January 2022

Reducing Unnecessary Primary Cesarean Sections: A Quality Improvement Project

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Reducing Unnecessary Primary Cesarean Sections: A Quality Improvement Project

Submitted to the Facility
Yale University School of Nursing

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Nursing Practice

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May 2022

This DNP Project is accepted in partial fulfillment of the requirements for the degree Doctor of Nursing Practice.

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Abstract

Background: The cesarean section (CS) is the most common surgical procedure in the United States and while often necessary and life-saving, brings higher risk of morbidity and mortality for both patient and neonate than vaginal birth (Boyle et al., 2013; Lagrew et al., 2018). CS rates in nulliparous, term, singleton, vertex (NTSV) patients vary dramatically, from 7.1% to 69.9%, throughout US birthing facilities but can be safely reduced via the implementation of evidence-based safety bundles that aim to reduce variation in care (Council on Patient Safety in Women's Health Care, 2020; Kozhimannil et al., 2013).

Local Problem: A large birthing hospital in Maryland has NTSV CS rate of 23% with a reduction goal to 20% or less.

Methods: Plan-Do-Study-Act Cycles were utilized as the project model over 3-month period.

Intervention: CS rate reporting was scaled out to include Registered Nurse (RN)-specific rate measures in the established clinician audit and feedback process while also tailoring and launching a CS communication tool.

Results: While unit CS rates did not decrease during the project period, the RN-specific CS rate measures did identify positive outlier RNs with NTSV CS rates consistently lower than goal, ranging for 0.00% to 16.67%.

Conclusion: This project demonstrates the need for continued analysis of RN-specific NTSV CS rates to identify and study the practices of these positive outliers to identify best practices, direct from the frontline, that contribute to successful, safe physiologic birth.

Keywords: NTSV, cesarean section, quality improvement, RN NTSV rate, interprofessional team, pre-cesarean checklist

Table of Contents

Chapter I

Introduction

Overuse of cesarean sections (CS) is nearing epidemic levels and identified as a significant safety issue (Lagrew et al., 2018). The CS is the most common surgical procedure in the United States (US) with 1.2 million performed per year and while often necessary and life-saving, it brings higher risk of morbidity and mortality for both patient and child than vaginal birth (Al Yassan, Al-Asadi, & Khalaf, 2019; Boyle et al., 2013; Centers for Disease Control and Prevention (CDC), 2015; CDC, 2020; Keag, Norman, & Stock, 2018; Lagrew et al., 2018). As of 2020, the Centers for Disease Control and Prevention (CDC) reports nearly one-third of births in the US are by CS with a 25.9% CS rate in low-risk first-time patients. However, the World Health Organization (WHO) (2015) cites 10-15% as a safe and acceptable goal rate and the National Partnership for Maternal Safety proposes 19% as the lowest safe rate based on updated research (Lagrew et al., 2018). More concerning still is the 50% increase in the US primary CS rate since 2000 in low-risk patients (Osterman, et al., 2015).

Not accounting for adverse outcomes, an uncomplicated CS incurs a higher level of patient acuity and staff utilization, a longer length of stay which impacts throughput and capacity, and higher costs than vaginal birth (DeJoy, et al., 2019; Rosenthal, 2013). CS patients require indwelling Foley catheters, increasing the risk of a hospital-acquired catheter associated urinary tract infection which costs the US an estimated $450 million annually (Leelakrishna & Karthik, 2018; Scott, 2009). CS patients have longer periods of immobilization leading to increased risk of blood clots, higher risk for falls, and experience more pain in the postpartum period, requiring higher utilization of opioids which adds potential of dependency (Babazade et al., 2019; Landau, 2019).

The most common diagnosis associated with a primary low-risk or nulliparous, term, singleton, vertex (NTSV) CS, is labor dystocia which is defined as a slow or abnormally progressing labor that has achieved a cervical dilation of at least six centimeters, yet up to 40% of cases do not meet diagnostic criteria (Boyle et al., 2013; Florida Perinatal Quality Collaborative, 2019; Wise & Jolles, 2019; Zhang et al., 2010). Further, there is up to a ten-fold variation in CS rates among providers and institutions, with a range from 7.1 to 69.9% nation-wide, demonstrating a lack of consistency in protocols, guidelines, management of latent and active labor, and the diagnosis of labor dystocia (American College of Obstetricians and Gynecologists (ACOG), 2014; Cox & King, 2015; Kozhimannil et al., 2013). However, entities such as the California Maternal Quality Care Collaborative (CMQCC) demonstrate CS rates can be safely decreased without increasing risk to patient or neonate by reducing variation in practice via the implementation of standardized, evidence-based practices (Main et al., 2019). Given the high degree of variability in CS rates among facilities and evidence these rates can be safely reduced, the Joint Commission (TJC), ACOG, Association of Women's Health, Obstetrics and Neonatal Nurses (AWHONN), American College of Nurse-Midwives (ACNM), Society for Maternal-Fetal Medicine (SMFM), and US Department of Health and Human Services (DHHS) agree CS rates are modifiable and reduction measures must be taken (The Joint Commission (TJC), 2020; Kozhimannil, Law, & Virnig, 2013; Vadnais et al., 2016).

TJC has instituted one such reduction measure, Perinatal Core (PC) Measure 02, requiring birthing hospitals seeking accreditation to maintain a NTSV CS rate at or below 30% by January 2021 or face public reporting as a poor performer and substantial financial implications in the form of a 2% reduction in all Medicare reimbursement payments made to the institution (TJC, 2021; Centers of Medicare and Medicaid Services (CMS), 2022). Private

insurance companies are also considering adding NTSV rates at the US DHHS goal level in their value-based purchasing measures which would result in decreased reimbursement to poor performing hospitals with clients re-routing to other higher performing facilities (D. Lagrew, personal communication, October 17, 2019). Given that a primary cesarean birth is approximately double the cost of a vaginal birth, reduced reimbursement for high rates of CS will compound financial impact on organizations (DeJoy et al., 2019; Rosenthal, 2013; Smith et al., 2016). Additionally, PC-05 measures the percentage of infants exclusively breastfeeding during hospitalization and places poor CS performers at further financial disadvantage due to decreased rates of successful breastfeeding and increased risk of human-milk substitute use in infants born via CS (TJC, 2019; Zhang et al., 2019).

Problem Statement

While maternal comorbidities and choice are often cited as key contributors to increasing NTSV CS rates, it would appear the individual hospital's practice culture is the true driver with rates varying from 7.1% to a staggering 69.9% throughout US birthing facilities (Caceres et al., 2013; Kozhimannil et al., 2013). Given this variability of practice, it is important to focus on ensuring consistent, high-quality care by implementing patient safety bundles which, by definition, leverage and implement evidence-based practices in a structured and systematic way to ensure complete consistency of care (Council on Patient Safety in Women's Health Care, 2020). Implementing a bundle to include checklists, audits, and clinician feedback, including reporting of individual provider and registered nurse (RN) NTSV CS rates, will aid in standardizing care throughout the labor process to reduce NTSV CS due to the diagnosis of labor dystocia (Chaillet & Dumont, 2007; Lagrew et al., 2018). Further, the standardized care provided by a labor dystocia checklist is shown to reduce costs by $19,091.93 per birth (Westermann et

al., 2018). The implementation of best practices, CS audits, and clinician feedback showed a four-year savings of $21.6 million USD in Quebec and a potential $120.6 million savings nation-wide (Bermudez-Tamayo, Johri, & Chaillet, 2018). While the project site is utilizing components of an evidence-based care bundle, such as provider NTSV rate reporting, encouraging the use of doulas, and reducing elective CS, the elements of the labor dystocia checklist and RN NTSV rate reporting remain unimplemented. The goal of this project is to reduce the rate of primary CS in the NTSV population to 20% or less at a birthing hospital in Maryland by translating and scaling the care bundle component of NTSV rate analysis and reporting to include RNs and then implementing a labor dystocia checklist found in the California Maternal Quality Care Collaborative (CMQCC) toolkit developed from ACOG/SMFM criteria (ACOG, 2014).

Significance

Preventing the first unnecessary CS is critical as 90% of women who undergo a CS will have CS with subsequent births, conversely, 90% of women who give birth vaginally will continue to have successful vaginal births (Haelle, 2018; Main, 2016). The evidence shows each subsequent CS increases morbidity and mortality (Almeida, Nogueira, Candido dos Reis, & Rosa e Silva, 2002; Keag, Norman, & Stock, 2018; Kennare et al., 2007). CS prevention is also significant for newborn outcomes via increasing early breastfeeding initiation and decreasing human-milk substitute supplementation (Li, Wan & Zhu, 2021; Zhang, 2019). Additionally, those born via CS are at higher risk for neonatal intensive care unit (NICU) admission which increases acuity, cost, and staff resource utilization (Berg & Hung, 2011; Overfield, et al., 2005; Stevens, et al., 2014).

WHO estimated 6.20 million unnecessary CS were performed in 2008, costing 2.32 billion US dollars around the globe (Gibbons et al., 2010). However, the WHO estimate does not

account for the additional costs of morbidity and mortality which are difficult to quantify. For example, the care of one patient with severe morbidity due to placenta accreta, a complication most commonly seen due to previous CS, can exceed one million dollars; with a 1 in 272 incidence rate in US women with birth-related diagnosis at hospital discharge (ACOG, 2018; Bowman, et al., 2014; Ellison & Martin, 2017; Wu, Kocherginsky, & Hibbard, 2005). Further, those dyads that ultimately were unable to breastfed contributed at an estimated three billion dollars in healthcare costs per year (Babazade et al., 2019). Despite these increased costs and risk, no improvement in patient and neonatal morbidity and mortality rates have been noted with higher NTSV CS rates (ACOG, 2014; Gregory et al., 2012). Therefore, implementing interprofessional interventions to reduce unnecessary NTSV CS is an urgent need.

Chapter II

Review of Literature

While patient factors such as personal choice and comorbidities are often cited as key contributors to CS, after adjusting for comorbidities, demographics, and socioeconomic status, it would appear the individual hospital's practice culture is the true driver of CS rate variation (Caceres et al., 2013). With such variation in CS rate amongst institutions and apparent lack of standardization in clinical practice, the National Partnership for Maternal Safety issued a consensus statement recommending the implementation of evidence-based care practices designed to reduce NTSV CS (Lagrew et al., 2018). However, little is known of effectiveness and efficacy of RN NTSV rate reporting and the individual bundle component of a labor dystocia checklist in safely decreasing NTSV CS (Ogunyemi et al., 2018; Vadnais et al., 2017; Wise & Jolles, 2019). Given this knowledge gap, a review of literature was completed exploring the research question: does implementing RN NTSV CS rate reporting and the care bundle component of a labor dystocia checklist reduce the rate of primary cesarean in the NTSV population?

Search Strategy

A review of the literature on NTSV CS prevention strategies with a focus on RN NTSV rate reporting, labor dystocia checklists, and team huddles was conducted following the adapted Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines (see Appendix A).

Medline, Embase, and PsycINFO, and PubMed databases were used. The terms NTSV AND reduction, labor AND dystocia AND checklist, RN AND NTSV, RN and Cesarean, and primary AND cesarean AND reduction were searched. Articles meeting search criteria in English with an

abstract were included for further review. An exclusion was placed to limit publication dates greater than five years prior to search date, however, older works identified via ancestry were included if deemed seminal or important source material.

The search revealed a total of 1,471 articles for review with two additional articles identified through ancestry. After duplicates were excluded, 646 remaining abstracts were screened. Of those, 598 articles without full text or identified as clearly irrelevant were excluded. A final review excluded an additional 38 articles with 6 being conference abstracts, 11 conducted outside of the US using out of scope guidelines, and the remaining 21 articles out of scope for NTSV or overall CS reduction intervention implementation. The remaining 10 articles were included in the review (see Appendix A). Data were organized for analysis into an evidence matrix (see Appendix B) into the fields: title authors date, purpose, sample, design, results, strengths, weaknesses, and contributions to science and/or practice.

Synthesis of Evidence

All interventional studies reviewed, except Gams et al. (2019), list sample sizes (n = 55 to 126,480) with approximately 160,600 total NTSV participants over an average of 2.5 years (n = 7 weeks to 7 years). Two articles were level I with a meta-analysis and a systematic review of literature, one was a level V consensus statement, and the rest were level III evidence. All interventional research was conducted in inpatient settings with a mix single and multiple sites and academic and community hospitals. All but one of the interventional studies reviewed were conducted in the US, representing a wide sample of the country. One study was conducted in France but met inclusion criteria for review as it followed the same evidenced-based guidelines, implemented the same interventions of interest, and measured the same outcomes (Thuillier et al., 2018). While the level I studies are not specific to NTSV CS, all interventional studies do

share this focus but guidelines followed vary from ACOG and SMFM's Prevention of the Primary Cesarean Section Delivery Guideline (Bell et al., 2017; Main et al., 2019; Ogunyemi et al., 2018; Thuillier et al., 2018; Wise & Jolles, 2019), ACNM's Promoting Spontaneous Labor Bundle (Gams et al., 2019), and self-designed evidence-based recommendations from ACOG and National Institutes of Health (NIH) (Vadnais et al., 2017). All studies assess balancing measures pre- and post-intervention, such as NICU admission and postpartum hemorrhage (PPH) rates, to evaluate NTSV CS reduction interventions' impact on patient outcomes to address potential safety implications. Please see Evidence Matrix for in-depth detail (See Appendix B).

Literature Findings

A decrease in the NTSV CS rate post-intervention was noted in all studies reviewed with an average reduction of 28.04% (n = 13.65% to 44.35%). Notably, Wise and Jolles (2019) found once the project ended the NTSV CS rate rebounded to 39.32% above pre-intervention baseline. A significant increase in adherence to the labor dystocia checklist by providers was noted by Bell et al. (2017) from 86.2% to 91.5% (OR 1.73, 95% CI 1.11-2.70). The implementation of pre-operative team huddles increased team engagement from 85% to 98% (Wise & Jolles, 2019). Three studies reported improvement in neonatal outcomes with significant decreases in NICU admissions (Main et al., 2019; Ogunyemi et al., 2018; Wise & Jolles, 2019), three reported no significant change (Gams et al., 2019; Thuillier et al., 2018; Vadnais et al., 2017), and one was underpowered to detect change (Bell et al., 2017). Patient outcomes are overall positive with decreases in vaginal lacerations and episiotomies and no significant changes in rate of PPH (Main et al., 2019; Ogunyemi et al., 2018; Thuillier et al., 2018; Vadnais et al., 2017).

Education

A strong educational component as part of an intervention was the most common theme noted when reviewing the evidence. All of the literature supports clear and structured healthcare team education that targets the entire interprofessional cadre of registered nurses (RNs), certified nurse midwives (CNMs), and physicians on the implemented pieces of the care bundle (Bell et al., 2017; Challiet & Dumont, 2007; Chen et al., 2018; Gams et al., 2019; Lagrew et al., 2018; Main et al., 2019; Ogunyemi et al., 2018; Thuillier et al., 2018; Vadnais et al., 2017; Wise & Jolles, 2019). However, Chen et al. (2018) provided evidence that physician education by a respected peer was the most successful educational intervention in reducing unnecessary CS. Four articles (Bell et al., 2017; Gams et al., 2019; Lagrew et al., 2018; Ogunyemi et al., 2018) either recommended or implemented patient and family education on safe labor guidelines while Chen et al. (2018) found childbirth education effective in reducing CS. However, none of the evidence supports education as the sole intervention.

Collaboration, Teamwork, and Culture Change

Teamwork and collaboration to create a unit culture change to support physiologic birth is another common thread in the literature. Strong interprofessional teams of RNs, midwives, and physicians actively working together on the unit and role modelling behaviors are noted in four studies (Bell et al., 2017; Gams et al., 2019; Ogunyemi et al., 2018; Vadnais et al., 2017). In one study a team, led by Doctor of Nursing (DNP) students, role modelled the desired behaviors and saw positive results initially (Wise & Jolles, 2019). Upon completion of the project, the DNP students left the site with no members of the unit team identified to sustain practice changes and reinforcement of expectations, which led to regression to previous practices and a significant increase in the NTSV CS rate (Wise & Jolles, 2019).

However, a similar study conducted by DNP students which incorporated an interprofessional team of engaged unit leaders reported a sustained culture change upon the students' exit (Gams et al., 2019). State-wide collaborative teams following the same evidence-based guidelines with frequent calls to support each other were noted in two studies (Gams et al., 2019; Main et al., 2019). The unit-based teams not a part of a collaborative have an average NTSV CS rate reduction of 35.26% (n = 28.21 to 44.35%) (Bell et al., 2017; Ogunyemi et al., 2018; Thuillier et al., 2018; Vadnais et al., 2017) while the collaborative teams have an average rate reduction of 14.17% (n = 13.65 to 14.68%) (Gams et al., 209; Main et al., 2019).

Standardization of Practice with Feedback

Standardization of practice through policy change is critical to NTSV CS reduction. All articles with sustained change reported implementation of policies to incorporate care bundle elements into practice as interventions (Bell et al., 2017; Challiet & Dumont, 2007; Chen et al., 2018; Gams et al., 2019; Lagrew et al., 2018; Main et al., 2019; Ogunyemi et al., 2018; Thuillier et al., 2018; Vadnais et al., 2017). Two studies (Gams et al., 2019; Wise & Jolles, 2019) implemented a labor dystocia team huddle and checklist which are in line with Lagrew et al.'s (2018) consensus statement which emphasized the importance of implementing standardized algorithms to respond to labor dystocia. Five studies (Bell et al., 2017; Gams et al., 2019; Ogunyemi et al., 2018; Vadnais et al., 2017; Wise & Jolles, 2019) audited charts for provider compliance to labor dystocia guidelines and provided feedback while two (Ogunyemi et al., 2018; Vadnais et al., 2017) use transparent provider and institution NTSV rate reporting on the units. Further, both pieces of level I evidence, Challiet and Dumont (2007) and Chen et al. (2018), strongly support that audits and feedback in order to coach providers in effectively adhering to evidence-based interventions are the most impactful interventions in reducing CS

rates. None of the reviewed pieces directly addressed individual RN NTSV rate measurement or reporting. However, the RN's role in influencing method of birth has been documented, along with a variation in CS rate of 4.9 to 19% noted between RNs per Radin, Harmon, and Hansen (1993) (Edmonds and Jones, 2012). The evidence demonstrates a need to measure RN-specific CS rates to better understand the ability of individual RN to influence method of birth and how RN practice influences outcomes (Edmonds, et al., 2016; Edmonds, Clarke, & Shah, 2017). Edmond et al. (2020) found that RN-specific CS rates should be included as a part of the audit and feedback process but more studies with large samples are required to reliably determine individual RN performance as a valid metric.

Strengths and limitations of literature reviewed

Individually the studies potentially face the threat to external validity with a lack of generalizability, but together they are representative of a very large sample of the US population with the South, Midwest, West, and East Coasts as well as one international study with small community to large academic hospitals included. All studies control for subject characteristics with clearly defined criteria for inclusion as NTSV patients with Vadnais et al. (2017) going a step further examining CS rate differences in NTSV populations with the diagnosis pre-eclampsia and gestational diabetes. Many studies give statistical demographic details to describe subject characteristics to include race (Gams et al., 2019; Wise & Jolles, 2019) and age, education, body mass index, prenatal care, co-morbidities, and insurance status (Bell et al., 2017; Main et al., 2019; Ogunyemi et al., 2017; Thuillier et al., 2018; Vadnais et al., 2017).

Power to detect significant changes to NTSV rate was a strength in a handful of the studies with large sample sizes (Main et al., 2019; Ogunyemi et al., 2018; Thuillier et al., 2018; Vadnais et al., 2017) with the same studies as well as Bell et al. (2017) providing strong details

on design methodology to include appropriate statistical testing methods and effect size. All studies follow well-researched, validated, evidence-based practice (EBP) bundles based on either ACOG/SMFM or ACNM guidelines except for Vadnais et al. (2018) which is a seven-year repeat measures descriptive measures cross-sectional design that provides exceptional design methodology detail based on ACOG guidelines and allowing for replicability. There is no selection or exclusion bias given the studies' design methodologies did not withhold the intervention from a control group and no risk of attrition or maturation as all studies used data collection via chart reviews and vital statistics.

There is a small internal validity threat to rigor of the literature as the bulk of the studies were level III and there are no randomized control trials (RCTs) but, given the ethical challenges of withholding high quality care from a control group, this weakness is understandable. All studies review the implementation of multiple, concurrent interventions without controlling for the analysis of individual intervention's impact to the outcome of NTSV CS rate. No studies included spoke to the historical threat of the world-wide attention to the US' high CS rate and the nation-wide pressure to decrease NTSV rates or compared study results to the state-wide rates which may also note corresponding decreases. Also, both pieces of level I evidence may lack generalizability as they were not specific to NTSV CS reduction but rather overall CS reduction (Chaillet & Dumont, 2007; Chen et al., 2018).

In three studies reviewed (Gams et al., 2019; Vadnais et al., 2017; Wise & Jolles, 2019) it was unclear how many reviewers examined the records for adherence and outcomes with no validation of accuracy of data interpretation. There is also the instrumentation challenge of interrater reliability in the data collection as patient outcome data were obtained from chart reviews and vital statistics records which are not immune from incomplete or inaccurate

documentation (Bell et al., 2017; Gams et al., 2019; Main et al., 2019; Ogunyemi et al., 2017; Thuillier et al., 2018; Vadnais et al., 2017). Further, data collected such as APGAR scores and cervical exams are quite subjective measurements that can vary based on practitioner.

Statistical analysis gaps existed in a few pieces of evidence. While reporting data to include p-values, Gams et al. (2019) did not include information on chosen statistical methods to allow for validation of appropriateness. Wise and Jolles (2019) did not report any statistical analysis beyond displaying data in averages and a run chart. Even in studies with large samples and appropriate analysis, power was insufficient to detect subtle changes in patient and neonatal outcomes such as five-minute APGAR scores, meconium aspiration syndrome, and PPH (Gams et al., 2019; Ogunyemi et al., 2018; Thuillier et al., 2018), with the strongest analysis from Vadnais et al. (2018) warning readers that more research is needed after seven years of data on over 15,000 NTSV births.

Finally, two studies raise methodology concerns upon review. Wise and Jolles (2019) measure team engagement pre- and post-implementation of a pre-cesarean team huddle via two unvalidated tools developed by the researchers and reported a decrease in NTSV CS rate based on seven weeks of data. Gams et al. (2019) uses unvalidated, self-reported data from RNs to report an increase in one-to-one labor support.

Summary of literature findings

The literature demonstrates the effectiveness of a multi-faceted interprofessional quality improvement (QI) approach that includes standardization of practice via evidence-based care bundles that include pre-cesarean team huddles, labor dystocia checklists, policy changes, multi-professional education, and transparency of data with audits and feedback in decreasing the NTSV CS rate with no significant adverse impact on patient or neonatal outcomes (Bell et al.,

2017; Chaillet & Dumont, 2007; Chen et al., 2018; Gams et al., 2019; Main et al., 2019; Ogunyemi et al., 2017; Vadnais et al., 2017; Wise & Jolles, 2019). In fact, Gould et al. (2004) found NTSV rates between 15-20% carry safer patient outcomes and no change in neonatal outcomes than with higher CS rates. The literature provides evidence that NTSV CS rates are modifiable with evidence-based intervention and the importance of the strong interprofessional teams of engaged unit leaders collaborating in establishing the buy-in necessary with the front-line to both drive and sustain meaningful practice change. However, not all team types may be equally effective. As previously noted, greater reduction of NTSV CS rates is seen in proactively formed unit-based collaboratives versus hospital teams created as a part of state-wide collaboratives. This may more reflect the unit's culture of readiness and willingness to change than the method of team formation (Callaghan-Koru et al., 2019). It appears change may be short-lived when initiated and led by outsiders to the unit culture; highlighting the need to establish engagement and a true desire to improve practice at unit level (Wise & Jolles, 2019). The intervention's focus should not be on changing the practice of individual practitioners but on the overall culture of practice (Caceres et al., 2013; Ogunyemi et al., 2017). Finally, teams should maintain a state of surveillance to sustain change and readiness for continuous improvement when opportunities arise to increase quality and patient safety (Child & DeCesare, 2017; Vadnais et al., 2017).

Organizational Assessment- SWOT Analysis

An analysis of the strengths, weaknesses, opportunities, and threats (SWOT) of large community birthing hospital in Maryland was performed (See Appendix D). Having a comprehensive understanding of the organization in its current state is essential to the team effectively implementing a project. This knowledge equips the team to act strategically to

leverage the best people and tools to achieve and sustain success.

Strengths

Strengths speak to the organization's internal factors that place it an advantageous position (Teoli & An, 2019). Strengths included Magnet status, four stars from the CMS (2022), and a LeapFrog Hospital Safety Grade A rating (n.d.). The organization has a clear mission, vision, values, and strategic goals. Nursing is valued with a nurse in the Chief Executive Officer and President positions. EBP is a strength with a Nursing Research and Quality department, staff researchers with grants, and staff-led projects. The project site has a strong culture of EBP with three nurse educators, a Chief of Obstetrics who is active in the Institute for Healthcare Improvement (IHI) and expects best practice, and a team of hospitalists trained in IHI that round on all patients and approve all scheduled cases to assure guideline compliance. Evidence-based staffing guidelines are followed on the labor unit to promote effective labor support. The site also has a grant doula program for low-income patients and encourages doula support for all. All RNs and providers must maintain certification in electronic fetal monitoring as a condition of employment and/or privileges. A new obstetrician residency program began in July 2020 and has the potential to increase EBP with the infusion of a new generation of practitioners.

Weaknesses

Weaknesses address the organization's internal factors that play negatively toward the project and must be considered (Teoli & An, 2019). The organization has a high birth volume, over 5000 births annually with only 5 triage rooms, 24 labor rooms, and 36 postpartum rooms, posing a challenge to consistent adherence to EBP and staffing guidelines, and to throughput. Of note, there is a postpartum overflow unit with an additional 26 rooms, however, this space was converted to novel coronavirus disease 2019 (COVID) and medical/surgical overflow. A new

group of private physicians and the obstetric residency program onboarded in July 2020 and may disrupt the current culture; although, as noted above, the opposite may hold true. There are communication gaps in the team and private practitioners are not always up-to-date on unit EBP changes. Additionally, staff includes members that work off-shifts or on an irregular basis, which may lead to gaps in knowledge that impact practice. Staff turnover is also a challenge.

Opportunities

Opportunities speak to factors external to the organization that may positively impact the project (Teoli & An, 2019). CS reduction has strong media attention with initiatives and safety bundles recommended by the ACOG, ACNM, and others with WHO (2015) and Healthy People 2030 (2022) stressing CS reduction (Lagrew et al., 2018). There is strong community support of the institution with generous donors, excellent reviews of care provided with maternity services especially valued, and no comparable competition.

Threats

Threats represent the factors external to the organization that may negatively impact the project (Teoli & An, 2019). CMS and TJC (2020) have instituted core measures based on CS rate which could reduce reimbursements; however, this also can be an opportunity to leverage buy-in for change. The ongoing novel COVID-19 pandemic impacted labor support with only one support person allowed for the entirety of the hospital stay. Also, the now infamous 2018 ARRIVE study is a strong threat against the culture of CS reduction as it is often cited as evidence for unilateral elective induction of labor (IOL) at 39 weeks, which is shown to increase NTSV CS in facilities not adhering to EBP to reduce CS due to labor dystocia and failed IOL; unlike the study site which follows strict EBP with a baseline CS rate below the 23.9% goal (Christopher, 2018). This shift towards elective IOL, coupled with a public culture that views

elective CS as a safe and schedule-friendly birth method is substantial threat to CS reduction measures; especially if a provider who views CS as the safer, less litigious option (Spong, 2015; Weaver & Magill-Cuerden, 2013).

Project Model

The model chosen to guide this project is the plan-do-study-act (PDSA) model for improvement (See Appendix C). This model leverages the scientific method to create a highly structured framework for testing change and creating improvements (Nelson, Batalden, & Godfrey, 2007). Just as the name suggests, the PDSA model clearly illustrates a four-step continuous process the change agent utilizes to both rapidly test and learn from interventions to determine the best solutions to an identified problem (Nelson, Batalden, & Godfrey, 2007).

Evidence-Based Advancing Research and Clinical Practice Through Close Collaboration (ARCC) Model based on the Control and Cognitive Behavior theories was selected as a supporting framework (See Appendix C). This model was selected as it focuses not just on implementation of EBP at the healthcare system level but on sustaining the change (Melnyk & Fineout-Overholt, 2015). ARCC is suited to the project as it seeks to bridge gap between research and translation into clinical practice implementation to improve outcomes and healthcare quality by addressing barriers and developing a culture that sustains EBP (Melnyk & Fineout-Overholt, 2015).

Goal and Aims

The goal of this project is to employ an evidence-based clinical protocol to decrease the NTSV CS rate from 23% to 20% at a large birthing hospital in Maryland via the ACOG/SMFM criteria.

The aims of the project are:

- To develop a clinical protocol to incorporate RN NTSV rate analysis and reporting to an interprofessional audit procedure to reduce the NTSV CS rate on a large labor and delivery unit.
- To implement and evaluate the clinical protocol.
- To make recommendations related to the scaling and sustainability of the protocol within and across systems.

Chapter III

Methods

Description and Approaches to Aims

The project goal is to decrease the overall NTSV CS rate from 23% to 20% or less at a large birthing hospital in Maryland by implementing an evidence-based clinical protocol based on the ACOG/SMFM criteria. The NTSV CS reduction protocol consists primarily of the implementation of RN NTSV CS rate analysis and reporting accompanied by an NTSV CS checklist adapted from the CMQCC Toolkit which will be reviewed and completed by the members of care team prior to proceeding with a non-emergent NSTV CS (See Appendix E). The transparent audit and feedback process currently in place at the project site was modified to include monthly reporting of RN NTSV rates alongside provider and overall NTSV rates. PDSA cycles were utilized as the change management structure as a real-time measure of the project's success and to allow the team to rapidly adjust with modifications as needed. The project aims and methods are be described in-depth below.

Aim 1: Develop a clinical protocol to incorporate RN NTSV rate reporting and analysis with an interprofessional audit procedure to reduce the NTSV CS rate on a birth unit.

In order to develop an evidence-based clinical protocol, a formal literature review was conducted to evaluate and translate the evidence. The review revealed strong evidence including, a consensus statement, affirming utility of elements of a protocol to standardize care and reduce NTSV CS rates that include: NTSV rate reporting, audit and feedback procedures and NTSV CS checklist. An expert panel was deemed unnecessary as the elements of the protocol were validated and affirmed via inclusion in the CMQCC toolkit.

Project and components were discussed with site nursing and provider leadership and received approval. The project was then discussed with the Director of Nursing Quality and Research to understand and complete steps for official site approval to include an Affiliation Agreement and submission of project proposal documentation. Upon completion and submission, all project proposal documentation was then reviewed and approved by the Nursing Quality and Research Committee; per the committee no IRB is required as this is a QI project. With approval, the DNP student met with department leadership and identified key stakeholders who agreed to be on project implementation interprofessional team. Additionally, the RN who collects and reports NTSV data for the department consented to be the project Data Champion. All identified key team members served on the implementation interprofessional team throughout the course of the project.

The project implementation interprofessional team modified the current feedback and audit process conducted to include all NTSV CS charts. The review was completed with the help of the Data Champion who assisted the DNP student in creating tailored reports to obtain the required data on NTSV patients through the EPIC Electronic Medical Record (EMR) system, utilizing the same previously created, validated reports that are currently used by the Women's and Children's leadership team for analysis and reporting purposes. Next, the team modified current collection and reporting process of individual provider and overall NTSV rates to include RN NTSV rates. The DNP student then validated with Data Champion that the data needed to calculate RN NTSV CS rates could be pulled into an EPIC report from the datapoint of Delivery RN in Delivery Record. Calculation of RN NTSV CS rates was added to the established data collection process of NTSV Providers rates within EPIC and analyzed by the DNP Student.

Analysis of baseline RN NTSV CS rates was completed and shared with Unit Leadership in three, four, and five-month rolling increments to include name, number of births, and rate of NTSV CS including for each RN. Unit Leadership and the DNP student discussed RN NTSV CS data and determined a five-month rolling rate provided an adequate number of births per RN for reliable RN NTSV CS rate measurements and will be utilized for the project (See Appendix F). Unit Leadership also provided list of the RNs who primarily circulate CS cases so that any NTSV CS case attributed would be double-checked to validate who provided care at CS decision. This identified RN NTSV CS rolling rate was disseminated on a monthly cadence to RN leadership and team via e-mail after developing and implementing an education plan with RN and provider team to explain the new measure, reason for analysis, and report that included team huddles, e-mails, and meetings.

The project implementation interprofessional team reviewed the CMQCC NTSV CS checklist to assess appropriateness for implementation into current rate reporting, audit and feedback structure (See Appendix E). Next, this same team disseminated proposed NTSV CS checklist to identified unit and provider leadership for feedback on checklist to determine if modification needed and how to best incorporate checklist into clinical practice. The project implementation interprofessional team then met to discuss feedback and determined further modification was needed to incorporate current retrospective NTSV CS audit tools, which varied by provider practice checklist, and to include hard to retrieve data points. A final draft of the tool was approved by the team and renamed NTSV CS Communication Tool (see Appendix G).

NTSV CS Communication Tool collection and audit process for compliance was determined to be on a weekly cadence by team. After walking the proposed process on the unit, the team decided to place NTSV CS Communication Tool collection baskets in the CS PACU and at the

Labor and Birth team station to facilitate ease of use. This same team discussed and determined with RN and Provider Champions a plan to review NTSV CS cases found to be out in compliance with checklist on a weekly basis and to send names of corresponding RN and Provider to appropriate leadership for follow-up.

Aim 2: To implement and evaluate the clinical protocol.

The data collection and analysis process started by obtaining and analyzing baseline retrospective NTSV data set from 12-month period prior to project implementation at the project site and baseline overall and RN NTSV rates were analyzed to reflect an accurate retrospective data set to compare to the project implementation period. Data Champion showed the DNP student how to collect data in EPIC and filter in Excel using determined parameters.

Protocol implementation training plan and materials were developed using the CMQCC Toolkit as a guide and then were presented to the interprofessional team members for review and approval. Staff training then occurred via joint provider and nursing roll-outs through team meetings, educational sessions, e-mails, huddles, and one on one sessions with key unit leaders who then presented materials in practice-specific and resident training meetings. Training materials were then presented in PowerPoint, huddle message, and e-mail formats to ensure maximum saturation to team working variable shifts. Uniform content material, to emphasize the addition of RN NTSV CS rate measure, was presented to all members of the obstetric team that included opportunities for questions and feedback.

Collection of RN NTSV CS rates was added to current process of monthly provider and overall NTSV rate collection. Analysis of baseline RN NTSV CS rates was completed by the DNP student and shared with Unit Leadership for the five-month time period of July through November 2021 to include RN name, number of births, and rate of NTSV CS including for each

RN. Five-month rolling RN NTSV CS rates for the project implementation period were the analyzed, displayed in table format and shared on a monthly basis with Unit Leadership for review and distribution as a part of the current transparent reporting of overall and provider NTSV CS rates (See Appendix F). Finally, feedback and coaching were provided by members of interprofessional team as appropriate in 1:1 manner as per current peer review structure. Upon project completion, overall and RN NTSV CS data, which excludes scheduled cs, for the project period was obtained and analyzed using the same steps described for the baseline data collection. The deidentified data was securely e-mailed to a statistician for analysis.

Due to multiple limitations, the NTSV CS Communication Tool was implemented in Phase II of this project on February 9th, 2022, and will be fully evaluated for effectiveness in a later publication. This tool is completed by the primary provider and RN prior to CS decision. Any member of the team can review patient's plan of care and labor progression using the NTSV CS Communication Tool adapted from the CMQCC Toolkit. The team reviews tool and then determines next step in patient's plan of care. If the criteria for NTSV CS is deemed to be met, checklist is completed and signed by the delivering provider or attending midwife who makes the decision to proceed with NTSV CS. Completed NTSV CS Communication Tools are placed in a designated location for collection.

Fidelity to the protocol is monitored by the trained members of the project implementation interprofessional team and DNP student who report any deviations to the protocol via e-mail to the implementation interprofessional team. Additionally, the completed communication tools are collected and evaluated for compliance on a weekly cadence by the DNP student and deviations reported to the appropriate leader. The project site feedback and audit process was adapted to include the PDSA structure to allow for real-time monitoring and adjustment during

implementation. Weekly audits of communication tool compliance are being conducted with weekly run charts created to display NTSV rates to allow for modifications to project as needed via PDSA cycle structure. Next, all NTSV CS cases are being audited for compliance to communication tool on a monthly basis by identified interprofessional team.

Both Phases of this project have or will be evaluated for significance in reducing NTSV CS rate excluding scheduled CS, with the assistance of a statistician, using a Chi-square analysis to compare the pre-intervention and post-intervention groups on categorical parameters. Frequency and percentage statistics will be calculated to give context to the chi-square findings. Data will be compared to retrospective data of the same time period prior to implementation. For the purposes of this preliminary review, compliance to the NTSV CS Communication Tool will be displayed via a run chart showing rate trends from implementation. Post-implementation balancing measures have been compared to pre-implementation retrospective data using overall rates and a chi squared analysis. Quantitative data collected for this project consists of overall NTSV CS rate, preliminary compliance percentage to NTSV CS Communication Tool, and NTSV CS rate excluding scheduled cases. Balancing data collected for this project to measure protocol's impact on patient and neonatal safety consists of APGAR scores less than 7 at 5 minutes of life, NICU admissions, shoulder dystocia, intrauterine infection, PPH, and 3rd or 4th degree laceration rates.

Aim 3: To make recommendations related to the scaling and sustainability of the protocol within and across systems.

No barriers are anticipated to sustainability as project is in line with current NTSV reduction work and will leverage already established and delegated resources. The Provider Champion has been trained on the collection and analysis process of RN NTSV CS rates for

measure sustainability. Project findings have been shared via PowerPoint presentation to the Women's and Children's Quality and Safety Committee, the Nursing Research Council, and to the front-line teams in staff meetings. Also, will present poster at Health System's Annual Quality and Safety Program and will then submit materials for considered for inclusion as a poster presentation at the AWHONN's Annual Convention. Additionally, the project will be submitted for publication with the *Journal of Obstetric, Gynecologic, and Neonatal Nursing* or comparable journal. Finally, the project will be implemented at a second hospital in the health system upon completion and successful evaluation.

Implications

This DNP project provides additional tools and structure to the continuing work of standardizing individual practice to evidence-based best practice. Such work in reducing variability has the potential to improve unit practice culture, team communication, RN and overall NTSV CS rates, and morbidity and mortality, both in the short and long term (ACOG, 2014; Boyle et al., 2013; Centers for Disease Control and Prevention, 2018; Lagrew et al., 2018; Smith et al., 2016). While improving this project site is certainly the goal of this project, the protocol can easily be replicated and implemented to improve outcomes on a wider scale.

Building upon the current structure to allow for a team-centered approach in avoiding unnecessary CS may improve staff engagement, increase a feeling of clinician empowerment to advocate for the patients under their care, and improve team communication and collaboration (Smith et al., 2016). When utilized appropriately in obstetrical care, checklists have been shown to improve team performance and communication while standardizing patient care (Bernstein et al., 2017). It is anticipated that improved team collaboration and communication will also translate to improved HCAHPS patient experience and Gallup employee engagement scores.

Further, ensuring every patient receives equitable, high-quality care is an essential step in addressing unconscious bias and eliminating disparities in healthcare; this includes robust and transparent examination of failures via chart reviews (Ozimek & Kilpatrick, 2018).

By reducing unnecessary NTSV CS and promoting normal, physiologic birth, this project can reduce healthcare costs and improve efficiencies in a multitude of ways, including:

- Increasing compliance to labor management guidelines (Bell et al., 2017; Smith et al., 2016)
- Decreasing early or latent stage labor admissions which, in turn, improves staff and bed utilization and availability (Bell et al., 2017; Smith et al., 2016)
- Decrease staffing needs and on call and overtime utilization (DeJoy et al., 2019)
- Decreasing unnecessary medical intervention (Smith et al., 2016)
- Decreasing overall length of stay and patient acuity (DeJoy et al., 2019)
- Meeting CMS VBP goals to receive full reimbursement (TJC, 2020)
- Increasing early breastfeeding initiation and exclusive breastfeeding and decreasing human-milk substitute supplementation (DeJoy et al., 2019)
- Decreasing patient complications and long-term morbidity and NICU admissions (Bell et al., 2017; Boyle et al., 2013; CDC, 2015; Main et al., 2019)

Human Subjects

This project carries no risk to the patient population beyond that of established, normal care and has the potential to benefit all patients receiving care at the implementation site. In completing the Yale University Institutional Review Boards Checklist, all answers were in the affirmative which indicate this project does not involve human subject research and meets the criteria of a QI project. As a QI project, no research was conducted, the practice change/protocol

was applied to the entire practice environment and involved all the normal NTSV patient population while working to improve outcomes by decreasing variability of practice and no consent was required beyond the normal consents obtained for the population. The project was carried out by staff as a part of their normal duties with no outside funding.

Return on Investment

An in-depth Return on Investment and Project Budget analysis was completed to support the business case for this project. A project should either reduce costs, increase revenue, or achieve strategic priorities if it hopes to be meaningful and approved; this project to reduce unnecessary NTSV CS, does all three (Agency for Healthcare Research and Quality, 2008). In reducing the project site's NTSV CS rate from 23% to 20%, an estimated 49 NTSV CS will be prevented over the course of a year.

Given an uncomplicated CS patient at the project site is hospitalized from 72-96 hours, a conservative estimate of current average length of stay (LOS) for a CS was determined to be 79 hours versus an average LOS of vaginal birth as an estimated 36 hours; with an uncomplicated vaginal birth stay ranging from 24-48 hours. Knowing these averages and applying the 49 prevented CS annually, the facility will save a total of 2,107 hours per year. Per HealthCatalyst (2018) $10,400 is saved with each LOS day reduced; multiplying that by 2,107 hours or 88 days equals a savings of $915,200/year. Indirect benefits include: meeting the project site's Annual Operating Priority of an NTSV CS rate of 20% or less, potential to drive customers to the project site with TJC NTSV CS rate public reporting, and ability to increase volume via decreased LOS.

Timeline

Table 1. Project Timeline

Date	Timeline Activities
April 2021	DNP Project proposal defense
May-November 2021	Complete Project Aim 1
August-December 2021	Complete education and training component of Project Aim 2
December 2021	Implement RN NTSV CS rate reporting on unit. Send monthly NTSV rates via e-mail with individual RN information and RN NTSV CS rates, excluding scheduled CS, in run charts for real-time information.
December-March 2022	Sustain project and data collection
February 2022	Implement NTSV CS checklist component. Start conducting weekly audits of NTSV CS checklist compliance to evaluate adherence and update NTSV CS RN attribution to using PDSA structure to adjust. Monitor checklist compliance and report deviation to appropriate leader.
March-April 2022	Complete data analysis for project implementation period
March-April 2022	Complete and submit project paper
March-May 2022	Write and submit project for publication
April-May 2022	Complete Project Aim 3
April 2022	Present DNP Project

Leadership Immersion

DNP project implementation required the completion of a Clinical Education Affiliation Agreement between the clinical site and Yale University which required and received senior leadership approval from Barbara Jacobs, Chief Nursing Officer and Vice President of Nursing. Cathleen Ley, Ph.D., Director, Nursing Quality and Research served as External Expert and project advisor and Betsey Lewis-Snow, Senior Director, Women and Children's Services was selected as site advisor and project mentor. The project implementation interprofessional team consisted of: (a) Dr. Rhoda Raji, Associate Chair of Quality and Safety; (b) Allison Piquero, Clinical Educator, Labor and Delivery; (c) Labor and Delivery RNs and leadership, led by Jean Andres, Director, Labor and Delivery; (d) Crystal Asche, Clinical Supervisor. Updates were provided on a monthly basis, at minimum, during implementation phase to hospital mentor and

faculty per course requirement. The project was implemented and led by the DNP Student at the clinical site under the direction of the identified advisors and mentors.

Chapter IV

Results

During the three-month study period, the site had 415 NTSV births, excluding scheduled CS, which provided an excellent comparison to the 454 NTSV births in the 3-month baseline period. Using this data, the question of if a clinical protocol to incorporate RN NTSV CS rate analysis and reporting to an interprofessional audit procedure would reduce the NTSV CS rate on a large labor and delivery unit was addressed. While the original plan was to roll-out the RN NTSV CS rates and NTSV CS Communication Tool in tandem, the surge of the COVID-19 pandemic created a strain on staff resources, workload, and availability, making the addition of completing a robust education plan, team training and the roll-out of new checklist requiring intensive staff participation unreasonable. However, as the COVID-19 surge abated, team training on the tool commenced and phase II of the project launched February 9th, 2022 and will continue through May 31st, 2022; only preliminary data will be shared.

A retrospective review of EPIC data was conducted to review both RN-specific and total unit NTSV CS rates, excluding scheduled CS. Baseline RN-specific CS rates were collected over the months of July-November 2021 and then analyzed as individual and combined months to determine appropriate time period to examine to provide to most accurate RN NTSV CS rates while accounting for individual birth volume. The team determined a five-month rolling period to be appropriate for the RN NTSV CS rate analysis, however, given the variability in individual birth volume, number of birth data was included alongside each NTSV rate for review (See Appendix D). Unit-specific NTSV CS rates were noted to be 21.4% (97 CS/454 Total Eligible NTSV Births) during the three-month baseline period of September-November 2021 and 22.7% (94 CS/415 Total Eligible NTSV Births) during the three-month study period of December-

February 2022. Additionally, all 869 NTSV eligible charts were reviewed to obtain previously identified balancing measures of APGAR scores less than 7 at 5 minutes of life, NICU admission, shoulder dystocia, intrauterine infection, PPH, and 3rd or 4th degree laceration rates.

Statistical Methods

Chi-square analysis was used to compare the pre-intervention and post-intervention groups on categorical parameters. Frequency and percentage statistics were calculated to give context to the chi-square findings. A planned sub-group analysis associated with comparing White and Black participants on their respective rates of CS was performed as well. Statistical significance was assumed at a two-sided alpha value of 0.05 and all analyses were performed using SPSS Version 28 (Armonk, NY: IBM Corp.).

Statistical Results

The results of the chi-square analyses found non-significant differences between the pre-intervention and post-intervention groups for CS, $p = 0.65$, PPH, $p = 0.87$, 3rd-4th laceration, $p = 0.49$, NICU admission, $p = 0.64$, intrauterine infection, $p = 0.65$, shoulder dystocia, $p = 0.96$, operative vaginal birth, $p = 0.96$, and APGAR less than 7 at 5 minutes, $p = 0.67$ (See Table 2). However, there was a statistically significant difference between White ($n = 104$; 19.7%) and Black ($n = 62$; 30.4%) participants on their rates of CS, $p = 0.002$, with Black participants having 1.78 times increased odds of CS (95% CI 1.23 – 2.56) versus White participants.

Table 2: Chi-square Analysis of the Frequency and Percentage Statistics

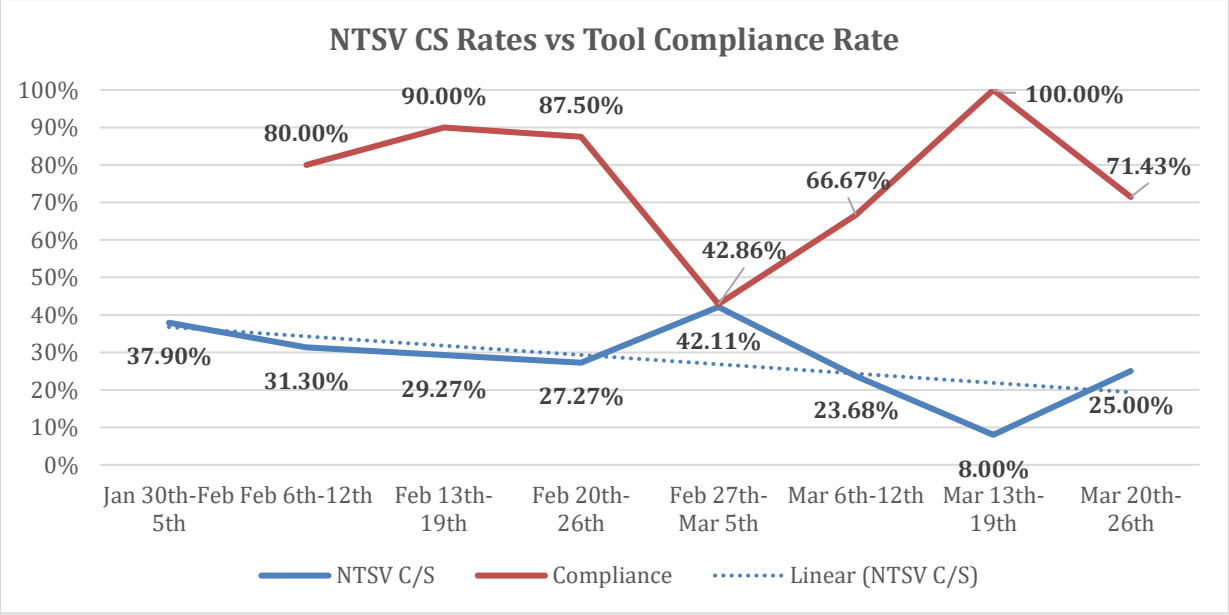
Variable	Pre-intervention	Post-intervention	*p*-value
C-section	97 (21.4%)	94 (22.7%)	0.65
Postpartum Hemorrhage	33 (7.3%)	28 (6.8%)	0.87

3rd-4th Laceration	23 (5.12%)	16 (2.2%)	0.49
NICU Admission	39 (6.4%)	31 (5.5%)	0.64
Intrauterine Infection	18 (4.0%)	20 (4.8%)	0.65
Shoulder Dystocia	9 (2.0%)	9 (2.2%)	0.96
Operative Vaginal Birth	30 (6.6%)	28 (6.3%)	0.96
APGAR < 7 at 5 minutes	8 (1.8%)	10 (2.4%)	0.67

Phase II Preliminary Findings

Since the February 9th, 2022, launch of Phase II, weekly NTSV CS rates have been analyzed and presented to the team to include a baseline week prior to implementation, and the project baseline data rate. A steady downward trend in weekly NTSV CS rates is noted in the data to date with the exception of the week of February 27th – March 5th wherein a sharp increase to 42.11% is noted. In review NTSV CS Communication Tool data (See Table 3), a similar increase in non-compliance is noted for the week of February 27th – March 5th.

Table 3: Rate of Weekly NTSV CS vs Tool Compliance, Excluding Scheduled CS



Chapter V

Discussion

The aim of this QI project was not achieved: to decrease the overall NTSV CS rate from 23% to 20% or less at a large birthing hospital in Maryland by implementing an evidence-based clinical protocol based on the ACOG/SMFM criteria. The overall NTSV CS rate of the baseline period, September through November, was 23.89% with 112 out of 469 eligible births occurring via CS while the overall NTSV CS rate of the project period was 25.52% with 110 out of 431 eligible births occurring via CS. To better understand the RN's impact on the NTSV CS rate, the decision was made to exclude scheduled CS as the RN is not involved in the decision-making or care planning of these cases, which occur prior to admission to hospital. With the exclusion of scheduled CS, the implementation of a clinical protocol to incorporate RN NTSV rate analysis and reporting resulted in a 22.7% NTSV CS rate for the project period of December through February in comparison to the 21.4% rate of the baseline period. While all reviewed overall institutional NTSV CS rates are beneath CMS' reportable threshold of 30%, the Healthy People 2030 target of 23.6% was exceeded (CMS, 2022; Office of Disease Prevention and Health Promotion, 2022). Further, the month-to-month rates demonstrate high variability, from 18.06% to 30.60% in NTSV CS excluding scheduled CS and 20.63% to 32.61% in all NTSV CS. However, the institutional rates still out-perform that of the latest annual Maryland NTSV rate of 27.9% and US annual rate of 25.6% (Maternal Safety Foundation, 2019).

Phase II of the projects adds the implementation of an NTSV CS Communication Tool, completed in real-time starting at admission for all NTSV eligible patients then reviewed and signed by the Provider and RN upon CS decision. While Phase II is preliminary and still in progress, it is showing promising results with a trend of decreasing weekly NTSV CS rates from

37.90% Week 0, 31.30% Week 1, 30.00% Week 2, 27.59% Week 3, 42.11% Week 4 (where low compliance was noted), 23.68% Week 5, 8.00% Week 6, to 25.00% Week 7 (See Table 3).

Identification of Positive Outlier RNs

While the implementation of a clinical protocol to incorporate RN NTSV CS rate analysis and reporting did not result in a significant decrease to NTSV CS rates, the five-month rolling RN NTSV CS rate data did reveal multiple RNs with consistently low NTSV CS rates despite similar or higher birth volumes than their peers (See Table 4 & Appendix D). The sample-size is too small to adequately power an analysis of the impact of these consistently lower than expected RN NTSV CS rates on the identified balancing measures, but no untoward trends were noted upon review. Ongoing RN NTSV CS rate review will continue at the project site both as a sustained practice change and to allow for further monitoring of this positive outlier trend to determine next steps.

Table 4: Positive Outlier RNs

Delivery RN	NTSV July-Nov 2021	NTSV Aug-Dec 2021	NTSV Sept-Jan 2022	NTSV Oct-Feb 2022
RN 12	21 (0%)	20 (5%)	14 (7.14%)	14 (7.14%)
RN 18	17 (0%)	18 (0%)	15 (0%)	14 (0%)
RN 43	13 (7.69%)	17 (5.88%)	16 (12.5%)	16 (12.5%)
RN 47	28 (10.71%)	36 (11.11%)	30 (10%)	26 (3.85%)
RN 51	17 (11.76%)	18 (11.11%)	12 (16.67%)	8 (12.5%)
RN 35	N/A	10 (10%)	14 (7.14%)	16 (6.25%)

Limitations

Data collection was a significant limitation with many EPIC report fields such as blood loss, laceration, and fetal presentation not consistently populating results. If a provider or RN failed to document a data point properly in the Delivery Summary or Delivery Note, the report would not be able to pull in the required data. Additionally, EPIC reports did not provide data on

NICU admissions nor intrauterine infections. In order to acquire all data points required, audits of 1,321 charts have been performed to date and in doing so a theme of inconsistent documentation emerged. It was noted that some providers would use Smart Phrase EPIC Delivery notes and either pull in required data points from the Delivery Summary or would manually input data, while others would not complete the Smart Phrase portion of the note and free text information at the bottom of the document. RNs also had challenges with documentation inconsistency as numerous Delivery Summaries were found to be incomplete and blood loss documented in different locations leading to issues of either no documentation or doubled documentation. It was also discovered that Delivery Providers rather than Delivery RN was the data field available to use in the EPIC report; this required removing all listed providers except for the Delivery RN to acquire the needed data point. Additionally, without manual chart audits reviewing History and Physical, Progress, Procedure, or Nursing Notes, there was no reliable method of determining reason for patient admission, membrane status upon admission, and if the patient was in spontaneous labor, an induction, or an augmentation of labor.

As this project was implemented during the pandemic, it is important to call-out the confounding factor that is COVID-19 and its potential to impact the NTSV CS rate within this and other organizations. For example, most hospitals including this project site, had limited visitation from admission to discharge to one person. Birthing people have been effectively forced to choose between their partners and a labor support person. These restrictions can impend the availability of continuous labor support which is shown to improve outcomes and decrease CS births (Bohren et al., 2017). Fortunately, the project site does allow licensed doulas to be present as a member of the care team, but this does raise an equity issue for those unable to afford a private doula or enroll in the doula grant program.

The COVID-19 pandemic provided another significant limitation to the project, effectively splitting the originally envisioned protocol into two separate phases due to concerns of added work to already strained staff and the inability to pull together the required stakeholders of the interprofessional team when all were needed for patient care. The pandemic has also exacerbated a nation-wide RN staffing crisis, to which the project site was not immune. High turnover of experienced birth RNs was seen, requiring the use of short-term local contracts, agency RNs, and new-to-specialty and new graduate RNs. The loss of experienced RN staff, coupled with the sudden increase of new staff, lead to challenges in consistent adherence to EBP.

Finally, this project was implemented in only one clinical setting over a three-month period. The project site does boast a high volume of patients to allow for robust data sets with adequate power to examine a multitude of variables. Regardless of patient volume, the site may lack external validity as it may only be representative of other similar practice settings in Maryland and/or the US Northeast Region.

Implications to Practice

While this project did not meet its goal of reducing the NTSV CS rate at this practice site during this time period, it does reinforce the importance of the RN as a member of the interprofessional care team and the need to better understand the individual RN's ability to promote physiologic birth. The presence of positive outlier RNs with consistently low NTSV CS rates prior to and during the project period adds validity to the term heard across birthing units: "baby whisperer," one that can seemingly help coax even the most difficult birth safely into the world without surgical intervention and is frequently requested and trusted by fellow providers. With the current high turnover of experienced RNs, the birthing community is at risk of losing these trusted and well-practiced RNs. Understanding this, it is critical to continue to analyze RN

NTSV CS rates to identify these positive outliers to further examine their individual practices that may contribute to successful, safe physiologic birth.

This project also highlights the need to improve clinical documentation and EMR reporting. The efficacy and utility of leveraging EMR to produce meaningful data sets cannot being understated. However, more work needs to be done to support clinicians and researchers in more effectively and efficiently wielding both the EMR and its data reporting technology.

While a not primary focus of this project, it is important to underscore the data analysis further illustrates continued disparities of care seen in Black patients. Black participants had 1.78 times increased odds of CS (95% CI 1.23 – 2.56) compared to White participants. Unfortunately, this racial disparity is in no way unique to the project site with a 1.73 times increased odd of CS (95% CI 1.45-2.06) seen in Black patients in California and increased odds of CS in all non-White patients (Okwandu et al., 2021). These findings reaffirm the importance of promoting EBP that supports physiologic birth and reducing variations in care. Phase II of this project, the implementation of NTSV CS Communication Tool, was adapted to include demographic information to allow for more in-depth analysis of indications for CS, baseline clinical data, and team interventions. Additionally, the Provider and RN NTSV CS rate data can be further analyzed to explore NTSV CS rates by race per Clinician.

Chapter VI

Conclusion

Overuse of preventable CS continues to be a concerning safety issue, bringing higher healthcare costs and risks of morbidity and mortality for birthing people and their neonates in the US. Collaborative, evidence-based interprofessional team interventions such as the implementation of RN NTSV CS rate reporting care and an NTSV CS Communication Tool work to reduce variation in care and increase standardization to EBP. While the data does not show a reduction in the NTSV CS rate, monitoring and reporting such rates are a critical component of the team audit and feedback practice. Further, the RN NTSV CS rate reporting has led to the identification of positive outlier RNs with consistently lower NTSV CS rates than their peers. Closer examination and analysis of the practices of these positive outlier RNs is a crucial next step in identifying, testing, and implementing EBP directly from those who have arguably the greatest potential for driving EBP change and research: front-line RNs.

References

Agency for Healthcare Research and Quality. (2008). *Will it work here? A decisionmaker's guide to adopting innovations.* Retrieved from https://innovations.ahrq.gov/sites/default/files/guides/InnovationAdoptionGuide.pdf

Al Yassan, A. Q., Al-Asadi, J. N., & Khalaf, S. K. (2019). The role of caesarean section in childhood asthma. *Malaysian Family Physician, 14*(3), 10-17.

Almeida, E. C., Nogueira, A. A., Candido dos Reis, F. J., & Rosa e Silva, J. C. (2002). Cesarean section as a cause of chronic pelvic pain. *International Journal of Gynaecology and Obstetrics, 79*(2), 101-104. doi: 10.1016/s0020-7292(02)00227-8

American College of Obstetricians and Gynecologists. (2014). Obstetric care consensus no. 1: Safe prevention of the primary cesarean delivery. *Obstetrics & Gynecology, 123*(3), 693-711. doi: 10.1097/01.AOG.0000444441.04111.1d

American College of Obstetricians and Gynecologists. (2018). Obstetric care consensus no. 7: Placenta accreta spectrum. *Obstetrics & Gynecology, 132*(6), e259-e275. doi: 10.1097/AOG.0000000000002983

Babazade, R., Vadhera, R. B., Krishnamurthy, P., Varma, A., Doulatram, G., Saade, G. R., & Turan, A. (2019). Acute post cesarean pain is associated with in-hospital exclusive breastfeeding, length of stay and post-partum depression. *Journal of Clinical Anesthesia.* [Epub ahead of print]. doi: 10.1016/j.clinane.2019.109697

Bell, A. D., Joy, S., Gullo, S., Higgins, R., & Stevenson, E. (2017). Implementing a systematic approach to reduce cesarean birth rates in nulliparous women. *Obstetrics and Gynecology, 130*(5), 1082-1089. doi:10.1097/AOG.0000000000002263

Berg, O., & Hung, K. J. (2011). Early skin-to-skin to improve breastfeeding after cesarean birth.

The American Journal of Maternal Child Nursing, 36(5), 318-324. doi: 10.1097/NMC.0b013e3182266314

Bernstein, P. S., Combs, C. A., Shields, L. E., Clark, S. L., & Eppes, C. S. (2017). The development and implementation of checklists in obstetrics. *American Journal of Obstetrics and Gynecology, 217*(2), B2-B6. doi: 10.1016/j.ajog.2017.05.032

Bermudez-Tamayo, C., Johri, M., & Chaillet, N. (2018). Budget impact of a program for safely reducing caesarean sections in Canada. *Midwifery, 60*(1), 20-26. doi: 10.1016/j.midw.2018.01.022

Bohren, M. A., Hofmeyr, G. J., Sakala, C., Fukuzawa, R. K., & Cuthbert, A. (2017). Continuous support for women during childbirth. *Cochrane Database Systematic Reviews.* doi: 10.1002/14651858.CD003766.pub6

Bowman, Z. S., Eller, A. G., Bardsley, T. R., Greene, T., Varner, M. W., & Silver, R. M. (2014). Risk factors for placenta accrete: A large prospective cohort. *American Journal of Perinatology, 31*(9), 799-804. doi: 10.1055/s-0033-1361833

Boyle, A., Reddy, U. M., Landy, H. J., Huang, C., Driggers, R. W., & Laughon, S. K. (2013). Primary cesarean delivery in the United States. *Obstetrics and Gynecology, 122*(1), 33-40. doi: 10.1097/AOG.0b013e3182952242

Caceres, I. A., Arcaya, M., Declercq, E., Belanoff, C. M., Janakiraman, V., Cohen, B., … Subramanian, S. V. (2013). Hospital differences in cesarean deliveries in Massachusetts (US) 2004-2006: The case against case-mix artifact. *PLoS One, 8*(3), e57817. doi: 10.1371/journal.pone.0057817

Callaghan-Koru, J. A., Creanga, A. A., DiPietro, B., Mark, K., Sowe, A., Aboutmatar, N., … Curran, G. (2019). Implementation of the safe reduction of primary cesarean births safety

bundle during the first year of a statewide collaborative in Maryland. *Obstetrics and Gynecology, 134*(1), 109-119. doi: 10.1097/AOG.0000000000003328

Centers for Disease Control and Prevention. (2015). Maternal morbidity for vaginal and cesarean deliveries, according to previous cesarean history: New data from the birth certificate, 2013. *National Vital Statistics Reports, 64*(4). Retrieved from https://cdc.gov/nchs/data/nvsr/nvsr64/nvsr64_04.pdf

Centers for Disease Control and Prevention. (2020). *Births-Methods of delivery.* Retrieved from https://www.cdc.gov/nchs/fastats/delivery.htm

Centers for Medicare and Medicaid Services. (2022). Hospital value-based purchasing. Retrieved from https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/Hospital-Value-Based-Purchasing-

Chaillet, N., & Dumont, A. (2007). Evidence-based strategies for reducing cesarean section rates: A meta-analysis. *Birth, 34*(1), 53-64. doi: 10.1111/j.1523-536X.2006.00146.x

Chen, I., Opiyo, N., Tavender, E., Mortazhejri, S., Rader, T., Petkovic, J., ... Betran, A. P. (2018). Non-clinical interventions for reducing unnecessary caesarean section. *Cochrane Database of Systematic Reviews, 2018*(9), 1-154. doi: 10.1002/14651858.cd00528.pub3

Child, R., & DeCesare, J. (2017). Reduction of nulliparous term singleton vertex cesarean deliveries with feedback and monitoring. *Obstetrics and Gynecology, 5*(129), 179S. doi: 10.1097/01.AOG.0000514132.62492.d7

Christopher, M. (2018). ACMN responds to release of ARRIVE Trial Study results: Acknowledges quality of study but raises concerns about potential for misapplying results. Retrieved from https://www.midwife.org/ACNM-Responds-to-Release-of-ARRIVE-Trial-Study-Results

Council on Patient Safety in Women's Health Care. (2020). Patient safety bundles. Retrieved from https://safehealthcareforeverywoman.org/aim/patient-safety-bundles/

Cox, K. J., & King, T. J. (2015). Preventing primary cesarean births: Midwifery care. *Clinical Obstetrics and Gynecology, 58*(2), 282-293. doi: 10.1097/GRF.0000000000000108

DeJoy, S. A., Bohl, M. G., Mahoney, K., & Blake, C. (2019). Estimating the financial impact of reducing primary cesareans [published online ahead of print July 28, 2019]. *Journal of Midwifery and Women's Health.* doi: 10.1111/jmwh.13010

Edmonds, J. K., & Jones, E. J. (2012). Intrapartum nurses' perceived influence on delivery mode decisions and outcomes. *Journal of Obstetric, Gynecologic and Neonatal Nursing, 42*(1), 3-11. doi: 10.1111/j.1552-6909.2012.01422.x

Edmonds, J. K., Hacker, M. R., Golen, T. H., & Shah, N. T. (2016). Nurses count: Tracking performance to improve cesarean delivery rates. *Birth, 43*(1), 3-5. doi: 10.1111/birt.12216

Edmonds, J. K., O'Hara, M., Clarke, S. P., & Shah, N. T. (2017). Variation in cesarean birth rates by labor and delivery nurses. *Journal of Obstetric, Gynecologic and Neonatal Nursing, 46*(4), 486-493. doi: 10.1016/j.jogn.2017.03.009

Edmonds, J. K., Weiseth, A., Neal, B. J., Woodbury, S. R., Miller, K., Souter, V., & Shah N. T. (2020). Variability in cesarean delivery rates among individual labor and delivery nurses compared to physicians at three attribution time points. *Health Services Research*. Advance online publication. doi: 10.1111/1475-6773.13546

Ellison, K., & Martin, N. (2017). Nearly dying in childbirth: Why preventable complications are growing in the U.S. *NPR.* Retrieved from https://www.npr.org/2017/12/22/572298802/nearly-dying-in-childbirth-why-preventable-complications-are-growing-in-u-s

Florida Perinatal Quality Collaborative. (2019). Promoting Primary Vaginal Deliveries (PROVIDE) Initiative June data report. [Unpublished Data Report].

Gams, B., Neerland, C., & Kennedy, S. (2019). Reducing primary cesarean: An innovation multipronged approach to supporting physiologic labor and vaginal birth. *The Journal of Perinatal and Neonatal Nursing, 33*(1), 52-60. doi: 10.1097/JPN.0000000000000378

Gibbons, L., Belizan, J. M., Lauer, J. A., Betran, A. P., Merialdi, M., & Althabe, F. (2010). *The global numbers and costs of additionally needed and unnecessary caesarean sections performed per year: Overuse as a barrier to universal coverage* (World Health Organization, Background Paper No. 30). Retrieved from: https://www.researchgate.net/publication/265064468_The_Global_Numbers_and_Costs_of_Additionally_Needed_and_Unnecessary_Caesarean_Sections_Performed_per_Year_Overuse_as_a_Barrier_to_Universal_Coverage_HEALTH_SYSTEMS_FINANCING

Gould, J., Danielson, B., Korst, L., Phibbs, R., Chance, K., Main, E.K. … Stevenson, D. K. (2004). Cesarean delivery rates and neonatal morbidity in a low-risk population. *Obstetrics and Gynecology, 104*(1), 11-19. doi: 10.1097/01.AOG.0000127035.64602.97

Gregory, K. D., Jackson, S., Korst, L., & Fridman M. (2012). Cesarean versus vaginal delivery: Whose risks? Whose benefits? *American Journal of Perinatology,29,* 7-18. doi: 10/1055/s-0031-1285829

Haelle, T. (2018). Your biggest c-section risk may be your hospital. Retrieved from https://www.consumerreports.org/c-section/biggest-c-section-risk-may-be-your-hospital/

HealthCatalyst. (2018). Systematic, data-driven approach lowers length of stay and improves care coordination. Retrieved from https://healthcatalyst.com/success_stories/reducing-length-of-stay-memorial-hospital-at-gulfport

The Joint Commission. (2019). Measure information: Perinatal Care PC-05. *Specifications Manual of Joint Commission National Quality Measures (v2016A!).* Retrieved from https://manual.jointcommission.org/releases/TJC2020A2/MIF0170.html

The Joint Commission. (2020). Measure information: Perinatal Care PC-02. *Specifications Manual of Joint Commission National Quality Measures (v2021A1).* Retrieved from https://manual.jointcommission.org/releases/TJC2021A1/MIF0167.html

The Joint Commission. (2021). Public reporting for hospital perinatal care measure to start in late january. Retrieved from https://www.jointcommission.org/resources/news-and-multimedia/newsletters/newsletters/joint-commission-online/jan-6-2021/public-reporting-for-hospital-perinatal-care-measures-to-start-in-late-january/

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). doi: 10.1371/journal.pmed.1002494

Kennare, R., Tucker, G., Heard, A., & Chan, A. (2007). Risks of adverse outcomes in the next birth after a first cesarean delivery. *Obstetrics and Gynecology, 109*(2), 270-276. doi: 10.1097/01.aog.0000250469.23047.73

Kozhimannil, K. B., Law, M. R., & Virnig, B. A. (2013). Cesarean delivery rates vary 10-fold among US hospitals: Reducing variation may address quality, cost issue. *Health Aff (Millwood), 32*(3), 527-535. doi: 10.1377/hltaff.2012.1030

Lagrew, D. C., Kane Low, 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-supporting intended vaginal births. *Journal of Midwifery and Women's Health, 63*(2), 235-244. doi: 10.1111/jmwh.12738

Landau, R. (2019). Post-cesarean delivery pain. Management of the opioid-dependent patient before, during and after cesarean delivery. *International Journal of Obstetric Anesthesia, 39*(1), 105-116. doi: 10.1016/j.ijoa.2019.01.011

The Leap Frog Group. (n. d.). Hospital ratings. Retrieved from https://www.leapfroggroup.org/hospitals/search/list/location/Annapolis%2C%20MD%2C%20USA/10

Leelakrishna, P., & Karthik, R. B. (2018). A study of risk factors for catheter associated urinary tract infection. *International Journal of Advances in Medicine, 5*(2), 334-339. doi: 10.18203/2349-3933.ijam20180525

Li, L., Wan, W., & Zhu, C. (2021). Breastfeeding after a cesarean section: A literature review. *Midwifery, 103*. doi: 10.1016/j.midw.2021.103117

Main, E. (Producer). (2016). *Safely reducing primary cesarean birth* [Video webinar].

Main, E. K., Chang, S. C., Cape, V., Sakowski, C., Smith, H., & Vasher, J. (2019). Safety assessment of a large-scale improvement collaborative to reduce nulliparous cesarean delivery rates. *Obstetrics and Gynecology, 133*(4), 613-623. doi: 10.1097/AOG.0000000000003109

Maternal Safety Foundation. (2022). NTSV Cesarean Birth Rate Dashboard: Maryland. Retrieved from https://www.cesareanrates.org/maryland

Melnyk, B. M., & Fineout-Overholt, E. (2005). *Evidence-based practice in nursing and healthcare: A guide to best practice.* Philadelphia, PA: Lippincott, Williams & Wilkins.

Melnyk, B. M., & Fineout-Overholt, E. (2015). *Evidence-based practice in nursing and healthcare: A guide to best practice.* (3rd ed.). Philadelphia, PA: Lippincott, Williams & Wilkins.

Moher D., Liberati A., Tetzlaff J., Altman, D. G., & The PRISMA Group. (2009). Preferred

reporting items for systematic reviews and meta-Analyses: The PRISMA Statement. *PLoS Med, 6*(7), e1000097. doi: 10.1371/journal.pmend1000097

Nelson, E. C., Batalden, P. B., & Godfrey, M. M. (2007). *Quality by design: A clinical microsystems approach.* (1st ed.). San Francisco, CA: Jossey-Bass.

Office of Disease Prevention and Health Promotion. (2022). *Healthy people 2030: Maternal, infant, and child health.* Retrieved from https://health.gov/healthypeople/objectives-and-data/browse-objectives/pregnancy-and-childbirth/reduce-cesarean-births-among-low-risk-women-no-prior-births-mich-06

Ogunyemi, D., McGlynn, S., Ronk, A., Knuden, P., Andrews-Johnson, T., Raczkiewicz, A., … Bahado-Singh, R. (2018). Using a multifaceted quality improvement initiative to reverse the rising trend of cesarean births. *Journal of Maternal Fetal and Neonatal Medicine, 31*(5), 567-579. doi: 10.1080/14767058.2017.1292244

Okwandu, I. C., Anderson, M., Postlethwaite, D., Shirazi, A., & Torrente, S. (2021). Racial and ethnic disparities in cesarean delivery and indications among nulliparous, term, singleton, vertex women. *Journal of Racial and Ethnic Health Disparities.* doi: 10.1007/s40615-021-01057-w

Osterman, M. J., Kockanek, K. D., MacDorman, M. F., Strobino, D. M., & Guyer, B. (2015). Annual summary of vital statistics: 2012-2013. *Pediatrics, 135*(6), 1115-1125. doi: 10.1542/peds.2015-0434

Overfield, M., Ryan, C., Spangler, A., & Tully, R. (2005). *Clinical guidelines for the establishment of exclusive breastfeeding.* Retrieved from https://www.ilca.org/custom404?pageid=3933

Ozimek, J. A., & Kilpatrick, S. J. (2018). Maternal mortality in the twenty-first century.

Obstetrics and Gynecology Clinics of North America, 45(2), 175-186. doi: 10.10.1016/j.ogc.2018.01.004

Radin, T. G., Harmon, J. S., & Hanson, D. A. (1993). Nurses' care during labor: Its effect on the cesarean birth rate of healthy, nulliparous women. *Birth, 20*(1), 14-21. doi: 10.1111/j.1523-536x.1993.tb00174.x

Rosenthal, E. (2013, June 30). American way of birth, costliest in the world. *The New York Times*. https://www.nytimes.com/2013/07/01/health/american-way-of-birth-costliest-in-the-world.html?nl=todaysheadlines&emc=edit_th_20130701&_r=2&

Scott, R. D. (2009). *The direct costs of healthcare associated infections in US hospitals and the benefits of their prevention.* Retrieved from https://stacks.cdc.gov/view/cdc/11550

Smith, H., Peterson N., Lagrew, D., & Main, E. (2016). Toolkit to support vaginal birth and reduce primary cesareans: A quality improvement toolkit. Stanford, CA: California Maternal Quality Care Collaborative. Retrieved from https://www.academia.edu/24991490/Toolkit_to_Support_Vaginal_Birth_and_Reduce_Primary_Cesareans_A_Quality_Improvement_Toolkit

Spong, C. Y. (2015). Prevention of the first cesarean delivery. *Obstetrics and gynecology clinics of North America, 42*(2), 377–380. https://doi.org/10.1016/j.ogc.2015.01.010

Stevens, J., Schmied, V., Burns, E., & Dahlen, H. (2014). Immediate or early skin-to-skin contact after a caesarean section: A review of the literature. *Maternal & Child Nutrition, 10*(4), 456-473. doi: 10.1111/mcn.12128

Teoli, D., & An, J. (2019). *SWOT Analysis* [Internet edition]. Treasure Island, FL: StatPearls Publishing. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK537302/

Thuillier, C., Roy, S., Peyronnet, V., Quibel, T., Nlandu, A., & Rozenberg, P. (2018). Impact of

recommended changes in labor management for prevention of the primary cesarean delivery. *American Journal of Obstetrics and Gynecology, 218*(3), 341.e1-341.e9. doi: 10.1016/j.ajog.2017.12.228

Vadnais, M. A., Hacker, M. R., Shah, N. T., Jordan, J., Modest, A. M., Siegel, M., & Golen, T. H. (2016). Quality improvement initiatives lead to reduction in nulliparous term singleton vertex cesarean delivery rate. *Joint Commission Journal of Quality and Patient Safety, 43*(2), 53-61. doi: 10.1016/j.jcjq.2016.11.008

Weaver, J., & Magill-Cuerden, J. (2013). "Too posh to push": The rise and rise of a catchphrase. *Birth, 40*(4), 264-271. doi: 10.1111/birt.12069

Westermann, M., Seet, E., Oakes, M., Crossland, B. A., Wu, E., Clair, K., & Chan. K. (2018). Hospital charge analysis of strict adherence to the 2012 Obstetric Care Consensus (OCC) Labor Dystocia Guideline amongst nulliparous term singleton vertex (NTSV) patients. *American Journal of Obstetrics and Gynecology, 218*(1), Supplement 1:S546.

Wise, G., & Jolles, D. (2019). Promoting effective care: Reducing primary cesarean births through team engagement and standardization of care at a community hospital. *Nursing Forum,* 1-10. doi: 10.1111/nuf.12384

World Health Organization. (2015). *WHO statement on caesarean section rates.* Retrieved from http://apps.who.int/iris/bitstream/10665/161442/1/WHO_RHR_15.02_eng.pdf?ua=1

Wu, S., Kocherginsky, M., & Hibbard, J. U. (2005). Abnormal placentation: Twenty-year analysis. *American Journal of Obstetrics and Gynecology, 192*(5), 1458-1461. doi: 10.1016/j.ajog.2004.12.074

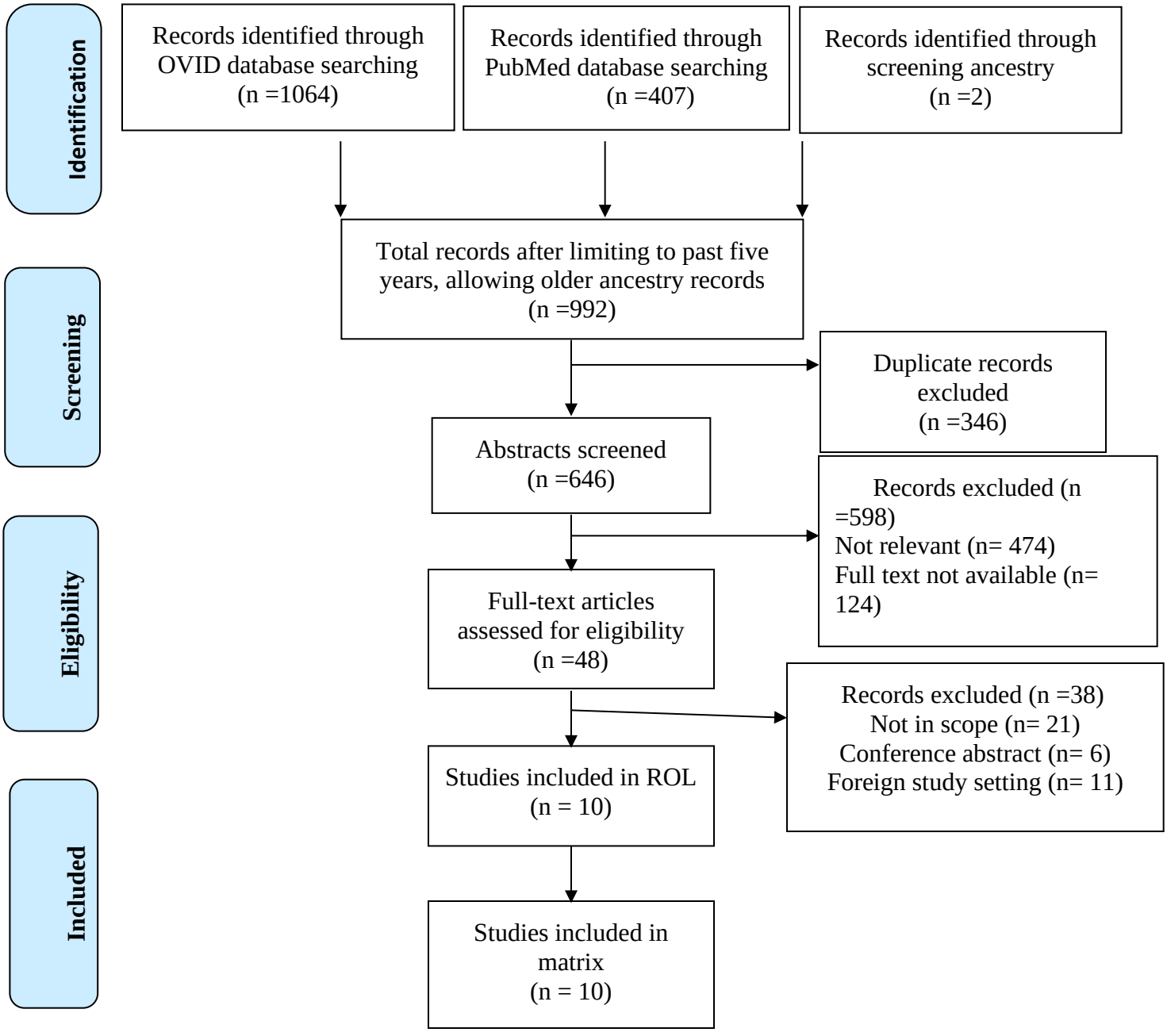
Zhang, J., Landy, H. J., Branch, D. W, Burkman, R., Haberman, S., Gregory, K. D. … Reddy, U.

M. (2010). Contemporary patterns of spontaneous labor with normal neonatal outcomes. *Obstetrics & Gynecology*, *116*(6), 1281-1287. doi: 10.1097/AOG.0b013e181def6e

Zhang, F., Cheng, J., Yan, S., Wu, H., & Bai, T. (2019). Early feeding behaviors and breastfeeding after cesarean section. *Breastfeeding Medicine*, *14*(5), 325-333. doi: 10.1089/bfm.2018.0150

Appendix A

Adapted PRISMA Flow Diagram



Adapted PRISMA flow diagram displaying number of studies throughout stages of literature review. *Source:* From Moher D., Liberati A., Tetzlaff J., Altman, D. G., & The PRISMA Group. (2009). Preferred reporting items for systematic reviews and meta-Analyses: The PRISMA Statement. *PLoS Med, 6*(7), e1000097. doi: 10.1371/journal.pmend1000097

Appendix B

Evidence Matrix

Title, authors, date	Purpose	Sample	Design	Oxford Centre Level of evidence	Results	Strengths	Weaknesses	Contribution: Science and /or Practice
Using a multifaceted quality improvement initiative to reverse the rising trend of cesarean births Ogunyemi, D., McGlynn, S., Ronk, A., Knudsen, P., Andrews-Johnson, T., Raczkiewicz, A., …Bahado-Singh, R. 2017	To describe quality improvement initiatives and implemented interventions to reduce the primary cesarean (CS) rate in the nulliparous, term, singleton, vertex (NTSV) patient population.	A total of 11,715 patient charts were reviewed at Beaumont Hospital Royal Oak in southeastern Michigan, part of the Vizient academic health network, from March 2014 to March 2016 with 1513 or 12.9% being primary CS and 3329 or 28.4% being repeat CS cases.	Prospective descriptive longitudinal design Individual provider NTSV rates were analyzed via U-chart control to identify outliers and a nested case-control review identified local risk factors for NTSV deliveries to compare with the American College of Obstetricians and Gynecologist (ACOG) and Society of Maternal-Fetal Medicine (SMFM) safe labor guidelines. Next, education to	III	U-chart analysis revealed no provider outliers in NTSV rates but rather all in control limits reflecting overall culture had greater impact on NTSV rates versus individual practice. Most common indications for NTSV CS were 38.1% abnormal fetal heart rate (FHR), 36.8% first stage labor arrest, and 24.5% arrest of	Clearly defined data and outcome measurements, design methodology, and statistical analysis. Large sample size with ability to collect and analyze data in the same population over time.	Multiple intervention approach without determining significance of individual intervention, may not be generalizable to non-Vizient, non-academic, and other institutions without midwives or in the Midwest, and data was based on chart reviews and ICD codes and	Demonstrates importance of assessing and addressing unit culture surrounding practices leading to NTSV CS when developing interventions. Provides evidence of effectiveness of multidisciplinary quality improvement approach that includes data transparency, feedback, education, and policy

			providers on ACOG/SMFM guidelines was provided in grand rounds, posters, and newsletters then a multidisciplinary team reviewed all NTSV CSs, gave providers feedback while displaying overall rates in the labor unit, giving individualized rates to nurses and providers, and created patient education brochures on safe labor. Labor dystocia guidelines were updated, nursing team received holistic nursing certifications, nurse-midwives joined the team and a Natural Birth Center was open in November 2014 for low-risk patients without epidurals, continuous fetal		descent and most common risk factors for NTSV CS were 38.7% category II FHR assessment, 34% admission in latent labor and 27.9% admission prior to six centimeters, 29.7% malposition, and 20.6% pushing < three hours and were significantly associated with increased body mass index, maternal age, low Bishop score, and NICU admissions. Primary cesarean outcomes decreased from 23.4% to 14.1% (p <.0001) in		may be inaccurate.	change in reducing both overall and NTSV CS rates without increasing adverse outcomes.

			monitoring or interventions. Primary outcomes were measured via Inpatient Quality Indicator (IQI) No. 33 and Joint Commission Perinatal Core Measure PC-02. Secondary outcomes were incidence of postpartum hemorrhage (PPH), infection, operative vaginal birth, third- and fourth-degree lacerations, maternal transfers, neonatal intensive care unit (NICU) admissions, stillbirths, and neonatal death. The Vizient network database was used to extract all outcome data based on ICD codes. At the end of the study, surveys were		IQI #33 and from 38.4% to 19.2% (p <.0001) in PC-02. No changes noted in PPH, infection, and stillbirth rates. Decreases noted in NICU admissions, 19.5% to 11.0%, vaginal lacerations, episiotomies, and vaginal operative deliveries.			

			performed to assess provider practice styles and attitudes, leadership attitudes, and stakeholder engagement. Statistical process control charts were developed with SPC for all study outcome variables and the Cochran-Armitage test was used for significance in temporal trends while t-test, one-way analysis of variance, and chi-square tests were used for corresponding continuous or categorical data with all p values set at <.05 in SAS version 9.4.					
Reducing primary cesareans: An innovative multipronged approach to	To reduce CS deliveries in the NTSV patient population via the	All NTSV births from 2016 to 2017 at the University of Minnesota	Descriptive longitudinal design Baseline NTSV data from 2015 was collected and a goal	III	Baseline data from 2015 shows a 29.3% NSTV rate out of 781 births. A 10% decrease to	High level of interdisciplinary involvement and utilization of evidence-based	No information on statistical analysis methodology or number of	Provides evidence of the effectiveness of the ACNM's

supporting physiologic labor and vaginal birth Gams, B., Neerland, C., & Kennedy, S. 2019	implementation of strategies to support normal labor as a member of the American College of Nurse-Midwives (ACNM) Healthy Birth Initiative: Reducing Primary Cesareans (RPC) Project.	Medical Center (UMMC). Total number of NTSV births not listed however UMMC has approximately 2500 births a year.	of a 3% reduction was set. An interdisciplinary team of a PhD midwife, nurse leader, chief of obstetrics, chief of anesthesia, and nursing director was established and recruited frontline nurses, midwives, and physicians to include residents. Next the team chose to implement the Promoting Spontaneous Labor Progress bundle from ACNM and then five DNP-CNM students from the institution's nursing program to implement five quality improvement projects. The team added the project to established meeting agendas instead of creating a new		26.1% was seen in 2016 and a decrease of 3.7% to 25.3% was seen in 2017. Continuous labor support was 47.5% in 2016 with no prior baseline data and increased to 66.3% in 2017. IA use was 8.1% in 2016 and increased to 9.1% in 2017. Out of 56 women eligible to use the labor lounge only 8 did so. Upright position time in labor went from 13.8% to 29.7%, augmentation of labor dropped from 38% to 30%, average length of labor for women in	interventions. Project part of larger ACNM Initiative which provided both support and validated, evidence-based practice strategies. Unit and team culture supportive of quality improvement. The resource of five DNP CNM students to lead projects and being a part of a large academic university as a fertile recruiting ground for doula training program volunteers.	patients in either intervention sample. No measurement to show efficacy or correlation of individual interventions related to NTSV rates. May not be generalize to non-academic facilities or hospitals without similar team culture.	labor dystocia prevention bundle initiative coupled with of an interdisciplinary team's ability to decrease NTSV rates without negatively impacting maternal and neonatal safety indicators. Also shows effectiveness of the interdisciplinary team and DNP student approach in promoting adoption of evidence-based practices. Highlights importance of upright

			meeting to increase buy-in. Next, a report was developed to pull key elements from the electronic medical record to negate need for paper checklists. During the first year of the projects of intermittent auscultation (IA) of fetal heart assessment, upright laboring positions, and an early labor lounge were implemented with a policy change, instructional videos, return demonstration competencies, patient education, bedside references, and pre- and post-intervention data was collected. During the second year a student doula DNP project was implemented to		bed was two hours longer than women upright 50% of the time or more at 26.3% versus 54.4%, P= 0.011) and being upright more the 50% of labor was significant in those without epidurals (7.3% vs 78.3%, P < 0.001). There were no significant changes in rate of low Apgar scores, neonatal intensive care admissions, infection, or PPH.			positioning during labor in decreasing augmentation and length of labor. Shows more research is needed in the early labor lounge.

			increase one-to-one labor support rates which recruited senior and junior nursing students with a survey then provided a four-day doula training course then students signed up for four 8-hour shifts. Next, the team implemented a labor management algorithm, a taskforce to create and implement a labor dystocia huddle which was held prior to any CS for that diagnosis, and a provider note template was created to standardize documentation to aid in case reviews on all CS due to labor dystocia every three months with cases not					

			meeting standards shared for education. Finally, the team tracked the safety measures of Apgar scores, infection, and PPH. No information on statistical analysis methodology was provided.					
National partnership for maternal safety: Consensus bundle on safe reduction of primary cesarean births-supporting intended vaginal births Lagrew, D. C., Low, L. K., Brennan, R., Corry, M. P., Edmonds, J. K., Gilpin, B. G., …Jaffer, S.	To present an evidence-based quality improvement bundle that can be replicated and readily implemented across all birthing hospitals to reduce NTSV CS deliveries and the burden related to creating similar quality improvement initiatives at the local level en lieu of a	Not applicable	Consensus statement Team of physicians, nurses, and public health researchers present an evidence-based safety bundle consisting of 14 identified elements categorized into the four overall domains of recognition and prevention, readiness, response, and reporting and systems learning. The 14 elements are: cultivating a culture that values	V	Not applicable	Comprehensive incorporation of supporting evidence for each practice. Consensus bundle workgroup consists of well-known and respected obstetric leaders and are key members of professional organizations such as the ACOG, Association of Women's Health, Obstetric and	As is consensus statement and not a research study there is no data provided to prove efficacy of this bundle in its entirety. Does not provide validated tools to implement however does list recommended resources	Provides comprehensive, evidence-based, implementable, expert practice recommendations in a clear and educational manner, generalizable to any birthing hospital seeking to reduce NTSV CS deliveries.

2018	national standard.		vaginal birth, engage patients and families, provider education, standardize triage and admission criteria, pain management supporting physiologic labor, standardize FHR assessment, protocols to recognize and mitigate preventable CS, in-house obstetric care, standardize labor induction scheduling, standardize algorithms to respond to labor dystocia, standardize protocols to recognize and respond to NRFHTs and uterine activity, have expertise available for special techniques, NSTV			Neonatal Nurses, the ACNM, and the National Partnership for Women and Families.	with web addresses.	

			data availability for comparison across providers, and track maternal and fetal outcomes as safety balancing measures.					
Quality improvement initiatives lead to reduction in nulliparous term singleton vertex cesarean delivery rate Vadnais, M. A., Hacker, M. R., Shah, N. T., Jordan, J., Modest, A. M., Siegel, M., & Golen, T. H. 2017	To study the influence of quality improvement interventions on the CS birth rate in the NTSV population.	All 15,144 NTSV births occurring at a single academic tertiary care medical center in Massachusetts from 2008 to 2015.	Repeat measures descriptive cross-sectional design A series of evidence-based targeted interventions focused on provider training, feedback and policy changes related to standardized FHR tracing management, labor management, labor induction, CS, and awareness of individual NTSV rate were implemented in multiple waves from 2008 to 2015 then NTSV rates, neonatal and maternal outcomes	II	NTSV CS birth rate decreased over eight years from the baseline 34.8% to 21.2% and the total CS rate decreased from 40.0% to 29.1% with no significant changes in rate of vaginal operative births, five-minute Apgar scores, admissions to neonatal intensive care, shoulder dystocia insurance status, fourth-degree lacerations, maternal age, or	Thorough review of literature, strong statistical analysis, large sample size, and study methodology allowed data collection over eight years to measure impact of multi-strategy approach over time in great detail with strong baseline data. High level of maternal medical history, demographic, maternal and	Multiple interventions occurring at single time so unable to analyze efficacy of individual interventions. Also, midwifery care was introduced during 2014 and not controlled for in NTSV data. May not be generalizable to non-academic and/or non-tertiary care centers.	Provides evidence that evidence-based quality initiatives focusing on policy change, provider education, and feedback of NTSV rates can decrease NTSV rates sustainably over time but should carefully monitor maternal and neonatal outcomes. Important to note that co-morbidities

			were examined annually via administrative claims and birth certificate data and a p-trend for categorical variables was calculated with the Cochran-Armitage test and continuous variables with linear regression. All tests are identified as two-side with the P values <0.05 and SAS 9.4 was used to analyze all data.		co-morbidities over time. Meconium aspiration syndrome increased from 0.1% to 0.9% and maternal blood transfusion increased from 0.6% to 1.4%. A decrease in third-degree lacerations and episiotomies was seen, 4.4% to 2.3% and 15.7% to 2.9%, respectively.	fetal outcome data displayed in multiple charts with statistical analysis. High level of detail makes study replicable.		such as gestational diabetes and pre-eclampsia did not impact NTSV rate.
Promoting effective care: Reducing primary cesarean births through team engagement and standardizatio n of care at a community hospital	To assess if checklists and team huddles would increase team engagement, communicatio n and compliance to labor dystocia and management of excessive	55 NTSV patients at a single 300-bed community hospital in the mid-Atlantic region from October 2018 to December 2018.	Simple descriptive design Baseline NTSV data of 32.3% collected from all NTSV deliveries in 2017 then additional chart audits from 20 CS cases in July 2018 were reviewed for labor dystocia and	IV	In the sample, the NTSV CS rate decreased from 32.3% to 23.6% with level II nursery admission decreased from 9.6% to 6.6%. Team engagement metrics increased from	Checklists were extensive, easy to understand and based on validated evidenced-based CMQCC toolkit checklists.	Small sample size over short period limiting reliability and generalizabili ty of results. No data to reflect statistical significance of findings.	Demonstrates effectiveness of evidenced-based standardized NTSV measures such as toolkits and checklists in reducing NTSV CS as well as improving

Wise, G., & Jolies, D. 2019	uterine activity guidelines to decrease NTSV CS births from 32.3% to 27.3%.		excessive uterine activity management. Four plan-do-study-act (PDSA) cycles on structured team huddles and a best practice checklist adapted from the CMQCC Toolkit to Support Vaginal Birth and Reduce Primary Cesareans were implemented by an interdisciplinary team. Checklists and charts were audited for congruence and all unexpected CS were reviewed input into spreadsheets then field note journals of qualitative staff feedback via conversations and notes of the Wise, G.'s "perception of the collective clinical skills of the L&D staff" were		85% to 98%. However, one project complete and monitoring ceased, NTSV rates over the next two months were 45% and 43%.		Team huddles only conducted at a shift change three times per week limiting participation.	team engagement communication. Highlights importance of strong, continued executive and frontline leadership, oversight, and team ownership in sustaining practice change and to never underestimate the impact of unit culture in change management.

			kept (2019, p. 3). Also, an anonymous three question Likert scale survey was given to staff prior to the PDSA cycles and after each cycle to measure perception of team communication and engagement. Baseline data on level II nursery admissions was collected and compared throughout. All data was collected as mean score percentages with no further statistical analysis.					
Safety assessment of a large-scale improvement collaborative to reduce nulliparous cesarean delivery rates	To assess neonatal and maternal safety quality measures during a quality improvement program to	56 birthing hospitals participating in NTSV reduction collaborative in California with NTSV rates above 23.9% in	Comparative descriptive design Baseline maternal data (blood transfusions, operative vaginal deliveries, infection, and third- or fourth-degree	III	In sample, NTSV rate decreased from 29.3% to 25.0% in 2017 adjusted OR (aOR) 0.76, 95% CI 0.73-0.78 with no significant	Large sample size with very prescriptive and objective data points. Participating hospitals all received same training and used same,	Data collected per participating hospitals' staff with no validation of collection accuracy or interrater reliability	Provides evidence that standardized NTSV reduction quality measures implemented via hospital collaboratives

Main, E. K., Chang, S. C., Cape, V., Sakowski, C., Smith, H., & Vasher, J 2019	reduce NTSV CS birth rates.	2015, from 2015-2017 with 126,480 NTSV births. 87.5% of the participating hospitals were community and 12.5 were academic.	lacerations) and neonatal (Apgar score < five at five minutes and severe unexpected complication) rates were collected from sample in 2015 then compared to the same safety data submitted by participants for 2017. Odds ratio and 95% CIs calculated via a mixed-effect multivariable logistic regression model.		differences in all of the safety outcomes and a decrease in severe unexpected newborn complication (3.2%-2.2%, aOR 0.71, 95% CI 0.55-0.92) noted at hospitals in tercile of greatest NTSV rate decline via a sensitivity analysis.	validated definitions and interventions. Data analysis, sample demographics, and results are extensive in multiple tables and graphs.	(i.e., Apgar scores). No information on efficacy of individual interventions.	can successful decrease NTSV CS rates while not negatively impacting maternal or neonatal outcomes.
Non-clinical interventions for reducing unnecessary caesarean section Chen, I., Opiyo, N., Tavender, E., Mortazhejri, S., Rader, T., Petkovic, J.,	To evaluate efficacy of non-clinical interventions designed to reduce unnecessary CS.	12171 articles reviewed with a total of 29 studies meeting criteria: 19 RCTs, 9 interrupted time series, 1 controlled before-after studies. 20 studies were	Systematic Review The Cochrane Central Register of Controlled Trials, Cochrane Pregnancy and Childbirth Group, MEDLINE, Embase, and CINAHL were searched then reference list, websites, and trial	I	29 studies from 18 countries, representing all continents except Africa, met review criteria. Four intervention types were noted: Interventions targeted at women or families,	Very in-depth description of design details with statistical analysis information that includes level of evidence certainty for each piece of evidence. Strong assessment of	Not specific to NTVS CS reduction and does not address labor dystocia checklists or team huddles.	Provides evidence that CS reduction interventions do not increase risk of maternal or fetal morbidity and mortality. Demonstrates more research is needed in multifaceted

... Betran, A. P. 2018		conducted in high-income countries and none conducted in low-income countries. No exclusions were placed on language and all articles meeting inclusion criteria and published since 2010 to March 2018 were reviewed.	registries were searched then experts contacted. Duplicates were removed then articles were entered into Covidence. Seven reviewers worked in independent pairs to screen articles and then five reviewers extracted data then assessed for bias using the Cochrane EPOC criteria and disagreements were resolved by discussion. Effect of interventions with dichotomous outcomes were assessed with RR, OR, or risk differences (RDs) and mean differences (MD) for continuous outcomes. Data was synthesized into four categories with an evidence table		Interventions targeted at healthcare professionals, Interventions targeted at healthcare organizations or facilities, and 'Cross-cutting' interventions which were hybrids of two categories. Three of eight studies targeted at healthcare professionals reduced CS rates: physician education by local leader (53.7%, 95% CI 46.5 to 61.0%; control: 66.8%, 95% CI 61.7 to 72.0%), audit and feedback combined with implementation of practice guidelines ((RD) -1.8%,	bias and high generalizability to practice.		CS reduction interventions.

			for each category. Confidence in the estimate of effect was assessed using GRADE by one author and checked by one or more authors. Far more details reported on additional data assessment.		95% CI -3.8 to 0.2), and mandatory second opinion for CS combined with implementation of practice guidelines (overall CS MD in rate change -1.9, 95% CI -3.8 to -0.1). Not enough evidence was available, with one two studies, to provide certainty of effectiveness in 'Cross-cutting' multifaceted interventions. No significant increases in fetal or maternal morbidity or mortality were noted.			
Evidence-based strategies for	To analyze literature, ascertain	All studies meeting criteria via	Meta-analysis	I	Out of 831 studies, 11 met criteria for	High level of design detail to include	Published in 2007 and does not	Provides Level I evidence on

reducing cesarean section rates: A meta-analysis Chaillet, N., & Dumont, A. 2007	efficacy of CS reduction interventions, impact on perinatal and maternal morbidity and mortality rates, and if identifying and addressing practice barriers can improve intervention effect.	the Cochrane and Effective Practice and Organisation of Care Group criteria on MEDLINE, Cochrane Library, and Embase from January 1990 to June 2005	Controlled and interrupted time series studies were searched by the primary author and a medical librarian via MEDLINE, Cochrane Library, and Embase with key terms then the two authors independently reviewed and abstracted data that was evaluated for inclusion and quality via the Cochrane and Effective Practice and Organisation of Care Group criteria. A meta-analysis of the dichotomous data was performed using relative risk for effect size. CS rates in randomized control trials (RCTs) were compared directly between intervention and control groups with		quality assessment with 10 deemed acceptable in both quality and inclusion criteria: 5 interrupted time series, 2 cluster RCTs, and 3 RCTS. Audits and feedback, quality improvement, and multifaceted strategies were identified as effective in reducing CS rates the largest impact of 27% was seen when implementing audit and feedback as a part of a multifaceted approach with a total of 2 or more interventions.	statistical analysis information for each type of study and to control for biases. Authors provided results with statistical information in graphs and tables that were clear and easy to understand.	evaluate evidence published after June 2005. Focuses on all CS reduction and not exclusively on NTSV rate reduction.	efficacy of CS reduction strategies and evidence that CS reduction interventions are safe for both mother and baby.

			adjusted risk ratios used when appropriate. Prerate and postrate interventions were used to estimate effect size in interrupted time series studies with the autoregressive integrated moving average (ARIMA) model computed via SPSS version 11.0 to validate intervention effect versus historical effect. Stata version 7.0 was used to compute the meta-regression and meta-analysis.		Analysis found CS rates significantly decreased (pooled RR, 0.81; 95% CI, 0.75-0.87; p <0.0001) and relative rate decrease of 19% (relative RR, 19%; 95% CI 13-25%) with significant reduction of labor dystocia, repeat CS, maternal and fetal indications. No significant differences were noted in either fetal or maternal outcomes in all by 1 study which found significant decrease in both with (RR = 0.53; 95% CI, 0.37-0.75) and			

					(RR = 0.37; 95% CI, 0.21-0.64), respectively.			
Implementing a systematic approach to reduce cesarean birth rates in nulliparous women Bell, A., Joy, S., Gullo, S., Higgins, R., & Stevenson, E. 2017	Implementation of a systematic method to safely reduce NTSV CS delivery rates.	Three acute care hospitals in Carolinas Health System North Carolina, one urban and two rural community, with a baseline total NTSV rate of 27.73%, from January 2015 to December 31, 2016 with a total of 434 patients in the pre-implementation cohort and 401 patients in the post-implementation cohort;	Comparative descriptive design All staff were educated on standardized triage management, admission criteria, FHR assessments, pain management techniques, patient support and education, and CS reduction protocols via the Council on Patient Safety in Women's Health Care: Patient Safety Bundle on the Safe Reduction of Primary Cesarean Births. One primary investigator reviewed all records for NTSV outcome, guideline compliance and outcomes:	III	In the sample the NTSV rates went from 34.0%, 32.9%, and 25.3% with a cumulative 27.9% to 22.4%, 19.4%, and 19.2% with a cumulative 19.7% (odd ratios (OR) 0.63, CI 0.46-0.88), respectively. Provider compliance increased from 86.2% to 91.5% (OR 1.73, 95% CI 1.11-2.70). Maternal position changing increased from 78.7% to 87.5% (OR 1.86, CI 1.29-2.68) and use of peanut	In-depth statistical analysis details were provided and results were clearly and thoroughly displayed in figures and tables. All obstetric staff at the three hospitals received the same detailed training and used a validated safety bundle to develop very prescriptive labor management and induction guidelines and were supported via a highly engaged leadership	Small sample size impacting generalizability, provider bias and inability to validate data is real-time. Underpowered to detect any significant differences in fetal or maternal outcomes. Further history bias could exist as NTSV reduction literature was plentiful prior to implementation.	Provides evidence that implementing a standardized approach to managing obstetric care in the NTSV population can decrease NTSV CS rates. Also shows value of using collaborative team approach to adapt evidence-based bundles to practice environment.

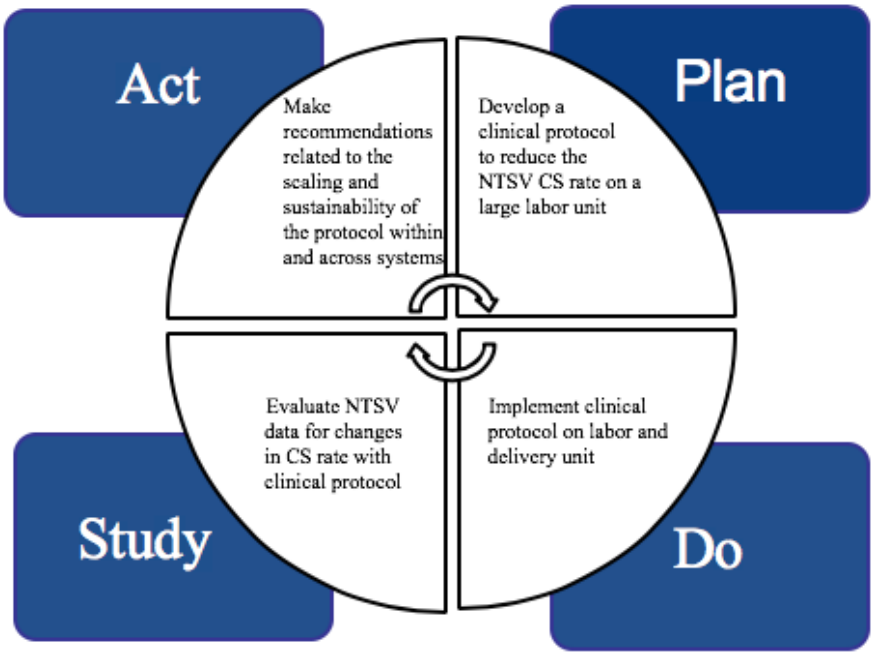
		excluding non-viable pregnancies.	infection, PPH, operative vaginal birth, and 3- or 4th-degree lacerations, meconium fluid, shoulder dystocia, five-minute Apgar less than seven, intensive care admission, and transfer. SPSS was used for statistical analysis with the X2 test used for categorical data or less than five, the Fisher exact test. T tests were used for continuous variables. Significance was set a <.05.		ball from 16.8% to 45.2% (OR 3.38, 95% CI 2.84-5.16). There were no statistically significant changes to maternal or fetal outcomes.	team with multiple provider and nursing champions at each site.		
Impact of recommended changes in labor management for prevention of the primary cesarean delivery	To assess if implementation of ACOG/SMFM's Consensus for safe prevention of the primary cesarean	At Poissy-Saint Germain Hospital in Poissy, France, a university hospital from March 2014 to May 2015.	Retrospective cohort study ACOG/SMFM's Consensus guidelines implemented to change protocol to emulate guideline recommendations	III	CS rate in NTSV patient population significantly decreased to 6.9% from 9.4% with protocol change (OR, 0.71, 95% CI, 0.59-0.85; P	Very in-depth detail on statistical analysis and research design; ACOG/SMFM's consensus used as well as	Conducted in France so many not be generalizable to US patient population (including in ROL given strict adherence to	Provides evidence that implementation of ACOG/SMFM's Consensus can safely decrease rate of NTSV CS

Thuillier, C., Roy, S., Peyronnet, V., Quibel, T., Nlandu, A., & Rozenberg, P. 2018	delivery would safely decease NTSV CS.	Including all NTSV patients, excluding elective CS and maternal complications such as diabetes and preeclampsia and fetal complications such as growth restriction. Total of 6351 patients with 3283 baseline and 3068 post-intervention.	for management of active labor and arrest of first and second stage arrest. Neonatal and maternal outcomes pre and post implementation were collected via electronic medical record and birth register and reviewed by one midwife and one of the authors. Method of delivery and indication and timing for CS were reviewed as well as operative vaginal deliveries, 3rd of 4th degree lacerations, PPH, gestational age at birth, Apgar scores, NICU admission, and umbilical cord PH. R studio version 0.99.896 (CRAN) software (Boston, MA) was used for statistical analysis and Fisher exact or		<.01) with CS of arrest of labor decreased significantly in first stage to 0.9% from 1.8% (OR, 0.51, 95% CI, 0.31-0.81; P <.01) and insignificantly in second stage to 1.0% from 1.3% (OR, 1.3, CI, 0.81-2.26; P =.2). Duration of labor before CS was significantly longer, operative vaginal rates decreased significantly to 17.2% from 19.5% with no change in maternal outcomes and no changes in neonatal outcomes except a	ACOG standards. Large sample size.	ACOG/SMFM Consensus). Lacks detail of all exclusion criteria giving two examples of maternal and fetal complications but not exhaustive list.	without increasing maternal or neonatal morbidity or mortality. Also shows improvement in one-minute Apgar scores and decrease in operative vaginal deliveries.

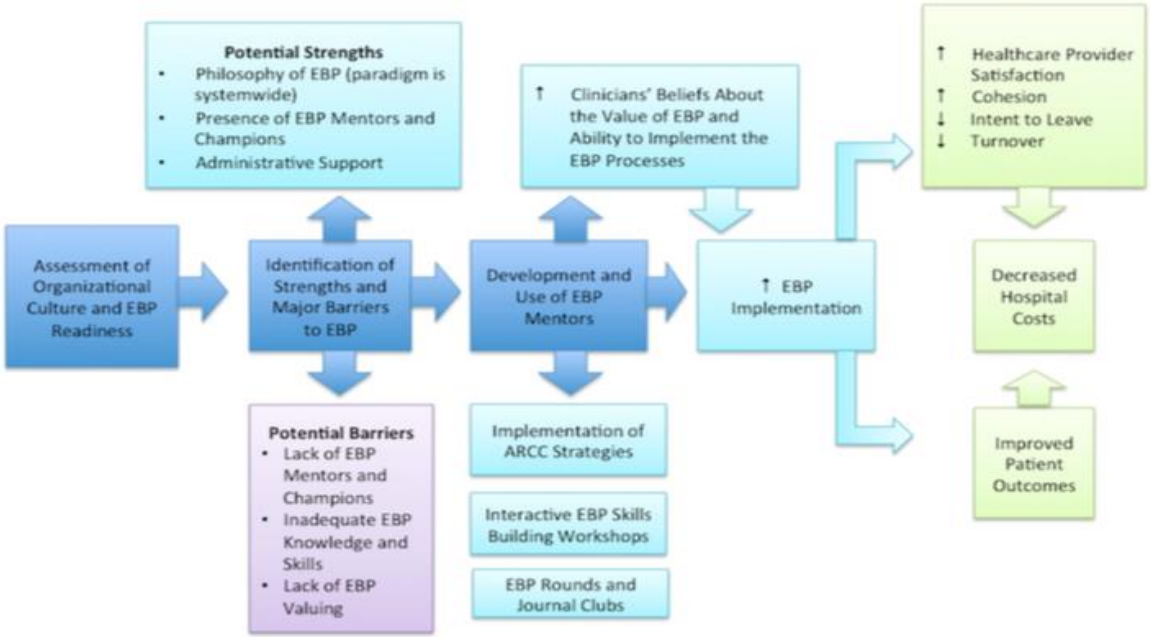
			X2 tests used for comparison of overall groups and subgroups and binary outcomes, with ORs to measure associations and mean durations of labor and other continuous variables measured via Independent Student t tests. P value set at <.05 for significance and two-sided analysis used.		significant decrease in rate of Apgar scores <7 at one minute to 6.95 from 8.4% (OR, 0.80, 95% CI, 0.66-0.97; P=.2).			

Appendix C

Project Model and Framework



Adapted PDSA Model for Improvement for Project *Source:* From Nelson, E. C., Batalden, P. B., & Godfrey, M. M. (2007). *Quality by design: A clinical microsystems approach.* (1st ed.). San Francisco, CA: Jossey-Bass.



Melnyk and Fineout-Overholt's ARCC Model© *Source:* From Melnyk, B. M., & Fineout-Overholt, E. (2005). *Evidence-based practice in nursing and healthcare: A guide to best practice.* Philadelphia, PA: Lippincott, Williams & Wilkins.

Appendix D

SWOT Analysis

Strengths

- Magnet, Five Stars, A rating
- Mission, vision, values, strategic goals
- Nursing leadership at executive level
- EBP and research at all levels with grants and staff-led projects
- Team culture of EBP throughout all professions
- High engagement of OB leadership: Chief of OB, Hospitalists, Educators, Nursing
- Care bundle implementation in progress

Weaknesses

- High birth volume leads to inconsistent adherence to practice and staffing guidelines
- New private physician group
- New OB residency program
- Communication gaps with private practitioners and off-shift/PRN staff
- Staff turnover brings gaps in education to unit practice
- Risk of culture change with new team member influence

Opportunities

- Strong media attention to high cesarean rate in US
- CS reduction initiatives and bundles readily available
- CS reduction promoted by WHO, ACOG, ACMN, CMS, and Healthy People 2020.
- Strong community support of organization
- Strong donor support of safety initiatives

Threats

- CMS and The Joint Commission core measures
- Public culture promoting elective cesarean birth
- Provider preference of cesarean due to convenience and reduced litigation
- ARRIVE Trial Study misapplication, increasing elective induction of labor at 39 week

Appendix E

CMQCC Labor Dystocia Checklist

Appendix K

CMQCC Labor Dystocia Checklist (ACOG/SMFM Criteria)

CMQCC California Maternal Quality Care Collaborative

CMQCC Labor Dystocia Checklist (ACOG/SMFM Criteria)

1. Diagnosis of Dystocia/Arrest Disorder (all 3 should be present)

- ☐ Cervix 6 cm or greater
- ☐ Membranes ruptured, then
- ☐ No cervical change after at least 4 hours of adequate uterine activity (e.g. strong to palpation or MVUs > 200), or at least 6 hours of oxytocin administration with inadequate uterine activity

2. Diagnosis of Second Stage Arrest (only one needed)

No descent or rotation for:

- ☐ At least 4 hours of pushing in nulliparous woman with epidural
- ☐ At least 3 hours of pushing in nulliparous woman without epidural
- ☐ At least 3 hours of pushing in multiparous woman with epidural
- ☐ At least 2 hour of pushing in multiparous woman without epidural

3. Diagnosis of Failed Induction (both needed)

- ☐ Bishop score ≥6 for multiparous women and ≥ 8 for nulliparous women, before the start of induction (for non-medically indicated/elective induction of labor only)
- ☐ Oxytocin administered for at least 12-18 hours after membrane rupture, without achieving cervical change and regular contractions. *Note: At least 24 hours of oxytocin administration after membrane rupture is preferable if maternal and fetal statuses permit

American College of Obstetrics and Gynecology, Society for Maternal-Fetal Medicine. Obstetric care consensus no. 1: safe prevention of the primary cesarean delivery. Obstet Gynecol. 2014;123(3):693-711.

Spong CY, Berghella V, Wenstrom KD, Mercer BM, Saade GR. Preventing the first cesarean delivery: summary of a joint Eunice Kennedy Shriver National Institute of Child Health and Human Development, Society for Maternal-Fetal Medicine, and American College of Obstetricians and Gynecologists Workshop. Obstet Gynecol. 2012;120(5):1181-1193.

Appendix F

Rolling RN NTSV CS Rates

Birth RN	Number of Births (July-Nov 2021)	NTSV Rate (July-Nov 2021)	Birth RN	Number of Births (Aug-Dec 2021)	NTSV Rate (Aug-Dec 2021)	Birth RN	Number of Births (Sept-Jan 2022)	NTSV Rate (Sept-Jan 2022)	Birth RN	Number of Births (Oct-Feb 2022)	NTSV Rate (Oct-Feb 2022)
RN 1	1	0.00%	RN 39	1	0.00%	RN 107	1	0.00%	RN 107	1	0.00%
RN 2	1	0.00%	RN 110	3	0.00%	RN 1	2	0.00%	RN 1	3	0.00%
RN 3	2	0.00%	RN 2	2	0.00%	RN 110	5	0.00%	RN 121	1	0.00%
RN 4	1	0.00%	RN 40	2	0.00%	RN 100	1	0.00%	RN 66	5	0.00%
RN 5	5	0.00%	RN 3	2	0.00%	RN 40	9	0.00%	RN 122	4	0.00%
RN 6	1	0.00%	RN 111	4	0.00%	RN 115	7	0.00%	RN 96	1	0.00%
RN 7	3	0.00%	RN 112	2	0.00%	RN 3	1	0.00%	RN 123	1	0.00%
RN 8	1	0.00%	RN 4	1	0.00%	RN 111	7	0.00%	RN 40	9	0.00%
RN 9	5	0.00%	RN 41	2	0.00%	RN 112	6	0.00%	RN 62	1	0.00%
RN 10	9	0.00%	RN 34	1	0.00%	RN 4	1	0.00%	RN 111	9	0.00%
RN 11	2	0.00%	RN 33	5	0.00%	RN 93	2	0.00%	RN 4	1	0.00%
RN 12	21	0.00%	RN 30	3	0.00%	RN 77	1	0.00%	RN 93	2	0.00%
RN 13	1	0.00%	RN 32	1	0.00%	RN 83	4	0.00%	RN 124	2	0.00%

RN 14	3	0.00%	RN 28	3	0.00%	RN 86	1	0.00%	RN 104	1	0.00%
RN 15	8	0.00%	RN 5	2	0.00%	RN 41	2	0.00%	RN 116	3	0.00%
RN 16	3	0.00%	RN 7	4	0.00%	RN 34	1	0.00%	RN 125	4	0.00%
RN 17	8	0.00%	RN 21	3	0.00%	RN 116	1	0.00%	RN 33	10	0.00%
RN 18	17	0.00%	RN 20	1	0.00%	RN 33	7	0.00%	RN 118	2	0.00%
RN 19	2	0.00%	RN 38	1	0.00%	RN 117	2	0.00%	RN 30	2	0.00%
RN 20	1	0.00%	RN 8	2	0.00%	RN 118	1	0.00%	RN 32	2	0.00%
RN 21	6	0.00%	RN 9	4	0.00%	RN 30	2	0.00%	RN 50	5	0.00%
RN 22	1	0.00%	RN 24	2	0.00%	RN 32	2	0.00%	RN 63	1	0.00%
RN 23	9	0.00%	RN 10	6	0.00%	RN 63	2	0.00%	RN 52	1	0.00%
RN 24	2	0.00%	RN 13	1	0.00%	RN 52	3	0.00%	RN 92	1	0.00%
RN 25	4	0.00%	RN 14	2	0.00%	RN 28	2	0.00%	RN 54	1	0.00%
RN 26	5	0.00%	RN 15	8	0.00%	RN 7	2	0.00%	RN 7	2	0.00%
RN 27	3	0.00%	RN 16	4	0.00%	RN 20	1	0.00%	RN 103	4	0.00%
RN 28	3	0.00%	RN 17	8	0.00%	RN 8	2	0.00%	RN 8	2	0.00%
RN 29	1	0.00%	RN 18	18	0.00%	RN 9	3	0.00%	RN 9	2	0.00%
RN 30	2	0.00%	RN 19	1	0.00%	RN 24	2	0.00%	RN 24	1	0.00%
RN 31	1	0.00%	RN 75	1	0.00%	RN 67	9	0.00%	RN 88	2	0.00%
RN 32	1	0.00%	RN 12	20	5.00%	RN 14	1	0.00%	RN 73	1	0.00%

RN 33	2	0.00%	RN 43	17	5.88%	RN 78	2	0.00%	RN 67	4	0.00%
RN 34	1	0.00%	RN 42	15	6.67%	RN 16	3	0.00%	RN 16	3	0.00%
RN 35	5	0.00%	RN 23	12	8.33%	RN 17	9	0.00%	RN 99	4	0.00%
RN 36	1	0.00%	RN 35	10	10.00%	RN 18	15	0.00%	RN 18	14	0.00%
RN 37	1	0.00%	RN 51	18	11.11%	RN 19	1	0.00%	RN 19	1	0.00%
RN 38	4	0.00%	RN 55	9	11.11%	RN 75	1	0.00%	RN 118	1	0.00%
RN 39	1	0.00%	RN 47	36	11.11%	RN 35	14	7.14%	RN 47	26	3.85%
RN 40	1	0.00%	RN 66	16	12.50%	RN 12	14	7.14%	RN 35	16	6.25%
RN 41	2	0.00%	RN 50	8	12.50%	RN 66	13	7.69%	RN 12	14	7.14%
RN 42	19	5.26%	RN 59	23	13.04%	RN 60	11	9.09%	RN 60	11	9.09%
RN 43	13	7.69%	RN 58	15	13.33%	RN 46	11	9.09%	RN 115	10	10.00%
RN 44	13	7.69%	RN 57	15	13.33%	RN 47	30	10.00%	RN 17	10	10.00%
RN 45	10	10.00%	RN 25	7	14.29%	RN 43	16	12.50%	RN 112	9	11.11%
RN 46	10	10.00%	RN 53	20	15.00%	RN 58	15	13.33%	RN 46	9	11.11%
RN 47	28	10.71%	RN 60	13	15.38%	RN 71	14	14.29%	RN 51	8	12.50%
RN 48	9	11.11%	RN 52	6	16.67%	RN 50	7	14.29%	RN 43	16	12.50%
RN 49	9	11.11%	RN 26	6	16.67%	RN 37	7	14.29%	RN 90	7	14.29%
RN 50	9	11.11%	RN 27	6	16.67%	RN 59	21	14.29%	RN 37	7	14.29%

RN 51	17	11.76%	RN 67	11	18.18%	RN 23	14	14.29%	RN 59	21	14.29%
RN 52	8	12.50%	RN 63	5	20.00%	RN 42	7	14.29%	RN 45	20	15.00%
RN 53	16	12.50%	RN 37	5	20.00%	RN 51	12	16.67%	RN 58	13	15.38%
RN 54	8	12.50%	RN 45	15	20.00%	RN 45	18	16.67%	RN 27	11	18.18%
RN 55	15	13.33%	RN 61	15	20.00%	RN 26	6	16.67%	RN 29	5	20.00%
RN 56	14	14.29%	RN 71	14	21.43%	RN 99	6	16.67%	RN 91	5	20.00%
RN 57	14	14.29%	RN 80	18	22.22%	RN 48	5	20.00%	RN 89	5	20.00%
RN 58	14	14.29%	RN 83	9	22.22%	RN 103	5	20.00%	RN 76	5	20.00%
RN 59	13	15.38%	RN 91	9	22.22%	RN 73	5	20.00%	RN 26	5	20.00%
RN 60	18	16.67%	RN 46	9	22.22%	RN 27	10	20.00%	RN 86	5	20.00%
RN 61	12	16.67%	RN 44	13	23.08%	RN 57	15	20.00%	RN 80	14	21.43%
RN 62	6	16.67%	RN 64	17	23.53%	RN 61	14	21.43%	RN 71	14	21.43%
RN 63	6	16.67%	RN 92	4	25.00%	RN 53	18	22.22%	RN 23	14	21.43%
RN 64	16	18.75%	RN 62	4	25.00%	RN 90	9	22.22%	RN 110	9	22.22%
RN 65	10	20.00%	RN 69	8	25.00%	RN 64	13	23.08%	RN 65	9	22.22%
RN 66	20	20.00%	RN 74	4	25.00%	RN 80	17	23.53%	RN 82	13	23.08%
RN 67	15	20.00%	RN 54	4	25.00%	RN 29	4	25.00%	RN 53	17	23.53%
RN 68	5	20.00%	RN 68	4	25.00%	RN 91	4	25.00%	RN 57	17	23.53%

RN 69	5	20.00%	RN 65	12	25.00%	RN 21	4	25.00%	RN 81	8	25.00%
RN 70	10	20.00%	RN 73	8	25.00%	RN 68	4	25.00%	RN 117	4	25.00%
RN 71	14	21.43%	RN 76	4	25.00%	RN 55	4	25.00%	RN 56	8	25.00%
RN 72	18	22.22%	RN 81	14	28.57%	RN 65	12	25.00%	RN 21	4	25.00%
RN 73	9	22.22%	RN 48	7	28.57%	RN 76	4	25.00%	RN 94	8	25.00%
RN 74	4	25.00%	RN 70	7	28.57%	RN 15	8	25.00%	RN 64	12	25.00%
RN 75	4	25.00%	RN 82	13	30.77%	RN 82	16	25.00%	RN 95	15	26.67%
RN 76	4	25.00%	RN 79	13	30.77%	RN 95	15	26.67%	RN 15	7	28.57%
RN 77	4	25.00%	RN 95	18	33.33%	RN 44	11	27.27%	RN 42	7	28.57%
RN 78	4	25.00%	RN 93	3	33.33%	RN 39	7	28.57%	RN 39	10	30.00%
RN 79	15	26.67%	RN 29	3	33.33%	RN 81	13	30.77%	RN 72	13	30.77%
RN 80	18	27.78%	RN 84	6	33.33%	RN 25	9	33.33%	RN 92	3	33.33%
RN 81	14	28.57%	RN 56	9	33.33%	RN 92	3	33.33%	RN 101	15	33.33%
RN 82	10	30.00%	RN 98	3	33.33%	RN 2	9	33.33%	RN 48	6	33.33%
RN 83	10	30.00%	RN 78	3	33.33%	RN 62	3	33.33%	RN 69	9	33.33%
RN 84	6	33.33%	RN 86	3	33.33%	RN 119	3	33.33%	RN 44	9	33.33%

RN 85	3	33.33%	RN 99	6	33.33%	RN 84	3	33.33%	RN 10	3	33.33%
RN 86	3	33.33%	RN 72	17	35.29%	RN 69	9	33.33%	RN 78	3	33.33%
RN 87	6	33.33%	RN 49	8	37.50%	RN 56	9	33.33%	RN 25	11	36.36%
RN 88	3	33.33%	RN 90	15	40.00%	RN 54	3	33.33%	RN 113	8	37.50%
RN 89	8	37.50%	RN 101	9	44.44%	RN 10	3	33.33%	RN 61	16	37.50%
RN 90	18	38.89%	RN 89	9	44.44%	RN 94	9	33.33%	RN 2	10	40.00%
RN 91	10	40.00%	RN 94	11	45.45%	RN 72	12	33.33%	RN 119	5	40.00%
RN 92	5	40.00%	RN 107	2	50.00%	RN 49	11	36.36%	RN 83	5	40.00%
RN 93	5	40.00%	RN 100	2	50.00%	RN 113	5	40.00%	RN 53	5	40.00%
RN 94	12	41.67%	RN 96	2	50.00%	RN 79	10	40.00%	RN 49	10	40.00%
RN 95	17	47.06%	RN 104	2	50.00%	RN 101	12	41.67%	RN 55	5	40.00%
RN 96	2	50.00%	RN 77	2	50.00%	RN 89	9	44.44%	RN 79	9	44.44%
RN 97	6	50.00%	RN 113	2	50.00%	RN 96	2	50.00%	RN 126	2	50.00%
RN 98	4	50.00%	RN 85	2	50.00%	RN 104	2	50.00%	RN 120	2	50.00%
RN 99	8	50.00%	RN 103	6	50.00%	RN 85	2	50.00%	RN 84	2	50.00%
RN 100	2	50.00%	RN 88	2	50.00%	RN 74	2	50.00%	RN 85	2	50.00%

RN 101	5	60.00%	RN 97	5	60.00%	RN 6	4	50.00%	RN 40	2	50.00%
RN 102	3	66.67%	RN 102	3	66.67%	RN 70	4	50.00%	RN 68	2	50.00%
RN 103	16	81.25%	RN 87	3	66.67%	RN 86	2	50.00%	RN 75	2	50.00%
RN 104	1	100.00 %	RN 6	3	66.67%	RN 102	3	66.67%	RN 41	5	60.00%
RN 105	1	100.00 %	RN 106	3	100.00 %	RN 97	5	80.00%	RN 102	3	66.67%
RN 106	4	100.00 %	RN 108	1	100.00 %	RN 106	3	100.00 %	RN 70	3	66.67%
RN 107	1	100.00 %	RN 114	1	100.00 %	RN 120	1	100.00 %	RN 106	4	75.00%
RN 108	1	100.00 %				RN 87	1	100.00 %	RN 6	4	75.00%
RN 109	3	100.00 %				RN 88	1	100.00 %	RN 97	5	80.00%
						RN 114	1	100.00 %	RN 127	1	100.00 %
									RN 43	4	100.00 %
									RN 74	1	100.00 %
									RN 96	1	100.00 %

Appendix G

NTSV Cesarean Section Communication Tool

Patient Label

NTSV Cesarean Section
Communication Tool

Patient Name:_____Gestational Age:_____wks_____/7ths days

Date of C-section:_____Time:_____am / pm Gravida_____Para

Race:_____

Baseline Clinical Information

Admission: Date: _____ Time: _____ am/ pm

Patient Status: ☐ Admitted in Active Labor
☐ Not in Active Labor at admission
☐ Scheduled Induction ☐ Unscheduled Induction ☐ Spontaneous rupture of membranes
☐ Previously Admitted Antepartum

Membranes on admission: ☐ Intact ☐ Ruptured

Cervical Ripening (*check all that apply*):
☐ None ☐ Misoprostol ☐ Foley Balloon ☐ Cook (double balloon) Catheter

Oxytocin (*check one*):
☐ None utilized ☐ Induction ☐ Augmentation at _____cm

Cervical Examinations *(please enter as much information as was documented):*

Event	Dilation (cm)	Effacement (%)	Station	Cx Position	Cx Consistency	Bishop Score*
Arrival/First Admission						
Last Exam Before Delivery						

Admitted for *Induction of Labor*:	Admitted for *Spontaneous Labor*:
❑ Mechanical Cervical Ripening ❑ Kinetic Epidural ❑ Peanut Ball ❑ Fetal tracing documented using NICHD terminology ❑ Nursing Labor Support ❑ Labor Loop ❑ Labor Dystocia Definitions ❑ Risk Reducing Induction	❑ Evidence of cervical change prior to admission ❑ Kinetic Epidural ❑ Peanut Ball ❑ Fetal tracing documented using NICHD terminology ❑ Nursing Labor Support ❑ Labor Loop ❑ Labor Dystocia Definitions

RN at C/S Decision:_____

Provider at C/S Decision:_____

Proceed to Back Page

In the next section please use the **primary indication** for this cesarean section and answer the appropriate questions ***(Physician to complete):***

- ❑ **Concerning fetal status**
  - ❑ Antepartum testing results precluding trial of labor
  - ❑ Category III FHR tracing
  - ❑ Worsening Category II FHR tracing despite intrauterine resuscitative measures
  - ❑ Other _____ _____

- ❑ **Failed Induction** – ***both should be present:***
  - ❑ Cervical ripening used if starting with unfavorable Bishop Score (<6 for multip and <8 for nullip).
  - ❑ Unable to generate regular contractions (every 3 minutes) and cervical change after oxytocin administered forat least 12-18 hours after membrane rupture. Note: at least 24-hours of oxytocin administration after membrane rupture is preferable if maternal and fetal statuses permit

- ❑ **Latent Phase Arrest (less than 6 cm)**
  - ❑ Moderate or strong contractions palpated > 12 hour without cervical change **OR,**
  - ❑ IUPC > 200 MVUs for > 12 hours without cervical change

- ❑ **Active Phase Arrest of Dilation** – ***all three should be present:***
  - ❑ Cervix ≥6cm dilated
  - ❑ Membranes ruptured
  - ❑ No cervical change (dilation, effacement, station, or position) after ≥ 4h of adequate uterine contractions (strong to palpation or ≥200MVUs)

    OR
  - ❑ Inability to generate adequate uterine contractions despite ≥ 6h of Oxytocin administration

- ❑ **Second Stage Arrest (of descent)** – **No descent or rotation for (*only need one*):**
  - ❑ Nullipara with epidural in the second stage pushing ≥4h

    OR
  - ❑ Nullipara without epidural in the second stage pushing ≥3h

    OR
  - ❑ Multipara with epidural in the second stage pushing ≥3h

    OR
  - ❑ Multipara without epidural in the second stage pushing ≥2h

- ❑ **Malpresentation:**
  - ❑ Malpresentation diagnosed antepartum without attempted external cephalic version
  - ❑ Malpresentation diagnosed antepartum period with unsuccessful external cephalic version
  - ❑ Malpresentation diagnosed during labor or after membranes ruptured

If none of the above indications were the reason please write in the diagnosis here with brief explanation:

_____

_____

_____

_____