The MFMU VBAC Calculator as a tool in offering TOLAC: Do our NNEPQIN Guidelines need a re-write?

Kelley McLean, MD
Associate Professor
University of Vermont

Will Williams, MD
Assistant Professor
Ochsner Health

Objectives

1) Review current VBAC rates and trends
2) Review current NNEPQIN and ACOG guidance re: TOLAC/VBAC
3) Review some Vermont-based TOLAC data, with an eye to how we may re-consider our NNEPQIN VBAC guidance
4) Consider current barriers to VBAC at each of our institutions

A few Definitions.....

- >600K births/year in the US to people with prior cesarean delivery (CD)
  - Any guesses as to VBAC rate, nationally?
- VBAC: Vaginal Birth After Cesarean
- TOLAC: Trial of Labor After Cesarean
- VBAC Rate: Number of vaginal births/# of people with prior CD
  - The "VBAC rate" does not reflect "VBAC eligible"- i.e. those with breech, previa, prior vertical incision, etc. are often included in national VBAC rate data
  - Publications reporting on VBAC rates should clarify how the "VBAC rate" is calculated- ie: using the national (National Vital Statistics/CDC definition), or using VBAC eligible as the denominator
- VBAC Success Rate: # VBAC/ # TOLAC
  - Partially reflects "choosing well"- though should be assessed with the maternal and neonatal morbidity as balancing measures

VBAC Whiplash.....

- Recommendations favoring TOLAC in the 1980s resulted in an increase in VBAC rates from around 5% in 1985 to 28.3% in 1996
  - Both NIH and ACOG had strongly- worded recommendations favoring VBAC during this time period, with little attention to individual risk factors
  - In some cases, insurance companies mandated a trial of labor, thereby limiting access to repeat cesarean for patients who desired it
- The repeat and total cesarean delivery rates concomitantly decreased as a result, however reports of uterine rupture and maternal/neonatal complications increased
- These reports, and the professional liability pressures they engendered, contributed in part to the reversal of the VBAC and CD trend
  - In 1999 (3 years after the MacMahon study*), ACOG published the now infamous VBAC Practice Bulletin in which they recommended that "VBAC should be attempted in institutions equipped to respond to emergencies with physicians immediately available to provide emergency care", and that anesthesia and personnel for an emergency cesarean be "available."
  - By 2006, the VBAC rate had decreased to 8.5%, and the total CD rate had increased to 31%

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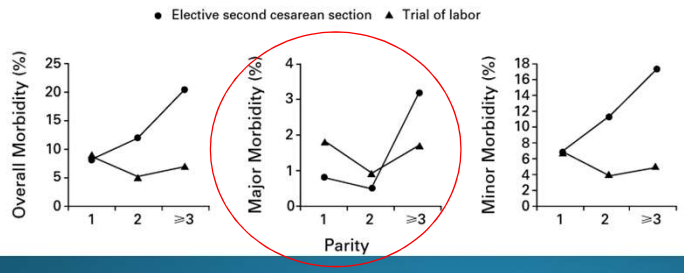
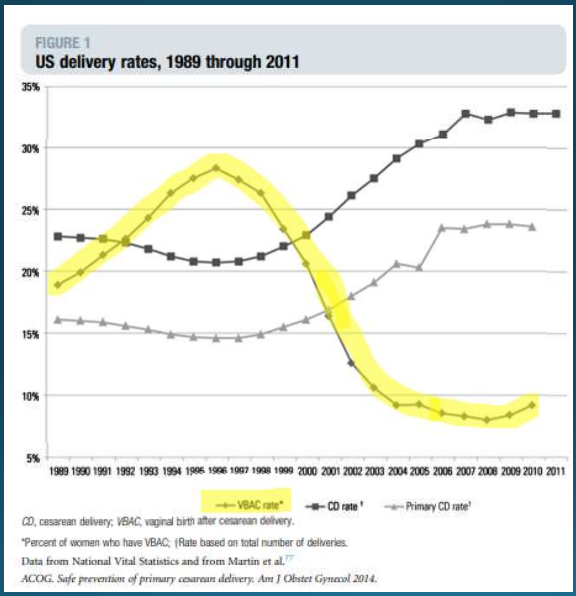
COMPARISON OF A TRIAL OF LABOR WITH AN ELECTIVE SECOND CESAREAN SECTION

MICHAEL J. MCMAHON, M.D., M.P.H., EDWIN R. LUTHER, M.D., WATSON A. BOWES, JR., M.D., AND ANDREW F. OLSHAN, PH.D.

TABLE 2. MORBIDITY IN PREGNANT WOMEN WHO CHOSE A TRIAL OF LABOR OR AN ELECTIVE SECOND CESAREAN SECTION IN NOVA SCOTIA FROM 1986 THROUGH 1992.

MORBIDITY*	TRIAL OF LABOR (N=3249)	ELECTIVE SECOND CESAREAN SECTION (N=2889)	ODDS RATIO (95% CI)†
	no. (%)		
Total complications	257 (7.9)	243 (8.4)	0.9 (0.8–1.1)
Major complications	53 (1.6)	24 (0.8)	1.8 (1.1–3.0)
Hysterectomy	5 (0.2)	6 (0.2)	0.6 (0.2–2.4)
Uterine rupture	10 (0.3)	1 (0.0)	5.2 (0.6–45.4)
Operative injury	41 (1.3)	18 (0.6)	1.9 (1.0–3.5)
Minor complications	204 (6.3)	219 (7.6)	0.8 (0.7–1.0)
Puerperal fever	171 (5.3)	185 (6.4)	0.8 (0.7–1.0)
Transfusion	36 (1.1)	39 (1.3)	0.8 (0.5–1.3)
Abdominal-wound infection	43 (1.3)	63 (2.2)	0.6 (0.4–0.9)





Caughy et al. AJOG 2014

2010 NIH Consensus Development Conference:

- To evaluate of all available evidence related to TOLAC and make recommendations for practitioners regarding the management of patients with a prior cesarean birth
  - "Given the available evidence, trial of labor is a reasonable option for many pregnant women with one prior low transverse uterine incision. The data reviewed in this report show that both trial of labor and elective repeat cesarean delivery for a pregnant woman with one prior transverse uterine incision have important risks and benefits and that these risks and benefits differ for the woman and her fetus."
  - "We are concerned about the barriers that women face in gaining access to clinicians and facilities that are able and willing to offer trial of labor."
  - "Concerns over liability have a major impact on the willingness of phaysians and healthcare institutions to offer trial of labor"

Maternal Risks: TOLAC vs. Planned Repeat CD

Maternal outcome	Number of studies/subjects	Frequency of outcome		
		TOLAC (95% CI)	PRCD (95% CI)	
Maternal death	12/402,883	0.004% (0.001-0.015)	0.013% (0.004-0.042)	RR 0.33, 95% CI 0.13-0.88
Uterine rupture	8/63,499	0.47% (0.28-0.77)	0.026% (0.009-0.082)	RR 20.7, 95% CI 9.8-44.0
Hysterectomy	8/402,059	0.17% (0.12-0.26)	0.28% (0.12-0.76)	NS
Hemorrhage	6/47,754	Insufficient data to evaluate	Insufficient data to evaluate	Insufficient data to evaluate
Transfusion	9/401,307	0.9% (0.4-2.0)	1.2% (0.5-2.6)	NS
Infection	22/354,060	4.6% (0.15-13.5)	3.2% (1.3-7.3)	NS
Surgical injury	4/53,282	Insufficient data to evaluate	Insufficient data to evaluate	Insufficient data to evaluate

Guise et al. *Obstet Gynecol 2010; 115:1267.*

Neonatal Risks: TOLAC vs. Planned Repeat CD

- Perinatal and neonatal mortality rates were higher for TOLAC than for planned repeat CD (perinatal mortality rate: 0.13 versus 0.05 percent; neonatal mortality rate: 0.11 versus 0.06 percent), although the absolute risk is low.
- Transient tachypnea of the newborn – more common with planned repeat CD compared with TOLAC (4.2 versus 3.6 percent).
  - Neonatal bag and mask ventilation was used more often in neonates born following TOLAC than in those born following planned CD (5.4 versus 2.5 percent).
- Multiple studies have reported the rates of suspected and proven neonatal sepsis are higher for TOLAC than planned repeat CD (suspected sepsis 5% vs. 2% percent; proven sepsis 1% vs. 0%) and report increased NICU admission risk with TOLAC compared to planned repeat CD

Guise et al. *Obstet Gynecol 2010; 115:1267.*

TOLAC vs. Planned Repeat CD

- There are no RCTs comparing maternal or neonatal outcomes between women attempting TOLAC and those undergoing a repeat CD
- The risk of maternal and neonatal morbidity is directly related to the probability of achieving VBAC
  - Those undergoing repeat, labored CD after failed TOAC are at the highest risk of morbidity (i.e., Successful VBAC < planned repeat CD < unplanned, labored CD)
  - More recent data also demonstrate that those who have a low probability of achieving VBAC also have a higher risk of morbidity EVEN if they achieve VBAC
    - *"37 year-old G2, now P2002 s/p successful VBAC. Delivery complicated by 4 hour second stage, 2min shoulder dystocia, and 4th degree perineal laceration. Neonate in NICU, cord gas 6.98"*.....was this a "successful VBAC"?
- Studies comparing risk estimates do not take future risk into account....

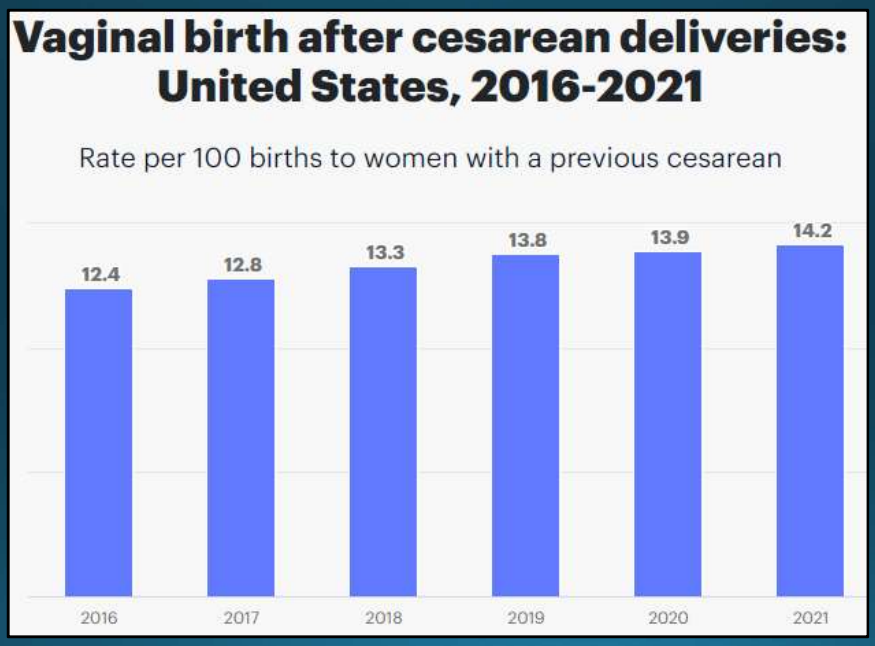
Risk of complications associated with multiple cesarean deliveries

Number of cesarean births	Risk of complications (%)				
	Placenta accreta	Hysterectomy	Transfusion	Cystotomy	Bowel injury
1 (primary cesarean birth)	0.24	0.65	4.05	0.13	0.11
2	0.31	0.42	1.53	0.09	0.06
3	0.57	0.90	2.26	0.28	0.13
4	2.13	2.41	3.65	1.17	0.34
5	2.33	3.49	4.26	1.94	0.00
6	6.74	8.99	15.73	4.49	1.12

Silver et al., *Obstet Gynecol 2006; 107:1226.*

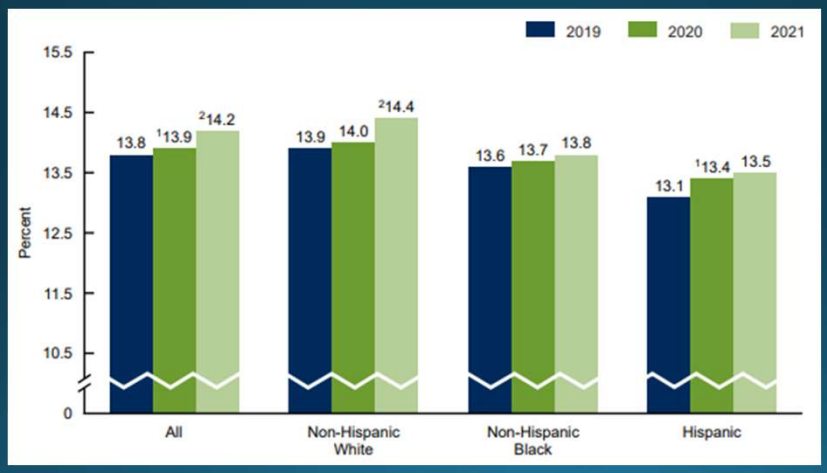
VBAC Whiplash, continued….

- Since the 2010 NIH Consensus Publication, much work and focus to bring VBAC rates back
- ACOG has modified their "immediately available" language:
  - TOLAC "should be attempted at facilities capable of performing emergency deliveries
  - "Women attempting TOLAC should be cared for in a level 1 center (one that can provide basic care or higher)"
  - "Because of the risks associated with TOLAC, and because uterine rupture and other complications may be unpredictable, ACOG recommends that TOLAC be attempted in facilities that can provide cesarean delivery for situations that are immediate threats to the life of t woman or fetus. When resources for emergency cesarean delivery are not available, ACOG recommends that obstetricians or other obstetric care providers and patients considering TOLAC discuss the hospital's resource and availability of obstetric, pediatric, anesthesiology, and operating room staff"
  - "Because of the unpredictability of complication requiring emergency medical care, homebirth is contraindicated in women undergoing TOLAC"
- VBAC rates have increased each year, reaching 14.2% in 2021.
  - Rising among women in their 20s and 30s, across ethnic and racial groupings, in 17 states, and among births delivered at 38 weeks of gestation and greater.
- The Healthy People 2020 goals included increasing the US VBAC to 18.3%



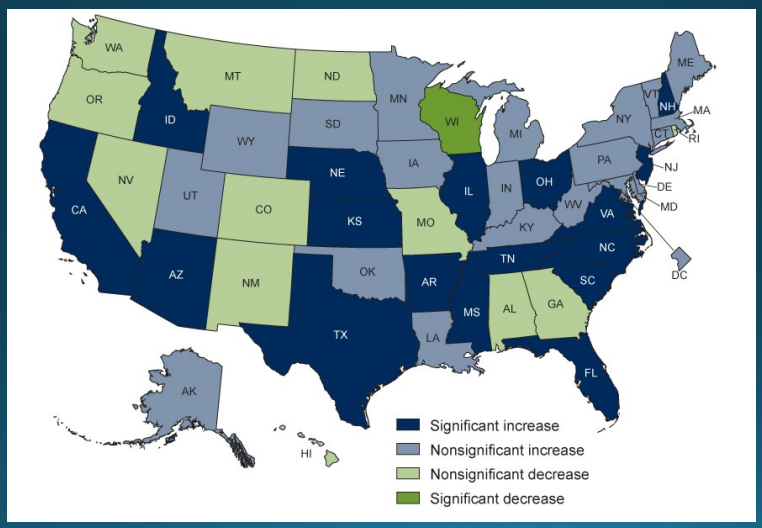
PeriStats | March of Dimes
www.marchofdimes.org

Vaginal Birth after CD, by race and Hispanic origin



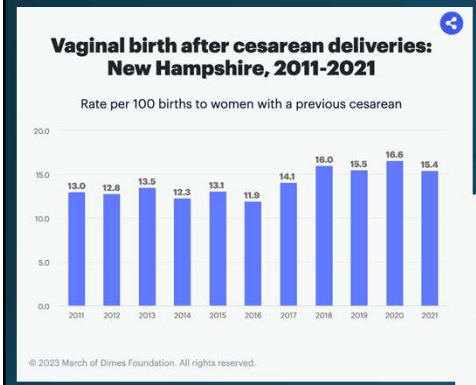
Martin et al., NCHS Data Brief, 2022

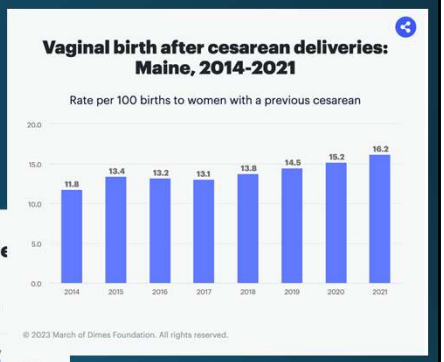
VBAC Rate, United States 2016 → 2018



Osterman, Michelle J.K. , Centers for Disease Control and Prevention, Data Brief , Mar. 2020

NH, VT, ME





	2018 data		
	VBAC Rate	NTSV Cesarean Birth Rate	Total Cesarean Rate
United States	**13.3%**	**25.9%**	**31.9%**
Mississippi	7.0%	31.2%	38.3%
Arkansas	8.4%	28.4%	34.8%
Alabama	8.7%	28.6%	34.7%
Oklahoma	8.8%	24.6%	32.8%
Louisiana	8.8%	29.2%	37.0%
Georgia	9.1%	27.9%	34.0%
West Virginia	9.3%	27.4%	34.2%
Kentucky	9.3%	27.8%	34.4%
Texas	9.8%	28.7%	35.0%
Florida	10.0%	30.4%	36.8%
California	10.5%	24.0%	30.9%
South Carolina	12.0%	26.9%	33.5%
Delaware	12.6%	24.0%	31.3%
New Jersey	12.7%	27.7%	34.8%
Nevada	13.0%	28.0%	33.8%
New York	13.1%	28.9%	33.9%
Wyoming	13.2%	20.4%	27.4%
Indiana	13.4%	23.5%	29.8%
Michigan	13.4%	27.3%	32.2%
Tennessee	13.4%	26.4%	32.4%
Montana	13.6%	22.7%	28.1%
Maine	13.8%	25.0%	30.4%
Iowa	14.0%	23.4%	29.9%
Virginia	14.3%	26.0%	32.4%
Kansas	14.5%	24.2%	29.7%
Connecticut	14.9%	29.4%	34.8%
Ohio	14.9%	25.4%	30.8%
Massachusetts	15.2%	25.4%	31.5%
Illinois	15.4%	25.2%	31.2%
Missouri	15.8%	23.9%	30.0%
New Hampshire	16.0%	27.1%	31.7%
Rhode Island	16.4%	27.8%	32.2%
Nebraska	16.4%	22.5%	29.9%
Maryland	16.5%	28.2%	33.9%
North Dakota	17.0%	19.3%	26.5%
North Carolina	17.1%	23.3%	29.4%
Pennsylvania	17.2%	25.1%	30.1%
Hawaii	17.6%	22.4%	26.9%
Arizona	18.1%	21.3%	27.5%
Oregon	18.8%	23.8%	28.0%
New Mexico	18.9%	19.6%	25.3%
Wisconsin	19.2%	22.3%	26.6%
Washington	20.1%	23.1%	27.9%
Colorado	21.3%	21.2%	26.1%
Minnesota	21.4%	22.9%	27.0%
South Dakota	21.5%	18.7%	24.6%
Vermont	22.1%	20.3%	25.9%
Idaho	22.2%	18.5%	24.0%
District of Columbia	22.9%	28.0%	31.6%
Utah	23.7%	18.3%	22.7%
Alaska	25.1%	16.7%	22.4%

Cesareanrates.org
Data source; CDC, NCHS 2018

Vermont: VBAC Rates by hospital type

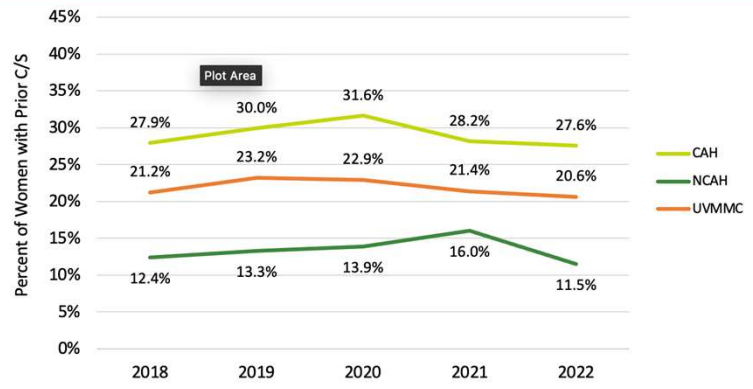


Figure: Percent of women with a prior cesarean delivery who delivered via vaginal birth (VBAC), 2018-2022. Data shown are from Birth Certificate data 2018-2022. CAH=critical access hospital, NCAH=non-critical access hospital.

Slide courtesy of: Avery Rasmussen, MPH, CPHQ
VCHIP Perinatal Data Manager, Research Specialist, University of Vermont

Minimum & maximum VBAC rates at Vermont community hospitals, 2018-2022

Year	Min (hospital designation)	Max (hospital designation)
2018	6.0% (NCAH)	28.3% (CAH)
2019	7.5% (NCAH)	29.2% (CAH)
2020	0.0% (CAH)	34.1% (CAH)
2021	0.0% (CAH)	36.0% (CAH)
2022	0.0% (CAH)	33.3% (CAH)

Slide courtesy of: Avery Rasmussen, MPH, CPHQ
VCHIP Perinatal Data Manager, Research Specialist
The Robert Larner, M.D. College of Medicine at the University of Vermont

MK1

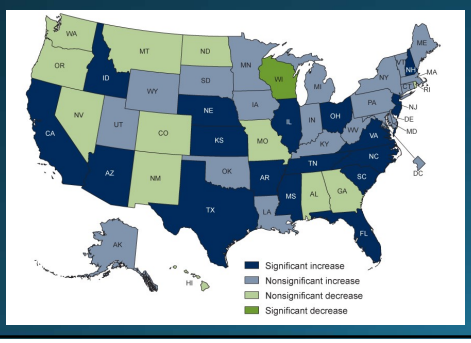
"The decision to undergo trial of labor after cesarean (TOLAC) or schedule a repeat cesarean birth is one in which a patient's values and preferences should be prioritized in a process of shared decision making"

ACOG Practice Advisory, Dec 2021

??????

Are we successfully prioritizing patient preferences and values?

How do we do so, safely???



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2022	0.0% (CAH)	33.3% (CAH)

Slide 21

MK1 McLean, Kelley, 6/2/2023

VBAC Success Prediction

- In attempts to more robustly and consistently inncorporate information about individual characteristics and obstetric history into VBAC counseling, multiple different VBAC success prediction calculators have been created
- The most widely validated calculator, the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development (NICHD) VBAC Calculator, was published in 2007 and identified age, body mass index, history of vaginal delivery, indication for prior cesarean, history of VBAC, and race and ethnicity as predictors of successful VBAC

Adjei et al. AJOG 2023

MFMU VBAC Calculator- morbidity prediction

Can a prediction model for vaginal birth after cesarean also predict the probabililty of morbidity related to a trial of labor?

William A. Grobman, MD, MBA[a], Yinglei Lai, PhD[b], Mark B. Landon, MD[c], Catherine Y. Spong, MD[d], Kenneth J. Leveno, MD[e], Dwight J. Rouse, MD[f], Michael W. Varner, MD[g], Atef H. Moawad, MD[h], Steve N. Caritis, MD[i], Margaret Harper, MD[j], Ronald J. Wapner, MD[k], Yoram Sorokin, MD[l], Menachem Miodovnik, MD[m,n], Marshall Carpenter, MD[o], Mary J. O'Sullivan, MD[p], Baha M. Sibai, MD[q], Oded Langer, MD[r], John M. Thorp, MD[s], Susan M. Ramin, MD[t], and Brian M. Mercer, MD[u] for the Eunice Kennedy Shriver National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network

MFMU VBAC Calculator- morbidity prediction

- Evidence suggests that women with at least a 60-70% likelihood of achieving a VBAC who attempt TOLAC experience the same or less maternal morbidity than women who have an elective repeat CD
- Similarly, neonatal morbidity is lower when the chance of achieving VBAC is higher

MFMU VBAC Success Prediction Calculator, Version 2.0 (updated 5.2021)

- The investigators who published the original NICHD calculator developed a new calculator utilizing the same dataset collected from 1999 to 2002 without including the socially constructed variables of race and ethnicity
  - The resulting calculator involves the same variables as the first model with the exception of race and ethnicity and added the variable of chronic hypertension treated with medication before and during pregnancy.
  - This calculator has been validated by other groups since its publication, demonstrating that the **prior calculator underestimated success in black and Hispanic patients**

https://mfmunetwork.bsc.gwu.edu/web/mfmunetwork/vaginal-birth-after-cesarean-calculator

Maternal-Fetal Medicine Units Network

VAGINAL BIRTH AFTER CESAREAN

Maternal age (range 15-50 years):

Height Unit:
- inches
- centimeters

Height (range 119-191 cm):

Weight Unit:
- pounds
- kilograms

Pre-pregnancy weight (range 34-206 kg):

Body mass index: kg/m^2

Obstetric History:
Previous VBAC

Arrest disorder indication for prior cesarean?
No

Treated chronic hypertension?
No

Calculate

The information on this website describes the outcome vaginal birth after cesarean (VBAC) in a term pregnancy for a population of individuals who received care at the hospitals within the NICHD MFMU Network between 1999 and 2002. Specifically, using the MFMU Network Cesarean Registry[1] data, individuals were included if they were 1) delivered at term (on or after 37 weeks 0 days) with a live single fetus at the time of labor and delivery admission, 2) had a trial of labor after cesarean, and 3) had history of one prior cesarean delivery. For more details, see the article "Prediction of vaginal birth after cesarean in term gestations: A calculator without race and ethnicity" cited below.[2]

PLEASE NOTE: Information from this website is not intended to be the only basis for making care decisions for an individual, nor is it intended to be a definitive means of assessing the chance of vaginal birth after cesarean in those with a term pregnancy. Users should keep in mind that every patient is an individual, and that factors beyond those described on this website influence vaginal birth after cesarean in a term pregnancy.

REFERENCES:

1. Landon MB, Hauth JC, Leveno KJ, et al. Maternal and perinatal outcomes associated with a trial of labor after prior cesarean delivery. N Engl J Med 2004;351:2581-9. https://www.nejm.org/doi/full/10.1056/nejmoa040405
2. Grobman WA, Sandoval G, Rice MM, Bailit JL, Chauhan SP, Costantine MM, Gyamfi-Bannerman C, Metz TD, Parry S, Rouse DJ, Saade GR, Simhan HN, Thorp JM, Tita ATN, Longo M, Landon MB for the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development Maternal-Fetal Medicine Units (MFMU) Network. Prediction of vaginal birth after cesarean in term gestations: A calculator without race and ethnicity. Am J Obstet Gynecol. 2021.https://www.ajog.org/article/S0002-9378(21)00587-1/pdf

Version 2.0 (updated May 2021)

https://mfmunetwork.bsc.gwu.edu/web/mfmunetwork/vaginal-birth-after-cesarean-calculator

MFMU VBAC Calculator, Version 2.0

- Similar to the prior calculator, the calibration curve shows that predictions are more likely to be accurate when the predicted likelihood of VBAC is 60% or higher and deviated substantially when the estimate was 40% or lower

Counseling Regarding Approach to Delivery After Cesarean and the Use of a Vaginal Birth After Cesarean Calculator

Practice Advisory | December 2021

Counseling Regarding Approach to Delivery After Cesarean and the Use of a Vaginal Birth After Cesarean Calculator

Practice Advisory | December 2021

A VBAC calculator is one of many tools that can be used to provide information during a shared-decision-making discussion.

When a calculator is used to provide an estimate of the likelihood of a clinical event, the limitations of the tool including uncertainty in the estimate and the impact of unmeasured or excluded clinical characteristics as well as variability in practice patterns must be included to balance the discussion.

A VBAC calculator score should not be used as a barrier to TOLAC.

This is particularly critical because of the greater likelihood of inaccuracy of the estimate of VBAC for those with lower predicted probabilities

UVMMC Studies

Maternal and Neonatal Morbidity as a function of VBAC success prediction

Study Objectives

- Can the Antepartum VBAC calculator predict maternal and/or neonatal morbidity in our population?
  - Can the previously established increased risk of morbidity with VBAC score of > 60% be applied to our population? [1,2]

- **Primary aim: Correlate thresholds for composite maternal and/or neonatal morbidity with VBAC success prediction in TOLAC eligible women.**

1. Cahill AG, Stamilio DM, Pare´ E, Peipert JP, Stevens EJ, Nelson DB, Macones GA. Vaginal birth after cesarean (VBAC) attempt in twin pregnancies: is it safe? Am J Obstet Gynecol 2005;193: 1050-5. Macones
2. Grobman WA, Lai Y, Landon MB, et al. Can a prediction model for vaginal birth after cesarean also predict the probability of morbidity related to a trial of labor? Am J Obstet Gynecol 2009;200:56.e1-56.e6.

Methods

- Retrospective cohort study (UVMMC), January 2016 - June 2019
- Inclusion criteria: Singleton pregnancy, cephalic presentation, 1 or 2 prior LTCS
- Exclusion criteria: contraindications to TOLAC
- Antepartum VBAC calculator scores were calculated through chart review and used to stratify patients by likelihood of VBAC success
- Outcomes:
  - Maternal morbidity[1]: uterine rupture, blood transfusion, intensive care unit admission, hysterectomy or need for concurrent surgical procedure, sepsis
  - Neonatal morbidity[2,3]: 5 minute Apgar < 4, umbilical artery blood gas pH < 7.0, unanticipated neonatal intensive care unit admission

1. Centers for Disease Control and Prevention, 26 Dec. 2019, www.cdc.gov/reproductivehealth/maternalinfanthealth/smm/severe-morbidity-ICD
2. Grobman WA, Lai Y, Landon MB, et al., Obstet Gynecol. 2007;109:806-12
3. Specifications Manual for Joint Commission National Quality Measures (v2020A1) , 2018, manual.jointcommission.org/releases/.

1018 eligible pregnant patients with prior cesarean delivery

208 patient excluded with > 2 prior LTCS contraindications to TOLAC (i.e. history of uterine rupture, history of classical or T-incision)

810 patients ultimately included

426 patients chose ERCD

384 patients chose TOLAC

The University of Vermont LARNER COLLEGE OF MEDICINE

Demographics

	ERCS (n=426)	**TOLAC** (n=384)	**p-value**
	Mean ± SD	Mean ± SD	
Maternal age	32 ± 5	32 ± 5	0.12
Race (White)	371 (93%)	318 (89%)	0.08
Ethnicity (Hispanic)	30 (7%)	34 (9%)	0.36
Gravidity	3 ± 1	3 ± 2	0.78
Parity	2 ± 1	2 ± 7	0.57
EGA	38.7 ± 0.9	39.4 ± 1.2	**<0.0001**
BMI	30.7 ± 9	28.0 ± 1.2	**<0.0001**

Results: VBAC success prediction

TOLAC group predicted score of 66%, successful VBAC 70%

Results: Morbidity as a Function of VBAC Predicted Success

	Rate of Maternal Morbidity (%)		p-value
	ERCS	TOLAC	
Total	1.2	6.8	<0.0001
VBAC score			
>60%	0.5	4.9	0.01
<60%	1.9	11.1	0.001

	Rate of Neonatal Morbidity (%)		p-value
	ERCS	TOLAC	
Total	2.8	8.3	0.001
VBAC Score			
>60%	2.4	6.4	0.01
<60%	3.3	12.8	0.001

Summary

- Rates of morbidity: Failed TOLAC > Successful VBAC > ERCD
- Rates of maternal and neonatal morbidity are highest among patients with likelihood of VBAC success <60%
- Higher maternal morbidity than previously reported with similar VBAC success prediction, and lower neonatal morbidity than previously reported[1]
- **Our results provide a contemporary assessment of the correlation between VBAC prediction score and morbidity**

1. Grobman WA, Lai Y, Landon MB, et al. Can a prediction model for vaginal birth after cesarean also predict the probability of morbidity related to a trial of labor? Am J Obstet Gynecol 2009

UVMMC Studies, cont.

Quality Initiative to Reduce Failed Trial of Labor after Cesarean Using Calculated VBAC Success Likelihood

Frank B. Williams, MD, MPH[1] Hayley Pierce, MD[1] Carole A. McBride, PhD[1] Justin DeAngelis, MD[1] Kelley McLean, MD[1]

[1] Department of Obstetrics, Gynecology and Reproductive Services, University of Vermont, Burlington, Vermont

Address for correspondence Frank Bernard Williams, MD, MPH, 2700 Napoleon Avenue, 4th Floor Maternal Fetal Medicine, New Orleans, LA 70119 (e-mail: frank.williams2@ochsner.org).

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American J of Perinatology, 2022

Study Objective

- To determine if formal incorporation of calculated VBAC likelihood into patient-centered counseling would reduce failed vaginal birth after cesarean

Methods: Quality Improvement Intervention

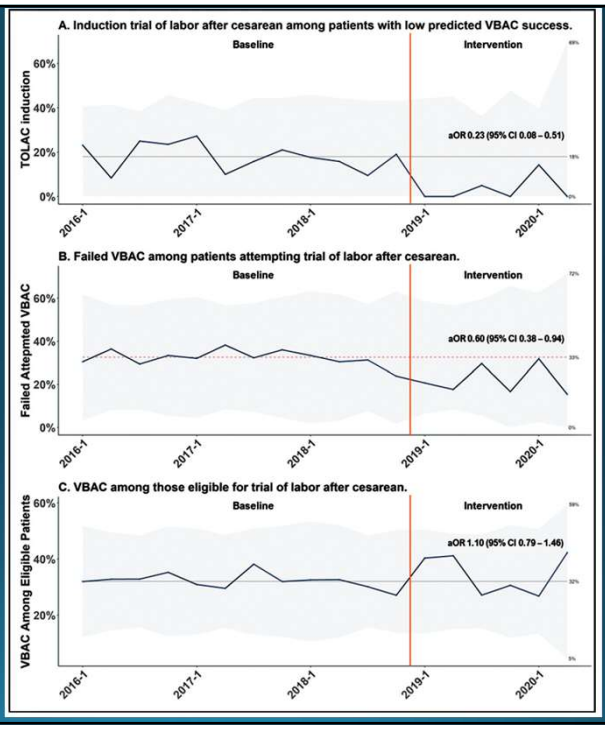
- Standardized TOLAC patient counseling was implemented at UVMMC, and an "Antepartum TOLAC Consult" SmartPhrase, with embedded VBAC probability calculation was used to document the MFMU VBAC success prediction score
  - Providers were educated on useof the SmartPhrase in group settings
- Patients with one or two prior cesarean deliveries with singleton pregnancies presenting at term for management of delivery were included in the analysis.
  - Exclusion criteria included contraindication to TOLAC (prior non lower segment hysterotomy, placenta or vasa previa, and noncephalic presentation)
- Prospective data were collected through April 2020 and compared with a historical cohort dating from January 2016 to December 2018

Results

Table 2 Quality outcome measure rates among patients eligible for TOLAC by time period

	Historical	Postintervention	OR	95% CI	aOR[a]	95% CI
Process measure						
Induction of patients with low predicted VBAC success	45/267 (16.9%)	6/125 (4.8%)	0.25	0.10–0.60	0.23	0.08–0.51
Outcome measure						
Failed VBAC among patients attempting TOLAC	107/329 (32.5%)	32/143 (22.4%)	0.60	0.38–0.94	0.60	0.39–0.91
Balancing measure:						
VBAC rate among patients eligible for TOLAC	222/693 (32.0%)	111/326 (34.0%)	1.10	0.83–1.45	1.08	0.79–1.46

Results, cont.



Conclusion:

- An intervention targeting provider counseling that included a validated vaginal birth after cesarean success likelihood was associated with decreased risk of failed TOLAC without affecting overall VBAC rate

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Should the MFMU VBAC Calculator be more formally embedded into the the NNEPQIN VBAC Guidelines?

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NNEPQIN

NORTHERN NEW ENGLAND
PERINATAL QUALITY IMPROVEMENT NETWORK

The following guidelines are intended as a general educational resource for hospitals and clinicians, and are not intended to reflect or establish a standard of care or to replace individual clinician judgment and medical decision making for specific healthcare environments and patient situations.

Vaginal Birth after Cesarean (VBAC) Guidelines
Revised June 2019

Background and Rationale:

Guidelines for provision of VBAC services for NNEPQIN member hospitals were first published in 2004 in response to changes in ACOG recommendations for the "immediate availability" of personnel able to perform an emergency cesarean delivery in the event of uterine rupture. These guidelines represent the iterative collaboration of NNEPQIN member hospitals in Maine, New Hampshire and Vermont since that time based on updated evidence and recommendations.

This document incorporates guidelines from ACOG and contemporary evidence from the medical literature, and presents a regional definition of provider "immediate availability" based upon patient risk status. The goal is to maintain the availability of VBAC services throughout the region, minimizing risk and maximizing safety and good maternal and neonatal outcomes.. These recommendations apply to VBAC candidates only, and recognize the need to adapt care to the unique circumstances of each case and setting.

Patient Selection and Counseling:

The importance of thorough counseling and a rigorous shared decision-making process between a woman desiring VBAC and her obstetrical care provider cannot be overemphasized. This discussion should be consistent, evidence-based, and clearly documented in the medical record to include a signed informed consent document. All patients should receive counseling about the risks and benefits of both successful and unsuccessful trial of labor after cesarean (TOLAC) as well as repeat cesarean delivery for both mother and infant. Unit staffing models and management plans for complications should be reviewed with the patient.

ACOG states: "Consistent with the principal of respect for patient autonomy, patients should be allowed to accept increased levels of risk; however, patients should be clearly informed of the potential increase in risk and management alternatives. Evaluation of a patient's individual likelihood of VBAC and risk of uterine rupture are central to these considerations….In settings

Consistent with ACOG Guidelines, NNEPQIN recommends that TOLAC be attempted in facilities that can provide cesarean delivery for any situation that are immediate threats to the life of the woman or fetus. Specifically, these facilities should meet the definition of at least a Level I center, which "must have the ability to begin emergency cesarean delivery within a time interval that best considers maternal and fetal risks and benefits with the provision of emergency care." (29)

Prediction of VBAC Success

The Maternal Fetal Medicine Unit Network performed a large multi-center trial evaluating VBAC and developed a nomogram to predict VBAC success. A free access web-based calculator based on this nomogram can be found at: (https://mfmunetwork.bsc.gwu.edu/PublicBSC/MFMU/VGBirthCalc/vagbirth.html.) This tool may be useful for individualizing the counseling given to patients about VBAC. In addition, a second calculator was developed to estimate an individual woman's likelihood of VBAC success based on additional factors at the time of admission for delivery: https://mfmunetwork.bsc.gwu.edu/PublicBSC/MFMU/VGBirthCalc/vagbrth2.html

Previous vaginal delivery is associated with higher rates of VBAC success and lower risk of uterine rupture.

Evidence suggests that women with at least a 60-70% chance of successful VBAC may experience equivalent or reduced morbidity if they attempt TOLAC compared to if they choose repeat Cesarean delivery. Conversely, women with less than a 60% calculated chance of successful VBAC are more likely to experience morbidity if they TOLAC than if they choose repeat Cesarean delivery. (26, 27).

Patient Risk Stratification:

Each patient should be evaluated for risk factors associated with decreased VBAC success and uterine rupture (See Table 1). The association of factors related to an increased risk of uterine rupture has not translated into the reliable prediction of uterine rupture (1, 2). Patients without other risk factors may still experience uterine rupture. There are limited data on outcomes for women with multiple risk factors present. Based upon careful review of the literature and regional experience over the past 15 years, NNEPQIN has devised the following risk stratification system to aid hospitals, maternity care providers, and patients in making decisions regarding the appropriate mode and place of delivery.

1. **Low Risk Patient:** Risk for uterine rupture approximately 0.3-0.7%.
   - 1 prior low transverse cesarean section
   - Singleton gestation
   - Spontaneous onset labor
   - No need for augmentation
   - No repetitive FHR abnormalities
   - Patients with a prior successful VBAC are especially low risk. However, their risk status escalates the same as other low risk patients.
2. **Medium Risk Patient:** Risk for uterine rupture is likely greater than 0.7%.
   - 2 prior cesarean sections
   - Induction of labor (mechanical and/or with oxytocin)
   - Oxytocin augmentation
   - < 18 months between prior cesarean section and current delivery
   - >1 hour duration of second stage of labor (28)
   - Twin gestation
3. **High Risk Patient:** Patients who have intra-partum signs or symptoms that may be associated with uterine rupture or failure of vaginal delivery (4).
   - Recurrent clinically significant deceleration (variable, late or prolonged fetal heart rate decelerations) not responsive to clinical intervention
   - Significant bleeding of uterine origin
   - New onset of severe abdominal pain disproportionate to labor
   - 2 hours without cervical change in the active phase despite adequate labor

Recommended Staffing and Resource Availability:

1. **Low Risk Patient:**
   - No additional interventions other than those listed above.
   - Cesarean delivery provider may have other acute patient care responsibilities during active labor, but should remain on the hospital campus.

2. **Medium Risk Patient:**
   - Cesarean delivery provider on the hospital campus during the active phase of labor. Cesarean delivery provider may have other acute patient care responsibilities.
   - An open and staffed operating room is available or there is a plan in place if immediate delivery is required. This may be a room where there is adequate lighting, instruments, and general anesthesia can be administered if needed.
   - An anesthesia provider is present on the hospital campus during the active phase of labor.
   - Anesthesia staff may have other acute patient care responsibilities.
   - There is an established back up protocol for anesthesia services during times of high clinical acuity.

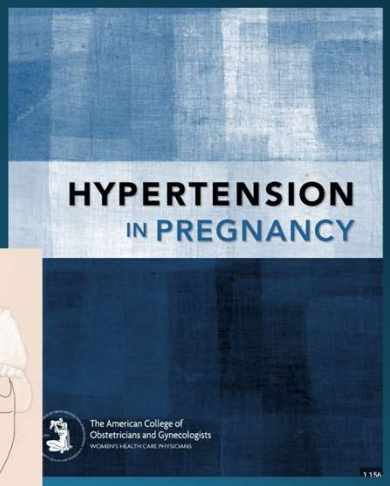
3. **High Risk Patient:**
   - The cesarean delivery provider is present on the hospital campus and does not have other acute patient care responsibilities
   - Anesthesia staff is present on the hospital campus and does not have other acute patient care responsibilities.
   - An open and staffed operating room is available.

ARRIVE, low tolerance for stillbirth risk, and increasing recognition of HTN-related maternal risk = More Inductions

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 AUGUST 9, 2018 VOL. 379 NO. 6

Labor Induction versus Expectant Management in Low-Risk Nulliparous Women

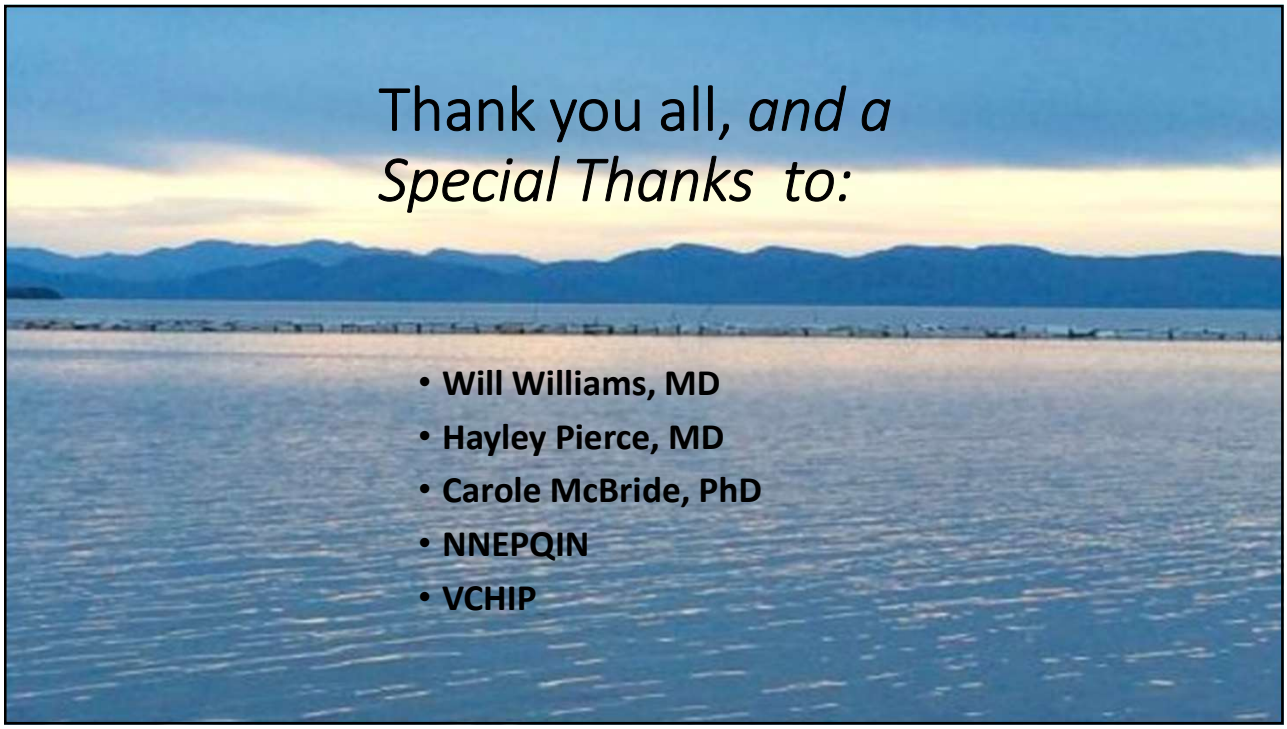


Uterine Rupture

- Risk with 1 prior LTCS: 0.7-1%
- Risk after 2 prior LTCS: 1-2%
- Risk with induction of labor (NOT using prostaglandins): 1.5-1.8%

- ***Risk of other obstetric emergencies requiring rapid delivery:***
  - placental abruption (0.6-0.8%)
  - cord prolapse (0.4-0.6%)
  - non-reassuring fetal tracing(hugely variable- 3%-6%)

The MFMU VBAC Calculator as a tool in offering TOLAC: Do our NNEPQIN Guidelines need a re-write?



EXTRA slides, questions that may come up….

Management of Labor has Changed

Current Commentary

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*

Catherine Y. Spong, MD, Vincenzo Berghella, MD, Katharine D. Wenstrom, MD, Brian M. Mercer, MD, and George R. Saade, MD

VOL. 120, NO. 5, NOVEMBER 2012 OBSTETRICS & GYNECOLOGY 1181

Table 6. Duration of Each Centimeter Change in Cervical Dilatation for Nulliparous Women With Spontaneous Onset of Labor*

Cervical Change (cm)	Median (h)	95th Percentile (h)
3–4	1.8	8.1
4–5	1.3	6.4
5–6	0.8	3.2
6–7	0.6	2.2
7–8	0.5	1.6
8–9	0.5	1.4
9–10	0.5	1.8

* Modified from Zhang J, Landy HJ, Branch DW, Burkman R, Haberman S, Gregory KD, et al. Contemporary patterns of spontaneous labor with normal neonatal outcomes. Obstet Gynecol 2010;116:1281–7.

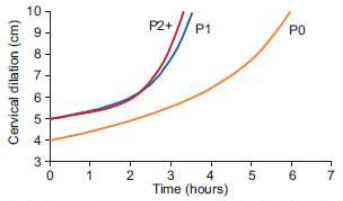


Fig. 2. Average labor curves by parity in singleton term pregnancies with spontaneous onset of labor, vaginal delivery, and normal neonatal outcomes. P0, nulliparous women; P1, women of parity 1; P2+, women of parity 2 or higher.

Zhang. Contemporary Labor Patterns. Obstet Gynecol 2010.

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Maternal Morbidity by Mode of Delivery

	Rate of Maternal Morbidity (%)	P-value
Successful VBAC (n=270)	1.5	<0.0001
Failed TOLAC (n=115)	19.3	

	Rate of Maternal Morbidity (%)	P-value
Successful VBAC (n=270)	1.5	<0.0001
Scheduled ERCD (n=426)	1.2	

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Neonatal Morbidity by Mode of Delivery

	Rate of Neonatal Morbidity (%)	P-value
Successful VBAC (n=270)	6.7	0.07
Failed TOLAC (n=115)	12.2	

	Rate of Neonatal Morbidity (%)	P-value
Successful VBAC (n=270)	6.7	0.02
Scheduled ERCD (n=426)	2.8	

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