

Obstetric interventions in a maternity hospital with a collaborative model of care: a comparative observational study

Intervenções obstétricas em uma maternidade com modelo colaborativo: estudo observacional comparativo

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Abstract Collaborative models (CM) focused on intrapartum care shared between both midwives and obstetricians have been proposed as a strategy to reduce these rates. Our aim was to compare use of evidence-based practices, obstetric interventions and c-section rates in two settings: a maternity hospital that applies a CM of care (MRJ) and data from a pool of maternity hospitals included in the Birth in Brazil Survey (NB) that do not adopt a CM. Data was abstracted from medical and administrative records in MRJ and from medical records and face-to-face interviews in NB. Differences were compared using chi-square test, with significance level set at $p < 0.05$. MRJ showed a higher frequency of labour companionship, labour care provided by nurse midwives, non-pharmacological pain relief methods, food intake during labour, and less use of oxytocin, analgesia and amniotomy. More women also had second stage assisted by a nurse midwife and in a vertical position, as well as lower use of episiotomies and vacuum-extractor/forceps. The c-section rate was lower at MRJ. Shared care between midwives and obstetricians can be an effective strategy to improve quality of intrapartum care.

Key words Maternal and child health, Caesarean section, Delivery, Outcome and process assessment (Health Care)

Resumo Modelos colaborativos (MC) com foco no cuidado intraparto compartilhado entre parteiras e obstetras têm sido propostos como uma estratégia para reduzir essas taxas. Nosso objetivo foi comparar o uso de práticas baseadas em evidências, intervenções obstétricas e taxas de cesarianas em dois ambientes: uma maternidade que aplica um MC de atendimento (MRJ) e dados de um conjunto de maternidades incluídas na pesquisa Nascer no Brasil (NB) que não adotam um MC. Os dados foram extraídos de prontuários médicos e documentos administrativos no MRJ e de prontuários e entrevistas presenciais em NB. As diferenças foram comparadas pelo teste do qui-quadrado, com nível de significância estabelecido em $p < 0,05$. MRJ apresentou maior frequência de acompanhante no parto, assistência ao parto por enfermeiras obstétricas, métodos não farmacológicos de alívio da dor, ingestão de alimentos durante o trabalho de parto e menor uso de ocitocina, analgesia e amniotomia. Mais mulheres também tiveram o parto assistido por enfermeira obstétrica e em posição vertical, bem como menor uso de episiotomias e vácuo-extrator/fórceps. A taxa de cesariana foi menor no MRJ. O cuidado compartilhado entre enfermeiras e obstetras pode ser uma estratégia eficaz para melhorar a qualidade do cuidado intraparto.

Palavras-chave Saúde materna e infantil, Cesárea, Parto normal, Avaliação de processos e resultados (Cuidados de Saúde)

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Introduction

In Brazil, an intensive use of interventions during labour and birth has been described¹⁻³. According to *Birth in Brazil* survey (NB), only 5.6% mixed obstetric risk women had a vaginal birth without any intervention in the country¹. The high caesarean section rate (of 55.9% in 2018) is also another consequence of this highly interventionist model of care⁴. Even though the full spectrum of clinical consequences of such higher caesarean sections rates are not completely understood, on an individual level it appears to be associated with higher maternal morbidity^{5,6} and mortality⁷, as well as with significant neonatal adverse effects when carried out before full term⁸, while also poses a burden on the healthcare system^{9,10}.

During the last decades, the Brazilian Ministry of Health issued programs and guidelines focusing on improving obstetric care in the country¹¹⁻¹³. In 2011, the federal government launched a national level program named *Stork Network* (RC) particularly targeting the public health care system¹². RC specifically adopted the collaborative model (CM) of intrapartum care, which consists of involving nurse midwives and midwives in the intrapartum care of low-risk pregnant women, ensuring medical intervention when required¹⁴⁻¹⁷. Studies have demonstrated lower rates of caesarean sections and obstetric interventions, as well as increased use of non-pharmacological pain relief methods and greater satisfaction when care is provided by midwives¹⁸⁻²⁰.

The present study aims to compare the adoption of evidence-based practices and caesarean section and obstetric interventions rates in a maternity hospital in Rio de Janeiro (MRJ) that adopts the CM of care since its foundation, following RC guidelines, with those in public maternity hospitals located in the Southeast region that were included in NB survey (carried out in 2011-2012, when RC was not yet a national policy).

Methods

This is a comparative analysis of two settings with different models of intrapartum care: a maternity hospital belonging to the local health system of Rio de Janeiro city (MRJ), Brazil, and publicly funded maternity hospitals located in the Southeast region that were enrolled in the NB (MRJ was not part of the NB). The MRJ was chosen due to two key factors: i) the lower c-sec-

tion rate (18% in 2012 and 24% in 2013)⁴ compared to the national average for publicly funded deliveries (43% between 2011 and 2012)³; ii) the adoption of a CM of intrapartum care since its foundation. In the MRJ CM, low-risk labour and births are primarily assisted by nurse midwives and rely on obstetricians only as a second line of care if complications emerge. Obstetricians are also the primary providers for women with known comorbidities or pre-established obstetric risk criteria.

MRJ Setting

A sample size to identify differences of 0.5% or more in obstetric interventions rates was initially calculated, using a 95% confidence interval and 80% statistical power. A minimum sample of 2,396 women were estimated and then increased by 5%, totalling 2,500 women. We performed a retrospective cohort study collecting data from January 1st to December 31st, 2018, when 5,450 women gave birth at a gestational age of ≥ 22 weeks and/or weight at birth of ≥ 500 g at MRJ – same eligibility criteria used in NB^{21,22}.

We selected the 2,500 women using simple random sampling from a database including all 5,450 women. Data was collected from the maternity ward electronic medical records system and when needed confirmed against information from administrative records kept in the labour and delivery room (L&D) containing summary data from each normal birth and caesarean section. All information was collected from medical records, except for the presence of labour companionship, use of methods for pain relief and the birth position, which we obtained reviewing the L&D administrative records.

Among the 2,500 women in the sample, we were unable to abstract data from hospital records for 265 women (10.6%), once their medical records were numbered according to an older filing system and stored outside the hospital premises. 425 women had their medical records in this situation, from which we were able to recover the medical charts of 160. However, information on maternal age, skin colour, parity, mode of birth, gestational age, birth weight, and Apgar score were available for all women in the L&D administrative records.

Using the available information, we were able to adjust a logistic model and calculate a sample weight so that those 160 women represented the 425 women whose medical records were stored

outside the hospital premises. The other women were assigned a weight of "1". Another 48 women (1.9%) did not have their medical records reviewed for different reasons, therefore were excluded from the sample. The final weighted sample included 2,452 women.

Birth in Brazil Survey

NB was a nationwide hospital-based survey carried out from February 2011 to October 2012, including 266 hospitals and 23,894 women from all regions of the country. The sample was selected in three stages. The criteria for hospitals were having attended ≥ 500 births in 2007, stratified by the five macro-regions of the country, location (State capital or not) and type of hospital funding (private, public, or mixed). On the second stage, a reverse sample method selected the number of days (minimum of seven) required to interview 90 postpartum women in each hospital. On the third stage, all women who delivered live babies in the hospital, regardless of weight and gestational age, or a stillbirth weighing over 500 g and/or gestational age above 22 weeks were invited to participate. The sample weights were established by the inverse probability of including each postpartum woman in the sample. We applied a calibration process to ensure that the total estimates were equivalent to the number of births in hospitals with 500 or more births/year in 2011. Detailed information about methods were published elsewhere^{21,22}.

The present analysis includes a subset of the NB database, comprised by postpartum women from the Southeast region whose births were funded by the public Brazilian Unified Public Health Care System ("SUS") (n=7,871). All variables in the present analysis were obtained from medical records, except for age, skin colour, education, history of prematurity, labour companionship, use of a non-pharmacological pain relief method, food intake during labour, and birth position, which were obtained during a face-to-face interview.

Exposure variables

Sociodemographic and obstetric variables included in the analysis were: age (10-19 years, 20-34 years, 35-39 years, >40 years); skin colour (white, black, brown, others); years of schooling (<8 years, 8-10 years, 11-14 years, >15 years); number of previous births (0, 1-2, ≥ 3); number

of previous caesarean sections (0, 1, ≥ 2); type of pregnancy (single, multiple); foetal presentation (cephalic, pelvic, anomalous, non-pelvic); high-risk pregnancy (yes/no); gestational age (<37 or ≥ 37 weeks); onset of labour (induced, spontaneous, caesarean section before labour); and mode of birth (vaginal, forceps/vacuum and caesarean section).

Risk status

We defined high-risk pregnancies as those in women who presented one or more of the following conditions: gestational hypertension/pre-eclampsia, chronic hypertension, eclampsia, pre-gestational diabetes, gestational diabetes, severe chronic diseases, infection at the time of admission for childbirth (including urinary tract infection and other severe infections, such as chorioamnionitis and pneumonia), placental abruption, placenta previa, restricted intrauterine growth and foetal malformations. Women who did not have any of these conditions were considered low-risk.

Robson Groups

We classified all women into the 10 Robson Classification groups, using the subdivision of groups 2 and 4 to distinguish women who had induced labour (groups 2a and 4a) from those who had elective caesarean sections (groups 2b and 4b). We aggregated groups 6, 7 and 9 (pregnancies with non-cephalic presentation), due to their high rate of caesarean sections. In both samples, we considered that women went into labour if they reached at least 4 cm cervical dilation. We defined elective caesarean sections as those in women who did not go into labour and did not receive any method of labour induction.

Outcomes

The outcomes variables related to intrapartum care were: labour companionship, labour care provided by a nurse midwife or midwife, presence of a partograph in the medical records, use of non-pharmacological methods for pain relief, food intake during labour, venous catheterization during labour, use of synthetic oxytocin, labour analgesia, amniotomy, birth assisted by a nurse midwife or midwife, birth position (vertical/non-vertical), episiotomy, and use of vacuum extractor/forceps.

Statistical analysis

To compare patient-level data from each setting, we used 95% confidence intervals and chi-square test *p*-values. All analyses considered the design effect weights of the NB survey, as well as the weighting of losses in the MRJ.

Ethical considerations

The survey at MRJ was approved by the institutional ethics committee under the register number CAAE: 00967118.7.3001.5279 on October 11th, 2018. Since it was a retrospective study and the data collection was restricted to medical charts and administrative records, a waiver of the Informed Consent Form (ICF) was requested and granted by the committee. NB survey ethical approval for all study procedures was obtained from the Public Health National School, Fiocruz Ethical Review Board, under the protocol 92/2010 on May 11th, 2010. Written informed consent from the postpartum woman was obtained prior to any data collection.

Results

The survey included 10,324 postpartum women, 2,453 from MRJ and 7,871 from the Southeast region subsample of NB. Comparing the socio-demographic and obstetric variables of low-risk women, MRJ had a higher proportion of older women (≥ 35 years old), with black skin, higher education, nulliparous and without previous caesarean sections than those in the NB subsample (Table 1). These baseline differences were also found among high-risk women, with an emphasis on the doubled percentage of women ≥ 40 years old and the lower number of white women at MRJ compared to NB. However, in terms of obstetric characteristics, there were no significant differences in parity and number of previous caesarean sections between MRJ and NB high-risk postpartum women.

Table 2 compares the mode of birth and the characteristics of the intrapartum care, stratified by obstetric risk. In low-risk women, the percentage of caesarean sections at MRJ was lower when compared to NB (22.9% vs. 34.8%), with also a significant difference on the percentage of pre-labour c-sections (9.7% vs. 23.4%). The percentage of spontaneous onset of labour within this group was also higher at MRJ (79.3% vs. 28.3%). In terms of evidence-based practices and interventions during labour, there were significant

differences for all of them, except for the presence of a complete partograph. MRJ showed a higher frequency of labour companionship, care provided by nurse midwives during labour, use of non-pharmacological pain relief methods, fluids and food intake during labour, and lower use of synthetic oxytocin, analgesia and amniotomy. There was a higher proportion of women who had a vaginal birth assisted by a nurse midwife and on a vertical position, in addition to less use of episiotomy and vacuum-extractor/forceps.

Among high-risk women, there was a lower percentage of c-sections (53.0% vs. 65.6%) and pre-labour c-sections (33.1% vs 49.2%) at MRJ. The difference in terms of spontaneous onset of labour was not that lower at MRJ, but the percentage of labour induction was much higher than observed in NB (31.2% vs. 18.5%). Most of the differences found for low-risk women were also seen in high-risk women, but there was an inversion in the care provided by nurse midwives during labour (first stage), with a lower percentage at MRJ. In the high-risk group, the rate of vaginal births attended by nurse midwives (second stage) was also lower at MRJ (7.6% vs. 25.5%). Even so, the percentage of deliveries in vertical or lateral positions was higher at MRJ, in addition to the much lower percentage of episiotomies (3.8% vs. 51.9%). Comparing low-risk with high-risk women at MRJ, we observed that there is no difference regarding the presence of a labour companionship, use of amniotomy, analgesia, episiotomy, and vacuum-extractor/forceps (Table 3).

Tables 4 and 5 display a comparison of caesarean section rates according to Robson Classification groups among low-risk and high-risk women. By assessing the distribution of the low-risk obstetric population, a higher proportion of women in group 1 and a lower proportion within groups 2, 5 and 10 are observed at MRJ. The rates of caesarean sections at MRJ were different from those found in NB for the group of non-cephalic presentations (79.3% vs. 93.4%) and for groups 5 (49.3% vs. 74.0%) and 10 (1.9% vs. 23.6%). We identified relevant differences in the analysis of relative contributions. In NB, almost 70% of caesarean sections are concentrated in groups 2 and 5, whereas these groups represent just over 50% of caesarean sections at MRJ. The contribution of group 1 is greater at MRJ (21.4% vs. 6.8%), whereas the contribution of group 10 is greater in NB (0.5% vs. 5.0%).

When assessing the distribution of the high-risk obstetric population in the Robson groups, we observed similar proportions at MRJ and

Table 1. Sociodemographic and obstetric characteristics in NB and MRJ samples according to obstetric risk status.

	Low-risk women					High-risk women				
	NB		MRJ		p-value ^a	NB		MRJ		p-value ^a
	n (5,842)	%	n (1,895)	%		n (2,029)	%	n (557)	%	
Age										
10-19 years	1,270	21.7	343	18.4	0.002	290	14.3	58	10.4	0.001
20-34 years	4,169	71.4	1,365	73.0		1,442	71.0	389	69.8	
35-39 years	324	5.5	130	7.0		248	12.2	83	14.8	
≥40 years	79	1.4	32	1.7		49	2.4	27	4.9	
Skin colour										
White	1,955	33.5	648	34.9	<0.001	666	32.8	138	24.8	<0.001
Black	586	10.0	258	13.9		262	12.9	99	17.7	
Brown	3,213	55.0	935	50.4		1,076	53.0	319	57.3	
Others	84	1.4	16	0.9		26	1.3	1	0.2	
Education (years)										
<8 years	1,436	24.7	232	12.6	<0.001	506	24.9	65	11.7	<0.001
8-10 years	1,792	30.8	691	37.4		610	30.1	186	33.4	
11-14 (middle school)	2,425	41.7	835	45.2		846	41.7	284	51.0	
≥15 (higher education)	166	2.9	91	4.9		68	3.3	22	3.9	
Previous births										
0	2,627	45.0	968	51.1	<0.001	894	44.0	233	41.9	0.215
1-2	2,638	45.2	805	42.5		873	43.0	261	46.9	
≥3	577	9.9	122	6.4		262	12.9	62	11.2	
Previous C-sections										
0	4,707	80.6	1,596	84.2	0.004	1,487	73.3	402	72.1	0.331
1	828	14.2	235	12.4		391	19.3	103	18.6	
≥2	306	5.2	65	3.4		151	7.5	52	9.3	

^aChi-square test.

Source: Authors.

NB for most groups. However, when evaluating the subcategories of group 2, we noticed a higher percentage of women in group 2a (induction of labour) at MRJ in relation to NB (14.5% vs. 7.8%). Likewise, group 4a was also more prevalent at MRJ (9.9% vs. 5.8%). The MRJ caesarean rates were significantly lower in groups 1 (20.9% vs. 41.1%), 2 (62.6% vs. 83.5%) and 8 (72.7% vs. 100%). Both at MRJ and NB, the groups that most contributed to the total number of caesarean sections were groups 5, 2 and 10, with the contribution of group 5 being proportionally greater at MRJ and the contribution of group 2 slightly higher in NB.

Discussion

In recent years, we have seen a transition in the obstetric model of care in the country. Although

caesarean sections rates are still high, we have seen improvement in the management of labour and childbirth both in public and private sectors²³. Our analysis showed significant differences between the two samples, which may be attributed to either the model of care adopted in each setting or some potential changes between data collection periods (NB in 2011-2012 and MRJ in 2018). The use of evidence-based practices and interventions during labour and childbirth in the MRJ was much higher than on the Southeast NB subsample. A study evaluating maternity hospitals that were part of the RC project in 2017 observed that evidence-based practices were still below the recommended level in the Southeast region. Only 60.7% of patients used non-pharmacological methods for pain relief and only 49.7% could eat during labor²³. Despite these figures surpass those seen in the NB study subsample, the MRJ rates were higher than the ones ob-

Table 2. Type of birth, labour characteristics and intrapartum care variables in NB and MRJ samples.

	Low-risk women (RH)					High-risk women (AR)				
	NB		MRJ		p-value ^a	NB		MRJ		p-value ^a
	n	%	n	%		n	%	n	%	
Type of birth	[5,842]	[100.0]	[1,895]	[100.0]		[2,029]	[100.0]	[557]	[100.0]	
Vaginal birth	3,810	65.2	1,460	77.1	<0.001	698	34.4	262	47.0	<0.001
Intrapartum caesarean or with attempted induction	665	11.4	251	13.2		998	49.2	111	19.9	
Caesarean without labour or attempted induction	1,367	23.4	184	9.7		334	16.4	184	33.1	
Labour onset	[5,842]	[100.0]	[1,895]	[100.0]		[2,029]	[100.0]	[557]	[100.0]	
Spontaneous	3,407	58.3	1,503	79.3	<0.001	657	32.4	199	35.7	<0.001
Successfully or unsuccessfully induced	1,068	18.3	208	11.0		374	18.5	174	31.2	
Without labour and induction	1,367	23.4	184	9.7		998	49.2	184	33.1	
Management during labour on the hospital	[4,111]	[100.0]	[1,630]	[100.0]		[890]	[100.0]	[321]	[100.0]	
Companion during labour	2,150	52.3	1,597	97.9	<0.001	396	44.5	310	96.6	<0.001
Care provided by nurse/nurse midwife	1,678	40.8	946	58.0	<0.001	342	38.4	36	11.2	<0.001
Complete partograph on medical records	2,810	68.4	1,114	68.3	0.987	579	65.1	174	54.2	0.001
Use of non-pharmacological methods for pain relief	1,632	39.7	1,161	71.2	<0.001	332	37.3	166	51.7	<0.001
Allowed to eat or drink	1,620	39.4	1,495	97.2	<0.001	346	38.9	284	88.5	<0.001
Use of peripheral intravenous catheter	2,872	69.9	417	25.6	<0.001	641	72.0	158	49.2	<0.001
Analgesia	312	7.6	87	5.3	<0.001	77	8.7	22	6.9	0.009
Use of synthetic oxytocin	2,261	55.0	354	21.7	<0.001	469	52.7	103	32.1	<0.001
Amniotomy	1,613	53.8	151	19.0	<0.001	351	51.5	46	21.4	<0.001
Management of vaginal birth	[3,800]	[100.0]	[1,460]	[100.0]		[698]	[100.0]	[262]	[100.0]	
Companion during birth	1,669	43.9	1,424	97.3	<0.001	310	44.4	249	95.0	<0.001
Assisted by nurse/nurse midwife	900	23.7	801	54.8	<0.001	178	25.5	20	7.6	<0.001
Vertical or lateral position	105	2.8	393	26.9	<0.001	21	3.0	21	8.0	0.007
Episiotomy	2,077	54.7	48	3.3	<0.001	362	51.9	10	3.8	<0.001
Use of vacuum extractor/forceps	179	4.7	50	3.4	0.040	26	3.7	11	4.2	0.730

^aChi-square test.

Source: Authors.

served in such study examining the impact of the RC program (71.2% and 91.7%, respectively).

A Brazilian federal law guarantees the presence of a chosen companion during labour and birth since 2005²⁴. Nearly all patients in the MRJ had the presence of a labour companionship, regardless of pregnancy risk. This demonstrates the consolidation of this legal right in comparison to

what was observed at the time of the NB survey (52.3%) and even in comparison to a more recent period (86.2% of companions during birth in the Southeast region in 2017)²³. Continuous support by a labour companionship is associated to a lower number of interventions during labour and birth, as well as lower caesarean section rates²⁴⁻²⁶, which may at least partially explain the

Table 3. Type of birth, labour characteristics and intrapartum care variables according to maternal risk at MRJ.

	MRJ low-risk	MRJ high-risk	p-value ^a
	(n=1,895)	(n=558)	
	%	%	
Type of birth			
Vaginal birth	77.2	47.0	<0.001
Intrapartum caesarean section or with attempted induction	13.1	19.0	
Caesarean section without labour or attempted induction	9.7	33.0	
Labour onset			
Spontaneous	79.3	35.7	<0.001
Induced with or without success	11.0	31.2	
No labour nor attempted induction	9.7	33.0	
Management during labour in the hospital			
Companion during labour	97.9	96.6	0.107
Care provided by nurse/nurse midwife	58.0	11.2	<0.001
Complete partograph in medical records	68.3	54.2	<0.001
Use of non-pharmacological methods for pain relief	71.2	51.7	<0.001
Allowed to eat or drink	97.2	89.9	<0.001
Use of peripheral venous catheter	25.6	49.4	<0.001
Use of synthetic oxytocin	21.7	32.2	<0.001
Amniotomy	19.0	21.4	0.251
Vaginal birth management			
Had a companion during vaginal birth	97.3	94.7	<0.001
Assisted by nurse/nurse midwife	54.8	7.6	<0.001
Analgesia	3.6	5.7	0.074
Labour position			
Vertical or lateral decubitus	26.9	8.0	<0.001
Semi-vertical	72.6	90.8	
Dorsal or lithotomic decubitus	0.5	1.2	
Episiotomy	3.3	3.8	0.386
Use of vacuum extractor/forceps	3.4	4.2	0.100

^aChi-square test.

Source: Authors.

lower percentages of interventions at MRJ. Furthermore, the MRJ infrastructure has individual labour, birth and postpartum rooms, where the woman can stay since active labour till the immediate postpartum period, providing a private environment for women and their labour companions²⁷.

The study also observed lower rates of synthetic oxytocin use among low-risk patients at MRJ (21.7%) in comparison with NB (55%). This difference persists even among high-risk patients at MRJ (32.2%). We also noticed lower use of amniotomies in low-risk and high-risk women. These differences seem to represent a paradigm shift in childbirth care, reflecting both the prioritization of childbirth as a physiological event according to RC guidelines and the recent changes in recommendations for the diagnosis of

intrapartum dystocias²⁸, after new studies have evidenced that normal labour progress is slower than perceived in the past^{27,29}.

The use of labour analgesia, despite current recommendations of use upon patients' request²⁷, was lower at MRJ among average and high-risk patients. The percentage of analgesia for all groups in both MRJ and NB was below 10%. The reduced frequency of labour analgesia in this setting could be attributed to the higher frequency of labour companionship and intrapartum care provided by nurse midwives (both associated with lower rates of epidurals^{18,26}), as well as increased use of non-pharmacological pain relief methods. However, it is not possible to rule out that barriers to access labour analgesia may also play a role. Previous studies indicated fear of labour pain as one of the contributing

Table 4. Distribution and rate of caesareans by Robson groups among low-risk women in NB and MRJ samples.

	NB					MRJ				
	All	%	CS	%	95%CIa	All	%	CS	%	95%CIa
All groups	5,842	100.0	2,032	34.8	31.1-38.7	1,895	100.0	435	23.0	20.8-25.2
1 - Nulliparous, single cephalic pregnancy, ≥37 weeks, spontaneous labour	1,280	21.9	138	10.8	7.7-14.8	698	36.8	93	13.3	11.0-16.0
2 - Nulliparous, single cephalic pregnancy, ≥37 weeks, induced labour or CS before labour	998	17.1	627	62.9	53.2-71.5	170	9.0	102	60.0	52.5-67.1
2a - Nulliparous, single cephalic pregnancy, ≥37 weeks, induced labour	577	9.9	206	35.7	27.1-45.5	108	5.7	40	37.0	28.5-46.5
3 - Multiparous, without previous CS, single cephalic pregnancy, ≥37 weeks, spontaneous labour	1,460	25.0	41	2.8	1.7-4.7	489	25.8	9	1.8	1.0-3.5
4 - Multiparous, without previous CS, single cephalic pregnancy, ≥37 weeks, induced labour or CS before labour	381	6.5	133	34.9	27.2-43.6	78	4.1	33	42.3	25.7-60.7
4a - Multiparous, without previous CS, single cephalic pregnancy, ≥37 weeks, induced labour	277	4.7	29	10.5	7.0-15.4	50	2.6	5	10.0	4.0-22.7
5 - Previous CS, single cephalic pregnancy, ≥37 weeks	1,060	18.2	785	74.0	67.8-79.5	272	14.4	134	49.3	42.3-56.3
8 - All multiple pregnancies, including previous CS	47	0.8	35	73.7	56.2-87.0	22	1.2	16	72.7	49.5-87.3
10 - All single cephalic pregnancies, ≤36 weeks, including previous CS	432	7.4	102	23.6	17.1-32.0	108	5.7	2	1.9	0.5-7.2
6, 7 and 9 - All single non-cephalic pregnancies	183	3.1	171	93.4	89.5-96.9	58	3.1	46	79.3	65.9-89.2

^aChi-square test.

Source: Authors.

factors for the choice of give birth by caesarean sections^{30,31}. In this sense, greater publicization of pharmacological analgesia and improved access to this technology when needed could encourage the choice of vaginal birth by pregnant women.

Another relevant difference was noticed on episiotomy rates. Among women who gave birth vaginally at MRJ, 3.3% were subjected to episiotomy, opposed to 50% in NB. Routine episiotomies are associated with more severe complications such as haemorrhage, increased risk of 3rd and 4th degree perineal tears, as well as increased postpartum pain³². Even though recommendations to avoid routine episiotomies are prior to the NB survey, at that time more than 50% of women had such intervention. In 2017, there was a decrease to 31% in an analysis of RC maternity hospitals²³, but still much higher than the rate seen at MRJ in 2018. It is important to note

that there is no difference in episiotomies among high-risk women (whose births are attended by doctors in more than 90% of cases) and low-risk women, showing that there is good adherence by the MRJ clinical staff to the restrictive episiotomy policy regardless of obstetric risk status and birth attendant.

This comparative analysis showed that at MRJ 58% and 55% of low-risk women received care during first and second stage, respectively, by a nurse midwife. These percentages were higher than those found in the NB survey. Previous studies have shown lower rates of interventions during labour when care is provided by non-physician providers^{14,18,19,33}, which potentially explains the lower use of interventions and more frequent use of evidence-based practices on low-risk women (primarily attended by nurse midwives). However, among high-risk wom-

Table 5. Distribution and rate of caesareans by Robson groups among high-risk women in the NB and MRJ samples.

	NB					MRJ				
	All	%	CS	%	95%CI*	All	%	CS	%	95%CI*
All groups	2,029	100.0	1,331	65.6	60.4-70.4	557	100.0	295	53.0	48.2-57.7
1 - Nulliparous, single cephalic pregnancy, ≥37 weeks, spontaneous labour	214	10.5	88	41.1	32.4-51.7	67	12.0	14	20.9	12.8-32.2
2 - Nulliparous, single cephalic pregnancy, ≥37 weeks, induced labour or CS before labour	430	21.2	359	83.5	77.2-88.3	115	20.6	72	62.6	53.4-71.0
2a - Nulliparous, single cephalic pregnancy, ≥37 weeks, induced labour	159	7.8	88	55.3	43.5-66.9	81	14,5	38	46.9	36.3-57.8
3 - Multiparous, without previous CS, single cephalic pregnancy, ≥37 weeks, spontaneous labour	272	13.4	28	10.3	6.2-17.0	66	11.8	5	7.6	3.1-17.2
4 - Multiparous, without previous CS, single cephalic pregnancy, ≥37 weeks, induced labour or CS before labour	219	10.8	129	58.9	48.8-68.0	70	12.6	24	34.3	20.5-50.6
4a - Multiparous, without previous CS, single cephalic pregnancy, ≥37 weeks, induced labour	118	5.8	28	23.7	16.6-32.7	55	9,9	9	16.4	6.0-36.7
5 - Previous CS, single cephalic pregnancy, ≥37 weeks	462	22.8	397	85.9	80.7-89.7	127	22,8	109	85.8	78.3-91.0
8 - All multiple pregnancies, including previous CS	21	1.0	21	100,0	-	11	2.0	8	72.7	41.4-91.0
10 - All single cephalic pregnancies, ≤36 weeks, including previous CS	308	15.2	216	70,1	59.2-79.2	81	14.5	47	58.0	46.2-69.6
6, 7 e 9 - All single non-cephalic pregnancies	103	5.1	93	90.3	76.4-96.7	21	3,8	16	76.2	47.8-93.3

*Chi-square test.

Source: Authors.

en, only 11% and 7.6% were assisted by nurses during first and second stage of labour at MRJ, numbers even lower than those found in NB, and the differences in the use of evidence-based practices and interventions remained the same. These results indicate that at MRJ the use of evidence-based practices and interventions is not only linked to the provider attending labour or birth, but the model of care implemented in the institution.

The MRJ CM of care is characterized by woman-centred, integrated interdisciplinary work shared between both obstetricians and nurse midwives. This model creates a favourable setting for transformation of the relationships between different birth attendants and clinical practices, resulting in a low number of interventions, lower rates of caesarean sections and higher use of evidence-based practices. The CM builds standards for clinical practice across provider teams by establishing evidence-based protocols^{16,17}.

The analysis of the distribution of low-risk women according to Robson groups reflects the care model implemented at MRJ, and the differences in relation to the NB survey. Nulliparous women with term pregnancies and cephalic presentation (Robson groups 1 and 2) accounted for 39% of the obstetric population in NB and were almost equally divided between groups 1 and 2. At MRJ, this percentage amounts to 46% of women, and group 1 is four times larger than group 2. The higher prevalence of group 1 to the detriment of group 2 reflects the lower use of early elective birth, either by induction of labour or pre-labour caesarean section.

The percentages of caesarean sections in groups 1, 2, 3, 4 and 8 among low-risk women at MRJ are similar to those of NB. However, we shall highlight the difference noticed in group 5, comprised of women with full-term pregnancies, cephalic presentation and at least one previous caesarean section. Over the years, there has been

an increase in the contribution of group 5 to the caesarean section rates in Brazil and worldwide^{3,34}. With the increase in caesarean rates globally, the number of women undergoing this surgery becomes more prevalent, increasing the susceptibility to repeating this mode of birth in future pregnancies³⁴. Within this group, we can notice a caesarean section rate of less than 50% at MRJ, much lower than the rates found in NB (74%). Even if we added high-risk women, the percentage of caesarean sections within group 5 at MRJ would still be 60.9%, i.e., lower than the rates for low-risk women in NB, and similar to the 61% rate seen in France (where overall caesarean section rate is 20%)³⁵. These results reflect a higher incentive to vaginal birth after caesarean section at MRJ.

Another fact that draws our attention is the difference in the percentage of caesarean sections in low-risk women within group 10, which includes pregnancies of cephalic preterm infants. In NB, the c-section rate for this group was 23%, while 2.9% at MRJ. This difference can be attributed to the higher percentage of spontaneous premature births at MRJ. However, the MRJ population has a higher level of education than that of NB and since spontaneous prematurity is related to social vulnerabilities, the reverse would be expected to occur³⁶⁻³⁸. Therefore, it is possible that this difference reflects different clinical practices towards women with preterm babies presenting at NB hospitals, such as greater use of labour induction for premature rupture of membranes or even pre-labour caesarean sections.

Concerning high-risk women, differences in c-section rates occurred in groups 1 and 2, where the rate of caesarean sections in group 1 at MRJ was half the rate on NB. In addition, in term pregnancies without labour at admission (groups 2 and 4), there was a higher frequency of labour induction in lieu of elective caesarean sections at MRJ. This data may be associated with well-established protocols for terminating pregnancies in patients with comorbidities, but clinically stable to allow labour induction³⁹.

One of the limitations of the study was the time difference (7 years) between data collection periods. Obstetric care in the country has changed over time. In most recent studies, we noticed a reduction of inequities of childbirth care with greater use of evidence-based practices and a reduction in the number of interventions⁴⁰. However, the large time gap between the samples allowed us to identify a change in the obstetric and sociodemographic profile of wom-

en, through the increase in education and higher proportion of primiparous women in 2018. These changes were also seen in cohort studies carried out in the South region of the country, showing an increased number of deliveries in primiparous women and a longer interval between pregnancies. These findings were significant regardless of skin colour and social class, with more robust differences between white women and higher family income⁴¹. Nevertheless, the caesarean section rates in the country barely changed in the period. In 2011, the year when the data collection for the NB study began, the overall caesarean sections rate in the Southeast region was 59.4%, while 58.4% in 2018⁴. Leal *et al.*²³ also did not show any relevant change in the caesarean section rates among publicly funded childbirths in the Southeast region between the NB survey and the *Rede Cegonha* assessment in 2017 (42.6% and 40.6%, respectively).

Our findings reinforce the feasibility of implementing collaborative models of care between midwives and obstetricians and their potential to improve care provided during labour and childbirth.

Collaborations

L Zaiden and M Nakamura-Pereira contributed to conceptualization, data acquisition, analysis, interpretation, writing the first draft of the manuscript and preparation of the final version. MAM Gomes contributed to conceptualization, analysis, and critical revision of the manuscript. AP Esteves-Pereira contributed to data curation; statistical analysis and writing the first draft of the manuscript. CP Matos and LA Barros contributed to data acquisition and critical revision of the manuscript. MLS Takemoto contributed to interpretation of data and preparation of the final version of the manuscript. MC Leal contributed to conceptualization, funding acquisition, and critical revision of the manuscript. All authors approved the final version.

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