OBSTETRICS

Changes in obstetrical practices and pregnancy outcomes following the ARRIVE trial

Laura C. Gilroy, MD; Huda B. Al-Kouatly, MD; Howard L. Minkoff, MD; Rodney A. McLaren Jr, MD

BACKGROUND: The ARRIVE trial demonstrated the benefit of induction of labor at 39 weeks gestation. Obstetrics departments across the United States faced the challenge of adapting clinical practice in light of these data while managing logistical constraints.

OBJECTIVE: To determine if there were changes in obstetrical practices and perinatal outcomes in the United States after the ARRIVE trial publication.

STUDY DESIGN: This was a population-based retrospective cohort study of low-risk, nulliparous women who initiated prenatal care by 12 weeks gestation with singleton, nonanomalous pregnancies delivering at ≥39 weeks. Data were obtained from the US Natality database. The pre-ARRIVE group were women who delivered between January 1, 2015 and December 31, 2017. The post-ARRIVE group consisted of women who delivered between January 1, 2019 and December 31, 2019. Births that occurred in 2018 were excluded. Practice outcomes were rates of induction of labor, timing of delivery, and cesarean delivery rate. Adverse maternal outcomes were blood transfusion and admission to medical intensive care unit. Adverse neonatal outcomes were need for assisted ventilation (immediate and >6 hours), 5-minute APGAR score <3, neonatal intensive care unit admission, seizures, and surfactant use. Univariate and multivariate analyses were performed. Trends were tested across the time period represented by the pre-ARRIVE group using Cochran—Armitage trend test.

RESULTS: There were 1,966,870 births in the pre-ARRIVE group and 609,322 in the post-ARRIVE group. The groups differed in age, race, body mass index, marital status, infertility treatment, and smoking history ($P<.001$). After adjusting for these differences, the post-ARRIVE group was more likely to undergo induction (36.1% vs 30.2%; adjusted odds ratio, 1.36 [1.36—1.37]) and deliver by 39+6 weeks of pregnancy (42.8% vs 39.9%; adjusted odds ratio, 1.14 [1.14—1.15]). The post-ARRIVE group had a significantly lower rate of cesarean delivery than the pre-ARRIVE group (27.3 % vs 27.9%; adjusted odds ratio, 0.94 [0.93—0.94]). Patients in the post-ARRIVE group were more likely to receive a blood transfusion (0.4% vs 0.3%; adjusted odds ratio, 1.43 [1.36—1.50]) and be admitted to medical intensive care unit (0.09% vs 0.08%; adjusted odds ratio, 1.20 [1.09—1.33]). Neonates in the post-ARRIVE group were more likely to need assisted ventilation at birth (3.5% vs 2.8%; adjusted odds ratio, 1.28 [1.26—1.30]) and >6 hours (0.6% vs 0.5%; adjusted odds ratio, 1.36 [1.31—1.41]). The neonates in the post-ARRIVE group were more likely to have low 5-minute APGAR scores (0.4% vs 0.3%; adjusted odds ratio, 0.91 [0.86—0.95]). Neonatal intensive care unit admission did not differ between the 2 groups (4.9% vs 4.9%; adjusted odds ratio, 1.01 [0.99—1.03]). There were no differences in neonatal seizures (0.04% vs 0.04%; adjusted odds ratio, 0.97 [0.84—1.13]), and surfactant use (0.08% vs 0.07%; adjusted odds ratio, 1.05 [0.94—1.17]) between the 2 groups.

CONCLUSION: There were more inductions of labor, more deliveries at 39 weeks' gestation, and fewer cesarean deliveries in the year after the ARRIVE trial publication. The small but statistically significant increase in some adverse maternal and neonatal outcomes should be explored to determine if they are related with concurrent changes in obstetrical practices.

Key words: ARRIVE trial, cesarean delivery rate, induction of labor, nulliparous, perinatal outcomes, 39 weeks induction

Introduction

Cesarean delivery rates are at or near their historic highs in the United States and other developed nations.[1] Increased rates of cesarean deliveries are accompanied by increased rates of maternal and neonatal morbidities associated with surgical birth.[2] Accordingly, there have been many attempts to reduce the rate of primary cesarean deliveries[3] while optimizing outcomes for mothers and newborns. The main target for these interventions have been low-risk, nulliparous women who would potentially also avoid repeat cesarean deliveries.[4]

Several recent studies have demonstrated the benefits of delivery at 39 weeks in low-risk groups.[5–9] The 2018 ARRIVE (A Randomized Trial of Induction Versus Expectant Management) trial demonstrated that induction of labor at 39 weeks gestation in low-risk, singleton, nulliparous populations led to lower cesarean delivery rates and lower rates of hypertensive disorders in pregnancy.[10] Subsequently, a meta-analysis concluded that induction of labor at 39 weeks was associated with a lower cesarean delivery rate, lower peripartum infection risk, fewer neonatal intensive care unit (NICU) admissions, less respiratory morbidity in newborns, and less perinatal mortality.[11]

These results suggest that low-risk nulliparous patients can or should be offered a scheduled induction at 39 weeks. However, it is not known if and how the findings of the ARRIVE trial have influenced obstetricians and obstetrics departments in the United States or whether there have been associated changes in outcomes for mothers and newborns. Following the trial's open-access publication, both the Society for Maternal-Fetal Medicine and the

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AJOG at a Glance

Why was this study conducted?

This study was conducted to assess the effect of the 2018 ARRIVE (A Randomized Trial of Induction Versus Expectant Management) trial publication on nationwide obstetrical practices and perinatal outcomes.

Key findings

There were significant increases in the rate of labor induction and delivery by 39+6 weeks in the post-ARRIVE group when compared to the pre-ARRIVE group. There were significant decreases in cesarean delivery rates in the post-ARRIVE group. There were small but significant increases in some adverse perinatal outcomes in the post-ARRIVE group.

What does this add to what is known?

This is an early assessment of the effect of ARRIVE on a nationwide scale. The 2019 US Natality database was not publicly available until mid-2021. Therefore, the nationwide birth data used to assess the trends in the year after the ARRIVE trial publication were not known previously.

American College of Obstetricians and Gynecologists acknowledged its findings publicly, telling obstetricians that offering induction of labor at 39 weeks to low-risk nulliparous patients would be "reasonable."[12] We do not know whether the impact of this widely-read study[13,14] was limited to the world of academic medicine or if these concepts permeated into broader healthcare settings. The well described "evidence-to-practice gap" suggests that the path from the publication of recommendations to demonstrable change is not straightforward.[15] The objective of this study was to determine if there was a change in obstetrical practices and perinatal outcomes following the ARRIVE trial publication compared with the 3 years before its publication. We also assessed preexisting trends in those practices and outcomes before the ARRIVE trial publication.

Materials and Methods

We conducted a population-based retrospective cohort study of nulliparous women who initiated prenatal care by 12 weeks gestation with singleton, nonanomalous fetuses and who delivered at 39+0 to 42+6 weeks in the United States. Nulliparity was defined as instances where patients were recorded as being para 0 on birth certificates. Pregnancies complicated by chronic hypertension, gestational hypertension, or pregestational diabetes were excluded, as were data from incomplete birth certificates. Data were obtained using the National Vital Statistics System (NVSS) database. The NVSS is published annually as a summary of birth certificate data submitted by the mandatory birth reporting systems within each state. These deidentified data are publicly available at www.cdc.gov/nchs/nvss since 2021. This study was deemed exempt from institutional review board approval.

The pre-ARRIVE group consisted of women who delivered between January 1, 2015 and December 31, 2017. The post-ARRIVE group consisted of women who delivered between January 1, 2019 and December 31, 2019. Births that occurred in 2018—the year of the ARRIVE trial publication—were excluded to allow time for uptake of results. Demographic data included age, body mass index (BMI), race, marital status, use of assisted reproduction technology, and smoking. The practice outcomes assessed were rates of induction of labor, cesarean delivery, and gestational age at the time of delivery. Adverse maternal outcomes were blood transfusion and admission to the medical intensive care unit (MICU). Adverse neonatal outcomes included immediate assisted ventilation, assisted ventilation for >6 hours, 5-minute APGAR <3, NICU admission, neonatal seizures, and surfactant use. Patients with missing outcome data were excluded.

The Shapiro–Wilk test was used to test the normality of continuous variables. The Student's *t* test or Wilcoxon rank sum test, as appropriate, were performed to compare continuous variables between the groups. Categorical data were analyzed using the chi-squared test. Multivariate logistical regression was used to assess the rate of each of the adverse outcomes, adjusting for the potential confounders including age, BMI, race, marital status, use of infertility treatment, and smoking status. All analyses were performed on STATA 17.0 (StataCorp, College Station, TX).

We also conducted trends analysis using the Cochran–Armitage trends test to assess whether there were significant preexisting trends across the 3 years within the pre-ARRIVE group. To determine whether differences from the pre- to post-ARRIVE trial were a continuation of pre-ARRIVE trends, we created a logistic regression model using the year as a predictor, restricting to 2015–2017. We then applied this model to the full data to see if the predicted probabilities were similar to the actual observed rates. These models were plotted with 95% confidence intervals and compared with the actual data. We would expect that if the trend from pre-ARRIVE held, then actual data should look similar to the predicted data, at least in slope.

Results

There were a total of 15,567,181 births in 2015, 2016, 2017, and 2019 combined. Among those, 2,576,192 (16.5%) births met our inclusion criteria (Figure 1). Of those, 1,966,870 comprised the pre-ARRIVE group and 609,322 comprised the post-ARRIVE group. The most common reasons for exclusion were multiparity and delivery before 39 weeks.

Women in the post-ARRIVE group were older, (27.0±5.6 years vs 27.4±5.6 years; $P<.001$), had a higher BMI (24.1

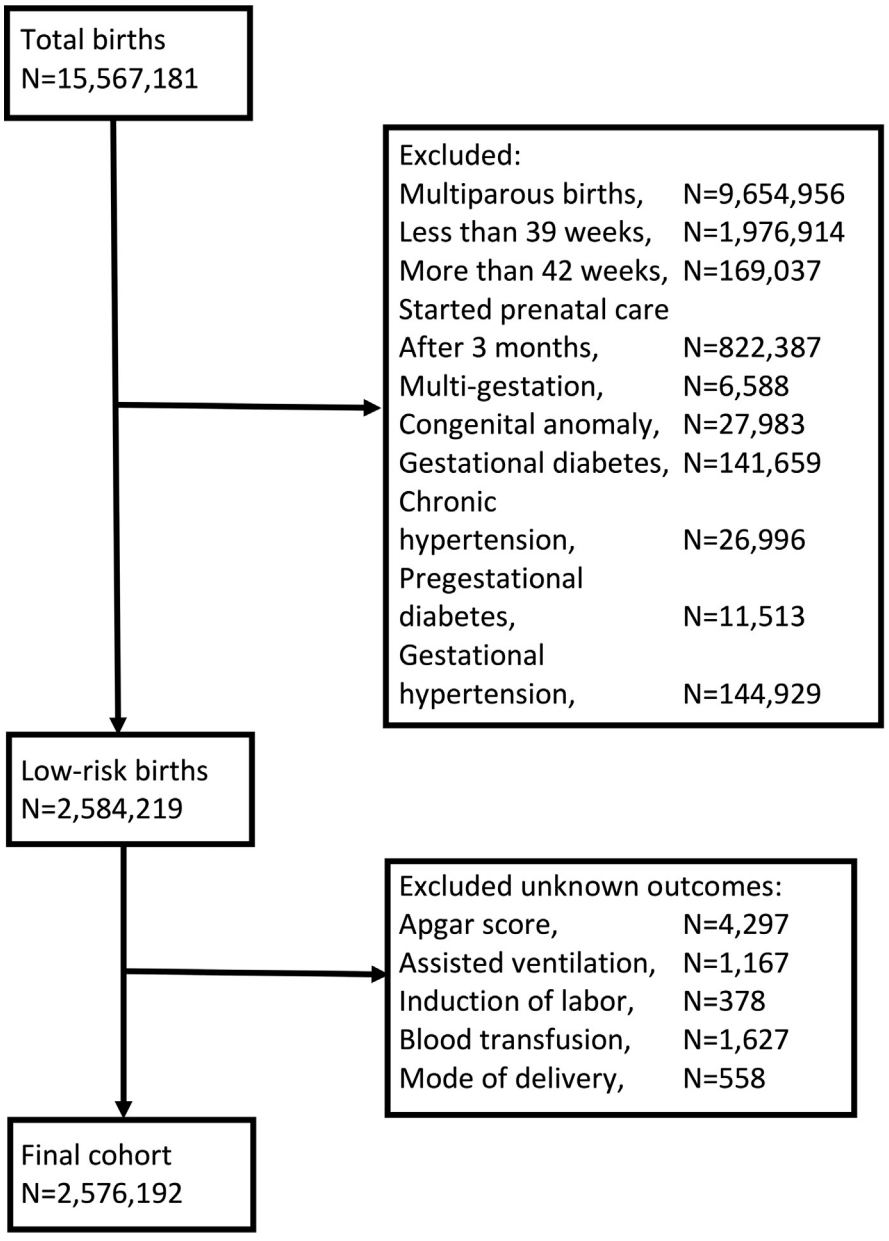
[21.5−28.3] kg/m^2 vs 24.5 [21.7−28.9] kg/m^2; $P<.001$), were more likely to be married (61.2% vs 61.8%; $P<.001$), and were more likely to utilize assisted reproductive technology (2.0% vs 2.5%; $P<.001$) than women in the pre-ARRIVE group. Women in the post-ARRIVE group were less likely to be White (61.7% vs 60.5%; $P<.001$) (Table 1). Obstetrical practices and adverse perinatal outcomes were determined after adjustment for these differences between the 2 groups.

Women in the post-ARRIVE group were more likely to undergo induction of labor (30.2% vs 36.1%; adjusted odds ratio [aOR], 1.36 [1.36−1.37]). In addition, women in the post-ARRIVE group were more likely to deliver by 39+6 weeks gestation (39.9% vs 42.8%; aOR, 1.14 [1.14−1.15]) and were less likely to undergo cesarean delivery (27.9% vs 27.3%; aOR, 0.94 [0.93-0.94]) than those in the pre-ARRIVE group. In addition, there was a significant increasing trend between 2015 and 2017 in the rate of labor inductions (from 29.5% in 2015 to 31.2% in 2017; $P<.001$) and deliveries by 39+6 weeks (from 39.9% in 2015 to 40.3% in 2017; $P<.001$) but not in the cesarean delivery rate (from 28.0% in 2015 to 27.9% in 2017; $P=.451$). However, after the ARRIVE trial publication, labor inductions increased by 5 percentage points compared with only 1 percentage point per year over the 3 years from 2015 to 2017. In addition, deliveries by 39+6 weeks increased by over 2 percentage points in the post-ARRIVE year compared with an increase of 0.4% increase per year over the 3 pre-ARRIVE years. For all the 3 obstetrical practice outcomes, the 2019 post-ARRIVE time period demonstrated a departure from the projected values on the basis of the model established by the 2015−2017 trends (Figure 2).

Table 2 shows differences in the adverse perinatal outcomes between the pre-ARRIVE and the post-ARRIVE groups. Patients in the post-ARRIVE group were more likely to receive a blood transfusion (0.3% vs 0.4%; aOR, 1.43 [1.36−1.50]) and be admitted to MICU (0.08% vs 0.09%; aOR, 1.20 [1.09−1.33]), though both outcomes were uncommon. No significant trends in MICU admission had been seen between 2015 and 2017 ($P=.777$), but there was a significant increasing trend in blood transfusion from 2015 to 2017 ($P<.001$). The 2019 rates for maternal blood transfusion are less than those that would have been expected on the basis of the 2015−2017 trends.

Neonates in the post-ARRIVE group were more likely to require immediate assisted ventilation (2.8% vs 3.5%; aOR, 1.28 [1.26−1.30]) and assisted ventilation for >6 hours (0.5% vs 0.6%; aOR, 1.36 [1.31−1.41]) and were more likely to have a 5-minute APGAR score

FIGURE 1
Selection cohort diagram from births between 2015 and 2017 and in 2019



This flow diagram depicts the selection process for our cohort of patients that met our inclusion criteria, with a breakdown of the births that were excluded and the reasons for exclusion.

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TABLE 1
Characteristics of the post-ARRIVE and pre-ARRIVE groups

Characteristic	Post-ARRIVE group N=609,322	Pre-ARRIVE group N=1,966,870	*P* value
Age (y)	27.4±5.6	27.0±5.6	<.001
BMI (kg/m^2)	24.5 (21.7–28.9) (600,961)	24.1 (21.5–28.3) (1,932,672)	<.001
Race			<.001
White	354,288 (60.5) (585,317)	1,168,980 (61.7) (1,894,210)	
Black	61,724 (10.6) (585,317)	194,739 (10.3) (1,894,210)	
Asian	47,258 (8.1) (585,317)	151,776 (8.0) (1,894,210)	
Hispanic	122,047 (20.9) (585,317)	378,715 (20.0) (1,894,210)	
Married	320,408 (61.8) (518,684)	1,144,573 (61.2) (1,870,023)	<.001
Smoking	21,020 (3.5) (607,442)	92,256 (4.7) (1,959,298)	<.001
Use of ART	15,264 (2.5)	39,360 (2.0)	<.001

Data are presented as mean±standard deviation, median (25th–75th percentile), number (percentage), and number, if missing data.

ARRIVE, A Randomized Trial of Induction Versus Expectant Management; *ART*, assisted reproductive technology; *BMI*, body mass index.

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<3 (0.3% vs 0.4%; aOR, 0.91 [0.86–0.95]). Significant preexisting upward trends had been seen between 2015 and 2017 in immediate assisted ventilation (from 2.7% in 2015 to 2.9% in 2017; *P*<.001) and in assisted ventilation >6 hours (from 0.4% in 2015 to 0.5% in 2017; *P*<.001) (Table 2). The 2019 rate of immediate assisted ventilation was higher than expected compared with the pre-ARRIVE trend. However, the 2019 rate of assisted ventilation >6 hours was lower than if the pre-ARRIVE trend continued, despite remaining statistically significantly higher than the overall average rate between 2015 and 2017. There was no significant trend in that period for the rate of 5-minute APGAR score <3 (from 0.4% in 2015 to 0.3% in 2017; *P*=.053), though the rate seen in the post-ARRIVE group was the same as that seen in 2015. There were no significant differences between the post-ARRIVE and the pre-ARRIVE groups in the rates of NICU admission (4.9% vs 4.9%; aOR, 1.01 [0.99–1.03]), neonatal seizures (0.04 % vs 0.04%; aOR, 0.97 [0.84–1.13]), and surfactant use (0.07% vs 0.08%; aOR, 1.05 [0.94–1.17]). Of note, there was a significant trend in NICU admissions during the pre-ARRIVE period (from 4.8% in 2015 to 5.0% in 2017; *P*<.001), and the rate in 2019 was equal to the average of those years.

We also compared the adverse perinatal outcomes between women who had labor induction and those with spontaneous labor in both the pre- and post-ARRIVE groups. Births with induction of labor had a significantly increased risk of all adverse perinatal outcomes except for MICU admission in the post-ARRIVE group and neonatal assisted ventilation >6 hours in the pre-ARRIVE group than births with spontaneous labor in both time periods (Supplemental Table).

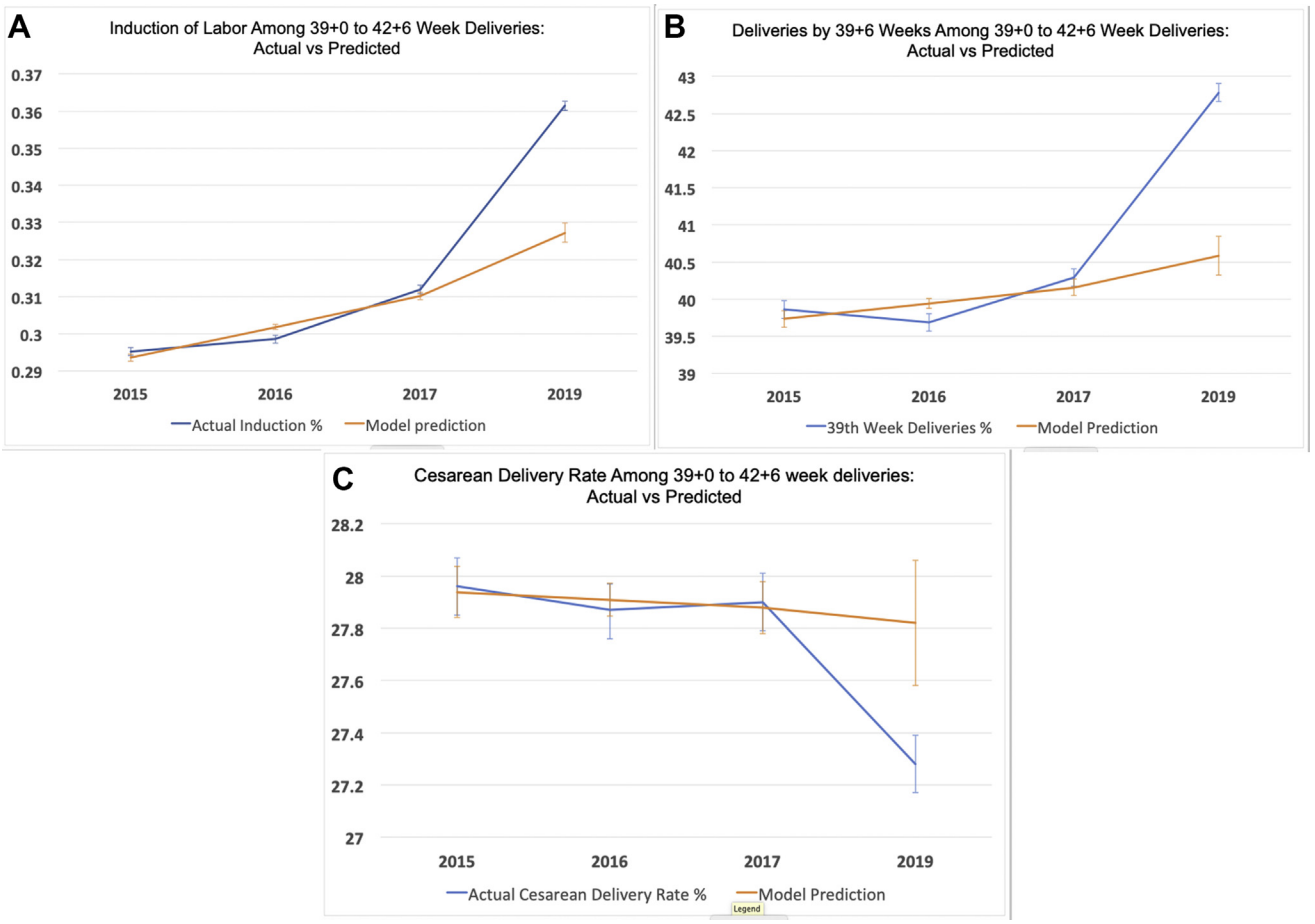
Comment

Principal findings

The rate of cesarean delivery among low-risk nulliparous patients significantly decreased in the year following the publication of the ARRIVE trial in contrast to the 3 years before the trial during which there were stable cesarean delivery rates. Nationwide rates of labor induction significantly increased in the year following the ARRIVE publication, as did delivery in the 39th week of gestation. There had been preexisting trends in the changes in obstetrical practices, but the post-ARRIVE rates exceeded rates that would have been projected on the basis of those trends alone.

The rates of MICU admission and blood transfusion increased in 2019, as did the rates of neonatal immediate and 6-hour ventilation and 5-minute APGAR score <3. Maternal need for transfusion had a previously existing upward trend, whereas MICU admission did not. Neonatal need for ventilation (immediate and prolonged) had been trending upward in the pre-ARRIVE period. Among these adverse perinatal outcomes, the 2019 rates appeared to depart from the previously existing trends in both directions. Although the need for immediate ventilation exceeded the projected value in 2019, maternal blood transfusion and prolonged neonatal ventilation would have been higher in 2019 if the pre-ARRIVE trend had continued. There were no significant differences in the post-ARRIVE group with regard to NICU admission, neonatal seizures, or surfactant use when compared with the pre-ARRIVE group. As we found that labor induction in both the pre-and post-ARRIVE groups was associated with higher rates of the reported adverse perinatal outcomes than spontaneous labor (with the exception of MICU admission in the post-ARRIVE group and 6-hour ventilation in the pre-ARRIVE group), it is not surprising

FIGURE 2
Obstetrical practices trend in the pre-ARRIVE and post-ARRIVE groups



The *blue graphs* depict the rates of obstetrical practices from 2015 to 2017 (pre-ARRIVE) and in 2019 (post-ARRIVE). The *orange graphs* represent a projection of what the rates would have been if the preexisting trends had continued unaltered by the ARRIVE publication. **A,** Induction of labor among 39+0 to 42+6 week deliveries: actual vs predicted; **B,** Deliveries by 39+6 weeks among 39+0 to 42+6 week deliveries: actual vs predicted; **C,** Cesarean delivery rate among 39+0 to 42+6 week deliveries: actual vs predicted.

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that a consequence of higher induction rates in the post-ARRIVE group would be the higher rates of these outcomes. Despite having significant increases when comparing the outcomes in the pre-ARRIVE years with the post-ARRIVE year, many of the differences were small and of questionable clinical importance.

Results in context

Our findings are useful, because they present an overview of nationwide practices and outcomes in the wake of a widely publicized paper that was anticipated to have profound effects on obstetrical practices. The ARRIVE trial challenged assumptions about the potential benefits and burdens of induction of labor in low-risk nulliparous women. Although the ARRIVE trial clearly demonstrated the efficacy of induction at 39 weeks in reducing the rates of cesarean delivery, our data provide an assessment of the potential effectiveness of that approach, and our findings comport with the findings of the ARRIVE trial. This is particularly important, given that the cesarean delivery rates are as high as 37% in some states.[16] Older observational studies that compared induction of labor with spontaneous labor suggested that labor induction in the low-risk population leads to a higher risk of adverse outcomes (eg, postpartum hemorrhage, neonatal oxygen requirement, and unplanned cesarean delivery).[17,18] It was also thought that low Bishop scores at the time of induction would be associated with higher rates of cesarean delivery.[19] More recent observational studies attempted to compare induction of labor to a more appropriate control group and showed that there may not

TABLE 2
Adverse maternal and neonatal outcomes between the post-ARRIVE and the pre-ARRIVE groups

Outcome	Post-ARRIVE group N=609,322	Pre-ARRIVE group N=1,966,870	Adjusted OR (95% CI)[a]
Maternal			
Blood transfusion[b]	2104 (0.4)	5062 (0.3)	1.43 (1.36–1.50)
MICU Admission[c]	577 (0.09)	1535 (0.08)	1.20 (1.09–1.33)
Neonatal			
Immediate assisted ventilation[b]	21,182 (3.5)	54,343 (2.8)	1.28 (1.26–1.30)
Assisted ventilation for >6 h[b]	3681 (0.6)	9302 (0.5)	1.36 (1.31–1.41)
Low 5-min Apgar[c]	2112 (0.4)	6661 (0.3)	0.91 (0.86–0.95)
NICU admission[b]	29,604 (4.9)	96,101 (4.9)	1.01 (0.99–1.03)
Neonatal seizures[c]	221 (0.04)	791 (0.04)	0.97 (0.84–1.13)
Surfactant use[c]	459 (0.08)	1350 (0.07)	1.05 (0.94–1.17)

Data are presented as number (percentage).

ARRIVE, A Randomized Trial of Induction Versus Expectant Management; *CI*, confidence interval; *MICU*, medical intensive care unit; *NICU*, neonatal intensive care unit; *OR*, odds ratio.

[a] Multivariable logistic regression adjusting for age, body mass index, race, marital status, smoking, and use of assisted reproductive technology; [b] Significant increasing trend from 2015 to 2017 by Cochran–Armitage test; [c] No significant increasing trend from 2015 to 2017 by Cochran–Armitage test.

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be a difference between patients who were induced and those awaiting the onset of spontaneous labor.[20,21] Using an appropriately powered randomized controlled trial, the ARRIVE investigators could confirm the latter findings. Our study provides an initial glance at how US physicians and patients may have been influenced by the trial's findings and how changes in practice may have changed outcomes outside of a controlled trial. We must acknowledge that our findings, though statistically significant, may not be a direct consequence of changes that occurred within individual hospitals and practice settings.

Clinical implications

We found that labor induction and delivery by the 39th week were trending upward before the ARRIVE publication. On the basis of the model we created using the pre-ARRIVE trends, the rates of these obstetrical practices in 2019 were different from where they would have been if those trends had continued unaltered. Significant increasing trends in maternal blood transfusions, neonatal immediate assisted ventilation, neonatal assisted ventilation >6 hours, and NICU admissions had already been ongoing between 2015 and 2017, making it unclear whether any extrinsic factors that led to those trends continued to do so, independent of any effect of the ARRIVE trial. Given that these outcomes were found to be more likely to occur in patients who underwent labor induction than those in spontaneous labor, we posit that the increase in these adverse perinatal outcomes would be expected, as labor inductions increased after the ARRIVE publication. It is important to note the difference in cesarean delivery rates seen in the general population (via vital statistics data) versus those seen in ARRIVE's trial settings. The baseline cesarean delivery rate in the trial's "induction" and "expectant management" groups were 18.6% and 22.2%, respectively.[10] These rates are markedly different from the real-world rates on the basis of birth certificates, both pre- and post-ARRIVE. This serves to remind us how the replication of a study's results is limited by more factors than those anticipated by a controlled trial within an academic setting.

Research implications

It remains unknown whether there is a gap between physicians' offering of induction and their hospital systems' ability to accommodate this practice change. Multiple attempts to quantify the cost of offering universal induction at 39 weeks have been made,[5,22] but given the vastly differing costs of medical care by state,[23] it is difficult to draw a conclusion that would apply across the United States. It would also be helpful to know which regions of the country are slower to adopt these practices during this post-ARRIVE era and why. We do not know if a specific subset of patients such as those at academic institutions or those in higher resource areas are being more preferentially offered labor induction at 39 weeks gestation. Gaining insight into these issues would help to elucidate the areas where social determinants of healthcare quality are limiting the implementation of the ARRIVE findings. Lastly, 1 year is a relatively short period of time to analyze in attempting to draw broad conclusions about nationwide changes; as subsequent years' natality data are published, it will be useful to observe the impact of ARRIVE's findings over time.

Strengths and limitations

We must acknowledge the limitations of our study. We were limited to variables available from the NVSS database, so any information that is not consistently recorded on birth certificates will exist as potential and unknown confounders. Similarly, perinatal deaths were not part of this dataset and have yet to be published for all of the years in question. However, we minimized potential confounders within the available data by including only complete birth certificates. In addition, there may be a small number of patients who were misclassified as being para 0 who did, in fact, have a previous stillbirth; this may have impacted the management of those patients' subsequent deliveries. However, the rates of stillbirth and perinatal death are unlikely to have varied enough between our 2 time periods such that we would anticipate this skewing our data. Of note, in the 2015 dataset, 2 states were not included because of incomplete implementation of the revised 2003 birth certificate forms. By 2016, all the US states, District of Columbia, Puerto Rico, and Guam used the 2003 birth certificate forms and reported birth data accordingly. The loss of 2 states' data from 1 year is unlikely to skew our study's results. Our study also does not address one of the key outcomes of the ARRIVE trial: the rates of hypertensive disorders of pregnancy. These were excluded because the database did not include the indication for induction. Therefore, it was not clear whether a patient was induced because of a hypertensive disorder or if they were coincidentally diagnosed with one subsequent to induction. However, the overall number of patients excluded for hypertensive disorders was relatively low (Figure 1). The study also had several strengths. A key strength was the large population size. The compulsory nature of the US birth registration system ensured that most newborns in the United States were counted, ensuring representative data.

Conclusions

There was a significant decrease in the rate of cesarean deliveries in 2019 after the publication of the ARRIVE trial, and this was in contradistinction to the rates of cesarean deliveries that had been stable in the 3 years before the publication. There were also increased rates of MICU admissions and low 5-minute APGAR scores (albeit still within the range of the rates seen over the 3 years in the pre-ARRIVE group) in the post-ARRIVE group. Although the changes in adverse perinatal outcomes were small, their potential clinical implications warrant further inquiry. ■

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Author and article information

From the Division of Maternal-Fetal Medicine, Department of Obstetrics and Gynecology at Maimonides Medical Center, Brooklyn, NY (Drs Gilroy and Minkoff); Division of Maternal-Fetal Medicine, Department of Obstetrics and Gynecology at Sidney Kimmel Medical College at Thomas Jefferson University, Philadelphia, PA (Drs Al-Kouatly and McLaren); and Department of Obstetrics and Gynecology and the School of Public Health, SUNY Downstate, Brooklyn, NY (Dr Minkoff).

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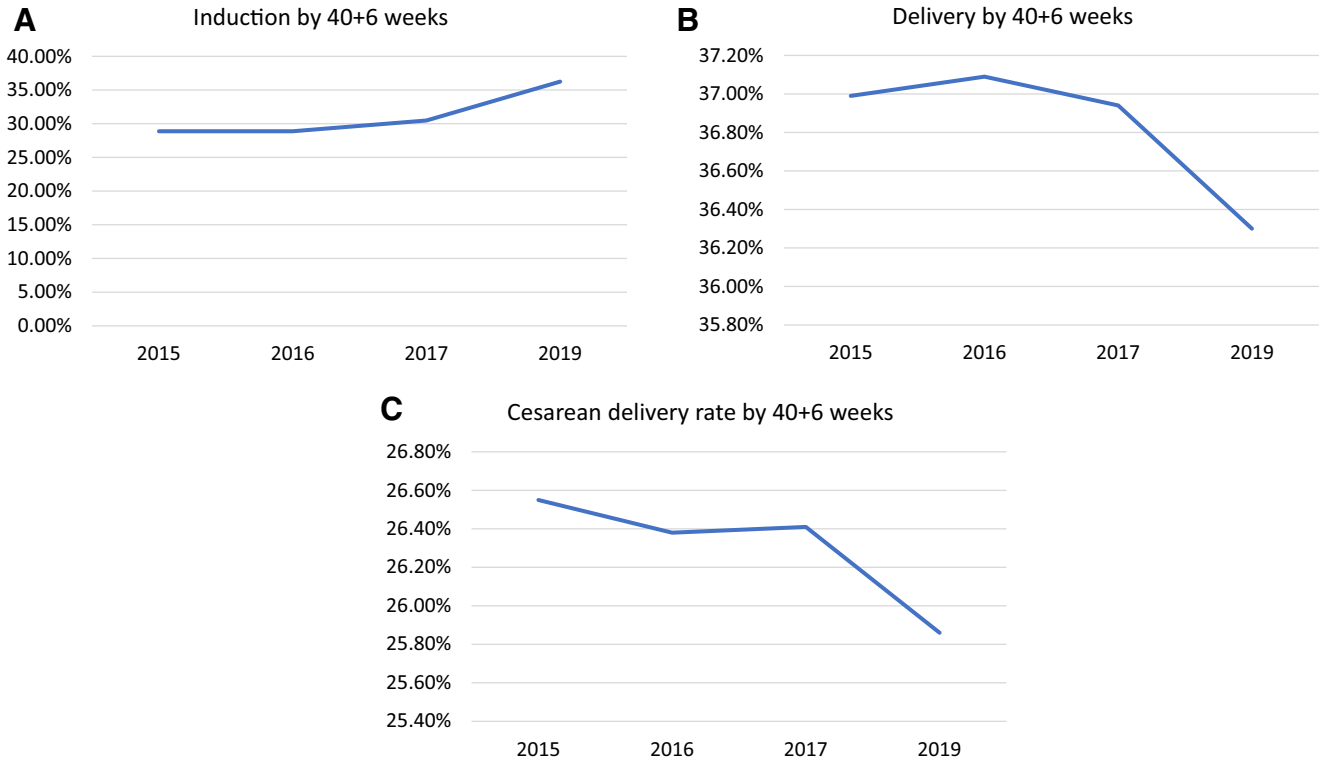
Corresponding author: Laura C. Gilroy, MD. lgilroy@maimonidesmed.org

SUPPLEMENTAL FIGURE 1
Obstetrical practice outcomes between 40+0 and 40+6 weeks gestation

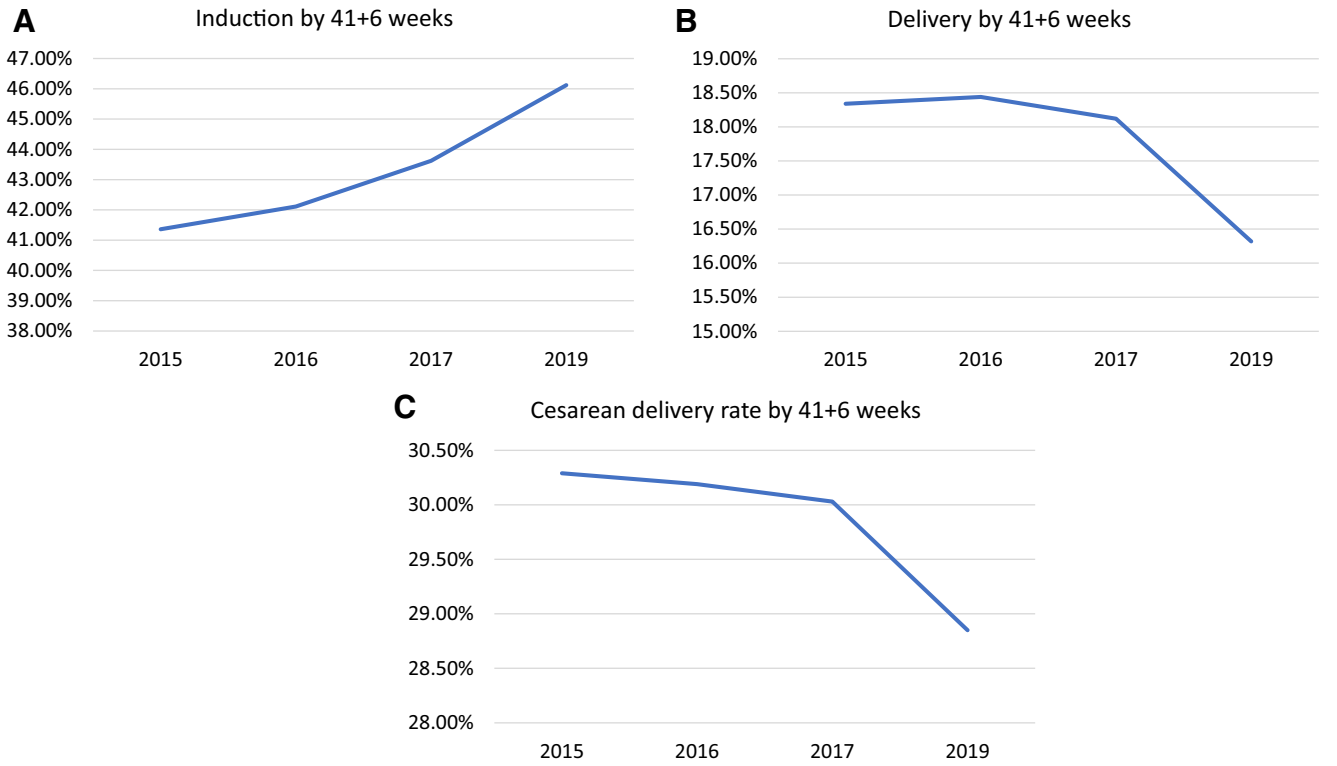


Induction (**A**): pre-ARRIVE trend, increasing: $P<.001$; post-ARRIVE vs pre-ARRIVE: higher in post-ARRIVE: $P<.001$. Delivery by 40+6 weeks (**B**): pre-ARRIVE trend, none: $P=.259$; post-ARRIVE vs pre-ARRIVE: lower in post-ARRIVE, $P<.001$. Cesarean delivery rate by 40+6 weeks (**C**): pre-ARRIVE trend, none: $P=.573$; post-ARRIVE vs pre-ARRIVE: lower in post-ARRIVE, $P<.001$.

ARRIVE, A Randomized Trial of Induction Versus Expectant Management.

Gilroy et al. ARRIVE trial impact on obstetrical practices and outcomes. Am J Obstet Gynecol 2022.

SUPPLEMENTAL FIGURE 2
Obstetrical practice outcomes between 41 + 0 and 41 + 6 weeks gestation



Induction (**A**): pre-ARRIVE trend, increasing: $P<.001$; post-ARRIVE vs pre-ARRIVE: higher in post-ARRIVE: $P<.001$. Induction (**B**): pre-ARRIVE trend, increasing: $P<.001$; post-ARRIVE vs pre-ARRIVE: lower in post-ARRIVE: $P<.001$. Induction (**C**): pre-ARRIVE trend, none: $P=.178$; post-ARRIVE vs pre-ARRIVE: lower in post-ARRIVE: $P<.001$.

ARRIVE, A Randomized Trial of Induction Versus Expectant Management.

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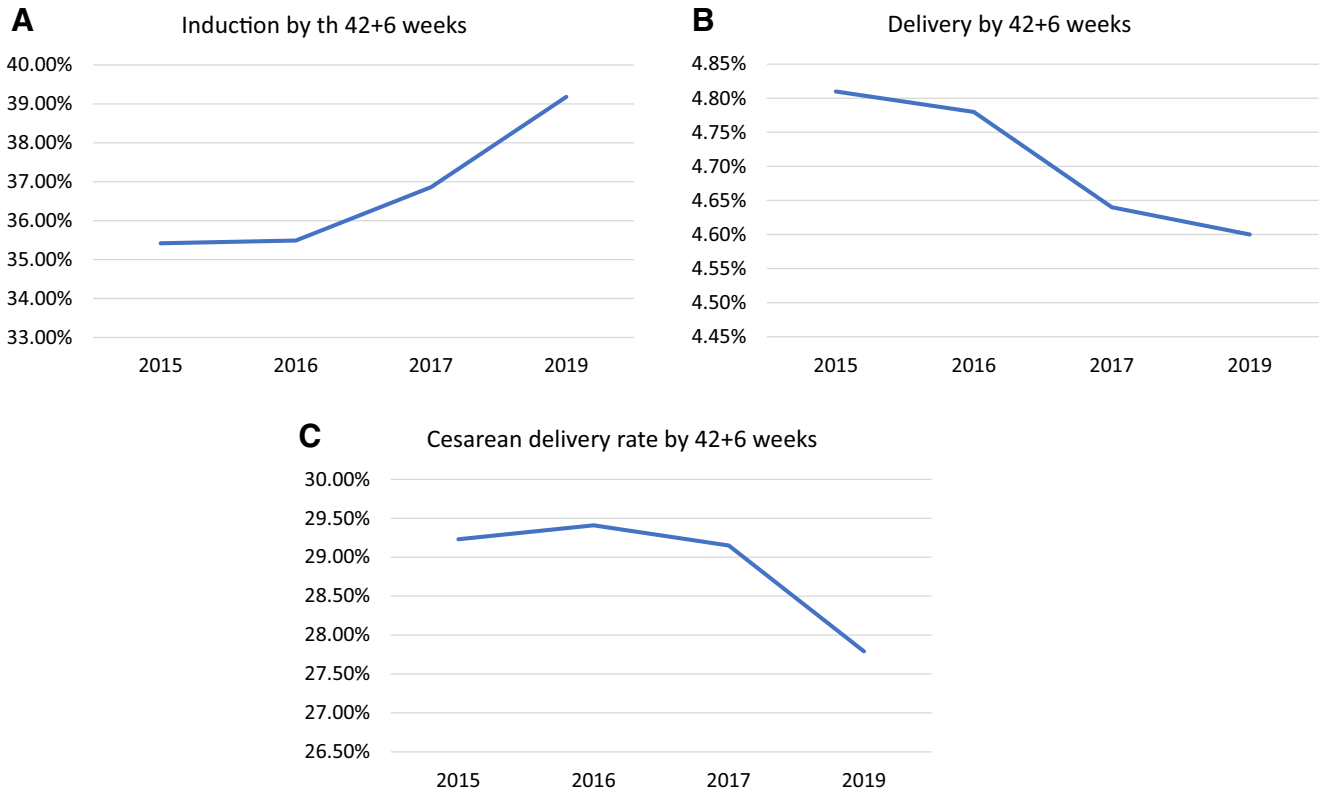
SUPPLEMENTAL FIGURE 3
Obstetrical practice outcomes between 42+0 and 42+6 weeks gestation



Induction (**A**): pre-ARRIVE trend, increasing: $P<.001$; post-ARRIVE vs pre-ARRIVE: higher in post-ARRIVE: $P<.001$. Induction (**B**): pre-ARRIVE trend, decreasing: $P<.001$; post-ARRIVE vs pre-ARRIVE: lower in post-ARRIVE: $P<.001$. Induction (**C**): pre-ARRIVE trend, none: $P=.847$; post-ARRIVE vs pre-ARRIVE: lower in post-ARRIVE: $P<.001$.

ARRIVE, A Randomized Trial of Induction Versus Expectant Management.

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SUPPLEMENTAL TABLE
Adverse perinatal outcomes by labor type

Outcome	Pre-ARRIVE group			Post-ARRIVE Group		
	Induction N=593,540	Spontaneous N=1,373,330	*P* value[a]	Induction N=220,223	Spontaneous N=389,099	*P* value[a]
Maternal						
Blood transfusion	2087 (0.35)	2975 (0.22)	<.001	1026 (0.47)	1078 (0.28)	<.001
MICU admission	557 (0.09)	978 (0.07)	<.001	220 (0.10)	357 (0.09)	.319
Neonatal						
Immediate assisted ventilation	19,245 (3.2)	35,098 (2.6)	<.001	8811 (4.0)	12,371 (3.2)	<.001
Assisted ventilation for >6 h	3025 (0.46)	6277 (0.51)	<.001	1442 (0.65)	2239 (0.58)	<.001
Low 5-min Apgar < 3	2225 (0.37)	4436 (0.32)	<.001	822 (0.377)	1290 (0.33)	.008
NICU admission	31,023 (5.2)	65,078 (4.7)	<.001	11,265 (5.1)	18,339 (4.71)	<.001
Neonatal seizures	287 (0.05)	504 (0.04)	<.001	103 (0.05)	118 (0.03)	.002
Surfactant use	421 (0.07)	929 (0.07)	.423	167 (0.08)	292 (0.08)	.923

ARRIVE, A Randomized Trial of Induction Versus Expectant Management; *MICU*, medical intensive care unit; *NICU*, neonatal intensive care unit.

[a] Chi-square test was performed.

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