Fall 2023

Incorporating Non-Pharmacological Labor Coping Methods to Improve Nursing Care and Reduce Primary Cesarean Section Rates: A Quality Improvement Project

Cait Maccabe
University of New Hampshire, Durham

Incorporating Non-Pharmacological Labor Coping Methods to Improve Nursing Care and Reduce Primary Cesarean Section Rates: A Quality Improvement Project

Cait Maccabe MSN, RN, CNL

DEMN Program

University of New Hampshire

NURS 958: Clinical Nurse Leader Capstone

July 28, 2023

Table of Contents

Abstract

BACKGROUND: Cesarean sections (c-sections), while life-saving in some circumstances, carry a significantly higher risk of morbidity and mortality than vaginal birth for birthing patients and neonates alike. Despite this, rates of c-section have continued to rise in the US and around the world. As primary cesarean births are highly likely to lead to repeat cesarean births, concerted efforts are being made to reduce them both broadly and within the setting of this quality improvement (QI) project: a labor and delivery unit located within a Level II trauma center in New Hampshire. A literature review provided evidence supporting the use of non-pharmacological labor coping (NPLC) methods as a means of promoting c-section reduction among low-risk nulliparous, term, singleton, and vertex (NTSV) pregnancies and revealed a gap in this knowledge and practice among labor and delivery professionals. This project focused primarily on increasing the incorporation of NPLC techniques into nursing care.

METHODS: The Plan, Do, Study, Act (PDSA) framework was used to guide the quality improvement process and increase the utilization of NPLC methods on the unit. Pre and post-intervention surveys of labor and delivery nurses were conducted in order to measure the project's efficacy and to generate feedback that would inform future PDSA cycles. The unit's NTSV c-section rate was also calculated and compared with pre-intervention rates to generate preliminary observations about the effect of the initiative.

INTERVENTION: In an attempt to remove the barrier of insufficient access to NPLC tools on the unit and to increase the use of non-pharmacological techniques, a "Labor Lending Library" of supplies to support NPLC alongside the information nurses need to facilitate their use was introduced. Details about the library and the tools it contains were distributed via the weekly email newsletter, via posters hung in key locations on the unit, and via a laminated set of infographics attached to the cart for educational reinforcement. Use of the cart was encouraged during the study period by the project lead with periodic informal presentations during change-of-shift huddles and an appearance at an Obstetric unit practice committee meeting.

RESULTS: The Labor Lending Library project aimed for 75% of surveyed nurses to report that they had sufficient tools to support NPLC nursing care on the unit, with sufficiency being defined as a rating of 8.5 out of 10 or better. It ultimately yielded this rating from 94.44% of post-intervention survey respondents, representing a 35% increase in average rating of the sufficiency of available tools to support NPLC from pre to post-intervention. The project's additional goal of increasing NPLC support by 25% overall was not entirely met, though reported use of all studied NPLC methods among nurses increased by 16.3% on average during the study period. The NTSV c-section rate on the unit was 24.48% during data collection, representing a 6.2% reduction in rate from the same time frame the previous year and 7.2% reduction from the overall rate of NTSV c-sections on the unit in 2022.

CONCLUSIONS: Actively promoting use of and access to NPLC methods via the Labor Lending Library intervention increased the use of these methods within the setting where it was initiated. Consolidating resources and creating complementary nurse education also led to a significant increase in nurses reporting that they had sufficient tools to facilitate use of NPLC techniques with their laboring patients. Continued use of NPLC supported by the Labor Lending Library may, over time, see a long-term overall decrease in NTSV c-section rates.

Keywords: labor and delivery, primary cesarean, NTSV cesarean, NTSV c-section reduction, primary c-section reduction, non-pharmacological labor coping methods, non-pharmacological pain management, labor and delivery nurses, labor and delivery nursing care, nursing education

Introduction

Cesarean sections (c-sections) are the most commonly performed surgical procedure in the United States. While clinically indicated in some circumstances and life-saving in others, cesarean sections carry a significantly higher risk of morbidity and mortality than vaginal birth for gestational parents and neonates alike (Lagrew et al., 2018). Their increased use in the US and around the world has not been associated with improvements in maternal or newborn outcomes. On the contrary, rising cesarean section rates have been correlated with increases in both maternal morbidity and birth-related newborn complications (WHO, 2021; DeJoy et al., 2019). Amid calls to decrease c-section rates from professional and public health organizations across the globe, particular attention is being paid to cesarean births among patients who are NTSV: nulliparous, term, singleton, and vertex (ACOG, 2023; ACNM, n.d.; Lagrew et al., 2018; Osterman, 2022; USDHHS, 2021; WHO, 2018). These low-risk patients are ideal candidates for vaginal childbirth, yet NTSV c-section rates have increased by 45% in the United States in the last 20 years (DeJoy et al., 2020). NTSV or otherwise, patients who experience a primary cesarean birth are highly likely to have a subsequent cesarean birth. This is a key contributor to the overall increase in use of the procedure to 32.1% as of 2021 (Osterman, 2022). Incidence of cesarean section varies dramatically between facilities and regions among NTSV patients and overall, which strongly indicates that clinical practices contribute to the number of surgical births being performed (ACOG, 2023).

For the safe reduction of primary cesarean births, both the American Congress of Obstetricians and Gynecologists (ACOG) and the American College of Nurse Midwives (ACNM) recommend incorporating evidence-based toolkits that contain a variety of initiatives geared toward decreasing the number of NTSV cesarean births occurring at a given facility (ACOG, 2023; ACNM, n.d.). Many such toolkits encourage the nurse-driven promotion of comfort in labor, specifically by incorporating non-pharmacological pain management techniques into nursing care (Lagrew et al., 2018; ACNM, n.d.). Non-pharmacological pain management, which

includes a wide range of interventions from water immersion to acupressure, has been shown to provide a multitude of benefits when used during labor. Better pain relief, increased satisfaction with the childbirth experience, fewer instrumental births, and ultimately lower rates of cesarean section are all positively associated with the use of these therapies (Jones et al., n.d.; Smith et al., 2019; Rodrigues et al., 2022).

As the professionals agree and the literature supports, non-pharmacological labor coping (NPLC) techniques can support quality patient care and decrease NTSV c-section rates. These facts provide the basic framework for this quality improvement initiative: the introduction of a Labor Lending Library at The Family Place (TFP) labor and delivery microsystem. A collection of tools to support NPLC alongside the information nurses need to facilitate their use, the Labor Lending Library project ultimately proved to support the increased use of these techniques among labor and delivery nurses on the unit. Going forward, continued use of the library may improve intrapartum nursing care at TFP and play a role in decreasing NTSV cesarean section rates on the unit. It is the first of many future quality improvement interventions that align with the unit's broader goal of decreasing this specific type of primary cesarean birth (A. Antognoni, personal communication, 2023).

Problem Description

As noted, vaginal birth is widely considered to be the safest way to have a baby (WHO, 2018; CDC, 2021; ACOG, 2023; ACNM, n.d.). This look at the value of NPLC methods for NTSV c-section prevention, meanwhile, comes at a time when America is the most dangerous place to give birth in the developed world (Tikkanen et al., 2020). According to a study by Tikkanen et al. (2020) for the Commonwealth Fund, an independent health research nonprofit, the United States has the highest maternal mortality rate among all industrialized nations. Rather than improving, maternal mortality has been increasing in the United States since the 1990s and experienced an unprecedented 40% rise at the height of the COVID-19 pandemic between 2020 and 2021 (Hoyert, 2023). Alarming mortality rates aside, close to 100 birthing people also

experience life-threatening complications for every childbirth-related death (Leonard et al., 2019). The Centers for Disease Control and Prevention (CDC) defines this level of severe maternal morbidity (SMM) as unexpected outcomes of labor and delivery that result in significant short or long-term health consequences. They use a list of 21 indicators to identify cases of SMM, and that list includes childbirth-related complications from requiring a blood transfusion to cardiac arrest during surgery (CDC, 2021).

Although not all instances of SMM are caused by cesarean sections, the procedure carries an increased risk for complication and has been identified as one of the major contributing factors to rising rates of morbidity in the United States (Leonard, 2019). In a cohort study used data from 4,063,106 births that occurred in California from January 1, 2007 through December 31, 2014, Leonard et al. found that cesarean delivery was associated with 2.7 times the risk of SMM (95% CI: 2.6, 2.7) compared to vaginal delivery. C-sections were further estimated to contribute to 37% (95% CI: 36, 38) of severe maternal morbidity cases in the population (Leonard et al., 2019). When examining each delivery year separately, Leonard et al. (2019) determined that cesarean delivery had the largest impact on the predicted prevalence of SMM among all factors they identified in their review.

It is important to note that, in the presence of maternal or fetal complications, cesarean deliveries can reduce maternal and perinatal mortality and morbidity. As Keag et al. (2018) found in a systematic review and meta-analysis of risks and benefits of c-sections, however, an increasing proportion of babies are delivered by cesarean when there is no medical or obstetric indication. One randomized controlled trial (RCT) and 79 cohort studies from high income countries were included in their analysis, involving 29,928,274 participants. Ultimately, Keag et al. (2018) found that, when compared to vaginal delivery, cesarean delivery was associated with the increased risk in subsequent pregnancies of complications ranging from placenta previa to stillbirth. Babies born by c-section were additionally found to be at a higher risk of both asthma and obesity (Keag et al., 2018).

In addition to a heightened risk of SMM and of long-term complications, c-sections also pose a threat to mental health. A 2021 systematic review and meta-analysis revealed that mode of delivery has a significant effect on the occurrence of postpartum depression. Patients who give birth by cesarean section - especially those who undergo an emergency cesarean section - are at a higher risk of postpartum depression (PPD). Multiple studies included in the review found that the risk of PPD after a c-section was higher than after a vaginal birth at several intervals in the postpartum period, though they do note that these findings were not duplicated in all of the studies they reviewed (Sun et al., 2021). All points considered, Sun et al. (2021) determined that the risk of PPD was 33% higher in patients delivering their babies via c-section than in those delivering vaginally. They recommended that medical professionals expect an increase in PPD as the c-section rate increases, and urged that these professionals include mental health risks when obtaining informed consent (Sun et al., 2021).

Despite the risks, as noted, rates of NTSV c-section have increased by 45% in the United States in the last 20 years (DeJoy et al., 2020). Any patient who experiences a primary cesarean birth is highly likely to have a subsequent cesarean birth, and this is a key contributor to the overall increase in use of the procedure to 32.1% in 2021 (Osterman, 2022). Alongside professional associations dedicated to the childbirth process and every major public health organization, TFP has concerns about its rate of cesarean birth. TFP provides birth care services to approximately 1,350 patients and their families annually, and the unit had a NTSV cesarean rate of 26.2% in 2022 (TFP, 2022). This is both higher than the overall NTSV rate in the US (22.4%) and higher than the CDC's Healthy People 2030 NTSV goal of 23.6% (Osterman, 2022; USDHHS, 2021).

Nurses, who are the primary providers of hospital patient care according to the American Association of Colleges of Nursing (2022), have a big part to play when it comes to supporting physiologic birth and decreasing primary cesarean rates. In a joint consensus statement, several organizations dedicated to the childbirth process - ACNM, Midwives Alliance of North America,

and the National Association of Certified Professional Midwives - identified factors that support physiologic birth and made policy and educational recommendations (Zielinski et al., 2016). "The level of obstetric interventions a woman experiences often is related to health care provider preferences or institutional policies," the statement reads. "The members of a woman's health care team, including midwives, physicians, nurses, and possibly doulas, can be significant factors that influence her ability to achieve a healthy birth" (Zielinski et al., 2016, p. 277). Nurses contribute more support and education for birthing people and their families than all other members of obstetric interdisciplinary teams during labor, Zielinski et al. (2016) further suggest, and as such their role in NTSV c-section prevention cannot be overstated.

It is in this context that Edmonds et al. (2017) conducted a retrospective cohort study designed to analyze the factors that can increase or decrease NTSV cesarean rates (N=3,031). After excluding births by scheduled cesarean for medical or elective reasons, cesarean rates were calculated for each nurse present at more than 15 of the eligible births during the study period. Nurses were then divided into four quartiles based on the distribution of their calculated cesarean birth rates. Finally, the resulting data sets were examined to determine which factors related to nursing care influenced c-section rates (Edmonds et al., 2017). In the end, their study showed significant variations in NTSV cesarean birth rates between labor and delivery registered nurses. Although most nurses had rates similar to the hospital's overall rate, Edmonds et al. (2017) observed a near 40% difference between the nurse with the highest and the nurse with the lowest rate: a range of 8.3%–48%. Given the parameters Edmonds et al. (2017) placed on their study, they determined the main potential explanation for the difference in NTSV cesarean rate to be related to differences between individual nurses. "It could be that nurses with more intrapartum nursing experience and beliefs supportive of physiologic labor will consistently have lower NTSV cesarean rates than their counterparts," they conclude (Edmonds et al., 2017). For the purpose of this quality improvement project, the finding by Edmonds et al. (2017) that the time a nurse spends in the provision of labor support might

influence mode of birth is critical. Specifically, providing more education to bolster direct nursing care and support at the bedside might decrease the risk for cesarean: the global aim of the Labor Lending Library (Edmonds et al., 2017).

Obstetric care providers in general and nurses in particular need education and accessible resources in order to effectively support vaginal birth (Zieleinski et al., 2016). Incorporating NPLC techniques into patient care supports the physiologic birth process and improves health outcomes for both birthing people and neonates (Jones et al., n.d.; Smith et al., 2019; Rodrigues et al., 2022). Despite this, research shows that these methods are not consistently endorsed or practiced by all labor and delivery professionals (Zieleinski et al., 2016; Ingram et al., 2022). As the literature supports and this quality improvement project attempts to demonstrate, initiatives such as the Labor Lending Library - which is designed to increase NPLC access, knowledge, and confidence among labor and delivery nurses - facilitates the use of these strategies and may ultimately promote physiologic birth.

Available Knowledge

Review of Literature

From 1985 to 2015, the World Health Organization (WHO) contended that 10-15% is the ideal rate for cesarean sections globally (WHO, 2015). More recently, the WHO (2015) has discouraged specific target rates, suggesting patient needs be assessed individually. Although the organization emphatically states that there is no improvement in outcomes when overall cesarean birth rates exceed 10%, they no longer have an established population-level goal (WHO 2015; WHO 2018). Instead, WHO recommendations are focused of late on 21 non-clinical interventions with the potential to reduce primary cesarean birth rates. Although many of the suggested interventions are either administrative or regulatory, a substantial number are focused on the management of labor (WHO, 2018). The WHO (2018) recommends both the education of health professionals and non-pharmacological intrapartum pain relief as a means

of NTSV cesarean birth prevention, a suggestion that is echoed universally among other professional organizations (ACOG, 2023; ACNM, n.d.; Lagrew et al., 2018).

As noted, ACOG (2023) recommends a toolkit for NTSV cesarean reduction that includes non-pharmacological modalities such as hydrotherapy, breathing exercises, relaxation, massage, and other complementary therapies. ACOG (2023) also recommends that healthcare providers educate birthing people about the benefits of non-pharmacological pain management techniques during childbirth, and emphasizes that "increasing women's access to nonmedical interventions during labor has been shown to reduce cesarean birth rates" (ACOG, 2023, p. 1). ACNM, for their part, created a Healthy Birth Initiative in response to rising c-section rates in the United States specifically. A multifaceted approach to improving birth outcomes and reducing primary cesarean section rates, ACNM's initiative focuses on several key strategies: using non-pharmacological pain management techniques with laboring patients and ensuring the availability of equipment and an environment that promotes these methods of coping among them (ACNM, n.d.).

The Association of Women's Health, Obstetric, and Neonatal Nurses (AWHONN) also endorses the use of non-pharmacological pain management as a way to reduce cesarean section rates. They purport that these techniques can help birthing people manage labor pain and discomfort, reduce anxiety, and promote relaxation: thereby reducing the need for medical interventions in general and cesarean sections in particular. In a consensus bundle on the safe reduction of primary cesarean births, AWHONN emphasizes both the need for non-pharmacological pain management and the importance of caregiver education on Labor & Delivery units (Lagrew et al., 2018). "To successfully lower cesarean birth rates," AWHONN suggests, "health systems must develop environments in which everyone appreciates the true value of achieving vaginal birth [...] and maintains educational processes, facilities, equipment, and staff expertise that maximize the likelihood of safe vaginal birth" (Lagrew et al., 2018, p. 216).

Search Methods

To synthesize research regarding the effectiveness of non-pharmacological labor coping methods for decreasing NTSV cesarean section rates, several databases were utilized. Pairing variations of "non-pharmacological pain management" with "c-section reduction" or "birth outcomes" as Boolean phrase criteria on CINAHL, MedLine, and the Cochrane Database of Systematic Reviews yielded 41 articles on the topic between 2018 and 2023 after duplicates were removed. Altogether, 32 articles were excluded for having highly regional specificity, for not measuring rates of cesarean birth, or for focusing on the use of non-pharmacological pain management at a non-intrapartum phase of birth. After applying these parameters, a total of nine articles remained. The majority of studies included in this literature review are classified as level one according to Melnyk's Levels of Evidence, though some level four evidence has been included in order to expand upon higher-level findings.

Appraisal of Systematic Reviews

As indicated by an oft-cited entry in the Cochrane Database of Systematic Reviews, there is evidence to suggest that non-pharmacological labor coping methods may not only improve the management of labor pain but also decrease obstetric interventions. According to Jones et al. (n.d.), who reviewed 310 trials for their paper, the inclusion of non-pharmacological therapies increased birthing patient satisfaction with labor and particularly with pain relief during the labor process. Promoting overall relaxation and incorporating acupressure into labor pain management were specifically associated with fewer instrumental vaginal births and a decreased rate of cesarean section. Though Jones et al. (n.d.) find the efficacy of non-pharmacological pain management methods to be somewhat unclear due to limited evidence, they conclude that these methods are non-invasive and safe. In addition, the authors suggest that further studies evaluating the effect of specific non-pharmacological therapies on key birth outcomes are needed. Despite the limits of their review, Jones et al. (n.d.) ultimately recommend that all patients be offered these promising interventions to promote coping during childbirth.

Smith et al. (2018), in a more recently published Cochrane review of non-pharmacological labor pain management, examined 14 trials of several therapeutic modalities: massage, reflexology, chiropractic care, osteopathy, musculoskeletal manipulation, and hot/cold therapy among them. The authors subsequently found that massage and hot/cold therapy methods may have a role in reducing pain, shortening labor, and improving the emotional experiences of birthing people. Six of the trials included in their review reported cesarean section rates as an outcome measure, all of which aimed to test the incorporation of massage into labor pain management. Two trials found a significant benefit to the intervention for the purpose of decreasing cesarean section rates (P=0.04), though the authors note that the overall quality of evidence is low due to small sample size. Despite this, Smith et al. (2018) emphasize the positive effect that non-pharmacological pain management methods can have on a myriad of birth outcomes. The authors conclude that their findings highlight a need for further research on this topic, as a number of the studies included in their review were focused on reported pain control and satisfaction rather than safety. Still, Smith et al. (2018) recommend non-pharmacological pain management as a helpful modality for childbirth with no evidence of harm.

Lastly, in an overview of systematic reviews, Smith et al. (2019) reveal 25 interventions to be effective for primary c-section prevention. Four of those interventions are non-pharmacological methods for pain relief in labor: acupressure, continuous support, hypnosis, and water immersion. The latter two interventions were also found to increase spontaneous vaginal birth and therefore decrease both forceps and vacuum-assisted deliveries. A strength of this review is that it only includes other reviews published after the year 2000: a deliberate effort to reflect on contemporary practices exclusively. The comprehensive selection process employed by the researchers also excludes low-quality reviews based on AMSTAR-2 systematic review criteria, ultimately including 99 reviews in their analysis. Building upon the Jones et al. and Smith et al. (2018) findings, Smith et al. (2019) also conclude that

non-pharmacological pain management techniques are as safe as the usual care provided to control groups across the reviews they considered and should be incorporated for birthing patients in the context of birth settings and available resources. The research team concludes their findings with specific recommendations: continuous support, hypnosis, and acupressure for pain management during labor. All three non-pharmacological labor coping practices they recommend should be implemented in order to reduce unnecessary cesarean births safely (Smith et al., 2019).

Appraisal of Randomized Controlled Trials

Alongside the broader systematic reviews of non-pharmacological labor pain management and their influence on birth outcomes were published, several promising individual studies have been conducted. Gallo et al. (2018) conducted a randomized controlled trial (RCT) in Brazil and found that a series of three non-pharmacological interventions - exercises on a yoga ball, lumbosacral massage, and a warm shower - decreased rates of cesarean section among primiparous patients by 50%. The series also significantly reduced the severity of labor pain and improved satisfaction as reported by the experimental group (Gallo et al., 2018). A similar Australian RCT also published in 2018 reveals that non-pharmacological labor management practices including acupressure, massage, the use of a yoga ball, and breathing techniques also significantly improved several key birth outcomes and reduced primary c-section rates by 45% (Levett et al., 2018). Both RCT studies were limited by somewhat small sample sizes of 80 and 176, respectively, but their comparable results are encouraging. Both groups of researchers ultimately suggest incorporating non-pharmacological labor coping into patient care as a means of safe c-section reduction (Gallo et al., 2018; Levett et al., 2018). “The promotion of birth as a normal physiological event is critical if we are to reduce interventions in birth,” conclude Levett et al. (2018). “This shift requires education and support to help women manage challenges faced during labor and birth. The results from our study demonstrate the potential effectiveness of complementary therapies for labor and birth in providing an

individualized, evidence-based, woman-centered, integrated approach to care that reduces medical interventions and morbidity in labor" (Levett et al., 2018, p. 8).

Appraisal of Cross-Sectional and Cohort Studies

A cross-sectional study by Carroll et al. (2022) presents findings derived from the incorporation of a framework for labor that involves intervals of upright positioning, water immersion, time spent on a yoga ball, and other non-pharmacological pain management methods offered to and chosen by individual birthing patients. The spontaneous vaginal birth rate in patients who reported using the framework was 77.1%, significantly higher than the overall hospital rate of 59.8% and the Irish national rate of 53.8% (P=<0.00001). The study included 809 patients who reported using the framework in 2017 at a large Irish hospital (Carroll et al., 2022). Although Carroll et al. (2022) attempted to reduce recall bias by surveying patients before hospital discharge, their study may have been vulnerable to reporting bias given that its participants were responding in the proximity of healthcare workers. The study also did not include a control group. Nonetheless, the findings of Carroll et al. (2022) contribute to the increasing amount of evidence that non-pharmacological labor management practices can support physiologic birth and decrease cesarean section rates.

Few researchers examine the effect of non-pharmacological labor coping methods in primiparous patients who have received epidural analgesia specifically, but Gribel et al. (2020) did just that in a recent retrospective cohort study (N=986). The therapies evaluated in this study included water immersion, massage, abdominal breathing, positioning, and music. Gribel et al. (2020) ultimately found that these non-pharmacological techniques were significantly associated with both reduced maternal complications and lower c-section rates: 30.4% of the control group had cesarean births, while only 12.2% of the study group did (P=<.0001). They conclude that the likelihood of unplanned cesarean sections among patients using epidural analgesia in labor is reduced by the use of complementary therapies, and they recommend their incorporation into patient care (Gribel et al., 2020).

Rodrigues et al. (2022), in another recent retrospective cohort study, examined all 3,391 medical records from a Brazilian maternity unit between 2013 and 2017. They found that 40.1% of patients in the sample had used a non-pharmacological pain management method during labor, and that this factor decreased risk of cesarean birth by 78% (CI 0.19-0.26). Patients who took warm showers or baths, used a yoga ball, tried different laboring positions, received relaxing massages, and/or were provided guidance on appropriate breathing techniques proved significantly less likely to give birth via cesarean section. Despite its limitations due to study type and possible information bias, the study is strengthened by its sufficient size. The use of secondary sources of information allowed researchers to identify the impact of the variables on mode of birth, which minimized the possibility of type II errors. Rodrigues et al. (2022) found non-pharmacological pain management to be a low-cost measure, and they suggest it should be offered to all birthing patients.

Evidence Synthesis

Research teams behind systematic reviews and RCTs alike consistently conclude that use of non-pharmacological pain management during labor reduces the likelihood of NTSV cesarean birth (Jones at al., n.d., Smith et al., 2018; Smith et al., 2019; Gallo et al., 2018; Carroll et al., 2022; Gribel et al., 2020; Rodrigues et al., 2022). Moreover, even reviews whose authors acknowledge the low-quality of their included studies recommend non-pharmacological labor pain management as a safe and worthwhile practice (Jones et al., n.d.). As noted, non-pharmacological interventions and their use with laboring patients as a means of preventing NTSV cesarean sections is supported by five research articles that qualify as Level 1 evidence: three systematic reviews and two RCTs (Jones et al., n.d.; Smith et al., 2018; Smith et al., 2019; Gallo et al., 2018; Levett et al., 2018) . This already substantial body of work is then reinforced by three pieces of Level 4 evidence in the form of cross-sectional and retrospective cohort studies (Carroll et al., 2022; Gribel et al., 2020; Rodrigues et al., 2022). The majority of analyses designed to test the efficacy of non-pharmacological labor coping techniques for

cesarean section prevention may be small, but preliminary research is nonetheless favorable and supports the findings of higher levels of evidence. Together with the recommendations of professional and public health organizations, there is truly a strong case to be made for the use of non-pharmacological pain management in labor as a means of decreasing NTSV c-sections.

Project Implications

Reducing NTSV c-sections is a nuanced process, and one which experts universally agree requires intervention on multiple levels of influence (ACOG, 2023; ACNM, n.d.; Lagrew et al., 2018). Focusing quality improvement efforts on education and improved labor support, arguably some of the more modifiable factors associated with decreased c-section rates, may be a catalyst for future change in addition to improving patient care on their own. Supporting patients with NPLC methods and tools, moreover, is an accessible and evidence-based way to improve nursing care and to potentially begin decreasing the number of NTSV cesarean sections being performed. In these circumstances, the Labor Lending Library project was conceptualized and initiated.

Rationale

Conceptual Framework

To guide this quality improvement project, a Plan-Do-Study-Act (PDSA) framework was incorporated. The PDSA cycle is a four-step problem-solving model used for improving a process or carrying out change. It includes planning outcome predictions and assigning tasks, implementing the plan, studying the collected data and results, and ultimately either adopting, adapting, or abandoning the process. Meanwhile, the data and subsequent knowledge gained from one cycle should inform the following cycles (Christoff, 2018). Adopting the PDSA framework for this quality improvement project within TFP's group of labor and delivery nurses ultimately demonstrated increased knowledge of resources and their potential to improve patient care, along with the confidence to use those resources appropriately. As ACOG, ACNM, and AWHONN suggest: boosting access to and education regarding NPLC methods are among

key strategies for improving patient care (ACOG, 2023; ACNM, n.d.; Lagrew et al., 2018). This is what the Labor Lending Library intervention aimed to accomplish and - to some degree - succeeded in doing during the study period.

Specific Aims

The specific aim of this quality improvement project was that, by the end of data collection period (July 22, 2023), 75% of nurses surveyed would report that they had sufficient NPLC resources to support laboring patients. A 25% increase in use of those resources, furthermore, would also be demonstrated. Although the entire unit was introduced to the Labor Lending Library, the goal was to solicit the participation of at least 40 nurses in the project's accompanying Qualtrics™ surveys so as to represent half of nursing staff and thereby increase the confidence interval of the data set enough to warrant assertions against its findings.

Global Aim

Although any collected data related to NTSV c-section rates at TFP during the intervention period (July 2nd-July 22nd, 2023) would be preliminary, an additional chart audit was conducted to compare the rate of NTSV births that occurred during the three week study period to those that occurred during the same weeks in July of the previous year (2022). This decision was made in order to potentially draw precursory positive associations between increased use of NPLC methods alongside decreased NTSV c-section rates.

Methods

Context

TFP, the microsystem for this quality improvement project, offers pediatric and birth care services to patients and families in its community. Although connected to and sharing resources with a pediatric unit, the labor and delivery section of TFP operates independently with members of an interdisciplinary team dedicated to the specialty. The unit includes 20 private rooms designed to accommodate the birth process from start to finish, four triage examination rooms, a special care nursery, and a dedicated operating room. The age distribution

for labor and delivery patients within TFP ranges from 18-40 years, although some patients every year are above or below this range (TFP, 2022).

The hospital in which the microsystem is located exists only to serve patients and their families, and The Family Place is no exception to that vision (Concord Hospital, 2023a). The unit is committed to meeting the birth care needs of the community from the prenatal to the postpartum period, providing high quality and compassionate services throughout the birth process (Concord Hospital, 2023b). Patients who deliver their babies at TFP receive care from obstetricians, midwives, nurses, pediatricians, social workers, lactation consultants, childbirth educators, and more. In the event that neonatal intensive care is required for a newborn, TFP facilitates transfers to appropriate facilities within New Hampshire or in the surrounding area. Overall, the focus for care on the labor and delivery unit is to provide safe and positive birth support, and to send birthing people and their newborns home both healthy and well-equipped to begin their lives together (A. Antognoni, personal communication, 2023).

Patient census at TFP averages 20 at any given time, with an average of five admissions daily. Triage examines an additional eight patients per day on average. Patient census overall averages 30 weekly, 116 monthly, and 1,400 annually (A. Antognoni, personal communication, 2023). Considering the fact that the majority of TFP admissions involve an associated newborn, these patient census numbers are actually twofold. A smaller proportion of patients are admitted to the unit as overflow from other hospital microsystems, or - most often - for postoperative care after a gynecologic procedure or surgery (A. Antognoni, personal communication, 2023). This continually high patient load, in combination with the needs of additional overflow patients, often limits the time TFP nurses have when it comes to providing patient care. Ultimately, these realities further support this quality improvement project: supplying nurses with increased access to NPLC tools and consolidating instructions on how to use them increases the use of these methods and consequently the quality of labor support being provided on the unit.

Cost-Benefit Analysis

Although the cost of childbirth of any type in America varies widely based on location, one of the major contributing factors to overall cost is mode of delivery. According to a 2023 analysis of standard charges across hospitals in the United States, the average cost difference between a cesarean section and a vaginal delivery is greater than $9,000 (Rivelli, 2023). Rivelli (2023) finds that cesarean births cost $22,646 on average, but that number can climb to more than $58,000 depending on the state in which the procedure is performed. Given that average length of hospital stay doubles after a cesarean birth, this cost is associated not only with the procedure itself but with the recovery it requires and the added complications it can contribute (Rivelli, 2023). The Health Care Cost Institute (HCCI), a nonprofit organization dedicated to analyzing American insurance claims data, reports that childbirth accounts for an estimated one in every six dollars spent on inpatient healthcare. Childbirth is therefore a significant element of health care utilization and spending, the HCCI points out, particularly for hospitals (Johnson et al., 2020).

DeJoy et al. (2020) aimed to evaluate the financial impact of reducing primary cesarean sections by collecting data from a Massachusetts hospital that had adopted initiatives set by the American College of Nurse Midwives (ACNM) for the purpose of NTSV c-section prevention. All patients giving birth at Baystate Medical Center from October 1, 2016 to March 31, 2017 were identified (N=1,747). Total hospital costs were then calculated for each of six groups: vaginal deliveries, primary cesareans, repeat cesareans, and the linked newborns for each birth type. A model was developed to estimate cost differences for first and second births, as well as for overall cost savings. For the NTSV birth group, total costs for primary cesarean and newborn care were $5,989 higher than vaginal birth and associated newborn care. For subsequent births, repeat cesareans and newborn care were $4250 higher when compared with vaginal birth. 69 primary cesareans were prevented during the data collection period, for an actual cost savings of

$413,241. Projecting the prevention of 66 subsequent repeat cesareans, DeJoy et al. (2020) found, would result in additional savings of $280,500 and a total savings of $693,741.

Straightforward as though the cost benefits of NTSV cesarean reduction may seem, a conversation about them is incomplete without addressing the fact that professional payment is often higher for cesarean birth than for vaginal birth. While providers are trained to do no harm and to act only in the best interests of their birthing patients, the pressures of payment incentives do appear to have an influence on c-section rates (DeJoy et al., 2020). Indeed, a 2023 cross-sectional study of US national hospital discharge data reveals that delivering at hospitals with higher profits from cesarean procedures was associated with a significantly higher likelihood of undergoing a cesarean delivery when compared with patients who delivered at lower-profit hospitals (Sakai-Bizmark et al., 2023). Over 13 million births were included in the analysis, of which 2,202,632 (16.7%) were cesarean deliveries. After establishing that cesarean delivery profits varied from $4,969 to $26,129, Sakai-Bizmark et al. (2023) found that patients admitted to hospitals in the two highest profit quartiles had higher probabilities of a cesarean delivery compared with those cared for during childbirth at hospitals in the lowest profit quartile (P=.007 and P=.005, respectively). In health systems where physician incomes are tied to procedure quantity, Sakai-Bizmark et al. (2023) contend, physician behaviors in general are likely associated with financial incentives. These findings highlight a key systemic contributor to the high number of cesarean deliveries in the US, and should inform policymakers and payers alike of the need to develop policies that stand to reduce cesarean rates.

The cost benefits associated with NPLC use on its own are not especially well-studied, within the childbearing population or otherwise. Dusek et al. (2018) aimed to change this when they studied one hospital's incorporation of integrative medicine, a promising non-pharmacologic pain management program. The purpose of the research by Dusek et al. (2018) was to examine the changes in patients' pain secondary to receiving integrative therapy, and ultimately compare the total cost of integrative medicine to usual care during an inpatient

hospital admission. Dusek et al. (2018) found in the end that, for patients receiving non-pharmacologic integrative medicine therapies, pain was reduced by an average of 2.05 points. Furthermore, this pain reduction was associated with a cost savings of $898 per hospital admission (Dusek et al., 2018). Even disregarding the potential savings associated with c-section prevention, non-pharmacological pain management in general has the potential to decrease costs in a meaningful way.

When it came to implementing the Labor Lending Library at TFP, there were limited costs to consider. Qualtrics™, the instrument used to collect data for this quality improvement project, is a free platform. Many of the tools that were used in support of the intervention are already present on the unit, though they had not previously been consolidated or paired with nursing education. A number of additional items for the Labor Lending Library were donated in support of the project. Non-financial costs were certainly incurred by the project lead in the form of over 500 hours spent on the unit between planning, data collection, and implementation of the project. Still, the cost of not implementing an effort of this type truly pales in comparison.

Intervention

To increase the use of NPLC methods at TFP, nursing staff were provided with a multi-format introduction to the Labor Lending Library prior to the study period. Subsequently, during data collection, nurses were encouraged to use NPLC methods with the support of the library. Voluntary participation in pre and post-intervention surveys via Qualtrics™ were used to measure the efficacy of the Labor Lending Library project, as well as to provide further insight into the initiative overall. Stakeholders in this intervention included TFP's staff nurses, unit management, the project lead, and - above all - birthing patients and their families.

Study of the Intervention

As noted, data to reflect the efficacy of this quality improvement project was generated from the results of the surveys distributed to nursing staff both before the Labor Lending

Library was introduced and after the intervention period concluded. To generate preliminary data related to the long-term goal of NTSV cesarean reduction on the unit, also as noted, a baseline level was established and compared to c-section rates during the intervention period. That primary data, combined with the structure of the surveys, allowed the project lead to both evaluate the success of the intervention and identify areas for improvement. Ultimately, the data generated in combination with the feedback received from nursing staff will direct future PDSA cycles.

Analysis

Following its implementation on July 2nd, 2023, an assessment of the Labor Lending Library and its corresponding nurse education was conducted on July 22nd, 2023. The expectation was that 75% of nurses surveyed would report that they have sufficient NPLC resources to support laboring patients, as demonstrated by an rating of 8.5 out of 10 or better on the post-intervention survey. A 25% increase in use of those resources would also demonstrate that the intervention has influenced the number of nurses incorporating NPLC methods into patient care. Ultimately, the global outcome measure was the unit's NTSV c-section rate for 2023, a data point that was tracked by TFP.

Ethical Considerations

The incorporation of NPLC methods into nursing care is evidence-based, and encouraging their use poses no risk to patient care or outcomes. The project lead is an employee of the facility in which the Labor Lending Library project was implemented, and has accepted a permanent nursing position at TFP to begin following the intervention period. Therefore, response bias by nurses may be noted. This project proposal was submitted to the University of New Hampshire Department of Nursing Quality Review Committee for review, and it received an exempt status from the Institutional Review Board.

Results

Initial Steps to the Intervention

To improve intrapartum nursing care within the global goal of primary c-section reduction at TFP, nursing staff were first voluntarily surveyed using the online platform Qualtrics™ in order to establish a baseline level of knowledge regarding NPLC methods. Nurse perception of the sufficiency of the tools available on the unit to facilitate use of these methods was also measured in the survey, as well as the frequency with which nurses used specific non-pharmacological techniques with their patients prior to the intervention. Following initial data collection, nurses were introduced to the Labor Lending Library cart. Information about it and the tools it contains were distributed via the weekly email newsletter, via posters hung in key locations on the unit, and via a laminated set of infographics attached to the cart for educational reinforcement. Nurses were then encouraged to incorporate NPLC methods into their care of birthing patients. Throughout the process, they were supported by unit management and directed to the author with questions.

At the end of the intervention period, a follow-up Qualtrics™ survey designed to re-evaluate NPLC nursing knowledge and to generate feedback about the initiative overall was distributed. Nurses were asked to share whether they had used the Labor Lending Library and whether they felt the initiative benefitted their nursing practice. As in the first survey, nurses were asked to report how often they suggested individual NPLC methods to their patients following the introduction of the Labor Lending Library on the unit. The survey also requested suggestions for improvement and other feedback. Both Qualtrics™ surveys included multiple choice and Likert scale-style questions. The post-intervention survey also contained a free-text response box. Ultimately, 20 nurses participated in the pre-implementation survey and 18 nurses participated in the follow-up.

To assess for a preliminary positive effect on the rate of vaginal birth among traditionally low-risk NTSV pregnancies, which are the focus of the unit's current c-section reduction efforts, birth record data was collected via chart audit during the intervention period. According to those

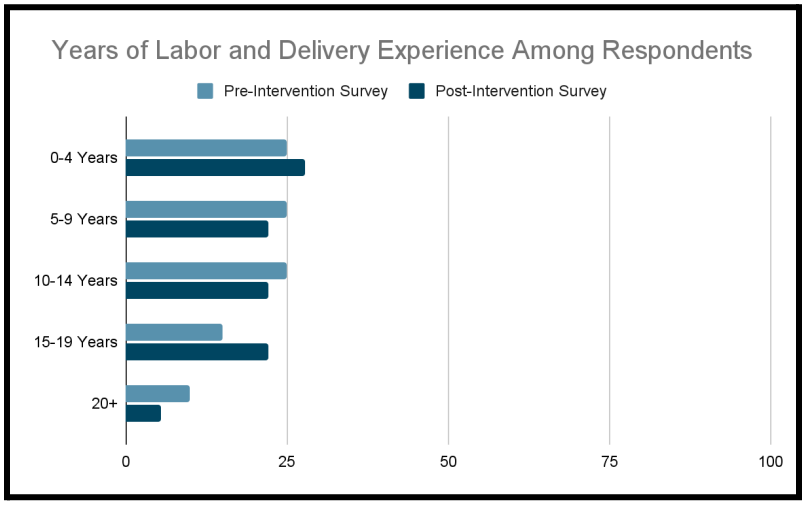
records, as previously mentioned, the overall NTSV c-section rate was 26.2% overall in 2022 and 26% during the same July time frame as the study period for this quality improvement project.

Measures and Outcomes

Of the 20 nurses who opted to participate in the pre-intervention survey, 25% reported that they had been working in labor and delivery for less than five years. An additional 25% had worked between 5-9 years and between 10-14 years at the time they were surveyed, respectively. 15% of respondents reported working in the field between 15-19 years, and 10% had been on the job for 20 years or more. The labor and delivery experience distribution was similar among respondents to the post-intervention survey, as demonstrated in Figure 1.

Figure 1

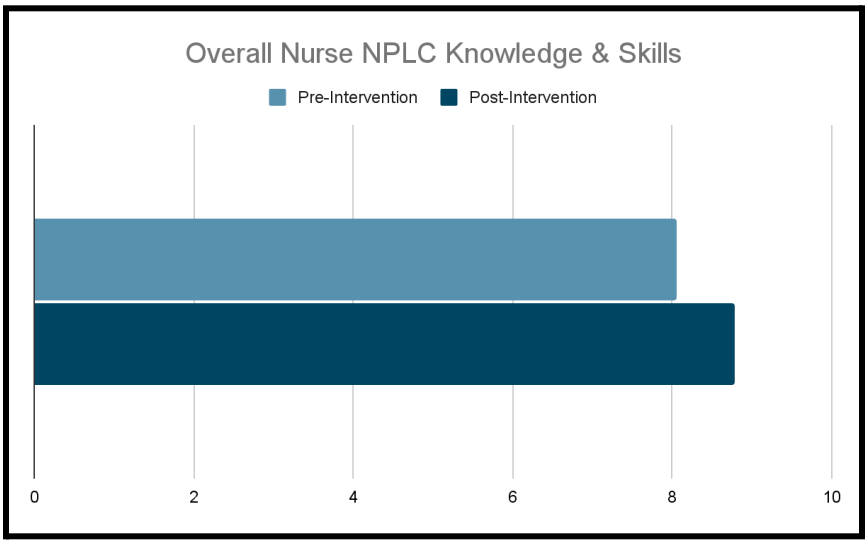
Demographic Data



When asked to rate their knowledge and skills regarding the provision of NPLC support to their laboring patients on a scale of 1 to 10, nurses responding to the pre-intervention survey rated themselves an average of 8.05. The minimum recorded rating was 5 and the maximum was 10, with a Standard of Deviation of 1.47. Those who responded to the follow-up survey rated their knowledge and skills at an average of 8.78, with a Standard of Deviation of .42. The change represents a 9% increase in overall reported nurse knowledge following this quality improvement project (Figure 2).

Figure 2

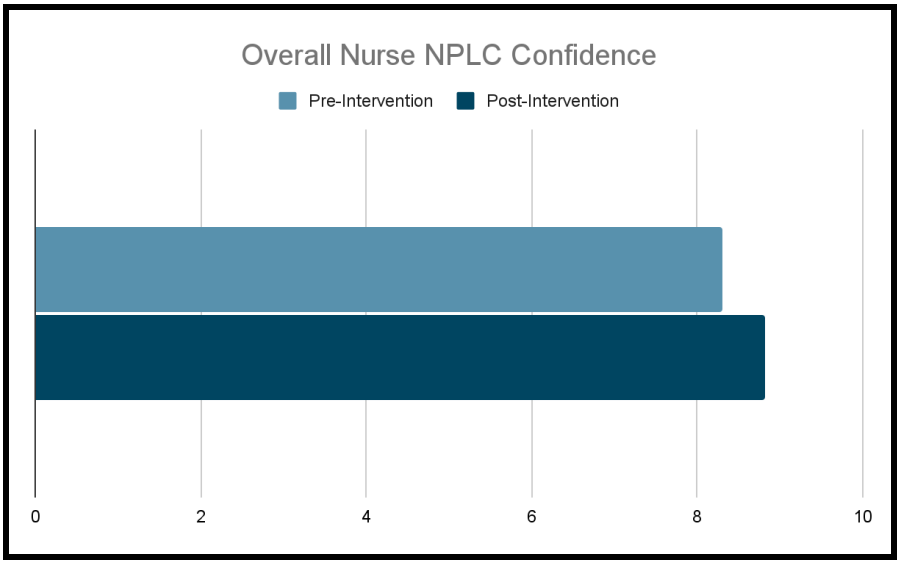
Comparison of Overall Nurse Rating of NPLC Knowledge and Skills



When it came to rating their confidence level regarding the provision of NPLC, all responding nurses rated themselves at a 6 out of 10 or higher initially. Their mean confidence score was 8.3, with a Standard of Deviation of 1.27. On the post-intervention survey, nurses rated their confidence level at an average of 8.82 out of 10, with a Standard of Deviation of .62. This represents a 6% increase in overall NPLC provision confidence among nurses from pre to post-intervention (Figure 3).

Figure 3

Comparison of Overall Nurse Confidence in Providing NPLC

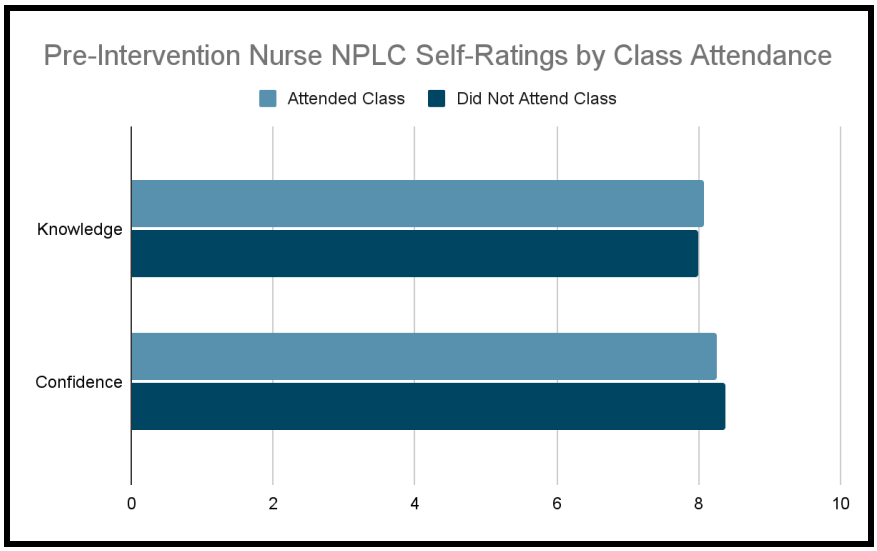


To further establish baseline nurse knowledge of NPLC methods and tools prior to initiating this quality improvement project, nurses were also asked whether they had attended a labor support continuing education class that had been offered on the unit earlier in the year. 60% of respondents reported that they had gone to the class, while 40% did not. Similarly, those responding to the post-intervention survey reported attending the class at a level of 58.8%.

Attending the labor support continuing education class appeared to have little effect on levels of nurse knowledge and confidence regarding NPLC prior to the intervention. Those who attended the class reported an average knowledge level of 8.08 out of 10, while those who did not reported an average knowledge level of 8 out of 10. Labor support class attendees subsequently rated their confidence prior to the intervention at an 8.25 out of 10 on average, while those who did not attend rated their knowledge at an average of 8.37 out of 10 (Figure 4).

Figure 4

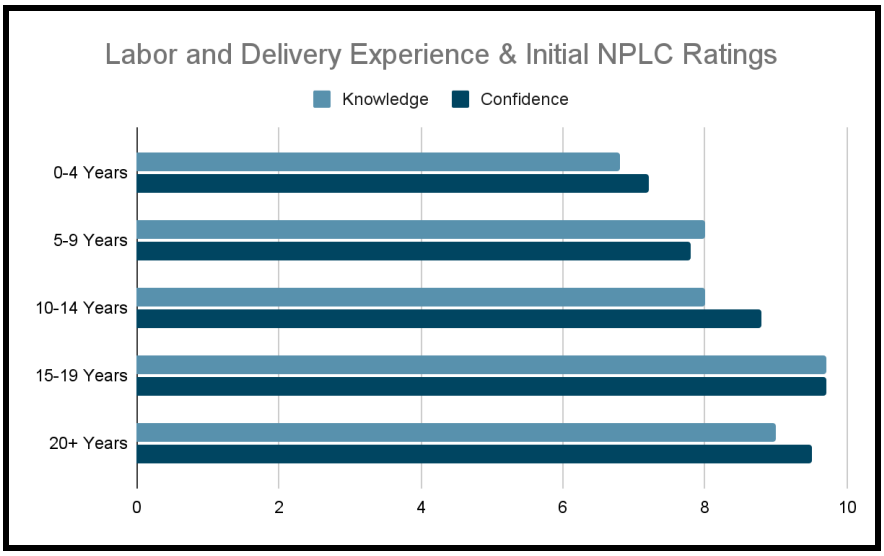
Influence of Labor Support Class on Pre-Intervention Knowledge and Confidence



Conversely, years spent on the job did appear to have an effect on pre-intervention levels of nurse knowledge and confidence. Nurses reporting having spent less than five years working in labor and delivery rated their NPLC knowledge level at an average of 6.8 out of 10, while those who had been working in the specialty for more than 20 years rated theirs at an average of 9 out of 10. Similarly, survey respondents with less than five years of labor and delivery experience rated their confidence level regarding the provision of NPLC at an average of 7.2 out of 10, while those with 20 or greater years of experience rated theirs at an average of 9.5 out of 10 (Figure 5).

Figure 5

Influence of Labor and Delivery Experience on Pre-Intervention Knowledge and Confidence



Number of years spent working in labor and delivery also appeared to have an effect on NPLC knowledge and confidence levels following the Labor Lending Library intervention, as the most significant changes in level were reported by those with the least amount of experience. Knowledge levels increased from an average of 6.8 out of 10 in the pre-intervention survey to an average of 8.8 in the post-intervention survey for responding nurses with between 0-4 years on the job. This represents a 29% increase in reported knowledge levels during the study period for that group. Similarly, reported NPLC confidence levels also saw the most significant jump among nurses in the 0-4 years of experience category: from an average of 7.2 out of 10 prior to the introduction of the Labor Lending Library to an average of 8.4 after it. Changes in knowledge and confidence level from pre to post-intervention were less marked among more experienced nurses, though most reported increased levels of both knowledge and confidence following the study period (Figure 6, Figure 7).

Figure 6

Effect of Labor and Delivery Experience on Change in Knowledge Level

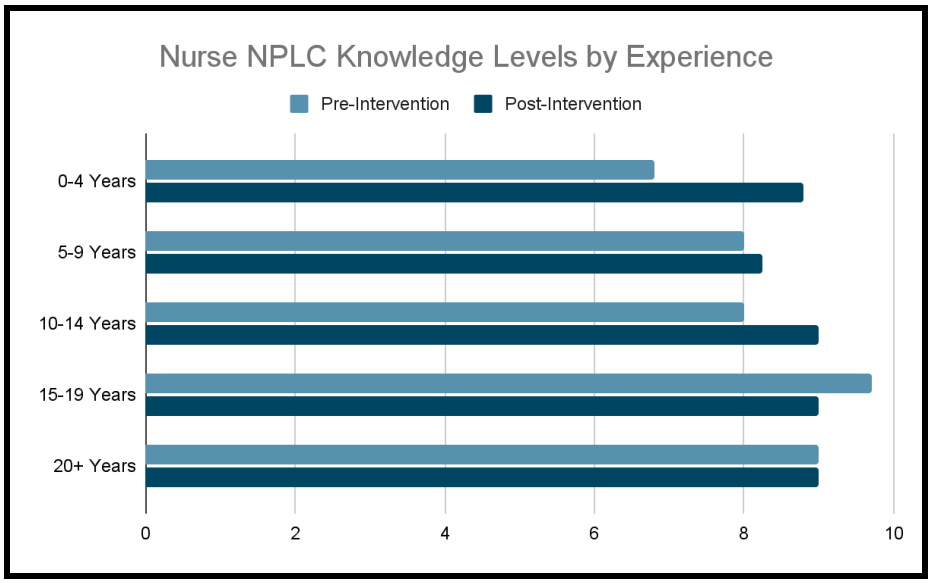
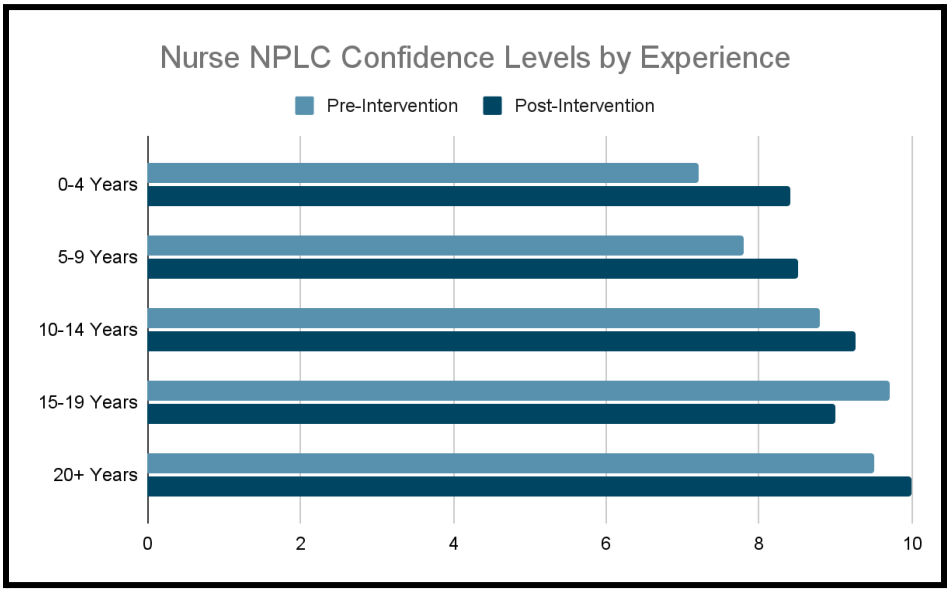


Figure 7

Effect of Labor and Delivery Experience on Change in Confidence Level



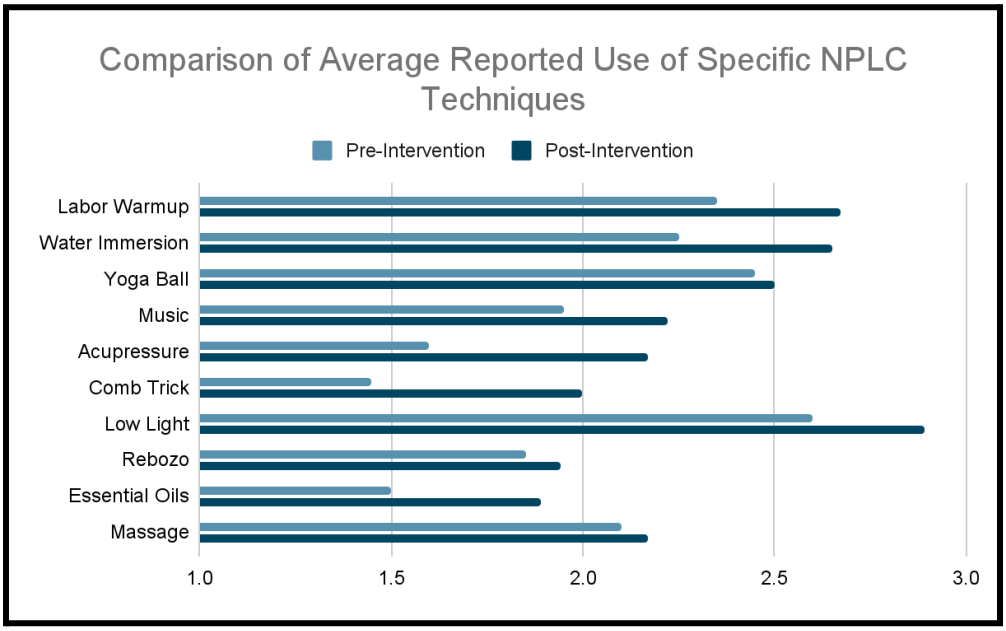
The frequency of use of specific NPLC methods were further assessed via Qualtrics™ using a multiple-choice question format. Nurses were asked to report whether they "never," "sometimes," or "always" suggest 10 individual non-pharmacological interventions - from low light and music to massage and water immersion - for their laboring patients. The comb trick, which is a way to encourage patients to disrupt contraction pain by squeezing the teeth of a

comb into their palm, was initially reported by 65% of responding nurses as something they "never" suggested. On the other hand, low light was the most common "always" suggestion on the pre-intervention survey, with 60% of respondents selecting this option.

Following the data collection period, responding nurses reported an increase in suggested patient use of all categories of NPLC support, most notably acupressure and the comb trick. Considering a "never" survey response to be a 1, and an "always" response to be a 3, acupressure experienced a significant rise in average response from 1.6 to 2.17: a 35% increase in reported use of this technique. Utilization of the comb trick saw an increase in average response from 1.45 to 2, or a 37% increase in reported use (Figure 8).

Figure 8

Comparison of Use of Specific NPLC Techniques from Pre to Post-Intervention

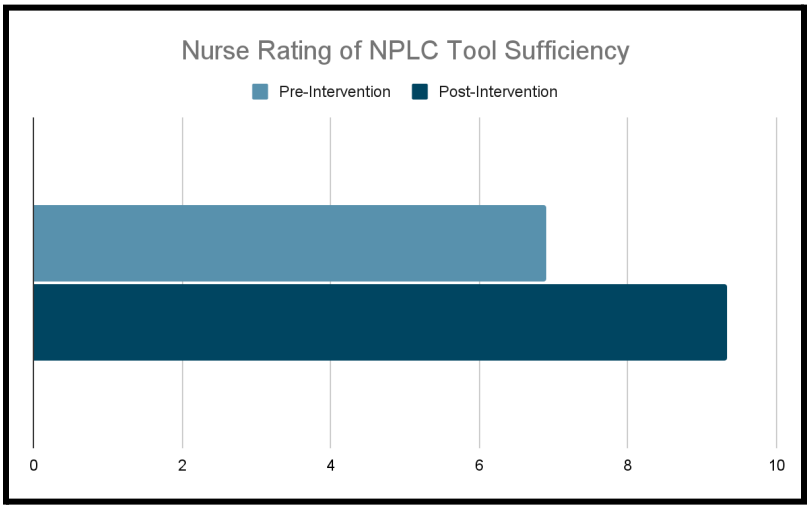


Nurses who responded to both surveys were also asked whether they felt they had sufficient tools available on the unit to support incorporating NPLC into nursing care, and to rate how sufficient they found the tools they had at their disposal to be on a scale of 1-10. Their initial ratings ranged from 4-10, with a mean of 6.9 and a Standard of Deviation of 2.21. Following the introduction of the Labor Lending Library and the intervention period, nurses

rated the sufficiency of tools to support NPLC on the unit at an average of 9.33 in the post-intervention survey (Figure 9). Post-intervention ratings ranged from 8-10, with 94.44% of respondents rating tool sufficiency above an 8 out of 10. This represents a 35% increase in rating of the sufficiency of available tools to support NPLC on the unit following the introduction of the Labor Lending Library.

Figure 9

Comparison of Nurse Rating of Sufficiency of Tools for Providing NPLC at TFP



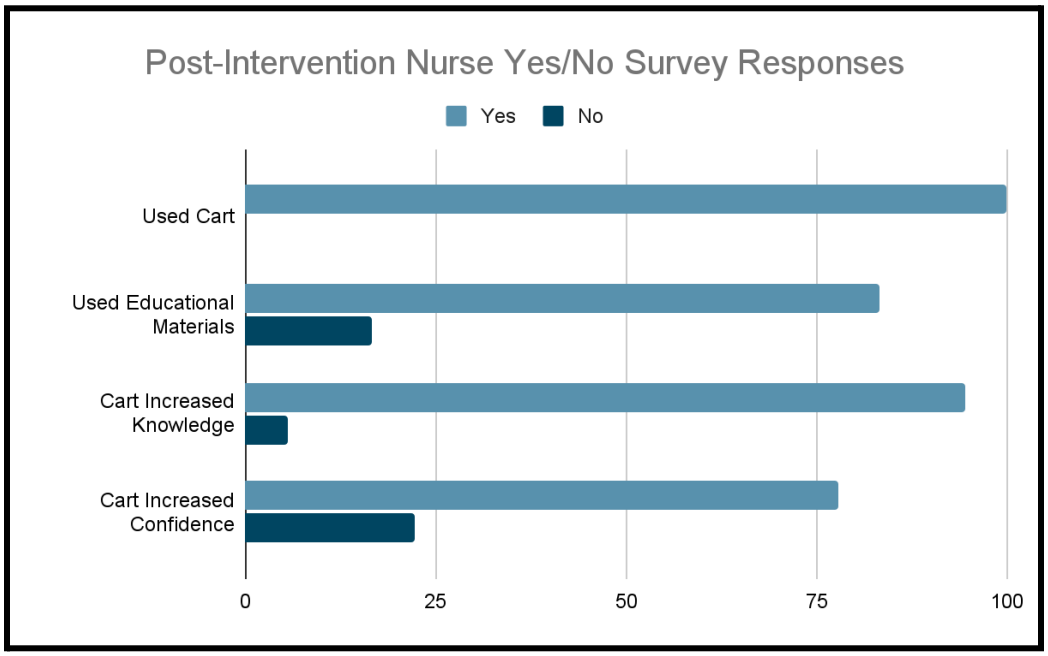
The post-intervention survey contained four Yes/No multiple-choice questions in addition to the content from the pre-intervention survey designed to assess the efficacy of the Labor Lending Library cart. Nurses were asked whether they had used the library's tools with their patients and whether they had used the corresponding educational content. They were also asked whether the cart had increased their knowledge regarding NPLC methods, and likewise whether the cart had increased their confidence when it comes to providing non-pharmacological nursing care to their laboring patients.

100% of post-intervention survey respondents reported that they had used the Labor Lending Library. 83.33% said they had used the cart's educational materials, while 16.67% said that they did not. Meanwhile, 94.44% of nurses reported that their knowledge of NPLC methods had increased with the help of the Labor Lending Library. 5.56%, conversely, said that it did not.

Finally, 77.78% of post-intervention survey respondents reported that the cart had increased their confidence regarding the provision of NPLC support. 22.22% said that it had not (Figure 10).

Figure 10

Post-Intervention Survey Responses



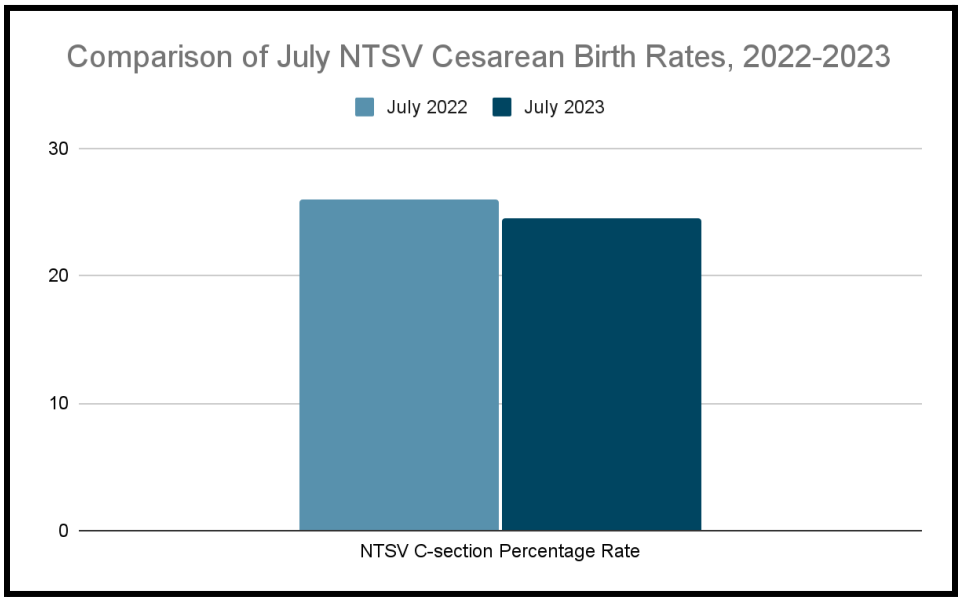
To conclude the post-intervention survey, responding nurses were given the option to provide suggestions and feedback for the Labor Lending Library. Responses were overwhelmingly positive and included insights such as *Helpful to have everything in one place and visual cues for a labor nurse's "bag of tricks," Maybe create a system for returning equipment to the cart so that we can be sure nothing is getting left behind in pt. rooms, You taught this old dog a new trick (the comb trick) and consolidated our patient comfort stuff in one mobile unit which is great,* and *Need a second one for the other side of the unit now!*.

During the Labor Lending Library intervention period, as noted, birth data was collected from a unit chart audit as a way to compare baseline NTSV cesarean rates with those recorded while the cart and its non-pharmacological tools and corresponding nurse education were available for nurses to use with their patients. Although this provides only a preliminary

snapshot of the project's potential to affect change in the primary cesarean rate, it is worth noting that the rate was 24.48% during the three week time frame. This is representative of a 6.2% reduction in rate from the same time frame the previous year (2022) and 7.2% reduction from the overall rate of NTSV c-sections on the unit in 2022, as shown in Figure 11.

Figure 11

Comparison of July NTSV Cesarean Data in 2022 and 2023 at TFP



Contextual Elements

One noteworthy contextual element influencing the study of this intervention is that participation was limited to nurses willing to complete the surveys within a limited time frame of one week on each end. The study period was also brief at a length of three weeks, with 83 births occurring on the unit during that time. Additionally, the project lead had hoped to garner 40 survey responses on each end. This number of responses would represent approximately half of labor and delivery nursing staff at TFP. Ultimately, the project lead is working with 20 and 18 responses to the surveys. The Labor Lending Library project and its associated surveys were also implemented during a historically busy season for birth at TFP, a factor which may have impeded participation.

Associations

Allowing for flexibility by providing a survey link in the newsletter, posting a QR code, and offering nurses the opportunity to photograph the provided QR code to scan at their convenience likely boosted participation in the project surveys. Still, it is entirely possible that nurses could have forgotten to circle back and complete the surveys during the data collection period, thereby decreasing participation. The contextual element of nurses being asked to participate in a project and survey during a busy period of time on the unit likely reduced the number of participants. Of the nurses who did participate in the survey, 100% acknowledged the terms and provided informed consent.

Unintended Consequences

There were no unintended or unexpected consequences associated with this intervention and its study.

Missing Data

All collected data for this project was submitted appropriately by the nurses who opted to participate, and no data were eliminated from the data set. As noted, the relatively minimal period of time for implementation of this project almost certainly affected the number of overall participants. The initial pre-intervention survey garnered 20 responses, representative of 23% of total eligible nursing staff at TFP. The subsequent post-intervention survey ultimately included 18 responses, or 20% of TFP nurses. This rather low participation rate could be due to a 9.2% increase in expected births on the unit during the study period, which again took place during a busy time of year for birth overall. Survey fatigue may also have limited the number of responses, as participants were ultimately asked to complete multiple surveys during the study of the Labor Lending Library intervention.

It is also worth noting, relative to the NTSV c-section rate on the unit during the three weeks the Labor Lending Library was being studied, that the collected data does not reflect which nurses and which specific births included non-pharmacological labor coping support

courtesy of the cart. Although 100% of the nurses who responded to the post-intervention survey reported using the Labor Lending Library with their patients during the intervention period, the relationship between the cart and the 6.2% decrease in NTSV c-section rate from the same time frame in 2022 is tangential.

Discussion

Summary

Key Findings

Although not all specific aims were ultimately realized, data collected from this quality improvement project suggest that incorporation of the Labor Lending Library at The Family Place (TFP) has improved nurse knowledge and confidence regarding the use of non-pharmacological labor coping (NPLC) methods as part of patient care. As noted, TFP nurses reported a 9% increase in knowledge levels and a 6% increase in confidence levels from the pre-intervention survey to the post-intervention survey (Figure 2, Figure 3). When asked directly whether the Labor Lending Library had improved their knowledge regarding NPLC, 94.44% of nurses said yes. Additionally, 77.78% of nurses reported that the cart had increased their confidence regarding the provision of NPLC nursing care (Figure 13). Increases in knowledge and confidence levels among nursing staff could promote use of NPLC methods on the unit over time, subsequently improving the outcomes outlined previously.

Respondents to the follow-up survey also reported a significantly more sufficient level of available tools to support the use of these methods when caring for laboring patients since the introduction of this intervention on the unit. Prior to initiating this quality improvement project, nurses collectively rated the sufficiency of tools to support NPLC on the unit as a 6.9 out of 10, with a Standard of Deviation of 2.21. Following the introduction of the Labor Lending Library on the floor, nurses rated the sufficiency of tools at an average of 9.33 out to 10, with a Standard of Deviation of .58. This represents a 35% increase in nurse perception of sufficient tools being available on the unit from the start of the study period, as depicted in Figure 12.

Survey questions about the number of years worked in the labor and delivery specialty and about whether respondents had attended the labor support class prior to the introduction of this quality improvement project were designed to measure baseline levels of knowledge based on exposure to NPLC practices. According to data, as noted in Figure 4, attending the labor support class prior to the introduction of the Labor Lending Library did not appear to affect pre-intervention levels of nurse knowledge or confidence on this particular topic in any meaningful way. On the contrary, having spent more years in the field increased initial levels of NPLC knowledge and confidence (Figure 5).

Changes to reported knowledge and confidence levels by experience were compared by the project lead as a way to measure the Labor Lending Library cart's efficacy and to gain insight into whether nurses in a specific group may benefit from this type of intervention more than others. As demonstrated in Figures 6 and 7, nurses with less labor and delivery experience tended to report more profound changes to their NPLC knowledge and confidence levels from pre to post-intervention than those with more experience. These findings suggest that the intervention may be most effective for newer nurses, though all groups appeared to benefit with the exception of those in the 15-19 years of experience grouping.

Again, 83 births occurred on the unit during the three week study period from July 2nd to July 22nd, 2023 according to unit birth log data. There were 53 vaginal births and 30 cesarean births. After eliminating repeat c-sections and those performed for breech presentation and controlling for the Vaginal Birth After Cesarean (VBAC) rate, the rate of NTSV c-sections was 24.48%, which is 6. compared to the rate during this time period in 2022.

Relevance to Rationale

The PDSA cycle framework utilized in this quality improvement project proved to be valuable in demonstrating the benefits of providing a consolidated collection of NPLC tools and corresponding education for the people at the front lines of labor and delivery care: nurses. Expanded knowledge of resources and their potential impact, along with the confidence to use

those resources appropriately, may improve nursing care in the short-term and birth outcomes in the long-term. As the professional organizations suggest and the literature supports: boosting access to and education regarding NPLC methods are among key strategies for improving patient care and decreasing NTSV c-section rates within labor and delivery units in the United States and around the world (ACOG, 2023; ACNM, n.d.; Lagrew et al., 2018).

Relevance to Specific Aims

The specific aim of this quality improvement project was that 75% of nurses surveyed would report that they have sufficient NPLC resources to support laboring patients at the end of the study period, while a 25% increase in use of those resources would also be demonstrated. The project lead determined that an post-intervention sufficiency rating of 8.5 out of 10 or better by surveyed staff would indicate that the former goal had been met, and this was achieved with 94.44% of nurses rating tool sufficiency at a 9 out of 10 or better. As noted, an average rating of 9.33 out of 10 following the introduction of the Labor Lending Library on the unit was recorded.

Of the 10 NPLC methods specifically studied, all saw an increase in reported incorporation into nursing care. Yoga balls had the smallest increase in use at 2% from pre to post-intervention, while the use of the comb trick technique had the greatest increase in use at 37%. Overall, use of specific non-pharmacological interventions with laboring patients rose an average of 16.3%. Although this falls below the established benchmark of 25%, the initial increases are promising. Future PDSA cycles could emphasize the specific NPLC techniques which saw a less marked increase in use from pre to post-intervention, and maximize some of the insight gained regarding which labor and delivery nurses appear to benefit most from this type of intervention.

Relevance to Global Aim

With the caveat that conclusions about the effect of increased use of NPLC methods on the NTSV c-section rate cannot be drawn after a three week study period, the 6.2% decrease in rate from the same time period the previous year is also promising. This quality improvement

project precedes the implementation of a number of initiatives geared toward decreasing NTSV c-section numbers on the unit in the future, and is a demonstration of the TFP's commitment to meeting this important goal.

Project Strengths

One strength of this quality improvement project is its user-friendly design and customizable nature. These attributes may enable similar labor and delivery microsystems to reproduce a Labor Lending Library-type intervention, potentiating a larger impact on the birthing population overall. As noted, a comprehensive review of available literature on the topic supports the increased use of NPLC methods as a means to improve nursing care and ultimately decrease the incidence of low-risk NTSV cesarean births. Use of the Qualtrics™ survey platform adds to this intervention's ease of use and versatility. Qualtrics™ content is highly adaptable, and could allow future project leaders to adjust to their own individual labor and delivery units.

A particular strength of this project includes enthusiastic participation by leadership and nursing staff alike. Both groups of key stakeholders are dedicated to improving patient care at every opportunity, and the unit's culture is strongly supportive of the quality improvement process. TFP's exceptional managers encouraged interdisciplinary teamwork via emails and weekly meetings with the project lead, facilitating communication with higher leadership and offering support throughout the implementation process.

Interpretation

Association Between Intervention and Outcome

The Labor Lending Library intervention was developed based on available literature and input from TFP management regarding barriers to NPLC technique utilization within the context of primary cesarean reduction, with the expectation that use of NPLC methods ultimately see a 25% increase in use once the cart was created. Though the outcome patterns associated with this project did not measure up to the goal for expanded use during the study period, there was an increase in all ten studied NPLC methods and an overall average increase in

use of 16.3%. Given that survey respondents also reported a 35% increase in the perception of NPLC resource sufficiency and responses to the project were overwhelmingly positive, the benefits of this intervention may appear primarily within the context of overcoming perceived barriers to accessibility. Potential contributions may appear in the long-term rather than in the short-term, as staff continue to incorporate NPLC methods into nursing care.

As the literature demonstrates, incorporating non-pharmacological labor coping techniques into patient care supports the physiologic birth process and improves health outcomes for both birthing people and neonates (Jones et al., n.d.; Smith et al., 2019; Rodrigues et al., 2022). Despite this, research shows that these methods are not consistently endorsed or practiced by all labor and delivery professionals (Zieleinski et al., 2016; Ingram et al., 2022). As Ingram et al. (2022) found, lack of knowledge and environmental barriers are among the top contributors to an underutilization of NPLC techniques among labor nurses and midwives. As such, efforts toward eliminating these barriers stand to have a sizable impact in the future at TFP and anywhere else they may be exerted.

Comparison of Results and Influence of Context

The global outcome of this intervention was similar to others of its nature. A quality improvement project conducted by a Nebraska Methodist College student in the labor and delivery setting focused both on NPLC and c-section reduction yielded improvements, though minimal enough to be statistically insignificant, to the NTSV c-section rate during the study period (Vegte, 2022). Notably, Vegte (2022) implemented a number of measures simultaneously as part of a toolkit designed to reduce NTSV cesareans in their microsystem rather than studying the effect of NPLC on its own.

To this point, the outcomes related to the specific aim of this intervention do not appear to be studied in detail elsewhere. Though the increased incorporation of NPLC methods into nursing care is widely accepted as a way to improve rates of physiologic birth, research into how to successfully accomplish this on labor and delivery units is lacking. Insight into perceived

barriers to the provision of NPLC by researchers such as Ingram et al. (2022) have played a crucial role in laying the foundation for future research, to be sure. Going forward, additional quality improvement projects aimed at increasing the use of NPLC support among labor and delivery nurses can help determine how individual microsystems can best facilitate this specific type of progress.

Project Impact

Initiating the Labor Lending Library project ultimately served to expand the use of NPLC at TFP. The project further provided an opportunity for nursing staff engagement, and was a way to begin the process of applying evidence-based solutions to the established NTSV c-section rate problem within the microsystem. Despite the unmet goal of this intervention, staff response to it was overwhelmingly positive. Several nurses indicated that the Labor Lending Library helped address the barrier of convenient access to helpful NPLC resources and tools. According to the unit manager, the project also appeared to facilitate staff connection between NPLC methods in NTSV c-section rates. The Labor Lending Library project supported a culture of teamwork and quality improvement within the microsystem overall, while emphasizing patient care and laying the foundation for future initiatives.

Opportunity Costs and Strategic Trade-Offs

The estimated total cost of this quality improvement project was $0, as all items on the cart were either donated or purchased with donations by the project lead. As noted, the cost of care for a patient who undergoes a c-section pales in comparison to the nominal expense of initiating an intervention that can minimize this occurrence going forward.

Limitations

Limits to the Generalizability

Generalizability of this quality improvement project is limited by its focus on labor and delivery nursing care specifically. Other factors further disrupting generalizability include the

somewhat limited participation by staff and subsequently small data sample collected, as well as the time constraints of the project.

Factors Limiting Internal Validity

TFP experienced an unexpected 9.2% increase in births during the study period, which may have impeded staff participation and/or affected survey results by limiting the amount of data available for analysis. The observed outcome may have differed from the expected outcome for portions of the intervention in this context. As this initiative is continued and further PDSA cycles are completed, leadership may develop a more accurate picture of NPLC support trends from several cycles worth of audits. As noted, the project lead also accepted a permanent position at TFP during the course of this project: a factor which may have resulted in some nurse response bias. Despite these limitations, the study remained free from any other issues.

Efforts Made to Minimize and Adjust for Limitations

Continued nurse engagement tactics were used throughout the project in an attempt to increase use of the Labor Lending Library and its accompanied surveys. These efforts included staff-wide emails, poster hanging, and presentations at both multiple change-of-shift meetings and to the Obstetric unit practice committee. Staff were continually reassured of the confidentiality of their responses and informed that their feedback would not be punitive to the project lead on multiple occasions in an attempt to mitigate response bias.

Conclusions

Usefulness of the Work

This quality improvement project was beneficial to TFP, as it increased use of NPLC methods among labor and delivery nurses on the unit and successfully eliminated one of the major identified barriers to the incorporation of these techniques: access to and sufficiency of the necessary equipment. It was also useful in empowering unit leadership and nursing staff alike to participate in an evidence-based practice change as a way to work toward the unit's global goal of NTSV c-section reduction.

Sustainability

According to unit management, use of the Labor Lending Library will continue indefinitely and will hopefully produce decreased NTSV cesarean rates over time. In order to produce sustainable change in the unit, use of the Labor Lending Library will need to occur consistently and assessed regularly. Long-term success will depend on nurse participation and leadership involvement to ensure that NPLC practices are being observed and that the intervention is modified as necessary.

Implications for Practice and Further Study

Implications for practice include continuing to promote NPLC methods, as evidence supports the benefit of these interventions as a means to promote NTSV c-section reduction. A system for tracking which specific births involved the use of NPLC methods supported by the Labor Lending Library should be developed to enhance the study of the intervention's effect on c-section rates. A protocol for returning Labor Lending Library items to the cart after their use should be developed, as one post-intervention survey respondent suggested. Lastly, in success, a duplicate cart should be created to avoid having to move the cart from one side of the unit to the other and to further increase access and ease of use.

Further studies should investigate alternative ways of promoting NPLC among labor and delivery nurses to determine which method is most likely to have a positive impact within microsystems of this type. Gathering robust data on this critical topic will certainly provide valuable insights for improving patient care and, ultimately, assist in developing effective strategies for stemming the tide of preventable NTSV c-sections.

Final Thoughts

Through the efforts of policy makers, professional organizations, facilities, and individuals initiating quality improvement projects, changes can occur that will promote evidence-based practices such as non-pharmacological labor coping into patient care. Based on

the rather large body of evidence presented here, such practices have the potential to optimize outcomes for mothers and newborns. They should not be underestimated.

References

American Association of Colleges of Nursing. *Nursing Fact Sheet*. https://www.aacnnursing.org/news-data/fact-sheets/nursing-fact-sheet

American College of Nurse Midwives. (n.d.). *Reducing Primary Cesareans: Promoting Comfort in Labor Bundle*. http://www.birthtools.org

American Congress of Obstetricians and Gynecologists. (2023). *Safe Prevention of the Primary Cesarean Delivery*. https://www.acog.org/clinical/clinical-guidance/obstetric-care-consensus/articles/2014/03/safe-prevention-of-the-primary-cesarean-delivery

Centers for Disease Control and Prevention. *Severe Maternal Morbidity in the United States*. (2021). https://www.cdc.gov/reproductivehealth/maternalinfanthealth/severematernalmorbidity.html

Carroll, L., Thompson, S., Coughlan, B., McCreery, T., Murphy, A., Doherty, J., Sheehy, L., Cronin, M., Brosnan, M., & O'Brien, D. (2022). "Labour Hopscotch": Women's evaluation of using the steps during labor. *European Journal of Midwifery*, *6*, 59. https://doi-org.unh.idm.oclc.org/10.18332/ejm/152492

Christoff, P. (2018). Running PDSA cycles. *Current problems in pediatric and adolescent health care, 48*(8), 198-201. https://doi-org.unh.idm.oclc.org/10.1016/j.cppeds.2018.08.006

DeJoy, S. A., Bohl, M. G., Mahoney, K., & Blake, C. (2020). Estimating the Financial Impact of Reducing Primary Cesareans. *Journal of Midwifery & Women's Health*, *65*(1), 56–63. https://doi-org.unh.idm.oclc.org/10.1111/jmwh.13010

Dusek, J. A., Griffin, K. H., Finch, M. D., Rivard, R. L., & Watson, D. (2018). Cost Savings from

Reducing Pain Through the Delivery of Integrative Medicine Program to Hospitalized Patients. *Journal of alternative and complementary medicine (New York, N.Y.)*, *24*(6), 557–563. https://doi.org/10.1089/acm.2017.0203

Edmonds, J. K., O'Hara, M., Clarke, S. P., & Shah, N. T. (2017). Variation in Cesarean Birth Rates by Labor and Delivery Nurses. *JOGNN: Journal of Obstetric, Gynecologic & Neonatal Nursing*, *46*(4), 486–493. https://doi-org.unh.idm.oclc.org/10.1016/j.jogn.2017.03.009

Gallo, R. B. S., Santana, L. S., Marcolin, A. C., Duarte, G., & Quintana, S. M. (2018). Sequential Application of Non-pharmacological Interventions Reduces the Severity of Labour Pain, Delays use of Pharmacological Analgesia, and Improves some Obstetric Outcomes: A Randomised Trial. *Journal of Physiotherapy*, *64*(1), 33–40. https://doi-org.unh.idm.oclc.org/10.1016/j.jphys.2017.11.014

Gribel, G. P. C., Coca-Velarde, L. G., & Moreira de Sá, R. A. (2020). Influence of non-pharmacological obstetric interventions on adverse outcomes of childbirth under regional analgesia. *Journal of Perinatal Medicine*, *48*(5), 495–503. https://doi-org.unh.idm.oclc.org/10.1515/jpm-2019-0366

Hoyert, D.L. (2023). Maternal Mortality Rates in the United States, 2021. *NCHS Health E-Stats*. https://dx.doi.org/10.15620/cdc:124678.

Ingram, M. A., Brady, S., & Peacock, A. S. (2022). The barriers to offering non-pharmacological pain management as an initial option for laboring women: A review of the literature. *European Journal of Midwifery*, *6*, 37. https://doi-org.unh.idm.oclc.org/10.18332/ejm/149244

Jebb, A. T., Ng, V., & Tay, L. (2021). A Review of Key Likert Scale Development Advances: 1995-2019. *Frontiers in Psychology*, *12*, 637547. https://doi-org.unh.idm.oclc.org/10.3389/fpsyg.2021.637547

Jones, L., Othman, M., Dowswell, T., Alfirevic, Z., Gates, S., Newburn, M., Jordan, S., Lavender,

T., Neilson, J. P., & Neilson, J. P. (n.d.). Pain management for women in labour: an overview of systematic reviews. *Cochrane Database of Systematic Reviews*, *3*. http://doi.org/10.1002/14651858.CD009234.pub2

Keag, O. E., Norman, J. E., & Stock, S. J. (2018). Long-term risks and benefits associated with cesarean delivery for mother, baby, and subsequent pregnancies: Systematic review and meta-analysis. *PLoS Medicine*, *15*(1), e1002494. https://doi-org.unh.idm.oclc.org/10.1371/journal.pmed.1002494

Osterman, M.J.K. (2022). *Changes in Primary and Repeat Cesarean Delivery: United States, 2016-2021*. U.S. Department of Health & Human Services. https://dx.doi.org/10.15620/cdc:117432

Lagrew, D. C., Kane, L., Corry, M. P., Edmonds, J. K., Gilpin, B. G., Frost, J., & Jaffer, S. (2018). National Partnership for Maternal Safety: Consensus Bundle on Safe Reduction of Primary Cesarean Births. *Journal of Midwifery and Women's Health, 63*(2), 235-244. http://www.doi.org/10.1111/jmwh.12738

Levett, K. M., Smith, C. A., Bensoussan, A., & Dahlen, H. G. (2018). Complementary therapies for Labour and Birth Study: A Randomised Controlled Trial of Antenatal Integrative Medicine for Pain Management in Labour. *BMJ Open*, *6*(7), e010691. https://doi-org.unh.idm.oclc.org/10.1136/bmjopen-2015-010691

Leonard, S. A., Main, E. K., & Carmichael, S. L. (2019). The contribution of maternal characteristics and cesarean delivery to an increasing trend of severe maternal morbidity. *BMC Pregnancy & Childbirth*, *19*(1). https://doi-org.unh.idm.oclc.org/10.1186/s12884-018-2169-3

Osterman, M.J.K. (2022). *Changes in Primary and Repeat Cesarean Delivery: United States, 2016-2021*. U.S. Department of Health & Human Services. https://dx.doi.org/10.15620/cdc:117432

Rodrigues, V. A. D. S., Abreu, Y. R., Santos, C. A. G., Gatti, A. F., Murer, G. M., Gontijo, B. D. R.,

Alves, J. S., Cunha, T. M., Azevedo, V. M. G. O., Mendonça, T. M. S., & Paro, H. B. M. S. (2022). Nonpharmacological Labor Pain Management Methods and Risk of Cesarean Birth: A Retrospective Cohort Study. *Birth: Issues in Perinatal Care*, *49*(3), 464–473. https://doi-org.unh.idm.oclc.org/10.1111/birt.12617

Smith, C. A., Levett, K. M., Collins, C. T., Dahlen, H. G., Ee, C. C., Suganuma, M., & Smith, C. A. (2018). Massage, reflexology and other manual methods for pain management in labour. *Cochrane Database of Systematic Reviews*, *3*. http://www.doi.org/10.1002/14651858.CD009290.pub3

Smith, V., Gallagher, L., Carroll, M., Hannon, K., & Begley, C. (2019). Antenatal and Intrapartum Interventions for Reducing Caesarean Section, Promoting Vaginal Birth, and Reducing Fear of Childbirth: An Overview of Systematic Reviews. *PLoS ONE 14*(10): e0224313. https://doi.org/10.1371/journal.pone.0224313

Sun, L., Wang, S., & Li, X.-Q. (2021). Association between mode of delivery and postpartum depression: A systematic review and network meta-analysis. *Australian & New Zealand Journal of Psychiatry*, *55*(6), 588–601. https://doi-org.unh.idm.oclc.org/10.1177/0004867420954284

The Family Place. (2022). *Birth Log 2022*. Unpublished internal Concord Hospital document.

Tikkanen, R., Gunja, M. Z., FitzGerald, M., & Zephyrin, L. (2020). Maternal mortality and maternity care in the United States compared to 10 other developed countries. Issue briefs, *Commonwealth Fund*. https://doi.org/10.26099/411v-9255

U.S. Department of Health and Human Services. (2021). *Reduce cesarean births among low-risk women with no prior births: Healthy People 2030*. https://health.gov/healthypeople/objectives-and-data/browse-objectives/pregnancy-and-childbirth/reduce-cesarean-births-among-low-risk-women-no-prior-births-mich-06/data

Vegte, M.V. (2022). *Reducing the Cesarean Rate in NTSV Births*. Nebraska Methodist College.

http://hdl.handle.net/10755/22703

World Health Organization. (2018). *WHO Recommendations: Non-clinical Interventions to Reduce Unnecessary Caesarean Sections*. http://apps.who.int/iris/bitstream/handle/10665/275378/WHO-RHR-18.20-eng.pdf?ua=1

World Health Organization. (2015). *WHO Statement on Caesarean Section Rates*. https://apps.who.int/iris/bitstream/handle/10665/161442/WHO_RHR_15.02_eng.pdf?sequence=1

Zielinski, R. E., Brody, M. G., & Low, L. K. (2016). The Value of the Maternity Care Team in the Promotion of Physiologic Birth. *JOGNN: Journal of Obstetric, Gynecologic & Neonatal Nursing*, *45*(2), 276–284. https://doi-org.unh.idm.oclc.org/10.1016/j.jogn.2015.12.009