

A Quality Improvement Initiative to Increase the Frequency of Vaginal Delivery in Brazilian Hospitals

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OBJECTIVE: To evaluate a quality improvement (QI) initiative designed to increase the frequency of vaginal delivery in Brazilian hospitals.

METHODS: Twenty-eight hospitals enrolled in a 20-month (May 2015–December 2016) Breakthrough Series Collaborative that used QI methods to increase implementation of obstetric approaches with potential to increase the frequency of vaginal delivery. All hospitals contributed qualitative data

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for iterative redesign. Thirteen intervention hospitals with complete data contributed to an analysis of changes in vaginal delivery in a targeted population over time. Hospitals from the São Paulo region (five intervention and eight non-intervention) contributed to a comparator analysis of changes in vaginal delivery for all deliveries over time.

INTERVENTION: Most hospitals targeted low-risk pregnancies in primiparous women, delivered by hospital-employed obstetricians or admitted through emergency departments, and some included all pregnant women. The collaborative tested four interventions to increase vaginal delivery: 1) coalition building of stakeholders with the common purpose of ensuring “appropriate delivery,” 2) empowering pregnant women to choose their preferred mode of delivery, 3) implementation of new care models favoring physiologic birth, and 4) improved information systems for continuous learning by health care providers.

RESULTS: For 119,378 targeted deliveries (36% of all deliveries) in 13 intervention hospitals, vaginal delivery increased from 21.5% in 2014 to 34.8% in 2016, a relative increase of 1.62 (95% CI 1.27–2.07, $P<0.001$). In the comparator analysis, vaginal delivery for all deliveries in the five São Paulo intervention hospitals increased from 16.1% to 23% (RI 1.43, $P<0.001$) and from 11.0% to 13.0% (relative rate ratio 1.18, $P<0.001$) in the eight nonintervention São Paulo hospitals. The relative increase in vaginal delivery between the São Paulo intervention and nonintervention groups was 1.21 (95% CI 1.05–1.41, $P=.01$). The rate of maternal adverse events and neonatal intensive care unit admissions for newborns who weighed at least 2,500 g did not differ significantly during the observation period.

CONCLUSIONS: Key interventions implemented with QI methods were associated with increased vaginal delivery. This approach may help address the global cesarean delivery epidemic.

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In 2016, Brazil had the highest cesarean delivery in the world, with 30–40% of public sector and 80–90% of private sector births by cesarean delivery, even though a 2014 study found 70–80% of Brazilian women delivering in the private sector prefer a vaginal delivery.¹ In Brazil, few hospitals use risk stratification, a well-documented strategy to reduce unnecessary cesarean delivery,² and many women are scheduled for elective cesarean delivery at times driven by convenience. Little attention is given to the resources, ambience, and approaches that can accommodate the longer timeframe of physiologic or augmented labor.³ A theoretical-conceptual framework by Torres⁴ proposed four principle contributors to excess caesarean delivery in the Brazilian private sector: 1) medical convenience, 2) autonomous obstetric practice, 3) a “maternity hotel” model of obstetric care, and 4) medicalization of childbirth.

Although quality improvement (QI) methods have been successfully used in the United States for cesarean delivery reduction,^{5–7} they have not been widely deployed in middle-income countries where the world’s highest cesarean delivery rates are found.^{8,9} Using a QI collaborative model,¹⁰ we tested four drivers of increased vaginal delivery 1) coalition-building of stakeholders with the common purpose of ensuring “appropriate delivery,” 2) empowering pregnant women to choose their preferred mode of delivery, 3) implementation of new care models favoring physiologic birth, and 4) improved information systems for continuous learning by health care providers. We hoped to increase the frequency of vaginal delivery in 28 Brazilian hospitals by 100% over 20-months (May 2015–December 2016) while not increasing perinatal risks.

METHODS

Our initiative to increase vaginal delivery followed efforts by the Brazilian public prosecutor to sue the private sector for lack of response to the high cesarean delivery rates,¹¹ and two successful small scale prototypes: one that demonstrated the effectiveness of a “baby-friendly” model of obstetric care¹² and a QI intervention that resulted in increased vaginal delivery.¹³ In December 2014, a call was issued to Brazil’s approximately 5,500 active maternities (1,848 private and the remainder public) for up to 28 hospitals (based on available project resources) to participate in Project Parto Adequarto (Project Appropriate Birth) Collaborative if they met the following criteria: more than 500 births per year, commitment to include at least 30% of all deliveries in the intervention, cesarean delivery rate greater than 75%, and a Patient Safety Committee established according to Ministry

of Health recommendations. In private hospitals, obstetric care was delivered by a mix of staff obstetricians and independent obstetricians paid on a fee-for-service basis. For private hospitals, eligibility also included subscription to insurance schemes that supported this initiative, and allocation of less than 50% of the beds to the public sector. In public hospitals, care was delivered by a mix of midwives and obstetricians employed by the hospitals. In both settings, anesthesiologists provide epidural analgesia if requested by women in labor. To better understand how the intervention needed to be adapted in a variety of hospital contexts, facilities were selected to represent all five geographic regions of Brazil.

Forty hospitals indicated interest in joining Project Parto Adequarto. Of these 28 hospitals (24 private and four public), selected on the basis of best fit with the eligibility criteria, participated in the full initiative of learning sessions, data sharing, learning network participation, and QI coaching (“Intensive hospitals”). The 12 applicant hospitals that were not selected were invited to participate in learning sessions and data sharing but did not receive QI coaching (“Follower hospitals”). Three hospitals familiar with QI methods participated in learning sessions as expert mentors, but their data were not included in the analysis (“Mentor hospitals”) (Fig. 1).

To account for secular trends in the rate of vaginal delivery, Project Parto Adequarto retrospectively identified a comparison group of eight hospitals in São Paulo that were similar to the five São Paulo intervention hospitals with respect to size, population characteristics, resources, insurance coverage, and health care provider mix, but had not applied to join Project Parto Adequarto (“Comparator hospitals”). We obtained vaginal delivery rates for these eight hospitals from the Ministry of Health. Unlike for intervention hospitals, we were unable to risk-stratify deliveries in the Comparator hospitals. Therefore, we could compare trends only in overall vaginal delivery rates at these hospitals, as opposed to trends in only low risk vaginal deliveries.

Based on close consultation with the hospitals during the set-up phase, Project Parto Adequarto hospitals targeted one of six defined subpopulations for the intervention: 1) all pregnant women in labor admitted through the emergency department (9,907 deliveries), 2) pregnant women in labor classified Robson 1–4¹⁴ (14,660 deliveries), 3) pregnant women in labor classified Robson 1–5 (937 deliveries), 4) all pregnant women in labor assisted by obstetricians on shift (7,709 deliveries), 5) all primiparous women in labor (8,934 deliveries), and 6) nonselected pregnant women presenting in labor (8,934 deliveries).

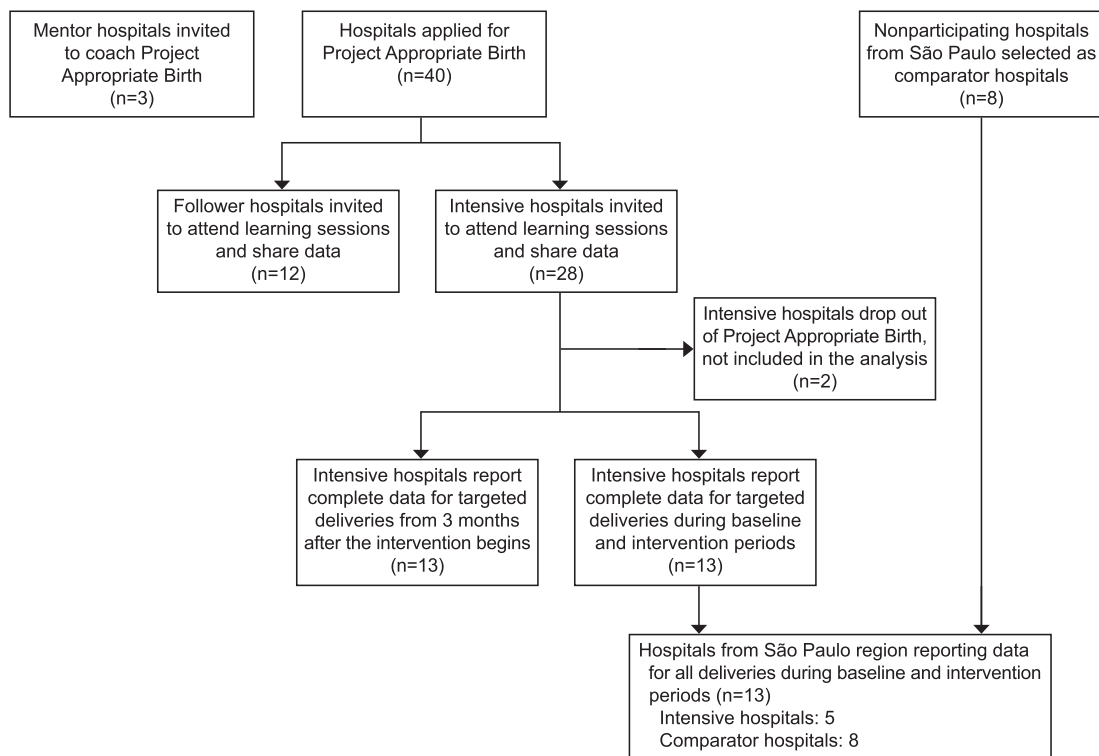


Fig. 1. Selection and participation of hospitals in Project Appropriate Birth. *Borem. Quality Improvement for Cesarean Delivery in Brazil. Obstet Gynecol 2020.*

Project Parto Adequarto organized improvement activities around four specific drivers of increased vaginal delivery:

- 1) A coalition of stakeholders with the common purpose of ensuring appropriate delivery (hospital leadership commitment to create an environment that is visibly supportive of vaginal delivery, building hospital leadership understanding and competence in using QI methods, new payer models to support vaginal delivery).
- 2) Empowerment of pregnant women to choose their preferred mode of delivery (shared decision making, a policy to respect birthing plans, support for birth companions, provision of prenatal information to women on delivery options).
- 3) New care models favoring physiologic birth (working in teams that include midwives, rooms that support physiologic birth, midwife-assisted low-risk deliveries, following best practices for low-risk birth, use of Robson classification to identify low-risk birth). Using a simulation laboratory, Sociedade Beneficente Israelita Brasileira Albert Einstein–trained 480 health professionals from all 43 Intensive and Follower hospitals on assisting vaginal birth. Between August 2015 and July 2016, two separate 2-day training sessions

were provided each week to groups of about 10 professionals from each hospital.

- 4) Information systems for continuous learning by health care providers (real time measurement systems for cesarean delivery, walk rounds using organizational learning boards).

These drivers were derived from scientific literature; previous experience with improving the percentage of vaginal deliveries in Brazil^{12,15}; the collective experience and knowledge of an expert group of clinicians, administrators, insurers, pregnant women, and mothers who were assembled at the start of the initiative; and global systematic reviews led by the World Health Organization.^{16,17}

This initial set of drivers formed the organizing framework for ideas for improvement (see Appendix 1, available online at <http://links.lww.com/AOG/B660>) generated by the teams; ideas were added, modified, or eliminated as they were tested by hospital QI teams for effectiveness. Implicit within the drivers were a number of socio-adaptive change features, including hospital leadership being encouraged to visibly and actively support the Project Parto Adequarto initiative through active participation in daily huddles and walk rounds. In the context of the Brazilian doctor-led model of care, physicians were encouraged to work more

collaboratively with pregnant women, nursing staff, midwives, and doulas during labor. In addition, hospital staff were encouraged to codesign labor and care plans with pregnant women and families, and to design antenatal sessions to empower women to contribute more to decisions made during pregnancy and labor.

Implementation was designed with national scale up of interventions to promote vaginal delivery in mind, following the phased scale-up approach outlined in the Institute for Healthcare Improvement Scale-Up Framework.¹⁸ In this Framework, the Project Parto Adequarto phase of the project was an initial test of scale-up to further develop the changes and tools in new contexts, to validate the findings of the earlier prototype study,¹³ and build will at multiple levels of the Brazilian health system to undertake the next phases of the national scale up.

Project Parto Adequarto started in December 2014 with the selection of the Intensive, Follower, and Mentor groups. From January to April 2015 (set-up period), Intensive and Follower hospitals were asked to retrospectively collect data on vaginal delivery from January to December 2014 (baseline period), and prospectively collect vaginal delivery data from January 2015 onward. They were given information about the intervention and asked to form QI teams. The first learning session took place in May 2015, and Project Parto Adequarto ended in December 2016 (intervention period).

The Breakthrough Series Collaborative approach,¹⁰ applied during the intervention period to the 28 Intensive hospitals, included a 3-day learning session in May 2015; 2-day learning sessions in August 2015, October 2015, and March 2016; and a 1-day learning session in November 2016. These sessions gathered teams from participating hospitals to receive basic training on QI methods, design initial tests of change to increase vaginal delivery, and share experiences of successes and challenges in implementing the changes. Teams typically included a representative of executive leadership, an obstetrician, and an obstetric nurse. Some teams included a patient representative. During the action periods between the learning sessions, teams were coached to work with other clinicians engaged in obstetric care at their sites to test and implement changes using plan-do-study-act cycles.¹³ Teams reported data on their activities and outcomes into a database shared among all teams as site-based, aggregated, de-identified data.

Project Parto Adequarto was supported by three levels of leadership: 1) the steering committee, comprising members from the Agencia Nacional de Saude Suplementar, the Sociedade Beneficente Israelita

Brasileira Albert Einstein, the Ministry of Health, and the Institute for Healthcare Improvement, met quarterly to review project progress and guided the work through iterative changes in project implementation design (eg, emphasis on low-risk women, duration of action periods); 2) the operations team (the Sociedade Beneficente Israelita Brasileira Albert Einstein and the Institute for Healthcare Improvement) coordinated activities, conducted learning sessions, provided virtual coaching and feedback, supported clinical training (simulation sessions), hosted meetings with local, regional, and national stakeholders, conducted site visits, and was responsible for dissemination of project progress; and 3) hospital QI teams were expected to include, at a minimum, a senior manager to remove obstacles and barriers (eg, resources, local policies), clinical experts (obstetricians and nurses or midwives), and patient representatives. Teams were expected to meet regularly to plan and execute plan-do-study-act cycles and share their data on the Collaborative's electronic platform. A few teams included a patient representative.

Project Parto Adequarto used an observational comparative longitudinal study to assess changes in patient outcomes, including mode of delivery over time, before and after the QI initiative in participating hospitals, and in a comparison group of nonparticipating hospitals. Additionally, to update and redesign its implementation strategy, Project Parto Adequarto conducted a survey to seek feedback from participating hospitals on the changes they had found most useful in driving toward appropriate birth.

Although the primary outcome for the Project Parto Adequarto participants was the percentage of vaginal deliveries in the target subpopulations, we also assessed the percentage of vaginal deliveries for all deliveries in a comparative subgroup analysis. Secondary outcomes included the Net Promoter Score, an indicator of the likelihood of patients and families to recommend the institution to friends or colleagues^{19–22} adverse maternal and newborn outcomes, based on the Joint Commission criteria (maternal death, intrapartum or neonatal death with birth weight 2.5 kg or more, uterine rupture, maternal admission to the intensive care unit, birth trauma [neonatal], return to operating room, admission to neonatal intensive care unit (NICU) for neonates with birth weights of 2.5 kg or more for more than 24 hours, Apgar score less than 7 at 5 minutes, blood transfusion, third- or fourth-degree perineal tear)²³; and NICU admission rate for neonates with birth weights of 2.5 kg or more.

The 28 Intensive hospitals were asked to produce monthly data reports (measures described above and

accumulated learning) for the baseline and intervention periods. These reports were discussed during monthly virtual meetings between the Institute for Healthcare Improvement technical support team and the hospital teams. Through a data-reporting platform (IHI Extranet), teams tracked their and other teams' progress on the indicators described. As is common in many QI projects, not all hospitals provided the monthly reports, despite the Project Parto Adequarto project managers' efforts to collect data from the onset of the initiative. Thirteen Intensive hospitals provided data for each of the baseline and intervention months. Within 4 months of the start of the intervention, 26 of the 28 Intensive hospitals were reporting timely, accurate, and complete monthly data. Two nonreporting hospitals were excluded from the analysis (one hospital closed down and the other never reported data). The Follower hospitals provided very few data on the project indicators but did contribute qualitative data for learning. The quantitative analysis is based on data reported by Intensive hospitals.

Two types of analyses were used. We used statistical process control²⁴ methods to explore variation in outcomes over time and, in particular, to explore the effect of key events such as learning sessions and the introduction of specific changes. In addition, we used a Poisson regression (incidence rate ratio and a 95% confidence interval) to estimate the change in the rate of vaginal deliveries in the target population in each hospital in the Intensive group, from the year before the start of Project Parto Adequarto (baseline period: January–December 2014) to the year after the set-up period of Project Parto Adequarto (full implementation period: January–December 2016).

To estimate the change in rate of vaginal deliveries in the Intensive group relative to the comparison group, we used a difference-in-difference approach. We used Poisson regression to compare change in annual percentage of vaginal deliveries for all hospital deliveries in the Intensive and the comparison groups during equivalent baseline and implementation periods.

Twelve months after the start of Project Parto Adequarto, all hospitals in the Intensive, Follower, and Mentor groups were asked to identify the “change ideas” that, in their opinion, had the greatest effect on increasing the percentage of vaginal deliveries. Hospitals were asked to provide anonymous responses to a survey asking 1) what changes had they implemented and 2) in their opinion, what was the strength of those changes in driving optimal mode of delivery (Appendix 2, available online at <http://links.lww.com/AOG/B660>). The responses were summarized

and analyzed by two authors (P.B., A.J.P.) and used to provide an updated Driver Diagram and Change Package.

Institutional review board approval was not sought because this was a QI project within maternal and newborn programs in public and private hospitals, aimed at improving the reliability of existing local, governmental, and World Health Organization protocols. Each hospital received a detailed description of how the data would be used by Project Parto Adequarto and how aggregated individual hospital data would be shared for learning within a private electronic platform. No individual patient data were collected. Data were reported by hospital as de-identified aggregate subpopulation data. Hospital subpopulations that were included in the initiative were identified either by level of risk or by empanelment with type of health care provider (eg, hospital employee or independent contractor).

RESULTS

Of the 28 hospitals in the Intensive group, two hospitals withdrew from the initiative. One hospital closed, and another never activated QI teams or tested implementation changes. Neither hospital submitted data for Project Parto Adequarto.

All hospitals were in medium- to large-sized cities across Brazil (ranging from 147,000–12 million people). In total, 36% of women (84,151 out of 228,612) who delivered in the 26 reporting Intensive hospitals over the 20-month intervention period (May 2015–December 2016) were targeted for improvement during the initiative (Table 1).

During the intervention period, efforts to improve the clinical skills and care models in the participating Intensive hospitals were associated with significant change in care practices and in the delivery environment favorable for vaginal delivery (Table 2).

For 13 Intensive hospitals that provided data reports consistently for the entire baseline and intervention periods, statistical process control analysis detected an increase in vaginal deliveries in the target populations from a baseline of 21.7% in 2014 to 35.5% over the intervention period (Fig. 2). Using Poisson regression, adjusting for clustering at the hospital level, vaginal deliveries increased from an average of 21.5% (95% CI 15.8–29.2%) in 2014 to 34.8% (95% CI 28.9–41.9%) in 2016, a relative increase of 1.62 (95% CI 1.27–2.07, $P < .001$), equivalent to a 62% increase in vaginal deliveries (Table 3). All 26 Intensive hospitals reported monthly data on vaginal delivery from June 2015 onward (4 months after the start of Project Parto Adequarto). Both groups of Intensive

Table 1. Types of Hospital Participants in Project Parto Adequarto

Type of Hospital Participant	No. of Hospitals		No. of Births/Month		Provider Mix (Open:Closed:Mixed)
	n	Private:Public	Mean	Range (Min–Max)	
Intensive: participated in the full PPA collaborative activities, including learning sessions, data sharing, learning network participation, and QI coaching	28	24:4	227	44–853	5:12:11
Follower: participated in the PPA collaborative learning sessions and data sharing but did not receive QI coaching	12	12:0	145	15–580	2:1:9
Mentor: hospitals familiar with QI methods that participated in PPA collaborative learning sessions as expert mentors but did not submit data	3	3:0	79	37–135	0:0:3
Total	43	39:4	194	15–853	7:13:23
Comparative analysis*					
Intensive group: hospitals in São Paulo that participated in the full PPA collaborative activities, including learning sessions, data sharing, learning network participation, and QI coaching.	5	5:0	359	18–740	0:0:5
Comparison group: hospitals located in São Paulo that did not participate in the PPA collaborative activities.	8	8:0	403	57–1,323	0:0:8

Min–Max, minimum–maximum; PPA, Project Parto Adequarto; QI, quality improvement.

* The comparative analysis focused on hospitals in São Paulo. The Intensive group comprised the five hospitals that participated in PPA from São Paulo, and the Comparison group comprised eight hospitals, also from São Paulo, that did not participate in PPA. The Comparison group had similar characteristics to the five Intensive hospitals in São Paulo in terms of size, population characteristics, resources, insurance coverage, and health care provider mix. For the purposes of this comparator analysis, we included all deliveries in intervention and nonintervention hospitals during the study period.

Table 2. Elements of Care Before and After Project Parto Adequarto

Element of Care	Before PPA	After 20 mo of PPA
Place of delivery	Birthing rooms are designed to perform cesarean delivery as needed, without transfer of mother.	Birthing rooms are designed for labor, delivery, and postpartum care, including purpose-built beds for multiposition labor, variable room illumination, equipment to manage pain (eg, large gym balls, warm showers, birthing stools, rocking chairs with head support).
Antenatal classes	Lecture style, delivered by an obstetrician; vaginal birth is rarely addressed.	Interactive, multidisciplinary delivery; vaginal birth is the main subject, and pregnant women are part of the team.
Care team	Obstetricians alone take care of the pregnant woman from prenatal period to postnatal care.	Team includes nurses, personal obstetrician, and obstetricians on duty; the prenatal care obstetrician could be different from the obstetrician or labor ward team who would assist labor and delivery.
Data and a system for learning	Maternity units do not collect and analyze their process and outcome data for deliveries, NICU admission rates, or adverse events.	Most maternity units collect and analyze performance data and take action based on their data (using control and run charts).
Labor management	Pregnant women are instructed to fast and are managed routinely using IV fluids; typically, women deliver alone; nonpharmacologic methods are used to manage pain.	Pregnant women have the option to eat, walk, and have a companion of their choice, and IV fluids are used selectively; hospitals offer practices that support physiologic birth and decrease the need for analgesics (large gym balls, warm showers, birthing stools, rocking chairs with head support).

PPA, Project Parto Adequarto; IV, intravenous.

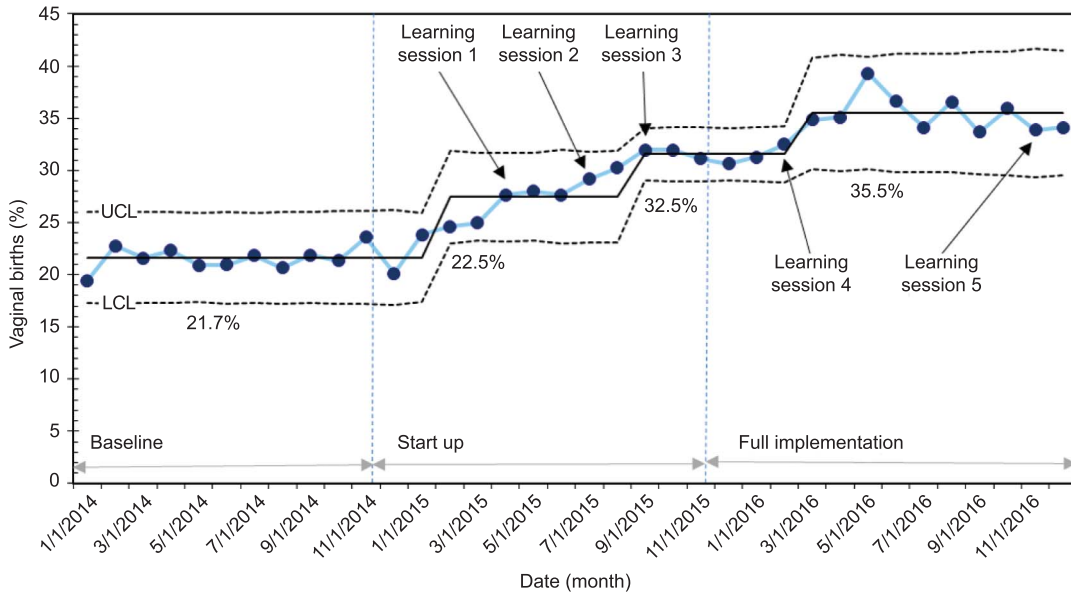


Fig. 2. U-chart of vaginal birth percentages in the target population of 13 hospitals in the Intensive group reporting continuously throughout the baseline, intervention, and follow-up periods. Learning session 1: hospitals introduced to the model for improvement. Hospitals introduced to more than 100 change concepts and ideas (from literature) to increase vaginal births. Hospitals began participation in clinical training for vaginal delivery practices after learning session 1. Learning session 2: hospitals shared their first experiences using the model for improvement. Hospitals introduced to specific concepts and ideas for patient and family engagement. Hospitals practiced “all teach, all learn” for the first time, exchanging experiences in the storyboard walkaround format. Learning session 3: health plans (insurance companies) formally invited to join the collaborative and to support participating hospitals in their transformation. Synthesized learning from testing and narrowed down the change package from more than 100 change concepts to 18 high-effect concepts and corresponding ideas. Learning session 4: hospitals introduced to methods and tools to promote physician engagement in improvement work and behavior change. Learning session 5: celebrated results and motivated hospitals. Selected hospitals shared their success stories on stage. Identified bright spot hospitals to lead subsequent phase. Set the vision for a national campaign in 2020. UCL, upper control limit; LCL, lower control limit.

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hospitals (13 hospitals in the complete reporting group and 13 hospitals in the incomplete reporting group) had similar average rates of vaginal delivery

in June 2015 (30% and 30%), the first month when all 26 hospitals were reporting, and similar average rates of vaginal delivery in 2016 (35% and 37%).

Table 3. Primary Outcome of Vaginal Births in 2014 and 2016 by Intensive and Comparator Groups

	No. of Hospitals	January–December 2014			January–December 2016			RRR (95% CI)	P	Relative Difference Between Intensive and Comparator Group	
		Vaginal Births	All Births	% (95% CI)	Vaginal Births	All Births	% (95% CI)			RRR (95% CI)	P
Target population											
Intensive group	13	3,821	17,811	21.5 (15.8–29.2)	5,608	16,120	34.8 (28.9–41.9)	1.62 (1.27–2.07)	<.001		
Comparative analysis											
Total hospital births											
Intensive group (São Paulo)	5	3,318	20,653	16.1 (12.6–20.4)	4,913	21,382	23.0 (19.9–26.5)	1.43 (1.25–1.64)	<.001	1.21 (1.05–1.41)	.01
Comparison group (São Paulo)	8	4,302	39,084	11.0 (9.3–13.1)	4,879	37,541	13.0 (10.8–15.6)	1.18 (1.09–1.27)	<.001		

RRR, relative rate ratio.

We compared average vaginal delivery rates for all deliveries in the five Intensive hospitals based in São Paulo with eight similar nonparticipating hospitals also in the São Paulo area for 2014 (baseline), 2015 (set-up), and 2016 (full implementation). From statistical process control analysis, vaginal births for all mothers in the Intensive hospitals increased from 15.6% to 23.0% and from 11.0% to 13.0% in the Comparator hospitals (Table 3 and Fig. 3A and B). After accounting for the

small secular increase in Comparator hospitals, Poisson regression detected a relative (difference of differences) increase of about 21% in vaginal births in the Intensive compared with Comparator hospitals (RI 1.21, 1.05–1.41, $P=.01$, Table 3). The small increase in vaginal delivery rates in the Comparator group occurred around the time of the Project Parto Adequato announcement (January 2015), with no further increase over the ensuing 2 years (Fig. 3B).

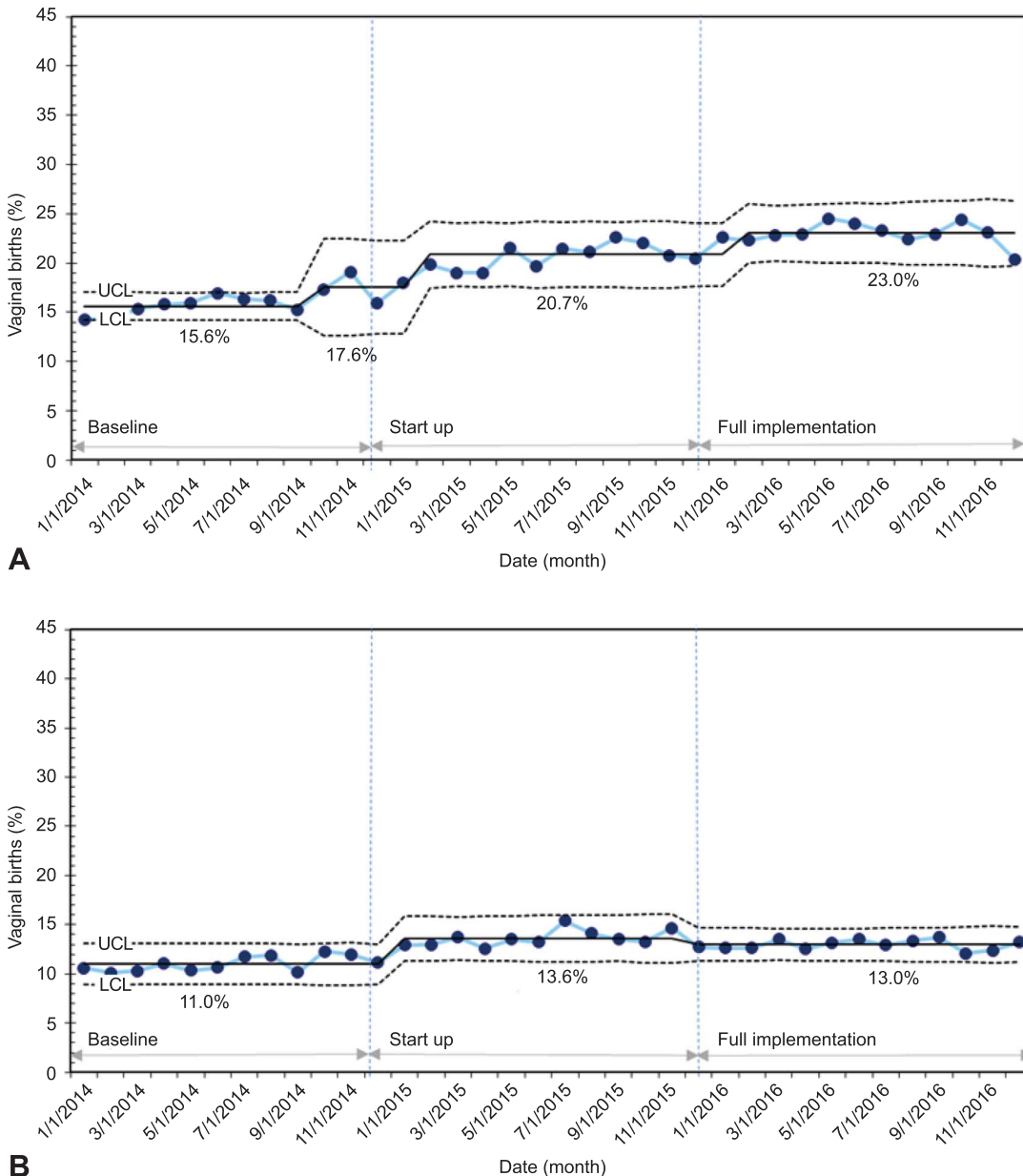


Fig. 3. **A.** U-chart of vaginal birth percentages among total hospital births in five hospitals comprising the Intensive group (São Paulo). **B.** U-chart of vaginal birth percentages among total hospital births in eight hospitals comprising the Comparison group (São Paulo). UCL, upper control limit; LCL, lower control limit.

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Table 4. Neonatal Intensive Care Unit Admissions in 2014 and 2016 for the Intensive Group

	No. of Hospitals	January–December 2014			January–December 2016			RRR (95% CI)	P
		NICU Admissions	Total Hospital Births	% (95% CI)	NICU Admissions	Total Hospital Births	% (95% CI)		
NICU admissions	5	444	12,313	3.6 (2.3–5.7)	540	13,267	4.1 (2.5–6.7)	1.13 (0.91–1.4)	0.27

NICU, neonatal intensive care unit; RRR, relative rate ratio.

For assessment of the association of vaginal delivery rates with secondary outcomes, complete data were available in a small number of hospitals in the Intensive group from January 2015 to December 2016. Although vaginal delivery increased significantly in all of the hospitals included in this secondary analysis, NICU admission rates, adverse events, and Net Promoter Score showed no change in reported values (Tables 4–6).

We received 32 responses from 40 hospitals surveyed for feedback on the percentage of hospitals implementing the different changes and the perceived value (strength) of the change ideas presented in the Driver Diagram/Change Package (Appendix 2, available online at <http://links.lww.com/AOG/B660>). Based on the results of this survey and the observations of the Project Parto Adequarto team, the theoretical health system drivers of improvement were modified and the effective implementation change ideas were condensed to reflect the change ideas that were considered most closely linked to the improvement in performance.

DISCUSSION

Hospital participation in a Brazilian QI learning collaborative was associated with a 62% increase in vaginal delivery over 20 months without change in harm. The increase in vaginal delivery was linked to changes associated with four drivers of vaginal delivery: a broad coalition, a vaginal delivery-centered care model, engaging women in decision-making, and a learning environment for change. Two observations suggests a plausible association²⁵

between the Project Parto Adequarto interventions and the observed changes in vaginal delivery: linkage of process changes with significant increases in vaginal delivery, and minimal change in vaginal delivery in eight nonintervention private hospitals in São Paulo.

As with other QI initiatives, some intervention hospitals initially struggled to establish systems for regular data reporting. Only hospitals reporting complete data for all phases of Project Parto Adequarto (including baseline) were included in the quantitative analysis. The failure of Follower hospitals to engage in Project Parto Adequarto and report their results points to the importance of site-based coaching in QI collaboratives.

We incorporated evidence-based changes known to be associated with decreased cesarean delivery frequency in our theory of change and provided clinical training, because confidence of health care providers in supporting vaginal delivery is reportedly a barrier to reducing cesarean delivery.¹⁷ A Cochrane review identified studies that had a small effect in reducing cesarean delivery rates using strategies to promote guideline enforcement.²⁶ In small-scale studies, use of Robson classification to identify low-risk women was linked to a decrease in cesarean delivery.^{4,14,27}

QI approaches have been associated, with modest results, in decreased cesarean delivery rates in the United States.^{5,28,29} Using QI collaboratives, Main et al⁷ recently reported a decrease in cesarean delivery (29–25%) with no difference in safety measures for low-risk women in 56 hospitals in California. Project Parto Adequarto included three of the interventions used in the California Collaborative (no elective cesarean delivery before 39 weeks of gestation, feedback to

Table 5. Adverse Events in 2015 and 2016 for the Intensive Group

	No. of Hospitals	July–December 2015			July–December 2016			Incidence Rate Ratio (95% CI)	P
		Adverse Events	Total Hospital Births	Rate/1,000 Live Births (95% CI)	Adverse Events	Total Hospital Births	Rate/1,000 Live Births (95% CI)		
Adverse events	5	281	6,435	43.7 (40.5–47.1)	283	5,716	49.5 (40.6–60.3)	1.13 (0.88–1.46)	0.32

Table 6. Net Promoter Score in 2015 and 2016 for the Intensive Group

	No. of Hospitals	July–December 2015		July–December 2016		Incidence Rate Ratio (95% CI)	<i>P</i>
		Responses	Net Promoter Score (95% CI)	Responses	Net Promoter Score (95% CI)		
Net Promoter Score	4	1,606	87.4 (78.4–97.5)	1,863	91.4 (87.4–95.5)	1.05 (0.96–1.13)	0.28

physicians on their rates of cesarean delivery, and use of multidisciplinary teams).

The strengths of our approach include the combination of four theoretical drivers of health system change with evidence-based interventions of vaginal delivery (clinical training, Robson classification, and feedback). Because prenatal care was not part of the intervention, we made least progress with the engagement of women in decision making.

To make changes more acceptable and feasible for the local physicians and organizations, Project Parto Adequarto hospitals had flexibility to decide which low-risk women to target for vaginal delivery. This resulted in variation in the composition of the target populations. As we move into the next phase of the work, we are promoting a common risk-stratification system—the Robson classification—across all hospitals.

The possibility of bias in favor of the 13 hospitals with complete reporting is unlikely given our observation that complete- and incomplete-reporting hospital cohorts had similar average percentages of vaginal deliveries from the time that all hospitals reported (June 2015) to the end of the project. Because we were unable to risk-stratify deliveries in the Comparator hospitals, we could only compare trends in vaginal delivery rates for all (ie, not just low-risk) deliveries for hospitals in this analysis, resulting in low baseline and postintervention vaginal delivery rates for both Comparator and intervention hospitals.

External factors that could have increased vaginal delivery included legal action and activist groups pressurizing private hospitals to change maternity care practice in favor of vaginal delivery. The small change in vaginal delivery in Comparator hospitals, coinciding with the Project Parto Adequarto launch, suggest external political and social factors that prompted the formation of Project Parto Adequarto may, on their own, have transiently increased secular rates of vaginal delivery for all hospitals.

The promising Project Parto Adequarto strategy has important lessons for efforts to reverse the global

rise in cesarean delivery. Use of evidence-based interventions delivered through QI methods and obstetric re-training fostered an environment that allowed obstetricians to change their clinical practice. Although the high baseline cesarean delivery rates in Brazil offered a great opportunity for improvement, the change ideas that emerged from Project Parto Adequarto, adapted to local contexts and supplemented with new ideas using QI methods, are applicable in all countries with excess cesarean delivery rates. Despite rapid progress, the cesarean delivery rate at the end of Project Parto Adequarto remained more than double the average in high-income nations. Change strategies, such as deeper engagement of women in decision making and uniform use of risk criteria are being tested in a much larger group more than 100 hospitals in Brazil, striving toward higher targets (more than 85%) for vaginal delivery in low-risk women, with national scale up of the approach envisioned within the next 2 years.

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