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Care for healthy newborns in Brazil: are we making progress in achieving best practices?

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Abstract *This paper aims to compare best practices for healthy newborns in public and mixed hospitals affiliated with SUS, according to type of birth, between "Nascer no Brasil/2011" (NB – Birth in Brazil) and in the last assessment cycle of Rede Cegonha, here called "Avaliação da Rede Cegonha/2017" (ARC – Stork Network Assessment). NB included a sample with national representativeness of 266 hospitals, and ARC was conducted in 606 maternity hospitals included in the Rede Cegonha strategy, totaling 15,994 and 8,047 pairs of healthy mothers and newborns, respectively.Between the two studies, NB-2011 and ARC-2017, although the proportion of cesarean sections remained around 44%, the prevalence of skin-to-skin contact with newborns, breastfeeding in the delivery room and breastfeeding in the first 24h of life increased by 140%, 82% and 6%, respectively. The proportion of upper airway aspiration of newborns dropped 65%. The results indicate that the use of evidence-based guidelines for the care of healthy newborns has increased in clinical practice, considering the six-year period between the compared studies. Despite the progress, important challenges remain to ensure best practices for all women and newborns, especially in relation to cesarean births.*

Key words *Unified Health System, Stork Network, Newborn, Birth assistance, Child care*

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Introduction

The standard of care for healthy newborns (newborns) in Brazilian maternity hospitals are still far from the best practices recommended by international guidelines.Practices considered inadequate such as the use of inhaled oxygen (9.5%), airway aspiration (71.1%), gastric aspiration (39.7%) and use of an incubator (8.8%) were excessively used, as shown by *Nascer do Brasil* study (NB-Birth in Brazil study), conducted in 2011-12. Breastfeeding at birth was considered low (16.1%), even in hospitals with the title Baby-Friendly Hospital (BFH) (24%)[1]. Other studies have also identified the absence of individual maternal factors that could explain the low rates of breastfeeding in the first hour of life[2,3].

Over the past decades, efforts aimed at reducing these interventions, promoting skin-to-skin contact, offering the breast right after birth and breastfeeding in the first 24 hours of life, practices recognized for their positive impact on child health[4], have been prioritized in public health policies through actions such as Baby-Friendly Hospital Initiative (BFHI) and Humanized Care for Low Weight newborns - Kangaroo Method. These actions were intensified with the implementation of *Rede Cegonha* (RC – Stork Network)[5,6], launched in 2011 by the Ministry of Health (MoH) with a focus at improving the quality of care for childbirth in the public health sector. Actions to promote humanized clinical practices and evidence-based care for labour, birth and newborns, involving more than 600 public maternities or SUS-affiliated, were central elements in the process of implementing RC[7].

In the same period, other initiatives to qualify neonatal care at birth were developed and/or intensified, with emphasis on the dissemination of clinical guidelines in relation to appropriate care for newborns with gestational age greater than or equal to 34 weeks at birth through the National Resuscitation Program[8,9]. Currently, international guidelines recommend not performing unnecessary interventions such as aspiration of air and gastric tracts and use of oxygen without indication[10-12].

Monitoring and assessing practices in labour, birth and newborns care are consolidated tools in the planning and management of public policies in countries with better performance in perinatal outcomes[13-16] and have been included as strategic axes of RC through their assessment cycles[17,18].

This paper aims to compare four practices of caring for healthy newborns in public and mixed hospitals according to the type of birth (vaginal or caesarean section), between "*Nascer no Brasil* (2011)" (NB – Birth in Brazil)[19] and the last RC assessment cycle, namely "*Avaliação da RedeCegonha*(2017)" (ARC – Stork Network Assessment). The four practices are: upper airway aspiration, skin-to-skin contact, breastfeeding in the first hour of life and breastfeeding in the first 24 hours of life.

Methods

This paper analyzed NB data, which occurred in 2011-12, and ARC, which occurred in 2017.

Nascer no Brasil

A national study was carried out into labour, birth and newborn care in a sample of 266 hospitals and a total of 23,894 puerperal women. The sample was selected in three stages. The first was composed of hospitals with 500 or more births/year in 2007 (which receive 87% of births in Brazil in that year), stratified by the five macro-regions, location (capital or non-capital), and by type of hospital (public, mixed and private). In each stratum, hospitals were selected with probability proportional to the number of births/year. In the second stage, an inverse sampling method was used to select the number of days required to reach 90 women in each hospital. The third stage was composed of the eligible puerperal women. Sample weights were established by the inverse of the probability of including each woman in the sample. A calibration procedure was used to ensure that the distribution of the sampled women was similar to that observed in the population in 2011. More details of the method used by the NB study were published by Leal and Gama[19].

Avaliação da Rede Cegonha

All public and private hospitals affiliated to SUS (mixed hospitals) were included, which, in 2015, were located in a health region with a RC action plan, totaling 606 establishments distributed in all states of Brazil.

Three methods of data collection were used: 1 - personal interview with key informants: managers, health professionals, and puerperal women; 2 - document analysis, verified the availability of standards, protocols and process and outcome indicators of labour, birth and newborn care was directly verified. Data on hospital care were

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extracted from the medical records of women and their newborns; 3 - on-site observation that aimed to verify the conditions of infrastructure and physical plant. The assessment covered all maternity settings, from the entrance and reception door to rooming-in (RI), including the neonatal unit. For this analysis, only the information collected in the interviews with puerperal women and managers and documentary analysis of hospital records are used.

Regarding the sample of puerperal women, the minimum size established for each macro-region was 1,800 women. A fixed number of days of data collection with women was defined according to the number of live births in 2015 in each macro-region: two days in the southeast and northeast, four days in the north, five days in the south and seven days in the Mid-West. At the end, 10,665 mothers were included. Sample weights were calculated by inverse the probability of including each puerperal woman. A calibration procedure was used to ensure that the distribution of the sampled puerperal women corresponded to the distribution of births that occurred in these 606 hospitals in 2017.

For maternity hospital managers, coordinators/heads - obstetrics and neonatology doctor and nurse, the interview was collective. A total of 2,765 people were interviewed. More information about the method can be found in Vilela et al.[18].

Inclusion and exclusion criteria

Both studies (NB and ARC) included women who had a hospital childbirth of a live birth, regardless of gestational age and weight, or a stillbirth weighing more than 500 grams or gestational age greater than or equal to 22 weeks. Women with communication difficulties (severe mental disorder, foreigners who did not understand Brazilian Portuguese and those with hearing impairment) and women with legal termination of pregnancy were excluded. Puerperal women were face to face interviewed during hospitalization and clinical data were collected from hospital records. Electronic forms were developed specifically for each study.

For the present analysis, firstly, births occurred in private hospitals of NB study were excluded (3,539), remaining 20,355 puerperal women (85%) with births in public or mixed hospitals in NB study. Subsequently, multiple births (212 and 122), fetal or neonatal deaths (267 and 109), newborns with Apgar less than 7 (1,013 and 603), newborns who were admitted to a Neonatal Intensive Care Unit (696 and 605), newborns with less than 37 gestational weeks (1,339 and 666), newborns with less than 2,500 grams (466 and 147) and newborns without any of this information (363 and 366) were removed from NB and ARC studies, respectively. After all exclusions, 15,994 and 8,047 pairs of puerperal women and newborns were analyzed, corresponding to 78.6% of the sample of public and mixed hospitals in the NB study and 75.5% of the total sample of ARC.

Exposure variables

As hospital variables we included: region (North, Northeast, Southeast, South, Mid-West), type (public, mixed), location (capital, non-capital), size (up to 999, 1,000-2999, ≥ 3,000 births/year), if it had the title of BFHI (yes, no), if it had nurse-midwife care for uncomplicated vaginal birth (yes, no) and availability of at least one room to assist labour, delivery and immediate postpartum (Birthing Rooms), the latter verified only in the study of ARC. All were collected in the interview with a manager.

The variables "presence ofnurse-midwives in uncomplicated vaginal birth care" and "availability of at least one Birthing Room" were collected at the hospital level and not individually. Birthing Room were considered to exist or not, regardless of whether they were absolute or whether different spaces existed for the care of puerperal women and newborns. Likewise, the presence ofnurse-midwives in uncomplicated vaginal birth care were considered regardless of its proportion in the hospital.

As maternal variables we included: age (≤ 19, 20-34, ≥ 35), skin color (white, black, brown), educational level (incomplete elementary school, complete elementary school, complete high school, complete university school or more), parity (primiparous, 1-2 births, ≥ 3 births), living with a partner (yes or no), presence of a hospital companion (not or partially, all the time) and type of childbirth (vaginal, cesarean). All were collected in the interview with the puerperal women.

Outcomes

The outcomes were dichotomous (yes, no). As best care practices for newbornswe included skin-to-skin contact in the delivery room, breastfeeding in the first hour of life and breastfeeding

in the first 24 hours after birth. As intervention we included upper airway aspiration. In both studiesthe variables were collected through a face to face interview with the puerperal woman, except for upper airway aspiration, which was extracted from the hospital records.

Data analysis

Initially we describe the hospital and women's characteristics as well as the prevalence of the outcomes studied, for both studies.

Then, absolute prevalence differences and prevalence ratios of the outcomes were calculated according to exposure variables and stratified by type of birth, vaginal or cesarean section. For assessment of statistical significance, Pearson's chi-square test was used for independent samples and a 95% confidence level, using the statistical program SPSS version 22.0.

Ethical assessment

Nascer no Brasil and *Avaliação da RedeCegonha* are guided by Resolution 196/96 of the Brazilian National Health Council (*Conselho Nacional de Saúde*), which establishes guidelines and parameters for human research, and Resolution 466/12 of the Brazilian National Commission for Ethics and Research, which regulates MoH Human Research Guidelines and Norms, safeguarding the ethical principles of autonomy, justice, beneficence and non-maleficence according to research protocols CEP/ENSP - CAAE (*Certificado de Apresentação para Apreciação Ética*- Certificate of Presentation for Ethical Consideration) and CEP/ENSP - CAAE. Care was taken to guarantee and preserve the privacy and confidentiality of research data. All hospital directors and puerperal women underwent a prior consent consultation and subsequently signed an informed consent form.

Results

Compared to hospitals in NB, hospitals assessed by ARC were more often public than mixed, had a higher volume of annual births, a greater role for nursing-midwifery in childbirth care and had a greater proportion of women with a companion during the entire hospital stay. Regarding women's characteristics, those included in ARC were older, had a higher educational level and declared themselves as black more frequently than those of NB. The other characteristics analyzed were similar (Table 1).

Between the two studies, NB (2011) and ARC (2017), although the proportion of cesarean sections remained around 44%, there was an increase in the prevalence of skin-to-skin contact with newborns (140%) and breastfeeding in the delivery room (82%). The proportion of NB upper airway aspiration, an intervention recognized as unnecessary, dropped 65% (Table 1).

From Table 2 to Table 5, each care practice for healthy newborns was stratified according to the type of birth.

Skin-to-skin contact in the delivery room doubled for vaginal births and tripled for caesarean sections. However, although the discrepancies between the types of birth have narrowed, skin-to-skin contact in caesarean sections have remained below half the prevalence seen in vaginal births. Northeast, which had the lowest prevalence in NB study, had the greatest increase in this best practice among vaginal births, reaching the same level as other regions. Regarding whether or not the hospital has a BFHI title, in the NB study the prevalence of skin-to-skin contact was higher in hospitals with this title - 50% higher in vaginal births and 170% higher in cesarean sections. In the ARC study, we observed a reduction in these differences. In the two periods studied, the hospital had the presence of nurse-midwife in uncomplicated vaginal birth care, as well as the woman having had a full-time companion, favored skin-to-skin contact. With regard to maternal characteristics, women of black skin color, compared to white and brown, had a greater increase in skin-to-skin contact for vaginal births, which did not happen for cesarean sections, where the increase was higher in white women (Table 2).

Breastfeeding in the first hour of life was more frequent among newborns with vaginal birth, in both studies. During the period, the practice doubled for vaginal births and rose by 30% between caesarean sections, thus increasing discrepancies between types of childbirth. Higher prevalence of breastfeeding in the delivery room was found in public hospitals located in the capital and with more than 3,000 births/year, in hospitals with BFHI initiative and which have the presence of nurses in childbirth care. However, this best practice had a greater growth among non-BFHI hospitals and without obstetric nursing performance in childbirth care. In the ARC study, breastfeeding was greater in the first hour of life (in vaginal births) when Birthing Room

Table 1. Distribution of hospital and postpartum characteristics and prevalence of outcomes in the two studies.

Hospital characteristics	Nascer no Brasil			Avaliação da Rede Cegonha		
	n (15,994)	%	CI	n (8,047)	%	CI
Region						
North	1,638	10.2	(6.8 - 15.1)	1,089	13.5	(10.5 - 17.3)
Northeast	4,454	27.8	(21.4 - 35.3)	2,456	30.5	(26.2 - 35.3)
Southeast	6,874	43.0	(35.2 - 51.1)	2,962	36.8	(32.2 - 41.7)
South	2,026	12.7	(8.9 - 17.7)	923	11.5	(9.0 - 14.5)
Center-West	1,002	6.3	(3.9 - 9.9)	617	7.7	(5.2 - 11.1)
Type						
SUS	7,416	46.4	(38.7 - 54.2)	4,822	59.9	(55.0 - 64.3)*
Mixed	8,579	53.6	(45.8 - 61.3)	3,225	40.1	(35.4 - 45.0)
Location						
Not capital	10,523	65.8	(57.2 - 73.5)	4,851	60.3	(55.2 - 65.2)
Capital	5,471	34.2	(26.5 - 42.8)	3,196	39.7	(34.8 - 44.8)
Number of childbirths						
up to 999	2,049	12.8	(8.8 - 18.3)	548	6.8	(5.6 - 8.3)*
1,000 to 2,999	7199	45.0	(37.6 - 52.7)	3,206	39.8	(35.5 - 44.4)
≥ 3,000	6,747	42.2	(34.4 - 50.4)	4,293	53.3	(48.6 - 58.1)
BFHI	7,274	45.5	(37.9 - 53.3)	2,900	36.0	(31.3 - 41.0)
Nurse in childbirth care	7,546	47.2	(39.4-55.1)	6,108	75.9	(71.9-79.5)
Presence of PCP rooms**	-	-	-	1,196	14.9	(11.4 - 19.2)
Hospital companion						
No or partially	13,114	82.0	(77.9 - 85.5)	2,179	27.6	(25.8 - 29.7)
All time	2,876	18.0	(14.5 - 22.1)	5,822	72.8	(70.3 - 75.1)*
Puerperal women's characteristics						
Age						
15 to 19 years old	3,362	21.0	(19.9 - 22.2)	1,621	20.2	(19.1 - 21.3)
20 to 34 years old	11,279	70.5	(69.4 - 71.6)	5,584	69.4	(68.2 - 70.6)
35 and older	1,352	8.5	(7.8 - 9.2)	840	10.4	(9.7 - 11.3)*
Race/color						
White	4,929	30.8	(27.9 - 33.9)	2,125	26.6	(24.7 - 28.7)
Black	1,512	9.5	(8.4 - 10.7)	1,049	13.1	(12.1 - 14.3)*
Brown	9,551	59.7	(56.8 - 62.6)	4,804	60.2	(58.2 - 62.2)
Educational level						
Incomplete ES*	4,770	29.9	(27.8 - 32.2)	875	10.9	(10.0 - 11.9)
Complete ES	4,593	28.8	(27.6 - 30.0)	2,104	26.2	(25.0 - 27.4)
Complete HS	5,900	37.0	(34.9 - 39.2)	4,531	56.5	(55.0 - 57.9)*
Complete HE and more	674	4.2	(3.6 - 4.9)	513	6.4	(5.7 - 7.2)*
Living with a partner	12,800	80.1	(78.8 - 81.3)	6,341	79.0	(77.6 - 80.4)
Parity						
Primiparous	7,043	44.0	(42.8 - 45.3)	3,713	46.3	(44.1 - 48.5)
1-2 previous childbirths	7,094	44.4	(43.3 - 45.4)	3,359	41.9	(40.0 - 43.8)
3 or more previous childbirths	1,857	11.6	(10.6 - 12.8)	947	11.8	(10.8 - 12.9)
Type of childbirth						
Vaginal	8,921	55.8	(52.7 - 58.8)	4,568	56.8	(55.0 - 58.5)
Caesarian section	7,073	44.2	(41.2 - 47.3)	3,478	43.2	(41.5 - 45.0)
Outcomes						
Skin-to-skin contact in the delivery room	4,554	28.5	(25.5 - 31.7)	5,366	67.5	(65.4 - 69.5)*
Breastfeeding in the delivery room	2,710	17.0	(13.8 - 20.7)	2,454	31.0	(28.6 - 33.5)*
Breastfeeding for the first 24 hours	14,187	91.5	(89.9 - 92.9)	7,676	96.6	(96.0 - 97.2)*
Upper airway aspiration	11,427	71.4	(66.6 - 75.9)	2,058	25.6	(23.1 - 28.3)*

*P value < 0.05 in Pearson's chi-square test. **Rooms with PCP bed: pre-partum, childbirth and postpartum. CI: confidence interval.

Table 2. Prevalence of skin-to-skin contact (%) and differences between NB and ARC studies according to hospital and maternal characteristics, for vaginal and cesarean childbirth.

	Vaginal					Cesarian section				
	NB (n = 8,921)	**ARC (n = 4,568)**	**Absolute Diff.**	**Ratio**	**P value**	**NB (n = 7,073)**	**ARC (n = 3,478)**	**Absolute Diff.**	**Ratio**	**P value***
Total	**41.4**	**87.1**	**45.7**	**2.1**	**<0.001**	**12.3**	**41.9**	**29.6**	**3.4**	**<0.001**
Hospital characteristics										
Region										
North	43.7	89.7	46.0	2.1	< 0.001	9.0	24.0	15.0	2.7	0.002
Northeast	37.3	88.9	51.6	2.4	< 0.001	14.3	43.5	29.2	3.0	< 0.001
Southeast	40.9	83.0	42.1	2.0	< 0.001	11.2	43.0	31.8	3.8	< 0.001
South	51.3	90.8	39.5	1.8	< 0.001	14.3	52.3	38.0	3.7	< 0.001
Center-West	40.8	90.0	49.2	2.2	< 0.001	12.8	49.8	37.0	3.9	< 0.001
Type										
SUS	41.7	87.9	46.2	2.1	< 0.001	14.9	41.8	26.9	2.8	< 0.001
Mixed	41.0	85.5	44.5	2.1	< 0.001	10.7	42.0	31.3	3.9	< 0.001
Location										
Not capital	37.5	84.9	47.4	2.3	< 0.001	11.0	37.1	26.1	3.4	< 0.001
Capital	48.0	90.2	42.2	1.9	< 0.001	15.3	49.7	34.4	3.2	< 0.001
Number of childbirths										
Up to 999	36.6	79.9	43.3	2.2	< 0.001	11.5	34.9	23.4	3.0	< 0.001
1,000 to 2,999	38.1	83.5	45.4	2.2	< 0.001	10.3	37.6	27.3	3.7	< 0.001
≥ 3,000	45.3	90.2	44.9	2.0	< 0.001	15.6	46.7	31.1	3.0	< 0.001
BFHI										
No	33.0	84.5	51.5	2.6	< 0.001	7.5	38.6	31.1	5.1	< 0.001
Yes	50.1	91.2	41.1	1.8	< 0.001	19.2	48.3	29.1	2.5	< 0.001
Midwife-nurse in childbirth care										
No	34.9	80.7	45.8	2.3	< 0.001	10.7	42.6	31.9	4.0	< 0.001
Yes	48.1	88.8	40.7	1.8	< 0.001	14.3	41.6	27.3	2.9	< 0.001
Presence of PCP rooms**										
No	-	86.0	-	-	-	-	42.0	-	-	-
Yes	-	92.2	-	-	-	-	41.5	-	-	-
Hospital companion										
Not or partially	37.4	78.5	41.1	2.1	< 0.001	10.3	31.6	21.3	3.1	< 0.001
All time	56.2	89.5	33.3	1.6	< 0.001	24.9	47.2	22.3	1.9	< 0.001
Puerperal women's characteristics										
Age										
≤19 years old	39.0	86.3	47.3	2.2	< 0.001	9.4	35.7	26.3	3.8	< 0.001
20 to 34 years old	42.3	87.4	45.1	2.1	< 0.001	12.1	42.3	30.2	3.5	< 0.001
35 or older	40.4	86.3	45.9	2.1	< 0.001	18.2	47.3	29.1	2.6	< 0.001
Race/color										
White	43.3	85.6	42.3	2.0	< 0.001	12.8	45.2	32.4	3.5	< 0.001
Black	36.2	89.9	53.7	2.5	< 0.001	13.3	41.7	28.4	3.1	< 0.001
Brown	41.4	87.3	45.9	2.1	< 0.001	11.9	40.2	28.3	3.4	< 0.001
Educational level										
Incomplete ES	40.8	83.2	42.4	2.0	< 0.001	12.6	45.1	32.5	3.6	< 0.001
Complete ES	41.3	87.1	45.8	2.1	< 0.001	10.3	38.6	28.3	3.7	< 0.001
Complete HS	41.6	87.7	46.1	2.1	< 0.001	12.7	41.7	29.0	3.3	< 0.001

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Table 2. Prevalence of skin-to-skin contact (%) and differences between NB and ARC studies according to hospital and maternal characteristics, for vaginal and cesarean childbirth.

	Vaginal					Cesarian section				
	NB (n = 8,921)	ARC (n = 4,568)	Absolute Diff.	Ratio	P value	NB (n = 7,073)	ARC (n = 3,478)	Absolute Diff.	Ratio	P value*
Complete HE and more	47.3	89.8	42.5	1.9	< 0.001	16.2	49.6	33.4	3.1	< 0.001
Living with a partner										
No	42.4	85.0	42.6	2.0	< 0.001	10.3	36.8	26.5	3.6	< 0.001
Yes	41.1	87.6	46.5	2.1	< 0.001	12.6	43.1	30.5	3.4	< 0.001
Parity										
Primiparous	42.0	87.2	45.2	2.1	< 0.001	11.4	42.5	31.1	3.7	< 0.001
1-2 previous childbirths	41.4	87.2	45.8	2.1	< 0.001	13.8	41.7	27.9	3.0	< 0.001
3 or more previous childbirths	39.3	86.1	46.8	2.2	< 0.001	9.5	40.5	31.0	4.2	< 0.001

*P value <0.05 in Pearson's chi-square test. **Rooms with PCP bed: pre-partum, childbirth and postpartum.

were present in the hospital. Regarding women's characteristics, those with complete higher education had a more expressive increase in breastfeeding in the first hour of life, regardless of the type of birth. On the other hand, women of black skin color had a greater increase in this practice among vaginal births, and white women aged ≥ 35 years, a greater increase in this practice in cesarean sections (Table 3).

Breastfeeding in the first 24h started from high prevalence in NB study, close to 95% in vaginal births and 90% in cesarean sections, reaching almost 100% and 95% in ARC, respectively. There were no relevant changes in the prevalence of breastfeeding between the variables studied, nor significant increases between the two studies (Table 4).

Routine airway aspiration of newborns has reduced to one-third in vaginal births and to less than half in caesarean sections. However, as the fall was more pronounced in vaginal births, the relative difference between types of birth increased. In the ARC study, airway aspiration of newborns (of vaginal births) was lower when Birthing Roomwere present in the hospital (Table 5).

Discussion

The four care practices at birth for healthy newborns, comparedin NB and ARC studies, showed a national pattern of improvement, with greater use of the desirable practices: skin-to-skin contact, breastfeeding in the first hour of life and breastfeeding in the first 24 hours of life and reduction of a practice that is not considered adequate (routine upper airway aspiration).

These improvement in care practices for healthy newborns should be discussed taking into account the context of changes in childbirth care model for healthy newborns:it is the central focus of MoH actions for obstetric and neonatal care translated into ongoing initiatives since the 90's and intensified with the Maternity Qualification Plan (MQP) (aimed at the north and northeast) and with the RC implementation, with national coverage[7,16].

As a federal initiative, the RC implementation is also accompanied by policies and programs at the level of states and municipalities, actions by researchers and professionals as well as social movements and women, in search of ensuring evidence-based clinical practices. These are actions that, over the period between studies, have pursued the same objective of improving practices, composing a new conception in childbirth care.

After an interval of 6 years from the mapping of neonatal practices carried out by NB study, there was a significant reduction of an unnecessary intervention in healthy newborns (upper airway aspiration) and the greater use of the three best practices analyzed, with greater positive variation for skin-to-skin contact and breastfeeding in the first hour.

Table 3. Prevalence of breastfeeding in the childbirth room (%) and differences between NB and ARC studies according to hospital and maternal characteristics, for vaginal and cesarean childbirth.

	Vaginal					Cesarian section				
	NB (n = 8,921)	**ARC (n = 4,568)**	**Absolute Diff.**	**Ratio**	**P value***	**NB (n = 7,073)**	**ARC (n = 3,478)**	**Absolute Diff.**	**Ratio**	**P value***
Total	**22.5**	**44.1**	**21.6**	**2.0**	**< 0.001**	**10.0**	**13.9**	**3.9**	**1.4**	**0.015**
Hospital characteristics										
Region										
North	17.5	44.9	27.4	2.6	0.001	5.6	11.7	6.1	2.1	0.019
Northeast	16.0	36.3	20.3	2.3	< 0.001	6.7	10.3	3.6	1.5	0.131
Southeast	26.5	46.9	20.4	1.8	0.001	10.2	17.3	7.1	1.7	0.011
South	30.9	48.5	17.6	1.6	0.003	17.4	16.5	-0.9	0.9	0.867
Center-West	17.5	51.1	33.6	2.9	0.001	12.3	13.9	1.6	1.1	0.761
Type										
SUS	23.2	45.7	22.5	2.0	< 0.001	13.1	15.5	2.4	1.2	0.348
Mixed	21.7	41.2	19.5	1.9	0.001	8.1	11.8	3.7	1.5	0.071
Location										
Not capital	18.2	37.3	19.1	2.0	< 0.001	10.0	12.0	2.0	1.2	0.320
Capital	29.8	53.6	23.8	1.8	< 0.001	9.9	17.0	7.1	1.7	0.005
Number of childbirths										
Up to 999	9.8	28.4	18.6	2.9	< 0.001	7.8	12.1	4.3	1.6	0.324
1,000 to 2,999	18.9	41.7	22.8	2.2	< 0.001	10.7	12.6	1.9	1.2	0.458
≥ 3,000	28.5	47.3	18.8	1.7	< 0.001	9.9	15.3	5.4	1.6	0.011
BFHI										
No	16.6	40.9	24.3	2.5	< 0.001	5.8	12.3	6.5	2.1	0.001
Yes	28.7	49.1	20.4	1.7	< 0.001	15.9	17.1	1.2	1.1	0.653
Nurse in childbirth care										
No	13.2	37.0	23.8	2.8	< 0.001	7.6	14.1	6.5	1.9	0.006
Yes	32.3	45.9	13.6	1.4	0.003	12.9	13.8	0.9	1.1	0.683
Presence of PCP rooms**										
No	-	39.3	-	-	-	-	13.8	-	-	-
Yes	-	67.2	-	-	-	-	14.9	-	-	-
Hospital companion										
Not or partially	17.8	29.9	12.1	1.7	< 0.001	8.4	8.8	0.4	1.1	0.759
All time	39.8	48.1	8.3	1.2	0.039	20.1	16.6	-3.5	0.8	0.258
Puerperal women's characteristics										
Age										
≤ 19 years old	20.5	39.4	18.9	1.9	< 0.001	8.3	9.1	0.8	1.1	0.662
20 to 34 years old	23.2	45.3	22.1	1.9	< 0.001	10.2	13.9	3.7	1.4	0.032
35 or older	22.4	46.1	23.7	2.1	< 0.001	11.4	19.3	7.9	1.7	0.016
Race/color										
White	26.2	43.9	17.7	1.7	< 0.001	11.7	18.3	6.6	1.6	0.022
Black	22.7	49.3	26.6	2.2	< 0.001	11.0	12.3	1.3	1.1	0.701
Brown	20.9	43.1	22.2	2.1	< 0.001	8.7	12.3	3.6	1.4	0.012

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derstood in this analysis of care practices for healthy newborns as revealing service contexts that had already, at least, started to incorporate concrete actions to change the model of evidence-based care and practiced in countries with better perinatal indicators[20-23].

Tabela 3. Prevalência da amamentação na sala de parto (%) e diferenças entre os estudos NB e ARC segundo características hospitalares e maternas, para o parto vaginal e cesariana.

	Vaginal					Cesarian section				
	NB (n = 8,921)	ARC (n = 4,568)	Absolute Diff.	Ratio	P value*	NB (n = 7,073)	ARC (n = 3,478)	Absolute Diff.	Ratio	P value*
Educational level										
Incomplete ES	20.1	40.4	20.3	2.0	< 0.001	8.8	13.5	4.7	1.5	0.086
Complete ES	22.5	40.3	17.8	1.8	< 0.001	9.4	14.0	4.6	1.5	0.024
Complete HS	25.2	45.8	20.6	1.8	< 0.001	10.9	12.9	2.0	1.2	0.288
Complete HE and more	21.9	53.6	31.7	2.4	< 0.001	10.8	21.2	10.4	2.0	0.010
Living with a partner										
No	21.3	43.5	22.2	2.0	< 0.001	8.9	13.2	4.3	1.5	0.084
Yes	22.8	44.1	21.3	1.9	< 0.001	10.2	14.1	3.9	1.4	0.017
Parity										
Primiparous	22.1	44.0	21.9	2.0	< 0.001	9.5	13.5	4.0	1.4	0.040
1-2 previous childbirths	23.2	43.7	20.5	1.9	< 0.001	10.7	14.2	3.5	1.3	0.044
3 or more previous childbirths	21.4	45.6	24.2	2.1	< 0.001	8.9	14.0	5.1	1.6	0.060

Table 4. Prevalence of breastfeeding in the first 24 hours of life (%) and differences between NB and ARC studies according to hospital and maternal characteristics for vaginal and cesarean childbirth.

	Vaginal					Cesarian section				
	NB (n = 8,921)	ARC (n = 4,568)	Absolute Diff.	Ratio	P value*	NB (n = 7,073)	ARC (n = 3,478)	Absolute Diff.	Ratio	P value*
Total	**93.7**	**97.8**	**4.1**	**1.04**	**< 0.001**	**88.7**	**95.1**	**6.4**	**1.07**	**< 0.001**
Hospital characteristics										
Region										
North	97.0	98.8	1.8	1.02	0.057	92.1	95.5	3.4	1.04	0.071
Northeast	91.5	97.8	6.3	1.07	< 0.001	85.7	96.3	10.6	1.12	< 0.001
Southeast	93.4	97.3	3.9	1.04	0.003	87.7	93.8	6.1	1.07	< 0.001
South	96.2	98.5	2.3	1.02	0.009	91.6	94.8	3.2	1.04	0.268
Center-West	96.4	97.4	1.0	1.01	0.233	94.8	95.7	0.9	1.01	0.506
Type										
SUS	94.8	97.7	2.9	1.03	< 0.001	88.7	95.4	6.7	1.08	< 0.001
Mixed	92.5	97.9	5.4	1.06	< 0.001	88.7	94.8	6.1	1.07	< 0.001
Location										
Not capital	93.4	98.1	4.7	1.05	< 0.001	88.5	94.5	6.0	1.07	< 0.001
Capital	94.3	97.4	3.1	1.03	0.026	88.9	96.1	7.2	1.08	< 0.001
Number of childbirths										
Up to 999	94.8	98.6	3.8	1.04	0.011	90.7	94.0	3.3	1.04	0.110
1,000 to 2,999	93.3	98.1	4.8	1.05	< 0.001	89.3	95.5	6.2	1.07	< 0.001
≥ 3,000	93.8	97.5	3.7	1.04	0.001	86.8	95.0	8.2	1.09	< 0.001
BFHI										
No	93.2	97.5	4.3	1.05	< 0.001	88.4	94.1	5.7	1.06	< 0.001
Yes	94.3	98.3	4.0	1.04	< 0.001	89.0	97.0	8.0	1.09	< 0.001
Nurse in childbirth care										
No	93.1	96.8	3.7	1.04	0.016	89.4	95.0	5.6	1.06	< 0.001
Yes	94.4	98.1	3.7	1.04	< 0.001	87.8	95.2	7.4	1.08	< 0.001

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Table 4. Prevalence of breastfeeding in the first 24 hours of life (%) and differences between NB and ARC studies according to hospital and maternal characteristics for vaginal and cesarean childbirth.

	Vaginal					Cesarian section				
	NB (n = 8,921)	**ARC (n = 4,568)**	**Absolute Diff.**	**Ratio**	**P value***	**NB (n = 7,073)**	**ARC (n = 3,478)**	**Absolute Diff.**	**Ratio**	**P value***
Presence of PCP rooms**										
No	-	97.6	-	-	-	-	95.2	-	-	-
Yes	-	98.8	-	-	-	-	94.7	-	-	-
Hospital companion										
Not or partially	93.2	96.7	3.5	1.04	0.005	88.0	93.7	5.7	1.06	< 0.001
All time	95.6	98.1	2.5	1.03	0.001	92.8	95.9	3.1	1.03	0.014
Puerperal women's characteristics										
Age										
≤19 years old	92.9	98.4	5.5	1.06	< 0.001	90.0	96.0	6.0	1.07	< 0.001
20 to 34 years old	94.1	97.8	3.7	1.04	< 0.001	88.7	95.1	6.4	1.07	< 0.001
35 or older	93.3	96.3	3.0	1.03	0.109	86.3	93.8	7.5	1.09	0.001
Race/color										
White	94.1	97.8	3.7	1.04	0.001	89.6	95.0	5.4	1.06	< 0.001
Black	94.8	97.2	2.4	1.03	0.073	85.4	94.2	8.8	1.10	< 0.001
Brown	93.4	98.0	4.6	1.05	< 0.001	88.5	95.4	6.9	1.08	< 0.001
Educational level										
Incomplete ES	92.3	95.8	3.5	1.04	0.026	85.6	96.3	10.7	1.12	< 0.001
Complete ES	94.0	98.3	4.3	1.05	< 0.001	89.1	94.7	5.6	1.06	< 0.001
Complete HS	94.7	98.1	3.4	1.04	< 0.001	89.8	95.1	5.3	1.06	< 0.001
Complete HE and more	96.4	95.9	-0.5	1.00	0.839	90.6	95.6	5.0	1.05	0.027
Living with a partner										
No	93.2	97.8	4.6	1.05	< 0.001	85.5	92.4	6.9	1.08	< 0.001
Yes	93.9	97.8	3.9	1.04	< 0.001	89.5	95.7	6.2	1.07	< 0.001
Parity										
Primiparous	93.2	97.5	4.3	1.05	< 0.001	88.7	94.0	5.3	1.06	< 0.001
1-2 previous childbirths	94.3	98.3	4.0	1.04	< 0.001	89.1	96.5	7.4	1.08	< 0.001
3 or more previous childbirths	93.5	97.4	3.9	1.04	0.003	85.9	93.5	7.6	1.09	0.003

Considering that the structure of motherhood for childbirth influences the experience of women and the standard of care practices for healthy newborns[7,17-19], the improvement in neonatal practices observed is consistent with structural improvement. As indicators of this impact, the availability of obstetric nurse-midwife stands out. In maternities with the availability of a Birthing Room, a variable analyzed only in ARC, the study confirms this influence by evidencing better results in neonatal practices in maternity hospitals that have this characteristic.

Likewise, the significant increase (300%) in the presence of a companion in ARC when compared to this same data in NB study is also a sign of adequacy of the structure and obstetric care processes in which efforts to improve care for newborns healthy are located.

The existence of Birthing Rooms and nursing-midwifery performance are, therefore, un-

Table 5. Upper airway aspiration prevalence (%) and differences between NB and ARC studies according to hospital and maternal characteristics, for vaginal and cesarean childbirth.

	Vaginal					Cesarian section				
	NB (n = 8,921)	**ARC (n = 4,568)**	**Absolute Diff.**	**Ratio**	**P value***	**NB (n = 7,073)**	**ARC (n = 3,478)**	**Absolute Diff.**	**Ratio**	**P value***
Total	**69.6**	**21.2**	**-48.4**	**0.30**	**< 0.001**	**73.7**	**31.4**	**-42.3**	**0.43**	**< 0.001**
Hospital characteristics										
Region										
North	66.5	14.9	-51.6	0.22	< 0.001	78.8	20.0	-58.8	0.25	< 0.001
Northeast	60.7	26.1	-34.6	0.43	< 0.001	66.4	37.1	-29.3	0.56	< 0.001
Southeast	77.2	21.2	-56.0	0.27	< 0.001	78.1	31.2	-46.9	0.40	< 0.001
South	71.5	16.5	-55.0	0.23	< 0.001	73.4	27.6	-45.8	0.38	< 0.001
Center-West	59.9	20.3	-39.6	0.34	< 0.001	68.0	35.5	-32.5	0.52	0.001
Type										
SUS	69.5	19.2	-50.3	0.28	< 0.001	72.5	25.1	-47.4	0.35	< 0.001
Mixed	69.8	24.5	-45.3	0.35	< 0.001	74.5	39.7	-34.8	0.53	< 0.001
Location										
Not capital	70.5	23.9	-46.6	0.34	< 0.001	73.7	35.0	-38.7	0.48	< 0.001
Capital	68.3	17.3	-51.0	0.25	< 0.001	73.8	25.4	-48.4	0.34	< 0.001
Number of childbirths										
Up to 999	76.0	17.7	-58.3	0.23	< 0.001	71.7	33.3	-38.4	0.46	< 0.001
1,000 to 2,999	68.7	24.5	-44.2	0.36	< 0.001	73.7	35.6	-38.1	0.48	< 0.001
≥ 3,000	69.0	19.4	-49.6	0.28	< 0.001	74.6	27.5	-47.1	0.37	< 0.001
BFHI										
No	69.1	21.6	-47.5	0.31	< 0.001	72.9	32.9	-40.0	0.45	< 0.001
Yes	70.2	20.6	-49.6	0.29	< 0.001	74.9	28.4	-46.5	0.38	< 0.001
Nurse in childbirth care										
No	66.9	21.9	-45.0	0.33	< 0.001	68.1	34.3	-33.8	0.50	< 0.001
Yes	72.5	21.0	-51.5	0.29	< 0.001	80.6	30.3	-50.3	0.38	< 0.001
Presence of PCP rooms**										
No	-	22.5	-	-	-	-	31.5	-	-	-
Yes	-	15.1	-	-	-	-	30.3	-	-	-
Hospital companion										
Not or partially	70.4	26.8	-43.6	0.38	< 0.001	73.4	32.8	-40.6	0.45	< 0.001
All time	66.7	19.7	-47.0	0.30	< 0.001	75.5	30.6	-44.9	0.41	< 0.001
Puerperal women's characteristics										
Age										
≤ 19 years old	67.3	23.3	-44.0	0.35	< 0.001	72.7	31.9	-40.8	0.44	< 0.001
20 to 34 years old	70.3	20.4	-49.9	0.29	< 0.001	73.7	31.7	-42.0	0.43	< 0.001
35 or older	71.1	22.6	-48.5	0.32	< 0.001	75.5	29.4	-46.1	0.39	< 0.001
Race/color										
White	72.3	21.0	-51.3	0.29	< 0.001	75.6	30.4	-45.2	0.40	< 0.001
Black	66.3	17.4	-48.9	0.26	< 0.001	73.1	30.1	-43.0	0.41	< 0.001
Brown	69.0	22.2	-46.8	0.32	< 0.001	72.6	32.1	-40.5	0.44	< 0.001

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Table 5. Upper airway aspiration prevalence (%) and differences between NB and ARC studies according to hospital and maternal characteristics, for vaginal and cesarean childbirth.

	Vaginal					Cesarian section				
	NB (n = 8,921)	**ARC (n = 4,568)**	**Absolute Diff.**	**Ratio**	**P value***	**NB (n = 7,073)**	**ARC (n = 3,478)**	**Absolute Diff.**	**Ratio**	**P value***
Educational level										
Incomplete ES	66.9	19.7	-47.2	0.29	< 0.001	72.0	31.9	-40.1	0.44	< 0.001
Complete ES	69.3	21.5	-47.8	0.31	< 0.001	72.7	31.4	-41.3	0.43	< 0.001
Complete HS	73.1	21.4	-51.7	0.29	< 0.001	74.9	31.5	-43.4	0.42	< 0.001
Complete HE and more	66.9	19.7	-47.2	0.29	< 0.001	76.9	30.5	-46.4	0.40	< 0.001
Living with a partner										
No	70.6	21.2	-49.4	0.30	< 0.001	77.0	28.3	-48.7	0.37	< 0.001
Yes	69.4	21.2	-48.2	0.31	< 0.001	73.1	32.1	-41.0	0.44	< 0.001
Parity										
Primiparous	70.1	18.7	-51.4	0.27	< 0.001	73.9	29.7	-44.2	0.40	< 0.001
1-2 previous childbirths	70.5	24.5	-46.0	0.35	< 0.001	73.9	33.8	-40.1	0.46	< 0.001
3 or more previous childbirths	65.8	20.2	-45.6	0.31	< 0.001	71.9	28.5	-43.4	0.40	< 0.001

Another element to be highlighted, due to its direct influence on the definition of a pattern of neonatal practices at the time of birth, is the Neonatal Resuscitation Program (PRN - *Programa de Reanimação Neonatal*), coordinated in Brazil by the Brazilian Society of Pediatrics. This program has wide national coverage and has been responsible for the dissemination of appropriate clinical practices, indicating the maintenance of healthy newborns with their mothers, providing skin-to-skin contact and breastfeeding in the first hour. PRN also reiterates that there is no need for routine airway aspiration for this group of newborns[8].

The increase in the proportion of skin-to-skin contact in BFHI and non-BFHI hospitals, both in vaginal births and cesarean sections, with a reduction in the differences between the two types of hospital, indicates the reach of RC actions and strategies for disseminating knowledge even in hospitals that do not yet have BFH certification. It is worth mentioning that in BFHI, a strategy prioritized by MoH since 1992, one of the biggest challenges has been located in the fulfillment of step 4, advocating the facilitation of immediate and uninterrupted skin-to-skin contact and support for mothers to initiate breastfeeding as soon as possible after birth[24,25].

Even considering that in 2009 the set of BFHI recommendations was reviewed by the World Health Organization and to them more comprehensive approaches related to best practices addressed also to the mother were added[26,27], it is possible to argue that the efforts and movements of implementing a model that covers the different moments of the line of care seems to have had a positive impact and of great power,contributing to the achievement of objectives of more focused strategies such as BFHI.

The increase in skin-to-skin contact in the North and Northeast, with an emphasis on the significant increase in the Northeast, and approximation to the prevalence found for the South and Southeast, which presented the best proportions in NB study, is an important result. This finding can be understood as a result of the consolidation of strategies to improve practices that had been implemented since MQP and Perinatal Networks of the Legal Amazon (LA) and the Northeast (NE) (MQP) in 2009 and which were intensified with RC that included strategies specific to those regions[28,29].

Both skin-to-skin contact and breastfeeding in the first hour showed growth, however the frequency of breastfeeding in the first hour remains much lower: about half the prevalence of

skin-to-skin contact. This scenario is still quite different from that seen in countries like Canada where only 8% of maternity hospitals do not have the practice of immediate mother-baby contact after birth[30]. Moreover, unlike skin-to-skin contact, the difference in the prevalence of breastfeeding in the first hour between vaginal births and cesarean sections increased between the two studies. This result highlights the importance of maintaining efforts to make skin-to-skin contact, which has not yet reached all births, but also points to the need for specific strategies for the breast provision at birth and intensification of efforts specifically aimed at implementing best practices for healthy newborns born by cesarean section.

Black women, compared to white women, had a more significant increase in skin-to-skin contact and breastfeeding in the first hour of life for vaginal births. For both practices, black women started from lower prevalence in NB study and even exceeded the prevalence of white women in ARC. This finding is compatible with that described by Leal et. al.[30], who found an important reduction in socioeconomic inequities related to best practices during childbirth care, in a comparison similar to the one performed here. In contrast, for cesarean sections, the increase in both practices was higher in white women than in brown or black women, revealing an increase in inequities in cesarean childbirth. More studies are needed for a better understanding of the dynamics of introducing best practices in childcare and newborn care in the country, which may vary according to maternal characteristics and type of childbirth.

As for breastfeeding in the first 24 hours, it is worth mentioning that, although the prevalence in the NB study was already high, there was room for an increase in ARC, expressing results of public policy actions, which must be maintained and expanded.

A limitation of this analysis refers to the differences in the representativeness of the sample of the studies compared. The ARC study involved the total number of maternity hospitals that received RC intervention, having national representativeness for this group of maternity hospitals. The NB study had national representativeness among all maternities with ≥ 500 births/year in the country. Although maternities with less than 500 births/year have been included in ARC, which did not occur in the NB study, it is unlikely that the results of these maternities have significantly affected the improvement observed in care practices[7]. Furthermore, the proportion of women with childbirth in hospitals with less than 1,000 births/year was lower in ARC than in the NB study. Another limitation was the reduced number of practices that could be compared between the two studies, given that the routine use of inhaled oxygen and gastric aspiration were collected only in the NB study, and the timely clamping of the umbilical cord, more recently discussed, was not addressed in any of the studies.

In Brazil, where most births are hospitalized, there is an improvement in the care for healthy newborns right after birth. The current results showed that guidelines based on the best evidence for care for healthy newborns are more present in clinical practice in public hospitals included in ARC compared to that found in public hospitals and SUS-affiliated hospitals in NB. In spite of this, important challenges remain so that best practices are guaranteed for the totality of women and children, particularly in relation to births by cesarean section. The continuity and strengthening of public policies aimed at qualifying care during pregnancy, labour, and chilbirth and the dissemination of knowledge for the improvement of clinical practice are fundamental to achieve this goal.

Collaborations

MASM Gomes, APE Pereira, SDA Bittencourt, LCR Augusto, F Lamy-Filho, ZC Lamy, C Magluta e ME Moreira participated in data conception, planning and analysis; writing or critical review of the final version and the final approval of the version to be published. They were responsible for all aspects of the work in ensuring the accuracy and integrity of its content.

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