Collaboration Between Obstetricians and Neonatologists: Perinatal Safety Programs and Improved Clinical Outcomes

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KEYWORDS

• Perinatal safety • Quality • Teamwork

What higher-risk situation exists than caring for a pregnant woman who actually carries two patients within one body? The best care for the mother may result in preterm birth of the baby. Conversely, the best care for the fetus may place the mother at risk. When multiples are involved, sometimes care is driven by the needs of one fetus, placing the other(s) at risk.

Quality improvement in obstetric care affects both mother and baby. Thus, when assessing patient safety and quality of care, it is logical that perinatologists and neonatologists work together. Historically, however, that generally has not been the case. When obstetricians created perinatal protocols, neonatologists and pediatrics often were not involved, and vice versa for newborn management plans. In recent years, however, the focus on improving quality of care, patient safety, and avoiding harm has fostered a more cohesive team approach.

The Institute for Healthcare Improvement (IHI) created a perinatal innovation community that began working together in February 2005. That same year, the IHI...
white paper, “Idealized Design of Perinatal Care,” was published.¹ This program was based on the fact that perinatal harm is rare, compared with the total number of births. When problems do occur, however, they can have devastating effects not only on the baby and family, but also on the medical care providers involved. The concept of the highly reliable organization, as used in the aviation industry,² has been applied to perinatal units by Knox and colleagues.³ To be successful, this strategy requires improvement in communication, documentation, and reliable processes in labor and delivery.

Over the past decade, national institutes and professional organizations such as the American College of Obstetricians and Gynecologists (ACOG) and the Association of Women’s Health, Obstetric, and Neonatal Nurses (AWHONN), have issued practice bulletins, opinions, and clinical position statements related to improving patient safety and avoiding fetal and maternal injury.¹⁻⁷ Individual medical centers and large hospital systems have been working with team approaches to improving patient safety and quality of care. The past year has seen several publications from across the country highlighting how effective this collaborative approach can be.⁸⁻¹¹

The Codman Award from The Joint Commission is presented to health care organizations for improvements in process and outcome measures that result in better quality and safer health care. In 2007, this award was presented to the Seton Family of Hospitals in Austin, Texas, for its perinatal safety initiative.⁸ The following is a detailed description of this successful quality improvement work, which combined the efforts of obstetricians, neonatologists, and hospital personnel. The authors offer it as a model for what might be achieved through this type of broad collaborative effort.

THE SETON FAMILY OF HOSPITALS’ EXPERIENCE

Background and Setting

The Seton Family of Hospitals is part of Ascension Health, the nation’s largest Catholic nonprofit network of hospitals and related health facilities. Ascension Health developed a perinatal safety priority for action as a result of collaboration between clinical and risk management teams. The main objective of the Seton network’s local perinatal safety initiative was to eliminate preventable birth trauma and to improve safety for mothers and babies. This was achieved by creating high-reliability obstetric units that implemented evidence-based obstetric practices.³ Ascension Health’s corporate belief was that improvement in safety for mothers and babies would not only improve care, but also reduce potential malpractice claims.

The Seton Family of Hospitals, comprised of eight acute care hospitals in the Austin and central Texas area, used the four hospitals that provided obstetric services. Four hospitals within the network served as the setting for this perinatal safety initiative: Seton Medical Center, a tertiary care high-risk referral perinatal center with a 40-bed neonatal intensive care unit (NICU) and approximately 4500 deliveries each year; University Medical Center at Brackenridge, an inborn city–county tertiary care center with a 25-bed NICU and approximately 2500 deliveries yearly (this hospital also functions as a pediatric and obstetric residency training facility); and Seton Northwest and Seton Southwest Hospitals, both primary and secondary care facilities delivering approximately 1800 and 1000 babies, respectively, each year.

The Seton multicenter network routinely tracked hospital-level patient safety indicators (PSIs) published by the Agency for Healthcare Research and Quality (AHRQ)¹²; among these indicators is neonatal birth trauma (PSI #17). The network sought to create and maintain a “high-reliability perinatal unit” in each of its facilities.¹,¹³,¹⁴ Low-reliability perinatal units are distinguished by their failure to recognize fetal distress or nonreassuring fetal status, failure to implement a timely cesarean section,
failure to properly resuscitate a depressed baby, their inappropriate use of oxytocin, and their inappropriate use of vacuum or forceps.\(^3\)

**Quality Improvement Methods**

In 2003, Seton formed a multidisciplinary work group to assess certain obstetric procedures and implement changes in labor management. The interdisciplinary team consisted of various types of hospital personnel including senior administrators; each site’s medical director; staff physicians from obstetrics (from each site), perinatology, and neonatology; labor and delivery nurses and managers from each site; a network risk management attorney; a network pharmacy administrator; a project data coordinator; and other medical staff support members. In conjunction with Ascension Health’s corporate patient safety goals, the work group focused on the five areas of highest risk for obstetric harm (failure to recognize fetal distress, failure to implement a timely cesarean section, failure to properly resuscitate a depressed baby, the inappropriate use of oxytocin, and inappropriate use of vacuum or forceps).

The perinatal safety initiative began with the education of key physician members of the work group, specifically site medical directors, obstetricians, perinatologists and neonatologists. Several physicians traveled to St. Louis, for a day-long training session by the IHI in methods used for obstetric quality improvement (QI). Travel expenses were covered by the Seton Healthcare Network. Subsequently, the work group met on a monthly basis to develop and monitor data and best practices that were shared and implemented by each hospital’s perinatal council. The project data coordinator position became fulltime within the first year of the initiative.

Task force members created or revised standardized order sets, which were adopted across all four sites and incorporated into the work flow of the physicians and nurses in each labor and delivery unit. Initially, clinical protocols for the use of oxytocin were reviewed. Key task force members presented regular clinical in-service educational sessions about operative vaginal delivery for labor and delivery nursing staff as well as physicians’ grand rounds on operative vaginal delivery and birth trauma.

In conjunction with the IHI, best obstetric practices, as defined by ACOG and AWHONN clinical practice guidelines, were incorporated into the creation of bundles of clinical care. As defined by IHI, a bundle is “a group of evidence-based interventions, or bundle elements, related to a disease or care process, that when executed together, result in better outcomes than when implemented individually.” Oxytocin bundles for labor augmentation and elective induction of labor had been developed by IHI.\(^1\) In addition, an operative vaginal delivery (OVD) bundle was developed as a potential birth trauma reduction strategy.

Oxytocin augmentation bundle elements developed by IHI included reassuring fetal status, estimated fetal weight, examination of the cervix within 1 hour before or after start of oxytocin, and absence or management of uterine hyperstimulation. Oxytocin elective induction bundle elements included reassuring fetal status, examination of the cervix within 1 hour before or after start of oxytocin, absence or management of uterine hyperstimulation, and documentation of gestational age greater than 39 weeks or estimated fetal weight (EFW). The locally developed OVD bundle elements included: indications for instrumented delivery, EFW relative to the size of the maternal pelvis, and presentation and station of the fetal head.

The work group provided anonymous data review, engaging physicians through peer comparisons and feedback of their own data describing rates of OVD, elective inductions, and rates of neonatal birth injury. At quarterly intervals, individual physicians’ data were compared in a blinded fashion with their peers who delivered babies.
Compliance with care bundles required documentation of all bundle elements in the medical record by physicians and nurses. Using monthly random chart audits, each site’s compliance with documentation of clinical bundles was tracked. A perinatal safety newsletter was published and distributed to all sites at least monthly. Data related to bundle compliance and other performance measures were generated on an ongoing basis for OVD, cesarean section rates, maternal injury, and birth trauma rates; these rates were published in the newsletter.

To promote the use of common terminology for electronic fetal monitoring, joint obstetric physician and nursing fetal monitor strip review sessions were conducted periodically, conforming to use of the common language advocated by the National Institute of Child Health and Human Development (NICHD). Labor and delivery room staff were trained in the use of a customized SBAR communication tool. SBAR (Situation, Background, Assessment, and Recommendation) is a standardized form of communication that helps caregivers, both physicians and nurses, speak about patients concisely and completely. At least quarterly, task force members from each site conducted clinical site visits of the other three network sites. This allowed nursing and physician personnel to witness firsthand significant differences in labor and delivery care practices from site to site.

During 2006, the network sent key nursing managers and educators for special education in simulation obstetric training. Thereafter, interdisciplinary crisis simulation training was implemented at all four labor and delivery sites using a high-fidelity birthing mannequin, Noelle (Gaumard Scientific, Miami, FL, USA). Simulation training focused on communication and teamwork by using medical actors and planned scenarios with the mannequin. Simulations for obstetric emergencies, such as shoulder dystocia and postpartum hemorrhage, were conducted quarterly at each site. Regular, structured team debriefings occurred after each simulation. Best practices were shared via team meetings and conference calls at least quarterly.

The perinatal safety initiative primarily was focused on three areas: (1) tracking compliance for oxytocin elective induction and augmentation bundles, (2) improved communication via the NICHD common language for electronic fetal monitoring and the SBAR tool, and (3) labor and delivery crisis simulation training of nurses and physicians. The primary goal of the initiative had been to eliminate preventable birth injuries. Throughout the initiative, rates of OVD, elective inductions less than 39 weeks’ gestation, total cesarean sections (both primary and repeat) and all infant morbidity designated as serious birth trauma were examined. For purposes of tracking serious respiratory illness in near-term babies, the work group defined iatrogenic prematurity as a NICU admitting diagnosis of respiratory distress syndrome (RDS) or transient tachypnea of the newborn (TTN) in inborn infants from 37 0/7 to 38 6/7 weeks gestational age. Babies remaining in normal newborn care with milder forms of TTN were excluded. Differences in hospital length of stay and charges associated with neonatal morbidity from serious birth trauma and respiratory distress of inborn neonates before, during, and after implementation of the perinatal safety initiative were examined.

Infants with birth trauma or respiratory distress were identified by tracking primary or secondary International Classification of Disease codes (ICD-IX) diagnoses, noted by ICD IX codes of 767.0 to 767.9 (representing the AHRQ codes specific for PSI #17 or neonatal birth injury), or the ICD-IX code 767.6 for brachial plexus injury. In addition, infants with gestational ages ranging from 37 0/7 weeks to 38 6/7 weeks gestation, who were admitted to NICU for care with ICD-IX codes for neonatal respiratory
distress, including 769 to 770.8, or persistent pulmonary hypertension 747.83, were tracked.

**Perinatal Safety Initiative Results**

From 2000 to 2007, the Seton network facilities altogether delivered on average 9745 babies annually. During the baseline period (2000 to 2003) before the initiative, the network hospitals delivered 31,290 newborns. Among these deliveries, there were 7.5% OVDs, 3.2% elective inductions less than 39 weeks, 22.5% total cesarean sections, and a rate of 0.3% for serious birth trauma. The period from 2003 to 2004 was considered to be a transition. The perinatal safety initiative, or intervention period, lasted from 2004 to 2007. During this period, the network hospital deliveries totaled 28,130, and the network rates fell incrementally to 4.5% for OVD, to 1.6% for elective inductions less than 39 weeks, and to 0.03% for serious birth trauma. This was a remarkable 90% reduction in the rate of serious birth injury (Figs. 1 and 2). During this time period, however, the network cesarean section rate rose to 29.3%.

In January 2007, the network hospitals reported a 36% reduction in the use of vacuum and forceps (from a frequency of 7.4% to 4.7%). Data were examined for unintentional harm that may have resulted from changes in practice related to prolonged second stage of labor when instrumented delivery was not performed, but no evidence was found to substantiate adverse injury to neonates as a result of changes in delivery practices. In addition, the relative change in the percentage of births performed by cesarean section was examined. It had been anticipated that the reduction in OVD would produce a rise in the primary cesarean section rate; although an upward trend in primary cesarean sections has been noted over time, the degree of change was slight, from 22% in 2003, and to 24% in 2007. This was consistent with national trends.

The rate of brachial plexus injury remained stable throughout the perinatal safety initiative, averaging 0.1%, or 1 of 1000 live births. The AHRQ dropped this particular diagnosis from among those codes defining PSI #17 (serious birth injury), as most obstetric experts felt that brachial palsy often occurred spontaneously and was largely uninfluenced by obstetric practices.

During the initiative, the average length of stay for infants admitted to the NICU for birth injury declined by 79% (compared with the baseline years), from 15.8 days to 3.4 days. This denoted a dramatic reduction in the clinical severity of the infants’ birth injury. Moreover, total hospital billed charges for NICU care for these infants declined

![Fig. 1. Operative vaginal delivery (OVD) rate, Seton Family of Hospitals.](image-url)
by 98% during the intervention, as compared with baseline, from $4,479,898 for the fiscal years 2000 to 2003 to $66,321 for fiscal years 2004 to 2007.8 The rate of respiratory morbidity requiring NICU care in near-term babies (iatrogenic prematurity) fell from 0.24% during the baseline period to 0.14% during the initiative. Total length of stay and hospital charges for NICU care for these near-term infants declined from 10 days and $1,825,486, respectively, during the baseline period, to 8 days and $1,010,620 during the intervention period. Although less dramatic, a reduction in the clinical severity of RDS and TTN among near-term babies was noted after the initiative. It appeared that infants admitted to the NICU for both respiratory distress and birth injury were less ill than previously. Comparing baseline with intervention periods, NICU days on oxygen fell from 3.8 to 3.1 days; the number of infants requiring artificial surfactant fell from 12% to 6%, and babies needing nasal continuous positive airway pressure support remained constant at 23% and 20%. The number of infants requiring mechanical ventilation, however, fell from 7% to 3%. Most notably, during the baseline period, 9 of 69 (13%) of these babies with respiratory distress requiring NICU care had been born after elective induction. During the transition period, only one case was delivered after elective induction, and after the initiative began, no cases were associated with elective induction of labor.

Although network hospital charges for neonatal morbidity, especially birth trauma, were reduced drastically as a result of the perinatal safety initiative, it was noteworthy that a similar amount, $4,300,000 in legal defense fees, was saved by the network during the same period. Risk management personnel attributed these savings to the prevention of serious birth trauma cases, thereby obviating the need to defend the care provided to these infants.

**Conclusions**

Because the initiative was multidisciplinary, multifaceted, and sequential, it is impossible to say just what methods, or quality improvement tools, had the greatest influence on the reductions in birth trauma that were observed. Vital factors in the success of this perinatal safety initiative included the commitment of the network’s senior leaders and managers, the public advocacy of the initiative by specific physician and nurse champions at each site, and the interdisciplinary nature of the initiative. Drawing clinicians’ attention to OVD and elective inductions may have influenced birth injury rates in and of itself (the Hawthorne effect).17 Obstetricians appreciated viewing maternal and neonatal morbidity data in a regular and confidential manner, allowing
them to compare their morbidity rates with those of their peers. Obstetric nurses greatly appreciated the updates on electronic fetal monitoring nomenclature and training in the use of SBAR tool and high-fidelity mannequins for crisis simulation. More so, they appreciated that their voices in describing current labor and delivery care practices were heard and respected.

This quality improvement initiative was successful because the hospital network allowed a team of personnel to implement small tests of change and allow sequential quality improvement efforts to evolve. With this approach, there was tremendous potential to achieve buy-in and support from some originally skeptical physicians. In addition, giving nurses a voice at the table with physicians and providing physicians with real-time data for self-examination resulted in greater acceptance of the need for change. Clearly, feedback of data to the physicians and nurses actively involved in care is paramount to success in any quality improvement initiative.

OTHER COLLABORATIVE EFFORTS

Recently Published Perinatal Quality Improvement Projects

The Seton Hospitals’ work was published in April 2008. In April of 2009, Fisch and colleagues, published their results from Magee Hospital in Pennsylvania in successfully reducing inappropriate inductions, particularly any elective induction under 39 weeks gestation and elective inductions in nulliparas. This paper was a retrospective study that looked at three time frames in 2004, 2005, and, finally, from 2006 to 2007 after a new scheduling process was implemented. Their goal was avoiding unnecessary primary cesarean sections, but they also anticipated that fewer babies would be expected to go to the NICU if no elective inductions occurred until 39 weeks or greater. They began with an educational program but did not see significant improvements until the new scheduling process began to strictly enforce the guidelines. Strong physician and nurse champions were crucial to their success.

Pettker and colleagues, from Yale-New Haven, published their patient safety results in May 2009. They used a collaborative team approach, tracking 10 obstetric-specific outcomes as patient safety interventions were begun over a 2-year period. An adverse outcome index (AOI) of 10 indicators was tracked prospectively over 36 months. Indicators included transfusion, maternal or neonatal death (over 2500 g), fetal birth injury, third or fourth degree perineal lacerations, maternal ICU admission, return to the operating room or labor and delivery unit, uterine rupture, 5-minute neonatal Agar less than 7, and unexpected NICU admission if over 2500 g and for over 24 hours. Their teamwork included nurses, obstetricians, anesthesiologists, neonatalogists, administration, and ancillary services. This group’s focus was to improve communication and coordination of care. Interventions over 2 years included hiring a patient safety nurse, standardizing protocols and guidelines, team training, electronic fetal monitoring certification, and formation of a patient safety committee. The composite AOI was used, because each individual indicator occurred infrequently. The AOI dropped from 3.25% to 1.75% over 36 months (Fig. 3).

In June 2009, Reisner and colleagues published prospective collaborative work on reducing elective inductions at Swedish Medical Center, Seattle. The report included over 29,000 deliveries during a 3.75-year period. A team of all obstetric care providers was formed with a goal of reducing elective inductions, and a particular focus on nulliparous women. Practitioners were educated about risks of induction, and their individual statistics were shared with them. There were existing scheduling parameters that did not allow elective inductions before 39 weeks’ gestation, but physicians did have the option for providing evidence of fetal lung maturity by
amniocentesis when gestational age was less than 39 weeks. In the new protocol, elective inductions were limited to 39 weeks or greater, with a favorable cervix (Bishop score of 6 or more). Patients were told they had a standby date when scheduled for any elective induction. Nulliparous elective inductions decreased from 4.3% to 0.8%, a rate which has been sustained now for 5 years (Fig. 4). Multiparous elective inductions dropped from 13% to 5%. Hours in labor and delivery were shortened by 4 to 5 hours for spontaneously laboring women, compared with those who were induced. Unplanned primary cesarean sections were significantly lower for both nulliparas and multiparas who were laboring spontaneously, compared with those being induced. The key to success was common, clear goals created by collaboration between the nurses, doctors, midwives, and office and hospital staff members. Sustaining the gains has been a result of continued shared individual and group data support of the guidelines and oversight.

**Small-Scale Collaborative Projects**

Large perinatal safety programs obviously require extensive planning with organizational support for the program itself, data collection/interpretation/reporting, and ongoing monitoring to assure sustainability. Other collaborative projects can be done on a smaller scale with perinatalogists, obstetricians, and family practitioners working with their neonatology or pediatric colleagues. Some examples would include collaborative work on a new protocol or guideline for screening and monitoring of potential drug-affected neonates, group B streptococcus management in labor, delivery, and after delivery, or diagnosis and treatment of chorioamnionitis in labor with appropriate newborn monitoring and care.

Another local collaborative project is joint presentations at Morbidity and Mortality or other educational conferences. This year at Swedish Medical Center in Seattle,
our neonatalogists encouraged a combined grand rounds presentation on the late preterm infant titled, “34–37 Week Newborns: More problems than we thought?”. The recent outcomes data on 34- to 36-week babies first were presented by a neonatologist who described the higher morbidity and mortality with this group of infants than previously known. A perinatalogist then discussed situations where these babies need delivery for significant maternal or fetal indications, such as preeclampsia, chorioamnionitis, bleeding complications, or other reasons. Part of the perinatal presentation, however, also encouraged obstetricians to reassess current management of a subset of late preterm deliveries, in which delivery at less than 37 or 38 weeks might not be essential.

This type of review challenges the near-term approach of perinatal care in the last decade or more. Recently, Lewis and colleagues\textsuperscript{18} published neonatal outcome results in women with mild preeclampsia and amniocentesis evidence of fetal lung maturity delivered between 34 and 37 weeks’ gestation. This paper was a retrospective review with its attendant limitations, but it raised some questions regarding management of mild preeclampsia in the late preterm period. The authors emphasized that a risk of immediate morbidity exists for these neonates with planned deliveries, such as NICU admission (31%), RDS (10%), and hyperbilirubinemia (30%), even when lung maturity testing has been performed. Although not a definitive study, it does remind practitioners that one constantly needs to look for new data and reevaluate current practices as one component of perinatal quality improvement.

**Benefits of Collaboration**

Because pregnancy represents a unique situation with two patients within one, the management of each of the patients necessarily must affect the other. Perinatologists/obstetricians and neonatologists/pediatricians are often the physician leaders who initiate and help sustain perinatal patient safety and quality care programs. Working collaboratively on these quality improvement projects, protocols, clinical educational efforts, and research is essential to achieve the best outcomes for both mother and baby.
REFERENCES


