Southern California CSU DNP Consortium

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IMPROVING NURSE MANAGEMENT OF THE SECOND STAGE OF LABOR

A DOCTORAL PROJECT

Submitted in Partial Fulfillment of the Requirements

For the degree of

DOCTOR OF NURSING PRACTICE

By

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ABSTRACT

Background: There is global concern that cesarean sections (CS) are overused because of the rapid increase in CS rates without corresponding decreases in maternal or neonatal morbidity and mortality (Caughey et al., 2014). In 1996, national CS rates were 20.7%, peaking at 32% in 2015 (Caughey, 2017). The *Healthy People 2020* goal of a 23.9% CS rate for nulliparous term singleton term (NTSV) women was identified as a national benchmark and primary strategy to safely decrease CS rates (Bell et al., 2017; Vadnais et al., 2017). Methodology: The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care was the framework used. Guidelines to support second stage nursing management were created by integrating unit policies with research evidence. Eighteen registered nurses (RNs) attended an instructional course (IC), the intervention, to improve nurse management of second stage of labor. Results of pre- and post-knowledge tests and pre- and post-intervention labor variables were compared. Results: RN knowledge increased, evidenced by mean pre- and posttest scores of 6.17 and 9.06 respectively, $t(17) = -6.43$, $p < .001$. Second stage labor outcomes also improved with more position changes and percentages of normal spontaneous vaginal deliveries (NSVD). Eighty-seven percent (n = 28/32) of patients cared for by IC RNs delivered by NSVD compared to 81.8% (n =18/22) cared for by non-IC RNs. Recommendations: Based on the positive response to the IC and improved clinical outcomes, regularly scheduled, interactive, evidence-based nursing education focused on strategies to improve second stage management should be provided.

Keywords: birth, obstetric; labor, second stage; term birth

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A principle of the nursing profession is lifelong learning, to which the DNP is a testament. I am proud to advance the profession by becoming doctorally prepared. It is an honor to be a nurse.

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Background

There is global concern that cesarean birth is overused because of the significant and rapid worldwide increase in cesarean section (CS) rates without corresponding decreases in maternal or neonatal morbidity and mortality (Caughey et al., 2014). National CS rates rose from 20.7% in 1996 to a peak of 32% in 2015 (Caughey, 2017). The World Health Organization's 2015 goal is to maintain rates of 10% -15% of all CS births, stating that there is evidence when the CS rate is maintained at this level, maternal and neonatal mortality rates decrease. Of note, maternal and neonatal outcomes do not improve as CS rates rise above this rate, but the goal in the United States (US) is to reduce the CS rate to the *Healthy People 2020* national target of 23.9% (Caughey, 2017; Lagrew et al., 2018; Smith et al., 2016; World Health Organization, 2015).

Problem Statement

The effort to reduce CS rates is essential because there are significant maternal morbidities associated with cesarean birth surgeries that increase with each subsequent pregnancy (Gams et al., 2019; Smith et al., 2016). Short term effects include infection, blood loss, and venous thrombosis. Long term complications include increased risks of abnormal placentation, hemorrhage, and hysterectomy, with risks increasing exponentially in each future pregnancy (Lagrew et al., 2018). Currently, leading obstetric organizations, including the California Maternal Quality Care Collaborative (CMQCC), the National Partnership for Maternal Safety (NPMS) within the Council on Patient Safety in Women's Health Care, the Association of Women's Health, Obstetric, and Neonatal Nurses (AWHONN), the American College of Obstetricians and Gynecologists (ACOG), the Society for Maternal-Fetal Medicine (SMFM), and the American College of Nurse-Midwives (ACNM), are focused on preventing unnecessary primary cesarean births, especially in low-risk pregnancies. A low-risk pregnancy is

identified as nulliparous, term, singleton, with vertex presentation (NTSV) (Lagrew et al., 2018). With the assumption that most women will have more than one child, if the first CS is avoided, the increased morbidities associated with each subsequent surgery will be eliminated (Lagrew et al., 2018; Smith et al., 2016).

The *Healthy People 2020* goal of a 23.9% CS rate for NTSV pregnant women was identified as a national benchmark and the focus of the primary strategy to safely decrease primary CS rates (Bell et al., 2017; Vadnais et al., 2017). The Joint Commission also stated that there is evidence that hospitals can safely reduce their CS rates without compromising neonatal outcomes. To this end, effective July 1, 2020, The Joint Commission began to use perinatal care cesarean birth measure (PC-02), which assesses the CS rate in the NTSV population, to publicize reports of hospitals that have consistently high NTSV CS rates (The Joint Commission, 2018).

In 2018, the CS rate in the NTSV population in the US was 25.9% (Martin et al., 2019). At the facility where this project was implemented, there was already a focused effort on decreasing the NTSV CS rate. In 2018, the NTSV CS rate was 27.8% and in 2019 it was 23.7%, with large fluctuations from month to month (CMQCC, 2020). The decreasing NTSV CS rate was slightly lower than the national benchmark. This project was designed and implemented to help ensure that the goal of a 23.9% NTSV CS rate would be sustained.

Multiple evidence-based quality improvement initiatives must be implemented in order to reduce NTSV CS rates, including patient-centered care and labor management using contemporary labor guidelines (Lagrew et al., 2018; The Joint Commission, 2018). These guidelines call for a delay in diagnosing arrest of labor in second stage until pushing for at least two hours in multiparous women and three hours in nulliparous women. Longer duration of second stage is permitted on an individual basis if pushing is effective, fetal descent is noted, and the fetus demonstrates continued evidence of adequate oxygenation (Caughey et al., 2014). In

accordance with research that epidural anesthesia lengthens the second stage of labor, research sponsored by the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) supports an additional hour of pushing before diagnosing second stage arrest in women with epidural analgesia (Ashwal et al., 2020a; Caughey et al., 2014). The NPMS developed a structured method of evidence-based actions, a safety bundle titled Safe Reduction of Primary Cesarean Births, to support health systems and healthcare providers to reduce primary cesarean births and support vaginal births safely. The bundle was intended to be adopted, individualized, and implemented by birth facilities and healthcare providers (Lagrew et al., 2018; Smith et al., 2016).

An essential element of any patient safety program in maternity care is to adopt healthcare provider education and training (Lagrew et al., 2018). This includes targeted and repetitive measures to reinforce clinicians' knowledge, skills, and attitudes in order to improve patient outcomes (Lagrew et al., 2018). Edmonds et al. (2017) and Adams et al. (2016) explain that individual nursing practice has the potential to influence the mode of birth outcome. Therefore, it is vital to engage nurses in these educational efforts (Edmonds, 2017).

Purpose of the Project

To decrease the number of primary cesarean sections in the NTSV population, the current medical literature guidelines advise clinicians to delay making a diagnosis of arrest of second stage of labor, noting that longer durations of pushing may be appropriate in individual cases (Caughey et al., 2014; Huang et al., 2019). The nurse is the primary healthcare provider responsible for managing patient care during pushing, making second stage nursing management a priority. This management includes continuous nursing presence during pushing, accurate assessment of fetal status and uterine activity, educating the woman about how and when to push (open glottis vs. closed glottis), assisting in frequent position changes (upright, hands/knees,

squatting, forward leaning, side lying), delayed pushing to allow for the passive descent of the fetal head if a patient lacks sensation with an epidural block, and collaborating with anesthesia providers as needed to titrate epidural dosing in dense blocks in order to balance greater motor control with adequate labor analgesia (Bell et al., 2017; Cheng & Caughey, 2015; Edmonds et al., 2017; Simpson, 2016; Smith et al., 2016). Therefore, the purpose of this project was to develop, implement, and evaluate an educational program to improve labor nurses' management of second stage labor.

Framework

Nursing care advances through the generation of new knowledge via research, yet there is often a significant time lag between knowledge generation and its translation into clinical practice (Duffey et al., 2015; Milat et al., 2015). In order to improve quality patient care, improve patient outcomes, and increase patient safety, it is essential to shorten this gap to ensure evidence-based practice (EBP) is implemented into patient care settings (Duffy et al., 2015; Warren et al., 2016). EBP, a problem-solving approach to care, is a shared decision-making model in which the best research evidence is integrated with the clinician's experience and the patient's desires (Cullen at el., 2018; Warren et al., 2016).

There are several theoretical models to guide the implementation of EBP (White & Spruce, 2015). The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care (Appendix A), hereafter referred to as the Iowa Model, is one example of an evidence-based practice model that addresses problem-focused issues by encouraging nurses to question current practices and determine if there is current research to support improved care (White & Spruce, 2015). The Iowa Model is used in many healthcare organizations and nurses report that it is straightforward, easy to use, and helpful in implementing practice changes (Iowa Model Collaborative, 2017; White & Spruce, 2015). For these reasons, the Iowa Model was used

as a framework to guide this Doctor of Nursing Practice (DNP) project (permission granted, Appendix B). This model focuses on three major decision points, many feedback loops, and multiple opportunities to redesign, reassemble, and/or consider alternatives (Iowa Model Collaborative, 2017).

The first step in the Iowa Model is to identify triggering opportunities. While focusing on quality and safety, clinicians often have questions that generate inquiry. Organizational, state, and national initiatives also lead to opportunities to engage in EBP (Cullen et al., 2018). At the project facility, the CS rate in 2018 exceeded the US Department of Health and Human Services *Healthy People 2020* Goal of a NTSV rate of 23.9% (Vadnais et al., 2017). This prompted an opportunity to analyze nursing practice that may have contributed to a higher than anticipated CS rate in this low-risk population.

In the second step of the Iowa Model, the project purpose is stated (Iowa Model Collaborative, 2017). In order to narrow the focus of the project, develop a purpose statement, and guide the literature search for evidence, a PICO (P = patient/problem/population, I = intervention, C = comparison, O = outcome) statement is written (Cullen at el., 2018). The PICO statement for this project was the CS rate will decrease in the NTSV population after an instructional course (IC) designed to improve nursing management of the second stage of labor, with a comparison of baseline labor and delivery nursing care during the second stage. The purpose of this project was to develop, implement, and evaluate an educational program to improve labor nurses' management of second stage labor.

At this juncture, the first decision point using the Iowa Model is to ask, "is this topic a priority" (Iowa Model Collaborative, 2017)? Factors that favor proceeding with the project include a topic that relates to patient safety, is aligned with the organization's strategic goals, has leadership support, and interprofessional commitment and engagement. Additional factors

include available resources, patient volume, and staffing levels that support clinician engagement with the project, feasibility of implementation, and available data to evaluate the topic (Cullen et al., 2018). With the increasing CS rates and associated morbidities and mortalities, the *Healthy People 2020* goal of 23.9% in low-risk women is used as a national benchmark for the NTSV CS rate (Vadnais et al., 2017). Accordingly, one of this project facility's 2020 strategic goals was to decrease the NTSV CS rate. Therefore, this project was identified as an institutional priority and support was obtained from the Director of Women's Services, the Chief Nursing Officer, and the divisional supervisors of the Quality Improvement and Human Resources departments.

In the third step of the Iowa Model, once the project was identified as a priority, a team is formed (Iowa Model Collaborative, 2017). It is vital to develop a team early in the EBP process as team member impacts the success of the project. Members were included based on skill, ability to influence, and commitment to invest a long period of time in organizing, implementing, and sustaining the project (Cullen et al., 2018). The team for this project included the author, the Director of Women's Services, the unit educator, clinical nurse champions, and other clinical nurses. Each stakeholder was key to the successful development, implementation, and evaluation of this project.

The fourth step is to synthesize the literature (Iowa Model Collaborative, 2017). The goal is to evaluate the quality and strength of the existing evidence to determine if it can be used in clinical practice (Cullen et al., 2018). A systematic search of available literature was completed and the evidence was leveled and weighed. One randomized control trial (level II evidence) and four cohort studies (level V evidence) provided the most robust evidence on which to base this EBP project. In addition, two quality improvement projects and multiple expert opinion pieces were reviewed.

The second decision point in the Iowa Model is to determine if there is sufficient evidence to proceed with the project (Iowa Model Collaborative, 2017). This was determined by considering the strength of the evidence, clinical and organizational priorities, risk and benefits, and expert clinical judgment (Cullen et al., 2018). Although no randomized control trials or meta-analysis studies regarding a nurse's management of the second stage of labor were found in the literature, expert opinion supports the prompt implementation of current evidence-based strategies to promote vaginal birth (Lagrew et al., 2018). Active nursing management of second stage is identified in the literature as a strategy to reduce primary CS rates in the NTSV population, providing validation for this project. Details about the evidence is provided in the Literature Review.

The fifth step is to design and pilot the practice change. Fundamental actions during this step are to collect baseline data, to develop a localized protocol, and to create an implementation, data collection, and evaluation plan (Iowa Model Collaborative, 2017). The project began with an analysis of multiple unit policies that address the second stage of labor to establish a baseline understanding of unit policy and support for the implementation of the educational intervention. After Institutional Review Board (IRB) approval was obtained, baseline data were collected by reviewing patient data extracted from the electronic medical record (EMR) for NTSV patients who delivered at the facility over the four-weeks prior to the intervention. Data collection included the gestational age, rupture of membrane method (spontaneous or artificial), total number of minutes elapsed from rupture of membranes to birth, number of minutes from 10 centimeters (cm) dilation to birth, number of minutes spent in delayed pushing (time from 10 cm to the initiation of pushing to allow for passive descent of the fetal head), and number of active pushing minutes. Birth outcome (normal spontaneous vaginal delivery [NSVD], operative vaginal delivery [OVD], or primary CS), time of birth with specific attention to delivery provider

(obstetrician, certified nurse midwife, or registered nurse), number of second stage patient position changes per hour in first, second, third, fourth, and fifth hours, total number of second stage position changes, number of nurse/provider communications during the second stage, and number of unanticipated neonatal intensive care unit (NICU) admissions were also collected. In addition, maternal co-variants, including age, body mass index (BMI), and labor epidural were gathered.

During the fifth step, the author developed an instructional course to increase nurse's knowledge integration and skills for second stage labor management. Course materials and teaching strategies were designed for the adult learner, including kinesthetic, auditory, visual, and tactile experiences. Subject content included theory presentation on local and national NTSV CS rates, contemporary labor management guidelines, assessment and documentation of maternal/fetal status and second stage progress/fetal descent, information about delayed pushing or "laboring down," open/closed glottis pushing, and crucial components of second stage nurse/provider communication. Maternal pushing positions were taught through both interactive role-playing and reflection. Appropriate nursing documentation was illustrated through demonstration in the practice environment of the EMR. In addition, the author created unit guidelines to support nursing management of the second stage.

In order to assess knowledge, pre- and posttests were administered. The test gathered information regarding second stage management as well as the nurse's confidence and integration of knowledge into clinical practice. Skill competency was ongoing throughout the course, demonstrated through the participant's interactive engagement in role-playing and established through appropriate nursing documentation in the EMR practice environment.

To implement the change, the author identified leaders to serve as change champions for this project, co-instructors for the course, and mentors for the attendees. Clinical nurses were

invited to attend this voluntary instructional course and were compensated by administration for their time. After the course was completed, attendees were encouraged to seek change champions for assistance while caring for patients in the second stage of labor. Likewise, change champions were encouraged to mentor attendees, and others who did not attend the program, by collaborating at the bedside as time permitted during second stage and then debriefing about second stage patient care.

In order to collect post-project data, the author collected data extracted from the EMR of NTSV patients who delivered at the facility over four weeks following the intervention, noting which patients were cared for by nurses who attended the instructional session. By measuring the number of minutes from 10 cm to birth, adjusting for the number of delayed pushing minutes and maternal co-variants, and analyzing the delivery outcomes, the effect of increasing nurses' knowledge and skills about second stage management was evaluated. The number of NICU admissions served as a balancing measure. By comparing pre- and post-project data for the time of delivery with specific attention to delivery on the day or night shift and number of years of obstetric nursing experience, the effect of education on the care delivered by novice, mid-career, and/or expert nurses was analyzed to determine if it could affect change in delivery outcomes.

The final stage of the Iowa Model is the integration of the new practice, sustainment of the change and dissemination (Iowa Model Collaborative, 2017). In order to integrate and sustain the change, actions must be hardwired into the system, key personnel must continue to engage, and data must continue to be analyzed (Iowa Model Collaborative, 2017). While the majority of these actions are beyond the scope of this DNP project, ideas for sustainability include modifying the unit's existing second stage policies to be evidence-based, teaching this course to all labor and delivery nurses who are currently employed on the unit, incorporating the class into new-hire orientation and annual skills evaluations, continued chart reviews and data analysis, and

routine sharing of data. Although the project data will be shared with unit/department administration, plans for further dissemination include poster and podium presentations at local, state, and national conferences, and publishing in a peer-reviewed journal.

Literature Review

It is essential to review and synthesize the existing literature to provide the context of the clinical problem, to describe the current evidence, and to provide the rationale for the project (Bonnel & Smith, 2018). A comprehensive literature review was completed by searching PubMed, CINAHL, and Google Scholar. Search terms included cesarean section, evidence-based, knowledge validation, labor, learning styles, length of labor, maternal positioning, nurse management, second stage, pushing/bearing down, prolonged, and second stage of labor. Peer-reviewed journal articles, written in English and published between 2015 and 2020 were included. The reference lists of the articles that were read were reviewed and relevant articles were obtained. These included an article published in 2010, followed by a landmark study published in 2010, guidelines jointly published in 2012 by the National Institute of Child Health and Human Development, SMFM, and ACOG to redefine labor arrest, and guidelines published in 2014 and reaffirmed in 2019 by the SMFM and ACOG to safely reduce the primary CS.

This section includes a review of current literature on labor and cesarean sections (CSs). It details nursing management techniques for the second stage of labor. This section also focuses on how nurses acquire knowledge and skills.

Labor

Labor is a natural process in which a fetus and placenta are delivered from the uterus through the vagina. Labor is defined as regular contractions that cause a measurable change in cervical dilation and/or effacement.

First Stage of Labor

The first stage of labor begins when labor starts and culminates when the cervix is 10 centimeters (cm) dilated. It is subdivided into two additional phases, which include the latent

phase from 0 to 6 cm dilation and the active phase from 6 to 10 cm dilation (Hutchison et al., 2019).

Second Stage of Labor

Second stage of labor is the time between 10 cm dilation and the birth of the fetus (Cheng & Caughey, 2017). The fetus descends into the vaginal canal once the cervix is completely dilated; this can occur with or without maternal pushing (Hutchison et al., 2019). Many maternal and fetal factors can influence progress during this stage. Maternal characteristics include parity, size and shape of the pelvis, age, height, weight, pre-pregnancy BMI, ethnicity, uterine contraction strength, epidural analgesia, expulsive efforts, soft tissue, hypertensive disorders, and/or diabetes mellitus. Fetal characteristics include weight, fetal occiput position, degree of flexion, and station at 10 cm dilation (Ashwal et al., 2020b; Cheng & Caughey, 2017).

Contemporary Labor Guidelines

Labor management has been mainly based on Dr. Emanuel Friedman's historical studies from the 1950's. Based on his work, the classic definition was that active labor began at three to four cm, and advanced at 1.2 cm an hour in nulliparous women (Hoppe et al., 2018). Minimal research was completed after Friedman's focused efforts until the rapid increase in CSs between 1996 and 2007, prompting renewed research efforts (Zhang et al., 2010b).

In order to collect comprehensive information about contemporary labor and delivery practices and to obtain a thorough understanding of the rationale for the high cesarean rate in the US, the NICHD, together with 19 hospitals across the US, collaborated to conduct a retrospective observational study of detailed labor and delivery information from 228,668 electronic medical records from 2002-2008 (Zhang et al., 2010b). This landmark study, published in 2010, is cited in the literature as Consortium on Safe Labor with Jun Zhang as the

primary researcher (Zhang et al., 2010b). The Consortium on Safe Labor established that one in three nulliparous women in the US delivered by CS. Almost one- third of all CSs were pre-labor repeat CSs, with a previous uterine scar documented as the most common indication. A high percentage of CSs were performed before six cm, especially in nulliparas, women admitted for induction of labor, and women attempting a trial of labor after CS. Also, 44% of the women attempting vaginal birth were induced, with the CS rate twice as high in this cohort as women in spontaneous labor. Finally, there was a low rate of trial of labor after CS contributing to the low success rate for vaginal birth (Zhang et al., 2010b)

Length of labor. Shortly after the Consortium on Safe Labor was published, Zhang et al. published a second study that defined labor in a contemporary population of women with increasing age, maternal and fetal body sizes, and obstetric interventions (Zhang et al., 2010a). This study analyzed data from 62,415 parturients with singleton, term, vertex, spontaneous onset of labor, and vaginal delivery of a live infant who had been included in the Consortium on Safe Labor study (Zhang et al., 2010a). Zhang et al. (2010a) established that it may take more than six hours to dilate from four to five cm and more than three hours to progress from five to six cm. In addition, Zhang et al. (2010a) identified six cm as the new landmark for active labor, explaining that both nulliparas and multiparas dilate at a similar rate until six cm (Zhang et al., 2010a). In multiparas, labor advances with rapid cervical dilation after six cm (Zhang et al., 2010a). This study further explained that although many parturients do not have a consistent pattern of active labor, many will achieve vaginal birth even when labor progresses slowly, calling for labor to continue within this newly established normal range as long as maternal-fetal conditions warrant (Zhang et al., 2010a).

Based on this data, Zhang et al. (2010a) created a partogram intended to evaluate labor, identify labor protraction and arrest disorders, and to prevent premature CSs (Zhang et al.,

2010a). The lines represent the 95th percentile with exponential stair-like lines that illustrate slow labor progress until six cm. After six cm, a steeper slope emerges to demonstrate more rapid cervical dilation beyond this point (Zhang et al., 2010a).

Professional Organizations' Recommendations

Zhang et al.'s research established contemporary labor curves, serving as the foundation for the 2012 recommendations from the NICHD, SMFM, and ACOG to redefine labor arrest, aiming to reduce the domestic primary CS rate (Hoppe et al., 2018). Zang's research is also the foundation for ACOG/SMFM's consensus statement on the safe prevention of the primary CS, hereafter referred to as Obstetric Care Consensus, initially published in 2014 and reaffirmed in 2019 (Caughey et al., 2014).

The Obstetric Care Consensus statement identifies recommendations to safely limit the number of primary CSs, including new guidelines for management of the first stage of labor. The onset of active labor is defined as six cm cervical dilation. Prolonged latent phase (greater than 20 hours in nulliparas and greater than 14 hours in multiparas) and slow, progressive progress in the latent phase are not indications for cesarean delivery. First stage arrest should not be diagnosed until a woman is at or beyond six cm dilation with ruptured membranes and either four hours of adequate contractions (more than 200 Montevideo units) or at least six hours of oxytocin administration and inadequate contractions with no cervical change (Caughey et al., 2014).

To address the second stage of labor, Obstetric Care Consensus recommendations state that an absolute length of the second stage of labor has not been identified. If maternal and fetal status permit, a multipara should be allowed to push for two hours, and a nullipara for three hours, before diagnosing second stage arrest, with more time allowed on an individual basis. The

NICHD document suggests that women with epidural analgesia should be given one additional hour before diagnosing second stage arrest (Caughey et al., 2014).

Literature Synthesis

This synthesis is based on six quantitative studies that focus on decreasing CSs in the NTSV population. The strongest evidence, Level II, is a randomized controlled trial (RCT) by Gimonsky and Berghella (2016) that included 78 nulliparous women and provided evidence that extending labor decreased the CS rate without increasing maternal or neonatal morbidities. Moreover, CSs decreased from 43.2% to 19.5% when labor was extended, with a relative risk of 0.45, and 95% confidence interval of 0.22-0.93. This result is significant because when the duration of labor was extended, CS rates decreased by more than one-half without increasing maternal or neonatal morbidities (Gimonsky& Berghella, 2016).

Four of five cohort studies, level V evidence, supported the results of the Gimonsky's and Berghella's RCT. In Grobman et al.'s (2016) observational study, the authors concluded that while the chances of CS or OVD increased as the duration of active pushing increased, it was uncommon for nulliparous women to push for more than three hours or for multiparous women to push for more than two hours to achieve vaginal birth. At more than four hours of active pushing, nulliparous women had a 78% chance of vaginal delivery, and after two hours of active pushing, multiparous women had an 82% chance of delivering vaginally, supporting the implementation of the Obstetric Care Consensus (Grobman et al., 2016). Wilson-Leedy et al.'s (2016) small retrospective cohort study compared CS rates before (N=275) and after (N=292) implementation of the Obstetric Care Consensus guidelines. They also demonstrated that the overall CS rate and maternal morbidity decreased when the guidelines were applied. In this study, the overall CS rate, which included women in spontaneous labor, decreased from 26.9% to 18.8% with an adjusted odds ratio of 0.63 and 95% confidence interval 0.42-0.94 (Wilson-Leedy

et al., 2016). While the baseline CS rate in Thuiller et al.'s (2018) large retrospective study, completed in France, was much lower than the baseline CS rates in the US, this research showed statistical and clinical decreases in the global CS rate, from 9.4% at the baseline to 6.9% after adoption of the Obstetric Care Consensus, demonstrating that the guidelines are an effective way to lower CS rates (Thuiller et al., 2018). Zipori et al.'s (2019) study, from Israel, further supports implementation of the Obstetric Care Consensus, with a decrease in CS rates from 23.3% to 15.7% after implementing the Obstetric Care guidelines.

Contrary to the results of other studies, the CS rates in Rosenbloom et al.'s study were not reduced after adopting the Obstetric Care Consensus guidelines. CS rates increased from 15.8% to 17.7% and both maternal and neonatal morbidity also increased (Rosenbloom et al., 2017). One possible explanation is the lack of interventional fidelity; while obstetric providers agreed to manage labor according to the Obstetric Care Consensus, it is possible that guidelines were not strictly followed, especially considering that the data collection began the year that Zhang et al.'s (2010a) landmark article was published. Also, the 15.8% baseline CS rate may have been as low as safely possible for the population.

To conclude, five of the six studies demonstrated a reduction in CSs when the Obstetric Care Consensus guidelines were followed. Each study was completed in a single academic institution, which limited generalizability when independently analyzed. Given the consistent results in most of the studies and considering the fact that the studies were completed on three separate continents, the outcomes of each study collectively expand the generalizability to broader populations. The data demonstrate that there is value in integrating the Obstetric Care Consensus guidelines into obstetric care.

Cesarean Section

CS is the surgical delivery of the fetus through an open abdominal incision (laparotomy) followed by a uterine incision (hysterotomy). It is the most common surgery performed in the US today (Ricci et al., 2017; Sung & Mahdy, 2019). There are both maternal and fetal indications for CS. Maternal reasons include previous CS, previous classical hysterotomy, previous uterine incision dehiscence, maternal request, cephalopelvic disproportion, pelvic deformity, abdominal cerclage, previous pelvic or anal/rectal reconstructive surgery, herpes simplex virus outbreak, placental abruption, abnormal placentation (including placenta previa and placenta accreta) and perimortem CS (Sung & Mahdy, 2019). Fetal indications include malpresentation, abnormal fetal heart rate tracing, umbilical cord prolapse, and failed OVD (Sung & Mahdy, 2019).

Primary Cesarean Section

The NTSV population is the most significant contributor to rising CS rates (Smith et al., 2016). The most commonly documented indications for primary CSs include labor dystocia, Category III fetal heart rate tracing, fetal malpresentation, suspected macrosomia, and multiple gestation (Caughey et al., 2014). CSs have significant maternal health risks and are associated with more morbidities and mortalities than vaginal birth (Lagrew et al., 2018; Zipori et al., 2018). Short term risks include infection, blood loss, venous thromboembolism, and anesthesia complications (Lagrew et al., 2018; Sung & Mahdy, 2019).

Repeat Cesarean Section

In the US, women who have primary CSs typically have repeat CSs. In addition to the short-term risks of the primary CS also present in repeat CSs, other risks including more adhesions, which create an increased risk of surgical injury and an increased risk of abnormal placentation, rise exponentially with each subsequent CS (Lagrew et al., 2017; Smith et al., 2016; Sung & Mahdy, 2019). Abnormal placentation includes placenta previa and placenta accreta spectrum disorders such as accreta, increta, and percreta (Silver & Barbour, 2015). Risks

of maternal morbidities secondary to abnormal placentation are significant and include, but are not limited to, preterm birth, hemorrhage, massive transfusion, hysterectomy, assisted ventilation, cardiac arrest, acute renal failure, intensive care unit admission, and death (Anderson-Bagga & Sze, 2019; Caughey et al., 2014; Gibbins et al., 2018).

Second Stage Nursing Management Techniques

With the high rate of CS and increased risks associated with each subsequent cesarean birth, prevention of the primary CS is a vital population health goal (Silver & Barbour, 2015; Zeevi et al., 2018). Nurses, who provide the majority of direct patient care through labor and birth, are critical members of the obstetric team (Edmonds et al., 2017). Research demonstrates that a nurse's attitude about birth and the time spent providing bedside labor support may influence the mode of birth (Edmonds et al., 2017). It is imperative for the nurse to engage in and promote shared decision making, a collaboration between the woman and her healthcare provider, to identify options for management of her care based on clinical evidence and her personal values and beliefs (Lagrew et al., 2018).

Obstetric nursing literature supports the normal physiologic process of birth and the avoidance of unnecessary interventions (Garpiel, 2018). There are numerous ways that labor and delivery nurses can focus their efforts to promote vaginal birth, including routinely reading current research evidence. This project focused explicitly on improving nurses' management of the second stage of labor.

Pushing

The nurse recognizes, responds to, and evaluates the physiologic and psychologic processes that occur during pushing, providing continuous bedside presence during active pushing (AWHONN, 2014; Lemos et al., 2017; Smith et al., 2016). An example is the period of

physiologic rest that a woman may have before feeling an urge to push. Hydration and rest are encouraged during this time (Smith et al., 2016).

Spontaneous pushing. Spontaneous pushing is the innate response to the natural urge to push in the second stage (AWHONN, 2014). For a woman without an epidural in the second stage of labor, the presenting part descends into the pelvis, which initiates the Ferguson reflex that causes a strong maternal urge to push (Lemos et al., 2017). The involuntary contraction, combined with the woman's voluntary explosive pushing effort, helps achieve birth (Lemos et al., 2017).

Current evidence supports non-directed pushing techniques, including open glottis pushing and vocalization through grunting or groaning (AWHONN, 2014). The nurse encourages the woman to trust her instincts, following her spontaneous urge to bear down and to push for as long as seems natural during the contraction (Smith et al., 2016). If pushing is not effective, the patient can be advised to make three to four pushing efforts for six to eight seconds with the contraction (Smith et al., 2016). While spontaneous pushing may prolong the second stage of labor, most women will accomplish birth within two hours of pushing (Koyucu & Demirci, 2019).

Closed Glottis Pushing. The alternative to spontaneous pushing is closed glottis pushing or directed pushing. In this intervention, primarily used when a patient has epidural anesthesia, the nurse instructs the woman to take a deep breath of air as the contraction begins, hold her breath, and to engage in a Valsalva movement by bearing down into her rectum for as long as possible during a contraction (Lemos et al., 2017). Repeated Valsalva attempts are made throughout the duration of the contraction (Koyucu & Demirci, 2019).

Evidence demonstrates that holding one's breath for a prolonged period and prolonged pushing efforts can lead to changes in the maternal cardiovascular system. This can result in

disruptions in uteroplacental circulation, ultimately leading to changes in the fetal acid-base status and the potential development of fetal hypoxia, acidosis, and low Apgar scores (Koyucu & Demirci, 2019; Lemos et al., 2017). Directed pushing can also lead to increased maternal fatigue, damage to maternal pelvic floor structure, and impaired bladder functioning (Lemos et al., 2017).

Closed glottis pushing should only be used when the benefits outweigh the risks (Garpiel, 2018). For example, directed pushing may be recommended when pushing efforts are ineffective, minimal fetal descent and/or rotation occur, and/or when maternal or fetal conditions warrant an expeditious birth and the woman does not have a spontaneous urge to push (Garpiel, 2018). AWHONN recommends that when closed glottis pushing is indicated, the woman limits her pushing efforts to three to four attempts for a six to eight second duration with each contraction (Garpiel, 2018).

Delayed Pushing. Delayed pushing is the contemporary practice of allowing the fetus to passively descend in the vagina in women with epidural analgesia because epidural analgesia can decrease a women's urge to push and can slow the rotation and descent of the fetus into the pelvis (Lemos et al., 2017; Waller-Wise et al., 2020). Also called, "laboring down," pushing commences either when a woman feels rectal pressure, an urge to push, or the presenting part is in the introitus or on the perineum (Lemos et al., 2017). CMQCC supports delayed pushing for 1-2 hours to encourage passive descent (Smith et al., 2016).

A systematic review by Lemos et al. (2107) concluded that while delayed pushing increases the length of labor by 56 minutes, it decreases the duration of pushing by 19 minutes. Also, laboring down decreases maternal fatigue, perineal injury, OVD, and fetal acidosis (Lemos et al., 2017). A systematic review and meta-analysis of randomized controlled trials that compared maternal and fetal outcomes between immediate and delayed pushing completed by Szu et al. (2020) further supported Lemos et al.'s conclusions. Szu et al. (2020) found that

delayed pushing decreased OVD and postpartum maternal fatigue scores. In addition, infants' one-minute Apgar scores were higher in the delayed pushing group and there was no statistical significance in CS rates or blood loss between the immediate and delayed pushing groups (Szu et al., 2020).

Maternal Pushing Positions

There are several recommendations for positioning patients in the second stage to promote optimal maternal and fetal outcomes (Huang et al., 2019). Upright and lateral positions facilitate maternal comfort and fetal progress to birth (Garpiel, 2018). For a mal-positioned, persistently occiput posterior/occiput transverse fetus, maternal position changes every 20 minutes can help promote fetal rotation and descent (Smith et al., 2016).

The most effective pushing positions include forward leaning positions. Examples include sitting (on the commode or birth seat) and leaning on support team members (either while standing or sitting). Kneeling (either on all fours or leaning forward and supporting oneself on the palms or forearms) and squatting (woman is vertical, one foot or both feet are on floor, and knees are bent) are also useful (Huang et al., 2019; Smith et al., 2016). The incorporation of positioning aids, such as the peanut ball, squat bar, and labor bed features, can be used to facilitate position changes (Garpiel, 2018; Smith et al., 2016).

Routinely pushing in the lithotomy position is discouraged unless requested by the birth attendant to facilitate an expeditious birth (Gapriel, 2018). When pushing in the lithotomy position is indicated, the legs should be placed in McRoberts position with buttocks slightly lifted and the patient's head flat on the bed in order to expand the pelvis and allow the fetus to descend under the symphysis pubis (Smith et al., 2016).

Maternal/Fetal Status

It is crucial for nurses to closely monitor the uterine contraction pattern and fetal response to contractions. Conventional methods to promote fetal oxygenation and manage tachysystole must be used. In addition, pushing can be modified by temporarily pausing pushing efforts or pushing with every second or third contraction to improve fetal circulation. Maternal-fetal tolerance to second stage guides second stage clinical decision making (Gapriel, 2018).

Second Stage Progress/Fetal Descent. In nulliparous women, the higher the station of the fetal head when the second stage begins, the longer the duration of the second stage. These patients have lower incidence of spontaneous vaginal birth and higher risk of operative delivery. Conversely, the lower the fetal station at the onset of second stage, the shorter the duration of second stage (Ashwal et al., 2020b). In the second stage of labor, the nurse must assess progression of fetal descent (Polnasek & Cahill, 2019). CMQCC recommends that as long as incremental fetal descent and/or rotation is made and fetal-maternal status warrant, the second stage should continue for at least four hours for nulliparous women and at least three hours for multiparous women with epidural analgesia (Smith et al., 2016). CMQCC also states that the best way to assess progress during the second stage is to have the same clinician assess the fetal station (Smith et al., 2016).

Assessment and Documentation. Management of the second stage of labor requires continuous assessment and evaluation of the maternal-fetal dyad and fetal descent (Smith et al., 2016). Factors to consider include descent, fetal station, rotation, and position of the fetal head. In addition, maternal vital signs, maternal fatigue, presence of meconium, diagnosis of chorioamnionitis, estimated maternal weight, and fetal heart rate tracing must be considered (Grantz et al., 2018). AWHONN recommends assessing the fetal heart rate and uterine activity every 15 minutes during delayed pushing, every 15 minutes during active pushing in a low-risk

patient, and every five minutes during active pushing with oxytocin infusing or when risk factors are present (AWHONN, 2015). It is critical for the nurse to thoroughly document assessments in the EMR according to the institution's policy (AWHONN, 2014). Also, all nurse-provider communication is documented in the electronic medical record (Smith et al., 2016).

Nurse-Provider Communication. Collegiality, mutual respect, and teamwork are essential to providing safe, patient-centered care (Smith et al., 2016). Obstetric team members must be able to work efficiently and fluidly (Smith et al., 2016). Effective communication skills must be used to deliver precise and efficient messages, conveying assessments, needs, and urgency. This can be accomplished by standardizing communication, such as SBAR (situation, background, assessment, and recommendation), and engaging in team briefings and debriefings (Smith et al., 2016). CMQCC has specific criteria for nurse-provider communication during the second stage of labor presented in *Algorithm for the Management of the Second Stage of Labor* (Smith et al., 2016). This document provides specific guidelines for the frequency of nurse/provider communication and intervals at which the provider comes to the bedside to evaluate progress (Smith et al., 2016).

Knowledge and Skill Acquisition for Nurses

In order to provide safe, patient-centered care, nurses need to acquire new scientific knowledge (Levine & Johnson, 2012; Takase et al., 2015). Professional learning and competence development involve acquiring new knowledge and behavior patterns based on one's previous knowledge and experiences (Takase et al., 2015). In order to support meaningful learning, it is important to consider the individual learning style preferences of nurses when developing plans for professional education (Mangold et al., 2018).

Nurses acquire knowledge and skills through a variety of modalities (AWHONN, 2019). These include formal and informal learning opportunities such as attendance at lectures,

conferences and training sessions, reading textbooks and journal articles, watching videos, engaging in simulations, observations, return demonstrations, role modeling, feedback, and reflective discussions about nursing practice (AWHONN, 2019; Levine & Johnson, 2012; Takase et al., 2015). Teaching strategies depend on the content being shared (Levine & Johnson, 2012).

In order to validate competence, nurses must be able to demonstrate the established skills and behaviors required to achieve the desired outcome. The chosen method to validate a competency is individualized based on what is to be achieved or the desired outcome (Levine & Johnson, 2012). When staff members perceive that the integration of new knowledge and innovations results in positive patient outcomes, they are likely to integrate new knowledge and innovations into patient care (Brewster et al., 2015).

Summary

In conclusion, in the US between 1996 and 2009, the CS rate rose from 20.7% of all births to 32.9% with 60% of these being primary CSs (Osterman & Martin, 2014). The Consortium on Safe Labor was the first study to analyze contemporary CS rates, followed by a landmark study by Zhang et al. that redefined active labor and established new durations for the first and second stages of labor, with multiple subsequent studies that confirmed Zhang et al.'s research. With knowledge of the normal physiologic process of birth and the increased duration of a normal second stage of labor, nurses can integrate their knowledge of pushing and positioning techniques with advanced assessment, documentation, and communication skills to improve management of the second stage of labor and promote vaginal birth.

Methods

Introduction

The purpose of this EBP project was to develop, implement, and evaluate an educational program to improve labor nurses' management of second stage labor. Evidence shows that individual nurse practice can influence the mode of infant delivery, making it essential for nurses to engage in education and training (Edmonds et al., 2017; Lagrew et al., 2018). This section includes details about the setting and sample where the intervention, an instructional course for nurses, occurred. Procedures and data analysis are also described. Data extraction from the EMR, review of unit policies, and the instructional course occurred at the facility.

Ethical Considerations

Before the project was initiated, a letter of support and approval from the Director of Women's Services was obtained (Appendix C). The author received approval to complete this DNP project from the institutional review boards at the hospital setting and California State University Long Beach (Appendix D). Before the class started, nurses completed written consent forms that addressed confidentiality, voluntary participation, the purpose of the project, and the potential risks, benefits, discomforts, and alternatives to participating (Appendix E).

Setting

This project was implemented in the labor and delivery unit at a 519-bed acute care teaching hospital located in a city on the Central California coast. In 2019, 2106 babies were born at this locale, attended to by physicians and midwives who provide care for all the privately and publicly insured patients. This facility is Baby Friendly USA accredited, has 12 labor, delivery, recovery rooms, and a Level III NICU. Patients receive one-to-one nursing care during the second stage of labor and the first two hours immediately following birth before transferring to the postpartum unit.

Sample

Forty-nine registered nurses (RNs) are employed in the labor and delivery unit as either 12-hour day or night shift employees, in a variety of full-time, part-time, and per diem positions, with the majority working part-time. The majority of the nurses had a Bachelor of Science in Nursing and labor and delivery nursing experience ranges from new graduates to over 40 years.

The convenience sample included RNs, from both the day and night shift, who volunteered to attend one of the instructional course sessions. The sample also included RNs, from both shifts, who volunteered to serve as nurse champions and attend at least one of the instructional course sessions. Participants were informed that participation was voluntary and that they could opt-out at any time with no consequences. Inclusion criteria included employment in the labor and delivery unit and willingness to complete both pre- and post-tests. There were no exclusion criteria.

Resources

This project required resources that were supplied by the DNP author. These included laminated charts, purchased from Premier Birth Tools for $115, to demonstrate various second stage positions. She also purchased three peanut balls (40cm, 50cm, and 60cm) to assist with second stage positioning; these items cost $146.98. The author planned to spend $100.00 on provisions for attendees, but hospital policy prohibited this practice during the COVID-19 pandemic.

The Director of Women's Services also provided unit resources to support nurses. The unit educator, who works on salary, dedicated 15 hours to this project. The instructional course was offered three times. Six RNs, one nurse who served as a nurse champion and assistant at each class session, and the author, were present at each class. With opportunities to compensate seven nurses for two hours three times, at an average hourly rate of $54.64 for a registered nurse

in California, labor costs were up to $2294.88 (Indeed, 2020). The total estimated cost of implementation was $2556.86.

Procedures

Creating guidelines

Multiple unit policies that address the second stage of labor were analyzed to establish a baseline of the unit's second stage management. Guidelines to support nursing management of the second stage of labor were created by integrating unit policies with EBPs from CMQCC and other sources into a new document. Input and feedback were sought from the nursing director, unit educator, clinical resource nurses, and physicians for the guidelines over a 14-day review period. Their suggestions, along with the sources of evidence for the recommendations, were reviewed and integrated into the guidelines. The nursing director and unit educator analyzed and approved the final draft of the guidelines before they were disseminated. The new guidelines, CMQCC's *Algorithm for the Management of Second Stage of Labor*, and various second stage position charts purchased from Premier Birth Tools were laminated, fastened together via binder ring, and then placed in a central location at the nurse's station for reference (Appendix E1 -E8).

Establishing Knowledge

A pre- and posttest were created to assess nurses' knowledge about the second stage of labor. Face validity of the test was confirmed by asking the unit educator and nurse champions to review it, with specific attention to readability and agreement on items and responses. The pretest included three questions about demographics, including the nurse's highest level of nursing education, years of labor and delivery nursing experience, and assigned shift. Ten questions that focused on nurses' knowledge of second stage, in multiple-choice and true and false format, were administered via SurveyGizmo® and were sent to the participants' institutional email account before the instructional course began (Appendix F).

The posttest was similar, though the demographic questions were excluded and the options for the answers to the multiple-choice questions were placed in a different order than the pretest (Appendix G). Before the classes ended, a second email was sent to the participants' institutional email accounts with a link to the posttest. Learners were asked to complete the post-test before leaving the class. Inferences were made about how one's level of education, years of labor and delivery nursing experience, shift work, and participation in a professional education course affect birth outcome. Knowledge acquisition was measured by comparing pre- and posttest answers.

Data Extraction from EMR

The author obtained medical records of all the NTSV patients who delivered in the first four weeks after IRB approval was obtained by reviewing both the unit's birth log and daily census reports. To establish baseline data, de-identified data were entered into a database. Metrics included the patient's age, BMI, gestational age, rupture of membranes method (spontaneous or artificial), number of minutes from rupture of membranes to birth, labor epidural use, number of position changes during each hour of second stage, total number of second stage position changes, number of nurse/provider communication interactions during second stage, number of minutes from 10 cm to birth, number of minutes in delayed pushing, birth outcome (normal spontaneous vaginal delivery, operative vaginal delivery, or primary CS), birth time, and provider type (obstetrician, certified nurse midwife, or RN). The number of infants admitted to the NICU, excluding those born with congenital anomalies, was collected as a balancing measure.

The process for post intervention data collection was similar to the process for baseline data collection. Data were entered into a database with an additional column added to address if the delivery nurse, or nurse who managed the majority of second stage of labor when delivery

occurred within one hour of change of shift attended the second stage instructional course. Data collection commenced at midnight following the completion of the third instructional course and continued for four weeks.

Learning Objectives for the Instructional Course

Learning objectives to help structure the course and to help participants reach their goals were written (Appendix H). Once the objectives were clear, the course was created by synthesizing EBPs published in the literature. The author, unit educator, and Education Department liaison collaborated to complete the California Board of Registered Nursing's requirements to offer continuing education units (CEUs) for course attendance. The unit educator submitted the required documents to the institution's Education Department to ensure that CEUs were issued for the course.

Developing the Instructional Course

This instructional course was offered in the labor and delivery unit by the project leader, in a regular labor and delivery room that is typically used for meetings and classes but can be used for patient care. This class was offered three times in a two-week period in order to provide multiple opportunities for nurses to attend. Due to classroom space and infection control practices during COVID-19, seven nurses were eligible to participate in each class.

The author prepared for the instructional course by identifying three expert nurses from the day shift and three expert nurses from the night shift who committed to serving as nurse champions by attending the course, co-teaching the hands-on portion of the class, and mentoring participants after the course. Two nurse champions and the author attended each session to be available as resources during the interactive learning experience and to help establish mentor relationships. The unit educator also attended one of the instructional courses to support the cultivation of knowledge and the integration of EBP into second stage nursing management.

Voluntary participants were recruited by preparing and distributing promotional material, by adding the course to the hospital's electronic catalog of classes eight weeks before the course, posting a flyer in the nursing lounge six weeks before the course, personally distributing the course flyer to all of the labor and delivery nurses via email four weeks before the course, advertising the class during the change of shift brief three weeks before the course, and by word of mouth (Appendix I).

Course Content

Welcome. Upon arrival, learners logged on to laptop computers, provided by the IT department, to complete the pretest by clicking on the link to the SurveyGizmo in their email account. Attendees also opened the learning environment in the EMR. Once everyone was present, participants were welcomed, thanked for attending the instructional session, and oriented to the safe learning environment using ground rules modified from the institution's simulation program. This was completed during the first 10 minutes of the course.

Lecture. The 30-minute didactic portion of the class was in lecture format, utilizing PowerPoint slides as visual aids. The content highlighted the national and local NTSV CS rates. Contemporary labor management guidelines and information about delayed pushing or "laboring down" and open/closed glottis pushing were incorporated. In addition, assessment and documentation of maternal/fetal status and second stage progress/fetal descent, and crucial components of second stage nurse/provider communication were discussed.

Interactive learning. Once the presentation was complete, participants actively engaged in an interactive experience to learn how to utilize a variety of maternal positions for the second stage. Models, including all of the participants, utilized the labor bed, squat bar, peanut ball, step stool, linens, and labor support personnel to illustrate various maternal pushing positions. Participants practiced with these tools and positions by using one another to simulate the role of

patient and nurse. The benefits and rationale for each position were discussed. Reflection was encouraged, calling on novice through expert nurses in attendance to describe previous clinical experiences in which position changes helped promote vaginal birth. Questions were welcomed throughout the fifty-five-minute learning experience.

Skills validation. Skills were validated through structured observation, as observation is a valuable method of learning and confirming information, concepts, and behaviors (Bonnel & Smith, 2015). To ensure consistency in observation, one nurse champion attended each education session and was responsible for observing attendants' second stage management skills. Skill observation was documented on a spreadsheet that was designed for this class (Appendix J).

Documentation. Once the demonstration was complete, attendees spent 15 minutes engaged in documentation. Attendees verbalized or demonstrated documentation of delayed pushing or "laboring down," open/closed glottis pushing, and details of second stage nurse/provider communication in the EMR. Nurse champions were available to assist learners with documentation and to review narrative notes to ensure effective communication and documentation.

Closure. Participants were required to complete an electronic posttest to appraise knowledge and a course evaluation issued by the institution to obtain CEUs. These tasks, along with final questions, thoughts, and reflections were welcomed and addressed during the last 10 minutes of the class. The IT Department retrieved the laptops after the conclusion of the courses.

Post Course Efforts to Sustain Practice Change

Following the course, the second stage guidelines were sent electronically to each nurse in attendance, were discussed at a staff meeting, and a laminated copy was displayed on the education bulletin board in the labor and delivery unit. In order to sustain the practice change, the author and change champions demonstrated the clinical practice skills by utilizing the second

stage guidelines in mentoring other nurses in clinical practice and debriefing with nurse colleagues after births. These leaders also continued work to sustain these practices and hardwire them into practice by engaging with those who did not attend an instructional course, by sharing course material and by reflecting on clinical experiences in which nurse's improved management of the second stage of labor changed outcomes. The unit educator focused on sustaining the change by ensuring that this course was incorporated into new-hire orientation and annual skills evaluations.

Data Analysis

Knowledge changes were measured using a pre- and posttest. A paired sample *t* test was used to analyze the mean difference between the pretest and posttest results. Data extracted from the EMR were analyzed using a Mann-Whitney test, Analysis of Variance (ANOVA), and Fisher's Exact test. Intellectus Statistics software programing was used to conduct these analyses. Data are displayed in tables, run charts, and bar plots.

It is important to recognize that while the purpose of this project was to develop, implement, and evaluate an educational program to improve labor nurses' management of second stage with an overarching goal to sustain the CS rate at or below the *Healthy People 2020* goal, one cannot lose sight of the balance between maternal and fetal well-being. As more nurses integrate evidence into their practice, one will expect outcomes to change, including more spontaneous and operative vaginal births and less CSs. Also, as the number of minutes spent in delayed pushing increases, the total number of minutes of second stage may also increase while the number of minutes in active pushing may decrease.

To align the purpose of the project with the methods that were implemented and evaluated, the number of NTSV patients who had a CS after completing the first stage of labor were included in the data analysis. The Joint Commission's perinatal care (PC) cesarean birth

measure PC-02 was used as an outcome measure (The Joint Commission, 2018). In this calculation, the numerator is the total number of NTSV CS and the denominator is the total number of NTSV births. The balancing measure was the number of infants admitted to the NICU, excluding those born with congenital anomalies.

Results

Demographic Information of Nurse Participants in Second Stage Educational Intervention

Descriptive statistics were used to explore the nurse sample including highest nursing degree (Associate Degree in Nursing [ADN], Bachelor of Science in Nursing [BSN], Master of Science in Nursing [MSN]), highest level of post-secondary education (Associate degree, Bachelor's degree, Master's degree), years of labor and delivery nursing experience (<1 year, 1-5 years, 6-10 years, >/= 11 years), and assigned shift (day or night). BSN and MSN degrees were combined into a single category to describe the highest level of nursing degree due to the small sample of MSN prepared nurses.

There were 18 nurses who participated in the educational intervention. The majority of the nurses in the sample had an ADN (*n* = 11, 61%) as their basic nursing degree. The primary nursing degree of six participants was a BSN and one had an entry level MSN degree for a combined group of seven (*n* = 7; 39%). There was an equal number of nurses working the day and night shift. The majority of nurses working both the day shift (*n* = 6; 55%) and night shift (*n* = 5; 45%) had an ADN degree as their highest level of nursing degree while the remainder had BSN (n = 6) or MSN (n = 1) degrees (Table 1). A portion of ADN prepared nurses had Bachelors (*n* = 4; 36%) and Masters (*n* = 1; 9%) degrees as their highest level of post-secondary education while four (57%) of the BSN prepared nurses also had Master's degrees (Table 2). The majority of ADN nurses had at least six years of labor and delivery nursing experience (*n* = 10; 91%) and the majority of BSN nurses had five or less years of experience (*n* = 4; 57%) (Table 2).

Table 1

Nursing Demographics

Variable	*N*	*%*
Basic Nursing Degree		
ADN	11	61.11
BSN/MSN	7	38.89
Shift		
Day	9	50.00
Night	9	50.00
Highest Academic Degree		
Associate	6	33.33
Bachelor	7	38.89
Master's	5	27.78

Note. ADN =Associate Degree in Nursing; BSN = Bachelor of Science in Nursing; MSN = Master of Science in Nursing

Table 2

Basic Nursing Degree, Highest Academic Degree, and Years of Experience

	ADN	BSN/MSN
Shift		
Day shift	6 (55%)	3 (43%)
Night shift	5 (45%)	4 (57%)
Highest Academic Degree		
Associate	6 (55%)	0 (0%)
Bachelor	4 (36%)	3 (43%)
Master	1 (9%)	4 (57%)
Years of Experience		
<1	1 (9%)	1 (14%)
1-5	0 (0%)	3 (43%)
6 -10	2 (18%)	0 (0%)
≥ =11	8 (73%)	3 (43%)

Second Stage Educational Intervention Pre- and Posttest Results

All 10 test questions were individually analyzed for differences in pre- and posttest scores. Five of the test questions were analyzed using descriptive statistics because of the homogeneity in the pretest and/or posttest results. McNemar's Chi-square test for 2 x 2 contingency tables were conducted to test the hypothesis that the outcome proportions were equal for five of the individual test questions. A two-tailed paired sample *t*-test was conducted to determine whether the mean difference of total scores on the pre-tests and post-tests were significantly different from zero. Finally, an ANOVA was conducted to determine whether there

were significant differences in pre-and posttest scores between nurses with various levels of nursing degrees, the highest level of post-secondary education, and assigned shift.

In the pretest, five of the nurses (27.7%) answered the test question that addressed the Obstetric Care Consensus second stage guidelines correctly, while 18 (100%) answered the question correctly on the post-test. Comparably, in the pretest, 11 of 18 (61.1%) answered the test question that addressed the NTSV abbreviation correctly, while 18 (100%) answered the question correctly on the post-test. Uniformly, in the pretest, eight of 18 (44.4%) answered the question correctly about the frequency of maternal position changes during the second stage of labor, while 18 (100%) answered the question correctly on the posttest. In the pretest questions that addressed examples of upright positions and effective communication techniques, 18 (100%) of the participants answered both questions correctly on both the pre-and posttest (Table 3).

Table 3

Individual Test Questions with Homogenous Pretest and/or Posttest Results

Test Question	Pretest *n* (% of correct answers*)*	Posttest *n (*/% of correct answers*)*
Obstetric Care Consensus guidelines	5 (27.7%)	18 (100%)
NTSV abbreviation	11 (61.1%)	18 (100%)
Frequency of maternal position changes	8 (44.4%)	18 (100%)
Upright positions	18 (100%)	18 (100%)
Effective communication	18 (100%)	18 (100%)

The result of the McNemar's Chi-square test for 2 x 2 contingency tables for the test question addressing the national NTSV benchmark CS rate based on the federal government's *Healthy People 2020* goal was significant based on an alpha value of 0.05, $\chi^2(1) = 13.00$, $p < .001$. There were significantly more correct answers in the posttest than the pretest (Table 4). Four other questions were analyzed using McNemar's Chi-square tests including those that addressed the Ferguson reflex, closed glottis pushing, following one's natural instinct to push, and the hospital's 2019 NTSV CS rate related to the *Healthy People 2020* benchmark. The results were not significant.

Table 4

Individuals (n =18) Who Changed from Incorrect to Correct Answers from Pretest to Posttest on Healthy People 2020 Question

	Incorrect	Correct	χ^2	*df*	*p*
Incorrect	1	13	13.00	1	< .001
Correct	0	4			

An analysis for differences in scores for tests of normality and homogeneity of variance was conducted based on statistical assumptions. A Shapiro-Wilk test (normality) was conducted to determine whether the differences in the pre- and post-test total scores could have been produced by a normal distribution (Razali & Wah, 2011). The results of the Shapiro-Wilk test were not significant based on an alpha value of 0.05, $W = 0.94$, $p = .241$. This result suggests the possibility that the differences in pre- and posttest total scores may have been produced by a normal distribution, indicating the normality assumption was met. Levene's test (homogeneity of variance) was conducted to assess whether the variances of pre- and post-test total scores were significantly different. The result of Levene's test was significant based on an alpha value of

0.05, F (1, 34) = 6.48, p = .016. This result suggests it is unlikely that pre- and posttest total scores were produced by distributions with equal variances, indicating the assumption of homogeneity of variance was violated (Intellectus Statistics, 2019).

The result of the two-tailed paired sample t-test was significant based on an alpha value of 0.05, t (17) = -6.43, p < .001, indicating the null hypothesis can be rejected. This finding suggests the difference in the mean of pretest total score and the mean of posttest total score was significantly different from zero. The mean of pretest total score was significantly lower than the mean of post-test total score. The results are presented in Table 5.

Table 5

Two-Tailed Paired Sample T-Test for the Difference Between Pretest Total Score and Posttest Total Score

Pretest Total		Posttest Total				
M	*SD*	*M*	*SD*	*T*	*P*	*D*
6.17	1.54	9.06	0.73	-6.43	< .001	1.52

Note. n = 18. Degrees of Freedom for the t-statistic = 17. d represents Cohen's d.

The effect of nursing degree, highest level of post-secondary education, and or assigned shift on pre- and posttest scores were investigated using ANOVA testing. Neither the ANOVA results of the pretest total scores nor the results of the posttest total scores were significant based on an alpha value of 0.05 using nursing degree, highest level of post-secondary education, or assigned shift as the independent variable. This indicates that there were no significant differences of pretest total scores or posttest total scores when any of these independent variables were analyzed (Table 6).

Table 6

Analysis of Variance Table for Pretest and Posttest Total Scores by Nursing Degree, Highest Level of Post-Secondary Education, and Assigned Shift

	Pretest	Posttest
Nursing degree	F (1, 16) = 2.49, p = .134	F (1, 16) = 0.16, p = .697
Highest level of post-secondary education	F (2, 15) = 0.53, p = .602	F (2, 15) = 0.40, p = .677
Assigned shift	F (1, 16) = 0.20, p = .661	F (1, 16) = 2.94, p = .106

Baseline and Post-Intervention NTSV Patient Characteristics and Provider Updates

Overall, the delivery modes between the pre- and post-intervention groups were similar (Figure 1**)**. The median number of NSVD births increased from the pre-intervention to the post-intervention cohort **(**Figure 2). A chart review was conducted of 114 NTSV patients collecting data over both a four-week baseline and post-intervention period (baseline n = 50, post-intervention n =64). Descriptive statistics were used to analyze the demographic characteristics of the samples. Also, a nonparametric Mann-Whitney test was used to determine if there were differences in patient demographics and labor variables between the pre- and post-intervention samples. It was also used to analyze for significant differences between the samples when women who did not labor or advance to the second stage of labor were excluded from the samples. Additionally, ANOVA was used to determine if there were significant differences in the duration of minutes from 10 cm to birth by delivery mode and in the number of position changes per hour of second stage in the pre- and post-intervention samples. Finally, a Fisher's Exact Test was used to determine if the delivery modes in the pre- and post-intervention samples were independent of one another.

Figure 1

Bar Graph: Delivery Modes Divided by Pre- and Post-Intervention Groups

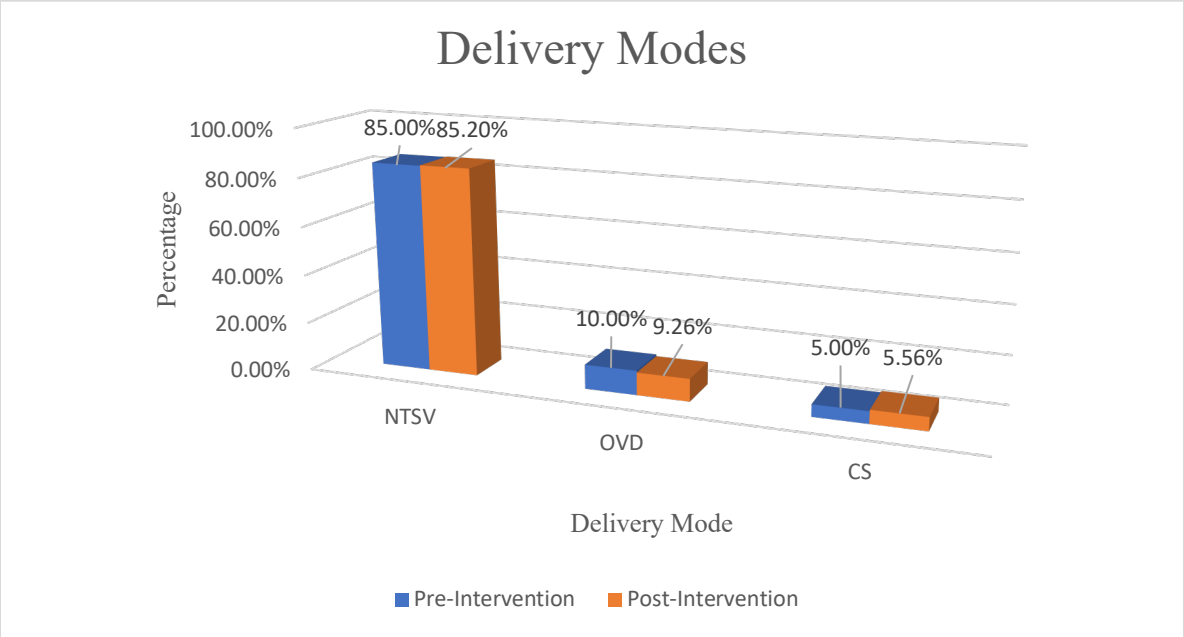
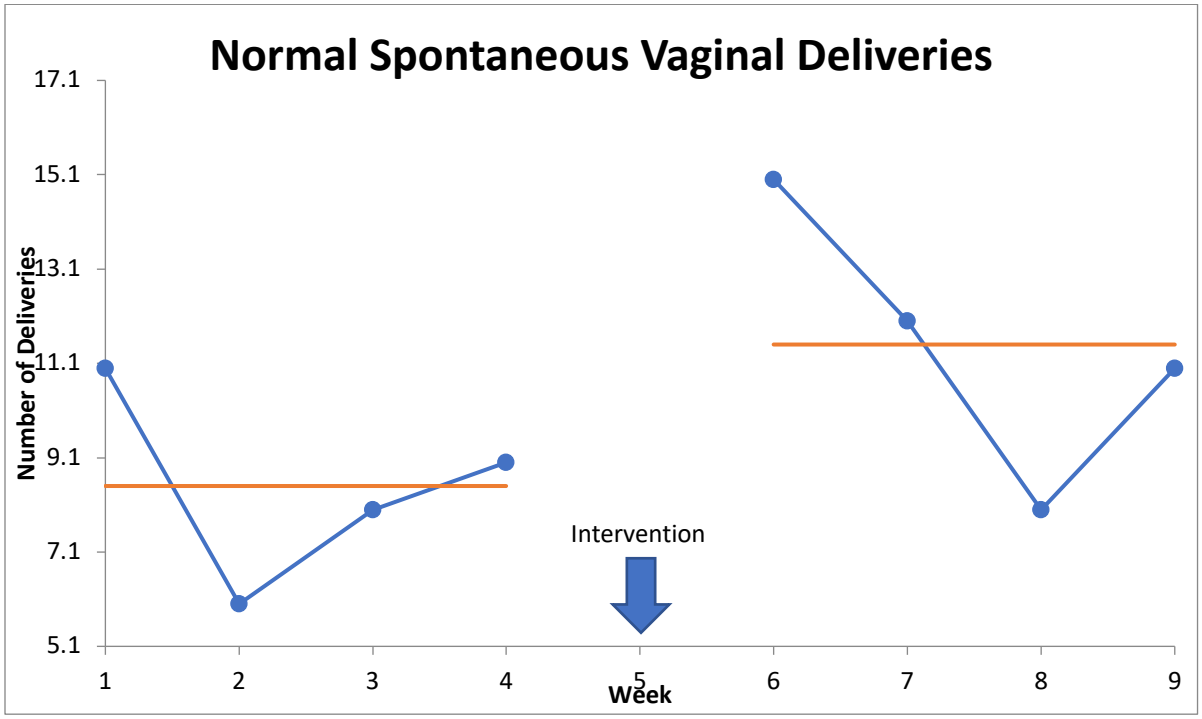


Figure 2

Run Chart: Normal Spontaneous Vaginal Deliveries



The average age and mean BMI of the 114 NTSV patients were 29 (*SD* = 5.93) and 30.22 (*SD* = 5.76) respectively, with an average gestation of 39.64 weeks (*SD* = 1.04). The average duration of delayed pushing (minutes) was 35.09 (*SD* = 57.49); active pushing had an average of 82.63 minutes (*SD* = 63.99). There was an average of 2.68 provider updates during the second stage (*SD* = 1.80) (Table 7). As seen in Figure 3, there were more provider updates in the post-intervention group than the pre-intervention group. Most women experienced spontaneous rupture of membranes (*n* = 74, 64.91%) and had epidurals (*n* = 84, 73.68%).

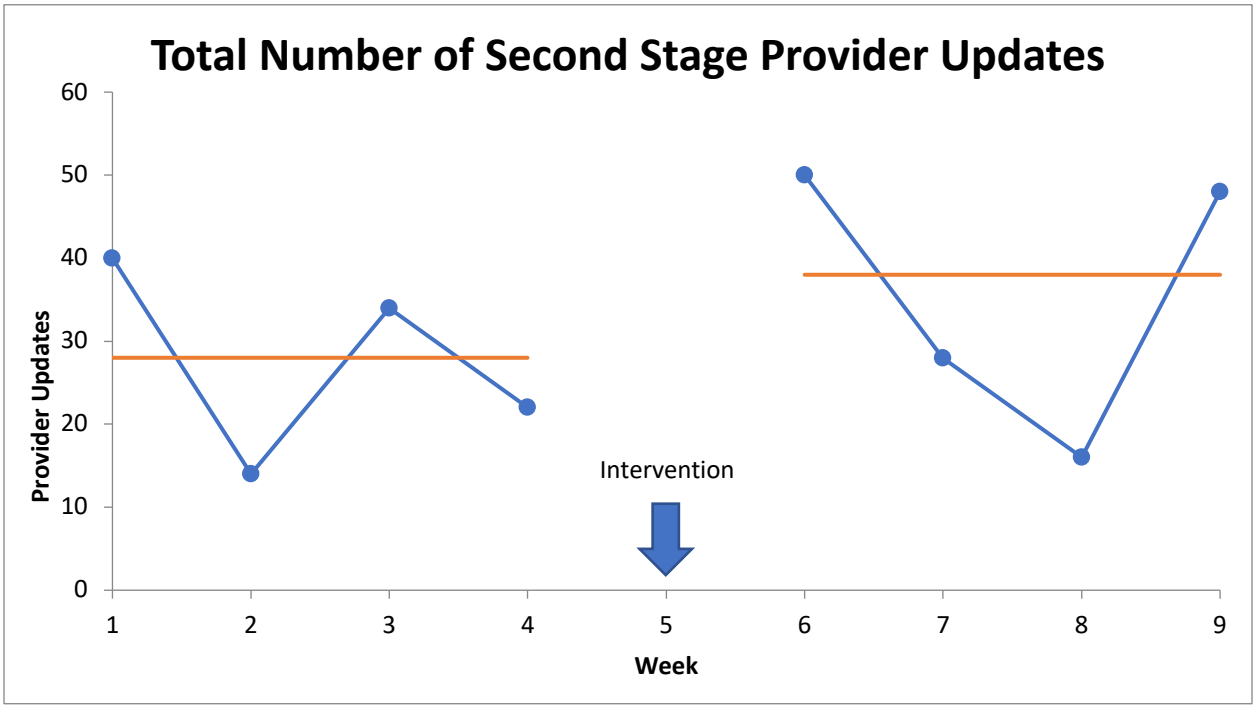
Table 7

NTSV Patient Characteristics (n = 114)

Variable	*M*	*SD*	*N*	SE_M	Min	Max	Skewness	Kurtosis
Age	29.00	5.93	114	0.56	16.00	42.00	-0.34	-0.43
BMI	30.22	5.76	114	0.54	21.00	51.00	1.31	2.05
Gestation	39.64	1.04	114	0.10	37.20	41.60	-0.39	-0.22
Delayed Pushing Duration	35.09	57.49	94	5.93	0.00	260.00	2.40	5.62
Active Pushing Duration	82.63	63.99	94	6.60	0.00	308.00	1.17	1.20
Number of Provider Updates	2.68	1.80	94	0.19	0.00	10.00	1.40	3.38

Figure 3

Run Chart: Total Number of Second Stage Provider Updates



The age and BMI of the patients were analyzed by delivery mode and compared by inclusion in the pre- or post-intervention group. NTSV patients who did not advance to the second stage of labor (n = 10 [pre-intervention], n = 10 [post-intervention]) were excluded from the analysis as the focus of this study was the second stage of labor. The NSVD patients (n = 34) in the pre-intervention group had an average age of 29.68 years and BMI of 29.79 while the average age and BMI in the post-intervention was 26.65 years and 29.67. OVD patients (n = 4) in the pre-intervention group had an average age of 31.5 years and BMI of 26.5 while the average age was 30.8 years and BMI was 28.0 in the post-intervention group (n = 5). Patients who reached the second stage of labor and delivered by unplanned (UP) CS in the pre-intervention group had an average age of 33.5 years and BMI of 34.00 and patients in the post-intervention group had an average age of 37.33 years and BMI of 31.67 (Table 8). The pre- and-post-intervention groups were similar in ages when grouped by delivery mode, except women

who delivered by NSVD were older in the pre-intervention group than the post-intervention group.

Women who delivered by UP CS in the post-intervention group were older than those in the pre-intervention group. The pre- and post-intervention groups were similar in BMI when grouped by delivery mode, except those who delivered by UP CS in the pre-intervention group had higher BMIs than those in the post-intervention group (Table 8).

Table 8

Age and BMI, Analyzed by Delivery Mode, and Compared by Pre -and Post-Intervention Groups

	Pre-Intervention				Post-Intervention		
Age	*M*	*SD*	*n*	**Age**	*M*	*SD*	*n*
NSVD	29.68	5.02	34	NSVD	26.65	6.11	46
OVD	31.50	5.00	4	OVD	30.80	8.87	5
UP CS	33.50	2.12	2	UP CS	37.33	4.16	3
BMI				**BMI**			
NSVD	29.79	5.81	34	NSVD	29.67	5.47	46
OVD	26.50	2.08	4	OVD	28.00	2.00	5
UP CS	34.00	2.83	2	UP CS	31.67	5.13	3

Note. UP = unplanned CS

A two-tailed Mann-Whitney two-sample rank-sum test was conducted to examine whether there were significant differences in age, BMI, gestational age, duration of ruptured membranes, minutes elapsed between 10 cm dilation and birth, delayed pushing minutes, active pushing minutes, total number of position changes in the second stage of labor, and number of provider updates in the second stage of labor between the pre- and post-intervention samples. There were 50 NTSV (43.86%) women in the pre-intervention sample and 64 (56.14%) in the post-intervention sample. There were no significant differences in these variables between the pre- and post-intervention groups at an alpha value of 0.05.

A two-tailed Mann-Whitney two-sample rank-sum test was also conducted to examine if there were significant differences in the measured variables when the NTSV patients who did not labor or did not reach the second stage of labor were excluded from the sample (n = 20, pre-intervention n = 10, post-intervention, n =10). There were 40 (42.55%) women in the pre-intervention sample and 54 (57.44%) in the post-intervention group. The results of the test were based on an alpha value of 0.05. There were significant differences in age between the pre- and post-intervention samples (U = 1336.5, z = -1.97, p = .049). The median age for the pre-intervention group (Mdn = 30.50) was significantly older than the median for the post-intervention sample (Mdn = 27.50). There were no other significant differences in these variables between the pre- and post-intervention groups at an alpha value of 0.05.

Provider, Delivery, and Newborn Admission Description

Frequencies and percentages of the 114 participants were calculated for delivery mode, nursing shift (day [0730-1930] or night [1930-0730]), provider credentials, pre- and post-intervention data collection period, delivery during provider office hours (0800-1730), and newborn admission disposition. The most frequently observed category of delivery mode was NSVD (n = 80, 70%), nursing shift was day shift (n = 67, 59%), category of provider was MD (n = 109, 96%), and data collection period was post-intervention (n = 64, 56%). An equal number of babies (n = 57, 50%) were delivered during and after the provider's office hours. The most frequently observed category of newborn admission disposition was newborn nursery (n = 111, 97%). The most frequently observed category of rupture of membranes and pain management was spontaneous (n = 74, 65%) and epidural (n = 84, 74%) (Table 9).

Table 9

Provider, Delivery, and Newborn Admission Description

Variable	*n*	*%*
Delivery Mode		
NSVD	80	70.18
OVD	9	7.89
CS	25	21.93
Nursing Shift		
Day	67	58.77
Night	47	41.23
Provider		
MD	109	95.61
CNM	3	2.63
RN	2	1.75
Delivery During Provider Office Hours		
Office Hours	57	50.00
After Hours	57	50.00
Newborn Admission Disposition		
Newborn Nursery	111	97.37
Neonatal Intensive Care Unit	3	2.63

Note. Due to rounding errors, percentages may not equal 100%.

Eighteen nurses attended the second stage class and cared for 35 of the 64 patients in the post-intervention group. The most frequently observed category of delivery mode for patients who were cared for by a nurse who attended the second stage class was NSVD (n = 28, 80%) compared to the NSVD rate of 62% (n = 18) of those who did not attend the class (Table 10). In controlling for the 10 patients who did not reach the second stage of labor, 32 of the 54 patients

were cared for by a nurse who attended the second stage class. The most frequently observed category of delivery mode for patients who were cared for by a nurse who attended the second stage class was NSVD (*n* =28, 88%) compared to the NSVD rate of 82% (*n* = 18) of those who did not attend the class (Table 11).

Table 10

Post-Intervention Group: Delivery Mode Based on Nurse Attendance at Educational Intervention

Delivery Mode	Class Attendance/Deliveries (*n* = 35/54.69%)	No Attendance/Deliveries (*n* =29/45.31%)
NSVD	28/80%	18/62.07%
OVD	2/5.71%	3/10.34%
CS	5/14.29%	8/27.59%

Note. Due to rounding errors, percentages may not equal 100%.

Table 11

Post-Intervention Group: Delivery Mode of Patients Who Entered Second Stage of Labor Based on Nurse Attendance at Educational Intervention

Delivery Mode	Class Attendance/Deliveries (*n* = 32/59.26%/)	No Attendance/Deliveries (*n* =22/ 40.74)
NSVD	28/87.5%	18/81.8%
OVD	2/6.25%	2/9.1%
CS	2/6.25%	2/9.1%

Pre- and Post-Intervention Group Labor Variables and Birth Outcome Comparisons

Duration of Minutes From 10 cm to Birth by Delivery Mode. The median duration (minutes) from 10 cm to birth increased from the pre-intervention group to the post-intervention group (Figure 4). An ANOVA was conducted for the patients who entered the second stage of labor (n

= 94) to determine whether there were significant differences in the duration of minutes from 10 cm to birth by delivery mode. The ANOVA was examined based on an alpha value of 0.05. The results of the ANOVA were significant, $F(2, 91) = 11.29$, $p < .001$, indicating there were substantial differences in the duration (min) from 10 cm to birth among the various delivery modes (Figure 5, Table 12).

Figure 4

Run Chart: Duration (min) 10 cm to Birth

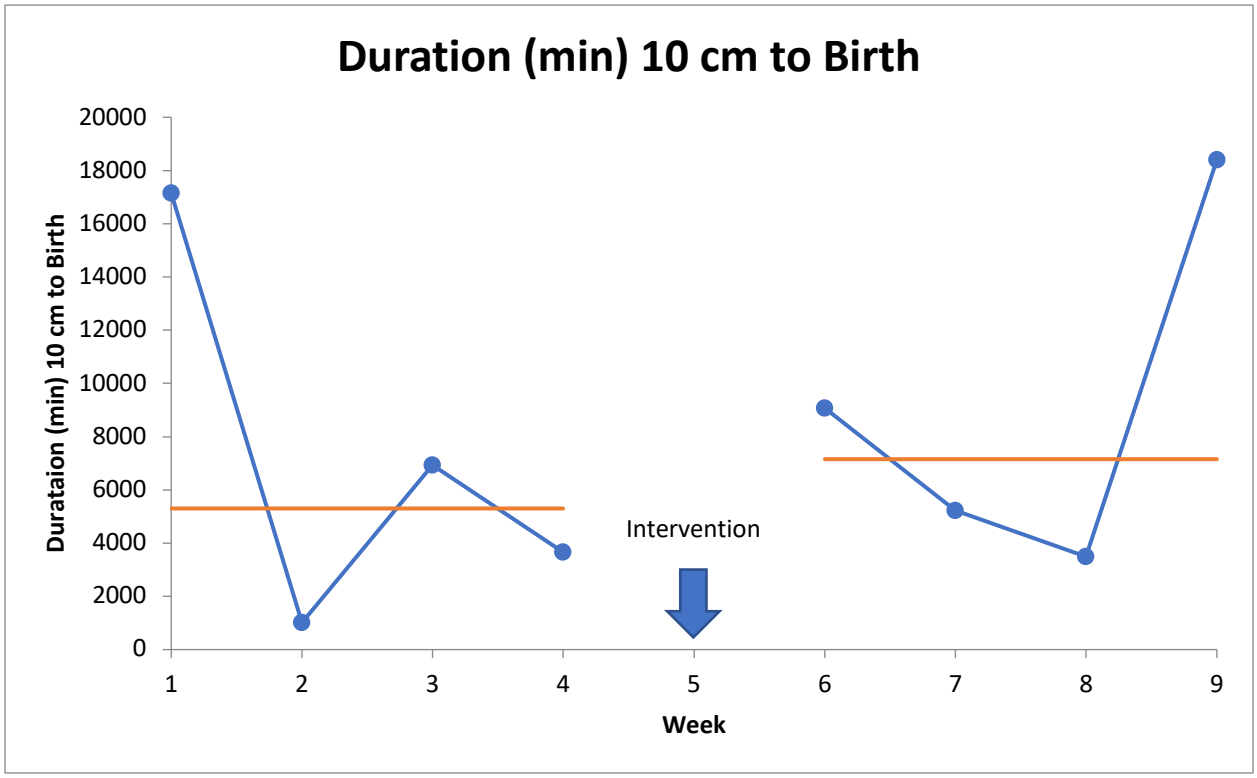


Figure 5

Mean Duration in Minutes from 10 cm to Birth by Delivery Mode

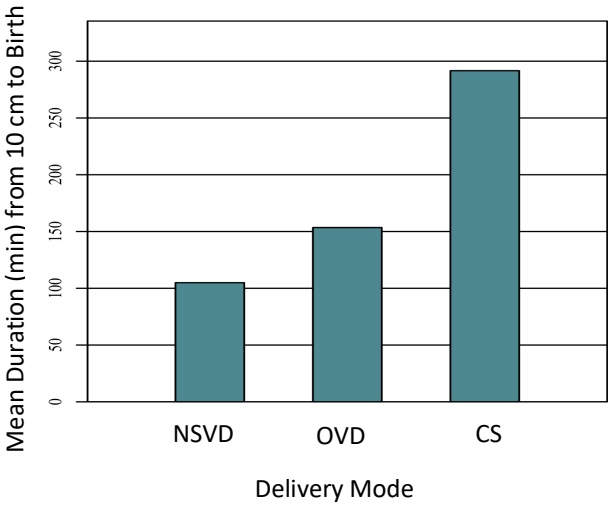


Table 12

Mean, Standard Deviation, and Sample Size for Duration in Minutes from 10 cm to Birth by Delivery Mode

Combination	*M*	*SD*	*N*
NSVD	104.91	76.48	80
OVD	153.44	170.14	9
CS	291.60	57.61	5

Number of Position Changes During Third and Fourth Hours of Second Stage of Labor.

The median number of total second stage position changes between the pre- and post-intervention groups increased (Figure 6). An ANOVA to determine whether there were differences in the number of position changes during the third hour of second stage was significant, ($F(1, 33) = 9.17$, $p = .005$) (Figure 7). The eta squared was 0.22, explaining approximately 22% of the variance in the number of position changes between the pre- and post-intervention groups (Table 13). An ANOVA conducted to determine whether there were significant differences in the number of position changes during the fourth hour of second stage,

between the pre- and post-intervention groups, was also significant, ($F(1, 17) = 6.56$, $p = .020$) (Figure 8). The eta squared was 0.28, explaining approximately 28% of the variance in the number of position changes between the pre- and post-intervention groups (Table 14).

Figure 6

Run Chart: Total Number of Second Stage Position Changes

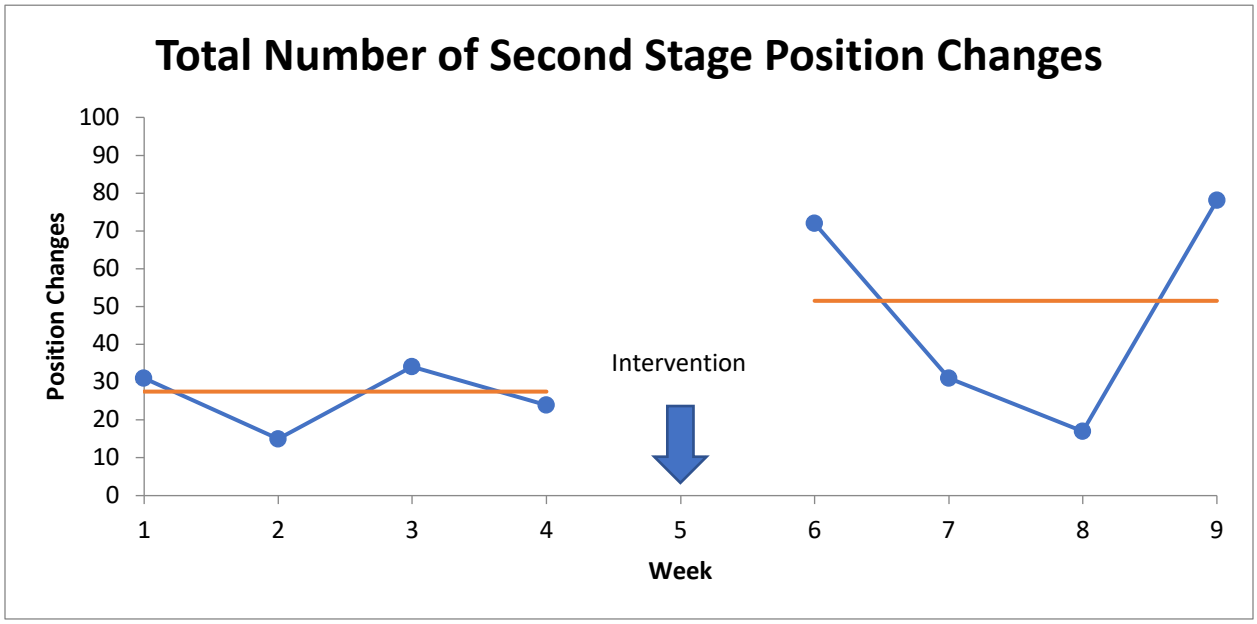


Figure 7

Mean Number of Position Changes During the Third Hour of Second Stage of Labor in the Pre- and Post-Intervention Groups

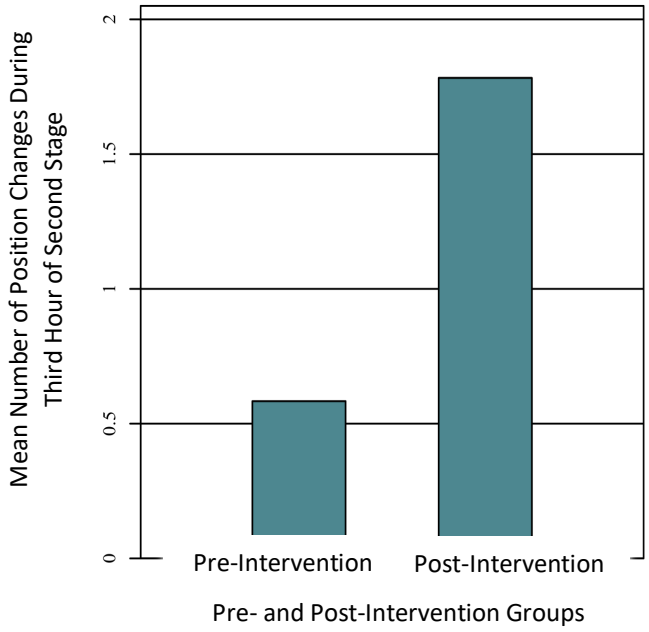


Table 13

Mean, Standard Deviation, and Sample Size for Number of Position Changes During the Third Hour of Second Stage of Labor in the Pre- and Post-Intervention Groups

Combination	*M*	*SD*	*N*
Pre-Intervention	0.58	0.79	12
Post-Intervention	1.78	1.24	23

Figure 8

Mean Number of Position Changes During the Fourth Hour of Pushing in the Pre- and Post-Intervention Groups

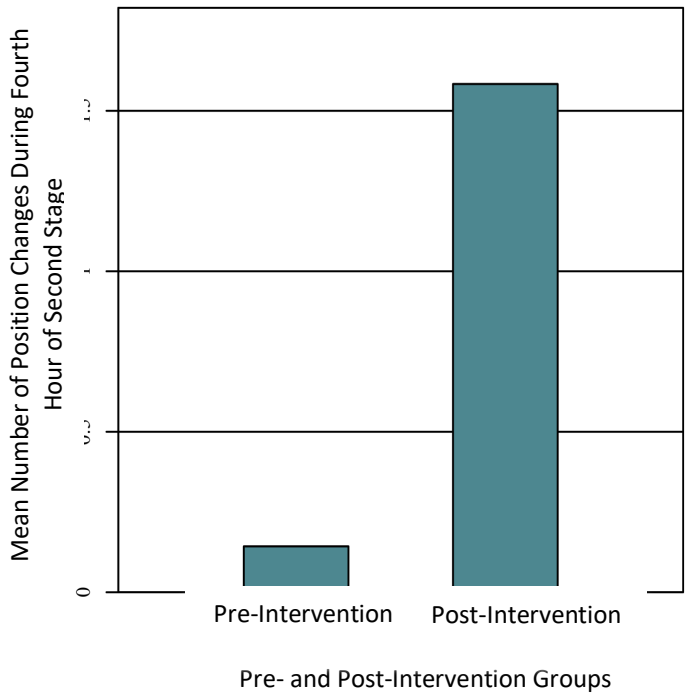


Table 14

Mean, Standard Deviation, and Sample Size for Number of Position Changes During the Fourth Hour of Second Stage of Labor in the Pre- and Post-Intervention Groups

Combination	*M*	*SD*	*N*
Pre-Intervention	0.14	0.38	7
Post-Intervention	1.58	1.44	12

Post-hoc. Post hoc analyses using paired *t*-tests were calculated for the three factors that significantly influenced delivery modes to further examine the differences among the variables. Tukey pairwise comparisons were conducted for all significant effects based on an alpha of 0.05.

For the main effect of delivery mode, the mean duration of minutes from 10 cm to birth for NSVD (M = 104.91, SD = 76.48) and OVD (M = 153.44, SD = 170.14) were significantly smaller than for CS (M = 291.60, SD = 57.61), $p < .001$. For the main effect of the pre- and post-intervention groups, the mean number of position changes during the third hour of the second stage of labor for the pre-intervention group (M = 0.58, SD = 0.79) was significantly smaller than for the post-intervention group (M = 1.78, SD = 1.24), $p = .005$. For the main effect of pre- and post-intervention groups, the mean number of position changes during the fourth hour of the second stage of labor for the pre-intervention group (M = 0.14, SD = 0.38) was significantly smaller than for post-intervention group (M = 1.58, SD = 1.44), $p = .020$. No other significant effects were found.

Labor Variables

The median number of delayed pushing minutes increased between the pre- and post-intervention groups (Figure 9). In addition, the median number of active pushing minutes also increased between pre- and post-intervention groups (Figure 10). An ANOVA to determine if there were significant differences in delayed pushing minutes by delivery mode was not significant, $F(2, 91) = 0.93$, $p = .399$. Additional factors were investigated using ANOVA to determine whether they were related to significant differences in the duration from 10 cm to birth, delayed pushing minutes, and active pushing minutes between the pre- and post-intervention groups. ANOVAs were also conducted to determine if there were differences in the number of position changes per hour in the two groups. Likewise, the number of provider updates in the pre- and-post-intervention groups were analyzed. The ANOVA testing indicated no significant differences between the pre- and post-intervention groups (n = 94) based on the identified variables.

Figure 9

Run Chart: Delayed Pushing Minutes

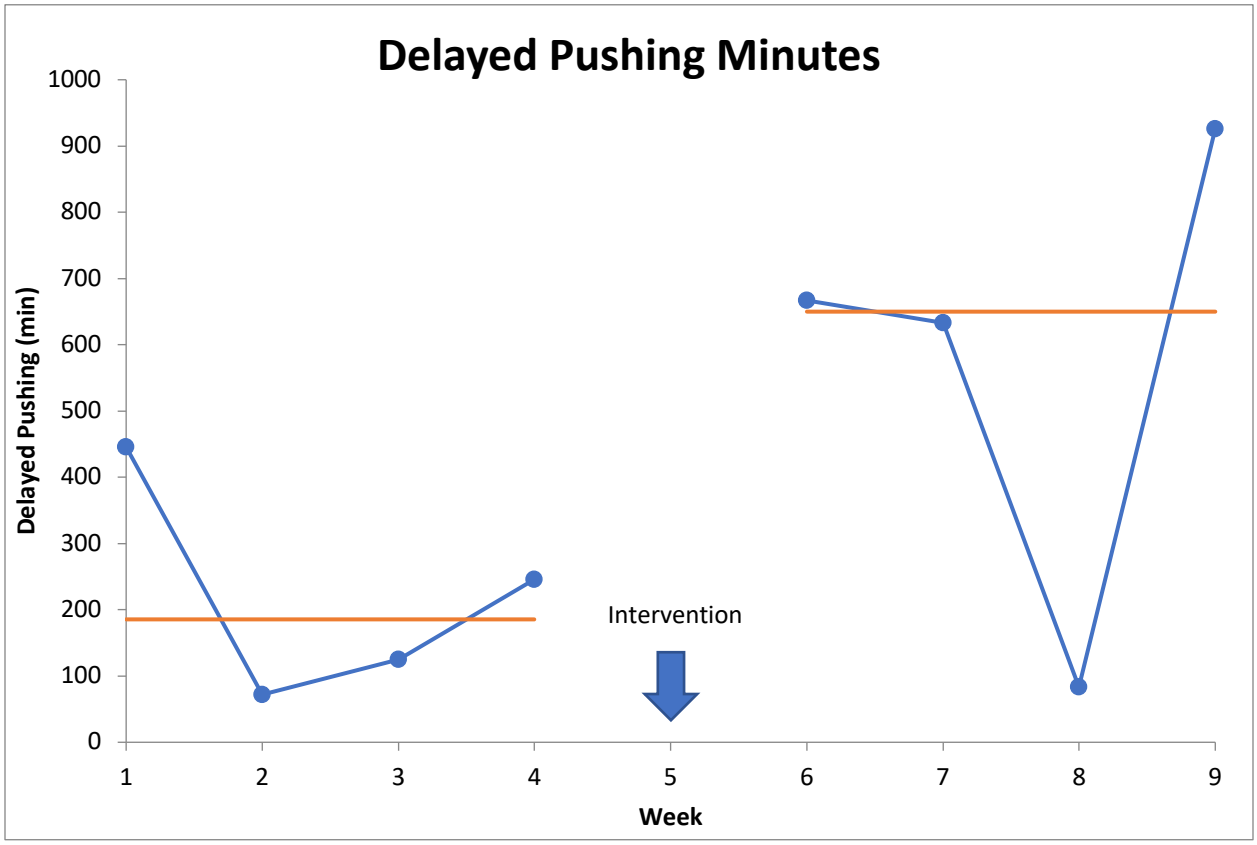
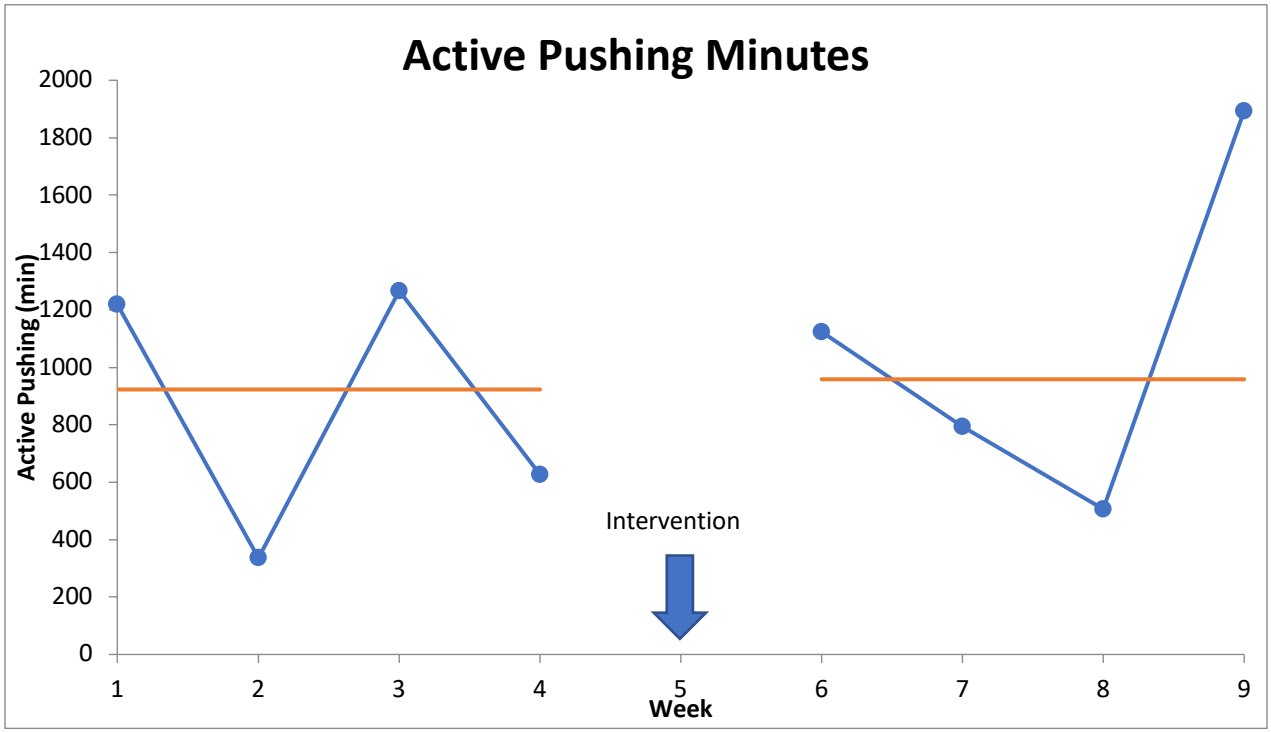


Figure 10

Run Chart: Active Pushing Minutes



Nurse Attendance at Educational Intervention. In the post-intervention group, 32 of the 54 patients who entered the second stage of labor were attended by 18 nurses who participated in the second stage education class. An ANOVA was conducted to determine whether nurses' participation in the educational course led to significant differences in the duration of delayed pushing, active pushing, total number of position changes, or number of provider updates during the second stage of labor for the post-intervention group. The results of the analyses were not significant.

Effect of Intervention on Delivery Modes. A Fisher's exact test was conducted to examine whether delivery modes in the pre- and post-intervention groups were independent. There were three types of delivery modes: NSVD, OVD, and CS in both the pre-intervention and post-intervention groups. The results of the Fisher exact test were not significant based on an

alpha value of 0.05, $p = 1.000$, suggesting that delivery mode and pre- and post-intervention groups could be independent of one another. This implies that the observed frequencies were not significantly different than the expected frequencies (Table 15).

Table 15

Pre- and Post-Intervention Delivery Modes

Delivery Mode	Pre-Intervention	Post-Intervention	*p*
NSVD	34[34.04]	46[45.96]	1.000
OVD	4[3.83]	5[5.17]	
CS	2[2.13]	3[2.87]	

Note. Values formatted as Observed [Expected].

Position Changes. Statistics were calculated for the number of position changes per hour for each hour of the second stage of labor related to the delivery mode (Table 16). NTSV patients who did not labor or did not reach the second stage of labor were excluded from the sample ($n = 20$). Calculations for the total number of position changes, split by birth outcome, and filtered by pre- and post-intervention groups were also made. For the pre-intervention group, NSVD patients had an average of 2.44 total position changes, OVD had 2.5, and CS had 5.5. For the post-intervention group, NSVD patients had an average of 3.13 total position changes, OVD had 5.6, and CS had 8.67 (Table 17).

Table 16

Second Stage Position Changes (Per Hour of Second Stage and Total) Related to Delivery Mode

Delivery Mode	**Hour 1** (M, SD, *n)*	**Hour 2** (M, SD, *n)*	**Hour 3** (M, SD, *n)*	**Hour 4** (M, SD, *n)*	**Hour 5** (M, SD, *n)*	**Total Position Changes** (M, SD, *n)*
NSVD	M= 1.49 SD= 1.20 *n* = 80	M= 1.29 SD= 1.27 *n* = 51	M= 1.19 SD= 1.10 *n* = 26	M= 0.80 SD= 1.14 *n* = 10	M= 1.50 SD= 1.91 *n* =4	M= 2.84 SD= 2.71 *n* =80
OVD	M= 1.11 SD= 0.78 *n* = 9	M= 1.25 SD= 0.93 *n* = 4	M= 2.0 SD= 1.63 *n* = 4	M= 1.75 SD= 2.06 *n* = 4	M= 2.00 SD= 1.63 *n* = 4	M= 4.22 SD= 5.14 *n* = 9
CS	M= 2.40 SD= 0.89 *n* = 5	M= 2.00 SD= 1.14 *n* = 5	M= 1.80 SD= 1.64 *n* = 5	M= 1.00 SD= 1.22 *n* = 5	M= 0.00 SD= 0.00 *n* = 3	M= 7.40 SD= 3.97 *n* = 5

Table 17

Total Number of Position Changes by Delivery Mode in the Pre- and-Post-Intervention Samples

Pre-Intervention				Post-Intervention			
	M	*SD*	*n*		*M*	*SD*	*N*
NSVD	2.44	2.41	34	NSVD	3.13	2.90	46
OVD	2.50	2.38	4	OVD	5.60	6.58	5
CS	5.50	0.71	2	CS	8.67	5.03	3

Duration From 10 cm to Delivery. The amount of elapsed time between reaching 10 cm dilation and delivery was analyzed by delivery mode and filtered by pre- and-post-intervention groups. NTSV patients who did not advance to the second stage of labor (*n* = 20) were excluded

from the analysis. In the pre-intervention group, the median duration of time from 10 cm dilation to delivery for NSVD, OVD, and CS patients was 97.76, 162, and 303.50 minutes, respectively. In the post-intervention group, the median duration of time from 10 cm dilation to delivery for NSVD, OVD, and CS patients was 110.20, 146.6 and 283.67 minutes, respectively (Table 18). In the NSVD group, more time (min) elapsed in the post-intervention group from 10 cm dilation to delivery than in the pre-intervention group. In contrast, more time (min) elapsed from 10 cm dilation to delivery in both the pre-intervention OVD and CS groups than in the post-intervention groups.

Table 18

Duration (min) Between 10 cm Dilation and Delivery by Delivery Mode, Filtered by Pre- and Post-Intervention Groups

Pre-Intervention				Post-Intervention			
	M	*SD*	*n*		*M*	*SD*	*n*
NSVD	97.76	56.76	34	NSVD	110.20	88.54	46
OVD	162.00	175.02	4	OVD	146.60	186.51	5
CS	303.50	84.15	2	CS	283.67	53.50	3

NICU admissions. In the analysis of the births that advanced to the second stage of labor (n = 94), the majority of the newborns were admitted to the newborn nursery (n = 92, 98%). Upon further analysis, no neonates were admitted to the NICU during the pre-intervention period, but two neonates (4%) were admitted to the NICU during the post-intervention period (Table 19).

Table 19

Neonatal Admission Disposition Divided by Pre- and Post-Intervention Groups

Admission Disposition	Pre-Intervention	Post-Intervention
Newborn Nursery Admission	40 (100%)	52 (96%)
Neonatal Intensive Care Unit Admission	0 (0%)	2 (4%)

Discussion

Labor and delivery nurses can influence birth outcomes through evidence-based interventions and practice (Adams et al., 2016). This EBP project demonstrated that the development and implementation of an educational program to improve labor nurses' management of the second stage of labor can change clinical outcomes. Based on the significant difference in the total mean scores between the pre- and posttests, nurses acquired knowledge between the start and completion of the educational course; five of the ten questions on the posttest were answered correctly by 100% of the nurses, including the questions about the Obstetric Care Consensus guidelines, NTSV abbreviation, frequency of maternal position changes, upright positions, and effective communication. While the demographic data demonstrated that neither the level of the nursing degree, level of post-secondary education, nor assigned nursing shift influenced a nurse's ability to learn new information, the analysis of labor variables from the chart review showed that nurses who attended the educational program demonstrated they were able to frequently and consistently utilize new knowledge from the second stage class in their practice.

Several important findings were noted that may affect the overall goal of improved or decreased C/S rates. First, the median duration of time from 10 cm to birth increased from the pre-intervention to the post-intervention sample of patients who were delivered by NSVD. These results are consistent with various studies that analyzed how extending the length of labor decreased the CS rate without increasing maternal or neonatal morbidities. These included Gimonsky and Berghella's (2016) study (CS rates decreased from 43.2% to 19.5% percent), Wilson-Leedy et al.'s (2016) study (CS rate decreased from 26.9% to 18.8%), Thuiller et al.'s (2018) study (CS rates decreased from 9.4% to 6.9%), and Zipori et al.'s (2019) study (CS rates decreased from 23.3% to 15.7%).

Equally important, the significant increase in the mean number of position changes during the third and fourth hours of the second stage between the pre-intervention and post-intervention groups showed that as time elapsed in the second stage, nurses repositioned the patients more frequently. Frequent repositioning is used to promote fetal rotation and descent in the maternal pelvis. A deep examination into the number of position changes per each hour of the second stage of labor showed notable differences in the median number of total position changes when analyzed by delivery mode; NSVD had 2.84, OVD had 4.22, and UP CS had 7.49, with the median number of total position changes for each delivery mode and the total number of second stage position changes increasing from the pre-intervention to the post-intervention sample. This result suggests that nurses caring for women who had second stages that extended beyond two hours or required assistance with delivery, including OVD and UP CS, applied the principles addressed in the second stage class and made valiant efforts to improve nursing management of the second stage of labor. The result also supports Huang et al.'s (2019) recommendations for second stage position changes to promote optimal maternal and fetal outcomes and exemplifies Brewster et al.'s (2015) evidence that when staff members perceive that new knowledge and innovations will improve patient care, they are likely to integrate them into patient care.

Further, another example of the integration of knowledge is that patients cared for by nurses who attended the second stage class had an 87.5% NSVD rate and a 6.2% CS rate compared to patients who were cared for by nurses who did not attend the second stage class, who had an 81.8% NSVD rate and a 9.1% CS rate. The NSVD run chart illustrates that the median number of NSVDs increased from 8.5 in the pre-intervention group to 11.5 in the post-intervention group. While these results are not statistically significant, any increase in NSVDs and decrease in CSs, even if small, have known clinical implications, including the reduction in the short-term risks associated with the primary CS and long-term risks that rise exponentially

with each subsequent CS. As the primary caregiver during the second stage of labor, nurses can influence birth outcomes by implementing strategies to reduce the risk of CS due to inadequate or ineffective pushing efforts.

Similar to Garpiel's (2018) quality-improvement project that introduced an interdisciplinary practice bundle for second stage labor that focused on 5 "P"s, patience, positioning, resuscitation, progress, and preventing urinary harm, this quality improvement project showed similar results in optimizing maternal and fetal outcomes while safely reducing the NTSV CS rate. Similarly, Waller-Wise et al.'s (2020) quality improvement project utilized a clinical practice guideline to care for women in the second stage of labor that focused on positioning, timing of pushing, type of pushing effort and the effect of perineal trauma and birth method. Important results of these efforts included increased NSVD and vaginal birth after CS. In addition, there were decreased OVD and perineal trauma. Clinical guidelines are important to change traditional nursing culture from a practice solely based on what was learned in nursing school, the way one was trained, and knowledge that is passed from one to another, to one that promotes the translation of current evidence into practice, thereby removing variation between nurses and promoting best practice (Wallller-Wise et al., 2020).

Of note, NICU admission was used as a balancing measure. While there were no NICU admissions in the pre-intervention cohort, there were two unanticipated NICU admissions in the post-intervention cohort. Reasons for NICU admissions were not collected, therefore it could not be determined whether these admissions were related to second stage labor management. In order to understand if nurse management of the second stage contributed to the intensive care requirement, a more thorough chart review would be indicated.

While the author anticipated that nurses with less than five years of experience would enroll in the course, the majority of the participants were seasoned nurses with more than 11

years of labor and delivery nursing experience. Nurse participants were eager to enroll in classes, received this evidenced-based information with enthusiasm, and demonstrated genuine interest in improving patient care. After attending the classes, nurses used their enhanced knowledge and skills to provide evidenced-based care, which optimized clinical outcomes, evidenced by the increased duration of time from 10 cm to birth, duration of delayed pushing minutes, duration of active pushing minutes, total number of both second stage position changes and total number of second stage provider updates, and increased number of NSVD. These outcomes reinforce Lagrew et al.'s, (2018) statement that an essential component of patient safety in obstetric care is to adopt health provider education and training. These outcomes also imply that nursing care can impact the delivery mode and, therefore, reinforce the value of ongoing education regarding EBP, including hands-on training, to promote improved clinical outcomes.

Moreover, immediately after the first second stage class was offered, participants asked the Director of Women's Services to place the second stage guidelines (including CMQCC's *Algorithm for the Management of Second Stage of Labor* and various second stage position charts purchased from Premier Birth Tools) in each of the unit's 12 labor rooms. These actions were completed in the weeks following the instructional courses. As nurses who attended the second stage class shared their successes with nursing colleagues, referenced the new guidelines and carried the new peanut balls through the hallways to use at the bedside, nurses who did not attend the class inquired about the purpose and utility. The enthusiasm toward implementing best practice will ensure continuation and sustainability in improved management of second stage. As opportunities for emergent second stage education ensue, nurses are subsequently encouraged to attend future second stage classes. In addition, hands-on learning and skills practice along with didactic information can be incorporated into other educational courses to improve nursing care and patient outcomes.

Limitations

One limitation of this project was the short time frame. The data collection period for both the pre- and post-intervention groups was only four weeks, resulting in a small sample size. Also, this project was completed at a single institution and may not be generalizable beyond that community. In addition, variations in practice and documentation between nurses was noted; validity and reliability of following the practice guidelines and documentation was not confirmed. Finally, each run chart demonstrates random signals of change. This analysis is limited due to only having eight data points. Run charts are unstable with less than 10 data points (Provost & Murray, 2011).

Strengths

The outcomes of this DNP project demonstrate that the nurses' management of the second stage of labor can affect delivery outcomes. The nurses who participated were empowered to make a difference in their patient's reproductive health. Having current knowledge and skills motivated them to do more to affect outcomes and made them want to share this information with other nurses. While this DNP project was underpowered to produce statistically significant results, there was a positive trend in the percentage of NSVD deliveries for women who were cared for by nurses who attended a second stage class.

Implications

This project served as a pilot to determine if an interactive educational training session could promote practice change and improve outcomes. After participating in the second stage class, nurses demonstrated increased knowledge regarding contemporary labor management, including the definition of the NTSV abbreviation and the *Healthy People 2020* goal to decrease the rate of UP CS in NTSV women to the 23.9% target. They followed the recommendations to promote position changes every 20-30 minutes during the second stage of labor, indications and

parameters for delayed pushing, and labor duration guidelines for the first and second stages of labor. This knowledge empowers nursing staff to use professional guidelines to advocate for the patient and engage with providers in interdisciplinary efforts to promote vaginal birth.

In order to continue to improve nurse management of the second stage of labor and sustain quality improvement efforts, additional second stage courses will be offered to ensure that all labor nurses receive the same training. Ongoing, interactive learning experiences will be an imperative component of continued improvements. In addition, this class will be integrated into unit -specific orientation. A limited number of monthly chart audits will continue to ensure that efforts to improve nursing management of the second stage of labor are maintained and chart reviews will also be conducted as needed. Data will continue to be plotted on both run and control charts, ensuring that trends continue in a positive direction. Outcomes will be shared with stakeholders, including nursing staff, obstetric providers, the hospital's quality improvement department, Board of Trustees, state-wide collaborative groups, non-profit and regulatory agencies, and the community.

It is imperative to employ all potential strategies to promote vaginal births in the NTSV population in order to ensure optimal maternal and fetal outcomes. It is also vital to engage in interdisciplinary efforts and to ensure organizational support to promote success. In addition to increasing nursing knowledge, more innovative strategies to promote vaginal births include the integration of evidenced-based second stage curriculum into free childbirth education classes, required second stage continuing education units for registered labor and delivery nurses prior to license renewal by state nursing boards, and the development of nursing expertise in physiologic birth and second stage management techniques as part of the clinical nursing ladder (Waller-Wise et al., 2020). Reducing CS rates minimizes the short- and long-term risks associated with the primary CS and the morbidities that rise at exponential rates with each subsequent CS. While

more research is needed on contemporary labor patterns, current evidence will continue to be reviewed and integrated into practice. As research continues to evolve, it will be essential to focus on more interactive teaching sessions for nurses along the continuum of professional experience, including novices to experts, in order to promote NSVD and affect reproductive health outcomes. The ultimate goal is to integrate this knowledge into professional nursing practice and disseminate the results to the broader obstetric community.

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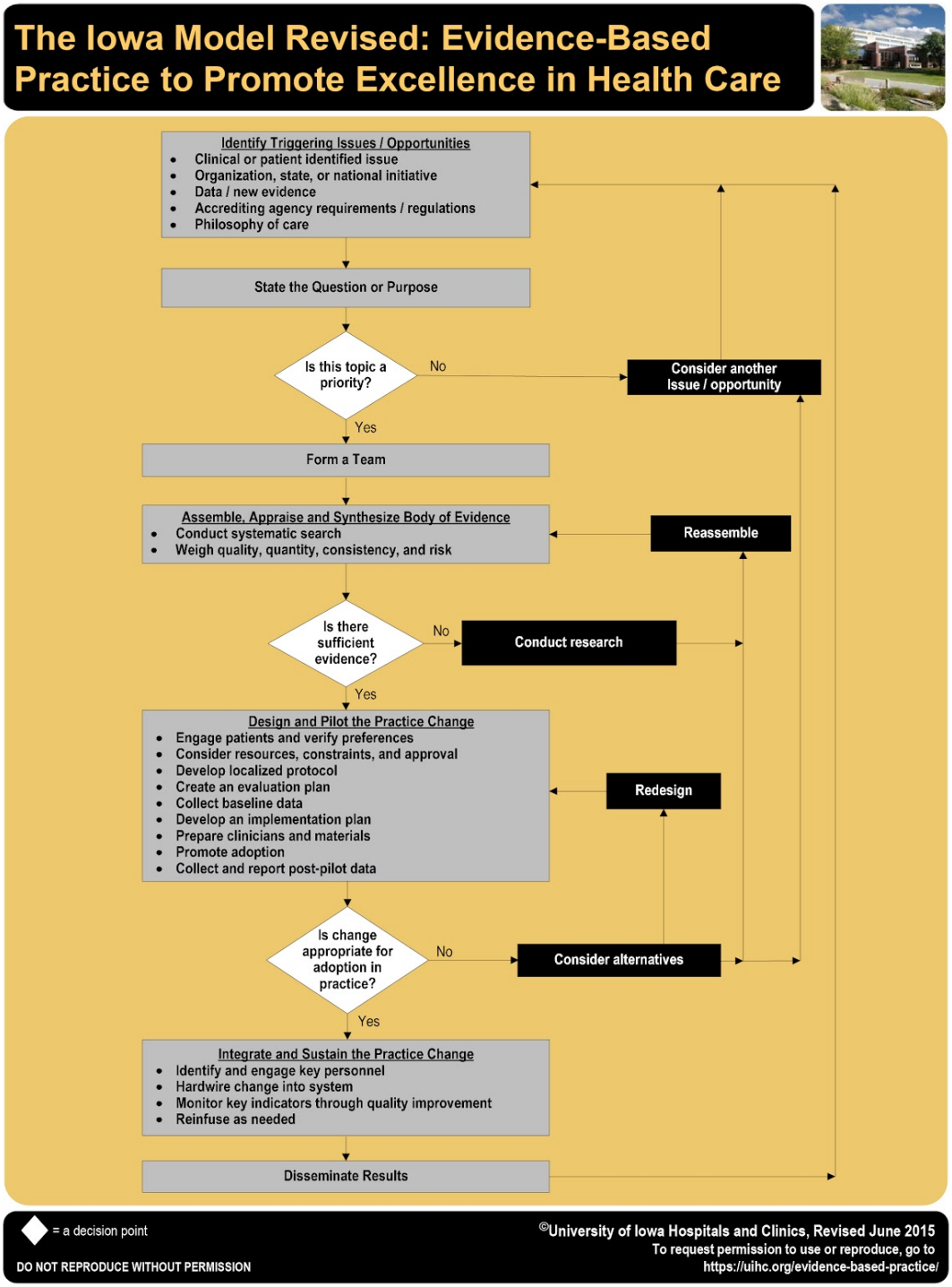
APPENDIX A

The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care



Note. Used/reprinted with permission from the University of Iowa Hospitals and Clinics, copyright 2015. Permission to use model is found in Appendix B.

APPENDIX B

Permission to Reproduce The Iowa Model

From: [redacted] - University of Iowa Hospitals and Clinics [redacted]
Date: April 27, 2019 at 2:21:00 PM CDT
To: [redacted]
Subject: Permission to Use The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care
Reply-To: [redacted] - University of Iowa Hospitals and Clinics [redacted]

You have permission, as requested today, to review and/or reproduce *The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care.* Click the link below to open.

The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care

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Citation: Iowa Model Collaborative. (2017). Iowa model of evidence-based practice: Revisions and validation. *Worldviews on Evidence-Based Nursing, 14(3), 175-182. doi:10.1111/wvn.12223*

> In written material, please add the following statement:
> *Used/reprinted with permission from the University of Iowa Hospitals and Clinics, copyright 2015. For permission to use or reproduce, please contact the University of Iowa Hospitals and Clinics at 319-384-9098.*

Please contact [redacted] with questions.

APPENDIX C

Director of Women's Services Letter of Approval and Support

April 3, 2020

California State University, Fullerton
School of Nursing, EC-190
800 N. State College Blvd.
Fullerton, CA 92831

Dear Rachel,

We received your letter dated March 31, 2020. Per the Student Internship Agreement signed by Mimi Dent, student and her management [redacted]ospital on March 02, 2020, we fully support her proposed project to implement and evaluate an educational program to improve labor nurses' management of the second stage of labor with an overarching goal of decreasing the cesarean section rate in nulliparous, term, singleton, vertex patients.

Sincerely,

[redacted]

[redacted]

APPENDIX D1

Institutional Review Board Letters

August 4, 2020

Mimi Dent, MSN, RNC-OB, C-EFM

RE: Your application dated 7/31/2020 regarding study number 20-86ne: Improving Nurse Management of the Second Stage of Labor

Dear Ms. Dent:

Your application for the new study listed above has been reviewed. This study qualifies as exempt from further review under the following guideline: Category #2.

You are free to conduct your study without further reporting to [redacted] Institutional Review Board. However, [redacted] Institutional Review Board may contact you on an annual basis to determine whether or not your study is still ongoing or whether our files can be closed.

Thank you for keeping the IRB informed of your activities.

Sincerely,

[redacted]

APPENDIX D2

Institutional Review Board Letter D2

CALIFORNIA STATE UNIVERSITY, LONG BEACH

OFFICE OF RESEARCH & SPONSORED PROGRAMS

DATE:	August 25, 2020
TO:	Mimi Dent, MSN
FROM:	CSULB IRB
PROJECT TITLE:	[1618570-1] Improving Nurse Management of the Second Stage of Labor
REFERENCE #:	21-033
SUBMISSION TYPE:	**New Project** [redacted]
REVIEW TYPE:	Administrative Review
ACTION:	**ACKNOWLEDGED WITH COMMENT)**
EFFECTIVE DATE:	August 25, 2020

Thank you for submitting the New Project materials for this Quality Assurance/Quality Improvement project. The California State University, Long Beach Institutional Review Board has ACKNOWLEDGED your submission. No further action on submission 1618570-1 is required at this time.

COMMENT: The PI and all personnel listed in the protocol must strickly follow all policy and procedures at the [redacted] **the mitigation of the riskS of potential COVID-19 infection, including the use of face marks and sanitizer, social distancing, etc. If there is any question, issue or concern, promptly contact the** [redacted]

The following items are acknowledged in this submission:

- [redacted]
- [redacted]
- Application Form - Dent, Mimi Project Approval Signed (2).pdf (UPDATED: 08/12/2020)
- Application Form - CSULB_IRB Application for Administrative and Limited Review_01-02-2018.docx (UPDATED: 08/12/2020)
- [redacted]
- [redacted]
- Letter - 20-86ne IRB Letter 8-4-2020 Approval (1).pdf (UPDATED: 08/12/2020)
- Letter - Dent IRB letter.pdf (UPDATED: 08/12/2020)
- [redacted]
- [redacted]

If any modifications for this project are required, please contact the [redacted] first, to seek approval prior to implementing the modifications. The IRB must confirm the modifications do not affect the risk/benefit ration for this project. The IRB must also determine whether the modifications would cause the project to meet the definition of "Research with Human Subjects." If yes, the IRB requests a separate, new IRB Application to conduct a formal review.

If you have any questions, please contact the CSULB IRB at (562) 985-8147 or IRB@csulb.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within California State University, Long Beach Institutional Review Board's records.

1250 Bellflower Blvd., Long Beach, CA 90840
Ph. (562) 985-8147 Fax. (562) 985-8665

APPENDIX D3

Institutional Review Board Letter D3

November 18, 2020

Mimi Dent, MSN, RNC-OB, C-EFM

RE: Your application dated 11/16/2020 regarding study number 20-86ne: Improving Nurse Management of the Second Stage of Labor

Dear Ms. Dent:

I have reviewed your application for revision of the study listed above. The requested revision involves changes to the protocol. Your request is eligible for expedited review under FDA and DHHS (OHRP) designation.

This is to confirm that I have approved your request for revision. The protocol is approved through Version 2, dated Nov. 13, 2020. Your updated Waiver of Authorization dated Nov. 16, 2020 is also approved.

As before, you are free to conduct your study without further reporting to [redacted] Institutional Review Board. However, [redacted] Institutional Review Board may contact you on an annual basis to determine whether or not your study is still ongoing or whether our files can be closed. Contact [redacted] email: [redacted] if you have any questions or require further information.

Sincerely,

[redacted]

APPENDIX D4

Institutional Review Board Letter D4

CALIFORNIA STATE UNIVERSITY, LONG BEACH

OFFICE OF RESEARCH & SPONSORED PROGRAMS

DATE:	December 14, 2020
TO:	Mimi Dent, MSN
FROM:	CSULB IRB
PROJECT TITLE:	[1618570-2] Improving Nurse Management of the Second Stage of Labor
REFERENCE #:	21-033
SUBMISSION TYPE:	**Amendment/Modification (Approved by Santa Barbara Cottage Hospital IRB)**
REVIEW TYPE:	Administrative Review
ACTION:	ACKNOWLEDGED WITH COMMENT
EFFECTIVE DATE:	December 14, 2020

Thank you for submitting the Amendment/Modification materials for this Quality Assurance/Quality Improvement project. The California State University, Long Beach Institutional Review Board has ACKNOWLEDGED your submission. No further action on submission 1618570-2 is required at this time.

COMMENT: The PI and all personnel listed in the protocol must strictly follow all policy and procedures at the Santa Barbara Cottage Hospital regarding the mitigation of the risks of potential COVID-19 infection, including the use of face marks and sanitizer, social distancing, etc. If there is any question, issue or concern, promptly contact the IRB of Santa Barbara Cottage Hospital.

The following items are acknowledged in this submission:

- Letter - CSULB_IRB Application for Administrative and Limited Review_01-02-2018.docx (UPDATED: 12/6/2020)

If any modifications for this project are required, please contact the **Santa Barbara Cottage Hospital** IRB first, to seek approval prior to implementing the modifications. The IRB must confirm the modifications do not affect the risk/benefit ration for this project. The IRB must also determine whether the modifications would cause the project to meet the definition of "Research with Human Subjects." If yes, the IRB requests a separate, new IRB Application to conduct a formal review.

If you have any questions, please contact the CSULB IRB at (562) 985-8147 or IRB@csulb.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within California State University, Long Beach Institutional Review Board's records.

1250 Bellflower Blvd., Long Beach, CA 90840
Ph. (562) 985-8147 Fax. (562) 985-8665

APPENDIX D5

Consent to be a Research Subject Forms D5

[redacted] IRB #: _____107312020____

Cottage Health

CONSENT TO BE A RESEARCH SUBJECT

Improving Nurse Management of the Second Stage of Labor

Protocol No.: 107312020

[redacted]

Institution: Santa Barbara Cottage Hospital

Sponsor: Not applicable

IRB: [redacted]

Name of Participant:_____

IRB #: _____107312020____

State of California

EXPERIMENTAL SUBJECT'S BILL OF RIGHTS

The rights below are the rights of every person who is asked to be in a research study. As an experimental subject I have the following rights:

1. To be told what the study is trying to find out.

2. To be told what will happen to me and whether any of the procedures, drugs or devices is different than what would be used in standard practice.

3. To be told about the frequent and/or important risks, side effects, or discomforts associated with the things that will happen to me for research purposes.

4. To be told if I can expect any benefit from participating and, if so, what the benefit might be.

5. To be told the other choices of procedures, drugs or devices I have and how they may be better or worse than being in the study, including risks and benefits.

6. To be allowed to ask any questions concerning the study and procedures both before agreeing to be involved and during the course of the study.

7. To be told what sort of medical treatment is available if any complications arise.

8. To refuse to participate at all or to change my mind about participating after the study has started. This decision will not affect my right to receive the care I would receive if I were not in the study.

9. To receive a copy of the signed and dated consent form.

10. To be free of pressure when considering whether I wish to agree to be in the study or not participate.

If I have questions about the research study, I should ask the researcher or research assistant. In addition I may contact the Institutional Review Board (IRB), which is concerned with protection of volunteers in research projects. I can reach the IRB office by calling 805-324-9255 during normal business hours, or by writing the Cottage Health Institutional Review Board, Santa Barbara Cottage Hospital, P.O. Box 689, Santa Barbara, CA 93102.

By signing below, I state that I have read and have had the opportunity to ask questions about the rights which all subjects in a research study have.

_____ _____

Signature of Participant Date

IRB #: _____107312020____

[redacted]

CONSENT TO BE A RESEARCH SUBJECT

Improving Nurse Management of the Second Stage of Labor

Key Information:
The purpose of this project is to develop, implement, and evaluate an instructional course designed to improve nurses' management of the second stage of labor. The duration of the class will be two hours. The requirements of the study are to complete a pre and post-test and to actively participate in the course. A potential benefit for nurses includes the acquisition of new knowledge that will improve clinical practice and outcomes. Potential physical risks to nurses will be the same, or less, than standard day to day practice in the labor and delivery unit. Nurses could potentially experience negative psychological or social effects.

Purpose of this Research Study:
You have been asked to participate in a research study because you are a registered nurse employed [redacted] and have volunteered to attend this class. Mimi Dent, DNPc is the principal investigator engaged in this evidence-based practice project to improve nurse management of the second stage of labor.

Study Procedures:
If you agree to participate in this study, you will be asked to do the following:

Complete the pre and post-tests, actively participate in the instructional course, and agree to skills validation by a clinical resource nurse.

Risks and Discomforts:
There are risks in any research study, although the dangers for this particular study are minimal. There is a very small possibility that participants could be identified by the last four digits of their phone number. Physical risks to nurses also exist, but they will be the same, or less, than standard day to day practice in the labor and delivery unit. Nurses could also potentially experience negative psychological effects, social effects, or feel uncomfortable during the interactive learning experience and/or skills validation portion of the class.

Potential Benefits:
You may not receive any direct benefit by participating in this study. It is possible that this study will help [redacted] implement evidence-based practices to promote improved maternal outcomes. In the future, information obtained about this evidence-based practice may be disseminated to the greater obstetric community to further promote improved maternal outcomes.

Alternatives to Participation:
If you do not participate in this study, there may be opportunities to participate in this class in the future.

Patient Confidentiality:

No medical information will be collected about you. You will be asked to fill out a pretest asking questions about your highest level of nursing education, highest level of non-nursing education, years of labor and delivery experience, and primary shift. Names will not appear on pretests, posttests, or skills validation forms. Given the nature of the questions and the size of the cohort involved in this study, your identity may be able to be recognized. All members of the healthcare team are bound by confidentiality laws to keep information about you confidential.

Participation in Research is Voluntary:
You are free to decline to participate or to discontinue participation in the study at any time without any penalty or loss of benefits to which you may otherwise be entitled. There are no penalties, if you want to change your mind. If you no longer wish to participate in this research project, you may contact the [redacted] The investigator is also free to terminate the study at any time. Clinically relevant research results will not be disclosed to you.

Payment or Reimbursement:
You will be compensated for the time that you spend participating in this study at your hourly rate of pay.

Reimbursement for Treatment of Research-Related Injury:
In the event that you believe participation in this research study has led to injury, you may contact [redacted] to identify the medical resources that may be available to you and to assist you in obtaining appropriate medical care. The hospital makes no commitment to provide free medical care or payment for any unfavorable outcomes resulting from participation in this research. Your medical expenses will be your responsibility or that of your third-party payer. Your doctor, the investigator(s), their affiliated organizations and [redacted] do not have any program to provide compensation for persons who may experience injury while participating in research projects.

Additional Information:
If you would like any additional information regarding this study, you may contact Mimi Dent at [redacted]. If you would like any additional information regarding your rights as a research subject, you may contact the Institutional Review Board at [redacted]

_____ _____
Signature of Participant Date

IRB #: _____107312020____

OFFICIAL SIGNATURE OF RESEARCH SUBJECT

I have read this document (or someone has read it to me). I have been given an opportunity to ask questions concerning the details of the research. I wish to participate in this study. I shall receive a signed copy of this document, which includes the *State of California Experimental Subject's Bill of Rights, the Consent to be a Research Subject,,* and *the Authorization for Use or Disclosure of Health Information*. My consent is valid for the duration of this study.

Patient Signature	Date	Time

SIGNATURE OF INVESTIGATOR *(or investigator-designated member of the research team with sufficient knowledge of the protocol)*

I have explained the research to the participant and answered all of his/her questions. I believe that he/she understands the information described in this document and freely consents to participate.

Investigator's Signature	Date	Time
Name & Signature of Designated Research Team Member Obtaining Consent (if other than Investigator)	Date	Time

APPENDIX E1

Nursing Guidelines for the Second Stage of Labor
Key Principles to Support Women During Second Stage

1. Provide labor support
    1. Physical-facilitate positioning, provide clean linens/pads/gowns
    2. Emotional-be present, provide reassurance/encouragement/empathy
    3. Informational-provide education to make informed decisions, discuss/explain sensations that are normal (pressure, stretching, straining), discuss advantages/disadvantages of various pushing techniques, incorporate patient/family choices as desired
    4. Advocacy-engage in active listening, provide accurate information, set realistic expectations, support choices & alternative approaches to care
2. Utilize gravity and frequent position changes to help fetus descend through pelvis.
3. Use spontaneous pushing to conserve maternal effort/energy & promote fetal oxygenation.
4. Allow for passive descent/delayed pushing to conserve maternal effort/energy & promote fetal oxygenation when clinically indicated, considering maternal vital signs (VS), fetal heart rate, fetal response to contractions, urge to push/rectal pressure & comprehensive clinical status.
5. Use sterile vaginal exam (SVE) to assess effectiveness of pushing. If ineffective, consider UC pattern/strength, effect of epidural, & patient's ability/knowledge. Once effective pushing is established, continue SVEs at regular intervals to ensure continued progress.
6. Absolute maximum length of time for the second stage of labor has not been defined.
    a. In collaboration with provider and as long as maternal/fetal condition permits, arrest of 2nd stage diagnosis should not be made until there is no descent or rotation in a
        i. Nullipara who pushes for 3h (without epidural) or for 4h (with epidural)
        ii. Multipara who pushes for 2h (without epidural) or for 3h (with epidural)

Pushing Positions

1. Change maternal position q 20 min to promote fetal rotation/descent during delayed *and* active pushing
2. Position to promote maternal comfort & fetal oxygenation
    1. Upright/lateral positions
        i. Purpose: to utilize gravity to increase strength of UC/efficiency of pushing, increase pelvic diameter, promote fetal descent, facilitate fetal oxygenation, decrease duration of 2nd stage/perineal trauma, minimize pain, increase patient satisfaction.
        ii. Examples: sitting (chair or toilet), leaning on support person (either standing or sitting), kneeling (hands & knees), squatting
    b. Lithotomy
        1. Purpose: to facilitate an expeditious birth, delivery provider preference
        2. Disadvantages: inhibits fetal rotation, is associated with impaired fetal oxygenation & risk of lumbosacral spine/lower extremity nerve damage
    c. Use positioning aids
        i. Examples: peanut ball, squat bar, chair, toilet, labor bed

Pushing Styles

Open glottis pushing (non-directed/spontaneous/physiologic pushing)

1. Encourage the woman to trust her instincts & do what feels natural
2. Push for as long as feels natural during the contraction
    a. If pushing is ineffective (no fetal rotation or descent), advise patient to push for 6-8 seconds, slightly exhale & then repeat 3-4 times (or as tolerated by patient & fetus) with each UC

Advantages: conserves maternal energy, promotes fetal oxygenation, decreases risk of episiotomy, 3rd/4th degree lacerations, genital tract trauma & operative vaginal delivery
Disadvantage: may increase length of second stage

Closed glottis pushing (directed pushing)

1. Indications
   a. When open glottis pushing is uncoordinated/ineffective (no rotation or descent) x1 hour
   b. If a patient has limited sensation to push after laboring down with epidural
   c. When an expeditious birth is indicated (chorioamnionitis, significant FHR decelerations, Category III FHR tracing, operative vaginal delivery)
   d. Limit to 3-4 pushing efforts with each contraction, x6-8 second duration

   Advantages: helps woman gain control (of intensity of labor and/or pushing) & used to expedite birth

   Disadvantages: associated with abnormal FHR patterns, fetal acidemia & increases maternal fatigue

Delayed pushing (laboring down)

1. Allows the fetus to passively descend in vagina in patients with epidural analgesia
   a. Up to 2 hours in nulliparous woman, 1 hour in multiparous woman
2. Assess fetal & maternal status (delayed pushing may not be advised with abnormal maternal VS or FHR patterns)
3. Educate patient about what sensations to anticipate (rectal pressure, urge to have BM)
4. Assess sensations (perineal pressure/urge to push); assess pushing efforts & fetal position/station with SVE
5. Pushing will ideally begin when the woman feels intense rectal pressure or the presenting part is in the introitus or on the perineum
   a. If unable to feel pressure, discuss PCEA rate change with OB & anesthesia; obtain order for rate change prn

   Advantages: decreases duration of pushing, maternal fatigue, perineal injury, operative vaginal delivery, cesarean delivery & fetal acidosis

   Disadvantages: prolongs total duration of second stage

Maternal status/communication

1. Ensure adequate UC pattern and fetal response
   a. Delayed pushing: assess FHR/UC pattern q 15 min, document FHR/UC pattern q 30 min
   b. Active pushing: assess FHR/UC pattern q 5-15 min according to risk status, document FHR/UC pattern q 15 min
   c. May modify pushing to reduce breaks in fetal oxygen pathway (FHR variable or late decelerations, indeterminate FHR baseline) by pushing with every 2nd/3rd UC
2. Assess/document fetal descent at regular intervals
3. Full bladder may impede labor progress/descent, reduce bladder tone & increase risk of infection
   a. Encourage patient to void on toilet/bedpan at regular intervals
   b. Avoid foley catheters in 2nd stage; may use straight catheter at regular intervals
4. Nurse must deliver precise/efficient messages to provider
   a. Convey assessments, needs & urgency
   2. Use standardized SBAR communication, briefs & debriefs
   3. Document all communications

References

Association of Women's Health, Obstetric, and Neonatal Nurses. (2019a). Basic, high-risk, and critical care intrapartum nursing: Clinical competencies and education guide (6th ed.). *Nursing for Women's Health, 23*(2), e1-e22. https://doi.org/10.1016/j.nwh.2019.02.004

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Smith, H., Peterson, N., Lagrew, D., & Main E. (2016). *Toolkit to support vaginal birth and reduce primary cesareans: A quality improvement toolkit*. California Maternal Quality Care Collaborative. https://www.cmqcc.org/VBirthToolkit

APPENDIX E2

Algorithm for the Management of Second Stage of Labor

APPENDIX E3

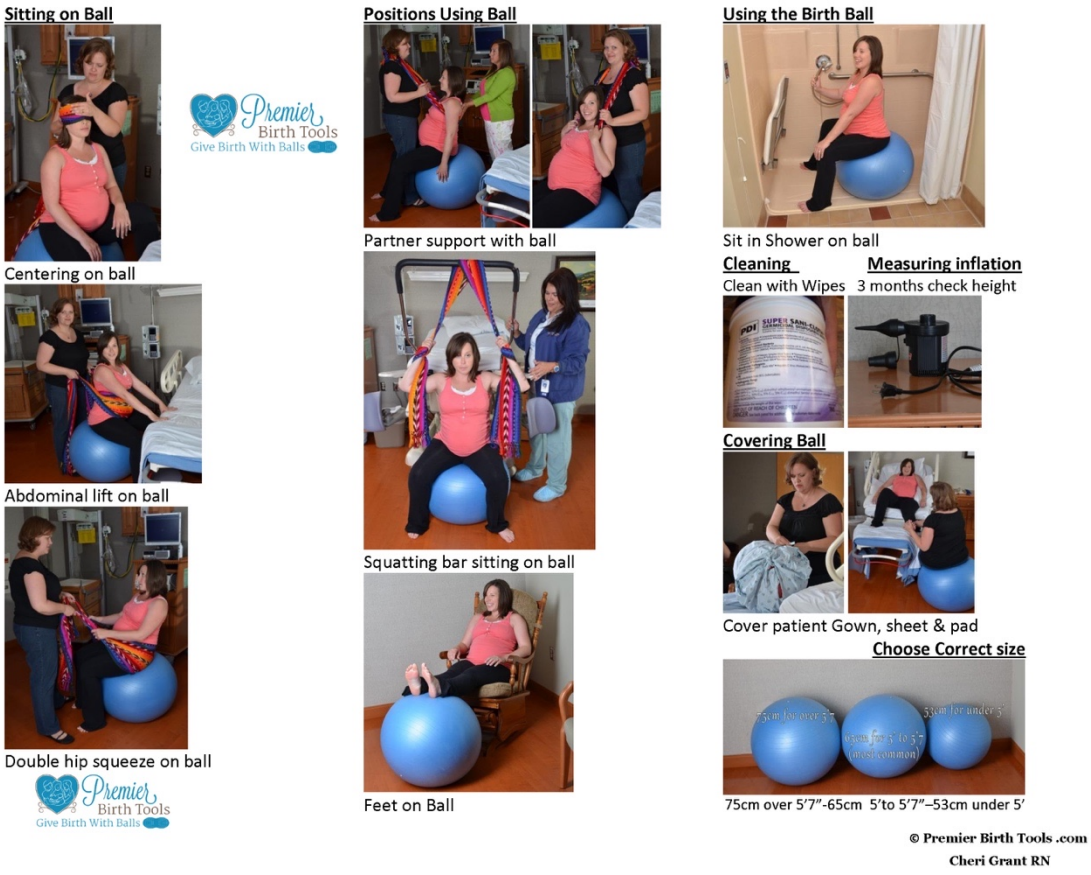
Figure E3

Birthing Ball Positions

APPENDIX E4

Figure E4

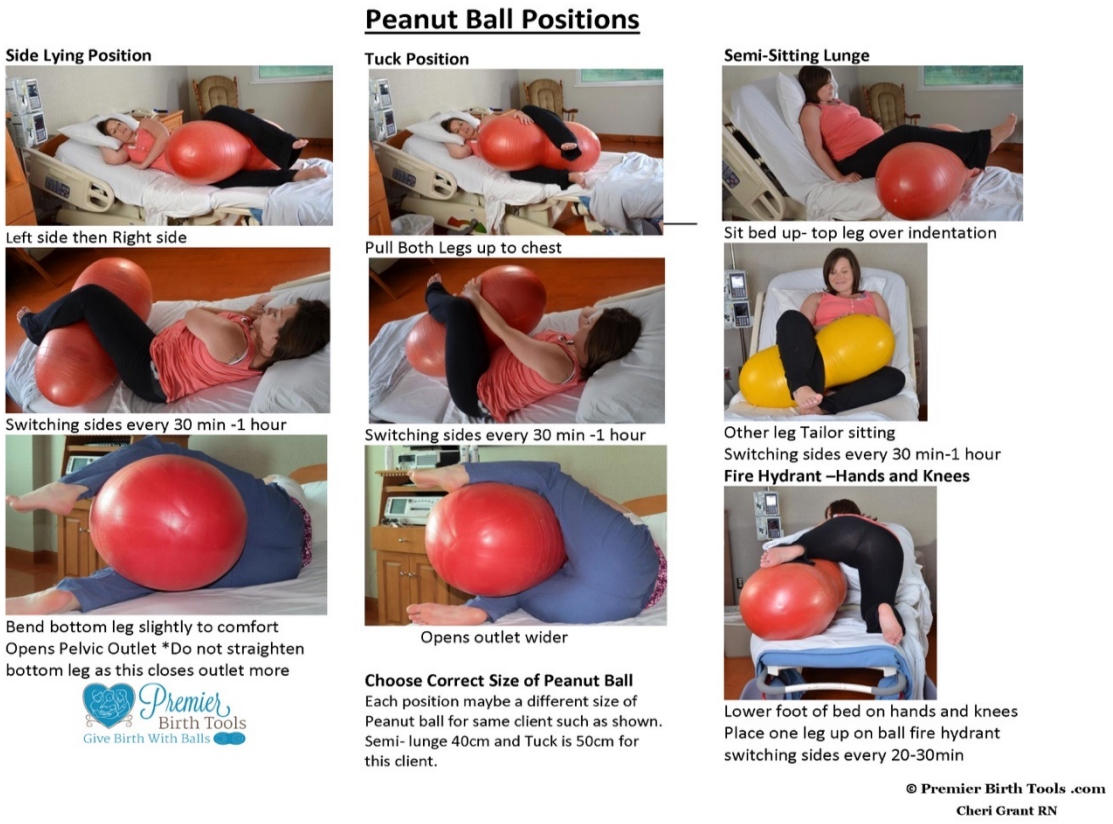
Birthing Ball Positions 2



APPENDIX E5

Figure E5

Peanut Ball Positions



Used with permission from Premier Birth Tools LLC; available for purchase at www.premierbirthtools.com

APPENDIX E6

Figure E6

Peanut Ball Positions 2

APPENDIX E7

Figure E7

Labor Positions

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APPENDIX E8

Figure E8

Pushing Positions

APPENDIX E9

Figure E9

Sheets for Pushing

APPENDIX E10

Figure E10

Sheets for Pushing 2

APPENDIX E11

Figure E11

Peanut Ball Pushing Position

APPENDIX E12

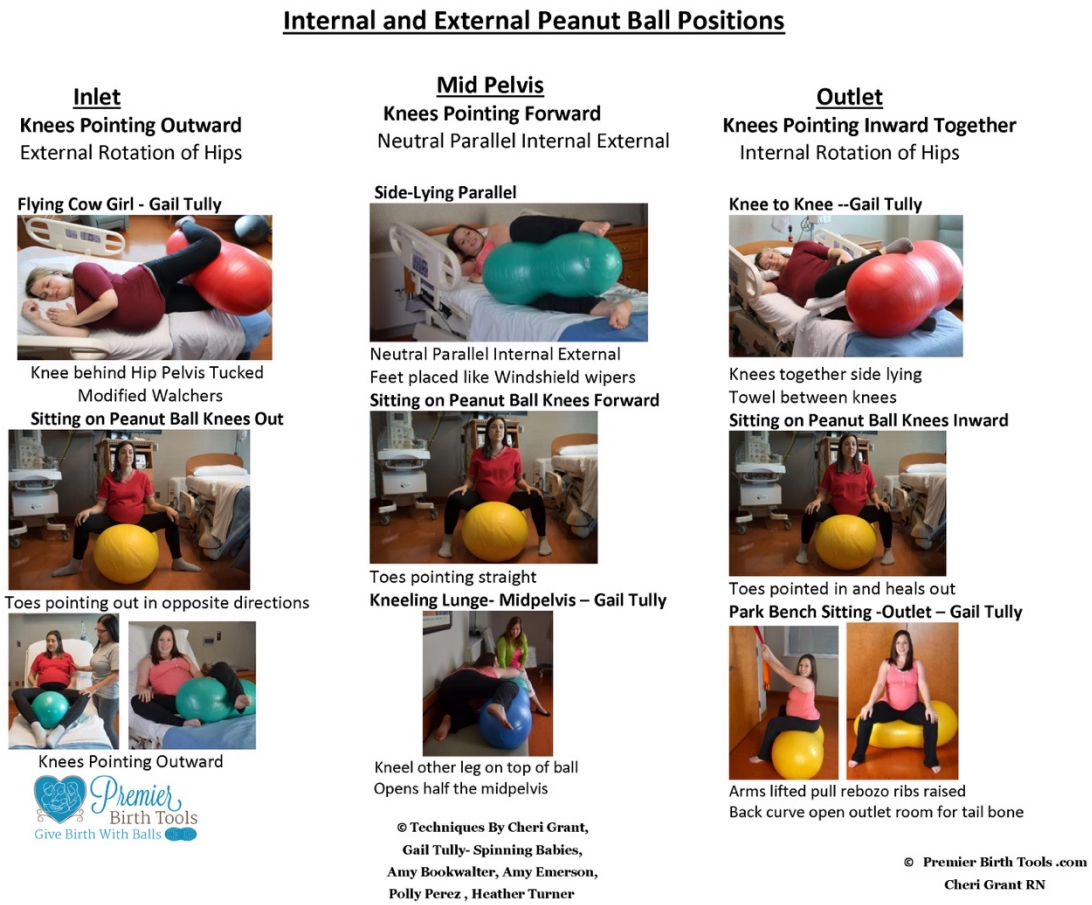
Figure E12

Peanut Ball Pushing Position 2

APPENDIX E13

Figure E13

Internal and External Peanut Ball Positions



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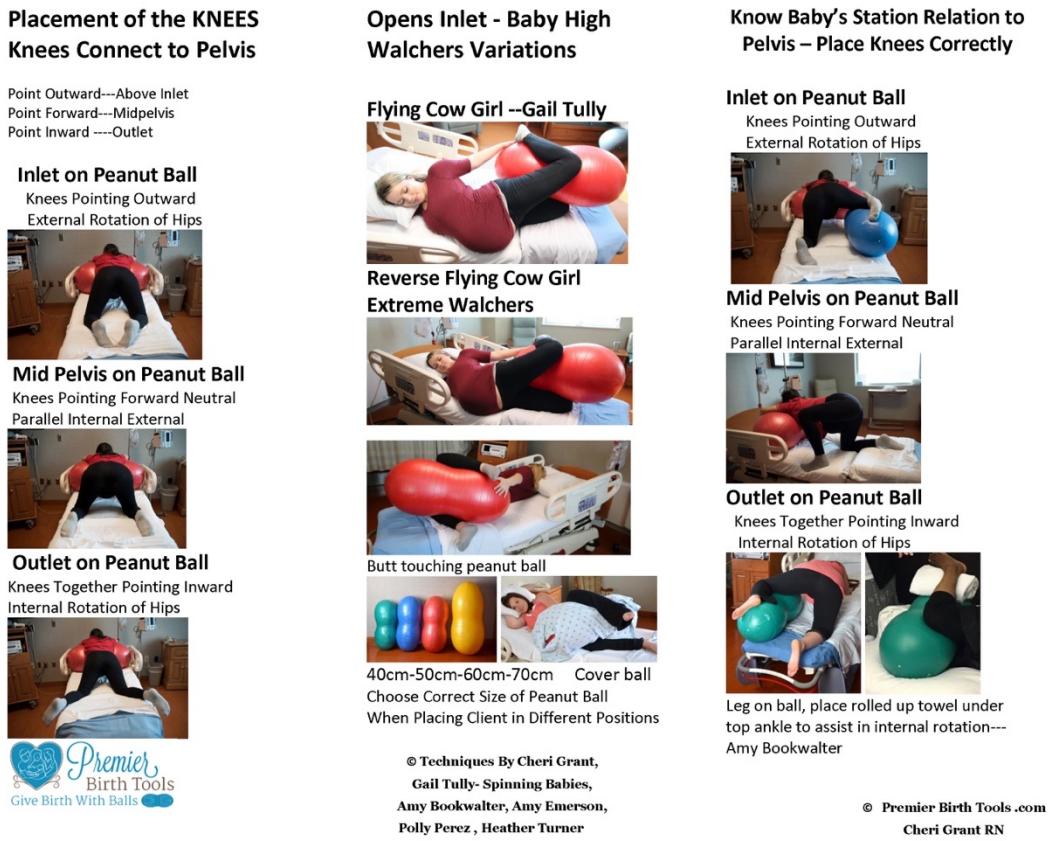
Appendix E14

Figure E14

Internal and External Peanut Ball Positions 2



APPENDIX E15

Figure E15

Opens Outlet

APPENDIX E16

Figure E16

Peanut Ball More Positions

APPENDIX E17

Figure E17

Peanut Ball More Positions 2

APPENDIX E18

Figure E18

Position for Asymmetric OP

APPENDIX E19

Figure E19

Position for Asymmetric OP 2

APPENDIX E20

Figure E20

Peanut Ball NEW Positions

APPENDIX E21

Figure E21

Peanut Ball NEW Positions 2

APPEMDIX F

Knowledge Pretest

Second Stage Labor: Pre Test

Second Stage Labor: Pre Test

1. Last four digits of cell phone number

2. Highest level of nursing education
- ○ Diploma Nurse
- ○ Associate Degree of Nursing
- ○ Bachelor of Science of Nursing
- ○ Master of Science of Nursing
- ○ Doctor of Nursing Practice/Doctor of Nursing Science

3. Highest level of non-nursing education
- ○ Associate Degree
- ○ Bachelors Degree
- ○ Masters Degree
- ○ Doctor of Philosophy
- ○ N/A

4. Years of labor and delivery experience
- ○ Less than 1 year
- ○ 1-5 years
- ○ 6-10 years
- ○ 11 or more years

5. Primary shift
- ○ 0700-1900
- ○ 1900-0700

6. NTSV is an abbreviation for
- ○ Normal term spontaneous vertex
- ○ Natural term spontaneous vaginal
- ○ Nulliparous term singleton vaginal
- ○ Nulliparous term singleton vertex

7. The national benchmark for the NTSV rate is
- ○ 23.9%
- ○ 14.8%
- ○ 24.1%
- ○ 33.2%

8. The 2019 NTSV CS rate at this facility was below the Healthy People 2020 goal
- ○ True
- ○ False

9. According to the Obstetric Care Consensus, second stage must be completed by
- ○ An absolute length of second stage has not been identified
- ○ 2 hours in a nullip without epidural, 3 hours in a multip with epidural
- ○ 3 hours in a nullip without epidural, 4 hours in a nullip with epidural
- ○ B and C

10. The spontaneous urge to push is caused by the Ferguson reflex that occurs as the presenting part descends into the pelvis.
- ○ True
- ○ False

11. A woman should be allowed to follow her natural instinct during the second stage of labor. If pushing is not effective, she should be advised to hold her breath for ten seconds at a time and bear down at least three times during each contraction.
- ○ True
- ○ False

12. Closed glottis pushing (holding one's breath and engaging in Valsalva efforts) causes changes in the maternal cardiovascular system. It also leads to decreased maternal fatigue and decreased risk of damage to maternal pelvic floor structure.
- ○ True
- ○ False

13. Maternal position changes every _____ minutes can promote fetal rotation and descent.
- ○ 30
- ○ 60
- ○ 20
- ○ 45

14. Examples of upright positions that can be utilized during the second stage include
- ○ Kneeling
- ○ Standing/Leaning
- ○ Sitting/Squatting
- ○ All of the above

15. Effective communication can be accomplished by
- ○ Using SBAR (situation, background, assessment & recommendation) reports
- ○ Engaging in team briefings and debrielings
- ○ A&B
- ○ None of the above

Appendix G

Knowledge Posttest

Second Stage Labor: Post Test

Second Stage Labor: Post Test

1. Last four digits of cell phone number

2. NTSV is an abbreviation for
- ○ Nulliparous term spontaneous vaginal
- ○ Natural term spontaneous vaginal
- ○ Normal term singleton vertex
- ○ Nulliparous term singleton vertex

3. The national benchmark for the NTSV rate is
- ○ 14.8%
- ○ 23.9%
- ○ 33.2%
- ○ 24.1%

4. The 2019 NTSV CS rate at this facility was below the Healthy People 2020 goal.
- ○ True
- ○ False

5. According to the Obstetric Care Consensus, second stage must be completed by
- ○ 2 hours in a multip without epidural, 3 hours in a multip with epidural
- ○ 3 hours in a nullip without epidural, 4 hours in a nullip with epidural
- ○ An absolute length of second stage has not been identified
- ○ A and B

6. The spontaneous urge to push is caused by the Ferguson reflex that occurs as the presenting part descends into the pelvis.
- ○ True
- ○ False

7. A woman should be allowed to follow her natural instinct during the second stage of labor. If pushing is not effective, she should be advised to hold her breath for ten seconds at a time and bear down at least three times during each contraction.
- ○ True
- ○ False

8. Closed glottis pushing (holding one's breath and engaging in Valsalva efforts) causes changes in the maternal cardiovascular system. It also leads to decreased maternal fatigue and decreased risk of damage to maternal pelvic floor structure.
- ○ True
- ○ False

9. Maternal position changes every _____ minutes can promote fetal rotation and descent.
- ○ 45
- ○ 60
- ○ 20
- ○ 30

10. Examples of upright positions that can be utilized during the second stage include
- ○ Standing/Leaning
- ○ Kneeling
- ○ Sitting/Squatting
- ○ All of the above

11. Effective communication can be accomplished by
- ○ Engaging in team briefings and debriefings
- ○ Using SBAR (situation, background, assessment & recommendation) reports
- ○ A&B
- ○ None of the above

Submit

0%

Appendix H

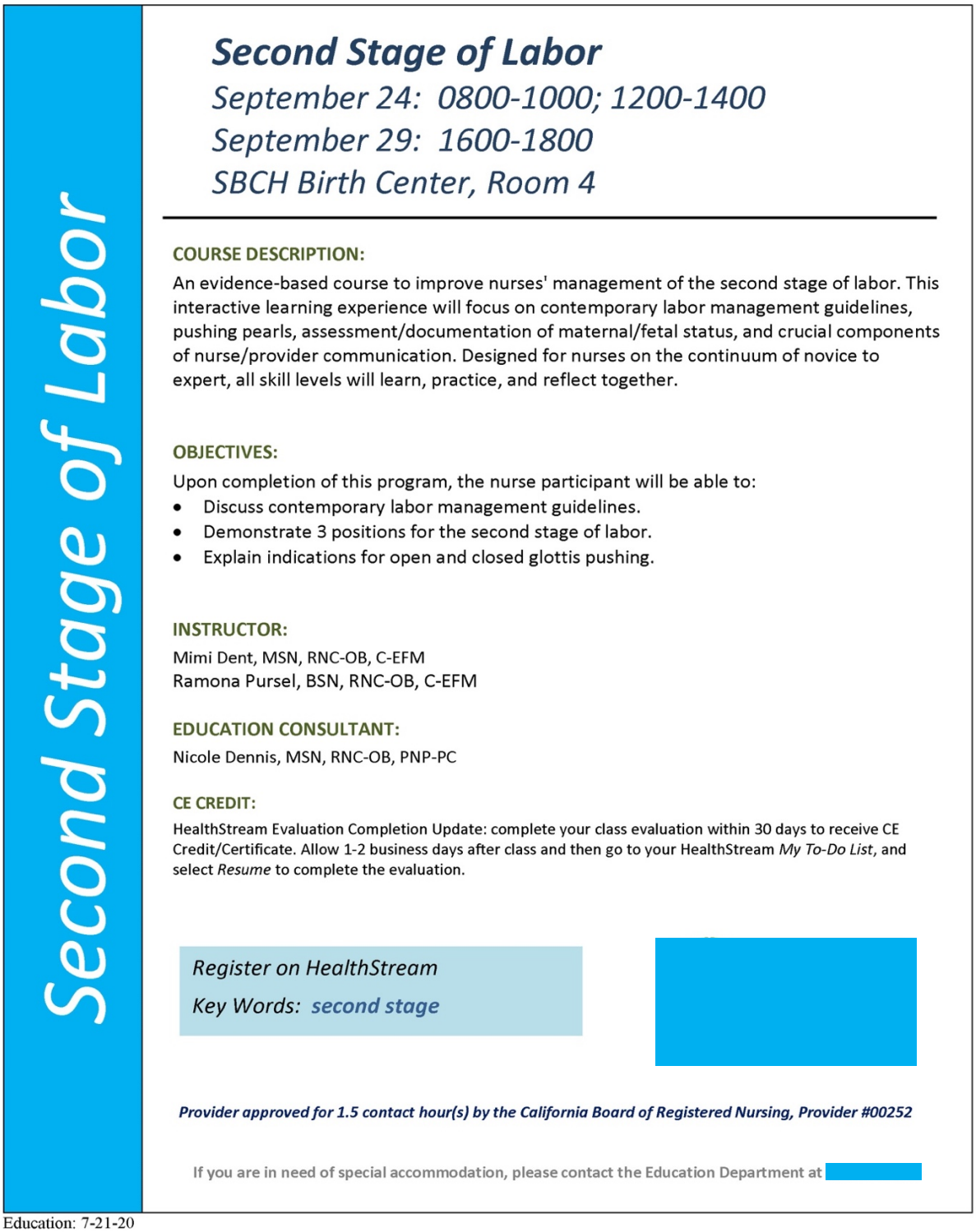
Learning Objectives

Upon completion of this program, the nurse participant will be able to:

- Discuss contemporary labor management guidelines
- Demonstrate three positions for the second stage of labor
- Explain indications for open and closed glottis pushing

Appendix I

Promotional Flyer



Education: 7-21-20

Appendix J

Skills

Skills Observation

Nurse Management of Second Stage

Nurse (to be observed) _____ Date ____/____/____

Nurse Observer _____ _____ _____
Print Sign Initials

Utilization of tools	Verbalize (V) Return Demonstration (RD)	Observer initials
Position changes		
Labor bed		
Squat bar		
Peanut ball		
Step stool		
Linen		
Labor support		
Documentation	Verbalize (V) Return Demonstration (RD)	Observer initials
Labor down (start time)		
Active pushing (start time)		
Pushing technique Open glottis Closed glottis		
MD communication		