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ORIGINAL ARTICLE

Attributes of newborns who required oxygen in a high-risk tertiary maternity unit in Fortaleza

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Keywords:
Oxygen,
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diseases,
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Abstract

Introduction: Oxygen therapy is one of the most commonly used treatments in Neonatal Care Units. When necessary, it is essential to maintain the biophysiological integrity of the newborn, but its use must be judicious due to its high potential for complications such as brain, lung, eye, and intestinal injuries, and even death. **Objective:** To analyze the prevalence and profile of newborns who required oxygen therapy/ventilator. **Materials and methods:** A cross-sectional and retrospective study was conducted from July 2022 to June 2024, analyzing newborns who required admission to a Neonatal Unit and who used oxygen in a high-risk tertiary maternity hospital. **Results:** A total of 1004 newborns were analyzed, with a mean gestational age (GA) of 32.22 weeks (±3.02) and a median birth weight of 1,840 g (400g - 4320 g). 674 (67.1%) developed respiratory distress syndrome (RDS) and 316 (31.5%) had transient tachypnea of the newborn (TTN). Antenatal corticosteroids were administered to 602 (59.96%) pregnant women and exogenous surfactant to 194 (19.3%) newborns. Nasal CPAP was used in 537 (53.5%) and mechanical ventilation (MV) in 331 (33%) newborns. The mean total duration of oxygen use was 6.34 days (1-82) and the median duration of mechanical ventilation was 5 days (1-76). Of the total sample, 26 (2.6%) developed necrotizing enterocolitis and 85 (8.46%) developed retinopathy of prematurity (ROP). **Conclusion:** A high prevalence of oxygen therapy was observed, especially in preterm infants, but the monitoring of target saturation during hospitalization was not performed, increasing the risks of complications associated with oxygen use.

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INTRODUCTION

The most critical requirement of the newborn (NB) is the establishment of adequate respiratory activity to ensure efficient gas exchange. The maintenance of respiration is vital for survival and for the biophysiological integrity of the NB; therefore, failures in this process may require specific treatment[1].

In situations where pulmonary gas exchange is impaired, oxygen therapy (O_2) may be used as a therapeutic measure. Neonatal Care Units frequently employ oxygen therapy through different techniques and devices, selected by the attending physician based on clinical assessment, diagnostic tests, team experience, and the availability of resources within the hospital[2,3].

However, it is crucial to recognize that insufficient or unnecessary oxygen administration may result in severe and irreversible complications, such as brain injury, bronchopulmonary dysplasia (BPD), necrotizing enterocolitis (NEC), retinopathy of prematurity (ROP), and even death[2-4].

Thus, newborns receiving oxygen therapy require specialized care from a multidisciplinary team, which should follow a structured care plan aimed at achieving target oxygenation levels and appropriate monitoring, considering the patient as a whole and addressing individual needs according to the method of oxygen administration used. This approach enables individualized, evidence-based care and contributes to faster patient recovery[5].

For more than 40 years, neonatology has sought to define optimal target oxygen saturation levels to avoid hypoxia and/or hyperoxia and their associated harms. It is essential to have up-to-date data on the quality of healthcare delivery in one of the main maternity reference centers in the state of Ceará in order to plan targeted interventions[6].

This study aimed to conduct a descriptive analysis of newborns who required oxygen support during hospitalization in the Neonatal Unit of a tertiary hospital in the city of Fortaleza, with the goal of improving care organization, minimizing sequelae, and enhancing the quality of patient care.

METHODOLOGY

This was a cross-sectional and retrospective study. The study population consisted of term and preterm neonates who received oxygen therapy during hospitalization in one of the Neonatal Units—Neonatal Intensive Care Unit (NICU), Conventional Neonatal Intermediate Care Unit (UCINCo), or Kangaroo Neonatal Intermediate Care Unit (UCINCa)—of a tertiary referral maternity hospital in Fortaleza, Ceará, Brazil. This study was approved by the Research Ethics Committee of the Instituto Fernandes Figueira/FIOCRUZ/Ministry of Health (approval no. 5,486,251) and was conducted in accordance with ethical standards.

Newborns admitted to one of the Neonatal Units who received oxygen therapy for at least 24 hours were included in the sample. All oxygen delivery devices were considered, including nasal cannula, oxy-hood, continuous positive airway pressure (CPAP), or invasive mechanical ventilation (IMV), during the period from July 2022 to June 2024. Newborns who were not hospitalized, those who did not receive oxygen therapy, and those with incomplete medical records that precluded statistical analysis were excluded from the study.

Data collection was carried out in July 2024 using the standardized QualiNeo strategy form (Appendix 1), based on a review of the institution's electronic medical records. Personal and birth data were collected (sex, gestational age [GA], birth weight [BW], APGAR score, type of delivery), as well as data related to healthcare assistance (type of hospitalization, duration of oxygen use, need for neonatal resuscitation, use of CPAP, need for intubation, duration of IMV, use of antenatal corticosteroids, use of exogenous surfactant, oxygen use on the 28th day of life and at 36 weeks of gestational age, progression to necrotizing enterocolitis [NEC], and retinopathy of prematurity [ROP]).

Data were entered into an Excel spreadsheet and subsequently analyzed using the Statistical Package for the Social Sciences (SPSS) software.

RESULTS

During the data collection period, 1,400 newborns (NBs) required hospitalization in one of the Neonatal Units (NICU, UCINCo, and UCINCa), with 454 admissions in 2022, 568 in 2023, and 378 in 2024. Of these, 1,004 (71.71%) NBs received some form of oxygen support and were eligible for inclusion in the study: 261 in 2022 (26%), 454 in 2023 (45.22%), and 289 in 2024 (28.78%).

Of the sample, 552 (55.0%) were male, 443 (44.1%) were female, and 9 (0.9%) had indeterminate sex.

Regarding birth weight classification, 375 (37.35%) NBs were classified as appropriate for gestational age, and 629 (62.65%) as low birth weight. Among those with low birth weight, 403 (40.14%) had low birth weight (<2,500 g), 152 (15.14%) had very low birth weight (<1,500 g), and 74 (7.36%) had extremely low birth weight (<1,000 g) (Table 1).

With respect to gestational age (GA), 302 (30.1%) NBs were born at term (GA ≥ 37 weeks), and 702 (69.9%) were preterm (GA < 37 weeks). According to prematurity classification, 297 (42.31%) were classified as late preterm (GA 34 to <37 weeks), 168 (23.93%) as moderate preterm (GA 32 to <34 weeks), 172 (24.51%) as very preterm (GA 28 to <32 weeks), and 65 (9.25%) as extremely preterm (GA < 28 weeks) (Table 1).

Table 1. Characteristics of the sample according to gestational age and birth weight.

		(N)	(%)
Gestational age (weeks)	<28 weeks	65	6,5
	28-31 weeks	172	17,1
	32-33 weeks	168	16,7
	34-36 weeks	297	29,6
	≥37 weeks	302	30,1
	Total	1004	100,0
Weight (g)	<750	30	3,0
	750-999	44	4,4
	1000-1499	152	15,1
	1500-2499	403	40,1
	≥2500	375	37,4
	Total	1004	100,0

Legend: GA: Gestational age; g: grams; N: sample size.

The mean gestational age at birth in the sample was 33.97 weeks (± 3.72), and the median birth weight was 2,160 g (range: 400–5,660 g).

Regarding the type of delivery, 772 (76.9%) newborns were delivered by cesarean section, 228 (22.7%) by vaginal delivery, and 4 (0.4%) with the assistance of forceps.

In the 1-minute APGAR score classification, 618 (61.4%) scored above seven, 251 (25.1%) scored between four and six, 133 (13.3%) scored below three, and information was unavailable for 2 newborns (0.2%). At the 5-minute assessment, 936 (93.2%) scored above seven, 58 (5.77%) scored between four and six, 8 (0.8%) scored below three, and information was unavailable for 2 newborns (0.2%). The mean APGAR score was 6.48 at 1 minute and 8.19 at 5 minutes.

Regarding immediate postnatal care, 397 (39.5%) newborns required neonatal resuscitation, of whom 297 (74.81%) were preterm. During resuscitation, 352 (35.1%) required positive pressure ventilation (PPV) with bag-valve-mask, 355 (35.4%) required supplemental oxygen with an inspired oxygen fraction (FiO_2) greater than 21%, 203 (20.2%) required orotracheal intubation, 16 (1.6%) required chest compressions, and 10 (1.0%) required vasoactive drugs. After post-resuscitation stabilization, 345 (34.4%) newborns were placed on nasal CPAP in the delivery room (Table 2).

Respiratory distress syndrome (RDS) was present in 674 (67.1%) newborns, and 316 (31.5%) developed transient tachypnea of the newborn (TTN).

Antenatal corticosteroids were administered to 602 (59.96%) pregnant women, of whom 561 delivered preterm newborns (93.18%). Exogenous surfactant was required in 194 (19.3%) newborns after birth; among these, 191 (98.45%) were preterm.

After the need for hospital admission was identified, 687 (68.4%) newborns were admitted to the NICU, 811 (80.8%) to the UCINCo, and 249 (24.8%) to the UCINCa.

During hospitalization in one of the intermediate or intensive care units, 537 (53.5%) newborns required nasal CPAP, and 331 (33.0%) required conventional mechanical ventilation; of these, 261 (78.85%) were preterm.

At 28 days of life, 52 (5.2%) newborns were still receiving some form of oxygen support. At 36 weeks of corrected gestational age, 25 (2.5%) remained intubated, and 49 (4.9%) were receiving another type of oxygen support.

These data are presented in Table 3.

The median duration of mechanical ventilation among all newborns was 5 days, ranging from 1 to 76 days. The mean total duration of oxygen use was 6.34 days, with a minimum of 1 day and a maximum of 82 days.

In the sample, 26 (2.6%) newborns developed necrotizing enterocolitis (NEC), and information was unavailable in 3 medical records. Of these, 10 (1.0%) required surgical intervention.

Regarding fundoscopic examination, 242 (24.1%) newborns underwent the examination, and information was missing in 5 medical records. Retinopathy of prematurity (ROP) was

Table 2. Profile of immediate postnatal care among newborns who required oxygen therapy, according to ges-tational age.

		Term newborns	Preterm newborns	N (%)
Oxygen use		302	702	1004 (71,7%)
		100	297	397 (39,5%)
Neonatal re-suscitation	O_2 with FiO_2 > 21%	83	272	355 (35,4%)
	Bag-valve-mask ventilation	92	260	352 (35,1%)
	Chest compressions	1	15	16 (1,6%)
	Vasoactive drugs	2	8	10 (1,0%)
	Nasal CPAP in the delivery room	40	305	345 (34,4%)
	Orotracheal intubation	38	165	203 (20,2%)

Legend: O_2: oxygen; FiO_2: fraction of inspired oxygen; CPAP: Continuous Positive Airway Pressure; N: sample size.

Table 3. Profile of the type of care received during hospitalization by newborns who required oxygen therapy, according to gestational age.

	Term newborns	Preterm newborns	N (%)
SDR (Respiratory Distress Syndrome)	74	600	674 (67,1%)
TTN (Tran-sient Tach-ypnea of the Newborn)	199	117	316 (31,5%)
Antenatal corticosteroids	41	561	602 (59,96%)
Exogenous surfactant	3	191	194 (19,3%)
IMV (Invasive mechanical ventilation)	70	261	331 (33%)
CPAP (Con-tinuous Pos-itive Airway Pressure)	67	470	537 (53,5%)
Oxygen use on the 28th day of life	10	42	52 (5,2%)
Oxygen use at 36 weeks of corrected gestational age (CGA)	2	47	49 (4,9%)
IMV at 36 weeks of corrected gestational age (CGA)	3	22	25 (2,5%)

Legend: RDS: Respiratory distress syndrome; TTN: Transient tachypnea of the newborn; IMV: Invasive mechanical ventilation; CPAP: Con-tinuous Positive Airway Pressure; O_2: oxygen; CGA: Corrected gestational age; N: sample size.

diagnosed in 85 (8.46%) newborns, of whom 42 (4.19%) had stage I, 25 (2.49%) stage II, 16 (1.59%) stage III, and 2 (0.2%) stage IV ROP; information was unavailable in 9 medical records. Surgical treatment was required in 12 (1.2%) cases (Table 4).

Table 4. Incidence of NEC and ROP complications.

	N (n%)	Surgical intervention
NEC	26 (2,60)	10 (1,0%)
ROP	85 (8,36)	12 (1,2%)

Legend: NEC: Necrotizing enterocolitis; ROP: Retinopathy of prematurity; N: sample size.

DISCUSSION

This study showed that one of the main causes of hospitalization of newborns in this maternity hospital was respiratory disorders, with a high need for ventilatory support and/or oxygen therapy (71.7%). This finding is similar to that reported in a retrospective study published in 2022, in which, among 8,474 newborns delivered at a tertiary maternity hospital over a six-month period, 1,367 were hospitalized and oxygen therapy was required in 903 (66%) of them[7].

Prematurity is one of the leading causes of neonatal morbidity and mortality. The causes of preterm birth are multifactorial and may be divided into maternal, fetal, placental, and environmental factors[8]. In the present study, 69.9% of hospitalized newborns were preterm, and due to the structural immaturity of the lungs, this was associated with a high incidence of respiratory distress syndrome (RDS) (67.1%).

RDS also includes other important contributing factors, such as the quality of prenatal care, cesarean delivery without labor, and the low use of antenatal corticosteroids and exogenous surfactant after birth.

According to the World Health Organization (WHO), the recommended ideal cesarean section rate in a country is 15%[9]. In Brazil, this rate has already reached approximately 57.2% in the public healthcare system and continues to increase annually[10]. In the population studied, the cesarean delivery rate (76.9%) was significantly higher than the national average. Although often necessary, cesarean delivery may interfere with pulmonary fluid clearance and reduce surfactant production compared with vaginal delivery, thereby hindering adaptation to extrauterine respiration.

The use of antenatal corticosteroids in pregnant women at risk of preterm delivery promotes pulmonary maturation and is associated with a significant reduction in the need for respiratory support and supplemental oxygen. In this study, antenatal corticosteroids were administered to 602 (59.96%) pregnant women, of whom 561 delivered preterm newborns (93.18%), demonstrating high accuracy in prenatal follow-up. A systematic review and meta-analysis concluded that antenatal corticosteroid administration, including in pregnancies between 34 and 36 weeks, reduced the incidence of RDS, transient tachypnea of the newborn (TTN), and the need for mechanical ventilation, in addition to reducing the duration of oxygen use[11].

Surfactant therapy was required in 194 (19.3%) newborns after birth, almost all of whom were preterm. This rate is significantly lower than that reported in an observational study conducted at a Brazilian public university hospital, in which 26 (41.9%) of 62 newborns admitted to the NICU received exogenous surfactant. This discrepancy may be explained by differences in the mean gestational age of hospitalized newborns. The rate of surfactant use in newborns is influenced by factors such as gestational age, resource availability, and local clinical practices. That same study concluded that the duration of oxygen use and length of hospitalization were directly proportional to the group that received antenatal corticosteroids and exogenous surfactant[12].

Although this study characterized the profile of newborns who were still receiving oxygen at 28 days of life and at 36 weeks of corrected gestational age to predict bronchopulmonary dysplasia (BPD) outcomes, the most recent definition of BPD does not require diagnosis based solely on these variables. Lung injury is related to the duration of exposure to high oxygen concentrations and to the type of ventilatory support used (invasive versus noninvasive)[13,14]. In a prospective multicenter cohort study, 704 preterm newborns were

followed from NICU admission to 1 year of corrected age. They were stratified into high (FiO_2 > 33.1%), intermediate (FiO_2 29.1–33.1%), and low (FiO_2 < 29.1%) oxygen exposure groups. Highly exposed groups showed abnormal pulmonary function tests at 1 year of age, indicating early evidence of obstructive lung disease, which may predispose newborns to increased long-term pulmonary morbidity[15]. In the present study, the mean total duration of oxygen use was 6.34 days and the median duration of mechanical ventilation was 5 days (range: 1–76 days); however, the development of BPD was not assessed.

The choice of ventilatory support modality for managing respiratory disorders influences the duration of oxygen therapy and the severity of complications. In this study, CPAP was the most frequently used modality among newborns, both in immediate postnatal care (34.4%) and during hospitalization (53.5%). Currently, greater awareness of complications associated with invasive mechanical ventilation has led to the use of noninvasive ventilation as the first-line therapeutic option, as recent studies show that noninvasive methods can minimize the risk of lung injury and reduce the need for surfactant therapy[16].

The complications evaluated in this study were necrotizing enterocolitis (NEC) and retinopathy of prematurity (ROP). In the sample, 26 (2.6%) newborns developed NEC, a rate lower than the global incidence average, which ranges from 6% to 15% among extremely low birth weight newborns. This difference may be explained by the low prevalence of this population in the study. Nearly half of these cases required surgical intervention. In a multivariate analysis that followed 16,131 newborns, independent factors associated with the need for surgery included extremely low birth weight, birth weight, and prenatal antibiotic administration[17].

The incidence of ROP was 8.36%, and that of severe ROP was 1.2%, both lower than the rates reported in a meta-analysis evaluating the global prevalence of ROP over four decades, which found a prevalence of 31.9% among preterm infants and 7.5% for severe ROP[18].

Although this study has limitations—such as partial inclusion of medical records in the database, lack of data on oxy-hood and nasal cannula use, and absence of follow-up for BPD-related outcomes—it provides important insights into neonatal care practices. The data revealed a high prevalence of oxygen use in neonatal units, which paradoxically was not associated with adequate control of target oxygen saturation. Furthermore, low tolerance for permissive hypoxemia suggests excessive and potentially unnecessary oxygen use.

The findings highlight opportunities for discussion regarding the need to improve prenatal and postnatal care, implement strict protocols for target oxygen saturation monitoring, and establish a baseline for comparison with other centers, aiming to minimize complications related to oxygen therapy.

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APPENDIX 1

MONITORING DO CAREFUL NEONATAL (marked) with * you (Required fields)

Record of collect data System to inclusion of registration: smcon.iff.fiocruz.br

IDENTIFICATION DO RECORD - Tab of REG system

1)Declaration of Born Alive (DNV) *_____

2)Origin * : ( ) Born in this hospital ( ) Born outside this hospital

3)Birth * : _____ / _____/ _____ 4) Time of Birth: _____

DATA MATERNAL - Tab of system MAT

5) Age Maternal (years): _____ 6) Color/Race from the Woman:( ) White (Black ( ) Brown (Yellow ( ) In-digenous

7)Education: ( ) < 8 years ( ) 8 years ( ) 9 the 11 years ( ) 12 years or more

8)Smoke: ( ) Yes ( ) No

9)Frequency of Drink Alcoholic During Pregnancy:

(I didn't drink. or node maximum 2 times per month (Weekly

10) Use of Drugs Psychoactive in Gestation (lawful) or illicit): ( ) Yes ( ) No

11) Violence Suffered: Violence Psychological and/or Violence Physical and/or Sexual: ( ) Yes ( ) No

12) How many prenatal appointments? _____

13) Hypertension Arterial: ( ) Yes ( ) No. 14) Gestation Multiple: ( ) Yes ( ) No

15) Bag Route in Admission: ( ) < 6pm ( ) >=18h the 24h ( ) > 24h ( ) No

16) Steroid Antenatal * : ( ) Yes ( ) No 17) Sulfate of Magnesium: Yes ( ) No ( )

18) Type of Childbirth * : ( ) Vaginal ( ) Forceps (Cesarean

DATA DO BIRTH Tab of system NASC

19) Sex: ( ) Masculine ( ) Feminine ( ) Undetermined

20) Birth weight in grams *: _____

Gestational Age: 21) Weeks *: _____ 22) Days *: _____

23) Head circumference in centimeters with a decimal: _____

24) Resuscitation Neonatal * : ( ) Yes (No , skip to 25

24.1) Use of Oxygen > 21% in Ventilation: ( ) Yes ( ) No

24.2) Ventilation with Mask and balloon self inflatable: ( ) Yes ( ) No

24.3) Ventilation with Fan mechanic manual with part T: ( ) Yes ( ) No

24.4) Ventilation with Cannula Tracheal ( ) Yes ( ) No

24.5) Massage Cardiac: ( ) Yes ( ) No

24.6) Drugs: ( ) Yes ( ) No

25) CPAP Nasal in Room of Childbirth – Stabilization Post Resuscitation: ( ) Yes ( ) No

Apgar: 26) First minute *: _____ 27) Fifth minute *: _____

28) Time to the Clamping of Cord Umbilical: ( ) < 1 minute ( ) ≥ 1 minute

29) Measures for Avoid Hypothermia in Room of Childbirth * : ( ) Yes ( ) Do n't No, to jump to 30

29.1) It involved in Bag Plastic: ( ) Yes ( ) No 29.2) He put on a hat. ( ) Yes ( ) No

29.3) Used Thermal Mattress: ( ) Yes ( ) No

HOSPITALIZATION US COMPONENTS FROM THE UNIT NEONATAL - Tab of system INT/MC

30) There was hospitalization in NICU * ? ( ) Yes ( ) No

30.1) Date of admission to the NICU: _____ / _____/ _____

31) There was hospitalization in UCINCo?) Yes ( ) No

31.1) Date of admission to the NICU: _____ / _____/ _____

32) There was hospitalization in UCINCa?) Yes ( ) No

32.1) Date of admission to the NICU: _____ / _____/ _____

32.2) Weight from RN (g) no day of admission at UCINCa: _____

33) THE Temperature of RN he was measure in 1st time of Admission in ICU or in UCINCo * ? ( ) Yes ( ) No

33.1) What was the measured temperature _____?_____

METHOD KANGAROO - Tab of system INT/MC

34) Skin Contact the Skin in ICU Neonatal (NICU) or Unit Intermediate Conventional * ? ( ) Yes ( ) No

35) Time of Life in days of First Contact Skin The Skin *: _____

SYSTEM RESPIRATORY - Tab of system RESP

36) SDR- Syndrome of Discomfort Respiratory: ( ) Yes ( ) No

37) Adaptation Respiratory or TTRN: ( ) Yes ( ) No 38) Hypertension Pulmonary: ( ) Yes ( ) No

39) Bleeding Pulmonary: ( ) Yes ( ) No

40) Pneumonia Congenital: ( ) Yes ( ) No 41) Acquired Pneumonia: ( ) Yes ( ) No

42) Pneumothorax associate the Ventilation Mechanics Conventional * : ( ) Yes ( ) No

43) Oxygen After Resuscitation Initial: ( ) Yes ( ) No 43.1) Time Total of Oxygen in days: _____

44) Oxygen on the day 28 of life: ( ) Yes ( ) No

45) Oxygen with 36 weeks of IG corrected: ( ) Yes ( ) No

46) Ventilation Mechanics Conventional * : ( ) Yes ( ) No

46.1) Ventilation Mechanics Conventional in days: _____

47) Ventilation Mechanics Conventional with 36 weeks of IG corrected: ( ) Yes ( ) No

48) CPAP Nasal * : ( ) Yes ( ) No 48.1) CPAP Nasal before or without never to have received Mechanical Ventilation with Tracheal Cannula: ( ) Yes ( ) No

49) Surfactant in Some Moment * : ( ) Yes ( ) No

49.1) With as lifespan performed first dose (Hours)?_____

50) Extubation Accidental * : ( ) Yes ( ) No

BRAIN AND ABDOMEN - Tab of system HERE

51) Seizure until day 3 of life: ( ) Yes ( ) No

52) Bleeding Intracranial: ( ) Degree 0 – No there was bleeding intracranial ( ) Degree I ( ) Degree II (Grade III Grade IV (Did not take the exam.

53) Enterocolitis Necrotizing * : ( ) Yes ( ) No

53.1) Surgery or Abdominal Drainage to ECN: ( ) Yes ( ) No

INFECTION - Tab of system INFC

54) Infection Early (Smaller or equal the 48h of life) * : ( ) Yes ( ) No

54.1) If there was infection early, he was confirmed put Blood culture? ( ) Yes ( ) No

55) Infection Late (Greater than 48h of life) * : ( ) Yes ( ) No

55.1) If there was infection late, he was confirmed by Blood culture? ( ) Yes ( ) No

56) Use of Antibiotic with start in First Week of Life to Sepsis * :

( ) Did not use ( ) Smaller or equal the 48h ( ) Greater than 48 h and smaller or equal 72h ( ) Greater than 72 hours and less than or equal to 7 days (Greater than 7 days

57) Treatment to Congenital Syphilis :

( ) Yes, it did. syphilis and treated ( ) No dealt with, but he had syphilis ( ) Don't applies

58) Pneumonia Associated with Ventilation Mechanics: ( ) Yes ( ) No

59) Infection of Current Blood Associate to the Catheter: ( ) Yes ( ) No

60) Drugs Vasoactive until the day 3 Life * : ( ) Yes ( ) No

ACCESS VASCULAR AFTER ADMISSION NA UNIT NEONATAL - Tab of system AV

61) Epicutean: ( ) Yes ( ) No. 61.1) Duration in days of Epicutean:_____

62) Dissection Venous: ( ) Yes ( ) No 62.1) Duration in days from the Venous Dissection:_____

63) Catheter Umbilical Venous: Yes ( ) No ( ) 63.1) Duration in days of Catheter Umbilical Venous: _____

64) Catheter Umbilical Arterial: Yes ( ) No ( ) 64.1) Duration in days of Catheter Umbilical Arterial: _____

NUTRITION - Tab of system NUTRITION

65) Use Serum with Amino Acid node First day of Life: ( ) Yes ( ) No ( ) No if applies

66) Parenteral full or total * : ( ) Yes ( ) No ( ) No if applies

66.1) Time of life in days in the first day of administration from the parenteral: _____

66.2) Duration of parenteral in days: _____

67) Enteral * : ( ) Yes ( ) No

67.1) Time of life in days node first day administration of enteral: _____

67.2) Type from the first enteral:

( ) Milk maternal and/or Colostrum – no consider the colostrum therapy (Pasteurized human milk) Formu-la

RETINOPATHY FROM THE PREMATURITY - Tab of system ROP/AC

68) exam of bottom of eye performed during the hospitalization * ? ( ) Yes ( ) No

68.1) Worse degree from the retinopathy from the prematurity: ( ) Without ROP ( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5

68.2) He accomplished surgery to ROP?) Yes ( ) No

ANOMALY CONGENITAL - Tab of system ROP/AC

( ) Anomalies of System Nerv-ous Central (Cardiac Anoma-lies

( ) Anomalies Gas-trointestinal (Geni-tourinary Anomalies

( ) Anomalies Chromosomal (Pulmonary Anoma-lies

( ) Others Defects Congenital

69) Which?_____

70) Surgery put Congenital Anomaly: Yes ( ) No ( )

OUTCOME - Tab of system DESF

71) Type of Outcome *: ( ) High Hospital (Transfer Death

72) Completion date *: _____ / _____/ _____ 73) Weight in grams at outcome *:_____

74) Head circumference in centimeters with one decimal In the end: _____

75) Diet prescribed in high from the neonatal unit :

( ) Milk Maternal ( ) Milk Maternal + Formula ( ) Formula

76) Local of death: (ICU Neonatal ( ) Local of Childbirth Center Obstetrics) Others spaces

77) Cause of death: Select the cause main

( ) Sepsis

( ) Asphyxia perinatal (Pneumothorax ( ) Bleeding Intracranial (Pulmonary Hemorrhage

( ) Anomaly Malformation Congenital

( ) Disorder metabolic

78) Other Why? ( ) Yes ( ) No