CE **1.5 ANCC Contact Hours**

Abstract

Background: There is renewed interest in second-stage labor practices as recent evidence has challenged historical perspectives on safe duration of second-stage labor. Traditional practices and routine interventions during second-stage have uncertain benefit for low-risk women and may result in cesarean birth.

Purpose: The purpose of this quality improvement project was to implement an interdisciplinary second-stage practice bundle to promote safe outcomes including method of birth and women's birth experience.

Methods: Standardized second-stage labor evidence-based practice recommendations structured into a 5 Ps practice bundle (patience, positioning, physiologic resuscitation, progress, preventing urinary harm) were implemented across 34 birthing hospitals in the Trinity Health system.

Results: Significant improvements were observed in second-stage practices. Association of Women's Health, Obstetric and Neonatal Nurses' perinatal nursing care quality measure Second-Stage of Labor: Mother-Initiated Spontaneous Pushing significantly improved [pre-implementation 43% (510/1,195), post-implementation 76% (1,541/2,028), $p < .0001$]. Joint Commission Perinatal Care-02: nulliparous, term, singleton, vertex cesarean rate significantly decreased ($p = 0.02$) with no differences in maternal morbidity, or negative newborn birth outcomes. Unexpected complications in term births significantly decreased in all newborns ($p < 0.001$), and for newborns from vaginal births ($p = 0.03$). Birth experience satisfaction rose from the 69th to the 81st percentile.

Clinical Implications: Implementing 13 evidence-based second-stage labor practices derived from the Association of Women's Health, Obstetric and Neonatal Nurses and the American College of Nurse-Midwives professional guidelines achieved our goals of safely reducing primary cesarean birth among low-risk nulliparous women, and optimizing maternal and fetal outcomes associated with labor and birth. By minimizing routine interventions, nurses support physiologic birth and improve women's birth satisfaction.

Key words: Cesarean birth; Epidural analgesia; Laboring down; Maternal positioning; Peanut ball; Physiologic birth; Pushing; Second-stage labor; Urinary catheterization.

Effects of an INTERDISCIPLINARY PRACTICE BUNDLE FOR SECOND-STAGE LABOR on Clinical Outcomes

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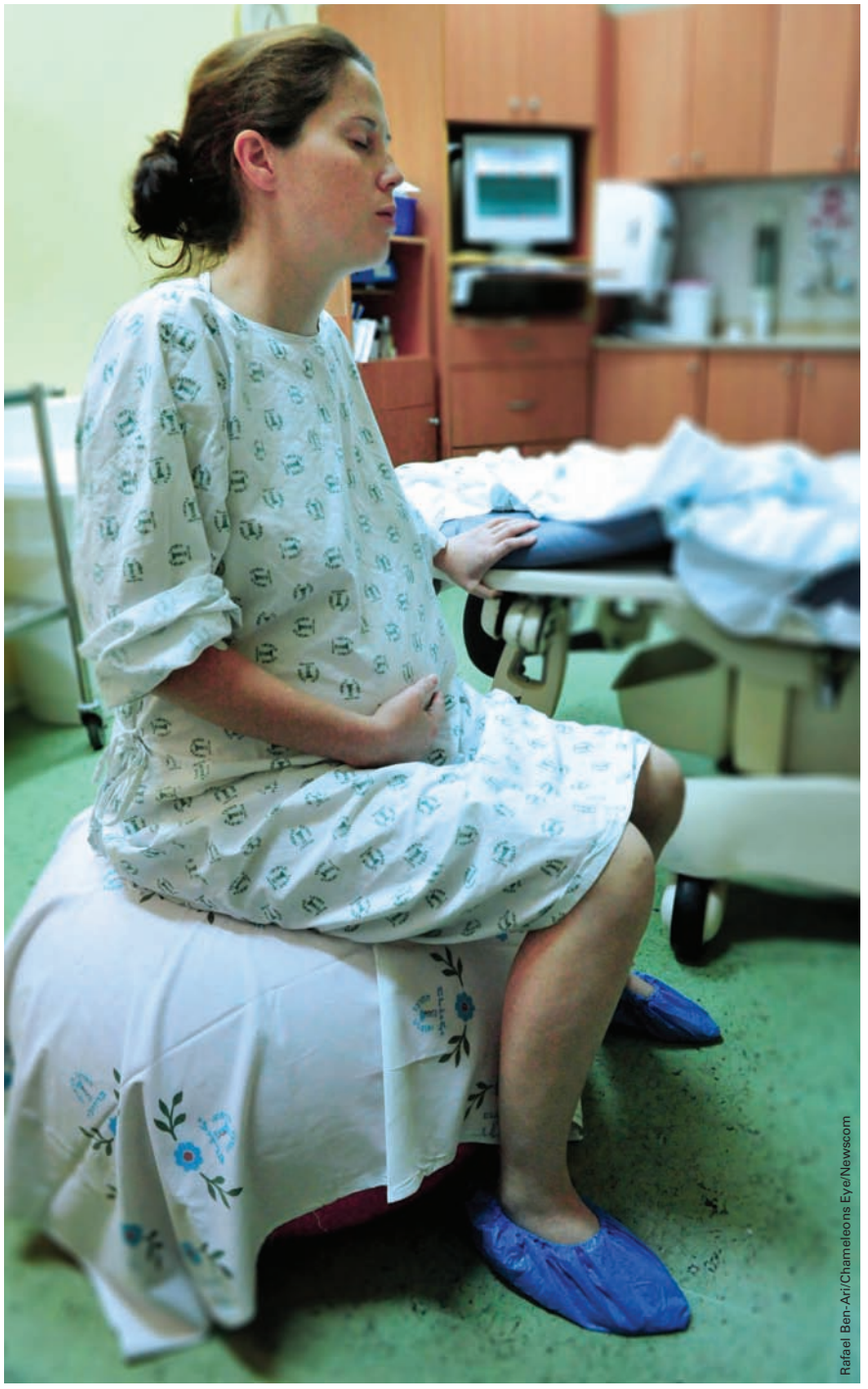
There has been renewed interest in second-stage labor practices since publication of American College of Obstetricians and Gynecologists (ACOG) and Society for Maternal-Fetal Medicine (SMFM) (2014) Obstetric Care Consensus Statement *Safe Prevention of the Primary Cesarean Delivery*. Several recommendations challenged historical practices: 1) lengthening second-stage duration, 2) revising the diagnostic *second-stage labor arrest* time period from total duration (complete cervical dilatation to birth) to length of *pushing*, and 3) concluding "the specific maximum length of time spent in second-stage of labor beyond which all women should undergo operative birth has not been identified" (ACOG & SMFM, p. 9). In 2017, ACOG suggested that clinicians use low-interventional approaches for labor management to help women meet their labor and birth goals and to improve birth satisfaction.

Several experts have expressed concern that maternal and fetal safety evidence for lengthening second-stage is not robust (Leveno, Nelson, & McIntire, 2016). Laughon et al. (2014) reported increased risk of maternal and neonatal morbidity associated with prolonged second-stage from a large retrospective cohort.

Grobman et al. (2016) analyzed medical record data abstracted during active pushing and concluded longer duration of pushing was associated with increased odds of both cesarean birth and neonatal adverse outcomes. Limitations of this observational study included lack of practice standardization and consideration of fetal status and labor progress during the study time periods. Gimovsky and Berghella (2016) conducted a randomized controlled trial to evaluate how extending length of labor in nulliparous women might affect rate of cesarean birth and maternal–neonatal outcomes. Nulliparous women with epidurals, whose second-stage pushing phase was continued for an additional third hour, had a 50% reduction in first cesarean birth without differences in maternal or neonatal morbidity outcomes.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Duration is the primary variable within the context of second-stage labor that is thought to influence maternal–fetal outcomes based on studies conducted by physicians (Bleich, Alexander, McIntire, & Leveno, 2012; Laughon et al., 2014). Nurse-midwifery literature attributes supporting normal physiologic labor and birth processes without unnecessary interventions to be more likely to result in safe and healthy mother and baby outcomes (American College of Nurse-Midwives [ACNM], 2013, 2015; Kopas, 2014). The Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN, 2008) has provided evidence-based guidelines for perinatal nurses to manage second-stage labor by empowering and supporting women, and recognizing and responding to the laboring woman's normal physiologic and psychologic processes while promoting fetal well-being. For more than a decade these publications have guided nurses and nurse-midwives with evidence-based interventions that when combined with the art of labor and birth management result in safe, quality birth outcomes.

Omission of some second-stage birth process interventions in the medical literature, particularly passive descent, upright positioning, and modifying pushing to improve fetal heart rate (FHR) tracings, has led to clinical disagreement and ineffective interdisciplinary communication (Simpson, James, & Knox, 2006; Simpson & Lyndon, 2009; Simpson & Lyndon, 2017). This gap in the physician–nurse team approach has potential to have a direct impact on a woman's birth experience and her birth outcome. Buckley (2015) linked unnecessary interventions and mismanagement of second-stage labor with disruption of normal maternal-fetal hormonal physiology in low-risk women. Disruption results in increased maternal–fetal risk of immediate and long-term harm and cesarean births, and a negative impact on the mother's birth experience. Women's desire for fewer birth interventions is supported by *Listening to Mothers III,* a 2013 national survey of women's childbearing experiences; more than 60% of women agreed "giving birth is a process that should not be interfered with unless medically necessary" (DeClercq, Sakala, Corry, Applebaum, & Herrlich, 2013, p. 49). It is imperative that perinatal teams design structured second-stage labor management care practices to create a shared mental vision that include women as partners. This collaborative approach is endorsed by nearly 20 organizations

representing a wide variety of medical specialties and professions (ACOG, 2016).

Problem Description

Based on our experience as perinatal nursing and medical directors of a large health system with 40 birthing hospitals with ~69,000 annual births, we felt an interdisciplinary second-stage labor initiative was essential to improve perinatal patient safety and family birth experience. Practice gap analyses, birth outcomes, professional liability claims, and women's birth experience scores supported this as a priority initiative. Perinatal physician and nurse leaders in our system were surveyed about 14 second-stage contemporary practices using a Likert 5 choice (always, mostly, sometimes, rarely, never) survey. Less than 25% of responding clinicians (n = 65) reported they "always" or "mostly" performed second-stage practices consistent with AWHONN (2008) and ACNM (2013) professional guidelines. Internal quality review of hospital medical records detected traditional nonevidence-based second-stage labor management practices and unnecessary interventions such as routine sustained coached pushing without consideration of the fetal response. These practices created iatrogenic conditions contributing to low Apgar scores in term newborns, and necessitating special care nursery or neonatal intensive care unit (NICU) care. Unsupported routine interventions were a prominent clinical feature of second-stage related newborn closed malpractice claims representing a significant risk of preventable harm to babies. The system Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) satisfaction survey "likely to recommend" scores for women with diagnostic-related group (DRG) birth diagnoses averaged 69th percentile (target national birth score performance: 78.8%–84.3%). Labor and birth management contributed to 30% of low-risk, nulliparous (NTSV) women in our health system having a cesarean birth.

Purpose and Rationale for Second-Stage Labor Initiative

Our aim was to design and implement a bundle of standardized evidence-based practice recommendations for interdisciplinary management of second-stage labor with ultimate goals of safely preventing primary cesarean births, optimizing maternal–fetal birth outcomes, and improving women's birth experiences. Foundational second-stage labor practices were derived from the AWHONN (2008) *Nursing Management of the Second-Stage of Labor Evidence-Based Practice Guideline* and ACNM's *BirthTOOLS* (2015) to support physiologic birth. Search sources included Cochrane Library, CINAHL, and MEDLINE (January 2008 to May 2015) that identified 45 articles with key words: second-stage labor, peanut ball, pushing, maternal positioning, laboring down, physiologic birth, epidural analgesia, cesarean birth, and urinary catheterization.

Methods

An interdisciplinary team reviewed literature for second-stage labor to design the system-wide evidence-based guideline. The literature review included professional practice guidelines and published quality studies considered relevant to support evidence-based practice recommendations. Selected practices were structured in a "bundle" framework called *5 Ps of Safe Second-Stage Labor Care*. The 5 Ps bundle framework was used to structure interdisciplinary training and design the data collection tool for process measures. Process, balancing, and outcome metrics were selected to evaluate impact of implementing the standardized evidence-based practices. We projected measurable improvement in mother and baby outcomes and women's birth experience satisfaction when these evidence-based interdisciplinary practices are performed collectively and reliably.

Available Knowledge: Evidence for 5 Ps Second-Stage Bundle Framework

Title and framework of "5 Ps" Second-Stage Bundle originated from key concepts prevalent in second-stage of labor literature: **p**atience, **p**ositioning, **p**hysiologic resuscitation, **p**rogress, and **p**reventing urinary harm. Patience was derived from AWHONN (2008) and ACNM (2013) recommendations to support the laboring woman's normal physiologic processes, and avoid unnecessary interventions. Recommendations include: a) delay maternal bearing down efforts until conditions exist to facilitate effective pushing, that is, woman has the urge to push or fetal head is at the introitus, unless an expeditious birth is clinically indicated by fetal condition, b) support the woman's spontaneous pushing efforts, unless interventions are necessary for maternal–fetal clinical indications, and c) lengthen pushing duration if progress (fetal descent or rotation) and fetal tolerance is evident.

Contemporary practice for laboring women is to delay pushing up to 2 hours after complete dilatation, unless maternal urge or the fetal head is at the introitus for women with epidural analgesia (Kopas, 2014). Passive descent time may be extended beyond 2 hours if fetal progress is evident with a normal fetal heart rate (FHR) tracing. Delaying pushing is physiologically beneficial for a laboring woman and her fetus. Since delayed pushing increases second-stage labor duration, and available studies excluded women with significant medical complications, Kopas recommended immediate pushing in situations when an expeditious birth is clinically indicated.

Contemporary pushing techniques are called *spontaneous supportive* pushing (also known as natural or open glottis), as a laboring woman is supported to delay pushing until she feels a natural urge and initiate her spontaneous bearing down efforts. Evidence continues to support spontaneous supportive pushing as physiologically beneficial for optimal maternal and fetal outcomes (Prins, Boxem, Lucas, & Hutton, 2011; Simpson & James, 2005; Yildirim & Beji, 2008). Women have reduced maternal fatigue from shorter pushing periods, normal bladder function, and less perineal trauma. Shorter pushing duration using spontaneous instinctive efforts may improve maternal–fetal circulation by reducing the negative

Table 1. Guidelines Based on Phases of Second-Stage Labor

Passive Phase: Time Period to Delay Pushing	Active Phase: Time Period of Active Pushing	Total Duration of Second-Stage (Complete Cervical Dilation to Birth)	Diagnosis of Second-Stage Labor Arrest
Delay pushing for up to 2 hours after complete dilatation, unless the woman has an urge to push, or the fetal head is at the introitus (Kopas, 2014). Immediate pushing in situations when expeditious birth is indicated (Kopas, 2014). Delayed pushing may be extended beyond 2 hours if progress (descent and/or rotation) is evident and there is a "reassuring" fetal heart rate tracing.	<u>Nulliparous women:</u> At least 3 hours of pushing. <u>Multiparous women:</u> At least 2 hours of pushing. Longer durations may be appropriate on individualized basis (e.g., with use of epidural analgesia or with fetal malposition) as long as progress is being documented (ACOG & SMFM, 2014).	The specific maximum length of time spent in second-stage of labor beyond which all women should undergo operative birth has not been identified (ACOG & SMFM, 2014).	Definitions of second-stage arrest were based on parity and the presence or of regional analgesia and include: <u>Nulliparous women:</u> No progress for > 4 hours with an epidural. No progress for > 3 hours without an epidural. <u>Multiparous women:</u> No progress for > 3 hours with an epidural. No progress for > 2 hours without an epidural (Spong, Berghella, Wenstrom, Mercer, & Saade, 2012).

Note. Participants were informed that table 1 lists some guidelines (ACOG & SMFM, 2014) that may provide for the safe prevention of primary cesarean birth during the second-stage of labor. This information is designed to aid practitioners in making decisions about appropriate obstetric care. These guidelines should not be construed as dictating an exclusive course of treatment or procedure. Variations in practice may be warranted based on the needs of the individual patient, resources, and limitations unique to the institution or type of practice.

effects of prolonged sustained pushing that result in FHR decelerations and fetal hypoxemia (Caldeyro-Barcia et al., 1981; Kazandi, Sendag, Akercan, Terek, & Gundem, 2003; Simpson & James, 2005).

Telling laboring women when to begin pushing and using directive methods are considered interventions, and as such should be used only in circumstances when benefits are judged to outweigh risk. However, a modified active directive approach may be indicated in certain clinical situations: when a woman's pushing efforts are ineffective, there is minimal progress, or when an expeditious birth is indicated by an urgent maternal or fetal condition and a laboring woman has no spontaneous urge. Appropriate active directive techniques are described in AWHONN's (2008) guidelines: have woman bear down for 6 to 8 seconds only and perform no more than three to four pushing efforts with each contraction.

Traditionally, second-stage labor duration was defined as onset of complete cervical dilatation and ending with birth. Measuring second-stage labor duration this way combined with the traditional 2-hour period to accomplish birth has contributed to increased diagnoses of prolonged, protracted, or arrested second-stage labor and consequent increase in cesarean births (ACOG & SMFM, 2014). The ACOG and SMFM consensus statement redefined second-stage labor duration as *pushing* time, rather than duration of the entire second-stage. Current recommendations are to afford nulliparous women at least 3 hours of pushing and multiparous women at least 2 hours of pushing before diagnosing a second-stage labor arrest. Longer durations may be appropriate on an individualized basis (for example, with use of epidural analgesia or with fetal malposition) as long as progress is being documented. Cheng and Caughey (2015, p. 237) acknowledged, "in contemporary obstetric practice with continuous fetal monitoring, greater patience in the second-stage appears to be merited."

Three "patience" process metrics may influence a woman's ability to achieve an intended vaginal birth. Lack of clinician patience evidenced by premature pushing or prolonged pushing technique may lead to iatrogenic fetal stress and maternal fatigue necessitating a cesarean birth. Prematurely diagnosing second-stage labor arrest based on dated unsupported time frames may increase risk of a preventable cesarean birth. Early in this initiative, some hospital obstetricians expressed concern that the ACOG and SMFM (2014) consensus statement second-stage duration changes would be misinterpreted and create a significantly prolonged stage posing maternal and fetal risk. To mitigate these concerns and standardize the duration approach, the interdisciplinary work group included evidence-based guidelines delineating passive, active, total second-stage duration and diagnosis of second-stage arrest (Table 1).

Positioning (second "P") comprises key labor positioning practices, and increasing maternal movement to promote progressive fetal rotation and descent during second-stage labor. Zwelling (2010) reported maternal labor mobility may be impaired from increased medical technology and routine interventions, for example, amniotomy, induction of labor, and epidural analgesia/anesthesia. Labor immobility may be exacerbated by an increased prevalence of maternal obesity and reduced childbirth class attendance producing a lack of knowledge of the importance of movement in facilitating labor progress. Zwelling further identified techniques to promote maternal movement and effective position changes to facilitate

labor progress, decrease pain and labor duration, improve maternal–fetal circulation, and enhance fetal descent through the pelvis.

Nurses can significantly affect women's birth experiences and quality outcomes by promoting upright or lateral positional changes. They can assist women to select positions of comfort that facilitate labor progression during second-stage labor and birth. Many low-risk women continue to birth in the lithotomy position despite evidence that indicates it is not an ideal childbirth position. In the *Listening to Mothers III* survey, over 60% of women give birth in lithotomy position and 23% in a semisitting position (Declercq et al., 2013). Gupta, Hofmeyr, and Shehmar (2012) found that second-stage bearing down in upright positions for women without an epidural is more efficient, resulting in significantly fewer episiotomies and vacuum and forceps-assisted births. Avoiding supine lithotomy positioning may reduce altered maternal and fetal hemodynamics and indeterminate or abnormal FHR patterns, reducing risk of fetal hypoxemia and acidemia (Hanson, 2009; Hanson & VandeVusse, 2014).

Kemp, Kingswood, Kibuka, and Thornton's (2013) Cochrane review of studies of women with an epidural showed insufficient evidence to make a recommendation about optimal positioning during second-stage. They recommended women with epidurals should use positions in which they feel most comfortable. Encouraging frequent spontaneous movement or assisting a woman to change positions minimally every 15 to 30 minutes is important to promote movement, fetal rotation, and descent throughout labor and birth. Positioning aids may facilitate progress in women with labor epidurals. Epidural analgesia has unintended consequences of limiting maternal movement, contributing to longer labor duration and an inability to position women for optimal progress (Gupta et al., 2012). Labor epidurals are associated with increased operative vaginal birth and fetal malposition with increased risk of cesarean birth. Several randomized controlled trials revealed laboring women with epidurals had significantly shorter labor length and higher likelihood of spontaneous vaginal birth when a peanut ball was used as a positioning aid (Roth, Dent, Parfitt, Hering, & Bay, 2016; Tussey et al., 2015). Modern birthing beds contain many features that support women in comfortable upright and lateral positions during the birth process. Nurses can avoid injury to themselves and labor support partners by using well-designed bed features instead of their own bodies as positioning aids.

Nursing practice recommendations for second-stage positioning include: 1) promote upright, lateral, and nonsupine maternal positions to facilitate maternal comfort and fetal progress to birth, 2) support and assist laboring woman to change positions every 15 to 30 minutes, 3) use labor bed features and position aids, for example, a peanut ball, and 4) avoid routine lithotomy positioning during pushing, unless maternal or fetal conditions warrant an expeditious birth to facilitate the birth attendant access for safety (AWHONN, 2008).

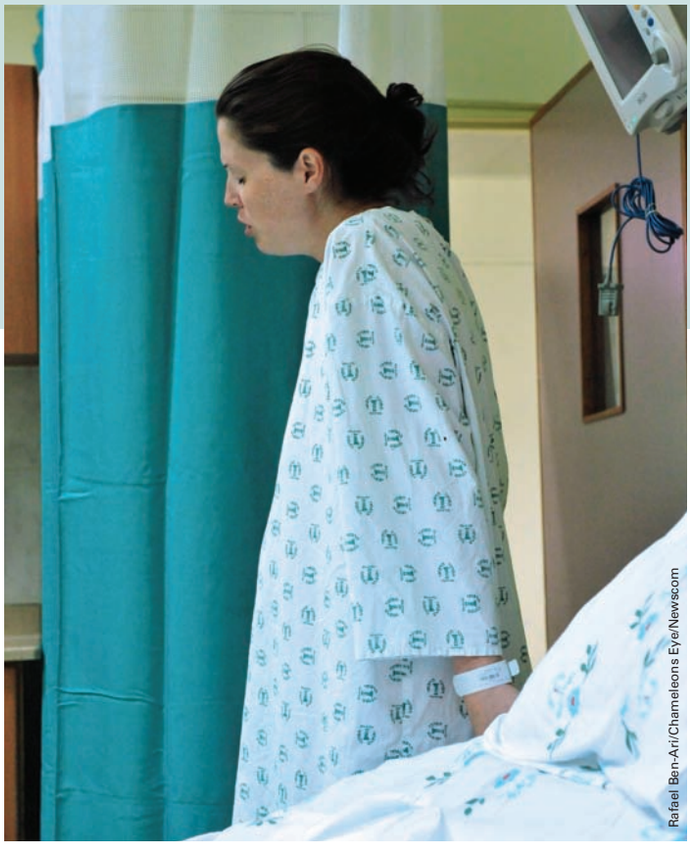
Physiologic resuscitation practices (third "P") are important to manage uterine tachysystole and promote fetal recovery during stressful contractions. Uterine tachysystole may be unrecognized during the second-stage when endogenous oxytocin surges occur, particularly in women receiving oxytocin for induction or augmentation. Studies have shown 30 minutes of tachysystole results in progressive decreasing fetal oxygenation (Simpson & James, 2008). One hour or more of tachysystole is significantly associated with an umbilical artery pH < 7.1 at birth (Bakker & van Geijn, 2008).

Interventions to manage uterine tachysystole and improve fetal oxygenation include: 1) decrease or discontinue exogenous oxytocin at second-stage onset to modify physiologic labor contraction patterns and prevent tachysystole, 2) if tachysystole occurs, decrease oxytocin rate by half if FHR pattern is Category I or discontinue the oxytocin if FHR pattern is Category II or III, and 3) avoid increasing oxytocin to facilitate pushing to expedite birth (Simpson, 2013, 2015). Continued pushing may reduce fetal oxygenation, creating iatrogenic Category II or III FHR patterns (Simpson & James, 2005). Some fetuses tolerate decelerations during pushing, but some may have less physiologic reserve due to existing maternal or fetal conditions, for example, preterm, intrauterine growth restriction. The FHR pattern should be used as an indicator of fetal response to second-stage stress (Simpson, 2016a). Recurrent variable decelerations are associated with respiratory acidosis at birth, and may progress to develop metabolic acidosis if this pattern continues (AWHONN, 2008). During pushing, maintain a normal FHR pattern by modifying pushing based on fetal status (AWHONN). During Category II and III FHR patterns, recommendations are to push with every other, every third contraction, or temporarily stop pushing to allow fetal recovery to a normal FHR pattern (AWHONN). Modifying maternal pushing efforts promotes physiologic resuscitation to improve fetal blood flow and oxygenation (Simpson & James, 2005).

Progress (fourth "P") is a key indicator to determine ongoing second-stage plan of care. Clinical progress and maternal–fetal tolerance are major factors that should guide decision-making. Recommendation is to evaluate and communicate at regular time intervals birth progress and maternal–fetal tolerance to enable team members to develop a collaborative plan for a safe birth (Simpson, 2016b). Safety huddles are recommended when: the woman achieves complete cervical dilatation, there is lack of progress or changes in maternal-fetal condition, and imminent birth requires bedside attendance and evaluation. Individualized care and clinical judgment are warranted based on the woman's needs, hospital resources, and limitations. Patience does not mean that there is unlimited second-stage duration. Safe care requires balancing maternal and neonatal consequences of continuing second-stage efforts to "maximize the probability of vaginal birth while minimizing the risks of maternal and neonatal morbidity and mortality" (Caughey, 2009, p. 337).

Preventing untoward urinary harm (fifth "P") addresses bladder care for laboring women with epidural analgesia/anesthesia. A historical practice to prevent urinary retention and possible labor obstruction was to place an indwelling catheter in women receiving an

An interdisciplinary evidence-based practice bundle for second stage labor care can promote optimal outcomes for mothers and babies.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intrapartum epidural for analgesia/anesthesia. To prevent risk of catheter-associated urinary tract infection (CAUTI), the Centers for Disease Control and Prevention (CDC) (2009, 2018) recommends intermittent catheterization at regular intervals rather than indwelling catheters unless they meet clinical criteria. Women with continuous indwelling urinary catheters experience urethral irritation, potential bacterial contamination, more pain requiring increased need for analgesia, need for oxytocin augmentation, longer second-stage, and less satisfaction with their birth experience (Rigini, Evron, Sadan, Szmuk, & Ezri, 2006). Unnecessary use of nonindicated indwelling urinary catheters may contribute to cesarean birth. Wilson (2015) found significantly increased likelihood of cesareans in women who had continuous urinary catheters (28.8% as compared with 9.9%) in women with intermittent urinary catheterization. Limiting catheter insertion in laboring women is an important step to prevent CAUTI, and meet the Centers for Medicaid and Medicare Services Value Based Purchasing outcome measure. In July 2017, CDC broadened the scope of the National Quality Forum (NQF)-endorsed measure to include patient care areas outside of intensive care units in acute care facilities, except level II or level III NICUs.

An indwelling catheter may be indicated for critically ill labor patients who need accurate intake and output measurements. If an indwelling urinary catheter is needed, it should be removed before maternal bearing down efforts. Pushing with an indwelling urinary catheter can cause urethral overdilatation and subsequent stricture. Fetal head pressure on the catheter bulb during pushing motions may cause shearing of the bladder detrusor muscle resulting in increased urinary tract trauma and prolonged urinary dysfunction and retention (De Sevo & Semeraro, 2010). Current urinary care during labor includes: 1) avoid indwelling urinary catheters during labor, 2) assess bladder status and encouraging women to void before placing an epidural, 3) offer a bedpan or use intermittent catheterization to empty her bladder if determined to be over distended, 4) assess bladder status throughout labor at least every 2 to 4 hours, and 5) consider performing an intermittent catheterization immediately prior to onset of maternal pushing (AWHONN, 2008).

Methods

Thirteen second-stage practices were incorporated into a standardized system guideline and implemented in 34 of the 40 birthing hospitals. (Six hospitals joined the health system after project began.) Approximately 2,500 clinicians (nurses, physicians, and midwives) completed an education program designed to provide evidence supporting the 5 Ps practice bundle including a 35-minute narrated slide program and a pre- and posttest learning evaluation. Nursing site champions attended monthly virtual meetings to share learning, progress, and tools for successfully implementing the practices.

Measures

Maternal process, maternal–fetal and newborn outcome, and balancing measures were selected to evaluate the effect of the second-stage labor bundle. Process metrics included care practices structured according to the "5 Ps" framework for safe second-stage care (Table 2). Progress in the practices was measured using a modified version of Michigan Hospital Association's second-stage data collection tool developed by Simpson, Kortz, and Knox (2009) for two previous health system-wide and statewide quality improvement projects (Simpson, Knox, Martin, George, & Watson, 2011). The tool was modified with permission based on minor changes in language and evidence, and structured into an Excel format to provide hospital clinicians with colorful visual status charts upon data entry. Nursing site coordinators were educated about sample selection procedures, and data abstraction methodology from medical records using standardized definitions and processes. Abstracted process data included 2 months of pre-implementation baseline data, and 4 months post-implementation data from each of the 34 hospitals.

Table 2. The 5 Ps Second-Stage of Labor Process Results

5 Ps Process Metrics (Aspects of Care)	Baseline (n = 1,278)	4 Months Post-implementation (n = 2,158)	p Value
PATIENCE			
1. Pushing is delayed until the urge to push or fetal head at the introitus.	939 (73%)	1,858 (86%)	<0.001
2. Pushed immediately without indication of abnormal fetal heart rate tracing.	326 (26%)	231 (11%)	<0.001
3. Method of pushing is to support mother's spontaneous pushing efforts.	875 (68%)	1,810 (84%)	<0.001
4. Active directive pushing used without clinical indication.	366 (29%)	274 (13%)	<0.001
5. Active directive pushing technique appropriate.	252 (81%)	460 (91%)	<0.001
POSITIONING			
1. Second-stage position changes occur every 30 min.	216 (62%)	770 (76%)	<0.001
2. Nonsupine lithotomy position used for birth.	964 (80%)	1,908 (90%)	<0.001
PHYSIOLOGIC RESUSCITATION			
1. Modified pushing with category II or III FHR tracings.	736 (58%)	1,491 (69%)	<0.001
2. Tachysystole (if present) is managed appropriately.	68 (45%)	139 (68%)	<0.001
PROGRESS			
1. Progress (fetal descent and/or rotation) is documented if delayed pushing > 2 hours.	41 (71%)	118 (92%)	<0.001
PREVENT URINARY INJURY (For Women with Epidurals)			
1. Indwelling urinary catheter present.	560 (44%)	429 (20%)	<0.001
2. Indwelling urinary catheter was indicated.	175 (59%)	123 (80%)	<0.001
3. Indwelling catheter removed prior to pushing.	411 (73%)	315 (73%)	0.4

Balancing metrics were evaluated because retrospective studies suggested that increasing second-stage duration may increase likelihood of operative interventions and maternal morbidities, including puerperal infection, and postpartum hemorrhage (Laughon et al., 2014; Rouse et al., 2009). As those analyses were unable to establish a clear causal relationship between prolonged second-stage and maternal morbidity, these conditions served as balancing metrics in this analysis. Primary outcome metrics focused on safely preventing primary cesarean birth, optimizing maternal and newborn birth outcomes, and improving women's birth experience, as measured by HCAHPS "likely to recommend" satisfaction scores.

Results

Significant improvements were observed post-implementation for 12 of the 13 aspects of care process metrics (Table 2). Two process metrics were used to calculate AWHONN's proposed perinatal nursing care quality measure 02: Second-Stage of Labor: Mother-Initiated Spontaneous pushing. The AWHONN (2014) pushing measure is defined as a mother's response to a natural urge to push or bearing down effort that comes and goes several times during each contraction. Two documentation components are measured: patient's report of sensation to push before actively pushing, and nurse's support of mother's spontaneous pushing efforts. Measure calculation comprised "yes" responses to "pushing delayed until urge" and "spontaneous pushing supported." There was significant improvement in the AWHONN measure in 4 months (pre—43% [510/1,195], post—76% [1,541/2,028], $p < 0.0001$).

Barriers to achieving mother-initiated spontaneous pushing were: maternal lack of pushing sensations related to dense epidural analgesia/anesthesia, physician routine practice of directive pushing, and fetal compromise as evidenced by Category II or III tracings necessitating an expeditious birth. Nurse site coordinators who abstracted the records reported nurses initiated pushing if fetal station was +3 or greater in women with dense epidurals who had no pushing urge sensations. To meet AWHONN's measure goal of 100%, modification of inclusion and exclusion criteria is recommended to accommodate epidural analgesia/anesthesia influence on physiologic urge to push.

There was a significant reduction of placement of continuous indwelling urinary catheters in laboring women with epidurals. During the 2-month preimplementation period, 44% (n = 560) of laboring women with epidurals had nonindicated indwelling urinary catheters. Four months postimplementation, only 18% (n = 429) of laboring women had indwelling catheters placed that did not meet American Nurses Association (2015) CAUTI criteria, a 60% reduction of catheter placement ($p < 0.001$). Although rate of removing urinary catheters

prior to pushing did not change (73% pre and post), there were significantly fewer catheters maintained or not documented they were removed prior to pushing (2 months baseline n = 315 catheters; 4 months postimplementation n = 114 catheters, p = 0.04). Clinical leaders from hospitals that retained urinary catheters during pushing were advised to immediately discontinue this practice due to risk of long-term urinary system harm.

Implementation of the second-stage bundle affected low-risk cesarean birth, reducing the newborn with complication rate and improving birth experience. The Joint Commission perinatal care measure PC-02, nulliparous, term, vertex, and singleton pregnancy (NTSV) was used to measure cesarean birth outcome. There was a significant decrease (p = 0.02) in the PC-02 NTSV cesarean rate 4 months postimplementation as compared with preimplementation rate (Table 3).

The primary newborn outcome was the NQF Term Newborn Complication rate. Term newborn NICU admission has been an established newborn outcome measure in majority of second-stage labor studies. Our hospital system data revealed significant criteria variability for term newborn NICU admission related to processes (e.g., NICU admission for antibiotic prophylaxis), practices (e.g., pediatric provider location preferences), and conditions unrelated to second-stage of labor care (e.g., congenital malformations, neonatal abstinence syndrome). Therefore, NQF Term Newborn Complication rate was the selected proxy measure as standardized, coded conditions for specific preventable diagnoses using administrative data were readily available. There was a significant decrease in complications for all term births of newborns postimplementation versus preimplementation (p < 0.001), and for newborns from vaginal births (p = 0.03).

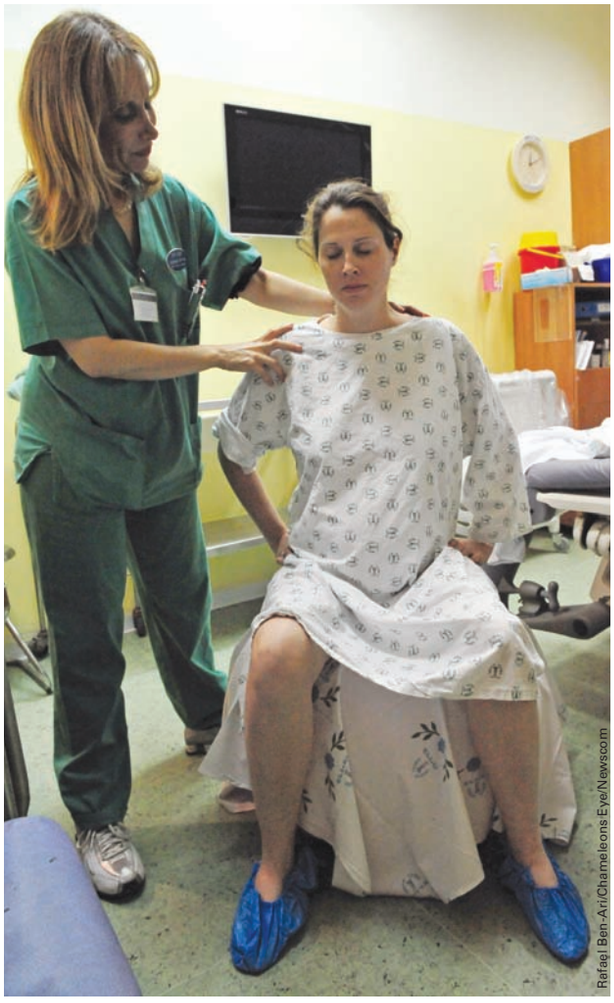
Women's reported HCAHPS "likely to recommend" satisfaction scores were derived from vaginal and cesarean birth DRGs to report birth experience. Prior to bundle implementation, birth experience was the 69th percentile. By 4 months post-implementation, this rate increased to 81st percentile for women reporting satisfaction with their birth, and likely to recommend their hospital. Nurses attributed this improvement trend to birth practices that supported women's birth plans and preferences through patience, positioning for comfort and progress, and supporting her spontaneous pushing efforts, as there was no other competing experience of care initiative during this period.

Balancing metrics are important safety measures to ensure practice changes do not negatively affect other outcomes. Contrary to previous retrospective study concerns, this prospective standardized implementation of a second-stage labor bundle revealed no significant differences during the 4-month postimplementation period in maternal morbid conditions (i.e., chorioamnionitis, postpartum hemorrhage), operative vaginal birth, shoulder dystocia, and newborn birth trauma (Table 3). Our findings support importance of setting practice guidelines based on prospective, planned, standardized implementation rather than inferred outcomes from an analysis of large data sets.

There was no significant increase in the total second-stage duration (pre—75.3 ± 89.6 minutes; post—74.7 ± 94.5 minutes, p = 0.38). Passive second-stage duration

Table 3. The 5 Ps Second-Stage of Labor Balancing and Outcome Metrics

Metric	Baseline (n = 6,012)	4 Months Postimplementation (n = 11,223)	p Value
Maternal Morbidity			
• Chorioamnionitis	106 (1.76%)	236 (2.10%)	p = 0.13
• Postpartum hemorrhage	228 (3.8%)	411 (3.7%)	p = 0.67
Birth Outcomes			
• Assisted vaginal birth (forceps/vacuum)	372 (6.1%)	642 (5.7%)	p = 0.21
• Shoulder dystocia	168 (2.8%)	285 (2.5%)	p = 0.32
Cesarean Birth (Joint Commission PC-02 NTSV)	1,713 (28.5%)	2,805 (25%)	p = 0.02
Newborn Birth Trauma			
• All singleton term births	43 (0.7%)	65 (0.46%)	p = 0.05
• Singleton vaginal births	38 (2.4%)	58 (2.3%)	p = 0.07
Term Newborn with Complications			
• All singleton term births	247 (3.9%)	265 (2.7%)	p < 0.001
• Singleton vaginal births	146 (3.2%)	404 (2.9%)	p = 0.05
	Baseline (n = 4,500)	**4 Months Post-implementation (n = 9,500)**	**p Value**
Singleton Term Vaginal Births			
• Newborn Birth Trauma	38 (2.4%)	58 (2.3%)	p = 0.07
• Term Newborn with Complications	146 (3.2%)	404 (2.9%)	p = 0.05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was unchanged (pre—28.0 ± 44.3 minutes; post—31.9 ± 51.9 minutes, $p = 0.11$). Average length of active pushing phase was significantly shorter postimplementation (pre—47.2 ± 67.3 minutes; post—42.8 minutes ± 62 minutes, $p = 0.01$).

Discussion

Second-stage labor care practices were organized into a practice bundle framework of 5 Ps: **p**atience in delaying pushing and lengthening pushing time, frequent and upright **p**ositioning, **p**hysiologic resuscitation by modifying pushing, **p**rogress and maternal-fetal response as the determinants for continuing the second-stage plan of care, and **p**reventing urinary harm by eliminating routine indwelling urinary catheters. Patience means delaying pushing until the laboring woman is physiologically ready to improve pushing effectiveness and reduce active pushing duration. Patience involves supporting adequate time for both second-stage phases as long as maternal progress and fetal well being exists. Upright and lateral positioning and frequent position changes can facilitate fetal descent and rotation to improve maternal outcomes at birth. Labor progress, maternal tolerance, and fetal well being should be primary determinants for continuing second-stage plan of care rather than defined duration periods alone. Patience practices do not prolong second-stage, rather the stressful active pushing period is shortened resulting in significantly fewer NTSV cesarean births, significantly fewer term newborns with complications and an improved birth experience. Physician pre-implementation concerns about second-stage practices increasing second-stage duration were unfounded based on our results.

A polling survey during a system learning meeting call revealed that majority of participating hospital site coordinators admitted their unit culture was such that RNs did not notify an OB physician when a woman was completely dilated if they were concerned that the physician would begin pushing interventions too early. Nurses further disclosed omission of documenting correct times of complete cervical dilation in medical records with identical concerns. Misleading communication about labor progress to avoid pushing when conditions are not perceived to be favorable has been reported by Simpson, James, and Knox (2006) and Simpson and Lyndon (2017). This cultural finding's predominance has significant ramifications on validity of data in studies focusing on variable of time (e.g., Grobman et al., 2016), rather than maternal progress and fetal response to determine safe practices during second-stage labor. Studies using documented time of complete dilatation as second-stage onset potentially have likely underreported second-stage duration if this cultural phenomenon existed in hospitals where these data were collected. Simpson and Lyndon (2017) recommend that resolution of nurse–physician communication gaps is imperative to promote safe care. Future second-stage labor studies need to consider nurse–physician communication as a potential confounding unit culture variable.

Providing physiologic fetal resuscitation by alternating or discontinuing pushing with Category II/III FHR patterns and physiologic management of oxytocin reduces risk to the fetus of tachysystole. These interventions may prevent iatrogenic fetal intolerance resulting in cesarean birth.

Clinical Implications

- Implementing the AWHONN second-stage labor practices and ACNM physiologic birth tools promotes vaginal birth and improves newborn outcomes.
- Minimizing interventions, that is, indwelling urinary catheters, delaying pushing until maternal urge, and encouraging spontaneous pushing efforts, support physiologic birth and may improve birth satisfaction by helping women to meet their goals for birth.
- By promoting upright or lateral positional changes, and assisting women to select positions of comfort that facilitate labor progression during second-stage labor and birth, nurses can improve vaginal birth outcomes.
- Use labor progress, maternal tolerance, and fetal well-being as the primary determinants for continuing second-stage plan of care rather than focusing on defined duration periods alone.

For laboring women with epidurals, a fifth "P" includes practices to prevent untoward effects of routine indwelling urinary catheterization. Placing an indwelling urinary catheter only when medically indicated and removing it prior to pushing may reduce long-term maternal harm.

Conclusion

Many practices described in the 5 Ps second-stage bundle support reducing unnecessary interventions as per ACOG (2017) that recommends approaches to limit intervention during labor and birth. Obstetricians-gynecologists, midwives, nurses, and others providing labor support can help women meet their goals for labor and birth by using techniques associated with minimal interventions and improve women's satisfaction, that is, delaying pushing and using woman's preferred pushing technique. Our experience demonstrates that a focused implementation of an evidence-based, interdisciplinary second-stage labor practice bundle can achieve the goals of safely preventing the primary cesarean birth in low-risk nulliparous women, optimizing maternal and fetal outcomes associated with birth, and improving a woman's birth experience. ✣

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