

INTERHOSPITAL TRANSPORT OF THE HIGH-RISK NEWBORN: A CHALLENGE FOR THE NURSING STAFF*

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ABSTRACT: This study aimed to investigate the conditions in which the interhospital transport of high-risk newborns takes place, between their municipality of origin and the Mother and Child Hospital in Belo Horizonte, in the Brazilian State of Minas Gerais. It is an exploratory and descriptive study undertaken with 35 nursing professionals who are members of the neonatal transport team, between 1st November 2014 and 30th July 2015. It was evidenced that the interhospital transport of at-risk newborns occurs frequently, from the interior of the State of Minas Gerais to Belo Horizonte, confirming that the municipalities identified lack the human and/or material resources to assist them appropriately, which is considered serious due to the possibility of promoting the worsening of the patient's clinical condition. It is recommended to the municipalities' managers that they should be alert to the necessary conditions required for the transport, so as to minimize adverse events during the journey and so that the newborn may be assisted with quality and safety.

DESCRIPTORS: Transportation of patients; Infant, newborn; Infant, premature; Nursing; Nursing care.

O TRANSPORTE INTER-HOSPITALAR DO RECÉM-NASCIDO DE ALTO RISCO: UM DESAFIO PARA A ENFERMAGEM

RESUMO: Este estudo teve como objetivo conhecer as condições em que se dá o transporte inter-hospitalar de recém-nascidos de alto risco entre o município de origem e o hospital de assistência materno-infantil de Belo Horizonte, Minas Gerais. Trata-se de uma pesquisa exploratória e descritiva realizada com 35 profissionais de Enfermagem integrantes do transporte neonatal entre 1º novembro de 2014 a 30 de julho de 2015. Constatou-se que o transporte inter-hospitalar de recém-nascidos de risco ocorre com frequência, do interior do Estado de Minas Gerais para Belo Horizonte, confirmando que os municípios identificados não dispõem de recursos humanos e/ou materiais para assisti-los adequadamente, o que é considerado grave pela possibilidade de favorecer a piora clínica do paciente. Recomenda-se aos gestores dos municípios que atendem para as condições necessárias exigidas para o transporte, a fim de minimizar eventos adversos durante o trajeto e para que o recém-nascido seja assistido com qualidade e segurança.

DESCRIPTORIOS: Transporte de pacientes; Recém-nascido; Prematuro; Enfermagem; Cuidados de enfermagem.

EL TRANSPORTE INTERHOSPITALAR DEL RECIÉN NACIDO DE ALTO RIESGO: UN DESAFÍO DE LA ENFERMERÍA

RESUMEN: Estudio cuyo objetivo fue conocer las condiciones del transporte interhospitalar de recién nacidos de alto riesgo entre el municipio de origen y el hospital de asistencia materno-infantil de Belo Horizonte, Minas Gerais. Es una investigación exploratoria y descriptiva realizada con 35 profesionales de Enfermería integrantes del transporte neonatal entre 1º de noviembre de 2014 y 30 de julio de 2015. Se constató que el transporte interhospitalar de recién nacidos de riesgo ocurre con frecuencia, del interior del Estado de Minas Gerais para Belo Horizonte, confirmando que los municipios identificados no disponen de recursos humanos y/o materiales para realizar esa asistencia de modo adecuado, lo que es considerado grave a causa de la posibilidad de llevar a un empeoramiento clínico del paciente. Se sugiere a los gestores de los municipios que pongan atención a las condiciones necesarias exigidas para el transporte, para minimizar eventos adversos durante el trayecto y para que el recién nacido sea asistido con calidad y seguridad.

DESCRIPTORIOS: Transporte de pacientes; Recién nacido; Prematuro; Enfermería; Cuidados de enfermería.

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● INTRODUCTION

Interhospital transport refers to transferring patients between health units, whether these are public or private, hospitals or not, for attending urgent and emergency cases and which function as bases for stabilizing seriously-ill patients⁽¹⁾.

Regarding neonatal transport, questions are addressed which involve this type of locomotion which, when successful, brings important benefits to the newborn (NB)⁽²⁾.

The safest way of transporting an at-risk baby is within the mother's womb, a conduct which is capable of contributing to reducing neonatal mortality⁽³⁾, given that tertiary centers which are well-equipped with material and human resources have the conditions to prevent neonatal morbidity and mortality⁽⁴⁾. It is estimated that in developed countries, 15 to 20% of children are born in places without infrastructure. In Brazil, these percentages are unknown and may be still higher. This being the case, perinatal care becomes significant in dealing with neonatal morbidity and mortality, as the mortality rates in premature babies increase when the births occur in centers without adequate infrastructure⁽²⁾.

When the high-risk NB is born in a center which lacks resources which are essential for her care, interhospital transport becomes necessary; the objective of this is to provide conditions such that the baby may be assisted in the appropriate locale, thus reducing the risks of morbidity and mortality⁽³⁾.

It is highlighted that transport can also be a risk factor for the critically-ill newborn, and that because of this it must be considered as an extension of the intensive care. In this sense, the transference can only be undertaken after the NB's clinical situation has been stabilized⁽²⁾. This being the case, the responsibility for recommending transference falls to the team which provides the care to the NB in the center of origin⁽⁴⁾.

Once the need for interhospital transport has been defined, the recommendations must emphasize respiratory, cardiovascular, metabolic and thermal stabilization, as well as safe vascular access. It is the responsibility of the nurse, during the journey, to observe possible changes in the NB's vital signs and changes in her face and/or crying, as well as to attempt to ensure that the noise and light do not harm the baby, as these factors predispose to greater stress on the NB during the journey⁽⁵⁾.

The conditions necessary for quality neonatal transport are already well-established in the literature; however, various studies have described serious situations arising from failure to comply with the norms which govern this matter⁽⁶⁾. Some examples are that transferring the NB in inadequate conditions is a cause of death, as, even if the transport is undertaken in adequate conditions, that is, with a trained team and the appropriate equipment, it is necessary to be alert to the clinical complications which may occur⁽⁶⁾.

It is essential that the transference of the NB should be effected in conditions which are safe so as to reduce the risks during the transport⁽⁶⁾, that is, continuity of the intensive care provided by a specialized team. The measures are necessary, as complications can occur, such as clinical or physiological changes (variations in temperature, arterial pressure, or cardiac or respiratory frequency) in the NB, or problems of poor functioning of equipment, factors which – added to the inexperience of the transport team, or to the absence of qualified professionals – can end up compromising the safety of the patient in question⁽⁷⁾.

In the neonatal unit where I work as a neonatology nurse, I observe that in many situations, we receive NBs who have been transported inadequately; it is possible to evidence, after taking a patient history and recording the vital signs, the occurrence of hypothermia, the absence or compromising of a safe venous network, and – in the majority of cases – the absence of a professional nurse during the journey.

Considering the relevance of neonatal transport for the qualification of the care to this high-risk population, the article has as its objective: To investigate the conditions in which the interhospital transport of the high-risk NB takes place, between the municipality of origin and the Mother and Child Hospital in Belo Horizonte, Minas Gerais.

● METHODOLOGY

This is an exploratory and descriptive study, based in the private law philanthropic hospital, specialized in care for the woman and NB, in Belo Horizonte, Minas Gerais. The hospital assists an average of 1000 births/month, and in 2014 admitted 1,104 NBs to the Neonatal Intensive Care Unit (NICU), of whom 90 – that is, 8% – were transported from other municipalities⁽⁸⁾.

The period covered for the undertaking of the study was from 1st November 2014 to 30th July 2015. A total of 40 NBs were admitted via transfer, and the members of the respective transport teams totalled 35 professionals. When consulted by the researcher regarding their interest in participating in the study, only 30 were favorable. The remaining five professionals refused to participate, stating that they did not feel comfortable with the interview, particularly through fear of exposing the institution which employed them. The inclusion criteria were defined as: participants who worked directly in the transport and who were part of the workforce of the institution of origin, responsible for the transport of the NB. The nursing professionals who made themselves available to participate in the study were approached personally by the researcher within the premises of the Sofia Feldman Hospital.

As a data collection instrument, a questionnaire was applied containing relevant information regarding interhospital transport: municipality of origin and distance traveled; characteristics of the NB during the transport and observation of the NB's characteristics on admission, as well as the characterization of the professionals who provided the care. Regarding the NBs' data, the following variables were consulted in the transport reports: type of ventilatory assistance, weight, gestational age, type of venous access, temperature during the journey, and temperature upon arrival in the hospital.

Regarding the information on the professional who provided care, these were questioned regarding their length of experience in working in transport of NBs, whether they had received any type of training regarding transport, if they had experience in neonatology, and who was responsible for preparing the material/equipment for the transport.

The information obtained was tabulated by hand and transcribed to tables, elaborated with the purpose of ensuring the accurate presentation of what had been said by the study participants in relation to each item of the questionnaire. The data were next analyzed in the light of what the Brazilian Ministry of Health and the Brazilian Federal Council of Nursing (COFEN) stipulate in regards to interhospital transport.

The project was submitted to the Research Ethics Committee of the Faculty of Medicine of the Fluminense Federal University, and was approved under Opinion N. 765,702. The participants' anonymity was assured.

● RESULTS

Based on the questionnaire, it was possible to produce Table 1, containing the main characteristics of how the transport of the high-risk NB took place, from municipalities of Minas Gerais to the Sofia Feldman Hospital. In order to protect the names of the NBs' municipalities of origin, these were substituted with numbers.

Of the total of 35 transports, 12 of the transported NBs came from municipalities close to the state capital; however, one transport was recorded from a municipality which is located 471 km from Belo Horizonte. In relation to this transport, part of the journey was made by plane and the rest by land.

In the case of 17 transports undertaken by land, the distance was superior to 50 km, however, attention is drawn to one NB with a gestational age of 28 weeks which came by a journey of 250 km.

Among the transports, three in particular call attention, two because they came from distant municipalities (they travelled approximately 200 km from Belo Horizonte), transporting NBs with borderline weight and low gestational age (GA), and one transport which, in spite of being close to the capital (57 km), carried an NB weighing 1200 g with a GA of 31 weeks breathing air.

Table 1 – Presentation of the newborns transported, in relation to the distance from the municipality of origin and the professional responsible for the transport. Belo Horizonte, MG, Brazil, 2015

Municipality		Characteristics of the NB			The NB's conditions upon admission in ICU			Prof. Transport
Municipalities of origin of the NB	Dist. traveled to BH (km)	Diag.	G.A	Weight (Birth.)	Ventilatory support	Venous access	Temp. (°C)	
1	39	TT	FTI	3205	MV	KTU	36.4°C	NT
1	39	RDS	39+4	3200	EA	PVA	35.1°C	Nurse
2	200	PTNB	30	1110	HOOD	KTU	36.6°C	Nurse
2	200	PTNB	31	1120	CPAP	PVA	36°C	NT
3	226	PTNB	33+2	2100	MV	PVA	35°C	Nurse
3	226	PTNB / Sepsis	34	2400	MV	PVA lost	33.6°C	Nurse
4	62	Sepsis	FTI	2400	MV	PVA	35.1°C	Nurse
4	62	Sepsis	35	1650	MV	PVA	36°C	NT
4	58	Sepsis	35	2650	MV	KTU	32.2°C	NT
5	23	PTNB	27+1	1060	MV	KTU	35.3°C	Nurse
5	23	PTNB	34	1460	MV	PVA	34°C	NT
6	36	RF	31	1985	MV	CPA / PVA	36°C	NT
6	36	HMD	31+6	1650	MV	PVA	36.9°C	Nurse
7	214	HMD	37	2220	MV	PVA	35.3°C	NT
8	57	PTNB	31	1200	EA	KTU	35°C	NT
9	471	PTNB	33	1239	EA	PVA	35.6°C	Nurse
10	20	Sepsis	FTI	3000	CPAP	KTU	36°C	Nurse
11	118	DNJ	FTI	3140	MV	PVA	36.2°C	Nurse
12	250	SDP/PTNB	28	1315	MV	PVA	36.4°C	NT
13	101	PTNB	31+5	1775	HOOD	KTU	36°C	NT
14	100	PNM	FTI	2350	NC	PVA	35.1°C	Nurse
15	204	FTI	39	2300	EA	PVA	35.2°C	NT
16	290	RDS	33	1695	EA	PVA	38.3°	NT
17	90	Sepsis	FTI	3240	HOOD	PVA	37.6°C	Nurse
18	126	PTNB	33	1200	MV	KTU	37.9°C	NT
19	100	Sepsis	39	3250	MV	KTU intracardiac	36.9°C	Nurse
20	86	Delayed sepsis	36	2465	MV	PVA	36°C	NT
21	174	HMB	35	2800	CPAP	KTU	34.4°C	Nurse
22	20	PTNB	30	1600	EA	No access	33.1°C	Nurse
23	76	Sepsis	36	2465	MV	PVA	35°C	NT

Key: Dist. = Distance; Diag. = Diagnosis; G.A = Gestational age; Temp: Temperature; Prof. = Professional; NT = Nursing technician; HMB = Hyaline Membrane Disease; FTI = full-term infant; RF = Respiratory Failure; RDS = Respiratory Distress Syndrome; TT= Transient Tachypnea; PNM = Pneumonia; DNJ – Delayed neonatal jaundice; MV = Mechanical Ventilation; EA = Environmental Air; HOOD = Hood.; CPAP = Continuous Positive Airway Pressure; NC = Nasal Catheter; KTU = umbilical catheter; PVA = Peripheral Venous Access; CPA = Cardiopulmonary Arrest; PTNB = Preterm Newborn.

Of the 30 NBs transported who arrived at the hospital, 15 had GA <35 weeks, 17 were on mechanical ventilation, three on CPAP, three under oxygen hoods, one with a nasal catheter and six breathing air (as opposed to oxygen).

Among these distant transports, there was one NB with weight/GA: 1120g/ 31 weeks on CPAP; one weighing 1110g/ 30 weeks in an incubator and the transport close to the capital; one NB weighing 1200g and 31 weeks transported breathing air without assistance. Upon admission in the hospital's ICU, in the first two cases, it was necessary to progress from incubators and CPAP ventilatory support to a chest tube, and, in the last case, CPAP was installed. It was observed that the three NBs transported were below 30 weeks old and weighed below 1500 g.

In relation to the ventilatory support of the 30 NBs transported, 17 were intubated, six were on air, three on CPAP, three in incubators and one with a nasal catheter. Regarding the type of venous access, among the 30 NBs transported, 10 had umbilical catheters, among whom one catheter was intracardiac, that is, badly positioned after confirmation using the x-ray in the Neonatal Unit, 19 had peripheral venous access (in two cases, the access points had tissue (that is, infiltration had occurred), and one premature baby with GA 30 weeks was admitted without venous access. In this study, however, it was observed that in 19 of the NBs transported, peripheral venous access predominated. However, two NBs had peripheral access which was leaking, which resulted in a situation of hypoglycemia in one of them, according to the team's report; while the other NB, premature and born at 30 weeks, was transported without venous access.

Upon analyzing these NBs' temperature on admission, it was possible to observe that of the 30 NBs transported, nine presented mild hypothermia (36°C - 36.4°C); 15 had moderate hypothermia (32°C - 35.9°C); two were hyperthermic (above 37.5°C) with temperatures of 37.9°C; and only four were normothermic (36.5°C - 37.0°C); that is to say, of the 30 NBs transported, 24 presented hypothermia, of whom four presented GA of 31 to 33 weeks and arrived on air, favoring a possible respiratory failure.

● DISCUSSION

There is a high incidence of babies who need to be transported/transferred in specially equipped vehicles, accompanied by an appropriately trained professional team, so that they may have better survival. Each one's survival can be improved through adequate stabilization, regionalization and training, with a view to reducing morbidity and mortality⁽⁹⁾.

In order to have success in neonatal transport, it is necessary to have both a trained and empowered team, as well as the technology of the equipment, with simultaneous and effective interaction between these two elements⁽¹⁰⁾.

In the present study, a total of 30 professionals were interviewed, the sample being made up of 15 nurses and 15 nursing technicians. Among the 15 nurses interviewed, seven had postgraduate qualifications in Neonatology, of whom five confirmed that interhospital transport had been addressed in the course undertaken, while eight stated that they did not have this title. However, the same postgraduates (seven) stated that they did not have experience in Neonatology.

In the case of the nursing technicians, among the 15 interviewees, 13 reported having experience in Neonatology and two stated that they did not have this, adding that they had also not been trained for this. Nevertheless, they stated that in the hospital where they worked, transport with children was undertaken.

In relation to the time of experience in transport of the NB, among the 30 interviewees, only 11 had from 04 to 06 years; eight had over 06 years; nine stated that they did not have experience, and two stated that they had less than 4 years of experience.

Safe neonatal transport must be guaranteed, regardless of the region, but it is not possible to organize a universal protocol for this type of attendance, due to the differences of the geographical conditions, of the organization of the team, and of the demand of the service. The big discussion will be to decide rationally which vehicle is to be used. It is necessary to acquire a vehicle capable of maintaining a safe system and with the capacity to provide the team with the support necessary in

order to minimize any risks during the transport⁽¹¹⁾.

It is important to emphasize that the transport of the critically-ill patient involves a series of risks, including failure in control of the respiratory functions, causing physiological instabilities with reduction in tissue oxygenation, arrhythmias, obstruction and severe hypertension. Some risks are directly related to the transport, regardless of the time or distance to be traveled, and these changes may be imperceptible if the monitoring of the patient is inadequate⁽¹²⁾.

The preparation of the NB for transport, according to the interviewees, was undertaken by 12 nurses, 09 nursing technicians, and 09 physicians. All of the Nursing professionals stated that the previous stabilization of the patient was ensured.

The positioning of the venous access, when assured prior to the transport, has the aim of avoiding losses and leakage of medications which could cause burns on the patients' skin, as well as being safer if there should be a need to use emergency drugs⁽¹³⁾. When the peripheral access is inviable due to being considered unsafe during the transport, the possibility of placing a central access device must be considered, with the umbilical catheter being most used. In this case, the access must be appropriately identified, fixed, and its position confirmed using x-ray⁽¹⁴⁾.

Taking into consideration that the majority of the NBs transported arrived in the institution which was the study scenario in a hypothermic condition, due to being in this situation, the extremities of their limbs are compromised. An attempt at central venous puncture at this point would be contraindicated as it is a slow invasive procedure, entailing a risk in the situation of hypothermia, while peripheral puncture could also be made difficult due to the vasoconstriction of the venous network.

The positioning of the umbilical catheter must be confirmed through the use of x-ray in the NICU. According to the literature, an intracardiac catheter can provoke mechanical complications such as: perforations of the myocardium, pericardial effusion, cardiac tamponade and arrhythmia⁽¹⁴⁾.

A patient who is transported with the norms instituted by the Ministerial Ordinances being observed is less subject to adverse events related to her clinical condition, to the contrary of what occurs during a prolonged transport, which has potential for complications, leading to a worse prognosis in terms of morbidity and mortality⁽¹⁵⁾.

Consequently, in the case of land-based transport in which the distance to be traveled is above that recommended for NBs <31 weeks, there is a greater chance of the occurrence of intracranial hemorrhage⁽¹⁶⁾.

Intraventricular or periventricular hemorrhage has deserved, in recent years, greater emphasis than any other neurological problem of the NB. It is a common infirmity which affects NBs <30 weeks of gestation and weighing below 1500 g, as they possess functional and anatomical immaturity, and are associated with a higher rate of morbidity and mortality, including cerebral paralysis⁽¹⁷⁾.

One study undertaken in India with the objective of determining the predictors of neonatal mortality during interhospital transport concluded that among the factors analyzed, the duration of the transport being greater than one hour, for extremely premature babies, was significant for neonatal mortality⁽¹⁸⁾.

Body temperature below 36°C is a risk factor for neonatal morbidity and mortality as it aggravates the acid-base imbalance, respiratory discomfort, necrotizing enterocolitis and periventricular hemorrhage in very low weight NBs. This information characterizes an important and severe data, as hypothermia, before and during the transport, promotes the worsening of the patient's clinical condition, principally if it is associated with other infirmities, it being important to emphasize that it increases the chance of death by 67% when the child is admitted to NICU in a hypothermic state and with one hour of life⁽¹⁹⁾.

All NBs, principally those premature, are imperfect thermoregulators, that is, they are able to overheat (fever) and cool rapidly. At birth, they have an ability to control the blood flow of the skin, however, they do not have the same ability to maintain their body temperature. In the same way, they present an inability to conserve heat when exposed to thermal stress⁽²⁰⁾. This being the case, the NB is a being who is directly dependent on her caregivers, who are fundamental in promoting an ideal thermic environment for ensuring not only her survival, but also optimal physical and neurological

development⁽²⁰⁾.

Incidentally, in the 1990s, hypothermia was one of the factors related to 70% of adverse events during neonatal transport. However, unfortunately, hypothermia continues to have a central role in the clinical deterioration of the patient⁽²¹⁾.

Comparing the distances of the municipalities mentioned in Table 1 with the patients' temperatures, it may be perceived that this did not interfere in the results, given that 15 NBs presented, mainly, moderate hypothermia, considering that the distances varied from 20 km to 226 km from the capital of Minas Gerais. It cannot be affirmed, but it may be the case that these NBs' hypothermia may be associated with the team's unpreparedness to maintain the patients' normothermia.

The thermal control of the premature baby is one of the major challenges faced by nursing, however, in particular in this population, an imbalance can occur, with heat loss being greater than heat production, due to the lower store of brown fat⁽²²⁾.

The monitoring of temperature is essential for NBs, principally those which are premature, as hypothermia can worsen the prognosis, increasing neonatal morbidity and mortality, as already mentioned. The indicator of temperature is a factor which deserves special attention, principally in the cases of neonatal transport, as the hypothermia which occurs during the journey, in the majority of cases, is associated with death⁽²¹⁾. The normothermia of the NBs must be the object of extreme attention on the part of the nursing team, whose members need to be trained, particularly when the vehicle lacks the appropriate equipment for minimizing the risks of hypothermia⁽²²⁾. The quality of the care provided during transport must be maintained in the neonatal unit. Furthermore, hypothermia reduces the production of surfactant, vital for the NB, increasing oxygen consumption and the depletion of the calorie reserves, contributing to the worsening of the respiratory failure⁽²²⁾.

The premature baby is already compromised in the production of surfactant which, associated with hypothermia, contributes to their being a reduction of this, resulting in the worsening of these children's respiratory situation. Furthermore, in cases of severe hypothermia, it is possible for there to occur hypotension, bradycardia, irregular respiration, reduction of activity and of reflexes, vomiting and nausea, metabolic acidosis, hypoglycemia, oliguria and even generalized bleeding, which may lead to the patient's death⁽²²⁾.

In order to combat hypothermia, and minimize the harm to the NB during interhospital transport, what is indicated most is that the vehicle should be appropriately equipped with a transport incubator. However, the NBs' institutions of origin do not always have adequate or available equipment for the transport. This lack or inadequacy of equipment was observed upon the admission in ICU of two cases of transports, out of the total of 30, in which one NB arrived in a bath, and another, on the lap of the health professional.

It is known that survival of premature babies and those born full-term increases when they are transported in closed chambers (incubators), with temperatures determined according to the children's age, an initiative which as well as reducing oxygen consumption, helps to keep them warm⁽²³⁾. The simple fact of wrapping the low weight NB in a plastic bag stops her from losing heat, ensuring normothermia. One can also use a cap on the region of the head, the area of greatest heat loss among these preterm babies. These strategies have been considered efficacious and efficient in reducing loss of water from the skin and, consequently, oxygen consumption⁽²³⁾.

● FINAL CONSIDERATIONS

The interhospital transport of the at-risk NB occurs with great frequency, proceeding from the interior of the State of Minas Gerais to its capital, Belo Horizonte. In the present study, we identified that the professionals were not appropriately trained and lacked the appropriate materials for caring for the NB.

As evidenced, hypothermia was the predominant adverse event in the population studied; normothermia is considered essential for the survival of the NB, above all when premature. In the majority of the transports, the NBs arrived in the institution's Neonatal Unit in a hypothermic condition,

even when cared for by nurses and settled in incubators during the transport; from which it may be inferred that the professionals who provided the care were not being attentive to adjustment of the ideal temperature of the incubator, or even to undertaking the necessary procedures for avoiding hypothermia and thus ensuring the NB's survival.

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