

**Elective Induction at 39 Weeks: Analyzing the Impact on Cesarean Delivery Rates
Compared to Expectant Management**

Claire Geldhof, Cali Marsh, Sharissa Morgan, & Stacey Policarpio
University of Colorado Anschutz Medical Campus, College of Nursing

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Dr. Shu-Yi (Emily) Wang, PhD, RN, CNS

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Introduction

Pregnancy can be a wonderful and joyous time, but there can be many uncertainties surrounding labor and delivery. As health information online has increased dramatically (Finney Rutten et al., 2019), labor and delivery conversations amongst healthcare providers and health consumers have grown in participation, expanding questions of best practices, particularly around delivery options. A current topic of interest focuses on the practice of elective inductions. Elective induction is defined as labor induction without strict medical maternal or fetal benefit for delivery compared with continuation of pregnancy (Dögl et al., 2018). Current clinical practice, set by the American College of Obstetrics and Gynecologists (ACOG) and the Society for Maternal-Fetal Medicine (SMFM), does not support induction of labor prior to 39 weeks if there are no medical indications (2019).

In the United States, induction of labor, including elective induction, has more than tripled since induction was first documented on certificates of live birth in 1989; recorded in 9% of births in 1989, to 31.37% of births in 2020 (Simpson, 2022). In a 20-year population study reviewing trends in labor inductions, Swift et al., (2022), note the rapid increase of elective inductions in middle and high-income countries over the past decade. As induction rates have risen, so have concerns that induction might increase the risk of cesarean delivery and other adverse outcomes (Dublin et al., 2014). In conversations about pregnancy and delivery, some online discussion groups have endorsed a notion that synthetic oxytocin (used for induction) will cause fetal distress, leading to emergency deliveries. Yet obstetricians continue to widely offer elective induction to qualifying patients despite concerns and ongoing questions about its purpose and effect.

Understanding the relationship and evidence between elective inductions and cesarean delivery rates is important as healthcare providers and health consumers consider the risks and potential outcomes of labor and delivery practices. Delivery options and varied opinions can be challenging for patients navigating the labyrinth of labor and delivery services. When referring to delivery recommendations and best practices, what should patients know about elective induction? How can healthcare providers counsel the evidence behind elective induction and the incidence of cesarean deliveries compared to expectant management? The basis of this group paper and research query was developed from the PICO question: *In women who are at 39 weeks gestation, how do elective inductions impact the rate of cesarean delivery compared to expectant management?*

Literature Search

A literature search was conducted using search engines such as Google and the Strauss Health Science Library. The databases included PubMed, CINAHL, and Elsevier. This search aimed to identify articles relevant to our topics of interest, using keywords such as “term pregnancy”, “ ≥ 39 weeks gestation”, “elective induction”, “spontaneous labor”, and “expectant management”. Booleans applications were used for “cesarean section” and “c-section”.

The search parameters were established over the past seven years, with the exception of an RCT from Miller et al., (2015) which was included because of challenges in finding an RCT within the date criteria. The search focused on elective induction and term pregnancies (beyond 37 weeks, ideally 39 weeks). In total, we reviewed approximately 20 articles. Articles that were based on the inclusion criteria were presented for review via group email. The final selection was made based on the level of evidence. We understood systematic reviews, meta-analysis, and RCTs are the highest level of evidence and those were kept. In a group review and discussion,

we decided to keep the strongest level of evidence and discard lower levels of evidence, such as non-experimental and retrospective studies. We decided on eight articles, including three systematic reviews and meta-analyses, three non-experimental/retrospective studies, and two randomized control trials (RCT) were selected.

Review of Articles

In a systematic analysis review and meta-analysis, Fonseca et al., (2020) reviewed eight studies that took place between January 2000 and March 2020. The studies included 81,151 pregnancies (26,631 in the induction group, and 54,520 expectantly managed). The purpose was to assess if induction of labor in advanced maternal age (women ≥ 35), was associated with increased rates of cesarean delivery compared to expectant management (Fonseca et al., 2020). The review and analysis covered an impressive number of pregnancies and added to the strength of evidence that induction of labor at 39–40 weeks, (maternal age ≥ 35), does not significantly alter the incidence of cesarean delivery. The size of the study also weakened the meta-analysis with significant heterogeneity and difficulty to control confounding factors, particularly amongst the cohort studies. In the quantitative synthesis of outcomes, a forest plot was developed to show there was no significant difference between induction of labor and expectant management with a pooled Odds Ratio [OR] of 0.97 (95 % CI = 0.86–1.1).

A retrospective cohort study conducted by Cozzi-Glaser et al., (2023) compared the rates of cesarean sections among women who were electively induced before, during, and after a policy change and the ARRIVE trial. This study analyzed 10,758 patients, 2521 (23.4%) were pre-eIOL (before policy and trial), 5410 (50.3%) during-eIOL (during trial), and 2827 (26.3%) post-eIOL (after policy and trial) between January 2012 and December 2021 (Cozzi-Glaser et al.,

2023). Inclusion criteria for this study consisted of viable, singleton pregnancy at greater than or equal to 39 0/7 weeks, low risk for adverse pregnancy outcomes, and no medical or fetal indication for induction prior to 39 weeks. Exclusion criteria included high risk for adverse pregnancy outcomes, indication for delivery prior to 39 weeks, and any other health conditions that could affect the pregnancy or labor. Patients in the post-eIOL had the highest rate of labor induction (64.1%) compared to the pre-eIOL (36.2%) and the during-eIOL (40.9%). The results of this study show that “cesarean birth occurred in 15.3% of the post-eIOL patients and 17.5% of pre-eIOL patients” which shows decreased odds of cesarean delivery. The limitations of this study include the retrospective approach, using coded electronic extraction as opposed to detailed chart review, lack of indications for cesarean deliveries, no data on specific labor induction or augmentation, and being conducted at a single center. Strengths of this study include having a large and diverse cohort, adjustment for specific baseline characteristics reduced the risk of confounding, and the ability to perform additional analyses by labor type and parity.

A randomized control trial by Miller et al., (2015) compared the effects of elective induction of labor at 39 weeks of gestation on cesarean delivery rates in nulliparous women with an unfavorable cervix, comparing it to expectant management. This RCT was conducted at a military tertiary care medical center. The participants of this trial were at least 18 years of age with a singleton gestation in the cephalic presentation and a modified Bishop score of five or less. The results of this study showed that cesarean delivery rates were 30.5% (25/82) in the elective induction group versus 17.7% (14/79) in the expectant management group, relative risk 1.72, 95% confidence interval 0.96-3.06. This RCT concludes that for nulliparous women with an unfavorable cervix, elective induction of labor at 39 weeks gestation does not statistically significantly increase the rate of cesarean delivery compared to expectant management. The

study's strengths include a randomized control trial design and minimization of biases by using standardization of labor-management protocols. Limitations to this study include its ability to only detect a twofold difference in cesarean delivery rates and the use of arrest disorders criteria not aligned with current guidelines of this time, which could have influenced cesarean delivery rates.

A systematically reviewed meta-analysis conducted by Grobman and Caughey (2020) reviewed observational cohort studies to assess the impact of elective induction of labor at 39 weeks on cesarean delivery rates and other maternal and paternal outcomes compared with expectant management among nulliparous women. This study incorporated data from 6 studies with a total of 650,409 participants, the findings revealed that elective induction at 39 weeks is associated with a significantly lower risk of cesarean delivery (26.4% vs. 29.1%), peripartum infection (2.8% vs 5.2%), and various adverse perinatal outcomes, such as respiratory morbidity (0.7% vs 1.5%) and NICU admissions (3.5% vs 5.5%), compared to expectant management. The strengths of this study are the comprehensive and systematic literature search, large sample size, pooled relative risks with 95% confidence intervals, use of the random effects model, and assessment of heterogeneity. The limitations of this study are the inclusion of only observational studies, which may be subject to confounding biases. There was significant heterogeneity, greater than 75%, indicating variability in the studies results which could complicate the interpretation of the pooled data.

A large multicenter trial performed by Grobman et al., (2018) investigated the uncertainty of perinatal outcomes when low-risk nulliparous women underwent induction of labor. After screening for eligibility, the researchers randomly assigned participants into two groups: induction of labor between 39 weeks 0 days to 39 weeks 4 days (n= 3059), and expectant-

management to wait for spontaneous labor (n= 3037). Those in the expectant-management group were requested to not initiate elective induction before 40 weeks and 5 days. Investigated consequences were numerous, including various maternal and neonatal outcomes. While other outcomes were studied, the prevalence of cesarean deliveries remains the main focus of this discussion. The rate of cesarean delivery was proven to be lower in the induction group (18.6%) compared to the expectant-management group (22.2%, $p<0.001$). Strengths of this trial include randomization of participants, a large sample size, and participation from numerous university and community hospitals throughout the United States, which may suggest generalizability. Given the inability to create a double-blind study based on the circumstances, this is a limitation of the trial and could increase the risk of bias. The statistically significant results and 95% confidence interval can suggest that induction of labor was not associated with an increased risk for cesarean delivery.

A systematic review and meta-analysis conducted by Hong et al., (2023) compared maternal labor-related complications and neonatal outcomes between elective induction of labor at 39 weeks of gestation and expectant management. 14 studies were reviewed that included 1,625,899 multiparous and nulliparous women. This study found elective induction at 39 weeks gestation is associated with a reduction in the likelihood of third- or fourth-degree perineal injury, operative vaginal birth, macrosomia, and low five-minute Apgar scores. Multiparous women were specifically found to have a reduction in emergency cesarean sections (OR, 0.61 [95% CI, 0.38-0.98]) and no difference in operative vaginal birth (OR, 1.01 [95% CI, 0.84-1.21]). It was also found that nulliparous women should use caution with elective induction at 39 weeks due to the increased risk of shoulder dystocia. This study was conducted according to PRISMA guidelines and registered with PROSPERO, showing this study's high level. The

overall study is of medium quality and strength with its large sample size, use of subgroups, comprehensive search, inclusion of various study designs such as a randomized clinical trial, retrospective cohort studies, and a cross-sectional study, and use of Newcastle-Ottawa Scale and Cochrane for risk of bias assessment. The limitations were the large number of observation studies used which can affect the strength of the evidence and the high level of heterogeneity found in emergency cesarean sections.

A retrospective, observational study was performed by Kim et al., (2019) comparing the rate of cesarean sections among women who had elective inductions versus expectant management. The purpose of the study was to identify if the use of elective inductions increases the rate of cesarean sections. Women were given the choice at 39 weeks gestation between expectant management and induction of labor. This study was based on 237 women with the inclusion criteria being: “primiparous women, uncomplicated living singleton pregnancy, gestational age from 39 weeks, 0 days to 41 weeks, 6 days, cephalic presentation, and intact amniotic membrane”. Exclusion criteria included women who had placenta previa, previous cesarean section status, previous myomectomy, and any high-risk or serious medication conditions. The induction group (n=164) received either oxytocin or prostaglandin E2. The expectant management group (n=73) waited for spontaneous labor and augmentation with oxytocin was attempted if labor progression was inadequate. This study showed that of all the women, 199 (84.0%) delivered vaginally, thirty-eight women (16.0%) required cesarean delivery. Among the two groups, this study showed that there was no difference in the rate of cesarean sections. Some limitations of this study include the small sample size and having the induction group larger than the expectant group. Some strengths of this study include the ability to obtain complete records from a single institution with a uniform protocol for analysis,

assessments were performed by only 1 expert, and the exclusion of women who would likely undergo cesarean delivery from the start of the study which gave the ability to adjust the bias of the cesarean delivery rate to favor the control group.

A retrospective cohort study by Sinkey et al., (2019) compared perinatal outcomes between low-risk multiparous women at 39 weeks gestation. The groups being compared were those who underwent elective induction of labor (n=453) and those who participated in expectant management (n=2,174). Data was collected from the University of Alabama at Birmingham Hospital between the years 2014 and 2018. Elective inductions were managed per protocol, in accordance with ACOG and SMFM guidelines, between 39 0/7 and 39 4/7 weeks gestation. In addition to other noted outcomes, there were fewer cesarean deliveries observed in the elective induction group (5.1%) compared to the expectant management group (6.6%). A strength of this trial was the fact that inductions were managed by national guidelines, however, a major limitation was that the study was only inclusive to a single hospital. Different hospitals have different protocols and resources, and providers may practice in different ways. This limitation can impact the generalizability. Additionally, the retrospective design may not have captured all indications for induction of labor. Although it was a single-center retrospective study, Sinkey et al., (2019) claim that their results are similar to other trials, suggesting that elective inductions can decrease the risk for cesarean delivery.

Synthesis of the Evidence

Our group reviewed eight articles which included retrospective cohort studies, systematic reviews and meta-analyses, and randomized control trials. The locations of the studies varied with most taking place in the United States and one, Kim et al., (2019), in South Korea. These studies investigated the relationships of maternal labor-related complications and outcomes

following elective induction of labor at 39 weeks compared with expectant management, with nuances between nulliparous and multiparous, maternal age, and other factors like what Hong et al., (2023) studied with Apgar scores, macrosomia, and shoulder dystocia. In the study completed by Grobman and Caughey (2020), adverse perinatal outcomes like peripartum infection rates, NICU admissions, and respiratory morbidity were also measured factors.

While examining the corresponding evidence that related to the PICO question, we noted that among the studies, robust sample sizes were a common measurement of strength. The Fonseca, et al., (2020) systematic analysis review and meta-analysis included 81,151 participants. The Grobman & Caughey (2020) systematic analysis and meta-analysis also contained a large sample size and covered 66,0619 women undergoing elective labor induction, and 584,390 women undergoing expectant management. Grobman et al., (2018) included numerous university and community hospitals in the study sample, serving as a strength and means for generalizability from the documented findings.

The observational nature of many of the studies was considered a weakness, lessening the power of evidence. From the research included to support this PICO question, there were significantly more participants in the expectant management group than in the induction group. From the example of the Fonseca et al., (2022) and the Cozzi-Glaser et al., (2024) studies, the number of participants in the induction group exceeded the number of participants in the expectant management group by more than half. Another limitation that arose from the study by Fonseca et al., (2020) was the limited capacity to reveal other indicators that might necessitate induction of labor. In the example of the Sinkey et al. (2019) retrospective cohort study, the research was confined to a single center and posed limitations on how other facilities might manage delivery protocols and how methods vary between providers.

The evidence concluded from these studies infers that elective induction of labor is not a precursor to cesarean delivery outcomes. Marrs et al., (2019) describe how there have been a handful of small randomized control trials dating back to 1975 comparing elective induction of labor at 39-40 weeks with expectant management, none of which have shown a difference in cesarean-delivery rates between groups. The conclusion from Grobman et al., (2018) indicated cesarean delivery was in fact lower in the induction groups than expected management. The chosen research articles demonstrated that for those who are at 39 weeks gestation and have had an elective induction, the rate of cesarean delivery is lower compared to expectant management.

Conclusion/Discussion

From the literature and evidence compiled in our critical review, the PICO question: *In women who are at 39 weeks gestation, how do elective inductions impact the rate of cesarean delivery compared to expectant management?* was answered and from the summary of findings, did not lead to an increased rate of cesarean sections. The evidence gathered from this review helps to support and answer the stated PICO question. According to Cozzi-Glaser et al. (2023), Grobman & Caughey (2020), Grobman et al. (2018), Hong et al. (2023), and Sinkey et al. (2019), the frequency of cesarean sections decreases when elective induction of labor at 39 weeks gestation is compared to expectant management. According to Fonseca et al. (2020), Kim et al. (2019), and Miller et al. (2015), there is no statistically significant difference in the frequency of cesarean sections between induction of labor and expectant management.

For patients and clinical providers, the corresponding research relating to the PICO question strengthens the understanding that induction at 39 weeks does not relate to a higher incidence of cesarean delivery. This information can be implemented into future clinical practice, by educating patients and other providers on the evidence and the potential benefits of induction

of labor at 39 weeks. This clinical knowledge and education can enhance the delivery of care options for expecting families and help to reassure future mothers that induction of labor will not necessarily lead to a cesarean section.

Synthesis Table

Studies	Design	Interventions	Sample	Outcomes
Fonseca, M. J. et al., (2020). Delivery outcomes with induction of labor at 39–40 weeks for advanced maternal age compared to expected management in advanced maternal age.	Systematic analysis review and meta-analysis	- Intervention: Elective induction of labor at 39–40 weeks in advanced maternal age population (35 y.o. and >) - Comparison: expectant management	81,151 participants met the inclusion criteria for meta-analysis. 26,631 in the induction group, and 54,520 in the expectant management group.	When comparing induction to expectant management in advanced maternal age, the review and analysis did not show a significant increase in cesarean section, assisted vaginal delivery, or postpartum hemorrhage with the practice of elective induction.
Cozzi-Glaser et al., (2023). Outcomes in low-risk patients before and after an institutional policy offering 39-week elective induction of labor	Retrospective observational study	- Intervention: Elective induction of 39 weeks gestation in low-risk patients between January 2012 to December 2021. - Comparison: No control group, the study compared rates of	10,758 deliveries occurred at ≥39 0/7 weeks. 2521 (23.4%) were pre-eIOL, 5410 (50.3%) during-eIOL, and 2827 (26.3%) post-eIOL. Groups differed concerning labor type, age, race/ethnicity, marital and payor status, and	Cesarean birth occurred in 15.3% of the post-eIOL patients and 17.5% of pre-eIOL patients, corresponding to decreased odds of cesarean delivery. Post-eIOL was associated with higher odds of chorioamnionitis and hemorrhage compared to pre-eIOL.

		inductions between 3 groups- pre-eIOL (prior to the new policy and ARRIVE trial), during-eIOL (during the ARRIVE trial), and post-eIOL (after ARRIVE trial and policy introduction) .	gestational age at care entry.	
Miller et al., (2015). The effect of elective induction of labor in nulliparous women with an unfavorable cervix at 39 weeks of gestation on cesarean delivery rates	Randomized Control Trial	• Intervention: Elective induction of labor in nulliparous women with an unfavorable cervix at 39 weeks • Comparison: expected management	-Eligible women were at least 18 years of age, nulliparous, with a singleton gestation and a Bishop score of 5 or less, after 39 weeks of gestation. -916 patients were assessed for study eligibility, and 162 were enrolled.	- Compared with expectant management of pregnancy, the elective induction group did not double the rate of cesarean delivery.
Grobman, W. A., & Caughey, A. B. (2020). Elective induction of labor at 39 weeks compared with expectant management: A meta-analysis of cohort studies	Systematic review and meta-analysis	• Intervention: Elective induction of 39 weeks of gestation • Comparison: expected management	-66,0619 women undergoing elective labor induction -584,390 women undergoing expectant management.	-C-section frequency ↓ -Peripartum infections ↓ -Respiratory morbidity ↓ -NICU admission ↓ -Perinatal mortality ↓
Grobman et al., (2018).	Randomized control trial	• Elective induction of labor	A total of 6,106 deliveries were included.	The frequency of cesarean delivery was significantly

Labor induction versus expectant management in low-risk nulliparous women		between 39 0/7 and 39 4/7 weeks gestation in low-risk nulliparous women • Comparison: Expectant management	43.4% were white. 23.1% were black. 2.8% were asian. 28.3% were hispanic. 3,062 women were placed in the elective induction group 3,044 women were placed in the expectant management group	less in the elective induction group (18.6%) compared to the expectant management group (22.2%). The primary outcome (such as perinatal death, respiratory support, birth trauma, infection, and intracranial hemorrhage) was seen in 4.3% of the neonates in the induction group compared to 5.4% in the expectant management group.
Hong, J. et al., (2023). Comparison of maternal labor-related complications and neonatal outcomes following elective induction of labor at 39 weeks of gestation vs expectant management: A systematic review and meta-analysis	Systematic review and meta-analysis	• Intervention: Elective induction of labor at 39 weeks gestation. • Comparison: expectant management	-1,625,899 women birthing singleton pregnancies, based on 14 studies. -Mix of nulliparous and multiparous women, as well as those with a high BMI or those undergoing a trial of labor after a cesarean section	-C-section frequency in nulliparous and multiparous women ↓ -Additional findings for nulliparous women: reduction in operative vaginal birth, macrosomia, and low 5-minute and Apgar score, 7% reduction in third or fourth-degree perineal injury -The higher likelihood of shoulder dystocia compared to expectant management. -Additional finding

				multiparous women: no difference in operative vaginal birth.
Kim et al., (2019). Benefits and risks of induction of labor at 39 or more weeks in uncomplicated nulliparous women: a retrospective, observational study	Retrospective observational study	- Intervention: Elective induction of labor, oxytocin (intravenous injection, 10 IU/mL) or prostaglandin E2 (intravaginally, 10 mg) between January 1, 2011 and November 30, 2017 - Comparison: Spontaneous labor group	-237 uncomplicated nulliparous women who were at 39 weeks gestation or more of a singleton pregnancy with vertex presentation and intact membranes. -73 women in the expectant group and 164 women in the induction group. -Studies conducted in National Health Insurance Service Ilsan Hospital in the Republic of Korea.	-199 (84.0%) delivered vaginally and 38 women (16.0%) required Cesarean delivery. -The length of stay and blood loss during delivery were similar between the groups (4.3±1.5 vs. 3.9±1.5 days and 1.9±1.3 vs. 1.8±1.0 mg/sL, respectively; all P>0.05). -For neonatal outcomes, the rate of meconium-stained amniotic fluid, Apgar score <7 at 5 minutes, and intubation rate were similar between the groups (18.9% vs. 24.7%, 7.9% vs. 4.1%, and 6.1% vs. 4.4%, respectively, all P>0.05). -The neonatal intensive care unit admission rate was significantly lower in the induction group than in the spontaneous labor group (28.0% vs. 13.2%, P=0.001).

Sinkey et al., (2019). Elective induction of labor in the 39th week of gestation compared with expectant management of low-risk multiparous women	Retrospective cohort study	● Intervention: Elective induction of labor in low-risk multiparous women at 39 0/7 to 39 4/7 weeks gestation. ● Comparison: Expectant management	A total of 2,627 deliveries were deemed eligible. 453 women were placed in the elective induction of the labor group 2,174 women were placed in the expectant management group	Elective induction at 39 weeks in low-risk multiparous women was shown to decrease perinatal morbidity and decrease the prevalence of cesarean delivery (5.1% compared to 6.6%).
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Evidence Table

Problem Statement: To determine if elective inductions can increase the rate of cesarean sections.

PICO question: In women who are at 39 weeks gestation, how do elective inductions impact the rate of cesarean delivery compared to expectant management?

1st Author, et al., Year, Title, Journal	LOE	Aim/Purpose (e.g. hypothesis, research questions, QI or EBP purpose statement)	Theoretical framework for study (e.g. pathophysiology; practice model; change theory, nursing theory, etc)	Design /Instruments/Interventions Research methods; QI; EBP interventions	Sample and Setting information	Variables studied	Data Analysis Methods (e.g. what analysis was used; report statistically findings; and p value. Include information such as NNT, CI, effect size when appropriate)	Relative findings	Strengths /Limitations	Overall Strength / Quality of the article/study based on biases, concerns with methodology, etc. (High; Medium: Low)
Fonseca, M. J. et al., (2020), Does induction of labor at term increase the risk of cesarean section in advanced maternal age? A systematic review and meta-analysis <i>European</i>	I	Does induction of labor (at term), compared to expectant management increase the risk of cesarean section in women of advanced maternal age (≥35 years)	N/A	Systematic review and meta-analysis The research used PubMed/MEDLINE and the Cochrane Database of Systematic Reviews in English, Portuguese, Spanish and French. Preferred Reporting Items for	8 studies were selected for systematic analysis review and meta-analysis. These included 81,151 pregnancies (26,631 in the induction group and 54,520 expectantly managed) in women of advanced maternal age (≥35 years	Cesarean section rates between induced and spontaneous labor at term in women of advanced maternal age (≥35 years old). Independent variable: Induction of labor	The authors performed a meta-analysis using a random-effects model to calculate pooled odds ratios (ORs) and 95% confidence intervals (CIs). A sensitivity analysis was performed using MetaXL 2.0 (EpiGear International Pty Ltd, Wilston, Queensland,	Induction of labor was not associated with a significantly increased risk of cesarean delivery (OR 0.97, 95 % CI 0.86-1.1), assisted vaginal delivery (OR 1.12, 95 % CI 0.96-1.32) or	*Strengths include the robust literature search using systematic review guidelines and the exploration of heterogeneity and publication bias. * Limitations include the potential for residual confounding, especially	This systematic review and meta-analysis provides Level I evidence and is considered to be high in strength. The evidence provided that induced labor is associated with a lower risk of cesarean section in women of advanced maternal age

<i>Journal of Obstetrics & Gynecology and Reproductive Biology.</i> , 253,213-219.		old)?		Systematic Reviews and Meta-Analysis (PRISMA) guidelines.	old).	Dependent variable: Cesarean section rate	Australia) to calculate the pooled risk difference effect sizes between expectant management and induction group. There was no significant difference between induction of labor and expectant management with a pooled Odds Ratio [OR] of 0.97 (95 % CI = 0.79–1.19).	postpartum hemorrhage (OR 1.11, 95 % CI 0.88-1.41). The study found that induction of labor at term in advanced maternal age has no significant impact on cesarean delivery rates, assisted vaginal delivery or postpartum hemorrhage .	among the cohort studies reviewed, and challenges reviewing other indicators that might necessitate induction of labor. Through meta-analysis identified significant heterogeneity with observational and RCTs included in review. Some of the clinical trials had very small sample sizes.	compared to spontaneous labor. This information is helpful when counseling patients and families about delivery options and supports the theory that induction of labor at 39–40 does not increase risk for delivery complications like stillbirth. Appreciation for the robust sample size included in the review.
Hong, J. et al. (2023), Comparison of maternal labor-related complications and neonatal outcomes following elective induction of Labor at 39 weeks of gestation vs	I	To compare elective induction with expectant Management on labor related complications in women at 29 weeks of gestation	N/A	Design: Systematic review and meta-analysis Data source: MEDLINE, Embase, Cochrane Central Library, World Health Organization, and ClinicalTrials.gov, for articles published up to December 8, 2022	Sample: - 1,625,899 women birthing singleton pregnancies, based on 14 studies. - Mix of nulliparous and multiparous women, as well as those with a high BMI or those	Maternal outcomes and neonatal outcomes comparing elective induction of labor at 39 weeks of gestation with expectant management.	- Two independent reviewers who screened titles, reviewed full text, extracted data, and assess the risk of biases - Pooled odds ratio and 95% confidence interval using a random-effects model - Subgroup analysis used to compare nulliparous to multiparous	- Nulliparous women: reduction in operative vaginal birth, macrosomia, and low 5-minute Apgar score, and emergency c-section - 7% reduction in	Strengths: Large sample size, systematic and comprehensive search, included RCTs, cohort studies and cross-sectional studies, subgroup analysis, risk bias	Overall medium strength and quality. Study included a large size with subgroups nulliparous and to multiparous women. Using mainly observational studies can affect the strength of the evidence. The

expectant management: A systematic review and meta-analysis <i>Obstetrical & Gynecological Survey, 6(5),e2313162.</i>				Research method: Studies that compared elective induction of labor 39 weeks of gestation with expectant management Instruments: Newcastle-ottawa scale and Cochrane Risk of bias	undergoing a trial of labor after a cesarean section - Setting: Various healthcare settings, such as hospitals and maternity clinics, across different countries.	For maternal outcomes it compared the likelihood of emergency cesarean section, perineal injury, postpartum hemorrhage, and operative vaginal birth For neonatal outcomes it compared the likelihood of admission to NICU, Low 5-minute Apgar, macrosomia, and shoulder dystocia. IDV: 39 weeks of gestation induced labor and expected management	women -Heterogeneity I² statistic used -Third or fourth degree perineal injury 37% reduction (OR, 0.63; CI, 0.49-0.81), -Operative vaginal birth reduction (OR, 0.87; 95% CI, 0.79-0.97) -Macrosomia 34% reduction (OR, 0.66; 95% CI, 0.48-0.91) -Low 5 minute Apgar score 38% reduction (OR, 0.62; 95% CI, 0.40-0.96) -Shoulder dystocia (among nulliparous women) increased (OR, 1.22; 95% CI, 1.02-1.46)	third or fourth degree perineal injury -Higher likelihood of shoulder dystocia compared to expectant management. - Multiparous women: reduction in cesarean section, no difference in operative vaginal birth.	assessment. Limitations: Many of the studies were observational, the potential for publication bias, and underreporting.	feasibility of implementing the studies findings into clinical practice involves consideration of the benefits versus risk of elective induction at 39 weeks as shown by the results. given the studies findings suggest possible benefit with certain risk specific to nulliparous women, implementing these findings in clinical practice would involve detailed discussion with patients about these risks and benefits, which is feasible and aligns with personalized care strategies
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						nt. DV:Maternal outcomes including emergency c-section, perineal injury specificall y third or fourth degree perineal injury, postpartu m hemorrhag e, and operative vaginal birth. Neonatal outcomes these are measured by admission to NICU care, low 5-minute Aogar score , macrosomi a, and shoulder dystocia				
Grobman, W. A., & Caughey, A. B. (2020),	I	To compare elective induction of labor at 39	N/A	-Systematic review and meta-analysis	Sample consisted of low risk nulliparous	In this study there were primary	Meta analysis, pools relative risks with 95% confidence	Cesarean delivery (26.4% vs 29.1%; RR,	Strength: comprehensive and systematic literature	Overall high strength and quality, low risk of biases, high level of

Elective induction of labor at 39 weeks compared with expectant management: A meta-analysis of cohort studies. <i>Obstetric Anesthesia Digest, 304-310</i>		weeks versus expectant management and the association with cesarean delivery and other maternal and paternal outcomes.		-PubMed, EMBASE, and the Cochrane Library were used to search keywords related to labor induction and expectant management. Studies that were eligible were then pooled relative risks with 95% confidence intervals calculated using a random effects model. The NewCastle Ottawa scale was used to evaluate the quality and risk of biases. Heterogeneity among studies was assessed using the I² statics.	women. From six cohort studies there were 66,019 women undergoing elective induction at 39 weeks and 584,390 undergoing women expected management. The setting was across the United States that involved multiple institutes including academic and Community Hospitals from different regions	and secondary outcome variables. IDV: Election induction of labor at 39 weeks. DV: Cesarean delivery, Peripartum infection, postpartum hemorrhage, 3rd or 4th degree perineal lacerations, respiratory morbidity, meconium aspiration syndrome, NICU Administration, hyperbilirubinemia, and perinatal death. These variables are related	intervals calculated using random effects model, heterogeneity among studies using I2 statistic, and public biases were evaluated using funnel plots. NNT: based on the reduction in cesarean delivery rates, it was estimated that one cesarean delivery would be avoided for every 37 women who underwent elective induction at 39 weeks. Statistical significance was set at P<0.5 and all tests were two tailed. Review manager, version 5.3 was used to perform statistical analysis.	0.83; 95% CI, 0.74-0.93; P = .002). Along with figure 2 results. Peripartum infections (2.8% vs 5.2%; RR, 0.53; 95% CI, 0.39-0.72; P < .0001). Respiratory morbidity (0.7% vs 1.5%; RR, 0.71; 95% CI, 0.59-0.85; P < .001). NICU admission (3.5% vs 5.5%; RR, 0.80; 95% CI, 0.72-0.88; P < .0001). Perinatal mortality (0.04% vs 0.2%; RR, 0.27; 95% CI, 0.09-	search, large sample size, pooled relative risks with 95% confidence intervals, use of random effects model and assessment of heterogeneity. Limitations: only observational studies, subject to confounding biases. Significant heterogeneity, greater than 75%, indicating variability in the studies results which could complicate the interpretation of the pooled data	methodological structure. Due to the high heterogeneity among the studies caution should be used in interpreting the results. The findings do align with other research including randomized control trials on this topic which helps support the reliability of the conclusion. Overall the study appears feasible, given the rigorous mythology, availability of data, and expert handling of potential biases and statistical challenges. However, the typical challenges of observational data and the need for cautious interpretation of finding in real world settings remain pertinent.
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						to elective induction of labor at 39 weeks versus expectant management beyond 39 weeks. The primary outcome is the frequency of cesarean sections. Secondary outcomes were maternal risk for peripartum infection, postpartum hemorrhage, third or fourth degree perineal lacerations. Secondary perinatal outcomes were related to		0.76; P = .01).		
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						neonates respiratory complications, meconium aspiration syndrome, and hyperbilirubinemia, NICU admissions, and perinatal death.				
Grobman et al., (2018), Labor induction versus expectant management in low-risk nulliparous women. <i>New England Journal of Medicine.</i>	II	The authors' hypothesis was that elective induction at 39 weeks gestation would lower perinatal complications compared to expectant management in low-risk nulliparous women.	N/A	Randomized control trial Low-risk, nulliparous women were randomly assigned to one of two groups: elective induction between 39 0/7 weeks and 39 4/7 weeks, and expectant management. Labors were managed per facility protocol.	This multi-center trial was conducted at 41 hospitals across the United States. There were 3059 participants assigned to the induction group, and 3037 assigned to the expectant management group.	The dependent variables were broken down into two types of outcomes: primary and secondary. Primary outcome: a composite of severe neonatal complications, including death. Secondary	Wilcoxon signed-rank test (continuous variables), chi-square, Fisher's exact tests (categorical variables), multinomial logistic regression, Cochrane-Armitage trend test. A two-tailed P value of less than 0.046 represented statistical significance. 95% confidence interval for the relative risk.	The primary outcome occurred in 4.3% of newborns in the elective induction group, and 5.4% in the expectant management group. Among other measured outcomes, the percentage of women who underwent cesarean	Strengths included the utilization of both university and community hospitals across the U.S., along with the use of various obstetrical providers. This can help prove generalizability. Given the inability to create a double-blind study, this is a limitation of	The randomized control design allows this study to have a medium strength. Inability to create a double blind trial can increase the risk for bias. It is feasible to implement elective induction of labor into practice as long as the mother agrees and the unit can make accommodatio

						outcome: numerous perinatal complications, including the indication for cesarean delivery. Independent variables include the management of labor: expectant management or elective induction of labor.		delivery (secondary outcome) was significantly lower in the induction group than in the expectant-management group (18.6% vs. 22.2%; relative risk, 0.84; 95% CI, 0.76 to 0.93; P<0.001)	the trial as it could increase the risk for biases.	ns. Elective induction of labor at 39 weeks could be recommended to mothers in the clinic setting with informed consent.
Miller et al. (2015), Elective induction of labor compared with expectant management of nulliparous women at 39 weeks of gestation: A randomized controlled trial	II	To compare elective induction of labor at 39 weeks of gestation to expectant management in nulliparous women in terms of cesarean delivery rates, maternal and neonatal outcomes.	N/A	Randomized controlled trial For the randomized control blinding effect, a computer-generated list of random numbers was developed and concealed. After the participant completed enrollment, the envelopes containing numbers were opened and used	Setting: At a tertiary care medical center serving active-duty, beneficiaries of active-duty and retired military personnel. *916 patients were assessed for study eligibility and 162 were enrolled. The sample included	The study group was induced within 1 week of enrollment but not before 39 0/7 weeks of gestation. The control group continued routine prenatal care with	SPSS Statistics 17.0.0 was used for analysis. a two-tailed test with level of 0.05 and 80% power was also used.. The Student t test and the Fisher’s exact test were used to analyze normally distributed continuous data and categorical data. The cesarean delivery rate in the induction of labor group was 30.5% (25/82) compared	No statistical significance and difference in the rate of cesarean delivery (RR 1.72, 95% CI 0.97–3.06) between elective labor induction and expectant management	Strengths: Randomized design, standardization of labor management, the a priori power calculation, and intent-to-treat analysis. Limitations with design to only to detect the twofold difference and large	This RCT was high in strength of design and the results were supported with statistical significance. The exclusion of certain populations, where most of the participants were primarily young and Caucasian, English-speaking with

<i>The American College of Obstetricians and Gynecologists</i> , 126(6), 1258-1264.				to assign study number to patient.	women who were at least 18 years old, nulliparous, single gestation, and between 38 0/7 and 38 6/7, and a Bishop score of 5 or less. The sample was randomized into groups that were elective induction of labor or expectant management.	admission for labor or obstetric indication. Independent Variable: Induction of labor in nulliparous women at 39 weeks with an unfavorable cervix. Dependent variable: Cesarean rates	with 17.7% (14/79) in the expectant management group (relative risk, 1.72; 95% confidence interval, 0.96–3.06).	nt at 39 weeks of gestation using a standardized induction protocol compared with expectant management	difference in cesarean delivery rate between induction and expectant management. Difference in criteria for “arrest orders” and guidelines that outline induction practices.	similar baseline characteristics between groups may limit the generalizability of the results. The homogeneity of the study sample and uniqueness of the military-case setting impact the feasibility of this study.
Kim, H. I., et al., (2019) Benefits and risks of induction of labor at 39 or more weeks in uncomplicated nulliparous women: a retrospective, observational study <i>Obstetrics & Gynecology Science</i> , 62(1), 19-26.	IV	The purpose of the study was “to critically compare the benefits and risks of labor induction versus spontaneous labor in uncomplicated singleton gestations at 39 or more weeks of gestation and to evaluate whether induction of labor at full	N/A	Retrospective observational study conducted between January 1, 2011 and November 30, 2017 of 237 nulliparous women who were at 39 or more weeks of a singleton pregnancy given the choice between induction and spontaneous labor/Bishop’s score, cervical	Took place between January 1, 2011 and November 30, 2017 at the National Health Insurance Service Ilsan Hospital in the Republic of Korea. Total sample: 237 women Expectant group: n=73 Induction group: n=164	Independent variable: Induction of labor Dependent variable: Cesarean section rate Cesarean section rate, decrease in Hgb after delivery, Time from admission to delivery,	Demographic and clinical characteristics were compared between women with and without induced labor using Student’s t-test for continuous values and the χ^2 test or Fisher’s exact test for categorical values. Odds ratios obtained for successful vaginal delivery using a logistic regression model. All P-values were 2-tailed, and $P < 0.05$	Among all women, 199 (84.0%) delivered vaginally. 38 women (16.0%) required Cesarean delivery. The spontaneous labor group and induced labor group had a similar incidence of Cesarean	Limitations: small sample size for generalizability, induction group larger than the expectant group. Strengths: ability to obtain complete records from a single institution with a uniform protocol for analysis, assessments	Overall medium strength and quality article due to being a level IV LOE and electronic medical record review, including clearly defined methods and low risk of bias. Strengths and limitations clearly outlined. Findings of this study Help to support the PICO question

		term in low-risk women reduces the risk of composite maternal and perinatal morbidity.”		exam, ultrasound, oxytocin, prostaglandinE 2, fetal monitoring with cardiotocography, electronic health records.		Delivery within 12 hours, Length of Stay, Apgar Score (AS) at 1 min, AS at 5 min, AS at 5 min, NICU admission, meconium - stained amniotic fluid, an intubation	was considered statistically significant. All analyses were performed using the Statistical Package for Social Sciences, version 23.0. OR: Bishop score- 1.619, cervical length- 0.913 95% CI: Bishop score- 1.308- 2.005, Cervical length- 0.872- 0.955 P-value: bishop score- <0.001, cervical length- <0.001	delivery (17.7% vs. 12.3%, P=0.300). The length of stay and blood loss during delivery were also similar between the groups (all P>0.05). Neonatal outcomes, the rate of meconium-stained amniotic fluid, Apgar score <7 at 5 minutes, and intubation rate were similar between the groups (all P>0.05). Neonatal intensive care unit admission rate was significantly lower in the induction group than in the spontaneous labor	performed by 1 expert, exclusion of women who would likely undergo cesarean delivery from the start of the study which gave the ability to adjust the bias of the cesarean delivery rate to favor the control group.	formulated for this research.
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								group (P=0.001).		
Sinkey, R. G., et al., (2019) Elective induction of labor in the 39th week of gestation compared with expectant management of low-risk multiparous women <i>Obstetrics & Gynecology</i>	IV	To evaluate maternal and fetal outcomes in low-risk multiparous women who underwent elective induction at 39 weeks gestation, compared to those who were expectantly managed.	N/A	Retrospective cohort study A perinatal database search was conducted to view low-risk multiparous women who delivered between 39 0/7 and 42 6/7 weeks gestation. Data was taken from the electronic medical record between the years 2014 to 2018. Elective inductions were managed per protocol.	This was a single-center study conducted at the University of Alabama at Birmingham Hospital. Induction of labor, n= 453 Expectant management, n= 2,174. Women in the elective induction group were delivered between 39 0/7 and 39 4/7 weeks gestation. Women who delivered between 39 5/7 and 42 6/7 weeks gestation were assigned to the expectant management group.	Comparison groups included elective induction and expectant management (independent variables) Dependent variables were classified in two categories: <i>primary</i> and <i>secondary</i> outcomes Primary outcomes: death, the need for neonatal respiratory support, 5 minute APGAR scores, and prevalence shoulder dystocia. Secondary outcomes:	Differences between groups were compared using the χ^2, Fisher exact test (categorical variables), the <i>t</i>-test, or Wilcoxon rank sum test (continuous variables). <i>P</i> values less than 0.05 were considered statistically significant. Multivariable logistic regression models were also utilized.	Elective induction of labor was associated with decreased frequency of the “perinatal composite morbidity” (4.0% vs. 7.1%; aOR 0.57, 95% CI, 0.34-0.96). Additionally, induction of labor resulted in fewer cesarean deliveries (5.1% vs. 6.6%; aOR 0.60, 95% CI 0.37-0.97). Other outcomes were not different between groups.	Strengths: Robust cohort, inductions were managed by strict national guidelines and facility protocols. Limitations: This study was limited to a single-center. Different facilities can have different protocols, different populations, and different practicing providers. Additionally, the retrospective design may not have captured all possible indications for induction of labor.	Overall, the strength of this study was medium, given the limitation of it being a single-center retrospective trial. However, findings of this trial are similar to other studies, which can support their conclusions.

						cesarean delivery, chorioamnionitis, preeclampsia, operative vaginal delivery, neonatal birth weight and macrosomia, NICU admission, and triage/office visits at more than 39 weeks gestation.				
Cozzi-Glaser, G. D., et al., (2024) Outcomes in low-risk patients before and after an institutional policy offering 39-week elective induction of labor <i>The Journal of Maternal-Fetal & Neonatal</i>	IV	To compare the rates of cesarean sections among women who were electively induced before, during, and after a policy change and the ARRIVE trial.	N/A	A retrospective cohort study of all low-risk nulliparas and multiparas delivering at greater than or equal to 39 weeks' estimated gestational age (GA) at a single center from January 2012 to December 2021. Inclusion criteria: viable, singleton pregnancy, > 39	A single tertiary-care center 19,849 total deliveries between 2012 to 2021; 10,758 patients met criteria, pre-eIOL: n=2521 (23.4%) (before policy and trial), during-eIOL: n=5410 (50.3%) (during trial), and post-eIOL: n=2827 (26.3%)	The primary outcome: cesarean birth, secondary outcomes: select maternal morbidities (e.g. chorioamnionitis, operative delivery, postpartum hemorrhage) and neonatal morbidity	For binary outcomes, crude odds ratios (ORs) with 95% confidence intervals (CIs) were estimated using logistic regression with pre-eIOL as the referent group. All primary analyses were performed using SAS 9.4 and outcomes were evaluated at a 0.05 level of significance without adjustment for multiple comparisons.	Cesarean birth: 15.3% of the post-eIOL patients and 17.5% of pre-eIOL patients, (OR 0.85 [0.74-0.99]). The odds of cesarean delivery remained lower among the post-eIOL group after adjustment	Limitations: retrospective approach, using coded electronic extraction as opposed to detailed chart review, lack of indications for cesarean deliveries, no data on specific labor induction or augmentation, and conducted at a single center. Strengths: large and	Overall medium strength and quality. The study was thorough with their method of obtaining information but some information is missing including indications for cesarean sections and a comparison group to assess if cesarean section rate was higher

<i>Medicine</i>, 37(1), 2295223				0/7 weeks, low-risk, and no medical/fetal indication for early induction. Exclusion criteria: high-risk, indication for delivery prior to 39 weeks, and any other health conditions that could affect pregnancy or labor. Institutional Review Board approval (#300001415) was obtained in May 2022 prior to the study initiation. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cohort studies were followed	(after policy and trial)	s (e.g. birth weight, small- and large-for gestational age, hypoglycemia).		(aOR 0.83 [95% CI 0.72–0.96] post-eIO: higher odds of chorioamnionitis (OR 1.61 (1.24–2.10)), OVD (OR 2.84 (2.03–3.98]), and hemorrhage (OR 1.73 [1.39–2.15]) compared to pre-eIOL	diverse cohort, adjustment for specific baseline characteristics reduced the risk of confounding, and ability to perform additional analyses by labor type and parity.	among inductions vs. an expectant group. With the study being retrospective in nature there is a higher chance of bias.
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