

Neonatal bed status in Brazilian maternity hospitals: an exploratory analysis

Elaine Cristina Silva Miranda (<https://orcid.org/0000-0003-0881-7448>)¹

Camila Brito Rodrigues (<https://orcid.org/0000-0002-1005-3267>)¹

Luiza Geaquinto Machado (<https://orcid.org/0000-0001-7980-0390>)²

Maria Auxiliadora de Souza Mendes Gomes (<https://orcid.org/0000-0001-5908-1763>)³

Liliane Cristina Rodrigues Augusto (<https://orcid.org/0000-0002-8164-5577>)²

Vanda Maria Ferreira Simões (<https://orcid.org/0000-0001-8351-1348>)¹

Cynthia Magluta (<https://orcid.org/0000-0002-6630-3763>)³

Fernando Lamy-Filho (<https://orcid.org/0000-0002-7858-4195>)¹

Abstract Neonatal units should be organized as a progressive care line, with intermediate and intensive care beds (conventional and kangaroo). The aim of this study was to evaluate the status and adequacy of neonatal beds in maternity hospitals linked to the 'Stork Network' ("Rede Cegonha"). A descriptive study was conducted in 606 maternity hospitals in all regions of Brazil. The databases used belonged to the Stork Network Evaluation Survey and the National Live Birth System. To assess the distribution of neonatal beds by typology, the parameters proposed in Ordinance N. 930/2012 of the Ministry of Health were used. Most neonatal units are not organized as a progressive care line with the three types of bed planned. Kangaroo intermediate care beds comprise the minority of implanted beds. There is a concentration of intensive and intermediate beds in the Southeast and South regions, which show a kangaroo intermediate care bed deficit. Analyzing the adequacy of beds by the number of live births, one can observe an inadequacy of Kangaroo care beds in all regions of Brazil, as well as intensive bed deficit in the North and Northeast regions, and adequacy of conventional intermediate care beds in all regions.

Key words Neonatal intensive care units, Kangaroo method, Beds

¹ Centro de Ciências da Saúde, Universidade Federal do Maranhão. Av. dos Portugueses 1966, Vila Bacanga. 65080-805 São Luís MA Brasil. elaine.cristina@ifma.edu.br

² Ministério da Saúde. Brasília DF Brasil.

³ Instituto Fernando Figueira, Fiocruz. Rio de Janeiro RJ Brasil.

Introduction

Neonatal care in Brazil has been undergoing its organization process, starting with its last legal framework, (Ordinance GM / MS N. 930 of May 10, 2012)¹, which defined the guidelines for the establishment of comprehensive and humanized care for the ill or critically-ill neonate and the criteria for classification and accessibility of beds in Neonatal Units within the scope of the Unified Health System (SUS, *Sistema Único de Saúde*)¹.

Based on the perspective of integrality and humanization of care, the Ordinance defined that the neonatal unit and its components must establish a progressive careline¹, a concept that requires the service organization aiming to guarantee the neonate's access to the level of assistance that is adequate to their clinical condition², aiming at the rational use of beds and the best use of technologies.

Therefore, in Article 6, it organizes Neonatal Units according to the needs of care, in the following terms:

I - Neonatal Intensive Care Unit (NICU); II - Neonatal Intermediate Care Unit (UCIN, *Unidade de Cuidado Intermediário Neonatal*), with two types: a) Conventional Neonatal Intermediate Care Unit (UCINCo); and b) Kangaroo Neonatal Intermediate Care Unit (UCINCa). In addition to the Neonatal Unit organization, the ordinance establishes parameters for the quantity and quality of resources, technology, teams, and clinical criteria for admission to each unit¹.

Intermediate Care is a well-defined step for the group of newborns who do not require intensive care since their hospitalization or who have already passed their critical period but cannot yet be discharged from the hospital. The definition of two typologies for the organization of these beds is the result of the acknowledged Brazilian experience with the implementation of Humanized Care for Low-Weight Newborns –the Kangaroo Method (AHRNBP - MC)^{3,4}. The method, which appeared in the late 1970s in Colombia, showed a strong bias toward technology substitution and took on a public policy characteristic in Brazil, incorporating “a change in the perinatal care paradigm, in which the issues relevant to humanized care are not dissociated, but complement each other with technological advances”⁵.

Considered one of the main strategies used by SUS, the Kangaroo Method (KM) incorporates simple technologies and humanized practices aiming to ensure infant survival and played an important role in reducing infant mortality

regarding the neonatal component, both late and early, in Brazil^{3,4}.

The method promotes progressive care for low-weight newborns (NB) in three stages: the first starts during the prenatal period of the pregnancy that requires specialized care and continues with the admission of preterm newborns to the NICU and /or UCINCo. In the second stage, carried out at UCINCa, the infant remains continuously with their mother, who actively participates in the child's care and is encouraged to maintain the infant in the kangaroo position for as long as possible. In the third stage, the baby is accompanied through shared care in the Kangaroo Method Outpatient Clinic at the hospital of origin and in the Basic Health Unit (BHU), until the infant has reached a weight of 2,500 g⁶.

Although previous ordinances had already standardized the concept of the Kangaroo Unit for the care of eligible newborns, Ordinance N. 930 represented an important milestone in the conceptual and operational field of neonatal care, as it regulated the 2nd stage of the AHRNBP – MC in the Neonatal Intermediate Care scenario, allowing the creation of new beds at the UCINCa, which started to receive funds for financing through Ordinance GM/MS N. 1,300 of November 23, 2012⁶⁻⁸.

Although all stages are essential for the growth and development of low-birth weight neonates (LBWN), it is during the second stage, in the hospital environment, when the mother remains with her child, that the greatest gains are attained in comparison to conventional care. Moreover, there is evidence that indicates a better cost-effectiveness in maintaining NB under kangaroo intermediate care⁹.

After the regulation brought on by Ordinance GM / MS n. 930/2012 930, little is known about the characteristics of the neonatal bed supply by SUS. Literature searches in national and international databases identified a predominance of clinical studies, with very few studies characterizing the supply of neonatal care². Additionally, most articles on the topic used the databases of official secondary records from institutions such as the National Registry of Health Facilities (CNES, *Cadastro Nacional de Estabelecimentos de Saúde*), the Live Birth Information System (SINASC, *Sistema de Informação sobre Nascidos Vivos*), the Mortality Information System (SIM, *Sistema de Informação sobre Mortalidade*) and others, to the detriment of primary information from surveys.

Some issues remain unclear, especially those related to the effective implementation and

maintenance of an adequate ratio between beds in the different types of neonatal care units (NICU; UCINCo; UCINCa). The status of the UCINCa beds is of particular interest, since this unit is known to be the one that demands the most efforts for its implementation.

The present study aims to better understand the status of beds in Neonatal Units in Brazil, using data from the study “Assessment of Childbirth Care in Maternities from *Rede Cegonha*”, contributing to the understanding of the difficulties related to the effective implementation and utilization of this type of care.

Method

This is a descriptive study, whose analysis unit comprised the maternities linked to the “Stork Network” (RC, *Rede Cegonha*) and research participants. The aim of the research was to assess the status and adequacy of neonatal beds in the assessed institutions. The present study is part of the national research entitled “Assessment of Childbirth Care in Maternities from *Rede Cegonha*”, coordinated by the Ministry of Health (MH), in partnership with the Federal University of Maranhão (UFMA) and the National School of Public Health Sérgio Arouca (ENSP), from the Oswaldo Cruz Foundation (Fiocruz).

The research took place nationwide, from December 2016 to September 2017, aiming at evaluating the implementation of good practices at childbirth, according to the *Rede Cegonha* frame of reference. Maternity hospitals that were not affiliated to SUS were not included. The study included all public or mixed maternity hospitals (private ones affiliated to SUS) that met the following criteria:

- Having attended to 500 or more births and in a health region with the *Rede Cegonha* action plan, irrespective of the release of financial resources.
- Having attended to fewer than 500 births, and in a health region with the *Rede Cegonha* action plan, and release of financial resources;

Different methodological strategies were used to obtain information in the national survey: interviews, document analysis and on-site observation. The instruments were structured in accordance with the *Rede Cegonha* guidelines, and the official documents of the Ministry of Health were used as the basis for their creation: the National Humanization Policy¹⁰, *Rede Cegonha*¹¹, the Good Practices for Childbirth standards¹² and Ordinance GM / MS N. 930/2012¹.

A field work team was created in each participating state, consisting of health professionals, with one being a supervisor and the others, evaluators, according to the number of deliveries. In order to ensure team standardization, the theoretical and practical training of supervisors and evaluators was carried out under the responsibility of the regional evaluation coordination, in addition to a representative from the Ministry of Health.

For the present study, the data were obtained through on-site observation of maternity hospitals by the researchers, using an obstetric and neonatal bed counting instrument. Neonatal beds were investigated according to the definitions found in Ordinance GM/MS N. 930/2012¹: neonatal unit (NU), NICU bed, UCINCo bed and UCINCa bed.

The bed counting was performed by an evaluator who was mandatorily accompanied by a professional appointed by the maternity department and, whenever possible, by a representative of the SUS and / or the National Council of Municipal Health Management Secretariats (CONASEMS, *Conselho Nacional de Secretarias Municipais de Saúde*).

The data were collected in an electronic form, using the REDCap (Research Electronic Data Capture) web platform. The supervisors followed the form application in real time, in a virtual environment through the electronic application to confirm whether the evaluations were being carried out according to the previously agreed manner. In case of doubts or failures in filling out the forms, the evaluators were contacted for clarification.

The data on neonatal beds were obtained from the database of the research observation script. The variables used were: total number of neonatal beds, number of NICU beds, number of UCINCo beds and number of UCINCa beds. Data on live births in participating maternity hospitals in each of the Brazilian regions were obtained from the Live Birth Information System¹³ (SINASC), considering the CNES¹⁴ of the participating maternity hospitals.

A descriptive analysis of the studied variables was performed, showing absolute and relative frequencies, by region of Brazil. The STATA software, version 14.0. was used for the analyses. The need for neonatal intensive and intermediate beds was calculated according to the parameters established by the Ministry of Health, through GM/MS Ordinance N. 930 of May 10, 2012: for every 1,000 live births, 2 (two) NICU beds, 2

(two) UCINCo beds and 1 (one) UCINCa bed are required.

For that purpose, a ratio was calculated considering the number of existing beds for the total number of live births in the institutions participating in the study, in each Brazilian region, according to SINASC, aiming to estimate the number of beds required for the group of one thousand live births.

The research followed the ethical principles established in Resolution N.466/2012¹⁵ and its complementary regulations, which regulate research involving human beings, being approved by the Research Ethics Committee of the Federal University of Maranhão-UFMA, under Certificate of Presentation for Ethical Appreciation (CAAE, *Certificado de Apresentação para Apreciação Ética*).

Further details on the methodology of the study “Assessment of Childbirth Care in Maternities from *Rede Cegonha*”, are available from Vilela et al.¹⁶.

Results

A total of 606 maternity hospitals were investigated in the five major regions of Brazil. It was observed that most of the participating institutions were specialized hospitals (maternity hospitals) (16.01%) or general hospitals (81.85%). There were few Normal Delivery Unit or Emergency Room establishments (Table 1).

As for the type of management, most maternity units (65.18%) were under municipal management, 25.58% under state management, and the remainder had shared state and municipal management (9.24%) (Table 2).

Table 3 shows the organization of Neonatal Units by type of care offered (NICU, UCINCo and UCINCa). It is noteworthy that 29.37% of maternity units did not have neonatal units, especially in the North region, where this percentage reached 48.84%. Among the participating maternity hospitals, 24.42% had units with the three types of beds expected in the progressive care line: NICU, UCINCo and UCINCa. In the analysis by region, the Midwest showed the best percentage of neonatal units with the three types of beds (36.59%), whereas the South had the lowest percentage (16.05%).

Some patterns of typology combinations were observed in the assessed neonatal units. Exclusively NICU beds were observed mainly in the Midwest region (12.2%). NICU and UCINCa beds, without UCINCo beds, were observed in the South and Southeast regions and, in the South region, exclusively UCINCa beds were observed, without UCINCo beds.

A total of 8,227 neonatal beds were found in this research, distributed among the three types of beds established by Ordinance GM / MS N. 930/2012. The UCINCo accounted for 45.24% of this total number of beds, NICU coming in second place with 43.51% of neonatal beds and UCINCa appeared with only 11.27% of the beds (Table 4).

In the analysis by region (Table 4), the ratio of NICU beds is inadequate in the North and Northeast regions, while the proportion of NICU beds is inadequate only in the South region (which has the highest proportion of NICU beds) and the proportion of UCINCa beds is inadequate in all regions, with the Northeast and Midwest regions having the highest proportion of UCINCa beds (16.44% and 15.02%, respec-

Table 1. Participating Maternity Hospitals linked to Rede Cegonha by Region of Brazil and type of unit. Brazil, 2016.

	N		NE		SE		S		MW		Total	
	N	%	N	N	N	%	N	%	N	%	N	%
Normal Delivery Unit	0	-	1	0.57	0	-	0	-	0	-	1	0.17
Specialized Hospital	19	22.09	31	17.71	31	13.90	10	12.35	6	14.63	97	16.01
General Hospital	63	73.26	137	78.29	190	85.20	71	87.65	35	85.37	496	81.85
Specialized ER	0	-	2	1.14	1	0.45	0	-	0	-	3	0.5
General ER	0	-	0	-	1	0.45	0	-	0	-	1	0.17
MixedCare	4	4.65	4	2.29	0	-	0	-	0	-	8	1.32
Total	86	100.0	175	100.0	223	100.0	81	100.0	41	100.0	606	100.0

MW: Midwest; NE: Northeast; N:North; SE: Southeast; S:South. *Data extracted from CNES.

Table 2. Description of the participating Maternity Hospitals linked to Rede Cegonha by region of Brazil and type of management. Brazil, 2016.

	N		NE		SE		S		MW		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Double	5	5.81	14	8.00	12	5.38	23	28.40	2	4.88	56	9.24
State	28	32.56	43	24.57	52	23.32	19	23.46	13	31.71	155	25.58
Municipal	53	61.63	118	67.43	159	71.30	39	48.15	26	63.41	395	65.18
Total	86	100.00	175	100.00	223	100.00	81	100.00	41	100.00	606	100.00

Table 3. Description of the Neonatal Units implemented in the maternity hospitals linked to Rede Cegonha by typology. Brazil, 2016.

	N		NE		SE		S		MW		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
None	42	48.84	58	33.14	34	15.25	33	40.74	11	26.83	178	29.37
Only UTIN	5	5.81	7	4.00	21	9.42	9	11.11	5	12.20	47	7.76
Only UCINCo	18	20.93	50	28.57	33	14.80	3	3.70	7	17.07	111	18.32
Only UCINCa	0	0.00	0	0.00	0	0.00	1	1.23	0	0.00	1	0.17
UTIN and UCINCo	4	4.65	14	8.00	65	29.15	21	25.93	2	4.88	106	17.49
UTIN and UCINCa	0	0.00	0	0.00	1	0.45	1	1.23	0	0.00	2	0.33
UCINCo and UCINCa	2	2.33	8	4.57	2	0.90	0	0.00	1	2.44	13	2.15
UTIN, UCINCo and UCINCa	15	17.44	38	21.71	67	30.04	13	16.05	15	36.59	148	24.42
Total	86	100.00	175	100.00	223	100.00	81	100.00	41	100.00	606	100.00

Table 4. Distribution of neonatal beds by region of the country, according to their typology. Brazil, 2016.

	UTIN		UCINCo		UCINCa		Total	
	N	%(40%)*	N	%(40%)*	N	%(20%)*	N	%
North	315	37.32	409	48.45	120	14.21	844	10.26
Northeast	839	36.39	1087	47.15	379	16.44	2305	28.02
Southeast	1664	46.68	1633	45.81	267	7.49	3564	43.32
South	501	55.9	328	36.64	66	7.37	895	10.88
Midwest	261	42.16	265	41.68	93	15.02	619	7.52
Total	3580	43.51	3722	45.24	925	11.27	8227	100.00

tively), with the Southeast and South regions showing the lowest proportions.

One of the parameters used to calculate the need for neonatal beds is the population need. In the present study, according to the regional analysis by the total number of neonatal beds (Table 5), the Northern region did not show the adequate ratio for the 1,000 / LB group, whereas

the Southeast region extrapolated the predicted number, with 6.84 beds per 1,000 /LB. When analyzing by typology, none of the regions showed an adequate number, regarding the three types of beds, per group of 1,000 live births. The Southeast and South regions showed the highest NICU bed ratios, and the worst ratios were observed in the North and Northeast regions. All regions showed

Table 5. Number of live births (LB) and ratio of neonatal beds for every 1,000 LB in the assessed units, by region. Brazil, 2017.

	N° of NV	Neonatal Beds (5/1,000)	NICU (2/1,000) *	UCINCo (2/1,000) *	UCINCa (1/1,000) *
North	196,163	4.30	1.60	2.08	1.93
Northeast	433,531	5.31	1.93	2.50	0.87
Southeast	520,785	6.84	3.19	3.13	0.51
South	160,122	5.58	3.12	2.04	0.41
Midwest	109,973	5.62	2.37	2.40	0.84
Total	1,420,574	5.79	2.52	2.62	0.65

*as recommended by the Ministry of Health. OBS: Ratios calculated from LB numbers (DATASUS) and beds referring only to maternity hospitals linked to Rede Cegonha.

an adequate number of UCINCo beds (higher proportions in the Northeast and Southeast regions). As for the UCINCa beds, only the North region showed an adequate number of beds per group of 1,000 / LV (1.93 beds per 1,000/LV), almost twice the recommended number; The South and Southeast regions had the worst ratio per group of 1,000 live births (0.41 bed per 1,000 / LB; 0.51 per 1,000 / LB, respectively) (Table 5).

Discussion

When analyzing the current status of neonatal beds available in maternity hospitals linked to *Rede Cegonha*, this study provided information on the organization of the assessed neonatal units, regarding the available numbers and types of beds by region of Brazil.

The results of the present study showed that there is a considerable number of institutions without a Neonatal Unit (NU), and that the majority of NUs are not organized as a progressive care line with the three types of bed that are expected. Of the total number of available neonatal beds, most are UCINCo and NICU beds, whereas the UCINCa beds constitute the minority. There is a concentration of intensive and intermediate beds in the Southeast and South regions, which show a deficit regarding the number of UCINCa beds. When analyzing the adequacy of beds by region of the country and the number of live births, it was observed that the number of UCINCa beds is inadequate in all regions of Brazil in the maternity hospitals that belong to the RC, there is a deficit of NICU beds in the RC maternity hospitals located in the North and Northeast regions and the number of UCINCo beds is adequate in all regions.

Most of the assessed maternity hospitals were under municipal management. The process of municipalization of health was strongly stimulated in the 90s, which resulted in the expansion of service access, effective social control and improvement of care. Currently, in the context of health care networks, which includes the RC, not only municipalization but also the regionalization of assistance is encouraged as a central element, through the articulation of actions between the three spheres of government¹⁷.

When analyzing the presence of neonatal units in the assessed maternity hospitals, the research showed that some institutions that did not have a NU, especially in the northern region of the country. A national study has shown that more structural problems were found in maternity hospitals in the North region of the country, a region that concentrated higher rates of neonatal mortality, and less availability of ICU beds, especially for newborns whose mothers are at increased obstetric risk¹⁸⁻²⁰, indicating that childbirth and delivery care requires better structuring in this region, as pointed out by França and Lansky²¹.

Regarding the structure of Neonatal Units, this study showed that few institutions (148) had the three types of neonatal beds, indicating a low implementation of progressive care lines and possible fragmentation of care. The South region showed the lowest percentage and was the only region in the country to have UCINCa beds without the presence of UCINCo ones, going against the MH recommendations, which requires the presence of UCINCa beds in a unit that has UCINCo beds as well¹. The South region has the maternity hospitals with the best structure in the country, according to the study by Bittencourt et al.¹⁹; however, in the present study,

the region showed inadequate organization of the neonatal units.

It was also observed the presence of isolated NICU beds in all regions of the country, and NICU and UCINCa beds without the presence of UCINCo in the South and Southeast regions, situations contrary to the recommendation by Ordinance GM/MS N. 930/2012¹. These situations show that the care offered to the newborns in these circumstances is not in accordance with their specific clinical condition, which undermines the rational use of the beds, with unnecessary and prolonged hospitalizations in intensive care unit beds to the detriment of continued and progressive care.

It is important to emphasize that progressive care is a strategic element for organizing care of severely-ill or potentially severely-ill neonates, aiming at comprehensive and humanized neonatal care. This reorientation in the perinatal care organization in Brazil has been present since the MC was proposed and it intends to improve the care provided to the newborn⁶. Therefore, for an effective articulation of care, it is necessary to guarantee at least a minimal structuring of spaces in accordance with the current legislation, which in this study, proved to be a challenge to be overcome.

In this research, the UCINCo beds were the majority, followed by the NICU beds and, to a lesser extent, the UCINCa beds. In a survey carried out in 2016, based on CNES data, 8,565 neonatal beds were found, the majority of which were NICU beds (56%), followed by UCINCo beds (37%) and, in a similar manner, a smaller number of UCINCa beds (7%)². It should be noted that in both scenarios (research data and secondary data) the intermediate kangaroo beds comprise the minority.

The present study showed an increase in the number of beds for intermediate care, which can be considered an advance in newborn care. It is known that intermediate care provides more humanized assistance and a more appropriate adaptation process for the infants and their families. Maintaining the NB in the NICU due to the lack of an intermediate unit can lead to more interventions, higher costs and iatrogenic risks or infections, and it is in this context that intermediate care promotes more adequate assistance².

When analyzing the geographic distribution of neonatal beds in absolute numbers, the Southeast region concentrated the majority of the beds, almost six times the total number of beds found in the Midwest region, which had the lowest number. In this regard, significant regional dif-

ferences were identified regarding the total number of beds. In a recent survey carried out by the Brazilian Society of Pediatrics²² using CNES data, this geographical inequality was also identified and, similarly, the Southeast region had the highest number of the beds; however, it was the North region that showed the lowest number. Barbosa²³ has already pointed out that neonatal intensive care beds in Brazil showed an unequal distribution, with national and regional inequalities.

Regarding UCINCa beds, in absolute numbers, the Northeast region showed the highest number of beds of this typology, followed by the Southeast region. It is worth remembering that, historically, in Brazil, the Southeast and Northeast regions were the pioneers in the implementation of the Kangaroo Method during the 1990s, before it was adopted as a public policy⁵, which could justify, at least in part, the higher number of beds in these regions.

The analysis of the adequacy of neonatal beds, based on the two parameters presented by the Ministry of Health through Ordinance GM / MS N. 930/2012¹ (the distribution of the beds and the population need) demonstrated that the number of UCINCa beds is inadequate and insufficient in the assessed maternity hospitals, except in the North region, which is corroborated by the study performed by Augusto², who found that the greatest deficit of neonatal beds was related to the UCINCa typology.

The analysis of the adequacy of neonatal beds by region disclosed a pattern of inequalities, with greater adequacy of NICU beds in the South, Southeast and Midwest regions, as well as sufficiency of UCINCo beds in all regions and lower proportions of UCINCa beds in all regions, especially in the South and Southeast regions. The North and Northeast regions have a deficit regarding the intensive care beds, but greater proportions in kangaroo beds, without, however, reaching a sufficient number.

In this study, the Brazilian regions showed differences regarding the type of implemented beds and their sufficiency, with a clear preference for intensive and intermediate care beds, to the detriment of UCINCa beds. The richest and most developed regions of the country showed an adequacy of intensive care beds, which incorporate high technology, surpassing that recommended by the Ministry of Health. It is important to remember that the South and Southeast regions, during the 1980s and 1990s, experienced a great expansion in the number of neonatal intensive care beds in the public sector, concentrating a

large amount of material and human resources in these regions^{3,23}. At that time there was still no current organization of neonatal units and the implementation of a progressive care line with the UCINCo and, particularly the UCINCa typologies, required a difficult readjustment of the care process and structure of the units.

The UCINCa beds showed deficits in all regions of the country. According to the study by Machado⁷, data from the Ministry of Health indicate that Brazil has a deficit of 1,049 UCINCa beds to adequately meet the needs of the entire population. Despite the regulation of UCINCa through Ordinance GM / MS N. 930/2012¹, and the regulation of its funding through Ordinance 1,300 / 2012⁸, this study showed that the implementation of UCINCa beds in the country is still quite incipient.

This scenario indicates great inadequacies regarding the organization of care for the newborn, which must be progressive, where the care is offered according to their clinical condition. It is at UCINCa that the clinically stable newborn will continuously remain with the mother and the kangaroo position will be maintained for as long as possible, which requires changes in the neonatal unit space to provide a welcoming structure for the practice of the method²⁴. These infrastructure changes and adaptations have already been indicated as barriers to the implementation of the CM in the study by Cardoso et al.²⁵, in addition to the lack of institutional support and human resources²⁶.

It should be noted that despite the difficulties for its implementation, newborn care at the UCINCa brings several advantages: it reduces mortality, increases the possibility of exclusive breastfeeding, promotes a better bond between mother and baby, reduces the risk of sepsis, and hospital readmission when compared to conventional care^{27,28}.

In addition to the clinical advantages, as it is a lightweight and relational technology²⁹, the UCINCa has economic advantages. A study conducted by Entringer et al.⁹ in maternity hospitals in Rio de Janeiro compared the KM with the conventional method for clinically stable newborns who could receive assistance in both types of care. The study concluded that UCINCo costs 25% more than UCINCa. Another study concluded that the KM is less expensive when compared to UCINCo, which represents important savings for SUS³⁰.

Another aspect to be considered is the impact that the KM has shown on infant mortality, one

of the priority axes for SUS actions, through the *Rede Cegonha*, with emphasis on the neonatal component¹¹. This study demonstrated that the North and Northeast regions, which have the highest neonatal mortality rate²¹, have a significant deficit in intensive beds (North) and Kangaroo units (Northeast), requiring strategic actions, since neonatal mortality shows an inverse association with bed availability^{31,32}.

The present study showed that despite all efforts made in recent years to create and increase the number of neonatal beds in the *Rede Cegonha*³³, especially of UCINCa beds, there is still a lot to be done. The deficit in the number of beds indicates that the system fails to guarantee care for severely-ill or potentially severely-ill newborns and fails to implement public policies and guidelines based on scientific evidence. Moreover, there is an unequal distribution of technological resources and inequalities in the implementation of UCINCa beds.

Some important questions remained unanswered due to database limitations. The analysis of the adequacy of beds by health regions would be important, since regionalization is a priority for SUS. Information such as the location of these beds and the organization of reference services with a greater concentration of technological resources were not collected.

Another limitation was the fact that the sample, although robust, cannot be considered representative of the entire national territory. Nevertheless, it has the differential of including data from a national survey, which was not found in the literature in other studies regarding neonatal beds, and it had a large number of institutions investigated, in all regions of the country.

Final considerations

This study verified that the implementation of neonatal beds, especially of UCINCa, in Brazil is still incipient and unequal. Few NUs are organized to follow a progressive care line, with the three types of beds provided for in the legislation; a considerable number of institutions, especially in the North region, do not have a NU, indicating care gaps and major deficits in the care of severely-ill or potentially severely-ill newborns.

Although Ordinance GM/MS N. 930/2012 has brought advances to the organization of care for newborns and has reorganized care in the NU, these changes must be effectively implemented to obtain satisfactory results. For this purpose,

greater efforts are needed to reduce inequities between regions, ensuring appropriate care for severely-ill or potentially severely-ill newborns in the poorest regions of the country.

Progressive care, offered according to the patient's clinical condition, allows family participation and humanizes care, protecting the newborn

from unnecessary hospitalizations in intensive beds. Beyond the fact of just following regulations and standards, the transformation of the neonatal unit is also an important step towards perinatal care qualification and the improvement of health indicators.

Collaborations

ECS Miranda – study concept, organization, preliminary and final analysis of the data, writing of the manuscript and final version of the manuscript. CB Rodrigues – analysis, and preliminary and final version of the manuscript. MASM Gomes and F Lamy-Filho – study concept, analysis, investigation (data collection), discussion of the methodology and writing of the manuscript. LCR Augusto and LG Machado – study concept, analysis and writing of the manuscript. VMF Simões – investigation (data collection) and writing of the manuscript. C Magluta – investigation (data collection), analysis and writing of the final version of the manuscript.

References

1. Brasil. Ministério da Saúde (MS). Portaria nº 930, de 10 de maio de 2012. Define as diretrizes e objetivos para a organização da atenção integral e humanizada ao recém-nascido grave ou potencialmente grave e os critérios de classificação e habilitação de leitos de Unidade Neonatal no âmbito do Sistema Único de Saúde (SUS). *Diário oficial da União* 2012; 12 maio.
2. Augusto LCR. *A implantação do cuidado intensivo neonatal: análise da oferta de leitos no SUS* [dissertação]. Rio de Janeiro: Fiocruz; 2017.
3. Gomes MASM. Método Canguru no contexto das políticas públicas para atenção à gestação, parto, nascimento e recém-nascido no Brasil. In: Sanches MTC, Costa R, Azevedo VMGO, Morsch DS, Lamy ZC, organizadores. *Método Canguru no Brasil: 15 anos de política pública*. São Paulo: Instituto da Saúde; 2015. p. 165-186.
4. Magalhães ML, Cortez-Escalante J, Cannon RLC, Coimbra TS, Padilha H. Desafios da mortalidade infantil e na infância. In: Organização Pan-Americana de Saúde (OPAS), organizador. *Relatório 30 anos de SUS, que SUS para 2030?* Brasília: OPAS; 2018. p. 75-101.
5. Oliveira ND, Joaquim MCM, Maranhão AGK, Schubert C. Atenção humanizada ao recém-nascido de baixo peso - método canguru: 15 anos de uma política pública de saúde que mudou o cuidado perinatal brasileiro. In: Sanches MTC, Costa R, Azevedo VMGO, Morsch DS, Lamy ZC, organizadores. *Método Canguru no Brasil: 15 anos de política pública*. São Paulo: Instituto da Saúde; 2015. p.17-30.
6. Brasil. Ministério da Saúde (MS). *Atenção humanizada ao recém-nascido: Método Canguru: Manual Técnico*. 3ª ed. Brasília: MS; 2017.
7. Machado LG. *Fatores associados à transferência de recém-nascidos elegíveis para unidade de cuidados intermediários Canguru em maternidades brasileiras* [dissertação]. Rio de Janeiro: Fiocruz; 2017.
8. Brasil. Ministério da Saúde (MS). Portaria nº 1.300, de 23 de novembro de 2012. Inclui habilitações Tabela de Habilitações do Sistema de Cadastro de Estabelecimentos de Saúde - SCNES, inclui procedimentos na Tabela de Procedimentos, Medicamentos e OPM do SUS e altera atributos referentes a nome, descrição e habilitação dos procedimentos na Tabela de Procedimentos, Medicamentos e OPM do SUS. *Diário oficial da União* 2012; 23 nov.

9. Entringer AP, Gomes MA, Pinto M, Caetano R, Magluta C, Lamy ZC. Análise de custos da atenção hospitalar a recém-nascidos de risco: uma comparação entre Unidade Intermediária Convencional e Unidade Canguru. *Cad Saude Publica* 2013; 29(6):1205-1216.
10. Brasil. Ministério da Saúde (MS). *Política Nacional de Humanização da Saúde. Documento Base*. 4ª ed. Brasília: MS; 2007.
11. Brasil. Ministério da Saúde (MS). Portaria nº 1.459, de 24 de junho de 2011. Institui no âmbito do Sistema Único de Saúde - SUS - a Rede Cegonha. *Diário oficial da União* 2011; 24 Jun.
12. Organização Mundial de Saúde (OMS). *Assistência ao parto normal: um guia prático. Relatório de Grupo Técnico*. Genebra: OMS; 1996.
13. Brasil. Ministério da Saúde (MS). Departamento de Informática do Sistema Único de Saúde (DATASUS) - Sistema de Informações sobre Nascidos Vivos [online]. Brasília; [s.d.]. [acessado 2019 Jun 10]. Disponível em: <http://www.datasus.gov.br>.
14. Brasil. Ministério da Saúde (MS). *Cadastro Nacional de Estabelecimentos de Saúde (CNES)* [internet]. Secretaria de Atenção à Saúde. [acessado 2019 Jun 10]. Disponível em: <http://cnes.datasus.gov.br/>
15. Brasil. Ministério da Saúde (MS). Resolução nº 466, de 12 de dezembro de 2012. Aprova diretrizes e normas regulamentadoras de pesquisas envolvendo seres humanos. Brasília, *Diário Oficial da União* 2012; 12 dez.
16. Vilela MEA, Leal MC, Thomaz EBAF, Gomes MASM, Bittencourt SDA, Gama SGN, Silva LBRAA, Lamy ZC. Avaliação da atenção ao parto e nascimento nas maternidades da Rede Cegonha: Os caminhos metodológicos. *Cien Saude Colet* 2020; 26(3):789-800.
17. Reis AAC, Soter APM, Furtado LAC, Pereira SSS. Reflexões para a construção de uma regionalização viva. *Cien Saude Colet* 2017; 22(4):1045-1054.
18. Bittencourt SDA, Gurgel RQ, Menezes, MAS, Bastos LS, Leal MC. Neonatal care in Brazil: hospital structure and adequacy according to newborn obstetric risk. *Paediatr Int Child Health* 2015; 35(3):206-212.
19. Bittencourt SDA, Reis LGC, Ramos MM, Rattner D, Rodrigues PL, Neves DCO, Arantes SL, Leal MC. Estrutura das maternidades: aspectos relevantes para a qualidade da atenção ao parto e nascimento. *Cad Saude Publica* 2014; (1):S208-S219.
20. Lansky S, Friche AAL, Silva AAM, Campos D, Bittencourt DAS, Carvalho ML, Frias PG, Cavalcante RS, Cunha AJLA. Pesquisa Nascer no Brasil: perfil da mortalidade neonatal e avaliação da assistência à gestante e ao recém-nascido. *Cad Saude Publica* 2014; 30(Supl. 1):192-207.
21. França E, Lansky S. Mortalidade infantil neonatal no Brasil: situação, tendências e perspectivas. In: Rede Interagencial Informações para Saúde, organizador. *Demografia e saúde: contribuições para análise de situações e tendências*. Brasília: Organização Pan-Americana de Saúde; 2009. p. 83-112.
22. Sociedade Brasileira de Pediatria (SBP). *Faltam 3,3 mil leitos de UTI neonatal no País, denuncia a SBP ao cobrar medidas para o Nascimento Seguro de brasileiros*. [acessado 2019 Jun 10]. Disponível em: <https://www.sbp.com.br/imprensa/detalhe/nid/faltam-33-mil-leitos-de-uti-neonatal-no-pais-denuncia-a-sbp-ao-cobrar-medidas-para-o-nascimento-seguro-de-brasileiros/>
23. Barbosa AP. Terapia intensiva neonatal e pediátrica no Brasil: o ideal, o real e o possível. *J Pediatr* 2004; 80(6):437-438.
24. Brasil. Ministério da Saúde (MS). *Orientações para elaboração de projetos arquitetônicos Rede Cegonha: ambientes de atenção ao parto e nascimento*. Brasília: MS; 2018. [acessado 2019 Jul 03]. Disponível em: http://bvsmms.saude.gov.br/bvsm/publicacoes/orientacoes_projetos_arquitetonicos_rede_cegonhapdf
25. Cardoso JS, Lamy ZC, Lamy Filho F, Gomes MASM, Queiroz ALG, Gianini NOM, Lima GMS, Custódio ZAO, Sanches MTC, Almeida PVB. Análise Situacional da Implantação do Método Canguru em Maternidades Públicas Brasileiras. In: Sanches MTC, Costa R, Azevedo VMGO, Morsch DS, Lamy ZC, organizadores. *Método Canguru no Brasil: 15 anos de política pública*. São Paulo: Instituto da Saúde; 2015. p.165-186.
26. Gontijo TL, Xavier CC, Freitas MIF. Avaliação da implantação do Método Canguru por gestores, profissionais e mães de recém-nascidos. *Cad Saude Publica* 2012; 28(5):935-944.
27. Boundy EO, Dastjerdi R, Spiegelman D, Fawzi WW, Missmer SA, Lieberman E, Kajeepeta S, Wall S, Chan GJ. Kangaroo Mother Care and Neonatal Outcomes: A Meta-analysis. *Pediatrics* 2016; 137(1):e20152238.
28. Conde Agudelo A, Díaz Rossello JL. Kangaroo mother care to reduce morbidity and mortality in low birthweight infants. *Cochrane Database Syst Rev* 2011; (3):CD002771.
29. Silva LJ, Silva LR, Christoffel MM. Tecnologia e humanização na Unidade de Terapia Intensiva Neonatal: reflexões no contexto do processo saúde-doença. *Rev Esc Enferm USP* 2009; 43(3):684-689.
30. Entringer AP, Pinto MT, Magluta C, Gomes, MASM. Impacto orçamentário da utilização do Método Canguru no cuidado neonatal. *Rev Saude Publica* 2013; 47(5):976-983.
31. Projeto Avaliação do Desempenho do Sistema Saúde (PROADESS). Avaliação do desempenho do sistema de saúde. *Indicadores para o monitoramento do setor Saúde na Agenda 2030 para o Desenvolvimento Sustentável*. Boletim Informativo do PROADESS, nº 3, agosto/2018. [acessado 2019 Set 01]. Disponível em: https://www.proadess.icict.fiocruz.br/Boletim_3_PROADESS_Agenda%202030_agosto2018.pdf.
32. Oliveira GS, Lima MCBM, Lyra CO, Oliveira AGRC, Ferreira MAE. Desigualdade espacial da mortalidade neonatal no Brasil: 2006 a 2010. *Cien Saude Colet* 2013, 18(8):2431-2441.
33. Pasche DF, Vilela MEA, Almeida, PVB, Giovanni MD, Franco Netto TL. Rede Cegonha: desafios de mudanças culturais nas práticas obstétricas e neonatais. *Revista Divulgação em Saúde para Debate* 2014; (2):58-71.

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