



THERMOREGULATION OF THE NEWBORN: CARE DURING THE ADMISSION IN A PEDIATRIC EMERGENCY UNIT*

TERMORREGULAÇÃO DO RECÉM-NASCIDO: CUIDADOS NA ADMISSÃO EM UNIDADE DE EMERGÊNCIA PEDIÁTRICA

TERMOREGULACIÓN DEL RECIÉN NACIDO: ATENCIÓN EN LA ADMISIÓN EN UNIDAD DE EMERGENCIA PEDIÁTRICA

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We aimed to investigate the care in thermoregulation of the newborn during the admission in a High Complexity Pediatric Emergency Unit. Retrospective documentary study, carried out in a teaching hospital of Ceará, Brazil. Data collection was performed through a form, 149 medical records of newborns with a request for transfer to neonatal intensive care unit. There was prevalence of males, at term, weighing between 2,500 and 3,999 grams, and born vaginally in hospitals. Among the main causes that led to the unit transfer request, 44.3% presented respiratory disorders. Most (85.9%) was Normothermic, and the most evident care was checking the axillary temperature and the use of heat sources (incubator, radiant heat source). We concluded that mild hypothermia was the most present risk indicator and that cares concerning the thermoregulation in the admission of the newborn are consistent with the clinical manifestations presented.

Descriptors: Infant, Newborn; Body Temperature Regulation; Emergencies.

Objetivou-se investigar os cuidados realizados quanto à termorregulação do recém-nascido durante a admissão em unidade de Alta Complexidade de Emergência Pediátrica. Estudo retrospectivo, documental, realizado em um hospital escola do Ceará, Brasil. A coleta dos dados foi realizada por meio de formulário, 149 prontuários de recém-nascidos com solicitação de transferência para unidade de terapia intensiva neonatal. Predominou o sexo masculino, a termo, com peso entre 2500 e 3999 gramas, nascidos em hospitais por via vaginal. Dentre as principais causas que levaram a solicitação de transferência para unidade 44,3% apresentavam distúrbios respiratórios. A maioria (85,9%) mostrou-se normotérmica, sendo o cuidado mais evidente a verificação da temperatura axilar e a utilização de fontes de calor (incubadora, fonte de calor radiante). Concluiu-se que a hipotermia moderada foi o indicador de risco mais presente e que os cuidados quanto à termorregulação na admissão de recém-nascidos estão em consonância com as manifestações clínicas apresentadas.

Descritores: Recém-Nascido; Regulação da Temperatura Corporal; Emergências.

El objetivo fue investigar la atención en la termorregulación de recién nacidos durante la admisión en unidad de Alta Complejidad de Emergencia Pediátrica. Estudio retrospectivo, documental, en hospital de enseñanza del Ceará, Brasil. La recopilación de datos se realizó mediante cuestionario, 149 registros médicos de recién nacidos con solicitud de transferencia para unidad de cuidados intensivos neonatal. Predominó el sexo masculino, a término, con peso entre 2500 y 3999 gramos, nacidos en hospitales por vía vaginal. Entre las principales causas que llevaron a la solicitud de transferencia para unidad, 44,3% presentaron trastornos respiratorios. La mayoría (85,9%) fue normo térmica, siendo la atención más evidente con verificación de la temperatura axilar y uso de fuentes de calor (incubadora, fuente de calor radiante). La hipotermia moderada fue el indicador de riesgo más presente y la atención cuanto a la termorregulación en la admisión de recién nacidos tuvo consonancia con las manifestaciones clínicas presentadas.

Descritores: Recién Nacido; Regulación de la Temperatura Corporal; Urgencias Médicas.

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INTRODUCTION

According to the World Health Organization definition, the newborn (NB) normal temperature should be between 36.5 and 37 °C, suffering variations considered as mild hypothermia (36.0 to 36.4 °C), moderate hypothermia (32.0 to 35.9 °C) and severe hypothermia (below 32.0 °C). Temperatures above 37.5 °C are considered hyperthermia⁽¹⁾.

Studies carried out since 1950 demonstrate that NB with hypothermia have their clinical condition aggravated, which means that temperature control is essential for their survival⁽²⁾. Fetal temperature is approximately 0.5 °C higher than intrauterine temperature. However, during birth, the heat is rapidly lost due to external environment coldness and evaporation⁽³⁾.

If compared to term newborns, pre-term ones have their heat production and retention capacity reduced due to their lower subcutaneous fat percentage, poor vasomotor control, higher body mass in comparison to body volume and undeveloped epidermis⁽⁴⁾. Therefore, it is believed that body temperature care and monitoring can contribute to reduce neonatal morbi-mortality, thus facilitating homeostasis.

Body temperature care and control in newborns must start at birth, even in the delivery room, and followed throughout the entire hospitalization process. Studies show different strategies developed to achieve this goal, such as incubator use, keeping the delivery room heated, use of a polyethylene bag, etc⁽⁵⁾.

Neonatal assistance has been going through different transformations and the appearance of new technologies has allowed for a more comprehensive newborn care, in particular for those under high death risk. In this context, it is worth highlighting the upgrading of neonatal intensive care units (NICUs) and

the knowledge on psychopathological aspects of newborns in critical health conditions⁽⁶⁾.

A NICU is a technological environment in which professional work and technological progress are aimed at the NB recovery. In these units, in which many medical procedures are performed by different professionals, there is a tendency for thermo-irregularities due to the clinical instability of some assisted newborns⁽⁷⁾.

In the context of NB assistance in critical situations, it is important to remark that Pediatric Urgency and Emergency services often admit these patients due to the lack of beds available at NICUs, keeping them in High Complexity Pediatric Units (HCP), where professionals offer NB care seeking to recover those in critical health conditions, which predisposes professionals to the need to develop initiatives that include the use of new technologies and the permanent incorporation of knowledge.

NB thermoregulation care is a permanent challenge for professionals who assist this group of patients in the different health scenarios, especially in emergency units, in which NB assistance during the first weeks of life can have implications related to temperature issues.

Therefore, this study is relevant for nursing purposes, once this professional category is responsible for care management and events control. As these are units where countless medical procedures take place, with high patient turnover, we sought to investigate NB thermoregulation care during admission at High Complexity Pediatric Emergency Units.

METHODS

This is a descriptive-exploratory retrospective documentary study performed at the Pediatric Urgency and Emergency Unit of a school hospital, which is a reference center for 55 municipalities of the northern Ceará region in Brazil.

In this institution, the assistance is organized according to a risk level admission, redirecting patients to HCP units and observation units, as well as to the nursing procedures and small surgical procedures room. The team is composed of pediatricians, nurses, assistants and nursing technicians.

HCP units boast an infrastructure of four beds, being one standard unit, a transportation incubator and two pediatric beds.

It is worth highlighting that sample newborns were sent to the place of study from their municipalities of origin and transported in ambulances, as they needed intensive care that was unavailable at their places of origin. They remained at the HCP unit waiting to be transferred to a NICU - equipped hospital. The patient flow was managed by the Ceará State Hospital Bed Regulation Center.

Data collection was performed from October to December/2010. Medical records of term and pre-term newborns admitted from January 2008 to December 2009 were evaluated. The inclusion criteria were the NB clinical records with NICU transfer request and HCP unit admission during the research period. Identification of newborns with NICU transfer request was made through a unit registration book, which had 157 registered patients. However, the sample was composed of only 149 clinical records, as 8 of them were excluded for not

having their medical history number entered in the researched admissions book, which made it impossible to track their clinical records in the Medical Statistics Service File.

Information was collected from the clinical records available through a form to be completed with neonatal variables (gestational age, weight, sex, place of birth, delivery method, NICU transfer request), clinical conditions with regards to thermoregulation when admitted (normothermia, mild, moderate or severe hypothermia and hyperthermia) and care offered during hospitalization (temperature verification, methods used to promote heating) being evaluated records from all professional categories involved in the referred assistance, checking them with admission records.

All data was entered in Microsoft Excel 2007 charts and data was analyzed through descriptive statistics applying simple and absolute frequency. Data was then introduced in tables with further analysis and discussion supported by the relevant literature.

The study was approved by the Hospital Scientific Commission and the Research Ethics Committee of the Ceará Federal University, in according to resolution nº198/10, and ratified in the meeting celebrated on September 09, 2010.

RESULTS

It is important to get familiar with the variables related to NB birth conditions and the transfer request issued by the professional team of the hospital from which the baby was coming from originally, understanding its implications in the thermoregulation process during emergency unit admission.

Table 1 - Distribution of newborns according to neonatal variables. Sobral, CE, Brazil, jan 2008/dec 2009

Variables	N	%
Sex		
Male	85	57,0
Female	58	39,0
No Records	6	4,0
Gestational Age (without)		
Term ($\geq 37w$)	77	51,7
Preterm ($\leq 36w 6d$)	45	30,2
No Records	27	18,1
Birth Weight (g)		
<1,500g	21	14,1
1,500 a 2,499	23	15,4
2,500 a 3,999	97	65,1
>4,000	8	5,4
Place of Birth		
Hospital	138	92,6
Address	4	2,7
Ambulance	7	4,7
Delivery Method		
Vaginal	109	73,1
Abdominal	39	26,2
No Records	1	0,7

Source: NB records n=149

Results introduced in Table 1 show that males were predominant with 57% of the total sample. With regards to the Gestational Age, most were term births (51.7%). As for birth weight, most were in the range

between 2,500 and 3,999 grams, accounting for 65.1% of the total.

With respect to the birthplace, 92.6% of babies were born at hospitals of their place of origin and vaginal deliveries accounted for 73.1% of births.

Table 2 - Diagnosis for NB transferred to NICUs. Sobral, CE, Brazil, Jan 2008/Dec 2009.

Diagnosis	N	%
Respiratory Disorders	66	44,3
Prematurity	33	22,1
Infection	22	14,8
Congenital Malformations	13	8,7
Gastrointestinal disorders	5	3,4
Prematurity + Respiratory Disorders	5	3,4
Respiratory Disorders + Infection	2	1,3
Metabolic Disorders	3	2,0

Source: NB Records, n=149

When analyzing the reasons that led these newborns to need to be transferred to a NICU, as from table 2, we observe that the commonest event was respiratory disorders with 44.3%. This percentage includes disorders/pathologies that affected the respiratory tracts such as neonatal anorexia, meconium

aspiration syndrome, respiratory insufficiency and hyaline membrane syndrome among others. Another frequent diagnosis was prematurity with 22.1%.

Some NB received more than one diagnosis during admission. These cases accounted for 4.7% of the total sample.

Table 3 – Clinical events related to thermoregulation detected during admission. Sobral, CE, jan 2008/dec 2009

Clinical events	N	%
Normothermia	72	48,3
Hypothermia	46	30,9
Hyperthermia	10	6,7
No Records	21	14,1

Source: NB records, n = 149

As detailed in table 3, although most newborns admitted at the HCP unit were in normothermia conditions, 56 of them (37.6%) presented an alteration in the thermoregulation process, with 46 of them (30.9%) showing signs of moderate hypothermia (<35.9°C). There were no mild hypothermia cases and

only one case of severe hypothermia.

Table 4 illustrates care measures taken to promote thermoregulation as entered in clinical records. It is worth highlighting that more than one single measure can be taken during NB assistance.

Table 4 - Thermoregulation-related care during NB admission to the High Complexity Pediatric Unit in Sobral, CE, Brazil, jan 2008 to dec 2009

Thermoregulation care	N	%
Verify NB axillary temperature	128	85,9
Keep NB in heated incubator	61	41,0
Keep NB under radiant heat source*	64	43,0
Keep radiant heat source + cotton boots and gloves with bandage wrap*	7	4,7
No records of heat source installation	38	25,5
Antipyretic administration	10	6,7

Source: NB clinical records, *bedridden NB.

The most frequent action taken was axillary temperature verification, with 128 cases (85.9%), followed by keeping the baby under a radiant heat source, 64 (43%), keeping the NB in heated incubator

with 61 cases (41.0%). Only 7 cases (4.7%) needed radiant heat source application, dressing and wrapping the newborn in cotton boots and gloves.

DISCUSSION

The research on birth conditions and NICU transfer requests for possible NB hospitalization calls for some reflections on the possible causes for temperature imbalance during admission in the emergency unit, as nurse professionals must be committed to observing NB physiological alterations, always verifying the causes that provoke temperature variations⁽⁸⁾.

In this study, we noticed a predominance of term NB in comparison to pre-term ones. Based on data provided by the Live Births Information System - SINASC, in the analysis of the Northeastern region excluding capital cities, a reduction in prematurity was observed, going from 7.7% in 1994 to 5.2% in 2005. In Fortaleza, during the same period, the prematurity percentage decreased from 7.2% to 6.4%. This reduction may be linked to wider access to health services and an improvement in the quality of life in recent years in the interior of Northern and Northeastern states. However, further studies on the subject are necessary⁹⁾. Another study that corroborates this fact was carried out in the city of Maranguape - Ceará, Brazil. This study demonstrated that from 2000 to 2003 there was an increase in term births of newborns weighing from 2,500 to 3,999 grams⁽¹⁰⁾.

In agreement with table I data, male term newborns with adequate weight to their gestational age were majority in HCP unit admissions. In a study performed at the Emergency service of the Pernambuco Maternity and Child Institute, aimed at establishing mortality risks related to hypothermia during admission and based on a case study similar to the present research (predominance of male NB with weight between 2,500 e 5,100g) it was demonstrated that hypothermia is an important mortality risk factor, regardless of associations with other variables. The reasons appointed by the study are warming failure before and during transportation⁽¹¹⁾.

NB transportation must be an adequate and effective process in order to avoid possible thermoregulation-related complications. In a study on intra-hospital transfers it was revealed that even during short trips, the consequences for the NB health can be significant. They can develop hypothermia as the main complication followed by cardiac frequency disorders,, arterial pressure, respiratory frequency and oxygenation alterations⁽⁷⁾.

The stress provoked by exposure to cold creates metabolic and physiological problems to all newborns, regardless of their condition or gestational age. Although handling can be an aggravating factor that interferes with thermoregulation, its importance must be acknowledged, as nursing is one of the main actors in the search for better results with regards to newborn thermoregulation, and in particular, in the case of premature babies⁽¹²⁾.

The clinical records of studied NB reveal that most of them were delivered vaginally. Although Brazilian studies link more neonatal mortality to cesarean delivery, it is believed that this birth method can exert a protective effect, especially for pre-term newborns⁽¹³⁻¹⁴⁾.

The birth anticipation with a precise cesarean delivery may reduce death risks for these newborns, as the weight for natural delivery can be an aggravating factor. In this context, it is worth mentioning a study performed in Fortaleza-CE, that showed that prematurity and the time elapsed during the displacement from home to hospital ≥ 30 minutes, < 1 hour or \geq than 10 hours between hospitalization and birth represent important variables for neonatal mortality⁽¹⁵⁾.

As from the data obtained in table 1, it is clear that a small number of babies were born outside the hospital environment, such as homes (2.7%) and ambulances (4.7%). This fact must be considered by

professionals when investigating factors related to NB thermoregulation at the moment of hospitalization.

As for medical diagnoses found in studied newborns, there was a predominance of respiratory disorders with 66 cases (44.3%). Literature demonstrates that acute respiratory infections respond for nearly 20% to 40% of pediatric hospitalizations and between 30 to 60% of emergency care cases, being the main cause of death and hospitalization in children under five years of age. During the neonatal period, respiratory disorders are responsible for 30 to 40% of hospitalizations, which demonstrates its extreme relevance as a Public Health Problem⁽¹⁶⁾.

Prematurity was the second most frequent diagnosis that motivated NICU transfer requests. As for the mechanisms used to keep thermoregulation, it is known that premature babies with low weight at birth are more likely to suffer temperature instability due to the immaturity of their organs and systems⁽¹⁾.

Besides temperature instability, we must also mention the premature baby predisposition to contract respiratory diseases due to pulmonary immaturity, such as that the hyaline membrane disease, due to lack of adequate quantity of surfactant in the alveolar space⁽¹⁹⁾, which may multiply metabolic instability and consequently result in thermoregulation alterations.

While 56 (37.6%) of newborns presented temperature alterations, 30.9% of them were born with hypothermia. Both hypothermia and hyperthermia must be corrected, as they produce a severe metabolic tiredness in the newborn regardless of the disease that may be suffering from, as it can cause serious alterations in vital signs (including tachycardia, bradichardia, tachypnea and apnea) and increase energy consumption⁽³⁾.

A study on hypothermia carried out in Guinea Bissau aimed at analyzing long-term effects of neonatal hypothermia during survival showed that hypothermia is

linked to mortality beyond the perinatal period, up to two months of age⁽¹⁷⁾.

Even taking into account that this study was carried out in a tropical country (Brazil), the percentage of newborns admitted with hypothermia symptoms was considered relevant.

According to the World Health Organization (WHO), hypothermia must be prevented by educating the future parents, midwives and intra and extra-hospital assistance professionals on technical support and adequate hypothermia clinical diagnosis in newborns (irritability, excessive motor activity, tachycardia, bradichardia, crying, vasoconstriction signs, skin stains, pallor and cyanosis)⁽¹⁸⁾.

The administration of antipyretics is decided whenever the NB shows hyperthermia signs. Non-opioid analgesics are recommended for temporary alleviation in cases of very mild to moderate pain, discomfort after vaccination and as antipyretics for newborns⁽¹⁹⁾. Besides this practice, other auxiliary measures such as the use of incubators, removal and/or reduction of external heat sources such as blankets, warm lamps, phototherapy, oxygen therapy helmets with warm mist, monitoring of infection and dehydration signs, monitoring of possible convulsive crises and the use of physical means to stop hyperthermia should be considered^(12,19).

Axillary temperature verification in NB was the most frequent care measure (85.9%). Monitoring through verification of vital signs to keep body temperature in an environment with stable temperature must be a priority goal for the nursing team responsible for NB assistance⁽¹⁹⁾. However, this care requires that professionals should have scientific knowledge in order to identify alterations and to make the right decisions for each situation. For this reason, we emphasize that this practice should not be performed just as a service routine, being approached by professionals as a practice carried out to prevent clinical alterations, seeking to avoid more serious complications.

The temperature control in critical NB must be performed every three hours⁽¹²⁾. The thermometer used may be made of glass, leaving it for an average of three minutes for temperature measurement, or digital, which allows for faster reading. The thermometer must be placed in the axillary cavity with its end in contact with the skin and the baby's arm on the trunk⁽¹⁹⁾.

The installation of a radiant heat source for the admission of these newborns was implemented due to the lack of other equipment such as incubators and warm cradles at HCP units. In these units, the radiant heat source is applied together with physical heating sources such as the use of special cotton boots and gloves and bandage prepared to warm the NB extremities. However, we must pay attention to possible complications such as skin burns and tourniquets in body members provoked by the bandage.

Some studies suggest that although the use of cotton and woolen socks and hats are widely used due to their easy availability, they offer some improvement during the first 30 minutes of life but they are not effective to avoid heat loss. However, using the hat together with a transparent plastic covering may make a significant difference in improving thermoregulation^(3,5).

The use of incubators was present in 41% of the sample. Through these devices, we search for the neutral temperature environment, which provides temperature conditions that ensure minimal metabolic energy and calory waste and reduced oxygen consumption, thus allowing newborns to keep a stable body temperature⁽¹⁹⁾. For this purpose, it is necessary to place them in incubators or warmed cradles, especially in the case of premature babies incapable of keeping a normal body temperature⁽²⁰⁾.

It is perceived that except for the case of temperature monitoring, all other care measures are aimed at solving or preventing the hypothermia problem.

As these are urgency and emergency units, issues related to overcrowding and scarcity of equipment often limit professional initiatives aimed at offering adequate care. No records of medical gas administration or routine incubator temperature verifications were found.

Despite widespread misconceptions with regards to hypothermic newborns, cases are underreported⁽¹⁸⁾.

The clinical records must reflect the profile of the assistance offered and should include data on the responsible health professional and the patient, covering both ethical and legal issues. When these records are insufficient and inadequate, they compromise care services offered, the institution and the health care team⁽²¹⁾.

With this perspective, it is important to highlight the absence of records related to extra-hospital NB transportation features, as well as the care measures taken during transportation or the way in which parents took the NB to hospital. It is necessary to enter this information in the medical records, considering that care given prior to hospitalization admission affects the need for technology to keep a neutral temperature environment during HCP unit admission.

CONCLUSIONS

The number of NB in critical conditions who need intensive care is considerable and due to the scarcity of resources in their hospitals of origin, they are often transferred to other hospitals under risk of temperature instability and the consequent health damage, in particular for premature babies with respiratory disorders.

Most newborns were in normothermal conditions when hospitalized. Moderate hypothermia was predominant amongst thermoregulation alterations, proving that temperature care during extra-hospital transportation needs to be reevaluated by health

professionals and health services managers from the municipalities where the newborns were coming from.

Thermoregulation care actions taken during hospital admission are in agreement with the most frequent clinical events observed, as the main initiatives taken were aimed at hypothermia prevention and cure. However, it is mandatory to implement more efficient and less invasive remedies, such as the use of a transparent covering and the monitoring of incubator temperatures.

We are aware that public health services, and in particular urgency and emergency ones, have few resources, lack of enough professionals and suffer chronic overcrowdings, which can limit effective assistance and care quality. The lack of medical information, mainly with regards to extra-hospital transportation is ever-present in Brazilian health services, which oftentimes contributes to data underreporting, demonstrating the fragility of the health team records, thus limiting the development of documentary research.

It is important to highlight the need for further studies on this topic, seeking to evaluate the transportation conditions to which NB are exposed to, considering transfer times, qualitative and quantitative extra-hospital care offered by the professional team during transportation, birth features, delivery method and health conditions before and after hospital transfer.

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