborns to MTRH. Approximately 30% of the referred newborns seek surgical care<sup>6</sup>. Subsequently, 50 clinicians (10 from each county referral hospital) were selected by purposive sampling and included into the study during the study period (December 2017 – May 2018). Clinicians who were working in the Newborn Units/Labour Wards of the selected county referral hospitals were given a pretest using interviewer-administered questionnaires that were derived from a validated *Basic Knowledge Assessment Tool (BKAT)* to assess their knowledge and practices on transport of newborns with surgical conditions prior to the training sessions that aimed the introduction of a structured operating procedure for transport of newborns. Scores on the clinicians' knowledge and practices were determined on Likert-type scales. Data from the interviews were entered into STATA

version 11 and analyzed using descriptive statistics.

*Ethical Considerations.* Ethical approval was sought and granted by Moi University-MTRH Institutional Research Ethics Committee.

## RESULTS

A total of 50 participants, 10 from each of the 5 county referral hospitals were interviewed.

*Socio-demographic characteristics of the clinicians:* The participants were aged between 19 and 57 years, with a mean age of  $32.8 \pm 8.6$  years with a M:F ratio of 1.1:1. Most (34.0%) of the participants were nurses and only 2 (4.0%) participants were consultant paediatricians. The length of time that the participants had worked in the Newborn Unit/Labour Ward ranged from 4 months to 168 months (14 years), with a median of 36 months (Inter-Quartile Range, IQR=13,60). Table 1 shows the socio-demographic characteristics of the clinicians.

**Table 1**  
*Socio-demographic Characteristics of the Clinicians*

Variable	Frequency (%)
<b>Gender</b>	<b>N=50</b>
<b>Males</b>	26 (52.0)
<b>Females</b>	24 (48.0)
<b>Cadre</b>	<b>N=50</b>
<b>Paramedic</b>	5 (10.0)
<b>Nurse</b>	17 (34.0)
<b>Clinical Officer</b>	11 (22.0)
<b>Medical Officer-Intern</b>	7 (14.0)
<b>Medical Officer</b>	8 (16.0)
<b>Consultant</b>	2 (4.0)

*Clinicians' knowledge on safe transport of newborns with surgical conditions:* The majority (96.0%) of the participants agreed that newborns with surgical conditions need special considerations during their transport, both intra- and inter-facility. Overall, the clinicians' median knowledge score on safe transport of newborns with surgical conditions was 50.0% (IQR=25.0, 87.5). Only 2

(4.0%) participants correctly stated all the 8 principles of newborn transport. Appropriate escort for the newborn was the most (96.0%) known principle, while sending specimens with the newborns was the least (22.0%). Table 2 shows the principles of newborn transport that were correctly mentioned by the clinicians.

**Table 2**  
*Principles of Newborn Transport as correctly mentioned by the Clinicians*

<b>Principle</b>	<b>Frequency (N=50)</b>	<b>Percentage (100)</b>
<b>Tubes</b>	26	52.0
<b>Warmth</b>	34	68.0
<b>Oxygen</b>	40	80.0
<b>Pre-Transport Stabilization</b>	16	32.0
<b>IV access/Fluids</b>	23	46.0
<b>Documentation</b>	20	40.0
<b>Appropriate Escort</b>	48	<b>96.0</b>
<b>Specimens</b>	11	<b>22.0</b>

On assessment of clinicians' knowledge on the specific elements of principles of transport of newborns with surgical conditions, the importance of using oro-/naso-gastric tubes was mostly (30.0%) known by the medical officers. The importance of keeping the baby warm and administering oxygen during transport was mostly (29.4% and 30.0% respectively) known by the nurses. Pre-transport stabilization of newborn and gaining IV access and maintaining the baby on a drip was mostly (43.7% and 34.8%

respectively) known by the medical officers. The importance of ensuring appropriate escort during transport was mainly (33.3%) known among the nurses, while that of sending relevant medical documents and specimens with the newborn during transfer was mainly known by the medical officers (30.0% and 36.4% respectively). Table 3 shows the distribution of the participants' knowledge on principles of newborn transport by cadre.

**Table 3**  
*Distribution of the Participants' Knowledge on Principles of Newborn Transport by Cadre*

Cadre	Principle of Newborn Transport							
	Tubes N=26	Warmth N=34	Oxygen N=40	Pre- Trans port Stabili zation N=16	IV access N=23	Docum entation N=20	Escort N=48	Specime ns N=11
Paramedic (%)	0 (0.0)	2 (5.9)	3 (7.5)	0 (0.0)	0 (0.0)	0 (0.0)	5 (10.4)	0 (0.0)
Nurse (%)	7 (26.9)	<b>10 (29.4)</b>	<b>12 (30.0)</b>	1 (6.3)	7 (30.4)	<b>6 (30.0)</b>	<b>16 (33.3)</b>	1 (9.1)
Clinical Officer (%)	2 (7.7)	5 (14.7)	8 (20.0)	0 (0.0)	0 (0.0)	1 (5.0)	10 (20.8)	0 (0.0)
Medical Officer- Intern (%)	7 (26.9)	7 (20.6)	7 (17.5)	6 (37.5)	6 (26.1)	<b>6 (30.0)</b>	7 (14.6)	<b>4 (36.4)</b>
Medical Officer (%)	<b>8 (30.8)</b>	8 (23.5)	8 (20.0)	<b>7 (43.7)</b>	<b>8 (34.8)</b>	5 (25.0)	8 (16.7)	<b>4 (36.4)</b>
Consultant (%)	2 (7.7)	2 (5.9)	2 (5.0)	2 (12.5)	2 (8.7)	2 (10.0)	2 (4.2)	2 (18.1)

All the cadres of clinicians had the most knowledge on the importance of according the newborns with surgical conditions an appropriate escort. The paramedics and clinical officers had no knowledge on the importance of sending specimens with the newborn during transport. On calculating the knowledge level of each cadre on all the principles of newborn transport, the consultants' scored the highest at 100% while

the paramedics scored the lowest at 25.0%. There was no association between the clinicians' knowledge scores on the principles of newborn transport, and the length of time that they had worked in their respective Newborn Units/Labour Wards ( $p=0.042$ ). Table 4 shows the clinicians' knowledge level on each element of the principles of newborn transport by cadre.

**Table 4**  
*Clinicians' knowledge level on each element of principles of newborn transport by cadre*

Principle of Newborn Transport	Cadre N=50					
	Paramedics (n=5)	Nurses (n=17)	Clinical Officers (n=11)	Medical Officers- Intern (n=7)	Medical Officers (n=8)	Consultants (n=2)
Escort (%)	(5) 100	(16) 94.1	(10) 90.9	(7) 100	(8) 100	(2) 100
Oxygen (%)	(3) 60.0	(12) 70.6	(8) 72.7	(7) 100	(8) 100	(2) 100
Warmth (%)	(2) 40.0	(10) 58.8	(5) 45.5	(7) 100	(8) 100	(2) 100
Tubes (%)	(0) 0.0	(7) 41.2	(2) 18.2	(7) 100	(8) 100	(2) 100
IV access (%)	(0) 0.0	(7) 41.2	(0) 0.0	(6) 85.7	(8) 100	(2) 100
Documentation (%)	(0) 0.0	(6) 35.3	(1) 9.1	(6) 85.7	(5) 62.5	(2) 100
Pre-Transport						
Stabilization (%)	(0) 0.0	(1) 5.9	(0) 0.0	(6) 85.7	(7) 87.5	(2) 100
Specimen (%)	(0) 0.0	(1) 5.9	(0) 0.0	(4) 57.1	(4) 50.0	(2) 100
<b>Overall Knowledge Score (%)</b>	<b>25.0</b>	<b>44.1</b>	<b>29.5</b>	<b>89.3</b>	<b>87.5</b>	<b>100</b>

On the assessment of the clinicians' knowledge on the procedure of transporting newborns with surgical conditions, 28 (56.0%) stated correctly the need to involve the parents in the transport procedure. Thirty-three (66.0%) clinicians correctly stated that the basis of safe and timely transport was proper communication and coordination between referring and receiving hospitals.

None (0%) stated that there is rare need for haste during the transport procedure, and 18 (36.0%) stated correctly that the condition of the newborn dictates the choice of the mode of transport. Table 5 shows the responses of the participants to various questions pertaining to their understanding of certain aspects of newborn transport.

**Table 5**  
*Responses of the participants their knowledge on newborn transport*

<b>Variable</b>	<b>Category</b>	<b>Frequency (%)</b>
Safe newborn transport determines their overall survival at the receiving hospital.	Disagree	11 (22.0)
	Agree	25 (50.0)
	Strongly agree	14 (28.0)
Proper communication between referring and receiving hospitals is vital.	Disagree	17 (34.0)
	Agree	26 (52.0)
	Strongly agree	7 (14.0)
Should parents/guardians be informed about the transport of their newborn?	Yes	28 (56.0)
	No	22 (44.0)
Does the surgical condition dictate the choice of the mode of transport?	Yes	18 (36.0)
	No	32 (64.0)

Forty-three (86.0%) participants felt that safe transport of newborns with surgical conditions would improve the newborns' surgical outcome. When asked whether organized transport for newborns with surgical conditions should be incorporated into the county healthcare system, 42 (84.0%) agreed or strongly agreed.

On escort of the newborns during transport, 28 (56.0%) participants said they would escort the newborns with surgical conditions during transport. Of the 22 (44.0%) that would not escort the newborns, 8 (36.4%) opined that the

newborns are too difficult to handle, while 14 (63.6%) felt that they were too busy to offer escort to the newborns during transport. Forty-four (88.0%) participants mentioned lack of supplies and equipment needed for newborn transport, and 38 (76.0%) mentioned lack of newborn transport protocols, as the great impediments to organized safe transport of newborns with surgical conditions. Table 6 shows distribution of clinicians' reasons as impediments to safe newborn transport by cadre.

**Table 6***Distribution of clinicians' reasons as impediments to safe transport of newborn with surgical conditions by cadre*

Variable	Cadre						TOTAL (N=50)
	Paramedics (n=5)	Nurses (n=17)	Clinical Officers (n=11)	Medical Officers -Intern (n=7)	Medical Officers (n=8)	Consultants (n=2)	
Lack of Supplies/Equipment (%)	5 (100)	15 (88.2)	10 (90.9)	6 (85.7)	6 (75.0)	2 (100)	44 (88.0)
Improper Coordination/Communication (%)	2 (40.0)	3 (17.6)	1 (9.1)	5 (71.4)	7 (87.5)	2 (100)	20 (40.0)
Lack of Newborn Transport Protocol (%)	4 (80.0)	10 (58.8)	10 (90.1)	5 (71.4)	7 (87.5)	2 (100)	38 (76.0)

*Clinicians' practices of transport of newborns with surgical conditions:* With regard to past and current practices, only 11 (22.0%) clinicians had participated in transport of newborns with surgical conditions in the past 5 years, with 6 (54.5%) participating  $\geq 3$  times, 3 (27.3%) participating 2 times, and 2 (18.2%)

participating only once. None of the clinical officers and medical officers-intern had ever participated in transport of newborns with surgical conditions. Table 7 shows the distribution of the clinicians who have ever participated in transport of newborns with surgical conditions.

**Table 7***Distribution of Clinicians who have ever participated in Transport of Newborns with Surgical Conditions by cadre*

Variable	Frequency (%) n=11
Paramedics	5 (45.5)
Nurses	4 (36.3)
Clinical Officers	0 (0.0)
Medical Officers-Intern	0 (0.0)
Medical Officers	1 (9.1)
Consultants	1 (9.1)

Of the 11 (22.0%) that participated in the transport procedure that included escorting the newborns during transport, 6 (54.5%) stated that they had a bad experience, with 5

(45.5%) stating that the transport team and equipment were hastily assembled, 1 (9.1) stated that the clinical condition of the baby deteriorated while on transit, and 4 (36.4)



stated that the babies died while on transit. Only 1 (9.1%) participant who had a good experience stated that the transport process was well organized with transport team being informed well in advance.

The most observed elements by the clinicians who participated in newborn transport were; escort by trained medical

personnel (100%) and maintaining the baby on oxygen (100%). None (0.0%) of the clinicians observed the principles of documentation and delivery of specimens. Table 8 shows the distribution of the clinicians according to the specific elements of principles of newborn transport that were practiced during newborn transport, by cadre.

**Table 8**

*Distribution of Clinicians according to Specific Elements of Principles of Newborn Transport that were practiced, by cadre*

Variable	Cadre				
	Paramedics (n=5)	Nurses (n=4)	Medical Officers (n=1)	Consultants (n=1)	TOTAL N=11
Inserted & managed oro-/naso-gastric tube	2 (40.0)	0 (0.0)	1 (100)	1(100)	4 (36.4)
Kept the baby warm	3 (60.0)	3 (75.0)	1 (100)	1 (100)	8 (72.7)
Gave baby oxygen	5 (100)	4 (100)	1 (100)	1 (100)	11 (100)
Ensured the baby was stable before transport	0 (0.0)	0 (0.0)	1 (100)	1 (100)	2 (18.2)
Inserted IV line & maintained the baby on a drip	2 (40.0)	1 (25.0)	0 (0.0)	1 (100)	4 (36.4)
Delivered medical documents including consent for surgery	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Ensured the baby was escorted by trained medical personnel	5 (100)	4 (100)	1 (100)	1 (100)	11 (100)
Sent relevant specimens with the baby	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

On the availability of supplies and equipment during transport, the most available functional equipment in the ambulances were oxygen delivery equipment mentioned by 11 (100%) participants, and assorted items for IV fluid infusion as mentioned by 10 (90.9%)

participants. None of the clinicians mentioned mechanical ventilator, infant transport incubator, infusion pumps or Non-Invasive Blood Pressure (NIBP) monitor.

## DISCUSSION

This study, which was a pretest carried out to set the stage for the implementation of a structured standard operating procedure for transport of newborns with surgical conditions in western Kenya, found that the majority (96.0%) of the clinicians were in agreement that newborns with surgical conditions need special considerations during their referral and transport to a tertiary level hospital for specialized surgical care. With the realization that many conditions that result in perinatal deaths can be prevented or treated without sophisticated and expensive technology, the WHO advocated for education of clinicians on simple but critical interventions for the newborns. This resulted in the formulation of a guide that set the standards on referral and transfer of sick neonates, which was published in 2003<sup>7</sup>. Despite the existence of this guide, the clinicians' overall knowledge score was poor, with a median score of 50.0% (IQR=25.0, 87.5). Only 2 clinicians, the only consultant paediatricians who participated in this study, were aware of all the 8 principles of newborn transport. However, the knowledge on specific elements of the principles of newborn transport was mostly demonstrated by the nurses and the medical officers, who perhaps are the more critical cadres of clinicians, involved in referral of patients from the lower level health facilities to the tertiary level hospitals. The Ministry of Health in a survey done in 2013 reported that the referral procedures in the level 2 (dispensaries) and level 3 (health centres) health facilities were mainly done by nurses while those in level 4 (sub-county) and level 5 (county referral) hospitals were mainly done by medical officers<sup>8</sup>.

This study highlighted the disparities in the average level of knowledge on all principles of newborn transport. Whereas the consultants had the highest score (100%), the paramedics who apparently are the most involved in transport of newborns with surgical conditions scored the lowest (25%). Furthermore, the paramedics and the clinical officers were not aware of the importance of pre-transport stabilization and sending specimens with the referred newborns during transport. This perhaps indicates a clear gap that could be addressed by further training and implementation of newborn transport protocols. Kumar *et al* reported that proper training of the transport team and adequate pre-transport stabilization of the newborns can decrease transport-related morbidity<sup>9</sup>. The study further found no association between the clinicians' knowledge scores on the principles of newborn transport, and the length of time that they had worked in their respective Newborn Units/Labour Wards.

This study further highlighted disparities between the clinicians' knowledge and practices on transport of newborns with surgical conditions. Whereas the majority (86.0%) were of the opinion that safe transport of the newborns would improve the outcome of their surgical care at the tertiary hospital, only 11 (22%) had participated in the transport procedures of newborns with surgical conditions in the past 5 years. This further indicates need for training and mentorship program on newborn transport that would help decrease transport-related morbidity and mortality. Maríñez *et al* reported a significant improvement in neonatal survival following the implementation of a similar training course for medical and paramedical transport personnel<sup>10</sup>. Similarly, Spector *et al* reported improvement in the clinical status of

transported neonates following an implementation of a neonatal provider educational program<sup>11</sup>.

The majority (84.0%) of the clinicians opined that organized referral and transport for newborns with surgical conditions should be incorporated into national and county healthcare system. Woodward *et al* in a study done in Hungary reported that a structured and specialized neonatal transport service can lead to decreased transport-related neonatal mortality<sup>12</sup>. This study further highlights the two major challenges that the clinicians' thought could impede safe newborn transport as lack of supplies/functional equipment and lack of structured protocol for referral and transport of newborns with surgical conditions. The clinicians who participated in the transport of the newborns reported using poorly equipped road ambulances that had only oxygen delivery equipment (100%) and assorted items for IV fluid infusion (90.9%). Transport incubators which are vital in ensuring that the newborns are transported in a thermo-neutral environment that maintain continuum of care was not reported by any clinician. Joshi *et al* demonstrated that cheap and easily fabricated cardboard neonatal carrier can be effective in thermal control when used to transport neonates for short distances<sup>13</sup>. The use of Kangaroo Mother Care (KMC), aluminium foil and polythene paper wraps during transport have equally been shown to be effective.

### CONCLUSIONS

Overall, the clinicians' knowledge on safe transport of newborns with surgical conditions was poor, with a median score of 50.0% (IQR=25.0, 87.5). The cadres of clinicians that had poor scores on knowledge of specific principles of safe transport of

newborns with surgical conditions were the paramedics, the nurses and the clinical officers. Most of the clinicians who participated in the procedures of transporting newborns with surgical conditions were the paramedics and the nurses.

### RECOMMENDATIONS

The training of the clinicians on the structured Standard Operating Procedure for transporting newborns with surgical conditions should focus more on the paramedics and the nurses whom despite their poor knowledge were the main participants in the transport procedures of newborns with surgical conditions in the 5 county referral hospitals.

### REFERENCES

1. United Nations. The Millennium Development Goals Report 2013. 1<sup>st</sup> July 2013, ISBN 978-92-1-101284-2
2. UNICEF. Levels and Trends in Child Mortality - Progress Report 2015, 2015; Geneva, Switzerland.
3. Chirdan L.B., Elhalaby E. Neonatal surgery in Africa. *Semin Pediatr Surg* 2012; 21(2): 151 – 159.
4. National Bureau of Statistics – Kenya, ICF International. 2014 KDHS Key Findings 2015; Rockville, Maryland, USA: KNBS and ICF International.
5. Lawn J.E., Cousens S., Zupan J. 4 million neonatal deaths: when? Where? Why? *Lancet* 2005; 365(9462): 891 – 900.
6. Ikol KM, Saula PW, Gisore P, Mwangi HR. Outcomes of neonates requiring surgical interventions in Eldoret. *Ann Afr Surg* 2019; 16(1) 20-25.
7. World Health Organization. Managing Newborn Problems: A Guide for Doctors, Nurses and Midwives. 2003; Geneva, Switzerland.
8. Ministry of Health (Kenya). State of the Health Referral System in Kenya: Results from a Baseline Study on the Functionality of the Health Referral

System in Eight Counties.  
[www.measureevaluation.org](http://www.measureevaluation.org)

9. Kumar PP, Kumar CD, Shaik FA, Ghanta SB, Venkatalakshmi A. Prolonged neonatal interhospital transport on road: relevance for developing countries. *Indian J Pediatr* 2010; 77 (2): 151-154. <http://doi.org/10.1007/s12098-009-0336-2>

10. Martínez VR, López GL, Rodríguez MD, Torre GM, Sotto MJL, Márquez AM et al. Safe neonatal transport in Jalisco state: impact of S.T.A.B.L.E. program on morbidity and mortality. *Bol méd. Hosp. Infant. Méx* 2011; 68(1): 34-39.

11. Spector JM, Villanueva HS, Brito ME, Sosa PG. Improving outcomes of transported newborns in Panama: impact of a nationwide neonatal provider education program. *J Perinatol* 2009;29 (7): 612-516.

12. Woodward GA, Somogyvari Z. The Hungarian (Budapest) neonatal interfacility transport system: insight into program development and results. *Pediatr Emerg Care* 1997; 3(4): 290-293.

13. Joshi M, Singh S, Negi A, Vyas T, Chourishi V and Jain A. Neonatal carrier: an easy to make alternative device to costly transport chambers. *J Indian Assoc Pediatr Surg* 2010; 15:133-134.