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Early Labor Management: A Quality Improvement Project

Amy Dempsey

Submitted to Dr. Carol Wallman in partial fulfillment of NR706C DNP Project C

Regis University

April 11, 2022

Early Labor Management: A Quality Improvement Project

Abstract

Objective

The purpose of this quality improvement project is to safely reduce early labor admission rates through the implementation of evidence-based nursing triage management protocol focused on patient education and labor support for spontaneous early labor management in a community hospital setting. This initiative is part of a bundle of care intended to safely reduce primary cesarean birth rates.

Evaluation Methods

A paired sample t-test was used to compare the following: 1) early admission rates of NTSV patients before and after the study intervention which focused on both patient and staff education, 2) a pre and post knowledge survey taken by a convenience sample of labor and delivery nurses; 3) pre and post ELEQ survey results completed by postpartum patients prior to discharge.

Results

Strategies implemented in this project did not positively impact early admission rates which slightly increased from 9% to 11%. In addition, the paired samples t-test revealed a decrease of early labor admissions compared to active admissions from 1.84 to 1.76 (p 0.322). Overall, the aggregate score of staff knowledge related to care of this patient population increased slightly from 4.03 to 4.09 (p 0.438). Nurse willingness to implement and try new labor support techniques in early labor increased from 4.40 to 4.96 (p=<0.001) while their reported confidence with the new techniques declined from 4.95 to 4.68 (p 0.147). The overall ELEQ mean score used to measure patient satisfaction in early labor increased from 2.68 to 3.05, an increase of 7.4% (p 0.96). Of the 26 questions on the ELEQ survey, 24 had a slight increase in mean scores.

Conclusion

Delaying admission to the hospital until active labor is an important strategy in the approach to safely reduce primary cesarean births. This project had mixed results; while unable to positively impact the early labor admission rates, the interventions enhanced nurse involvement in early labor support and patient education. There was also an overwhelming increase in patient satisfaction scores related to their early labor experience. These trends suggest that the labor support techniques and patient education tools are positively impacting the patient experience. Reinforced education with nurses to change culture and increase confidence with new labor support techniques may contribute to a culture change and sustainment of best practice.

Keywords: Early labor management, primary cesarean birth rates, Early Labor Experience Questionnaire

Executive Summary

Problem

In 2012, the National Institute of Child Health and Human Development published a seminal study (Spong et al) which raised concern about the rapidly rising rates of cesarean deliveries in the United States without associated improvements in maternal or neonatal outcomes and suggested strategies to reduce primary cesarean births. Delayed admission to the labor and delivery unit is one evidence-based management method noted in the literature that promotes normal physiologic birth and reduces cesarean birth rates for low-risk women (Kobayashi et al., 2017).

PICO Statement

Population: Nulliparous, term, singleton, vertex (NTSV) women in early labor at Lutheran Medical Center

Implementation: Evidence-based nursing bundle of care for women who present to the hospital in early labor, focused on patient education, labor support and discharge teaching (when applicable) (Appendix A and B).

Comparison: Early labor vs. active labor admission rates of NTSV women in spontaneous labor

Outcomes/Goal:

- Decrease rates of early labor admission for NTSV women in spontaneous labor
- Increase staff knowledge related to care of the early labor patients (pre/post 14 question survey) (Appendix C)
- Improve patient satisfaction rates as measured by the Early Labor Experience Questionnaire (ELEQ) survey (pre/post intervention) (Appendix D) (Janssen & Desmarais, 2013)

Purpose

The purpose of this quality improvement project is to safely reduce early labor admission rates through the implementation of an evidence-based nursing triage management protocol focused on patient education and labor support for spontaneous early labor management in a community hospital setting (Breman et al, 2019; Council on Patient Safety in Women's Health Care, 2020).

Objective/Plan

Two key strategies focused on labor and delivery nurse and patient education. Specifically, the plan included the following steps:

- Updated the early labor management protocol to promote evidence-based nursing care (Appendix A).
- Implementation of non-pharmacologic pain management options for the early labor patient including hydrotherapy, ambulation, aromatherapy, and optimal positions to promote fetal rotation. Emphasis placed on the Spinning Babies curriculum (Spinning Babies, 2022).
- Updated education materials to teach patients early labor management techniques, promote consistent information and understand the labor evaluation process (for use in prenatal clinics, prenatal education and obstetrical triage) (Appendix B).

Outcomes and Results

Reduction of patients admitted in early labor (primary goal). The strategies implemented in this project did not positively impact early admission rates which slightly increased from 9% to 11%. Given the small sample size, reinforced education and study is recommended.

Staff knowledge and comfort caring for the early labor patient population: The aggregate score increased slightly from 4.03 to 4.09 (p 0.438). Of the 14 questions, six had a slight decline, six had a slight increase, 2 remained consistent and 12 questions showed statistical significance. Staff willingness to implement and try new techniques and provide patient education to patients in early labor increased while staff confidence with the new techniques declined, revealing a need to offer continued education, support and mentoring.

Patient satisfaction of their early labor experience: The overall mean score of the ELEQ survey increased from 2.68 to 3.05, an increase of 7.4% (p=0.96). Of the 26 questions, 24 had a slight increase

in mean scores which suggest that efforts made to improve patient support in early labor are focused appropriately and should continue.

Acknowledgements

I would like to give special recognition to the following people who partnered with me on this journey and helped with the success of this project.

Special thanks for my team at Lutheran Medical Center, who have supported me for the last 18 years and helped me become the best nurse I can be. For the labor and delivery staff who have tried new labor support techniques, listened to my lectures and trusted me for guidance. For the mom baby and lactation nurses who helped me collect what felt like countless surveys. For the obstetric providers, who trusted me to include their patients in this study. For my leadership team, who supported this vision, helped me obtain funding for education, trusted the value of this project and most importantly, believed in my potential and my contributions to our team. And for Ann Evans, my CNO, mentor and guide, who early in my career at Lutheran instilled in me a passion for research, believed in my abilities, and convinced me to present my first poster at a national conference which was the beginning of an amazing journey committed to generating and sharing knowledge around best nursing practice.

I would also like to thank my Regis team, who have provided guidance, input and direction for the last two years. I can't think of a better group of people to partner with during a pandemic! Special thanks to Dr. Wallman, my advisor; my student colleagues who shared this journey with me; Dr. Kruschke, my guide who helped me survive statistics and make meaning of my data; and Dr. Jules Javernick, my mentor, friend and colleague, who inspired me to pursue this degree, set the groundwork for this project, and constantly encourages me to be the best version of myself.

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Problem Recognition

Problem Statement

In 2014, Caughey et al. published a seminal document, "ACOG/SMFM obstetric care consensus: Safe prevention of the primary cesarean delivery." At the time of this publication, one out of three babies in the United States was born by cesarean section. The consensus statement was based on the NICHD study published in 2012 (Spong et al) which raised concern about the rapidly rising rates of cesarean deliveries in the United States without an associated improvement in maternal or neonatal outcomes. In fact, the opposite is true, and it appears that, in low risk women, the safest route of delivery is a vaginal birth.

Since this publication, increased attention has been drawn to the issue of maternal morbidity and mortality associated with cesarean deliveries. This problem of rising cesarean deliveries in low-risk women is included in the Healthy People 2030 initiatives (2020) and is a focus of work at the Colorado Perinatal Care Quality Council state collaborative (CPCQC, 2020). In 2020 the Joint Commission initiated PC-O2, the Perinatal Care Cesarean Birth Measure and publicly reports hospitals with primary cesarean delivery rates greater than 30% (Joint Commission, 2021). In addition, PC-02 is tied to hospital reimbursement for Medicaid patients in the state of Colorado as part of the 2021 Hospital Quality Incentive Payment (HQIP) Program (HQIP, 2021). The World Health Organization recognizes the problem as a global issue. "For nearly 30 years, the international health-care community has considered the ideal rate for caesarean section to be between 10% and 15%" and based on an expansive literature review states that cesarean birth rates greater than ten percent have not been associated with improved maternal or neonatal outcomes (World Health Organization, 2018).

Delayed admission to the labor and delivery unit is one evidence-based management method noted in the literature that positively impacts NTSV cesarean delivery rate (Kobayashi et al., 2017). Management of NTSV patients in early labor who present to the hospital varies in length and support

options for pain management. Better understanding of labor assessment, methods to promote labor progress, labor support, pain management (both pharmacologic and non-pharmacologic) and shared decision making can help promote vaginal birth (Council on Patient Safety in Women's Health Care, 2020).

Purpose

The purpose of this quality improvement project is to safely reduce early labor admission rates through the implementation of evidence-based nursing triage management protocol focused on patient education and labor support for spontaneous early labor management in a community hospital setting. (Breman et al, 2019; Council on Patient Safety in Women's Health Care, 2020).

The protocol includes the following:

- Updated early labor management protocol to promote evidence-based nursing care (Appendix A).
- Implementation of non-pharmacologic pain management options for the early labor patient including hydrotherapy, ambulation, aromatherapy, and optimal positions to promote fetal rotation.
- Updated education materials to teach patients early labor management techniques, promote consistent information and understand the labor evaluation process (for use in prenatal education and obstetrical triage) (Appendix B).

PICO Statement

Population: Nulliparous, term, singleton, vertex (NTSV) women in early labor at Lutheran Medical Center

Implementation: Evidence-based nursing bundle of care for women who present to the hospital in early labor, focused on patient education, labor support and discharge teaching (when applicable).

Comparison: Early labor vs. active labor admission rates of NTSV women in spontaneous labor

Outcomes:

- Decrease rates of early labor admission for NTSV women in spontaneous labor

- Increase staff knowledge related to care of the early labor patients (pre/post survey)
- Improve patient satisfaction rates as measured by the ELEQ survey (pre/post intervention)

Foundational Theories

The following are two theories used as a framework for this project. First, the "Inner Strength in Women" is a mid-range theory of the phenomenon of inner strength in women. The conceptual model of inner strength includes five constructs: (a) knowing and searching, (b) nurturing through connection, (c) dwelling in a different place by creating the spirit within, (d) healing through movement in the present, and (e) connecting with the future by living a new normal. While not all the constructs apply to women in labor, the overarching themes of connection, knowing and searching, and drawing from the spirt within are essential to helping women cope with the pain of early labor (Roux et al., 2002).

The second theory is Kotter's eight stage process for creating a major change. The steps include the following and are applicable to this DNP project: 1) establishing a sense of urgency, 2) creating the guiding coalition, 3) develop a vision and strategy, 4) communicating the change vision, 5) empowering broad-based change, 6) generating short-term wins, 7) consolidating gains and producing more change, and 8) anchoring new approaches in the culture (Pollack & Pollack, 2014).

Project Scope

In an effort to re-focus attention to the rising cesarean delivery rates, this project introduced a nursing focused intervention intended to impact mode of delivery. The population included in this project were low risk pregnant women who deliver their baby at Lutheran Medical Center (LMC) in Wheat Ridge, CO and present to the hospital in the latent phase of labor (latent (or early) labor are defined as less than 4 cm dilated for purposes of this project). In the context of this problem the National Vital Sign Statistics (Osterman and Martin, 2014) defines low risk births as primiparous (first

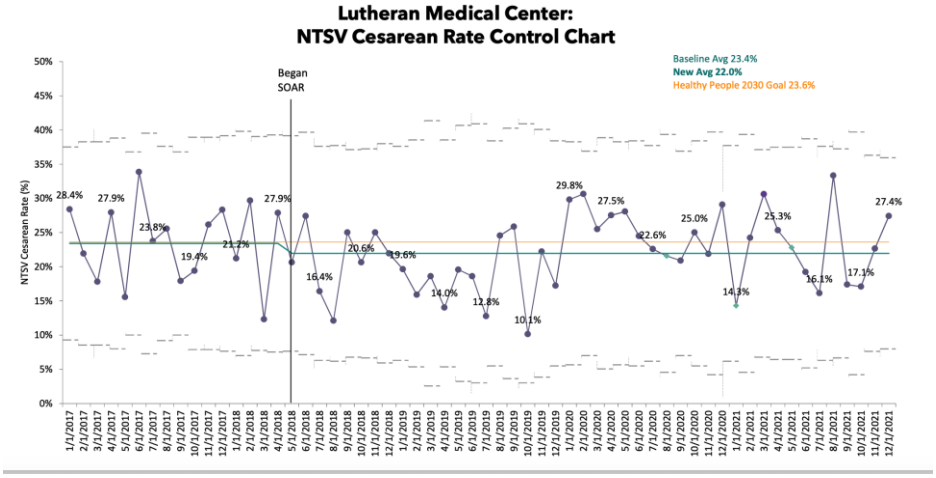
birth), term (37 or more completed weeks based on the obstetric estimate), singleton (one fetus), and cephalic presentation (head first). Rates of delivery for this patient population are referred to as NTSV rates (Healthy People 2030, 2020).

Lutheran Medical Center is a community, suburban hospital that averages approximately 150 births per month. There are three primary obstetric practices that employ 15 obstetricians who deliver babies at Lutheran. In addition, Kaiser Permanente expanded their delivery service to include Lutheran in January of 2021. One of the obstetric practices also employs a certified nurse midwife. The hospital unit has 12 labor and delivery rooms, two operating rooms, 32 postpartum rooms and a 20 bed NICU. Two of the labor and delivery rooms have been converted into low-intervention birthing suites (SCL Health, 2020; Javernick, Dempsey & DeLeon, 2021).

The patient population at LMC is predominantly white (70%) and Hispanic (25%). A small percentage of patients are black or Asian. Thirty-five percent of patients have Medicaid, 60 percent are private insurance and 5 percent are private pay. The majority of patients who deliver at Lutheran live in the local community.

The average, total NTSV Cesarean delivery rate at LMC since 2017 is reported as 22.0%. There was a notable decrease in 2019 to 18.2%, then the rate dramatically increased in 2020 to 25.6%, which is calculated as an increase of 40.7%. Below is the NTSV cesarean birth drate for Lutheran from March 2017 to December 2021. This data is based on Colorado birth certificate data and provided by the Colorado Perinatal Care Quality Collaborative (CPCQC, 2021).

Figure 1. NTSV Rate at LMC, March 2017- December 2021 (CPCQC, 2021)



Review of Literature

Overview

There are multiple articles that promote normal physiologic birth in the low-risk primiparous patient population which are included in the review of literature. Two primary articles specifically impacted the formation of this PICO statement. First, Breman et al. (2019), describes a quality improvement project focusing on the same problem and implementing a similar intervention (an early labor lounge). Several interventions in this quality improvement project have been replicated in this proposal. The second article of significance is Janssen and Demarias (2013a) and includes a validated patient satisfaction survey specific to early labor management. This survey, with permission from the author, is included in this protocol as a tool to evaluate patient perceptions of their early labor experience.

The data bases OVID and CINHAL were the foundation for the review of literature. Key words used include the following: nulliparous, physiologic birth, reduce primary cesarean, quality improvement, active labor, delayed labor, early-labor lounge, labor support, latent labor, patient satisfaction, triage. Review of literature included 39 articles that address the overall problem, strategies to address the problem, patient satisfaction tools, and both nursing and change management theories. Articles were prioritized based on publication year with an attempt to choose studies from the last five

years; location where practices are similar (United States or Canada); included tools that were published and replicated in future studies (patient satisfaction or labor admission algorithm); and consensus statements from professional organizations that establish the standard of care.

Overall Problem

The review of literature provided a solid base for the overarching purpose and need to reduce primary cesarean deliveries in the United States. Eleven studies and consensus statements by leading organizations support this initiative (ACOG, 2016; ACOG, 2017; Caughy et al., 2016; Chapman et al., 2019; Council on Patient Safety in Women's Health Care, 2012; HealthyPeople 2030, 2020; Javernick & Dempsey, 2017; Main et al., 2019; Spong et al., 2012; Zhang et al., 2010). Within these articles, there are three QI projects that have published efforts focused on the application of the consensus statements at site-based levels (Callaghan-Koru et al., 2019; Gams et al., 2019; Main et al., 2019). One of the strategies identified in the consensus statements is the delay of admission until active labor**.** Two of the QI projects in my literature review mentioned the use of PDSA cycles related to admission in active labor as an approach to reducing cesarean delivery rates at their hospitals (Breman et al., 2019; Javernick & Dempsey, 2017)

Strategies to Address the Problem: Delayed Admission Until Active Labor

The strategy to promote vaginal birth by delayed admission until active labor is addressed in twelve published studies (Bailit et al., 2005; Breman et al., 2019; Edmonds, et al, 2018; Janssen & Desmarais, 2013b; Janssen, et al., 2006; Kauffman, et al, 2016; Kesegari et al, 2020; Kobayashi et al., 2017; Low & Moffat, 2006; Marowitz 2014; McNiven, et al, 2018; Neal et al, 2014;). Seven (over half) of the studies look at outcomes related to admission of early labor vs. active labor. There are mixed outcomes and not all studies have shown that delayed admission until active labor impacts route of delivery; however, all studies show a reduction in interventions with delayed admission. Five studies evaluate women's perception of their experience (Beebe & Humphreys, 2006; Breman et al., 2019;

Janssen & Desmarais, 2013b; Hosek et al., 2014; Low & Moffat, 2006); three studies evaluate strategies to use for care of the woman in early labor (Janssen et al., 2006; Kasagari et al., 2020; Marowitz, 2014) and two articles address the triage process for women who present for labor evaluation (ACOG, 2016; Ruhl et al., 2015). In addition to these articles, there are three studies that specifically address the development of a protocol to guide the labor admission process (Cheyne et al., 2008; Javernick & Dempsey, 2017; Kesagari et al., 2019)

In addition to these studies, in Perinatal Guidelines of Care (2017, p.235), ACOG supports this practice and emphasizes that hospitals should have "a policy that allows for adequate evaluation of patients for the presence of active labor and prevents unnecessary admissions to the labor and delivery unit." When a woman is evaluated for labor, if she is determined to be in early labor, ACOG supports the practice of shared decision making and discharging women home with "a plan for self-care activities and coping techniques."

While literature supports the concept of active labor admission as safe and effective, there are limited studies published on strategies to effectively support women in early labor. The study published by Breman et al. (2019) addresses this gap and describes the implementation of an "early labor lounge" at an urban hospital in Maryland. This early labor lounge is a PDSA cycles referred to in the larger "Reducing Cesarean Delivery QI project" mentioned earlier (Callaghan-Koru et al, 2019). This QI project includes strategies to support women in early labor and evaluate their perception of the experience which provides a basis for the foundation of this study. In addition, because the project occurred within the United States, it compares favorably to the setting of this proposed project. In contrast, several of the studies included in the review of literature are international (Janssen et al., 2006; Kasagari et al., 2020). The widespread use of midwives is more prevalent in other countries and allows additional intervention options such as home visits and/or phone screenings, neither of which would be a feasible intervention for this project. However, in a United States study by Hosek et al. (2014), phone call follow-

up after patients were discharged home in early labor was noted to be helpful and is incorporated into the standardized early labor management plan proposed in this project. To enhance options for labor support of the patient in early labor, there are also two studies referenced that address the topics of hydrotherapy and non-pharmacologic strategies to relieve labor pain and reduce suffering (Cluett & Burns, 2014; Simkin & Bolding, 2004).

Perception of Birth Experience

There are three studies referenced that measure women's perception of their birth experience (Hodnett & Simmons-Troplea, 1897; Hosek et al, 2014, Janssen & Desmarias, 2013a). In the "early labor lounge" quality improvement project referenced earlier, the authors used the well-known "Labor Agentry Scale" to evaluate women's perception of their birth experience (Hodnett & Simons-Troplea, 1987). Janssen and Desmarias (2013a) specifically designed a tool to measure the experience of early labor entitled The Early Labour Experience Questionnaire (ELEQ). This tool contains 26 self-report items, rated on a 5-point scale, that measure women's affective experience of early labor (14 items), perceptions of nursing care (12 items), whether they would recommend this type of early labor care to a friend (1 item), and whether they believed they went to the hospital at the right time (1 item). Of the two birth perception tools, the ELEQ is used in this study since it specifically relates to early labor (Appendix C). In addition, Hosek et al. (2014) interviewed women discharged from the hospital in early labor and their feedback offers valuable insight into the triage process from a patient perspective. Women surveyed were more receptive of the plan for discharge home if they were reassured, they would receive a follow-up phone call. At time of discharge, the majority of women surveyed also preferred a paper form with instructions on when to return to the hospital.

Definition of Active Labor

Two studies included in the literature review evaluate and define the labor curve (Zhang et al., 2002; Zhang et al., 2010). Since 1955, the labor curve has defined early labor as zero to three

centimeters dilatation. This new labor curve based on the work of Zang, defines active labor as six centimeters. This definition helps guide clinical decision making on length of active labor and route of delivery based on lack of labor progress. The re-defined labor curve, however, does not address labor support and timing of admission. This remains a gap in the literature. Every study included in this review of literature uses a more realistic definition of "four centimeters and regular, strong contractions" as active labor admission criteria. This seems reasonable as a definition to use in the context of labor support and patient perception of pain related to progression of labor.

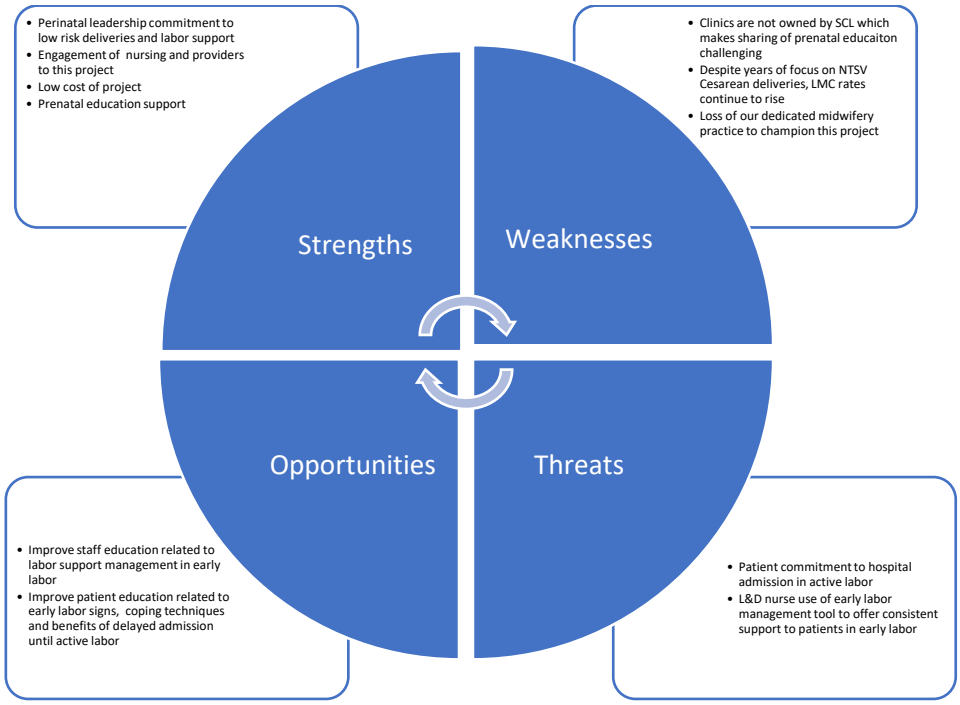
Levels of Evidence

Based on the Four-Tiered Levels of Evidence proposed by Houser and Oman (2011, p. 140), articles were evaluated and assigned a level of evidence. Refer to Appendix E for a summary of the 39 articles included in the review of literature and their assigned level of evidence.

Market/Risk Analysis

SWOT Analysis

Figure 2. SWOT Analysis of Early Labor Management QI Project at LMC



Stakeholders

Key stakeholders in this project were prenatal educators, obstetric providers and their clinic staff, labor and delivery nurses, and the patients who deliver at Lutheran Medical Center. In addition, the clinical informatics staff assisted with report building and data collection. Mom-baby nurses were included as participants in the data collection process. At a higher level, our quality management team and senior leadership were also stakeholders and shared engagement in this initiative, since our NTSV cesarean delivery rates are reportable metrics and associated with hospital reimbursement.

Project Team

The primary team members selected for this project included representatives from each of the main stakeholder categories: OB physician (1), midwife (1), prenatal educators and labor and delivery nurses (3) and a mom-baby nurse (1). It was essential for the OB providers to have representation in this project. First, they made a commitment to distribute and review the early labor education form at their offices with patients during their 36-week prenatal visit. Second, they were responsible for determining patient disposition (admission or discharge) during the labor triage process. We recognized that a collaborative approach supporting early labor interventions prior to admission was essential to the success of this project. Obstetric providers were responsible for promoting this project with their peers as well as relaying feedback on the office workflow related to education sheet distribution.

Ideally this project benefited from the input of both Labor and Delivery nurses as well as childbirth educators. Fortunately, there were three nurses employed at Lutheran in both roles and were ideal project members. They assisted with education for nurses on the early labor management bundle elements and reinforced knowledge related to early labor support techniques. In addition, they were instrumental to the success of the project as child birth educators. In this role, they incorporated the early labor education sheet into prenatal education classes and ensured patients were familiar with the benefits of early labor support techniques to promote a normal physiologic birth.

A mom-baby nurse champion was also a helpful project team member since patients were approached to complete the ELEQ patient satisfaction survey after admission to the mom-baby unit following the birth of their baby. This mom-baby nurse provided feedback for the workflow, educated the mom-baby staff about the project and helped ensure surveys are completed, collected and stored in a secure area.

Sustaining Forces and Constraints

Sustaining Forces

The timing of this project was ideal. There was support from administration, the quality department and perinatal leadership team to promote normal physiologic birth for low risk women in an effort to reduce our NTSV cesarean birth rates. Despite years of effort and focus on this issue, the NTSV cesarean birth rates at Lutheran Medical Center continued to rise which has the potential to impact financial reimbursement. As members of the CQCPC quality state collaborative, Lutheran had dedicated resources to support this project through data collection and analysis. There was also commitment from the hospital system to implement strategies supporting the reduction of NTSV cesarean birth rates.

In addition to these broader entities, there was strong support from the nursing staff. The majority of Labor and Delivery nurses at Lutheran Medical Center remain passionate about providing evidence-based care. They are also skilled at labor support and promoting normal physiologic birth through low-intervention coping techniques. This project capitalizes on the strengths of our nursing staff.

This project also aligned with the patient population who deliver at Lutheran. The majority of the labor patient population are defined as low-risk and ideal to include in this initiative. In general, women who are motivated to have a vaginal birth, believe in the power of their inner-strength and have strong support systems are proponents of this philosophy of care and drive best practice.

Constraints

The most significant constraint to this project was the projected timeline, which hinged on expedient IRB project approval. The project included two months of data collection to establish NTSV early admission rates, obtain patient satisfaction survey data and collect a baseline of staff knowledge specifically related to caring for this patient population. Intervention implementation was predicted to take 1 month (October 2021), followed by 2 months of post-data collection (early admission rates, patient satisfaction surveys and staff knowledge surveys).

Other constraints include staff and provider support which was essential to changing our current culture related to labor admission. Project team members became project champions and assisted with peer education. According to Kotter's theory for creating a major change it is essential to create a guiding coalition to help establish and communicate the vision and promote culture change (Pollack & Pollack, 2014). The project team was an essential key to addressing this constraint.

In addition, our budget and distribution process impacted our plan to create and distribute patient education tools which are intended for distribution at the 36-week prenatal visit. A low-cost marketing-approved patient education hand-out was created by the project team (Appendix B). These flyers were printed in color and distributed to the prenatal care offices by United States Postal Service. Initial printing and distribution were planned as one of the project interventions. Staff education was another expense requiring financial funding. Sustainment of this workflow will be one of the long-term challenges.

Cost-Benefit Analysis

Overall, this project had relatively low cost associated with the interventions. As mentioned above, the early labor management protocol included the following three items:

- Updated early labor management protocol to promote evidence-based nursing care (Appendix A). This intervention did not include any cost for development and was incorporated into the labor triage hospital policy.
- Implementation of non-pharmacologic pain management options for the early labor patient including hydrotherapy, ambulation, aromatherapy, and optimal positions to promote fetal rotation. These are interventions already available at Lutheran Medical Center and therefore, there was no cost to purchase items such as birthing balls, aromatherapy or jetted tubs for hydrotherapy. The cost associated with this intervention was related to nursing staff education. The plan incorporated education on early labor support and the management algorithm into our annual required nursing skills fair in October. The cost of education was based on the following: $35/hour x 40 nurses x .5 hours = $700. We also obtained funding from the SCL foundation to cover the cost of the locally held Spinning Babies workshop. This training fee was $185/person x 10 nurses = $1,850. The purpose of this training was to reinforce the knowledge base and expand education provided to the labor and delivery staff on the topic of early labor non-pharmacologic support techniques.
- Updated education materials to teach patients early labor management techniques and promote consistent information about the labor evaluation process (for use in prenatal education and obstetrical triage) (Appendix B). There was cost associated with this intervention related to printing of the flyers (estimated annual cost of $450) and postal fees to send the flyers to the 4 prenatal clinics (estimated shipping cost of $50).

The benefits of this project related to the potential reduction in cesarean delivery rates and improved patient satisfaction are captured in decreased hospital costs related to surgery and length of stay. There was also the goal to improve patient satisfaction. Hospital reimbursement for Medicaid is linked to these reportable measures (NTSV rates and patient satisfaction scores). The benefits of decreased hospital cost and increased patient satisfaction outweigh the burden of cost related to nurse

education, printing and distribution of flyers to the prenatal clinics which totals approximately $3,050 for the entire project.

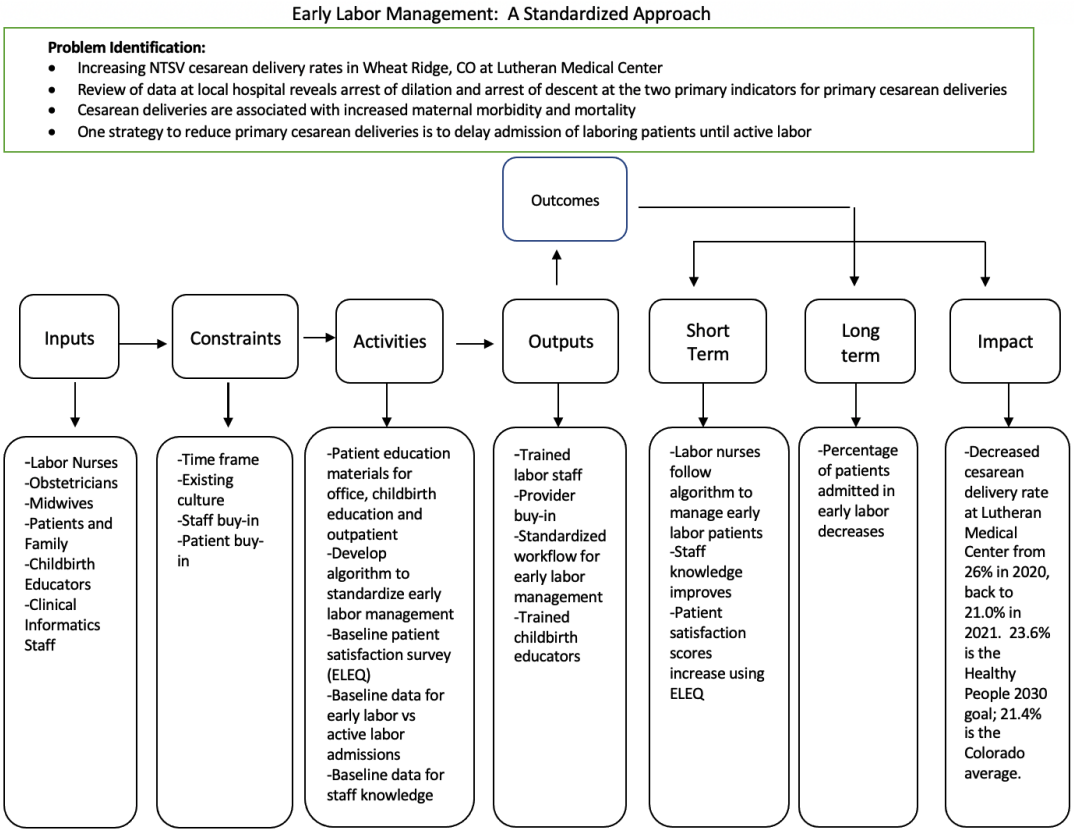
Project Objectives

Mission and Vision Statement

The mission of this project was to implement an evidence-based early labor management bundle of care to decrease admission rates of early labor in the nulliparous, term, singleton, vertex (NTSV) women in labor at Lutheran Medical Center. The vision was that all labor and delivery nurses would utilize the early labor management protocol to guide their care of women in early labor and that all pregnant women intending to deliver at Lutheran Medical Center would receive consistent early labor education at their prenatal clinic, in prenatal education and when applicable, on the labor and delivery unit.

Concept Map/Logic Model

Figure 3. Concept Map of Early Labor Management QI Project at LMC



The concept map is a visual representation of the proposed early labor management project. The problem identification highlights the issue of fluctuating and gradually rising cesarean delivery rates at Lutheran Medical Center. The overall average rate of NTSV cesarean delivery rate at Lutheran over the previous four years is 21.1%; however, rates fluctuate between 10.1% and 30.6%, with an alarming increase of 40.7% between 2019 and 2020. The state of Colorado has an average NTSV cesarean delivery rate of 21.4% (CPCQC, 2020). Healthy People 2030 (2020) reports a national average of 25.9% in 2018 and has established the national target of 23.6% for 2030. Our 2021 goal at Lutheran was a rate of 21.0%, which aligns with our philosophy of care, relatively low risk patient population and community setting with private obstetrician groups.

Project Goals

There were three phases of patient care impacted by this project. First, patients were instructed on signs and management of early labor in both the prenatal clinic and during childbirth education classes. The goal of this project was to create a tool used by prenatal providers, nurses and educators that relayed consistent early labor information for patients during the course of their prenatal care. The second phase addressed care provided to women who experienced spontaneous labor. The goal of this project was to update the early management protocol to promote evidence-based nursing care to care for women in early labor who present to the hospital for evaluation and support. The protocol emphasized strategies for labor support and facilitation of labor progress (Appendix A).

Third, it was predicted that approximately half of women who presented to the hospital for a labor evaluation would be in the latent (early) phase of labor. The decision regarding admission or discharge is a collaborative decision that includes the patient, family, obstetric provider and primary nurse. The obstetric provider caring is ultimately responsible for the decision related to hospital admission or discharge. When women in latent labor were discharged home based on their provider's evaluation and shared-decision, women were coached to continue their early labor process at home and

given instructions about when to return to the hospital. The purpose of this project was to incorporate the agreed upon prenatal patient education into the discharge process in an effort to support non-pharmacologic coping tools available for the patient at home (Appendix B).

Project Outcomes

There were three measurements used to evaluate the effectiveness of this QI project: 1) a decreased rate of patients admitted in early labor (reported in a ratio), 2) increased patient satisfaction of their early labor experience (collected using the ELEQ tool) (Appendix C) and 3) increased staff knowledge and compliance caring for women in early labor (measured by a nurse survey) (Appendix D) . Delayed admission until active labor aligns with the hospital's broader goal to reduce primary cesarean delivery rates which is presented as a percentage.

Methodology

Inclusion Criteria, Primary Variable

The purpose of this QI project was to determine if the implementation of an evidence-based early labor management bundle of care decreased admission rates of early labor in the nulliparous, term, singleton, vertex (NTSV) women in labor at Lutheran Medical Center. Approval was obtained from both the SCL and Regis IRBs (Appendix E) as well as the director of obstetrics (Appendix F). CITI training was completed to ensure the rights of participants were protected (Appendix G). This QI project included women admitted to the labor and delivery unit in spontaneous labor who met the defined inclusion criteria:

- Nulliparous (first delivery ≥20 weeks)
- Term pregnancy (≥ 37 0/7 weeks)
- Singleton
- Vertex (cephalic or head down presentation)
- Admitted to Lutheran Medical Center for birth of their baby

Exclusion Criteria:

- Planned cesarean birth
- Admitted for Pre-Labor Rupture of Membranes (PROM)
- Admitted for Induction of Labor (IOL)

Intervention, Staff Education

Nurse champions were identified and trained during the months of September and October 2021. Ten nurses were identified as proponents of normal physiologic birth and supported to attend a local eight-hour class, entitled Spinning Babies, a well-known curriculum that aligns with this described philosophy of care (Spinning Babies, 2022). In addition, the unit-based education council members were trained (either at the conference or by super-users) on the basic techniques of Spinning Babies in order to assist with education at skills fair and also support this practice change on the unit.

Thirty minutes were allotted in the annual skills fair to cover the topic of early labor management. Education covered the following: 1) rationale for discussion on this topic, 2) the potential association between early labor management and mode of delivery, 3) establish a goal of admitting patients in active labor (rather than early labor), 4) review the triage early labor management algorithm, 5) introduce the patient education handout and intended times of distribution, 6) and techniques to use in early labor to support optimal fetal positioning.

Support tools were included to supplement their knowledge on this topic. Nurses were given a "badge buddy" entitled "Bundle Birth Labor Warm Up" with suggestions for positions to use during early labor (Bundle Birth, 2021) (Appendix H). In addition, a short video was shown highlighting a technique promoted in the Spinning Babies curriculum referred to as "The Three Balances" which includes "The Jiggle," "Side-Lying Release" and "Inversion" (Spinning Babies, 2022) (Appendix I). The Three Balances is intended to promote appropriate fetal alignment in the pelvis, support blood flow to the fascia and relax the pelvic muscles to open the pelvic outlet and allow for fetal rotation and descent. Each small group of

three to six nurses spent time observing and performing a return-demonstration of these labor support techniques. Posters with suggested positions were also laminated and hung in each labor room as a visual reference for both patients and nurses.

Intervention, Patient Education

A patient education sheet was made available for distribution in October 2021 at several points of care delivery (Appendix B). The early labor patient education sheets were distributed to prenatal care clinics with a suggestion to review with patients at their 36-week clinic visit. Patients also electronically receive the education sheet again at their pre-registration visit and after completing their childbirth preparation class. If they were seen at the hospital for an early labor outpatient visit and discharge home as undelivered, they received a color copy pre-printed education sheet to reinforce consistent education on this topic.

Outcomes

Primary Outcome: Laboring Women Admitted in Early Labor

The primary outcome of this QI project was the number of NTSV laboring women admitted in early labor. The rate of patients who met criteria and were admitted in early labor was established prior to the implementation of a standardized process for early labor management. Post-intervention, we collected data on the number of NTSV patients admitted in early labor. This value was presented as a ratio (total number of NTSV patients / total number of NTSV patients admitted in early labor). Data was collected from the electronic medical record (Epic) using a report and individual chart review. The pre and post implementation rates were analyzed using an independent two tailed t-test (Polit, 2010). Because the two groups are unrelated and the data compared is a ratio, an independent t-test was used to determine if there was statistical difference between the two groups (pre and post protocol implementation). The two tailed test is the standard test utilized by researchers and uses “both tails of a

sampling distribution to determine the critical region for rejecting the null hypothesis" (Polit, 2010, p. 101). Data variables and a context specific database are later described in detail (Appendix F and G).

Secondary Outcomes

Staff Survey

Secondary outcomes were evaluated using pre and post survey data. Initially, labor and delivery staff were surveyed to establish baseline data related to their knowledge of the labor admission algorithm and perceived barriers to caring for this early labor patient population. Following staff education, a post-survey was administered to measure and assess knowledge as well as adherence to the standardized algorithm. A Likert scale survey utilizing a well-known web-based platform was developed and used (Survey Monkey, 2021). To encourage participation, staff were asked to complete the survey on their mobile device during change of shift briefs. Surveys were also accessible in an email link and by scanning a QRS code posted on the unit. A plan to compare groups included use of an independent two-tailed t-test (Polit, 2010). The staff completing the survey prior to bundle implementation may not necessarily be the same as those completing the survey post-implementation; therefore, the independent t-test is appropriate to compare the difference between the two unrelated groups, using interval data.

The relatively small size of nursing staff ensured that everyone received education on the bundle elements and participated in training related to the early labor management protocol. The consistency in training and small number of nurses implementing the bundle elements, increased the reliability of the survey results.

The survey was intended to measure staff knowledge of care related to the NTSV early labor patient population. This survey was be vetted by content experts; however, it was not a validated tool and has not been used prior to this study to measure nurse knowledge which lessens the validity of this measurement tool. To overcome these barriers, basic study design principles weremincorporated into

the survey development. The following are examples of a strong survey design: 1) avoid agreement responses, 2) address one idea per question, 3) label each response item, 4) evenly space response items, 5) separate the non-substantive response options ("not applicable" or "I don't know") from the substantive response options (Artino, A.R. et al., 2018). Using these recommendations, the survey included a 4-point Likert scale with an option for "not applicable" as an alternate response option (Appendix D).

Patient Satisfaction Survey

Patients who met inclusion criteria were approached on the mom-baby unit after delivery and asked to complete the ELEQ survey. Mom-baby nurses under the supervision of the project lead, were responsible for inviting delivered women who meet inclusion criteria to participate in the project. A paper tool was distributed to the women who agreed to participate and completed surveys were collected by the primary nurse prior to discharge. Basic demographic data was collected for each enrolled patient. The ELEQ survey was labeled with the study ID number and collected in a manilla envelope, labeled only with the study ID number to protect patient identification data. Envelopes were collected in a secure area of the nurse's station, retrieved by the primary investigator and stored in in the primary investigator's office.

To obtain baseline data, early labor patients meeting criteria and presenting prior to the implementation of this project were asked to complete the ELEQ survey after delivery. Following implementation of the standardized early labor management process, using the same process, delivered patients who met criteria were given this same survey. Total scores of the ELEQ surveys in the pre-implementation study were compared to total scores of the ELEQ surveys in the post-implementation group and analyzed using an independent two-tailed t-test (Polit, 2010). Because the two groups were unrelated and the data compared is interval, the analysis plan included use of an independent t-test to

determine if there is statistical difference between the two groups (pre and post protocol implementation).

Utilization of the ELEQ survey which has been used repeatedly and shown to measure patient satisfaction with the early labor experience, adds validity to this study. Discussion of the initial tool development revealed the following analysis, "strong support for the reliability of ELEQ subscale and total scores. Specifically, internal consistency was good, as indicated by Cronbach αcoefficients greater than 0.80 for the subscale as well as total scores. Additional analyses revealed good item homogeneity with subscales and overall, indicated by MICs between 0.20 and 0.50, and strong associations between items and scale scores, with MCITCs exceeding 0.30" (Janssen & Desmarais, 2013, pp. 187-188).

Sample Size and Outcome Data Analysis

Primary Outcome: Laboring Women Admitted in Early Labor

Typically there are approximately 30 NTSV patients admitted each month who meet the study inclusion criteria. Prior to this study it was estimated that approximately 50% of these women are admitted in early labor. Referring to the power analysis table in Polit (2010, p. 421), using a power of .80, α = 0.05, and an effect of .70, 33 women needed to be included in the sample size, which could be attained with data collection over a two-month period both before and again after bundle implementation. The comparison of number and ratio of women admitted in early labor pre and post intervention can be both described in simple text as well as in a table format.

The standard measurements used to determine early labor are cervical dilation (for purposes of this study <4cm) and regular, frequent, strong contractions. Cervical dilation is a standard measurement obtained during a cervical exam. While there is some subjectivity based on each examiner's individual interpretation of their assessment, cervical exams are a routine measurement learned in an orientation program, practiced daily and reported in centimeters. Contractions are measured with a

tocodynamometer using an electronic fetal monitor and are reported in frequency (minute-to-minute interval) and length (seconds). Both cervical exams and contraction patterns are considered reliable and valid methods of measurement (Lyndon & Ali, 2015).

The most significant identified issue of reliability is related to our small sample size. It was difficult to reach statistical significance with such a small population of patients who meet inclusion criteria. In addition, the following issues inherently contain variability and may impact validity of the study results: 1) individual nurse interpretation of the standardized algorithm, 2) patient's tolerance of perceived pain and 3) provider preference. A larger sample size would likely improve the opportunity for statistical significance and account for the variability associated with these issues. The effect size, which measures the "magnitude of difference between the groups" should ideally be low to moderate, to accommodate for these inherent variables (Polit, 2010, pp 126, 400). Given the constraints of this project (time, convenience sample, quality improvement project), a larger effect size of .7 was used, which supported a smaller sample size, but also impacted the power analysis.

Secondary Outcomes

Based on the number of Labor and Delivery nurses employed at Lutheran Medical Center (40), using a power of 80%, $\alpha = 0.05$, and an effect size of .70, 33 participants were needed to complete the survey (Polit, 2010, p. 421). One threat to validity was lack of staff participation. Using a QRS code for survey access and making the survey short and simple were strategies to encourage staff engagement.

Patient Survey

There are an estimated number of 30 NTSV women admitted in spontaneous labor who deliver at Lutheran Medical Center each month. Using a power of 80%, $\alpha = 0.05$, and an effect size of .70, 33 women needed to enroll in the study and complete the survey, both pre and post implementation of the bundle intervention (Polit, 2010, p. 421).

One threat to validity is lack of patient enrollment and completion of the survey. Patients were approached for enrollment after admission to the mom-baby unit and asked to complete the survey prior to discharge. Data collection took approximately 2 months before and then again after implementation of the bundle. One strategy to reduce the issue of missing or incomplete data was to ask patients to complete the survey in the presence of the investigator. Another strategy was to establish a defined time period for completion and pick up of the completed survey. There was a possibility that a few surveys would be incomplete. Every attempt was made to clearly label surveys, so if misplaced or sent to medical records they would be returned to the primary investigator. For those surveys with incomplete data, we planned to use pairwise deletion to "omit cases from analysis on a "variable-by-variable basis" (Polit, 2010, p. 370). Data is displayed in table format and compares NTSV patient data pre and post intervention.

Overall Issues of Validity and Reliability

Data collection process included demographic information for the patients included in the study such as age, ethnicity, insurance, provider, prenatal care and prenatal education. Given the fairly homogenous patient population cared for at Lutheran Medical Center, this may decrease the variability of data collected. The described data collection process accounts for tracking surveys to avoid loss of data for both staff and patients. Using a validated tool to measure patient satisfaction increases validity, although there is some concern because this tool was developed outside the United States that it may not be sensitive to labor management care of this defined patient population. In addition, the relatively small size of nursing staff, increased the reliability of the study results of the staff survey. As previously mentioned, the staff survey was a tool developed specifically for this project and may impact the validity of this specific measure.

Results

A total of 250 primiparous women who delivered at Lutheran Medical Center during the time frame of this project met NTSV criteria and were included in the data. The graphs below summarize the reasons for admission. The purpose of this project was to decrease the number of patients admitted in early labor, a patient population which is represented in yellow. The number of NTSV women who met criteria and were admitted in labor was higher than anticipated; however, the percentage of women admitted in early labor was much less than expected, in part due to high percentages of patients who present with spontaneous rupture of labor or who undergo induction of labo

Figure 4. Reasons for NTSV Patient Admissions to Labor & Delivery Unit (Pre and Post Intervention)

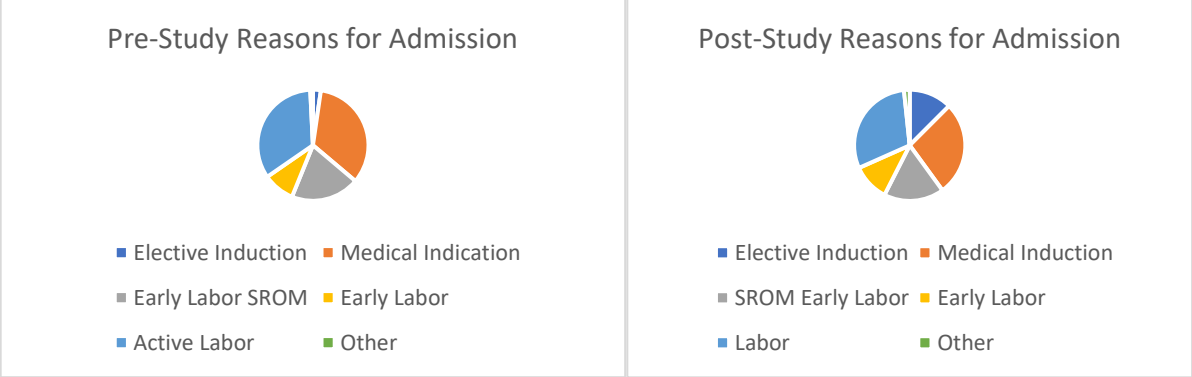


Figure 5. Reasons for NTSV Patient Population Admissions at LMC

Reasons for Admission	Elective Induction	Medically Indicated Induction	SROM in Early Labor	Early Labor	Labor	Other	Total
Pre-Study Intervention August/September	3 2%	44 34%	26 20%	12 9%	44 34%	1 <1%	130
Post-Study Intervention November/December	15 13%	33 27%	21 18%	13 11%	36 30%	2 1%	120

A paired sample t-test was used to compare the early labor and active labor rates during the two-month period prior to the study intervention (August and September 2021) versus the early and active labor rates during the two-month period following the study intervention (November and

December 2021). The analysis showed a slight increase in the early admission rates as compared to the active labor admission rates which correlates with the calculated percentages. This value was not statistically significant.

Figure 6. Paired Samples T-Test for Early vs. Active Labor

	Mean	T value	Two-sided p value
Pre-Study Intervention Early vs. Active Labor	1.84*	1.0	.322
Post-Study Intervention	1.76*		

*Early labor = 1; Active labor = 2

Originally, the intent of the project was to enhance early labor education and support for outpatient women in early labor whose disposition was discharged home, undelivered. After evaluating the baseline data it became evident that this patient population is a very small percentage of patients. We expanded the project to include early labor management support of both patients laboring at home and in the inpatient setting.

Figure 7. NTSV Outpatient Visit Summary

	Total Number NTSV Outpatient Visits	Outpatient Labor Evaluation Discharge Home
Pre-Study Intervention August/September	36	14
Post-Study Intervention November/December	39	11

Staff Survey Results

Using the Survey Monkey platform (Survey Monkey, 2021), the pre-survey was initially given to the labor and delivery staff during their annual “skills fair event” in October 2021. Each nurse was asked to access the survey with their mobile phone using a QRS code. Time was allotted for nurses to complete the survey during their education session. If nurses did not bring their mobile devices to the education session, they were given a copy of the QRS code to complete the survey at a later time.

Twenty-five nurses completed the survey which did not meet the goal set at 33 nurses (62% response rate).

After two months of implementation, the post-survey was administered over a two-week period in January 2022. Staff were sent an email link to the survey and QRS codes were posted throughout the unit. Nurses were reminded to complete the survey by personal invitation and during shift change announcements. A total of 22 nurses completed the post survey, again, less than the goal of 33 nurses with a 55% response rate. A paired sample t-test was used to analyze the data since nurses completing the pre and post survey were potentially different people.

The survey consisted of 14 questions (Appendix D). Question six was significantly altered in the post-test to better understand specific change of practice, question nine was slightly modified to reflect a new patient education tool and question 15 was an additional question only included in the post-survey. Of the 14 questions, six had a slight decline, six had a slight increase and 2 remained consistent. Twelve of the 14 questions had a p value <0.05. The overall total aggregate score increased slightly from 4.03 to 4.09 but was not statistically significant. (p 0.438).

It was hoped, through staff education and support, the majority of questions would have shifted in the positive direction. One of the limitations of the survey is that staff who completed the survey prior to training were not necessarily the same nurses who completed the survey after training. Another limitation was a response rate of slightly over 50%.

The labor and delivery annual skills fair is two hours in length and one-fourth was dedicated to the topic of early labor and the safe reduction of primary cesarean births, emphasizing the significance of this initiative. The mixed movement in our post-survey scores highlights a few potential issues pertaining to adult learning principles. New skills may not be best learned in a relatively short time in a classroom setting. Reinforcement at the bedside, modeling behavior during patient care with return-demonstration and coaching to support these new techniques are strategies to support the new

expectations. The slow change to incorporate evidence-based practice into bedside care, highlights the challenges of changing culture and sustainment of behavior change in the healthcare setting.

There are a few survey questions that are of particular interest. Questions ten and twelve addresses the topics of therapeutic rest and intermittent auscultation. Both remained unchanged in the pre and post survey. These topics relate to early labor management but were not specifically addressed in the training. Based on patient condition and random nurse-patient assignments, these practices may not have been used by individual nurses during the implementation phase of this project. It is expected this value would remain the same.

Survey results for question four were surprising. During the staff education session, the triage algorithm was discussed and each person received a copy of the algorithm, which was created five years ago and slightly modified to include the new non-pharmacologic labor support techniques. The survey asked a two-part question: are you aware of the algorithm and do you guide it to manage your care of the early labor patient. The results showed a statistically significant decrease from 4.45 to 4.09 ($p<.005$). Given that everyone received a copy of the algorithm in the training session, it seems reasonable to assume the decrease suggests the staff do not refer to the algorithm to guide care.

While not statistically significant, the answers to question one, "I am confident caring for patients in early labor," decreased from 4.95 to 4.68 (p 0.147). This may be attributed to the lack of confidence nurses feel with the new labor support techniques taught in class. It is also possible that overall, prior to training, nurses felt confident caring for patients in early labor and now recognize there is more complexity associated with care for this patient population than previously recognized.

Question nine addressed the importance of discharge teaching and early labor education tools and had a positive increase from 3.09 to 3.59 ($p <0.001$). The discharge process for our outpatient population has shifted from an epic education sheet on preterm labor to a color handout specifically

developed for this patient population. It is encouraging to see the significant increase and would like to see this number continue to climb.

The most encouraging responses are related to questions that address the use of new labor support techniques. Question six had a statistically significant increase ($p < 0.005$, 4.96) and asked nurses if they encourage patient to use a variety of non-pharmacologic early labor support techniques. The post question asked for a specific breakdown of preferences. Their response revealed a high usage of traditional therapies such as hydrotherapy, ambulation and rest. It was encouraging to see use of the Three Balances appear on the list of utilized interventions (Appendix N).

Question 15 was only included on the post-survey and intended to gain information regarding the specific implementation of the Three Balance technique. Labor nurses have a significant amount of autonomy in their practice with very little accountability related to labor support and non-pharmacologic interventions. This data shows a willingness of nurses to learn and try new techniques to provide support as well as promote normal physiologic birth.

Figure 8. Summary of Nurse Staff Survey Question 15

Question 15	I have used the "Three Balances" (jiggle, side-lying release, inversion) with patients in early labor	Four or More Times	Two-Three Times	Once	Never
		10	8	3	1
		45%	36%	14%	5%

Early Labor Experience Questionnaire Results

The Early labor Experience Questionnaire for both groups was distributed on the mom-baby unit after delivery, prior to discharge (Janssen, P.A & Desmarais, S.L., 2013). The questionnaire was originally distributed and collected by the mom-baby nurses. After a low return rate was quickly identified, the lactation consultants, who see every patient, agreed to distribute and explain the surveys. Surveys were either collected by the mom-baby nurses or lactation consultants and stored in a secure envelope. The team began to lose momentum again in early December but had a strong finish at the end of the month.

Response rates were expectedly higher when full time lactation consultants, committed to the project, were scheduled to work. A total of 57 completed surveys were returned in the pre-intervention group (44% of NTSV patients) and 41 were returned in post-intervention group (34% of NTSV patients).

A paired sample t-test was used to analyze the data to compare the patients participating in the study who completed the survey. Only question nine, "I felt tense," showed statistical significance (<.009). However, of the 26 question, 24 questions had an increase in the mean score, demonstrating clinical significance for the vast majority of questions (See Appendix O). Mean scores for questions regarding support and perception of nurses as "rude" declined. The overall mean score increased from 2.68 to 3.05, an increase of 7.4% which suggest that efforts made to improve patient support in early labor are focused appropriately. Further study and a larger sample size, would perhaps show a statistical significance given this overwhelming positive trend of increased mean scores.

Overall NTSV Cesarean Birth Rate

The overarching purpose of this project was to contribute to the safe reduction of the NTSV cesarean birth rates at Lutheran Medical Center. While admission of patients in early labor were not reduced, the 2021 NTSV cesarean birth rates declined from 25.6% to 22.4%, which is below the goal established by Healthy People 2030. The project raised awareness about this topic, introduced a bundle of evidence-based practices and improved labor support techniques offered by nurses. Together, these strategies may have contributed to the reduction of NTSV rates.

Figure 9. NTSV Cesarean Birth Rates at Lutheran Medical Center (provided by CPCQC)

NTSV Cesarean Delivery Rate by Year

Year	# NTSV Cesarean Deliveries	# NTSV Live Births	Avg NTSV Cesarean Rate	% Change in NTSV Rate
2017	207	876	23.6%	--
2018	158	734	21.5%	↓ 2.1%
2019	115	632	18.2%	↓ 3.3%
2020	181	708	25.6%	↑ 7.4%
2021	184	823	22.4%	↓ 3.2%

Conclusion

In the United States, one of every three babies are delivered by cesarean section. In an effort to reduce unnecessary cesarean deliveries, leaders in the obstetric community have focused on cesarean delivery rates in low-risk women (defined as NTSV). This community hospital leadership team has established an NTSV delivery rate goal of 21%. One evidence-based strategy to reduce the NTSV cesarean delivery rate is to delay admission until active labor.

The primary goal of the project was to reduce the number of patients admitted in early labor. After a review of the data, it is clear that this is a relatively small percentage of our NTSV patient population, at approximately 10%. The percentage of NTSV patients admitted in early labor actually increased from 9% to 11% and the percentage of patients admitted in active labor decreased from 34% to 30%. Initially, the intent of this project was to offer increased support to this specific patient population. Review of this data, revealed that 60% of our patients experience early labor while laboring in the hospital as either an induction of labor (36-40%) or a patient in early labor with spontaneous rupture of membranes (18-20%). The project interventions were expanded to include support of early labor both in the hospital and at home. Additional studies should consider the relationship between mode of delivery and early labor support in the inpatient setting as well as explore the application of the early labor management algorithm in hospitals with a variety of patient populations and settings.

Staff knowledge and comfort caring for the early labor patient population was evaluated prior to and following education using a 14-question survey. Overall, the total aggregate score increased slightly from 4.03 to 4.09 but was not statistically significant. (p 0.438). Of these 14 questions, six had a slight decline, six had a slight increase and 2 remained consistent. Twelve of the 14 questions had a p value <0.05. Staff willingness to implement and try new techniques and provide patient education to patients in early labor increased while staff confidence with the new techniques declined, revealing a need to offer continued education, support and mentoring.

Patient satisfaction of their early labor experience was measured using the 26 question Early Labor Experience Questionnaire. The overall mean score increased from 2.68 to 3.05, an increase of 7.4%, and of the 26 questions, 24 had a slight increase in mean scores which suggest that efforts made to improve patient support in early labor are focused appropriately and should continue. In addition, to the survey scores, two patients added free text comments related to their early labor experience which added insight and depth of the patient perspective. Further evaluation and study with a larger sample size would be beneficial as well as consideration of a qualitative study design to further explore patient perceptions to provide added information on the topic of early labor support.

In an effort to reach our hospital's established NTSV cesarean birth rate goal of 21% and improve our care of patients in early labor, continued support and education on this topic is essential. Changing culture within the labor and delivery unit to promote normal physiologic birth through the reduction of patient admissions in spontaneous early labor is a long-term initiative that requires ongoing coaching, mentoring and dedication. The results of this study can be used to raise nursing awareness regarding the connection between early labor support and both the patient experience and mode of delivery and ultimately motivate nurses to regularly incorporate the introduced early labor support tools into their practice.

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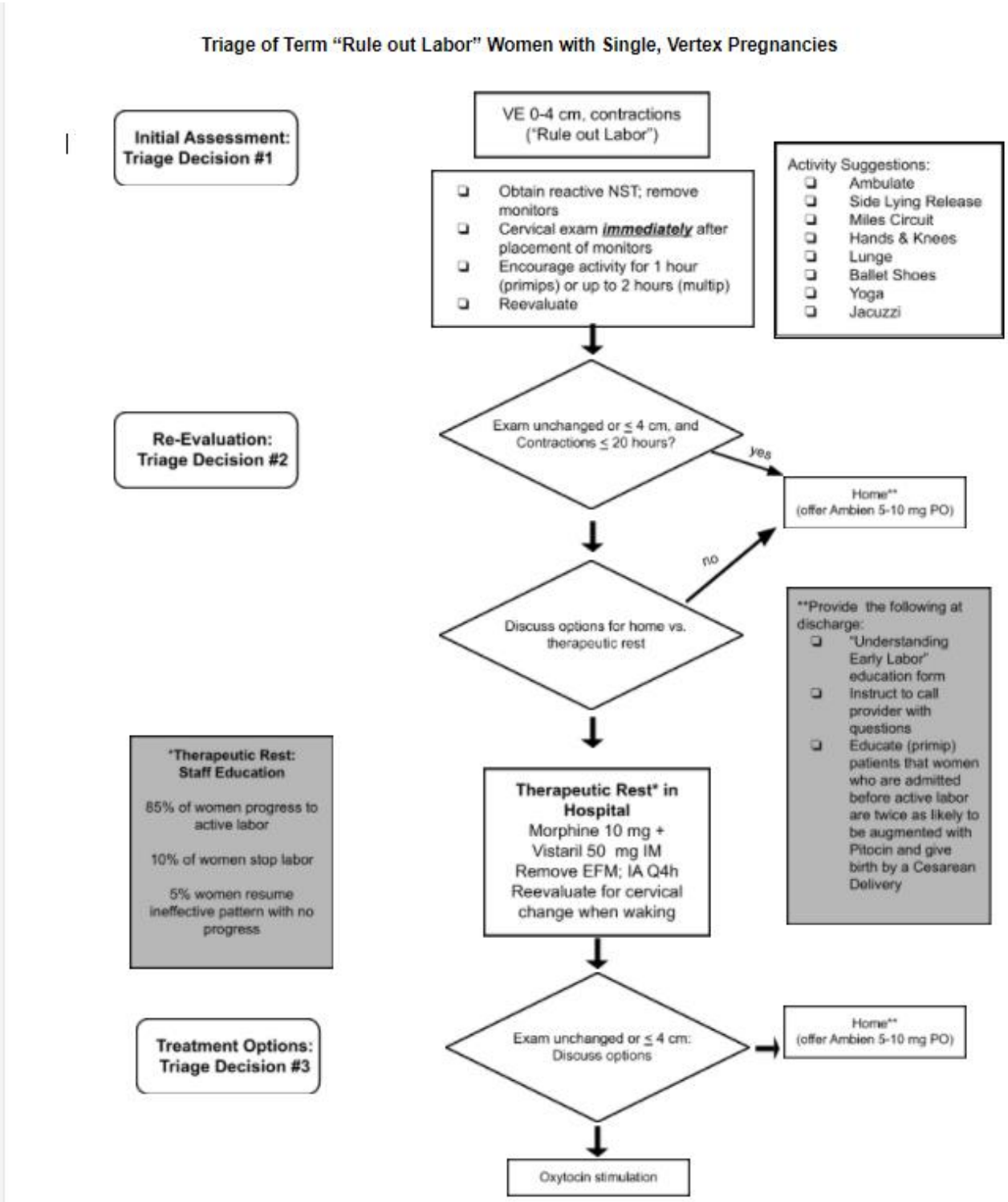
Appendix A



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Appendix B

At Lutheran Medical Center, we believe that birth is a normal process

and for women without significant risk factors, a vaginal birth is the preferred method of delivery. Evidence shows that laboring at home during the early stage supports the goal of a vaginal birth. Our hope is to help you recognize the signs of early labor, provide you with coping strategies and give you suggestions of when to consider coming to the hospital.

What is Early Labor?

Spontaneous labor usually begins at 37-42 weeks of pregnancy. Early labor generally lasts 6-12 hours and is usually longer (up to 24 hours) for first-time moms. This first stage of labor is when your cervix dilates from 0-6 cm.

Some women may experience "warm-up" contractions. These contractions prepare your body for labor. In general, warm-up contractions are mild and irregular; with time, movement, and drinking fluids, they become less frequent and less intense. They may come and go for several days.

"True" labor contractions cause your cervix to dilate. They are stronger, have a regular pattern, and last longer. Unlike "warm-up" contractions, these contractions continue to get stronger and closer even with activity, rest, and drinking plenty of fluids.

SCL Health

What can you do to feel more comfortable during early labor?

- One of the best ways to stay home during early labor is to have someone with you as your coach who can offer support and encouragement.
- Drink plenty of non-caffeinated clear fluids. Water, juice, popsicles, ice chips and gelatin are great options. Drink at least 8-12 ounces every hour.
- Eat small amounts of food to give you energy. Snacks should be light and frequent.
- Stand in the shower or soak in a warm bath.
- Use distraction. Watch a movie, listen to music, or play a game.
- Alternate between rest and activity. Take naps and rest between contractions.
- Practice rhythmic or deep breathing.
- Apply low back pressure, massage, or "hip squeeze."

What kinds of activities are helpful during early labor?

- Take a walk.
- Practice gentle yoga.
- Use an excercise ball for sitting or leaning over.
- Slow dance with your partner.
- Climb stairs or find a lunge position that feels comfortable.
- Change positions frequently.

When should I call my OB Provider?

Use the **5-1-1** rule as a guide. When your contractions are **5** minutes apart, last **1** minute each, and continue in this pattern for **1** hour and you can no longer talk through your contractions, call your obstetric provider. If you cannot get a hold of your provider, call the Labor and Delivery charge nurse at Lutheran, 303-425-2140. A phone call may reassure you and help avoid an unnecessary trip to the hospital.

Notify your obstetric provider earlier than the **5-1-1** if your think your bag of water has broken, have tested positive for Group B Strep and need more time at the hospital for antibiotics, live far from the hospital, or gave birth to a previous baby quickly.

If at any time you experience bright red vaginal bleeding or don't feel your baby moving, notify your provider.

Helpful Resources

- "Full Term" Contraction App to time contraction length and frequency
- Birthtools.org - Tools to help support physiologic birth
- Spinningbabies.com - Tips and tools to help guide expecting mothers through pregnancy and labor
- InJoy Health Education online - Information on preparing for childbirth, labor, and birth
- milescircuit.com - Positioning to help move labor along

5-1-1 Rule and description of early labor from Understanding Birth booklet by Injoy Health Education.

SCL Health

The Baby Place at Lutheran
8300 West 38th Ave., Wheat Ridge, CO 80033
P: 303-425-2140 | www.lutheranmedicalcenter.org/babies

Appendix C

Early Labor Experience Questionnaire Survey (Janssen & Desmarais, 2013s)

Instructions: Please answer these questions in relation to the time you spent in early labor before you came into the hospital. Please circle the answer most for you					
While you were in the hospital did you feel:	1 Yes, definitely	2 Yes, somewhat	3 Not sure	4 Not very much	5 Not at all
Safe?					
Confident?					
Scared?					
Happy?					
Excited?					
Anxious?					
Relaxed?					
Comfortable?					
Tense?					
Supported?					
Distressed?					
Insecure?					
In control?					
Confused?					
When you were in early labor, did your obstetric care team (nurse, midwife or doctor)					
Give you the information you wanted?					
Reassure you when you needed it?					
Spend enough time with you?					
Listen carefully to what you had to say?					
Treat your family/friends with respect?					
Respect your wishes about going to the hospital					
Did you feel you had confidence in your provider					
Did your nurse and doctor work together as a team in providing your care?					
Did you feel the nurse was at ease and calm with you?					
Do you feel the nurse treated you in a rude way?					
Would you recommend this type of early labor care to a friend?					
Do you feel like you went to the hospital at right time?					
Thank you for helping us learn more about women in early labor!					

Appendix D
Staff Survey

Instructions: Please answer these questions in relation to caring for patients in early labor					
	1 Yes, definitely	2 Yes, somewhat	3 Not often	4 Not at all	5 Not applicable
I am confident caring for patients in early labor					
I have the tools I need to care for patients in early labor					
I feel guilty when I have to send a patient home in early labor					
I am aware of the early labor triage algorithm and I use it to guide my care					
Conversations with the provider about early labor management can be challenging					
I encourage early labor patients to use the following labor support tools: • Ambulation • Hydrotherapy (tub) • Aromatherapy • Massage • Rest • Distraction • Gentle Yoga • Side Lying Release • Miles Circuit					
I have a sense of dread sending patients home who are in pain					
I do not feel like I have the tools I need to help patients continuing laboring at home					
I print the Epic Early Labor or Braxton Hicks instructions and send them home with the patient					
I have used therapeutic rest for early labor patients					
I am fearful patients discharged home in early labor will not return to the hospital at the appropriate time (ie. miss their opportunity for epidural or deliver en route)					
I am comfortable with the use of IA for low risk patients in early labor					
I believe our patients are adequately prepared for what to expect when they arrive in labor					
I take into consideration my patient's birth plan when making the decision for admission v. discharge					
Thank you for helping us learn more about caring for women in early labor!					

Appendix E

Level of Evidence	Total Articles	Article Author and Year
Level Ia	3	Chapman et al. (2019) Cluett & Burns (2014) Kobayashi et al. (2017)
Level Ib	6	Janssen et al. (2006) Janssen & Desmarais (2013a) Janssen & Desmarais (2013b) Kauffman et al. (2016) Kasegari et al. (2020) McNiven et al. (2018)
Level IIa	5	Breman et al. (2019) Hodnett & Simmons-Troplea (1987) Low & Moffat (2006) Main et al. (2019) Roux, Dingley & Bush (2002)
Level IIb	4	Bailit, et al. (2005) Ruhl, et al. (2015) Zhang, Troendle & Yancey (2002) Zhang, et al. (2010)
Level III	12	Beebe & Humphreys (2006) Callagahn-Koru et al. (2019) Cheyne et al. (2008) Edmonds et al. (2018) Gams, Neerland & Kennedy (2019) Hosek et al. (2014) Javernick & Dempsey (2017) Kaufman et al. (2016) Kasegari et al. (2019) Neal et al. (2014) Pollack & Pollack (2014) Zhang et al. (2010)
Level IV	6	ACOG (2016) ACOG (2017) Caughey et al., (2016) Council on Patient Safety in Women's Health Care (2012) HealthyPeople 2030 (2020) Spong et al. (2012)
Review of Literature; Opinion	2	Simkin & Bolding (2014) Marowitz (2014

Appendix F
SCL Health and Regis IRB Approvals (Final Signature Page)

From: Alan Stark <no-reply@irbnet.org>
Sent: Tuesday, August 3, 2021 9:29 AM
To: Amy Dempsey <amy.dempsey@sclhealth.org>; Wallman, Carol M <cwallman@regis.edu>
Subject: IRBNet Board Document Published

Please note that Regis University Human Subjects IRB has published the following Board Document on IRBNet:

Project Title: [1789072-1] Early Labor Management Protocol: A Quality Improvement Project
Principal Investigator: Amy Dempsey, MSN

Submission Type: New Project
Date Submitted: July 16, 2021

Document Type: Not Research Letter
Document Description: Not Research Letter
Publish Date: August 3, 2021

Should you have any questions you may contact Alan Stark at astark@regis.edu.

Thank you,
The IRBNet Support Team

G. Concurrence from Research Director or IRB

☒I have reviewed a written proposal of this project and concur with the investigator's assessment that this is a ☐ QA ☒QI ☐PE ☐EBP Projectand does not involve Research activities.

☐I have reviewed a written proposal of this project and do not agree with the investigator's assessment.

Cara Rawa, IRB Specialist — Signature
07/09/2021 — Date

Comment:

This project does not meet the criteria of research due to the application of the result being limited to Lutheran Medical Center.
The IRB received the letter of support dated and signed 07/07/2021 from Deb Lowery, Operational Leader, Director of Women's and Infants S Lutheran Medical Center.

Appendix G
Lutheran Medical Center Director Approval

SCL Health

Women and Family Service Line

7/7/2021
To Whom It May Concern:

I am writing in support of the Early Labor Management Quality Improvement Project at Lutheran Medical Center. This project is designed to evaluate management of early labor patients with the intent of offering support and education to delay admission until active labor. Ultimately, admission of laboring women during active labor (rather than early labor) has been shown to positively impact and reduce our primary Cesarean birth rates

The project will focus on education for patients related to the signs of labor and support techniques. We will measure patient satisfaction related to early labor management after patients have delivered. We will also provide education for nursing staff on early labor support and will measure their knowledge related to this topic

Primary cesarean birth rates are the focus of quality improvement projects throughout the United States. The safe reduction of cesarean birth rates impacts maternal morbidity and mortality outcomes, decreases length of stay and improves patient satisfaction. We hope this quality improvement project, which implements evidence-based nursing care, will have a significant impact on our patient outcomes. I am pleased to endorse this nurse-focused quality improvement project.

Sincerely,

Deb Lowery RNC, BSN, MS
Deb Lowery RNC, BSN, MS
Director/Women's and Infants
Saint Joseph Hospital/Lutheran Medical Center

500 Eldorado Blvd., Suite 4300, Broomfield, CO 80021-3564 P 303-813-5190 F 303-813-5199 sclhealth.org

Appendix H
CITI Training

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 1 OF 2
COURSEWORK REQUIREMENTS*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** Amy Dempsey (ID: 6497438)
- **Institution Affiliation:** Regis University (ID: 745)
- **Institution Email:** adempsey@regis.edu
- **Institution Unit:** nursing
- **Phone:** 303-981-9995

- **Curriculum Group:** Human Research
- **Course Learner Group:** Biomedical Research Investigators
- **Stage:** Stage 1 - Basic Course

- **Record ID:** 40899371
- **Completion Date:** 09-Feb-2021
- **Expiration Date:** 09-Feb-2024
- **Minimum Passing:** 80
- **Reported Score*:** 90

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED	SCORE
Recognizing and Reporting Unanticipated Problems Involving Risks to Subjects or Others in Biomedical Research (ID: 14777)	09-Feb-2021	4/5 (80%)
Populations in Research Requiring Additional Considerations and/or Protections (ID: 16680)	13-Aug-2017	4/5 (80%)
Conflicts of Interest in Human Subjects Research (ID: 17464)	09-Feb-2021	4/5 (80%)
History and Ethics of Human Subjects Research (ID: 498)	11-Aug-2017	7/7 (100%)
Basic Institutional Review Board (IRB) Regulations and Review Process (ID: 2)	11-Aug-2017	5/5 (100%)
Informed Consent (ID: 3)	11-Aug-2017	4/5 (80%)
Records-Based Research (ID: 5)	11-Aug-2017	3/3 (100%)
Research and HIPAA Privacy Protections (ID: 14)	13-Aug-2017	4/5 (80%)
Belmont Report and Its Principles (ID: 1127)	11-Aug-2017	3/3 (100%)
Social and Behavioral Research (SBR) for Biomedical Researchers (ID: 4)	11-Aug-2017	4/4 (100%)
Research Involving Children (ID: 9)	13-Aug-2017	3/3 (100%)

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

Verify at: www.citiprogram.org/verify/?kf515e5f3-ef07-447f-a634-7b058e8998db-40899371

Collaborative Institutional Training Initiative (CITI Program)
Email: support@citiprogram.org
Phone: 888-529-5929
Web: https://www.citiprogram.org

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 1 OF 2
COURSEWORK REQUIREMENTS*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** Amy Dempsey (ID: 6497438)
- **Institution Affiliation:** Regis University (ID: 745)
- **Institution Email:** adempsey@regis.edu
- **Institution Unit:** nursing
- **Phone:** 303-981-9995

- **Curriculum Group:** Biomedical Responsible Conduct of Research
- **Course Learner Group:** Same as Curriculum Group
- **Stage:** Stage 1 - RCR
- **Description:** This course is for investigators, staff and students with an interest or focus in **Biomedical Research**. This course contains text, embedded case studies AND quizzes.

- **Record ID:** 40899372
- **Completion Date:** 13-Feb-2021
- **Expiration Date:** 13-Feb-2024
- **Minimum Passing:** 80
- **Reported Score*:** 100

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED	SCORE
Research Involving Human Subjects (RCR-Basic) (ID: 13566)	13-Feb-2021	5/5 (100%)
Authorship (RCR-Basic) (ID: 16597)	13-Feb-2021	5/5 (100%)
Collaborative Research (RCR-Basic) (ID: 16598)	13-Feb-2021	5/5 (100%)
Conflicts of Interest (RCR-Basic) (ID: 16599)	13-Feb-2021	5/5 (100%)
Data Management (RCR-Basic) (ID: 16600)	13-Feb-2021	5/5 (100%)

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

Verify at: www.citiprogram.org/verify/?k0f855705-5cc3-41e2-a492-f1fd33df8e8d-40899372

Collaborative Institutional Training Initiative (CITI Program)
Email: support@citiprogram.org
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Web: https://www.citiprogram.org

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 1 OF 2
COURSEWORK REQUIREMENTS*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** Amy Dempsey (ID: 6497438)
- **Institution Affiliation:** Regis University (ID: 745)
- **Institution Email:** adempsey@regis.edu
- **Institution Unit:** nursing
- **Phone:** 303-981-9995

- **Curriculum Group:** CITI Conflicts of Interest
- **Course Learner Group:** Conflicts of Interest
- **Stage:** Stage 1 - Stage 1

- **Record ID:** 40899373
- **Completion Date:** 10-Feb-2021
- **Expiration Date:** 09-Feb-2025
- **Minimum Passing:** 80
- **Reported Score*:** 87

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED	SCORE
Institutional Conflicts of Interest (COI-Basic) (ID: 16765)	09-Feb-2021	5/5 (100%)
Financial Conflicts of Interest: Overview, Investigator Responsibilities, and COI Rules (COI-Basic) (ID: 15070)	10-Feb-2021	4/5 (80%)
Institutional Responsibilities as They Affect Investigators (COI-Basic) (ID: 15072)	10-Feb-2021	4/5 (80%)

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

Verify at: www.citiprogram.org/verify/?k7da388fa-ce9d-47de-95f1-c41044a5d7bd-40899373

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Web: https://www.citiprogram.org

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 1 OF 2
COURSEWORK REQUIREMENTS*

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- **Institution Affiliation:** Regis University (ID: 745)
- **Institution Email:** adempsey@regis.edu
- **Institution Unit:** nursing
- **Phone:** 303-981-9995

- **Curriculum Group:** GCP – Social and Behavioral Research Best Practices for Clinical Research
- **Course Learner Group:** Same as Curriculum Group
- **Stage:** Stage 1 - Basic Course

- **Record ID:** 40899376
- **Completion Date:** 13-Feb-2021
- **Expiration Date:** 13-Feb-2024
- **Minimum Passing:** 100
- **Reported Score*:** 100

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED	SCORE
Module 1 - Introduction (ID: 17531)	13-Feb-2021	5/5 (100%)
Module 2 - Research Protocol (ID: 17532)	13-Feb-2021	5/5 (100%)
Module 3 - Recruitment and Retention (ID: 17533)	13-Feb-2021	5/5 (100%)
Module 4 - Informed Consent Communication (ID: 17534)	13-Feb-2021	5/5 (100%)
Module 5 - Privacy and Confidentiality (ID: 17535)	13-Feb-2021	5/5 (100%)
Module 6 - Participant Safety and Adverse Event Reporting (ID: 17536)	13-Feb-2021	5/5 (100%)
Module 7 - Quality Control and Assurance (ID: 17537)	13-Feb-2021	5/5 (100%)
Module 8 - Research Misconduct (ID: 17538)	13-Feb-2021	5/5 (100%)
Module 9 - Conclusion (ID: 17539)	13-Feb-2021	No Quiz

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

Verify at: www.citiprogram.org/verify/?keb4a9ad0-cb42-4906-83b7-193fbed0eac8-40899376

Collaborative Institutional Training Initiative (CITI Program)
Email: support@citiprogram.org
Phone: 888-529-5929
Web: https://www.citiprogram.org

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 1 OF 2
COURSEWORK REQUIREMENTS*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** Amy Dempsey (ID: 6497438)
- **Institution Affiliation:** Regis University (ID: 745)
- **Institution Email:** adempsey@regis.edu
- **Institution Unit:** nursing
- **Phone:** 303-981-9995

- **Curriculum Group:** Information Privacy & Security
- **Course Learner Group:** Health Privacy (HIPAA)
- **Stage:** Stage 1 - Basic

- **Record ID:** 40899375
- **Completion Date:** 14-Feb-2021
- **Expiration Date:** 14-Feb-2024
- **Minimum Passing:** 80
- **Reported Score*:** 90

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED	SCORE
Basics of Health Privacy (ID: 1417)	13-Feb-2021	5/5 (100%)
Health Privacy Issues for Clinicians (ID: 1418)	13-Feb-2021	5/5 (100%)
Health Privacy Issues for Researchers (ID: 1419)	14-Feb-2021	5/5 (100%)
Health Privacy Issues for Students and Instructors (ID: 1420)	14-Feb-2021	5/5 (100%)
Health Privacy Issues for Fundraisers (ID: 1421)	14-Feb-2021	2/5 (40%)
Health Privacy Issues for Marketers (ID: 1422)	14-Feb-2021	5/5 (100%)

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

Verify at: www.citiprogram.org/verify/?k373a54bc-4d73-4eb4-ae0f-a5c6c1b4dfe8-40899375

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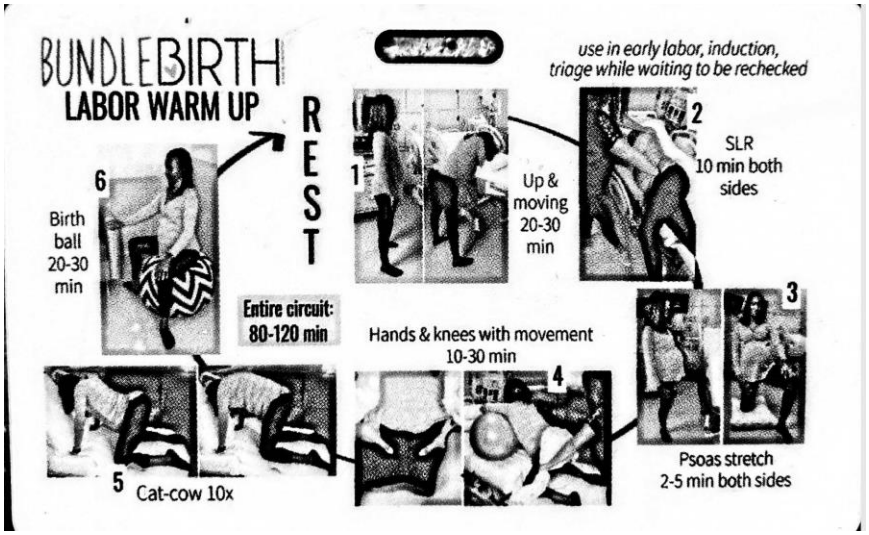
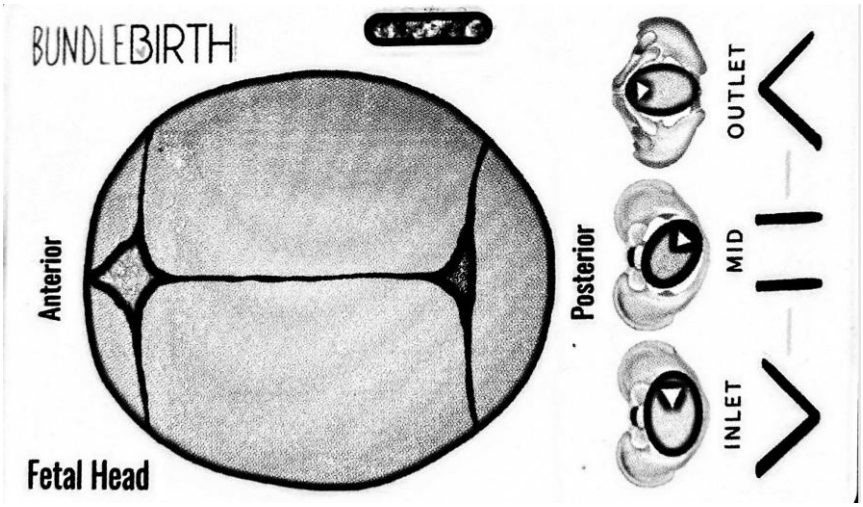
Appendix I
Bundle Birth "Labor Warm Up Badge Buddy" (Bundle Birth, 2020)





Appendix J

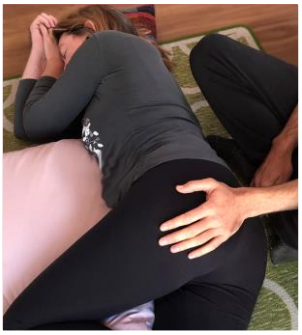
Introducing the

Three Balances℠

We call our body balancing arrangement the Three Balances℠

1. The Jiggle
2. Forward- leaning Inversion
3. Side- lying Release

Balancing the muscles and joints of the pelvis and back will add comfort in pregnancy and ease in childbirth. Each technique plays a special role in supporting labor progress.



The Jiggle

A gentle, sustained jiggle reduces pain and tension in pregnancy and labor. Tiny fibers in the connective tissues and muscles release. The Rebozo Manteada is a version using a traditional cloth.

Forward- leaning Inversion

The Forward- leaning Inversion balances ligaments near the cervix to ease dilation. FLI contributes to comfort, fetal positioning, and makes room for baby.

Side- lying Release

Use Side- lying Release in pregnancy to balance the muscles and joints in the pelvis and lower back. In labor, SLR helps baby to move into position for a shorter and less painful birth.

Before you begin, read safety warnings and instructions on each webpage.

SCAN ME

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Appendix K

Data Dictionary				
Variable	**Variable Name**	**Measurement units**	**Allowed values**	**Definition/Description of variable**
Early Labor Admission Rates	ELAR	Ratio; continuous proportion	0-100%	Total # NTSV: # NTSV admitted in early labor. Measurement: independent two-tailed t -test
Staff Knowledge	SK	Interval	0-5 / question # of questions (TBD)	Likert Scale (0-5) measuring staff knowledge, # of questions TBD Measurement: independent two-tailed t -test
Early Labor Experience Questionnaire	ELEQ	Interval	0-5/question 26 questions = 130 (total #)	Likert Scale (0-5) measuring staff knowledge, 26 questions Measurement: independent two-tailed t -test
Patient ID number	ID	Numeric	1-200	Unique patient identification
Birth date	DOB	mm/dd/yyyy	12/1/2020 – 1/1/2021	Date of birth
Gestational age	GA	Numeric	30.0-42.0	Gestational age of infant from 30 weeks to 42 weeks based on known estimated due date from obstetric dating
Provider Group	Name	Alpha	RR, AWH, WWC, Kaiser	Admitting provider assigned to patient
Admitting Nurse	Name	Alpha	Free text	Primary labor nurse assigned to patient on admission
Cervical Exam on time of admit	SVE	Numeric	0 – 10	Cervical exam on time of admit (cm)
Mode of delivery	DEL	Alpha	Free Text	Vaginal, Instrument Assisted, Cesarean
Gravida	G	Numeric	1-10	Number of confirmed pregnancies
Para	P	Numeric	1	Number of completed pregnancies >20 weeks
Outpatient Visits	OP	Numeric	0-10	Number of OP visits prior to admission; includes reason (labor check, decreased fetal movement, blood pressure check, rule out rupture, other)

Nulliparous, Term, Singleton, Vertex	NTSV	1-Yes/ 2-No	1, 2	NTSV defines inclusion criteria
Ethnicity	ETH	Alpha	white, Hispanic, black, Asian, other, unknown	Patients ethnicity as completed in EMR
Age	Age	Numeric	14-50	Patient's age based on DOB entry in EMR

Appendix L

Context Specific Database				
Variable	Glossary	Study Definitions	Definition	Value
Early Labor Admission Rates (ELAR) (Ratio)	Null-Hypothesis	ELAR will remain unchanged after implementation of early labor intervention bundle	Type I Error (false positive) (chance of rejecting the null-hypothesis when it is true)	**Alpha (α) = .05** (Risk of a Type I Error)
			Type II Error (false negative) (chance of accepting null hypothesis when it is false)	**Power (β) =.80** (Risk of a Type II Error)
	Alternate Hypothesis	ELAR will decrease after implementation of early labor intervention bundle		
	Effect Size	Relationship between ELAR and implementation of early labor intervention bundle	Measurement of strength between 2 variables	**Effect (Cohen's d) = .70**
	Sample Size	Number of NTSV women admitted in early labor	Estimate minimum number of participants for power analysis	**NTSV in early labor = 33***
Early Labor Experience Questionnaire (ELEQ) (Interval)	Null-Hypothesis	ELEQ total scores will remain unchanged after implementation of early labor intervention bundle	Type I Error (false positive) (chance of rejecting the null-hypothesis when it is true)	**Alpha (α) = .05** (Risk of a Type I Error)
			Type II Error (false negative) (chance of accepting null hypothesis when it is false)	**Power (β) =.80** (Risk of a Type II Error)
	Alternate Hypothesis	ELEQ total scores will increase after implementation of early labor intervention bundle		
	Effect Size	Relationship between ELEQ and implementation of early labor intervention bundle	Measurement of strength between 2 variables	**Effect (Cohen's d) = .70**
	Sample Size	Number of NTSV women who complete the ELEQ survey	Estimate minimum number of participants for power analysis	**NTSV who complete the survey = 33***

Staff Knowledge (SK) (Interval)	Null-Hypothesis	SK total scores will remain unchanged after implementation of early labor intervention bundle	Type I Error (false positive) (chance of rejecting the null-hypothesis when it is true)	**Alpha (α) = .05** (Risk of a Type I Error)
			Type II Error (false negative) (chance of accepting null hypothesis when it is false)	**Power (β) =.80** (Risk of a Type II Error)
	Alternate Hypothesis	SK total scores will increase after implementation of early labor intervention bundle		
	Effect Size	Relationship between SK and implementation of early labor intervention bundle	Measurement of strength between 2 variables	**Effect (Cohen's d) = .70**
	Sample Size	Number of Labor and Delivery Nurses who complete survey (total number on staff = 40)	Estimate minimum number of participants for power analysis	**L&D RNs who complete the survey = 33***

Appendix M
Staff Survey Results

Question Number	Question Content	Mean	Std. Deviation	Correlation Two-Sided p
Pre-Aggregate Sample = 25	All questions (excluding 6)	4.03	.971	.438
Post Aggregate Sample=22	All questions (excluding 6 and 15)	4.09	1.046	
Question 1-Pre	I am confident caring for patients in early labor	4.95	.213	.147
Question 1-Post		4.68	.477	
Question 2-Pre	I have the tools I need to care for patients in early labor	5.00	.000	-
Question 2-Post		4.77	.429	
Question 3-Pre	I feel guilty when I have to send a patient home in early labor (reverse)	3.55	.671	.002
Question 3-Post		3.64	.727	
Question 4-Pre	I am aware of the early labor triage algorithm and I use it to guide my care	4.45	.671	<.001
Question 4-Post		4.09	1.151	
Question 5-Pre	Conversations with the provider about early labor management can be challenging (reverse)	3.64	.581	<.001
Question 5-Post		3.41	.854	
Question 6-Pre	I encourage early labor patients to use support tools such as hydrotherapy, aromatherapy, massage, etc.	4.40	.577	<.001
Question 6-Post (aggregate)	I encourage early labor patients to use the following labor support tools (11 choices offered):	4.96	.200	
Question 7-Pre	I have a sense of dread sending patients home who are in pain (reverse)	3.86	.640	<.001
Question 7-Post		3.64	.848	
Question 8-Pre	I do not feel like I have the tools I need to help patients continuing laboring at home (reverse)	3.18	.795	<.001
Question 8-Post		2.45	.858	
Question 9-Pre	I print the Epic Early Labor or Braxton Hicks instruction and send them home with the patient	3.09	1.109	<.001
Question 9-Post	I give the "Early Labor Discharge" flyer to patients who are discharged but undelivered.	3.59	1.532	
Question 10-Pre	I have used therapeutic rest for early labor patients	4.45	.510	.007
Question 10-Post		4.45	.912	

Question 11-Pre	I am fearful patients discharged home in early labor will not return to the hospital at the appropriate time (ie. miss their opportunity for epidural or deliver en. route) (reverse)	3.14	.834	<.001
Question 11-Post		2.82	1.053	
Question 12-Pre	I am comfortable with the use of IA for low-risk patients in early labor	4.86	.351	.008
Question 12-Pre		4.86	.640	
Question 13-Pre	I believe our patients are adequately prepared for what to expect when they arrive in labor	3.73	.550	<.001
Question 13-Post		3.59	.796	
Question 14-Pre	I take into consideration my patient's birth plan when making the decision for admission v. discharge	4.77	.429	<.001
Question 14-Post		4.64	.581	

*Green indicates increase in Mean Score or P Value <.005

**Red indicates decrease in Mean Score

Appendix N

Post-Implementation Questions

Question 6: I encourage early labor patients to use the following labor support tools:

	YES, DEFINITELY	YES, SOMEWHAT	NOT OFTEN	NOT AT ALL	N/A	TOTAL	WEIGHTED AVERAGE
Ambulation	95.45% 21	4.55% 1	0.00% 0	0.00% 0	0.00% 0	22	1.05
Hydrotherapy (tub)	95.45% 21	4.55% 1	0.00% 0	0.00% 0	0.00% 0	22	1.05
Aromatherapy	63.64% 14	13.64% 3	22.73% 5	0.00% 0	0.00% 0	22	1.59
Massage	40.91% 9	31.82% 7	22.73% 5	4.55% 1	0.00% 0	22	1.91
Rest	81.82% 18	13.64% 3	4.55% 1	0.00% 0	0.00% 0	22	1.23
Distraction	59.09% 13	27.27% 6	13.64% 3	0.00% 0	0.00% 0	22	1.55
Gentle Yoga	18.18% 4	22.73% 5	36.36% 8	22.73% 5	0.00% 0	22	2.64
Side Lying Release	68.18% 15	31.82% 7	0.00% 0	0.00% 0	0.00% 0	22	1.32
Miles Circuit	22.73% 5	18.18% 4	13.64% 3	40.91% 9	4.55% 1	22	2.76
Jiggle	54.55% 12	18.18% 4	22.73% 5	4.55% 1	0.00% 0	22	1.77
Inversion	54.55% 12	18.18% 4	18.18% 4	9.09% 2	0.00% 0	22	1.82

Appendix O
Early Labor Experience Questionnaire Survey Data Results

Instructions: Please answer these questions in relation to the time you spent in early labor before you came into the hospital. Please circle the answer most for you				
While you were in the hospital did you feel:	Pre-Study Mean Score	Post-Study Mean Score	t-score	Two-sided p-value
Safe?	4.88	4.90	-.374	.710
Confident?	4.0	4.20	-.892	.378
Scared?	2.68	2.76	-.250	.804
Happy?	4.07	4.29	-1.026	.311
Excited?	4.41	4.61	-.1.052	.299
Anxious?	1.88	2.05	-.730	.470
Relaxed?	3.51	3.59	-.338	.737
Comfortable?	3.76	3.88	-.588	.580
Tense?	2.49	3.20	-2.750	.009
Supported?	4.71	4.49	1.138	.262
Distressed?	3.54	3.76	-.754	.455
Insecure?	3.78	4.02	-1.107	.275
In control?	3.63	3.95	-1.504	.140
Confused?	3.88	4.15	-.992	.327
When you were in early labor, did your obstetric care team (nurse, midwife or doctor)				
Give you the information you wanted?	4.61	4.63	-.114	.910
Reassure you when you needed it?	4.44	4.78	-1.739	.090
Spend enough time with you?	4.46	4.66	-.870	.389
Listen carefully to what you had to say?	4.51	4.83	-2.311	.026
Treat your family/friends with respect?	4.73	4.80	-.621	.538
Respect your wishes about going to the hospital	4.73	4.85	-.670	.507
Did you feel you had confidence in your provider	4.68	4.88	-1.537	.132
Did your nurse and doctor work together as a team in providing your care?	4.78	4.83	-.530	.599
Did you feel the nurse was at ease and calm with you?	4.76	4.83	-.489	.682
Do you feel the nurse treated you in a rude way?	4.78	4.54	1.350	.185
Would you recommend this type of early labor care to a friend?	4.59	4.80	-1.388	.173
Do you feel like you went to the hospital at right time?	4.63	4.76	-.682	.499
Total Overall Score	2.68	3.05	1.704	.096

*Green indicates increase in Mean Score or P Value <.005

**Red indicates decrease in Mean Score