OBJECTIVE: Nonmedically indicated (elective) deliveries before 39 weeks of gestation result in unnecessary neonatal morbidity. We sought to determine whether implementation of a process improvement program will decrease the rate of elective scheduled singleton early-term deliveries (37 0/7–38 6/7 weeks of gestation) in a group of diverse community and academic hospitals.

METHODS: Policies and procedures for scheduling inductions and cesarean deliveries were implemented and patient and health care provider education was provided. Outcomes for scheduled singleton deliveries at 34 weeks of gestation or higher were submitted through a web-based data entry system. The rate of scheduled singleton elective early-term deliveries as well as the rates of early-term medically indicated and unscheduled deliveries, neonatal intensive care unit admissions, and singleton term fetal mortality rate were evaluated.

RESULTS: A total of 29,030 scheduled singletons at 34 weeks of gestation or higher were delivered in 26 participating hospitals between January 2011 and December 2011. Elective scheduled early-term deliveries decreased from 27.8% in the first month to 4.8% in the 12th month (P<.001); rates of elective scheduled singleton early-term inductions (72%, P=.029) and cesarean deliveries (84%; P<.001) decreased significantly. There was no change in medically indicated or unscheduled early-term deliveries. Neonatal intensive care unit admissions among scheduled early-term singletons decreased nonsignificantly from 1.5% to 1.2% (P=.24). There was no increase in the term fetal mortality rate.

CONCLUSION: A rapid-cycle process improvement program substantially decreased elective scheduled early-term deliveries to less than 5% in a group of diverse hospitals across multiple states.

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LEVEL OF EVIDENCE: III

For more than 30 years, the American College of Obstetricians and Gynecologists has published guidelines that encourage health care providers to wait until at least 39 weeks of gestation to perform a nonmedically indicated (elective) delivery.1 Because inductions and cesarean deliveries have increased over time, the need to reduce the increasing number of elective...
Various health and safety organizations have recently designated elective deliveries before 39 weeks of gestation as a key quality indicator for obstetric care. Moreover, the March of Dimes has worked with its national and local partners to focus on reducing early elective deliveries. Successful programs to reduce elective deliveries before 39 weeks of gestation have been reported by the Intermountain Health Care System in Utah, Magee Women’s Hospital in Pittsburgh, Hospital Corporation of America, and the Ohio Perinatal Quality Collaborative. However, we have not found evidence that programs developed by these institutions have been widely replicated in hospitals across the United States.

Incentives to promote lowering the rates of early-term elective deliveries include better birth outcomes, public perception of hospital as a model for patient safety, reduced risk of litigation, quality standards, and reimbursement policies. Challenges such as gaining physician support for policy changes and handling patient preferences on delivery type and timing have precluded many hospitals from successfully implementing quality improvement programs to reduce elective early-term deliveries. The objective of this national demonstration effort was to see whether a collaborative process improvement program could be effective in decreasing elective deliveries before 39 weeks of gestation in a group of diverse hospitals.

MATERIALS AND METHODS

Started in 2007, the Big 5 State Prematurity Initiative is a collaborative of perinatal quality improvement advocates from state health departments, academic health centers, public and private hospitals, and March of Dimes chapters. Its objective is to work together on initiatives aimed at reducing preterm births and included representatives from the five most populous states: California, Florida, Illinois, New York, and Texas, which accounted for 38% of all births in the United States in 2010. The collaborative chose to undertake a quality improvement program to decrease singleton elective deliveries less than 39 weeks of gestation as its first project. Our project was reviewed by Loma Linda University’s institutional review board and considered not to meet the definition of human subjects’ research and exempt from review.

Twenty-six hospitals from the five states were selected through a competitive request for proposal and interview process. Hospitals with established policies or procedures to eliminate early elective inductions or cesarean deliveries were excluded from the interview process. Selected hospitals entered into a formal cooperative agreement with the March of Dimes and were provided a financial stipend to support implementation of the program. For a list of participating hospitals, see Appendix 1 available at http://links.lww.com/AOG/A370. The program started in September 2010 and concluded in February 2012.

Each hospital was required to compose a quality improvement team consisting of a physician champion, nursing leader(s), scheduler, and quality improvement staff member. A day-long session was held in each state in October 2010 to train hospital quality improvement teams on a standardized implementation process conducted by one of the authors (B.T.O.) to provide continuity in the training process. The hospital teams were given copies of the Elimination of Non-medically Indicated (Elective) Deliveries before 39 Weeks Gestational Age Toolkit to use as the implementation resource guide. Training included implementation guidelines and strategies to: 1) establish hospital policies and procedures regarding scheduling guidelines for inductions of labor and scheduled cesarean deliveries; 2) institute a standard induction and cesarean delivery scheduling form (see Appendix 2 available at http://links.lww.com/AOG/A371), which included specific medical indications for deliveries before 39 weeks of gestation; 3) implement a policy that included a “hard stop” physician approval process. Scheduled deliveries before 39 weeks of gestation without a listed medical indication were reviewed by a nurse and referred to physician leadership if necessary; 4) conduct professional educational opportunities, including Grand Rounds and other educational forums for medical and nursing staff; and 5) provide patient education in the hospitals and physicians’ offices using March of Dimes brochures and posters to teach women about the importance of a term delivery.

From January through December 2011, deidentified data for each singleton delivery scheduled for 34 weeks of gestation and higher were submitted monthly to the March of Dimes Perinatal Data Center through a web-based data entry system. Hospital staff entered data on the scheduling and outcome of each delivery, including the intended route of delivery, scheduled delivery date, gestational age at scheduling, gestational age confirmation method, the medical or elective indication for scheduling, presence of labor at time of delivery for cesarean delivery, actual delivery date, type of delivery, admission of neonates to a neonatal intensive care unit (NICU) or special care nursery, and fetal death. Gestational age at scheduled delivery date was assigned by the clinician based on the best clinical estimate. Fetal deaths were clinically defined as deliveries with 1- and 5-minute Apgar
scores equal to zero and not resuscitated. The total number of singleton live births and fetal deaths by gestational age and by month were also provided by hospital staff for 2010 and 2011.

Monthly and quarterly reports on elective early-term deliveries were provided to each hospital. Reports also provided comparisons to the aggregate rates for the network. Hospitals were encouraged to share the reports with their colleagues at department meetings. Additionally, monthly conference calls were conducted with the hospitals to discuss issues regarding implementation and to collectively share ideas and methods that were helpful in overcoming obstacles in the implementation process.

Hospital quality improvement teams were surveyed before program implementation and at program end to collect information on hospital characteristics and to assess hospital and health care provider policies and practices. These author-developed descriptive surveys were pilot-tested during the implementation phase with staff from participating hospitals.

Inductions were defined as all attempted inductions regardless of birth outcomes, including vaginal and cesarean deliveries. Gestational age at delivery was calculated as the gestational age at the scheduled date plus or minus the difference in the number of days between the scheduled date and the delivery date. Elective deliveries were determined as a scheduled delivery without a reported medical or obstetric indication. An unscheduled delivery was determined as one that was either not scheduled or the patient presented with spontaneous labor or rupture of membranes.

The early-term (37 0/7–38 6/7 weeks of gestation) elective delivery rates were calculated using two different denominators to measure effect narrowly (all early-term scheduled singleton deliveries) and more broadly (all term singleton deliveries at least 37 weeks of gestation). Other outcome rates for deliveries including early-term medically indicated deliveries, early-term unscheduled deliveries, and NICU or special care admissions among early-term scheduled deliveries were calculated using the latter denominator. Fetal mortality rates were calculated as fetal deaths at 37–41 weeks of gestation divided by all singleton deliveries 37–41 weeks of gestation multiplied by 1,000.

Of the 26 hospitals that were initially accepted in the hospital network, results are provided for 24 hospitals. One hospital was neither able to implement the initiative nor submit data. Two hospitals joined the hospital network as a single reporting unit and are reported as a single hospital, except in Appendix 3, where their responses are analyzed and presented separately, each with a weight of 0.5.

Analyses were performed using SPSS 15.0.1 and SAS 9.3.1. Statistically significant differences were determined at a $P$ value of .05. $\chi^2$ and paired $t$ tests were used to test differences in proportions in hospital responses to the preimplementation and project end hospital surveys. For analyses based on individual delivery records, scheduled singleton nonmedically indicated early-term deliveries by month and delivery type were evaluated for linear trend using binary logistic regression (proc surveylogistic in SAS) accounting for clustering of observations by hospital. Quarterly differences in rates of early-term nonmedically indicated, medically indicated, and unscheduled deliveries, NICU admissions, and singleton term fetal mortality were evaluated using Rao-Scott $\chi^2$ tests using proc surveyfreq in SAS accounting for hospital cluster effect.

RESULTS

Hospital characteristics are presented in Table 1. In 2010, a majority of the 24 study hospitals were nonprofit (75.0%) with an annual delivery volume between 2,000 and 4,999 deliveries (62.5%), designated as a Level III perinatal care facility (70.8%), and located in a large metropolitan county (66.7%). Study hospitals were more likely to have 50% or greater of their deliveries paid for by Medicaid (50.0%), have overall cesarean delivery rates less than 40% (68.2%), and overall induction rates less than 30% (54.6%). Singleton deliveries at participating hospitals totaled 66,282 in 2010.

Almost all participating hospitals were able to fully implement the quality improvement strategy, including the recommended hospital policy changes. Written policies were adopted in almost all hospitals (91.5%) and formal scheduling guidelines were in place in all hospitals by the end of the program period (see Appendix 3 available at http://links.lww.com/AOG/A372). Additionally, hospital quality improvement teams reported increased consistency among health care practitioners in determining medical and nonmedical indications and increased nurse empowerment to question those determinations ($P<.001$).

There were 29,030 scheduled singleton deliveries at 34 weeks of gestation or higher of which 20.2% were early-term deliveries ($n=5,865$). Elective early-term singleton scheduled deliveries decreased over the 12-month period (Fig. 1). Among all scheduled early-term singleton deliveries, elective deliveries decreased from 27.8% to 4.8% ($P<.001$). Inductions Elective inductions decreased 72% from 9.5% to 2.7% ($P=.029$), and elective cesarean deliveries decreased 84% from 43.5% to 7.1% ($P<.001$).
Substantial hospital variation in effectiveness was seen even when the first quarter elective delivery rates were taken into account (data not shown). Hospitals with higher first quarter rates of elective early-term deliveries (10% or more) experienced a larger reduction in the rate of elective deliveries compared with those hospitals with the lowest first quarter rates (less than 10%; Table 2). Neither the identified hospital characteristics (Table 1) nor the hospital survey responses on implementing the quality initiative explained the overall hospital variation in improvement. Among participating hospitals with an elective early-term delivery rate of 10% or greater in the first quarter, four hospitals experienced no or little improvement in their rate by the fourth quarter. Three of these four hospitals had a written early elective delivery policy and adhered to a written scheduling procedure. All four hospitals reported that their policies were successful or very successful in achieving compliance among health care practitioners. Two of these hospitals were not able to implement a hard stop policy and the remaining two did not implement such a policy until the second quarter.

To examine whether the decrease in elective early-term scheduled deliveries was the result of a shift in reporting classification from nonmedically to medically indicated or unscheduled, we examined outcomes for all singleton term deliveries (n=58,001). Again, a reduction was seen from 2.2% scheduled elective early-term deliveries among 13,649 term singleton deliveries in the first quarter to 0.6% in the fourth quarter (P<.001) (Table 3). Reductions were seen in both inductions of labor and cesarean deliveries. However, there was no significant change in medically indicated scheduled early-term deliveries and unscheduled early-term deliveries during the program period. The combined effect of these trends was that the overall percentage of all early-term deliveries...
decreased from 30.5% in the first quarter to 28.9% in the fourth quarter ($P = .002$).

We did not see any difference in the singleton late preterm birth rate (6.7% in both the first and fourth quarters). Neonatal intensive care unit admissions related to scheduled singleton early-term deliveries decreased from 1.5 to 1.2 NICU admissions per 100 singleton term deliveries, although the difference was not statistically significant ($P = .24$). The fetal mortality rate for deliveries 37–41 weeks of gestation fluctuated over the four quarters with no discernible trend with a rate of 1.1 per 1,000 deliveries in the first quarter to 0.9 in the fourth quarter. Similar fluctuations in fetal mortality rates were seen when examining the rates by gestational ages 37 to 38 weeks of gestation and 39 to 41 weeks of gestation over the four program quarters.

**DISCUSSION**

In this multistate quality improvement program, we showed that implementation of a comprehensive rapid-cycle change approach was effective in decreasing the rate of elective early-term deliveries from 27.8% to 4.8%, an 83% decline within 1 year. Elective inductions of labor were decreased, and elective cesarean deliveries were decreased by an even larger magnitude. Moreover, we implemented a successful program in a group of diverse hospitals in the five most populous states in the United States. The hospitals who participated in our program represented multiple health care systems, were located in rural and urban areas, included academic and community centers, and had varied delivery volumes. Like in previous reports, we found that having a hospital policy with a “hard stop” and strong physician leadership enhanced the likelihood of success in reducing elective early-term deliveries. Equally important was the labor and delivery nursing staff that provided the day-to-day leadership in the implementation of program goals along with the schedulers, unit clerks, and the data coordinators.

A unique feature of our collaborative was the mutual commitment of a group of diverse hospitals across multiple states to transform their hospital cultures.

**Table 2. Change in the Rate of Scheduled Singleton Early-Term Elective Deliveries From the First Quarter to the Fourth Quarter by Quarter 1 Initial Rate, 2011**

<table>
<thead>
<tr>
<th>Quarter 1 Hospital Elective Delivery Rate (%)</th>
<th>No. of Hospitals</th>
<th>Elective Delivery Rate</th>
<th>% Change</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–9</td>
<td>7</td>
<td>3.5</td>
<td>3.3</td>
<td>5.7</td>
</tr>
<tr>
<td>10–19</td>
<td>6</td>
<td>14.0</td>
<td>4.7</td>
<td>66.4</td>
</tr>
<tr>
<td>20–39</td>
<td>6</td>
<td>26.9</td>
<td>6.4</td>
<td>76.2</td>
</tr>
<tr>
<td>40–69</td>
<td>5</td>
<td>48.8</td>
<td>14.7</td>
<td>69.9</td>
</tr>
</tbody>
</table>

* The numerator is the number of scheduled singleton early-term nonmedically indicated deliveries, and the denominator is the number of scheduled singleton early-term deliveries.
regarding elective early-term deliveries. Our approach was one of "collective impact" comprised of a unifying infrastructure, dedicated team members, a structured implementation process shaped by a common resource guide, shared measurement, monthly communication, and mutual support. Regular monthly teleconferencing among all hospital teams provided a forum to work through problems and apply solutions on a regular basis. This continuing engagement approach was instrumental in bringing the strength of a collective to provide solutions to individual facilities. This initiative showed that the insights and support of the collective teams are a significant advantage and may help individual hospitals struggling to implement difficult quality improvement initiatives.

Critical to providing the safest level of care in reducing elective early-term deliveries was the rapidly returned monthly prospective data reports benchmarked against other (deidentified) participating hospitals. The provision of site-specific contemporaneous outcome data ensured a rapid-change cycle process both within each hospital and across hospitals in the collaborative. This measure created a level of mutual accountability to help achieve program goals. As a result, physicians, nurses, and other staff were continually engaged in the transformation process and changes were made at various facilities to streamline processes and improve acceptance of the program goals.

A major program limitation is the underestimation of the program’s effect because of the lack of comparable study outcome data before the start of the initiative. Prospective collection of scheduling data through a common scheduling form and data portal was an integral part of the quality improvement package and no comparable preimplementation data were available to use as baseline data. In addition, this evaluation examined the change in all participating hospitals over 1 year and did not include comparison outcomes from similar nonparticipating hospitals. Although the definitions for medical indications were defined in advance, the application of these definitions could have changed over the program time period to permit elective early-term deliveries. However, we did not see a concomitant increase in early-term deliveries from other indication categories. Also, although we did not find a change in the singleton late preterm birth rate over the 12-month project duration, any changes in the late preterm rate associated with a quality improvement program to reduce elective early term deliveries may require longer periods of time after practice patterns to become firmly established.

In a recent report, Clark et al noted that care must be taken to avoid unintentional consequences when instituting policies and guidelines designed to limit elective early-term deliveries. A key concern has been the possibility of increasing stillbirths in the general obstetric population. Most previous reports have not found increases in stillbirth in their populations after instituting “hard stop” policies. However, one report noted a significant increase in stillbirths when comparing 2 years of data. We did not find a significant increase in term stillbirths, but we recognize that

<table>
<thead>
<tr>
<th>Delivery Type</th>
<th>Quarter 1 2011</th>
<th>Quarter 2 2011</th>
<th>Quarter 3 2011</th>
<th>Quarter 4 2011</th>
<th>P</th>
<th>Quarter 1 to Quarter 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singleton term delivery (at least 37 wk of gestation)</td>
<td>13,649</td>
<td>14,149</td>
<td>15,293</td>
<td>14,910</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Singleton early term delivery (37–38 wk of gestation)</td>
<td>4,168 (30.5)</td>
<td>4,268 (30.2)</td>
<td>4,364 (28.5)</td>
<td>4,308 (28.9)</td>
<td>.002</td>
<td></td>
</tr>
<tr>
<td>Elective scheduled singleton delivery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Induction</td>
<td>57 (0.4)</td>
<td>32 (0.2)</td>
<td>27 (0.2)</td>
<td>30 (0.2)</td>
<td>.018</td>
<td></td>
</tr>
<tr>
<td>Cesarean</td>
<td>246 (1.8)</td>
<td>122 (0.9)</td>
<td>95 (0.6)</td>
<td>57 (0.4)</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Total deliveries</td>
<td>303 (2.2)</td>
<td>154 (1.1)</td>
<td>122 (0.8)</td>
<td>87 (0.6)</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Medically indicated scheduled singleton delivery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Induction</td>
<td>359 (2.6)</td>
<td>408 (2.9)</td>
<td>385 (2.5)</td>
<td>378 (2.5)</td>
<td>.49</td>
<td></td>
</tr>
<tr>
<td>Cesarean</td>
<td>340 (2.5)</td>
<td>328 (2.3)</td>
<td>370 (2.4)</td>
<td>346 (2.3)</td>
<td>.53</td>
<td></td>
</tr>
<tr>
<td>Total deliveries</td>
<td>699 (5.1)</td>
<td>736 (5.2)</td>
<td>755 (4.9)</td>
<td>724 (4.9)</td>
<td>.44</td>
<td></td>
</tr>
<tr>
<td>Unscheduled singleton delivery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total deliveries</td>
<td>3,166 (23.2)</td>
<td>3,378 (23.9)</td>
<td>3,487 (22.8)</td>
<td>3,497 (23.5)</td>
<td>.70</td>
<td></td>
</tr>
</tbody>
</table>

Data are n (%).
* The numerator is early term deliveries that were scheduled elective, scheduled medically indicated, or unscheduled; the denominator is all singleton term deliveries (at least 37 weeks of gestation).
additional data must be collected over several years given that stillbirth rates are known to fluctuate over time and with changes in practice. Furthermore, we echo the warning by Clark et al regarding reluctance to induce women when appropriate indications for early-term delivery are present. Following a written policy does not absolve the obstetric care provider from appropriate interventions, including early-term delivery, when clinically indicated.

Our quality improvement program demonstrated that a decrease in elective early-term deliveries can be achieved in a group of diverse hospitals across multiple states through an organized collaborative effort. This type of multistate collaborative program not only has the potential to be replicated, implemented, and disseminated nationwide to reduce early elective deliveries, but may also be used to rapidly and successfully promulgate other evidence-based practices.

REFERENCES


