Maternal and Neonatal Complications of Elective Early-Term Deliveries

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Abstract

Approximately 10% to 15% of all deliveries in the United States are performed before 39 completed weeks of gestation without a true medical indication for early delivery, despite long-standing recommendations against this practice. Early-term deliveries are those that occur between 37 0/7 and 38 6/7 weeks. It is now recognized that maternal and neonatal complications have increased for deliveries that occur at early- vs late-term gestation. The reasons for the increase in the rate of elective early-term deliveries are unclear but likely involve both patient and physician factors. Various strategies have been used to increase awareness of the morbidities associated with the practice of elective early-term delivery and to reduce its frequency. Insurers and quality accrediting agencies are increasingly holding hospitals accountable for their rates of elective early-term deliveries, and this pressure will likely continue to lead to widespread change in the practice of obstetrics. The interventions to increase adherence to evidence-based medicine guidelines that are described within this review may also be applicable to other areas of medicine.

For more than 3 decades, the American Congress of Obstetricians and Gynecologists (ACOG) has advocated against performing elective deliveries before 39 completed weeks of gestation.1 Historically, a term pregnancy has been defined as one in which 260 to 294 days have passed since the last menstrual period.2 The estimated date of delivery, or “due date,” is set at 40 weeks beyond the last menstrual period. Thus, a term pregnancy is one that occurs at 37 weeks or later. Early-term deliveries are those that occur between 37 0/7 and 38 6/7 weeks of gestation.3 In contrast, a preterm delivery occurs at less than 37 0/7 weeks of gestation; this category is subdivided into early (< 34 0/7 weeks) and late (34 0/7 to 36 6/7 weeks).
weeks) preterm deliveries. Postterm deliveries occur at 42 weeks or greater. Although the potential morbidities associated with preterm and postterm deliveries are well known, little attention has been paid to neonatal outcome across the spectrum of term gestation. It is now recognized that substantial differences exist in the maternal and neonatal outcomes of neonates delivered at early- vs late-term gestation.

Despite the long-standing position of the ACOG against elective early-term delivery, the rate of nonmedically indicated early-term deliveries has remained high in the United States, peaking at approximately 18% of all deliveries in 2010. At present, it is estimated that 10% to 15% of all deliveries in the United States are performed before 39 completed weeks of gestation without a solid medical indication. Compared with deliveries that are performed between 39 and 40 weeks of gestation, early deliveries are associated with increased maternal and neonatal complications (Table). In April 2013, the ACOG reiterated its recommendation and released 2 committee opinions that address the growing problem of nonmedically indicated early-term delivery, also known as elective early-term delivery.  

FETAL/NEONATAL RISKS

Morbidity and mortality rates are higher for early-term neonates than for those delivered at 39 weeks or later. Babies born at less than 39 weeks of gestation have higher neonatal mortality rates (adjusted odds ratio [OR] at 37 weeks, 1.9; 95% CI, 1.6-2.2; and adjusted OR at 38 weeks, 1.4; 95% CI, 1.2-1.6) than do 39-week babies, even after adjusting for pregnancy complications that may result in early delivery. There is also clear evidence that neonates born at 37 to 38 1/2 weeks of gestation have higher rates of respiratory morbidity than do those born later. The risk of respiratory distress at 37 weeks is thrice that at 39 weeks. These neonates also have higher rates of transient tachypnea of the newborn, pneumonia, ventilator requirement, and oxygen and surfactant use, with a composite respiratory morbidity frequency of 9.4% at 37 weeks vs 4.7% at 39 weeks of gestation. The presence of fetal lung maturity (FLM), as confirmed by amniocentesis, was often a reassurance that substantial morbidity was unlikely, but recent work has revealed that other organ systems may not be fully mature. Despite a positive FLM profile, early-term neonates are at higher risk of suspected or proven sepsis (5.3% vs 3.5% after 39 weeks), feeding difficulties (1.5% vs 0.4%), hyperbilirubinemia (9.2% vs 1.2%), and hypoglycemia (17.1% vs 5.7%). According to the ACOG, evidence of FLM via amniocentesis is insufficient justification for early delivery in the absence of other clinical indications.

The neonatal brain is particularly sensitive to the effects of early delivery. Cerebral palsy is 1.9 times higher at 37 weeks and 1.3 times higher at 38 weeks than at 39 to 41 weeks. Even within the range of normal developmental outcomes, each additional week of gestation confers an increase in scores for the Mental Developmental Index (0.8 points) and the Psychomotor Development Scale (1.4 points) in the Bayley Scales of Infant Development, a standardized series of measurements to assess the motor, language, and cognitive development of children aged 0 to 3 years. These increases persist even after adjusting for birth weight and socioeconomic status. Large population-based studies have also suggested a direct correlation between additional intrauterine gestation through 40 weeks, IQ, and school performance. These outcomes are likely related to the marked increase in both gray
matter development and white matter myelination that occurs in the rapidly growing third-trimester fetal brain.12,13

Because of these increased morbidities, elective early-term delivery results in higher rates of neonatal intensive care unit (NICU) admissions: from 17.8% at 37 weeks to 8.0% at 38 weeks vs a baseline risk of 4.6% at 39 weeks or later.5 Furthermore, early-term infants have longer durations of hospital stay at birth, increased rates of rehospitalization within the first year of life, and higher emergency department use.15

In addition to the aforementioned findings, the ACOG acknowledges that there are justified medical indications for late-preterm or early-term deliveries. These indications include certain hypertensive disorders (preeclampsia, eclampsia, and gestational hypertension or complicated chronic hypertension), other maternal medical conditions (poorly controlled pregestational or gestational diabetes, pregestational diabetes with vascular disease, and cholestasis of pregnancy), placental abnormalities (placenta previa or accreta and abruption), known fetal complications (growth restriction, multiple gestation, congenital malformations, alloimmunization with fetal effects), amniotic fluid abnormalities (oligohydramnios, premature rupture of membranes, and chorioamnionitis), or previous classic cesarean section or fibroid operation.3 In its most recent committee opinion that addresses early-term deliveries, the ACOG warns that avoidance of nonmedically indicated early-term deliveries before 39 weeks of gestation should not be accompanied by an increase in the expectant management of patients with genuine indications for earlier delivery. Thus, management decisions should balance the risks of prolonging the pregnancy with those associated with early-term delivery.3

MATERNAL RISKS
Maternal complications of elective early-term delivery include longer labors, more interventions during labor, and higher rates of cesarean delivery.16,17 Induction of labor may be prolonged if the cervix is unfavorable, that is, has not softened and begun to dilate as normally occurs before spontaneous labor. During labor, invasive internal fetal monitoring is used more often in women undergoing elective induction than in women at low risk for complications with spontaneous labor at term (relative risk [RR], 2.25; 95% CI, 2.2-2.92).18 The rates of instrumental deliveries (forceps and vacuum) have also been reported to be higher in electively induced vs spontaneous labors (OR, 1.2; 95% CI, 1.09-1.32).17 Prolonged labor is also associated with an increased risk of uterine infection and postpartum hemorrhage (PPH) due to uterine atony.17 Approximately 80% of cases of PPH are attributed to prolonged labor.19 Furthermore, PPH is associated with the induction of labor even when confounding factors are removed.20

Elective induction is also correlated with an overall increased risk of cesarean delivery (OR, 1.89; 95% CI, 1.12-3.18).17 In one cohort of more than 1100 women with low-risk, singleton-term pregnancies, there was a 3-fold increased risk of cesarean delivery for nulliparous women with induced labor vs nulliparous women with spontaneous labor (17.5% vs 6.0%; RR, 2.9; 95% CI, 1.6-5.2).21 For parous women, there was a 2-fold increase in cesarean deliveries for women who underwent induction compared with those who did not.21 Long-term sequelae of cesarean delivery may be underappreciated. After cesarean delivery, the incidence of adhesion formation in the abdomen is 25.6%, which may increase the operative time for future cesarean deliveries or hysterectomy by up to 1 hour.22 The uterine scar at the hysterotomy site places women at risk for uterine rupture with future pregnancies, although the overall incidence is small (<1%). The risk of abnormal placentation in subsequent pregnancies is also increased. An abnormal attachment of the placenta to the endometrium (placenta accreta) or invasion into (intra) or through (percreta) the muscular wall of the uterus can cause serious medical and surgical complications. The most common abnormality, placenta accreta, has an RR of 1.3 (95% CI, 0.7-2.3) during the second cesarean delivery and an RR of 2.4 (95% CI, 1.3-4.3) during the third.18 In many circumstances, placenta accreta is identified at the time of attempted manual separation of the placenta from the uterus. Part, or all, of the placenta remains attached, and no clear plane of separation can be identified. In the most serious circumstance, placenta percreta, an invasion of placental vessels through the uterus and into adjacent structures such as the bladder, can
occur. Profuse, life-threatening bleeding may result; poorly controlled hemorrhage related to abnormal placentation is the indication for nearly two-thirds of peripartum hysterectomies. Other potential sequelae include disseminated intravascular coagulopathy, adult respiratory distress syndrome, renal failure, unplanned operation, and maternal or fetal death. A review of 109 cases of placenta percreta reported 10 cases of fetal death and 8 cases of maternal death.

**EVOLUTION OF THE PROBLEM**

The reasons for the increase in the rate of elective early-term deliveries are unclear. Some women may want to schedule delivery during a time that is convenient for themselves or family members or push for delivery to relieve symptoms associated with late pregnancy. Obstetricians may suggest elective induction of labor for their own convenience or perceived liability concerns, such as risk of stillbirth during late gestation. However, the evidence does not support a benefit to these practices. Furthermore, despite the long-standing opinion of the ACOG against elective early-term deliveries, many obstetricians feel that the ACOG’s stance is unwarranted, citing opposition to policies limiting elective early-term deliveries owing to loss of autonomy in determining the timing of delivery. Other experts cite normalization of deviance—a term describing an unsound practice that persists owing to anecdotally favorable outcomes—as a reason for nonadherence with the ACOG recommendations. For example, if an obstetrician performs 200 annual deliveries and 10% of them are elective early-term deliveries, it is estimated that only 2 neonates per year would require NICU admission. Because the obstetrician does not provide care to the neonate in the NICU, he or she may be unaware of immediate and long-term morbidity, and over time, lack of awareness of the sequelae of his or her actions, combined with the generally favorable outcome for most of the early-term neonates, may cause a behavioral drift to an unsafe practice in the individual obstetrician.

Patients may also be unaware of risks associated with early-term deliveries or lack knowledge of when it is safe to deliver a baby. One study of 650 women who recently delivered a baby examined their understanding of what constituted a term pregnancy and the gestational age at which delivery is safe in an otherwise healthy pregnancy. Half of the respondents believed that a full-term pregnancy occurred at 37 to 38 weeks, with the remainder divided equally into believing that a term pregnancy occurred at 34 to 36 and 39 to 40 weeks. When queried about the earliest point in a pregnancy when it is safe to electively deliver a baby, half of the women chose 34 to 36 weeks, 41% chose 37 to 38 weeks, and less than 10% chose 39 to 40 weeks of gestation.

**STRATEGIES TO DECREASE RATES OF ELECTIVE EARLY-TERM DELIVERIES**

In 2007, the March of Dimes initiated a pilot campaign called “Healthy Babies Are Worth the Wait” that was directed at women and health care professionals to reduce early deliveries. The primary message was simple: If a pregnancy is progressing normally and without any complications, it is best to wait for labor to begin on its own, rather than scheduling an earlier induction of labor or a cesarean section. In 2012, the program was expanded as part of the “Strong Start for Mothers and Newborns” initiative of the Department of Health and Human Services, which is a public-private partnership and awareness campaign to reduce the rate of elective early-term deliveries and improve outcomes for pregnant women and newborns.

Hospitals have used various approaches to decrease the number of nonmedically indicated early-term deliveries, including implementation of “hard-stop” policies that prohibit this type of delivery at the hospital level. Physicians are not allowed to schedule elective inductions of labor or primary or repeated cesarean sections before 39 weeks. The policy is enforced by designated hospital staff who are empowered to refuse to schedule such deliveries, and questionable indications for delivery are triaged via a chain of command. Hard-stop policies have been found to reduce the rate of nonmedically indicated early-term deliveries by more than three-quarters (from 8.2% to 1.7%; \( P = .007 \)). Programs educating physicians and patients about the risks associated with early-term deliveries have also been used but with less dramatic reductions (from 10.9% to 6.0%; \( P = .12 \)).

One large retrospective cohort study examined outcomes in 27 hospitals (encompassing >220,000 annual deliveries) before and after the implementation of strategies to reduce
elective early-term deliveries. Three strategies were compared: a “hard-stop” approach that prohibited all elective deliveries at less than 39 weeks (including repeated cesarean sections), a “soft-stop” approach in which adherence was left to individual physicians but any elective delivery performed at less than 39 weeks was subjected to peer review and possible disciplinary action, and finally, an education-only program in which physicians were given information about risks of early-term deliveries and professional association recommendations against the practice. The adoption of any strategy reduced the rate of early-term deliveries by more than half: from 9.6% to 4.3% of all deliveries ($P<.001$).27 However, among the 3 strategies, the hard-stop approach was the most effective, reducing elective early-term deliveries from 8.2% to 1.7% ($P=.007$). During this time frame, the system-wide rate of term newborn NICU admission decreased from 8.9% to 7.5% ($P<.001$), with no change in the rate of stillbirths.

The Ohio Perinatal Quality Collaborative, a consortium of more than 20 hospitals, Ohio Medicaid, and other stakeholders, used various interventions to shift nearly 21,000 deliveries from 36 to 38 weeks of gestation to 39 to 40 weeks over the course of 3 years (2008-2011). Nearly half of the deliveries involved women enrolled in Medicaid. Elective early-term deliveries for Medicaid-insured women were reduced from 10% to 7%, whereas the rate of elective early-term deliveries for privately insured women decreased from 13% to 6.5%. Compared with the baseline period, the initiative resulted in approximately $10 million in annual savings for maternity care. Neonatal intensive care unit admissions were reduced by 621 cases, a 3% reduction, during this interval. Savings from avoided NICU admissions alone were estimated to be $24.8 million.28

Insurers, oversight organizations, and government health care programs have taken notice. Both the National Quality Forum and the Joint Commission have included the rate of elective early-term deliveries as perinatal quality benchmarks. In 2011, the Texas Medicaid program stopped reimbursing physicians for performing early deliveries without a medical indication. South Carolina adopted a similar program in 2013; other states are considering the same action. In January 2013, UnitedHealthcare, the largest private health insurer in the United States, began paying hospitals more if they take steps to limit elective early-term deliveries and report a decrease in their rates. As of July 2013, Medicaid will require hospitals to report their rates of elective early-term deliveries, with possible penalties beginning in 2015 for institutions whose rates remain high. Reducing the rate of elective early-term deliveries to 5% or less has been suggested by many experts to be a reasonable goal.

**CONCLUSION**

Nonmedically indicated early-term deliveries are associated with increased risk of maternal and neonatal complications. Morbidity and mortality rates have increased for neonates delivered during the early-term period compared with those delivered at 39 to 40 weeks of gestation. Improving maternal and neonatal outcomes is a high priority for many health care organizations, including insurers, state Medicaid programs, and professional societies. Adoption and enforcement of policies to decrease the rate of elective early-term deliveries may reduce the frequency of these deliveries and, in turn, improve maternal and neonatal outcomes. National quality benchmarks of 5% or fewer elective early-term deliveries may be a reasonable and attainable goal. Educational campaigns targeting pregnant women and their health care professionals may be helpful to raise awareness of complications of early-term deliveries and to increase adherence to recommendations to limit these deliveries.

**Abbreviations and Acronyms:** ACOG = American Congress of Obstetricians and Gynecologists; FLM = fetal lung maturity; NICU = neonatal intensive care unit; OR = odds ratio; PPH = postpartum hemorrhage; RR = relative risk

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**REFERENCES**


