



Identification of the severity and use of interventions in neonates with perinatal asphyxia

Identificação da gravidade e do uso de intervenções em recém-nascidos com asfixia perinatal

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Objective: to identify the severity and the use of interventions in neonates with perinatal asphyxia. **Methods:** this is a documentary study carried out with 48 records of newborns with perinatal asphyxia in the Neonatal Intensive Care Unit, based on the neonatal therapeutic intervention score system. Data were analyzed using descriptive and inferential statistics. **Results:** preterm newborns presented complications such as presumed neonatal infection (63.2%), respiratory failure (59.1%), sepsis (38.7%) and seizure (39.7%). During hospitalization, 35.4% of them died. The most used interventions were transport and vital signs (100.0%), thermoregulated environment (97.9%), invasive mechanical ventilation (91.6%), antibiotics (77.0%), intubation (75.0%), phlebotomy (72.9%) and central venous catheter (68.7%). **Conclusion:** the mean score of the Neonatal Therapeutic Intervention Scoring System was 19.9, with statistically different means verified between the categories of variables Duration of hospitalization, Clinical outcome and Mother's education.

Descriptors: Neonatal Nursing; Intensive Care Units, Neonatal; Asphyxia Neonatorum; Neonatology.

Objetivo: identificar a gravidade e o uso de intervenções em recém-nascidos com asfixia perinatal. **Métodos:** estudo documental, realizado com 48 prontuários de recém-nascidos com asfixia perinatal em Unidade de Terapia Intensiva Neonatal, baseado no sistema de escore para intervenção terapêutica neonatal. Dados analisados por meio de estatística descritiva e inferencial. **Resultados:** os recém-nascidos avaliados apresentaram complicações como infecção neonatal presumida (63,2%), insuficiência respiratória (59,1%), sepse (38,7%) e convulsão (39,7%). Durante a internação, 35,4% foram a óbito. As intervenções mais utilizadas foram transporte e sinais vitais (100,0%), ambiente termorregulado (97,9%), ventilação mecânica invasiva (91,6%), antibióticos (77,0%), intubação (75,0%), flebotomia (72,9%) e cateter venoso central (68,7%). **Conclusão:** a média de pontuação do escore *Neonatal Therapeutic Intervention Scoring System* foi de 19,9, sendo verificadas médias estatisticamente diferentes entre as categorias das variáveis Duração da internação, Desfecho clínico e Escolaridade da mãe.

Descritores: Enfermagem Neonatal; Unidades de Terapia Intensiva Neonatal; Asfixia Neonatal; Neonatologia.

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Introduction

Perinatal asphyxia is a common clinical condition in the public health service. It is one of the most important causes of illness and death in children under two months old. It is associated with the percentage of preterm infants with low birth weight, constituting a threat to survival and health of children in the Americas⁽¹⁾. Also, it can progress to hypoxic-ischemic encephalopathy, responsible for high neurological morbidity⁽²⁾. Thus, infants with perinatal asphyxia need special care from the neonatal period and it can be lifelong⁽³⁾.

In the context of maternal and child care, in spite of the significant decrease in the infant mortality rate in Brazil, perinatal asphyxia is one of the causes that did not accompany this trend of marked reduction, which resulted in its rise from the fourth to the third cause of death in 2015 (1.93 per thousand live births)⁽⁴⁾.

In the hospital environment, regarding the use of new technologies, the assistance in neonatal intensive care units has been modified, contributing to the increase in the survival of newborns. Due to this necessity, objective gravity measurement systems and specific prognostic methods have been developed.

The Neonatal Therapeutic Intervention Scoring System (NTISS) is a predictive model of neonatal in-hospital mortality and morbidity, which also estimates the use of resources, particularly the nursing workload. It is unique because it uses treatments, rather than clinical factors. NTISS was constructed from the Therapeutic Intervention Scoring System, a system of severity measurement of adult patients hospitalized in the Intensive Care Unit, which quantifies the therapeutic interventions of medical and nursing procedures, based on that the more procedures the patient receives, the greater its severity and, consequently, more time spent by the nursing. It was validated in the United States, with 1,643 admitted newborns in neonatal intensive care units, considered a severity score with good accuracy and prognostic value, inclu-

ding estimates of risk and hospital mortality rate⁽⁵⁻⁶⁾.

The study on the use of care technologies allows the detection of variations in care practices, which reflect in operational costs and may guide the allocation of resources in neonatal intensive care⁽⁶⁾. For that, there is a need to use specific instruments by the nursing, aiming to know the demand for care to better planning, optimization of resources and consequent improvement of care.

Thus, it was intended to answer the following question: what are the severity and the need for interventions of newborns with perinatal asphyxia in a tertiary neonatal intensive care unit? The relevance lies in the fact that although there is a lack of knowledge about the mortality rate, there is a lack of knowledge about the severity they reach the tertiary hospital and consequent use of care interventions during hospitalization.

Thus, the objective was to identify the severity and the use of interventions in neonates with perinatal asphyxia.

Methods

This is a documentary study, carried out in medical records from January to August of 2016, in a Tertiary Neonatal Intensive Care Unit of a reference pediatric hospital in the State of Ceará, Brazil. Data were extracted from records of newborns with perinatal asphyxia, hospitalized from January to December 2015, at that institution. There was no sample calculation since it was decided to work with all cases since it was a specific clinical condition. Therefore, the inclusion criterion adopted was to be newborn with a diagnosis of perinatal asphyxia and to have been admitted in 2015 in the Unit of Neonatal Intensive Care, excluding only those who did not have NTISS completed in the medical record.

Thus, the first stage in data collection was to consult the book to identify the subjects of the study, obtaining a total of 63. In the second stage, information was collected in the medical records, using a form

developed by the researcher, with variables of the mother, childbirth, newborn, hospitalization and NTISS score in the first 24 hours of admission. Data were collected from hospital standardized records, such as admission, discharge, and NTIS, in the evolutions and declarations of live births and death.

The NTISS score consists of eight dimensions related to the type of care: respiratory, monitoring, cardiovascular, drug therapy, metabolic/nutrition, transfusions, procedures and vascular access. Each of these has items that correspond to interventions used in neonatal intensive care units. The quantity of items in the dimensions is varied. They score from one to four, where the value one is attributed to less invasive therapy; and the value four is attributed to the most invasive therapy, adding up to 62 as the maximum score. A value of zero is assigned when the item is not used in the patient in that period⁽⁵⁻⁶⁾.

The data were organized into tables in Microsoft Excel 2010, expressed in absolute and relative frequencies and submitted to statistical analysis (Mann-Whitney test), through the program Statistical Package for the Social Sciences, version 20.0.

The study complied with the formal requirements contained in the national and international regulatory standards for research involving human beings.

Results

A total of 63 medical records were evaluated, but 15 of them did not have completed NTISS and were excluded from the study. Thus, there were 48 records of newborns with perinatal asphyxia present, with most males (58.3%) coming from the interior of Ceará (83.3%), children of multiparous mothers (54.1%), aged between 20 and 35 years old (65.9%).

As for perinatal aspects, most of the babies had more than six prenatal consultations (67.3%), they were born from normal delivery (54.1%), the gestational age was above 37 weeks (66.6%) and they had an average weight of 2768 g, ranging from 800g to

4715g. The means of the Apgar Index in the first minute was 3.5, being 84.4% inferior to seven; and in the 5th minute, it was 5.7, with 64.4% less than seven.

The age at admission prevailed between zero (45.8%) and one day of life (31.2%). The mean duration of hospitalization at the Neonatal Intensive Care Unit was 17.1 days, with a minimum of one and a maximum of 95 days, and the mean hospital stay was 42.2 days, ranging from one to 450 days.

Regarding the outcome, 35.4% died in the Neonatal Intensive Care Unit, 64.5% transferred to the medium risk group, 12.9% of them came from the medium risk unit to other sectors, such as resuscitation, neurology, cardiology, mechanically ventilated patients and neonatal and pediatric intensive care unit. Only 4.1% of the patients were transferred to other hospitals and one continued in the unit of patients dependent on ventilation for more than one year.

Besides to perinatal asphyxia, 50.0% presented up to three complications and 50.0% from four to seven complications, such as presumed neonatal infection (63.2%), respiratory failure (59.1%), sepsis (38.7%), seizure (39.7%), jaundice (26.5%), prematurity (26.5%), pulmonary hypertension (16.32%), heart disease (12.2%) and others. The mean NTISS score was 19.9, ranging from 7 to 48 and the median 19. In the first 24 hours of the Neonatal Intensive Care Unit, the decreasing order of means was: respiratory (4.7), monitoring (4.4), cardiovascular (2.5), medication (2.4), procedures (2.2), metabolic/nutrition (1.8), vascular access (1.7), transfusions (0.4).

The most used interventions in descending order were: transportation (100.0%), vital signs (100.0%), thermoregulated environment (97.9%), invasive mechanical ventilation (91.6%), antibiotics - a drug 77.0%), intubation (75.0%), phlebotomy (5 to 10) (72.9%), central venous catheter (68.7%), noninvasive monitoring (64.5%), cardiorespiratory monitoring (45.8%), fluid balance (39.5%), expander <15ml/kg, anticonvulsive therapy (35.4%), gavage (33.3%), peripheral venous access (27.0%), resuscitation (22.9%), vasopressor, phototherapy, intravenous

lipid and amino acid and potassium infusion (20.8%), among others. A mean of 12.6 interventions per patient was calculated.

Some interventions were not used during the first 24 hours of hospitalization such as mechanical and relaxing ventilation, high frequency mechanical ventilation, tracheostomy care, tracheostomy, extracorporeal oxygenation, invasive blood pressure monitoring, indomethacin, Standby cardiac pacemaker, use of cardiac pacemaker, gamma globulin, arterial catheter, partial and total exsanguine, red blood cell transfusion > 15 ml/kg, dialysis, pericardial drain, pericardiocentesis, oral diuretic and corticoid.

Table 1 shows the comparison of means of the NTISS score, according to the categories of each variable related to the newborn and hospitalization, which showed statistically significant differences in the categories of variables Duration of hospitalization and Clinical outcome.

Table 1 – Mean of NTISS, according to variables related to the newborn and hospitalization

Variables	n(%)	Mean/NTISS*	p
Gender			0.172
Female	20 (41.6)	20.4	
Male	28 (58.3)	19.4	
Weight (grams)			0.294
<2500	13 (27.0)	21.1	
>2500	35 (72.9)	18.5	
Apgar 1 st minute			0.362
< 7	38 (84.4)	20.2	
>7	7 (15.5)	18.5	
Apgar 5 th minute			0.617
< 7	29 (64.4)	20.7	
>7	16 (35.5)	19.5	
Number of complications			0.983
1 - 3	24 (50.0)	18.4	
4 - 7	24 (50.0)	21.4	
Age when hospitalized (day)			0.873
< 1	37(77.0)	19.5	
> 1	11 (22.9)	21.1	
Duration of hospitalization in the Neonatal Intensive Care Unit (days)			0.087
< 15	28 (58.3)	21.2	
≥15	20 (41.6)	18.1	
Duration of hospitalization (days)			0.047**
< 20	22 (45.8)	22	
> 20	26 (54.1)	18.2	
Outcome			0.029**
Death	17 (35.4)	21.0	
Transference	31 (64.5)	19.3	

*NTISS = Neonatal Therapeutic Intervention Scoring System; **p≤0,05, significant (Mann-Whitney Test)

Table 2 shows the comparison of means of the NTISS score for each category of variables related to mother and childbirth, observing a statistically significant difference in the categories of the mother's education level variable.

Table 2 – Mean of NTISS score according to variables related to mother and childbirth

Variables	n(%)	Mean/NTISS*	p
Maternal age (years)			0.955
10 - 19	8 (17.0)	19.1	
> 20	39 (82.9)	20.2	
Marital status			0.647
Single	16 (40.0)	18.9	
Married/stable marriage	24 (60.0)	20.3	
Education (years of study)			0.050**
< 9	15 (34.8)	21.6	
>9	28 (65.1)	18.8	
Previous deliveries			0.788
Primparent	21 (43.7)	19.2	
Multiple deliveries	26 (54.1)	20.2	
From			0.824
Fortaleza	8 (16.6)	18.8	
Interior	40 (83.3)	20.1	
Prenatal consultation number			0.715
< 6	15 (32.6)	18.9	
> 6	31 (67.3)	20.5	
Way of delivery			0.917
Vaginal	26 (54.1)	20.8	
C-section	22 (45.8)	18.8	
Gestational age (weeks)			0.249
<37	15 (32.6)	21	
>37	31 (67.3)	19.3	

*NTISS = Neonatal Therapeutic Intervention Scoring System; **p≤0.05, significant (Mann-Whitney Test)

Discussion

The records did not unanimously present the NTISS, constituting a limitation for the study, since it jeopardized the adequate collection of data on all cases of perinatal asphyxia in the unit, as well as the development of future studies aimed at improvement of

health care. This is an unpublished research with patients with perinatal asphyxia, which brings the profile of the use of care interventions in health for this specific population as a scientific contribution.

Regarding the variables Mother's Education, Duration of hospitalization and Outcome of hospitalization, a significant statistical difference was verified when correlated with NTISS, demonstrating its validity as an important tool in the direction of nursing care. This significance can also alert to the consequences of quality maternal and child health care, motivating reflections on cross-sectoral policies and specific health actions, both locally and broadly, improving the high costs of hospital services and indicators of health care. The reduction of neonatal mortality due to avoidable gravel is highlighted among these markers.

Regarding the Apgar Index, the patients obtained an average of 3.5 in the first minute, with 84.4% lower than seven. At the fifth minute, the mean was 5.7, with 64.4% lower than seven. When correlating the Apgar Index with the NTISS score, no significant statistical significance was obtained. However, the mean NTISS score was higher in the patients presenting Apgar less than seven in the first and fifth minutes, with 20.2 and 20.7, respectively, demonstrating that Apgar less than seven may generate a greater need for interventions.

Regarding the maternal education, statistical significance ($p=0.050$) was found when correlating with NTISS, which allows inferring that the mother's education may interfere in the need for interventions and, therefore, in the prognosis of the newborn. These results demonstrate the importance of care for mothers with low education since it can cause problems, such as a low number of prenatal consultations, or associated ($p\leq 0.001$) with the mortality rate, presenting four times more chances for neonatal death⁽⁷⁻⁸⁾.

Regarding the hospitalization variables, the meantime in the neonatal intensive care unit was 17.1 days, lower than in another study (36 days)⁽⁹⁾. However, mean hospital admission was 42.2 days, showing a statistically significant relationship, when associa-

ted with the NTISS value ($p=0.047$), allowing to infer that the NTISS value influences the length of hospitalization. In this way, the importance of its application as a planning, care, and management tool⁽⁵⁾ is concluded.

The outcome was also statistically significant ($p=0.029$), confirming the direct relationship with the patient's prognosis, that is the higher the score, the worse the prognosis⁽⁶⁾. A population cohort in São Paulo identified that 3,247 (22.0%) of the 14,597 early neonatal deaths were associated with perinatal asphyxia⁽¹⁰⁾, which corroborates the high frequency of death outcome of the newborns evaluated in the present study (35.4%), with a mean NTISS value of 21 and an average of 12 days of hospitalization, ranging from one to 42 days.

Regarding the NTISS, the mean value found (19.9) during the first day of hospitalization did not vary widely than a study carried out to evaluate the severity of critically ill newborns in Ukraine (22.4), as well as compared to other types of studies, showing similarity in the severity and use of interventions in neonatal care in different localities, such as Londrina (17.2), performed with 81 newborns; in Mato Grosso do Sul (18), with 83 newborns; in Mexico (20.4), with 505 newborns; and Taiwan (20.3) with 172 newborns^(6,11-14).

A study with the objective of evaluating the complexity of nursing care, classifying it as low, medium and high complexity, through NTISS, indicated that scores between 13 and 40 indicate high complexity care, which represented 91.6% of newborns -children with perinatal asphyxia in this study⁽¹⁵⁾.

Regarding the dimensions assessed by NTISS, respiration obtained the highest mean (4.7), followed by monitoring (4.4). This result differs from a study with newborns, which found monitoring (5.5), with an upper respiratory rate (2.5)⁽⁶⁾. Despite being a neonatal intensive care unit, characterized by intense monitoring, patients with perinatal asphyxiation require more respiratory care, as demonstrated by the high frequency of more invasive interventions, including invasive mechanical ventilation (91.6%), and intuba-

tion (75.0%) in the first 24 hours. This fact can also be explained by the indication of continuous monitoring of respiratory rate, heart rate, arterial oxygen saturation and blood pressure of these patients, and therefore, mechanical ventilation is recommended⁽³⁾.

Cardiovascular dimension was the third (2.5) highlighting the following interventions: expander <15 ml/kg (35.4%), use of a vasopressor drug (20.8%) and resuscitation (22.9%), which shows the severity in the first 24 hours of admission. In a study that analyzed the evolution of perinatal asphyxia, 70.0% of the newborns had a record of resuscitation at birth, 76.0% required vasoactive drugs at admission and 44.0% resuscitation at admission⁽¹⁶⁾.

The newborns in this study needed transportation soon after birth and they were more likely to present changes in the clinical outcome due to the greater exposure to possible complications such as orotracheal intubation or initial treatment, by a team that does not have experience with critical newborns. Thus, in the procedures dimension, the fourth score, all presented the item transportation, because it is a pediatric referral hospital without maternity, and most of the patients arrived with less than 24 hours (45.8%) or one day of life (31.2%).

About the drugs dimension, in which the most used medications were antibiotics - one drug (77.0%), other drugs (47.9%), anticonvulsants (35.4%), intravenous diuretics (4.5%) and bicarbonate (10.4%), is in line with the main systemic alterations found in asphyxia. These include systemic infection, metabolic acidosis, bleeding, bradycardia, and hypoglycemia, with the premature convulsive crisis being the most frequently presented neurological manifestation (55.0%) and the reference motif on the first day of life (70.0%), receiving phenobarbital as the first drug⁽¹⁶⁾. Also, the mean of the dimension (2.4) was similar to the study standard in Londrina (2.3)⁽⁶⁾.

In the metabolic/nutrition dimension, the fifth most scored, the interventions presented the following proportion: gavage (33.3%), phototherapy, lipid, potassium and endovenous amino acid (20.8%) and

insulin (4.1%). It is pointed out the absence of the fasting item, because although it is not characterized as an intervention, it may be related to severity or favor comorbidities, such as acquiring infections, increasing hospitalization time. In some cases, with hemodynamic decompensation and the severity of asphyxia, it is indicated in the first days of life until clinical and laboratory stabilization to prevent intestinal complications⁽¹⁷⁾.

In the vascular access dimension, seventh, the presence of central venous access in 68.7% in the first 24 hours of hospitalization is in line with the *Agência Nacional de Vigilância Sanitária* approach on the indication of central venous access to which a longer duration of hospitalization or intravenous therapy as a way to prevent infection related to health care⁽¹⁸⁾.

Among the limitations found in the score, we had the item Other drugs because there is a great diversity of medications in the neonatology area, such as vitamin K and nitric oxide. In the transfusion dimension, eighth, there were records only of red blood cells (4.1%), platelets (2.0%) and leukocytes (2.0%), lacking blood products such as albumin and immunoglobulins. These changes could provide more information about gravity.

The study shows poor prognosis of patients with perinatal asphyxia admitted to a tertiary hospital, due to the frequency of deaths and the need for the high complexity of nursing interventions. This implies alerting professionals and managers to improve care and strategies to prevent perinatal asphyxia.

The association evidenced between the NTISS and the variables Duration and Outcome of hospitalization demonstrate the importance of the application of this tool in nursing practice, aiming its contribution to planning and management of care. Knowledge about the severity and necessary interventions favors an adequate division of tasks among team members, contributing efficiently, not only to good clinical evolution but also to the quality of care and early discharge⁽¹⁵⁾.

Therefore, the main contributions of the use of

severity and prognostic scales in the context of knowledge production for nursing concern the fundamental role that the nursing team plays in the management of care and perception of the clinical changes and needs of the patients since the use of this type of scale based on the needs of nursing interventions can contribute to a critical reflection about the practice and the direction of the professional actions and capacities besides favoring care planning for a quality nursing care.

Conclusion

The mean score of the Neonatal Therapeutic Intervention Scoring System score was 19.9, with statistically different means verified between the categories of variables Duration of hospitalization, Clinical outcome and Mother's education.

Collaborations

Carne JL contributed to design and project, data interpretation and article writing. Mendes IC participated in the analysis of the data. Gomes PPS and Brito EGFM cooperated with the relevant critical review of intellectual content. Rebouças CBA and Damasceno AKC collaborated with the approval of the final version to be published.

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