

Reduction of inequities of access to appropriate childbirth care in *Rede Cegonha*

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Abstract *This article compares the findings of “Avaliação da Rede Cegonha” (ARC – Stork Network Assessment), an evaluative study on the Rede Cegonha (RC – Stork Network) program, with Nascer no Brasil (NB – Born in Brazil), a national survey on labor and birth, conducted in 2011-12, before the start implementation of RC. ARC was conducted in 2017, in 606 maternity hospitals involved in RC and NB included a sample with national representation of 266 hospitals. In the current analysis, we included the 136 SUS hospitals that participated in both studies, totaling 3,790 and 12,227 puerperal women. We perform comparisons of best practices and interventions in the management of labor and delivery using Pearson’s chi-square test for independent samples. The prevalence of best practices was, on average, 150% higher in ARC than in NB, with a greater relative increase in less developed regions, for older, brown and black women and less educated. Regarding interventions, there was an average reduction of 30% between NB and ARC, with a greater relative reduction in less developed regions and less educated women. There was a significant improvement in the scenario of care for labor and childbirth, with a reduction in regional, educational and racial inequalities in access to appropriate technologies, suggesting that the RC intervention was effective.*

Key words *Delivery care, Perinatal Care, Maternal health, Health policy*

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Introduction

Maternal and infant healthcare in Brazil is far from optimal. Despite the rollout of policies designed to progress care, many issues that exist in Brazilian society continue to permeate healthcare systems. Social and regional inequalities of gender, race and ethnicity all play a hand in shaping Brazil's healthcare system. Neglect, maltreatment and gender-based violence contribute to the continuation of practices proven to be harmful to the health of women and infants. Research has already highlighted the need to address these issues.¹ Excessive medical intervention in normal childbirth is common in Brazil, both in the public and private sectors. Giving birth has become generally synonymous with pain and suffering, and is a moment feared by women².

In 2011, Rede Cegonha (RC) aimed at addressing some of these issues by building on existing policies designed to improve maternal and infant healthcare in Brazil³. RC proposed a set of actions to accelerate change, emphasizing guaranteed access to quality healthcare for all women and children. Achieving quality required adapting the incumbent model of care, which was based on the concept of normality⁴. Two important facets included the introduction of nurse-midwives and midwives in maternal and infant care, alongside the implementation of Birth Centers (BCs), as recommended by the World Health Organization (WHO). WHO gathered robust studies showing superior health outcomes when maternal and infant care was based on multidisciplinary care¹. BCs were shown to remove pressure from hospitals by reducing the number of hospital beds required for childbirth. Studies also demonstrated that BCs were key to reducing excess interventions and increasing women's satisfaction with the childbirth process⁵⁻⁷.

An RC State Conducting Group was later launched. Priority health regions were selected for situational diagnostics, the formulation of plans and the implementation of actions. Using recommendations based on scientific evidence surrounding best care practices, the supply, demand and quality of services were analyzed across health regions, both in primary and specialized care units (hospital, low and high risk). After deciding the regional design of the network, resources were allocated in the form of incentives, under the commitment to meet targets. Funds were also allocated to the adaptation of obstetric centers to RDC 36-2008, the installation of BCs,

homes for pregnant women, babies and puerperal women. Resources were also allocated for training of the entire care team. Special attention was given to training courses for nurse-midwives, in terms of residency and specialization. In order to monitor and verify the commitments assumed, assessment processes were agreed. These were shared between the three spheres - municipal, estadual e federal - of *Sistema Único de Saúde* (SUS – Unified Health System)⁸.

NB was conducted in the same year of RC launch, in 2011, by the Oswaldo Cruz Foundation. It included a sample of hospitals stratified by geographical region and type of payment for care (private, public or mixed), totaling 23,894 women⁹. NB constitutes the baseline of indicators of childbirth and birth care for a later assessment of RC.

The assessment processes of policies implemented by SUS has been an important tool for decision-making and general program improvement¹⁰. ARC assessed managers, workers and puerperal women, as well as the general ambience and processes underway in maternity hospitals. Further details on the methodology of this study can be seen in Vilela *et al.*¹¹.

A study recently published by Leal *et al.*¹² compared the results of ARC with the public sector component (owned and affiliated to SUS) of NB. The authors identified the differences in the representativeness of the sample across the two surveys as a limitation. This study will compare the results of ARC with NB only in hospitals that participated in the two studies.

Methods

NB was a nationwide study on maternal and infant care comprising a sample of 266 public, mixed and privately funded hospitals treating a total of 23,894 puerperal women. This sample represented 87% of births in Brazil in that year. The sample was selected in three stages. The first was composed of hospitals with 500 or more childbirths per year in 2007, stratified by macro-regions, state location (capital or non-capital), and by type of hospital (private, public or mixed). In each stratum, hospitals were selected with probability proportional to the number of childbirths per year. In the second stage, an inverse sampling method was used to select the number of days (minimum seven) required to reach 90 women in each hospital. The third stage was composed of eligible postpartum women.

Data collection was carried out through interviews with postpartum women, via consultation of medical records and telephone interviews with women at the end of puerperium. Sample weights were established by calculating the inverse of the probability of including each puerperal woman in the sample. A calibration procedure was used to ensure that the distribution of the sampled postpartum women was comparable to figures observed in the population in 2011. More details of the methodology used in NB can be seen in Leal⁹ and Vasconcelos¹³.

In ARC, all public and mixed hospitals (privately insured by SUS) were eligible. In 2015, the following criteria for hospitals were established: having 500 or more childbirths per year and being in a health region with an RC action plan, regardless of the release of funding by the government ($n = 582$); having less than 500 childbirths per year and being in a health region with an RC action plan and release of resources ($n = 24$). This gave a total of 606 establishments.

ARC employed the following data collection methods: personal interviews with key informants, such as managers, health professionals and puerperal women; document analysis; and on-site observation. The study collected information on/from the following sources: a) management of services, which included teamwork processes, organization of care and process and outcome indicators of childbirth care, and hospital records; b) on-site observation to assess care processes and the conditions of infrastructure, physical plant, equipment, materials, supplies and the number of obstetric and neonatal beds in the hospital. For the present study, we used the information collected in interviews with puerperal women and via hospital records.

Regarding the sample of postpartum women, the minimum size established for each macro-region was 1,800 subjects. We established a fixed number of days during which interviews would take place with women in each macro-region, which varied according to the number of live births in 2015: two days in the South-East and North-East, four days in the North, five days in the South and seven days in the Midwest. A total of 10,665 women were included in the sample. We established sample weights by calculating the inverse probability of including each puerperal woman. We then applied a calibration procedure to ensure that the distribution of the sampled women corresponded to the distribution of

childbirths occurring in these 606 hospitals in 2017. Further details of ARC methodology can be found in Vilela et al.¹¹ and Bittencourt et al.¹⁴.

Inclusion and exclusion criteria for both studies

Our sample included postpartum women who had given birth in a hospital to at least one live infant—regardless of gestational age and weight—, or to a stillborn over 500g/of gestational age greater than or equal to 22 weeks. Our sample excluded women with communication difficulties (e.g., severe mental disorders, foreigners who did not understand Brazilian Portuguese and those with hearing and/or speech impairments), clinical severities, and those who legally terminated their pregnancy.

Postpartum women were interviewed face-to-face during their hospital stay, after reading and signing an Informed Consent Form (ICF). We collected clinical data from hospital records. We employed electronic forms (completed on tablets) developed specifically for each study.

The subjects of our study were puerperal women sampled from 136 public and mixed hospitals that participated in both NB and ARC. This gave a total sample of 12,227 (NB) and 3,790 (ARC) puerperal women. This number represents about 60% of the total number of women who gave birth in mixed and public establishments in overall NB sample, and 36% of the total number of women sampled overall in ARC. The calibration procedures used for NB and ARC studies, described in the methodology of each study, were not applied in the present analysis.

The number of puerperal women sampled in each hospital ranged from 87 to 94 in NB, whereas in ARC this number ranged from 3 to 142. Due to this range, we used a calibration procedure that aimed at matching the distribution of the women in the 136 hospitals included in the two studies.

Exposure variables

The exposure variable was participation in ARC compared to participation in NB. The sociodemographic variables included were geographical region, age, self-reported skin color and educational level. Both studies collected data on sociodemographic variables via interviews with puerperal women.

Outcomes

We considered best practice (for labour and childbirth care) to be when the following applied (answer: Yes or No): use of partogram, presence of a companion for labour, walking, adequate food supplied, massages offered, option of a shower or bathtub with warm water, use of other non-pharmacological methods for pain relief (including Swiss ball, stool, birthing stool, squat, bar, folding step stool ladder, squatting, armchair, *rebozo* (*Rebozo* is a Mexican shawl that relieves the pain of contractions and relaxes parturient women.), dance, music, breathing exercises, aromatherapy), use of analgesia, and the attendance of nurse-midwives Interventions included venoclysis, oxytocin for labour induction/acceleration, amniotomy, lithotomy, episiotomy, and the fundal pressure maneuver. In both studies, we collected the outcome variables via interview, with the exception of the use of partogram and the use of oxytocin to induce/accelerate labour, for both of which we extracted data from hospital records.

Data analysis

We defined the absolute and relative frequencies of female characteristics, and best practices and interventions for both studies as follows:

For the assessment of best practice and interventions during labour (partogram, companion, walking, food supply, massage, shower/bathtub, other methods, venoclysis and oxytocin), we only included women who were in labour. This gave 7,998 women in NB and 2,622 in ARC. For the assessment of best practices and interventions during vaginal childbirth (analgesia, childbirth by nurse, lithotomy, episiotomy, and fundal pressure maneuver), our analysis only included women who gave birth vaginally—6,918 in NB and 2,075 in ARC. Finally, for the assessment of amniotomy, we only included women who entered full labour and scholarship on admission for childbirth. This gave a total of 5,774 women in NB and 1,815 in ARC.

We analyzed the differences in the prevalence of best practices and interventions affecting all women. We stratified these differences by region (North, North-East, South-East, South, Mid-West), age (<20 years old, 20-34, ≥ 35 years old), skin color (white, black, brown), and educational level (completed high school: Yes or No). We calculated absolute differences and prevalence ratios. For the assessment of statistical signifi-

cance, we used the chi-square test for independent samples, with a 95% confidence level, using SPSS version 22.0.

Ethical assessment

NB and ARC adhere to Resolution 196/96 of the Brazilian National Health Council, which establishes guidelines and parameters for human research, and to Resolution 466/12 of the Brazilian National Ethics and Research Commission, which regulates the Guidelines and Norms of Research on Human Beings of the Ministry of Health. As such, the ethical principles of autonomy, justice, beneficence and non-maleficence are safeguarded, according to research protocols REC/ENSP – CAAE (*Certificado de Apresentação para Apreciação Ética* - Certificate of Presentation for Ethical Consideration) and REC/ENSP/UFMA - CAAE. Care was taken to preserve the confidentiality of research data. All hospital directors and postpartum women underwent a prior consent consultation and subsequently signed an informed consent form.

Results

Compared to NB (2011), a higher proportion of women had completed university education, declared themselves black, and had a previous cesarean in ARC (2017). The other sociodemographic characteristics analyzed show similar figures (Table 1).

In ARC, the prevalence of recommended best practices in labour management and vaginal childbirth were, on average, 150% higher than in NB. We observed an emphasis on massages (from 4.2% to 28.7%), use of analgesia (from 7.4% to 12.6%) and use of other methods of pain relief (from 11.8% to 37.5%). The prevalence of interventions in labour management and vaginal childbirth in 2017 were, on average, 30% lower than in 2011. We observed notable reductions in the use of amniotomy (from 47.6% to 20%) and the Kristeller maneuver (from 35% to 15%) (Table 1).

When comparing macro-regions, we observed that the relative increase in the odds of best practices was more pronounced in the North, North-East and Mid-West, where there were average increases of 330%, 270% and 380%, respectively. For the North and North-East, the increased usage of analgesia (more than six times higher), and for the Mid-west, the increase in

Table 1. Distribution of the characteristics of the mothers and the prevalence of good practices and obstetric interventions in the two studies.

	Nascer no Brasil 2011-2012		Evaluation of the Rede Cegonha 2017		Absolute Difference (%RC - %NB)	Ratio (%RC / %NB)	P- value*
	n (12.227)	%	n (3.790)	%			
Region							
North	2161	17.7	670	17.7	-	-	1.000
Northeast	3234	26.4	1002	26.4	-	-	
Southeast	3239	26.5	1005	26.5	-	-	
South	2340	19.1	725	19.1	-	-	
Midwest	1253	10.2	388	10.2	-	-	
Age in years							
10-19	2729	22.3	799	21.1	-	-	0.120
20-34	8402	68.7	2597	68.6	-	-	
>=35	1092	8.9	391	10.3	-	-	
Skin color							
White	3650	29.9	1033	27.4	-	-	< 0.001
Black	1119	9.2	500	13.3	-	-	
Brown	7454	61.0	2229	59.3	-	-	
Schooling years							
Elementary incomplete	3843	31.5	990	26.2	-	-	< 0.001
Elementary complete	3542	29.1	1050	27.7	-	-	
High School complete	4322	35.5	1472	38.9	-	-	
Higher Education and over	476	3.9	271	7.2	-	-	
Previous deliveries							
Primiparous	5408	44.2	1733	45.7	-	-	0.465
1-2	5247	42.9	1600	42.2	-	-	
≥ 3	1571	12.8	456	12.0	-	-	
Previous cesarean	2361	19.4	843	22.8	-	-	0.002
Good practices							
Partograph ¹	3919	49.0	1487	56.7	7.7	1.2	< 0.001
Companion during labor ¹	3367	42.1	2247	85.7	43.6	2.0	< 0.001
Walking around ¹	3967	49.6	2027	77.3	27.7	1.6	< 0.000
Food supply ¹	2175	27.2	1403	53.5	26.3	2.0	< 0.001
Massage ¹	376	4.7	753	28.7	24.0	6.1	< 0.001
Shower/bathtub ¹	1872	23.4	1269	48.4	25.0	2.1	< 0.001
Other1**	944	11.8	983	37.5	25.7	3.2	< 0.001
Analgesia ²	512	7.4	415	20.0	12.6	2.7	< 0.001
Delivery by nurse ²	1121	16.2	666	32.1	15.9	2.0	< 0.001
Mean	-	25.7	-	48.9	23.2	2.5	-
Interventions							
Venoclysis ¹	5743	71.8	1547	59.0	-12.8	0.8	< 0.001
Oxytocin ¹	3343	41.8	1004	38.3	-3.5	0.9	< 0.001
Amniotomy ³	2748	47.6	363	20.0	-27.6	0.4	< 0.001
Lithotomy ²	6344	91.7	1780	85.8	-5.9	0.9	< 0.001
Episiotomy ²	3487	50.4	577	27.8	-22.6	0.6	< 0.001
Kristeller ²	2470	35.7	324	15.6	-20.1	0.4	< 0.001
Mean	-	56.5	-	41.1	-15.4	0.7	-

* Chi-square test. ** Ball, stool, horse, squat, barbell, ling ladder, squat, armchair, taper, dance, music, breathing exercises, aromatherapy. 1 Women who experienced labor (7,998 in Nascer no Brasil and 2,622 in the Evaluation of Rede Cegonha). 2 Women with vaginal delivery (6,918 in Nascer no Brasil and 2,075 in the Evaluation of Rede Cegonha). 3 Women with labor and full pregnancy sac on admission for delivery (5,774 in Nascer no Brasil and 1,815 in the Evaluation of Rede Cegonha).

childbirths performed by nurses (from 0.7% to 11.5%) stood out. We observed a similar pattern in the reduction of interventions across macro-regions (approximately 40% in the North and North-East, and 30% in the South-East, South and Mid-West) (Table 2).

We observed that the relative increase in the odds of best practices was greater in puerperal women aged ≥ 35 years than in younger women. For all best practices analyzed, older women started with a lower prevalence in NB (2011). Older women saw an increase in the use of analgesia from 6.1% to 27.9%. This figure exceeded the prevalence in women aged 20-34 years in ARC (2017). The same reduction of interventions was observed in women of all ages (Table 3).

The relative increase in the odds of best practices was greater in black and brown women, compared to white women. For all the best practices analyzed, black women started from a lower prevalence in NB (2011). The most important relative increments in black women were the use of massage (from 2.6% to 23.6%), other methods of pain relief (from 8.6% to 36.4%) and analgesia (from 6.1% to 17.5%). The reduction in interventions was similar according to skin color (Table 4).

Regarding the level of education, there was a greater relative increase in the odds of best practices in childbirth care in women with lower levels of education, especially for massages (from 3.5% to 26.5%) and analgesia (from 6.5% to 20%). The reduction in interventions was similar according to level of education (Table 5).

Discussion

ARC (2017) showed that the prevalence of best practices recommended in the management of labour and vaginal childbirth in public or SUS-affiliated hospitals was, on average, 150% higher than in NB. Values were higher for the North, North-East and Mid-West regions for older, brown and black women with lower levels of education. The average reduction in interventions was 30%. This reduction followed the same distribution by geographical region and maternal education, but not by age and skin color. However, the highest absolute prevalence of best practices in labour and childbirth care continued in southern Brazil, a region made up of predominantly white women with higher levels of education. The only exception to this rule was the low rate of nurse-assisted births among this cohort.

For the period 2011-2017, the increased adoption of best practices led to a reduction in inequality. However, social groups, whose initial absolute values were higher also benefited from these initiatives. This explains why the prevalence of these indicators was higher in the most privileged groups. Only a sustained and longer-term investment can balance out the unequal access to health services between different social groups.

The only indicator that bucked this trend was the rate at which nurses assisted childbirth. In 2011, most childbirths (84%) were assisted by a doctor¹⁵. Currently, this remains the case. It is not surprising that groups with better social and economic conditions are more likely to be assisted by a doctor during childbirth care. Doctors have a higher prestige than other health professionals, such as nurses. However, this ignores the benefit of nurse-midwives, whose contribution to childbirth care improves outcomes for pregnant women and their offspring worldwide¹⁶.

Gama et al.¹⁵ compared the roles of nurse-midwives in ARC and NB. This study showed that childbirths monitored by nurse-midwives had a higher incidence of best practices and lower levels of obstetric intervention in vaginal childbirth than births monitored by other medical professionals. However, the study also revealed that physicians incorporated more best practices in 2017 than in 2011, which indicates an improvement in the level of care offered by this cohort.

Universal health systems like SUS aim to reduce inequality in both general health and society. Initiatives such as *Saúde da família* (Family Health), RC and *Mais Médicos* (More Doctors) have aimed at reducing such inequality³. In this regard, the results of this assessment, in addition to attesting to the achievement of RC's objectives of improving attention to labour and birth care based on scientific evidence, reinforce compliance with this principle of promoting equity in SUS.

Asaria et al.¹⁷ assessed the performance of the English National Health System (NHS) between 2004-05 and 2011-12. It showed that inequalities in primary care and quality of care provision had been almost eliminated in the period. However, there were modest reductions in inequities in health outcomes, such as preventable hospitalization and mortality. The authors conclude that reducing inequality in health outcomes is more complex and challenging than reducing inequality in access to health.

The increased adoption of best practice in Brazilian hospitals sampled in this study may

Table 2. Prevalence of good practices and obstetric interventions according to geographic macroregions and absolute differences and prevalence ratio between the two studies.

	North			Northeast			Southeast			South			Center-West												
	NB	RC	NB/RC	P value	NB	RC	NB/RC	P value	NB	RC	NB/RC	P value	NB	RC	NB/RC	P value									
Best practices																									
Partogram	21.7	43.0	21.3	2.0	*	40.6	50.8	10.2	1.3	*	70.6	64.6	-6.0	0.9	*	58.4	75.8	17.4	1.3	*	##	29.7	-15.5	0.7	*
Companion for labor	43.4	88.1	44.7	2.0	*	30.5	82.1	51.6	2.7	*	50.3	85.9	35.6	1.7	*	56.2	90.8	34.6	1.6	*	##	81.0	58.1	3.5	*
Walking	57.8	81.4	23.6	1.4	*	39.7	78.6	38.9	2.0	*	49.4	72.5	23.1	1.5	*	55.6	79.2	23.6	1.4	*	##	79.3	27.6	1.5	*
Food supply	25.4	47.7	22.3	1.9	*	18.5	46.8	28.3	2.5	*	40.2	53.4	13.2	1.3	*	27.0	65.4	38.4	2.4	*	##	56.0	37.2	3.0	*
Massage	1.8	27.4	25.6	15.2	*	4.7	28.1	23.4	6.0	*	5.6	25.4	19.8	4.5	*	6.3	37.1	30.8	5.9	*	4.5	25.3	20.8	5.6	*
Shower/bath/tub	16.8	29.4	12.6	1.8	*	14.0	32.2	18.2	2.3	*	35.7	56.1	20.4	1.6	*	27.9	66.7	38.8	2.4	*	##	57.6	38.3	3.0	*
Other**	7.1	29.0	21.9	4.1	*	7.9	35.2	27.3	4.5	*	14.8	37.2	22.4	2.5	*	19.9	44.6	24.7	2.2	*	8.2	41.4	33.2	5.0	*
Analgesia	2.1	15.5	13.4	7.4	*	1.8	13.9	12.1	7.7	*	15.7	19.9	4.2	1.3	*	8.1	27.2	19.1	3.4	*	7.5	28.2	20.7	3.8	*
Childbirth by nurse	18.5	58.2	39.7	3.1	*	8.7	36.3	27.6	4.2	*	31.5	33.1	1.6	1.1	*	9.9	17.3	7.4	1.7	*	0.7	12.2	11.5	17.4	*
Mean	21.6	46.6	25.0	4.3		18.5	44.9	26.4	3.7		34.9	49.8	14.9	1.8		29.9	56.0	26.1	2.5		-	-	25.8	4.8	
Interventions																									
Venodlysis	72.5	52.8	-19.7	0.7	*	71.1	55.9	-15.2	0.8	*	72.8	64.8	-8.0	0.9	*	71.7	60	-11.7	0.8	*	##	57	-13.1	0.8	*
Oxytocin	30.7	30.9	0.2	1.0	0.5	37.5	27.4	-10.1	0.7	*	53.7	49.6	-4.1	0.9	**	49.9	45	-4.9	0.9	**	##	31	4.3	1.2	**
Amniotomy	47.7	7.7	-40.0	0.2	*	38.6	6	-32.6	0.2	*	54.3	35.3	-19.0	0.7	*	52.8	26.7	-26.1	0.5	*	##	22	-21.2	0.5	*
Lithotomy	91.2	86.6	-4.6	0.9	*	89.0	86	-3.0	1.0	*	91.7	86.8	-4.9	0.9	*	94.0	84.6	-9.4	0.9	*	##	84	-12.0	0.9	*
Episiotomy	41.7	27.3	-14.4	0.7	*	44.5	20.7	-23.8	0.5	*	53.8	34.2	-19.6	0.6	*	56.9	24.6	-32.3	0.4	*	##	35	-25.1	0.6	*
Kristeller	34.9	13.1	-21.8	0.4	*	38.2	19	-19.2	0.5	*	36.0	16.3	-19.7	0.5	*	30.8	11.9	-18.9	0.4	*	##	16	-23.5	0.4	*
Mean	-	-	-16.7	0.6		-	-	-17.3	0.6		-	-	-12.6	0.7		-	-	-17.2	0.7		-	-	-15.1	0.7	

NB: Nascido no Brasil, RC: Rede Cegonha, RC-NB: Absolute difference, NB/RC: Ratio. Chi-square test p value. * < 0.001. ** < 0.050.

Table 3. Prevalence of good practices and obstetric interventions according to maternal age and absolute differences and in the prevalence ratio between the two studies.

	< 20 years				20-34 years				>= 35 years						
	Nascer no Brasil (a)	Rede Cegonha (b)	b - a	b/a	P-value	Nascer no Brasil (c)	Rede Cegonha (d)	d - c	d/c	P-value	Nascer no Brasil (e)	Rede Cegonha (f)	f - e	f/e	P-value
Good practices															
Partograph	50.4	56.6	6.2	1.1	< 0.001	49.0	57.6	8.6	1.2	< 0.001	44.6	50.1	5.5	1.1	0.045
Companion during labor	46.3	90.2	43.9	1.9	< 0.001	41.1	85.0	43.9	2.1	< 0.001	36.2	79.0	42.8	2.2	< 0.001
Walking around	48.8	76.7	27.8	1.6	< 0.001	50.5	77.8	27.4	1.5	< 0.001	45.1	75.5	30.3	1.7	< 0.001
Food supply	27.1	54.2	27.1	2.0	< 0.001	27.9	53.4	25.6	1.9	< 0.001	21.1	51.8	30.7	2.5	< 0.001
Massage	4.8	33.6	28.8	7.0	< 0.001	4.8	27.2	22.4	5.7	< 0.001	3.2	26.7	23.4	8.2	< 0.001
Shower/bath tub	24.8	56.1	31.4	2.3	< 0.001	23.7	46.9	23.3	2.0	< 0.001	16.2	37.9	21.7	2.3	< 0.001
Other**	12.4	45.0	32.7	3.6	< 0.001	12.1	35.8	23.7	3.0	< 0.001	7.6	29.5	21.9	3.9	< 0.001
Analgesia	8.9	16.3	7.4	1.8	< 0.001	7.0	20.3	13.3	2.9	< 0.001	6.1	27.9	21.8	4.6	< 0.001
Delivery by nurse	15.3	38.3	23.0	2.5	< 0.001	16.6	30.1	13.6	1.8	< 0.001	15.7	31.2	15.5	2.0	< 0.001
Mean	26.5	51.9	25.4	2.7		25.9	48.3	22.4	2.4		21.8	45.5	23.7	3.2	
Interventions															
Venoclysis	72.7	62.6	-10.1	0.9	< 0.001	71.2	58.4	-12.8	0.8	< 0.001	73.9	54.8	-19.1	0.7	< 0.001
Oxytocin	40.9	41.3	0.5	1.0	0.765	42.0	37.6	-4.4	0.9	< 0.001	43.3	35.2	-8.1	0.8	0.003
Amniotomy	50.7	24.1	-26.6	0.5	< 0.001	46.8	19.0	-27.8	0.4	< 0.001	44.2	14.0	-30.1	0.3	< 0.001
Lithotomy	92.0	86.3	-5.7	0.9	< 0.001	91.6	85.6	-6.0	0.9	< 0.001	91.6	86.3	-5.3	0.9	0.006
Episiotomy	63.8	34.7	-29.1	0.5	< 0.001	47.3	25.2	-22.1	0.5	< 0.001	33.5	30.5	-3.1	0.9	0.293
Kristeller	42.9	21.1	-21.8	0.5	< 0.001	33.3	14.4	-18.9	0.4	< 0.001	33.3	10.1	-23.2	0.3	< 0.001
Mean			-15.5	0.7				-15.3	0.7				-14.8	0.7	

Table 4. Prevalence of good practices and obstetric interventions according to maternal skin color and absolute differences and in the prevalence ratio between the two studies.

	White						Black						Brown					
	Nascer no Brasil (a)	Rede Cegonha (b)	b - a	b/a	P-value	Nascer no Brasil (c)	Rede Cegonha (d)	d - c	d/c	P-value	Nascer no Brasil (e)	Rede Cegonha (f)	f - e	f/e	P-value			
Good practices																		
Partograph	54.6	68.1	13.5	1.2	<0.001	45.8	51.0	5.2	1.1	0.025	47.2	52.9	5.7	1.1	<0.001			
Companion during labor	48.4	88.4	40.0	1.8	<0.001	34.4	83.8	49.5	2.4	<0.001	40.5	85.3	44.7	2.1	<0.001			
Walking around	53.7	77.0	23.3	1.4	<0.001	44.6	76.3	31.8	1.7	<0.001	48.7	78.1	29.5	1.6	<0.001			
Food supply	31.9	58.8	26.9	1.8	<0.001	23.5	55.7	32.3	2.4	<0.001	25.7	50.5	24.8	2.0	<0.001			
Massage	6.8	31.5	24.7	4.6	<0.001	2.6	23.6	21.0	9.0	<0.001	4.1	28.7	24.6	7.0	<0.001			
Shower/bathtub	27.2	58.2	30.9	2.1	<0.001	19.5	48.1	28.7	2.5	<0.001	22.3	43.8	21.5	2.0	<0.001			
Other**	16.2	42.1	25.9	2.6	<0.001	8.6	36.4	27.8	4.3	<0.001	10.4	35.5	25.0	3.4	<0.001			
Analgesia	10.2	26.1	15.9	2.6	<0.001	6.1	17.5	11.4	2.9	<0.001	6.5	17.2	10.7	2.7	<0.001			
Delivery by nurse	17.9	28.1	10.2	1.6	<0.001	11.7	30.0	18.3	2.6	<0.001	16.1	34.8	18.6	2.2	<0.001			
Mean	29.7	53.2	23.5	2.2		21.8	47.0	25.1	3.2		24.6	47.4	22.8	2.7				
Interventions																		
Venoclysis	72.5	60.6	-11.9	0.8	<0.001	71.6	60.9	-10.7	0.9	<0.001	71.5	57.8	-13.7	0.8	<0.001			
Oxytocin	47.8	41.3	-6.5	0.9	<0.001	42.5	45.2	2.7	1.1	0.249	39.2	35.0	-4.2	0.9	<0.001			
Amniotomy	48.4	27.2	-21.2	0.6	<0.001	47.3	18.6	-28.7	0.4	<0.001	47.3	17.0	-30.4	0.4	<0.001			
Lithotomy	92.2	84.5	-7.8	0.9	<0.001	89.1	83.4	-5.7	0.9	0.001	91.9	87.1	-4.8	0.9	<0.001			
Episiotomy	56.6	29.2	-27.4	0.5	<0.001	46.3	27.2	-19.1	0.6	<0.001	48.4	27.2	-21.2	0.6	<0.001			
Kristeller	35.6	13.5	-22.1	0.4	<0.001	35.6	13.4	-22.2	0.4	<0.001	35.8	17.2	-18.6	0.5	<0.001			
Mean			-16.1	0.7				-13.9	0.7				-15.5	0.7				

Table 5. Prevalence of good practices and obstetric interventions according to maternal education and absolute differences and prevalence ratio between the two studies.

	< complete high school					≥ complete high school					c/a	d/b
	Nascer no Brasil (a)	Rede Cegonha (b)	b - a	b/a	P value	Nascer no Brasil (c)	Rede Cegonha (d)	d - c	d/c	P value		
Best practices												
Partogram	47.0	53.6	6.6	1.1	< 0.001	53.0	61.0	8.0	1.2	< 0.001	1.13	1.14
Companion for labor	39.9	84.1	44.2	2.1	< 0.001	46.2	87.7	41.5	1.9	< 0.001	1.16	1.04
Walking	47.2	74.5	27.3	1.6	< 0.001	54.4	81.1	26.7	1.5	< 0.001	1.15	1.09
Food supply	24.7	53.4	28.7	2.2	< 0.001	31.8	53.6	21.8	1.7	< 0.001	1.29	1.00
Massage	3.6	26.5	22.9	7.4	< 0.001	6.8	31.6	24.8	4.6	< 0.001	1.89	1.19
Shower/ bathtub	21.2	45.4	24.2	2.1	< 0.001	27.5	52.6	25.1	1.9	< 0.001	1.30	1.16
Other**	10.0	34.3	24.3	3.4	< 0.001	15.3	41.7	26.4	2.7	< 0.001	1.53	1.22
Analgesia	6.5	20.0	13.5	3.1	< 0.001	9.4	20.0	10.6	2.1	< 0.001	1.45	1.00
Childbirth by nurse	15.5	34.0	18.5	2.2	< 0.001	17.5	29.3	11.8	1.7	< 0.001	1.13	0.86
Mean	24.0	47.3	23.4	2.8	-	29.1	51.0	21.9	2.1	-	1.34	1.08
Interventions												
Venoclysis	70.2	57.9	-12.3	0.8	< 0.001	74.8	60.7	-14.1	0.8	< 0.001	1.07	1.05
Oxytocine	40.2	38.0	-2.2	0.9	< 0.014	44.9	38.8	-6.1	0.9	< 0.001	1.12	1.02
Amniotomy	48.0	19.1	-28.9	0.4	< 0.001	46.8	21.0	-25.8	0.4	< 0.001	0.98	1.10
Lithotomy	91.5	85.9	-5.6	0.9	< 0.001	92.3	85.8	-6.5	0.9	< 0.001	1.01	1.00
Episiotomies	46.8	25.5	-21.3	0.5	< 0.001	57.6	31.2	-26.4	0.5	< 0.001	1.23	1.22
Kristeller	35.3	16.1	-19.2	0.5	< 0.001	36.7	14.9	-21.8	0.4	< 0.001	1.04	0.93
Mean			-14.9	0.7	-			-16.8	0.7	-	1.07	1.05

not directly entail an improvement in obstetric indicators, such as maternal mortality. Other determinants of maternal morbidity and mortality, such as socioeconomic factors, lifestyle, social and behavioral support, maternal co-morbidities, are also key to determining obstetric outcomes¹⁸.

However, RC complies with its principles by reducing inequities in more vulnerable women, such as those with black skin and lower levels of education^{19,20}.

While best practices are becoming more prominent in Brazilian hospitals, the number of unnecessary obstetric interventions has decreased very little. This may be because it is easier to introduce new care processes than to remove old ones. Significantly though, the fundal pressure maneuver, a notoriously painful procedure, was used less. This is likely a consequence of bet-

ter labour management and the use of best obstetric practices.

The results of this study show that the implementation of the protocol for vaginal childbirth care in the public network and under the SUS agreement is in process⁷. This protocol was developed with participation from gynecologists, obstetricians, midwifery and pediatrics societies, technical representatives from the Ministry of Health and State Offices, health professionals and female representatives. Its launch in 2016 was preceded by a public consultation. This participatory process collaborated with professionals' adherence to the new protocol recommendations.

In addition to the adoption of measures and procedures known to be beneficial for monitoring maternal and infant care and avoiding unnecessary interventionist practices^{1,7}, RC invested

in creating a welcoming institutional environment that broke with the traditional isolation of women on admission to hospital⁴.

Bittencourt et al.¹⁴ assessed RC maternity hospitals and found that *Diretriz de acolhimento em obstetrícia* (a guideline in obstetric care welcoming) was the most implemented. This involved calling pregnant women by their name, listening to their complaints, fears and expectations and effective communication between professionals and women. However, almost a quarter of the maternities had insufficient implantation in one aspect of the guideline, related to self-presentation of professionals to users¹³.

RC sought to analyze the establishment of dignified and respectful treatment towards pregnant women. When questioned whether this was achieved, about 20% of women wanted to speak, and of these, almost 60% commented on their satisfaction with the care received. These women highlighted their good relationship with health professionals¹⁶. The positive association between a good relationship between carer and cared-for has already been shown in other studies^{21,22}.

The presence of a companion chosen by parturient women was the most adopted best practice (between 80 and 90%) among all best practices of attention to work. The importance of the presence of a companion for parturient women's well-being and emotional support is recognized²³. Moreover, the presence of a companion has a positive impact on labour, reducing its duration and the need for cesarean²⁴. A companion can also reduce levels of abuse/mistreatment during hospitalization, leading to greater satisfaction with the care received^{25,26}.

Results obtained in aforementioned analysis did not differ from those found in the current comparison of ARC and NB¹¹. Moreover, the inclusion criteria for women's participation was the same across studies, as were the procedures and instruments for data collection.

The option to work only with hospitals that participated in the two surveys (NB and ARC) increased the comparability performed in the current analysis. However, this implies a loss of representativeness and possible reduction of the external generalization of the findings. Another aspect that deserves comment is the use of maternal information for analysis of the use of oxytocin and episiotomy. Our study found that collecting data from records was more reliable than data collected via interviews. In ARC, this information was not collected in the medical record. Because of this, we opted to use maternal information in both studies, thereby increasing comparability between studies.

In conclusion, women treated in the 136 SUS hospitals evaluated in this paper were more likely to receive better care (defined as care that incorporates what we have defined as best practice) in 2017 than in 2011. From 2011-2017, we observed a significant improvement in labour and childbirth care in Brazil. As such, the initiatives appear to have worked. We observed a reduction in inequalities resulting from geographical region, age, educational level and race. We also observed a similar reduction in inequality surrounding access to technologies appropriate to childbirth care, in compliance with RC and SUS guidelines. RC promoted greater equity in care for labour and birth care in these SUS hospitals in Brazil.

Collaborations

MC Leal was responsible for the conception and design of this study, as well as data acquisition. She also interpreted the data, wrote and critically revised the text, approving the final version to be published. APE Pereira participated in the conception and design of the study. She also critically analyzed and interpreted the data and made substantial contributions to text writing and revision, approving the final version to be published. MEA Vilela, MTSSB Alves, MA Neri, RCS Queiroz, YRP Santos and AAM Silva contributed to data acquisition, interpretation of results, writing and text review, approving the final version to be published.

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