

Episiotomy and Obstetric Trauma in Nevada: Evidence from Linked Hospital Discharge and Birth Data

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Abstract

Based on the perception that episiotomy prevents obstetric trauma, the procedure is liberally performed in U.S. Hospitals. Using linked Nevada Birth Registry and Nevada Inpatient Hospital Discharges (2000 to 2005), we applied descriptive analyses and logistic regression to examine the status of Nevada episiotomy practice and its impact on birth trauma for mothers. Of 106,461 vaginal live births, 26,383 (24.8%) episiotomies were conducted. Obstetric trauma rate declined from 5.2% of vaginal deliveries in 2000 to 4.4% in 2005. After statistically controlling for the effect of other risk factors, zero parity, episiotomy, other instrument assisted deliveries, non-MDs as birth attendants, rural hospitals, urban county residences, and non-teaching hospitals are associated with an elevated risk obstetric trauma. We conclude that Nevada is on par with the year over year decline in national episiotomy rates.

Key words: Episiotomy, obstetric trauma, lacerations, Nevada Inpatient Hospital Discharge Data

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Introduction

Episiotomy, a surgical incision of the mother's perineum performed at birth, is perceived to

prevent tears of the perineal muscles. The notion that episiotomies prevent third and/or fourth degree tears of the perineum, or protect the pelvic floor, has been repeatedly questioned. Previous research shows that although episiotomy may prevent lacerations and trauma in certain cases, the procedure is performed unnecessarily in many cases, doing more harm than good (Eason, Labrecque, Wells & Feldman, 2000; Woolley, 1995).

This research examines the relationship between episiotomy and birth trauma. Obstetric trauma was defined as third or fourth degree lacerations as proposed by the Agency for Healthcare Quality and Research's (AHRQ) Patient Safety Indicators (PSIs) 18 and 19. While a laceration is defined as "a cut, tear, or ragged opening in the skin caused by an injury or trauma", (Yale Medical Group, 2007) the 3rd and 4th degree lacerations in our study refer to more serious tears including those in the soft tissue, defined by ICD-9-CM codes in hospital discharge data¹ (Agency for Healthcare Research and Quality, 2007). The primary purpose of this research was to test the research hypothesis that Episiotomy does not necessarily prevent obstetric trauma; instead, it is associated with increased risk of obstetric trauma, measured by 3rd or 4th degree lacerations during child birth. The questions of interest were, "What are some factors explaining variation in episiotomy in Nevada hospitals, and how do episiotomies and other characteristics of hospitals and births impact obstetric and trauma?"

RELATIONSHIP BETWEEN EPISIOTOMY AND OBSTETRIC TRAUMA

An episiotomy is generally performed to prevent tears of the perineal muscles. For most of the twentieth century, the routine use of episiotomy was believed to have multiple benefits for both mother and infant. The earlier literature available on this subject, though not empirically sound, supported the use of universal episiotomy at delivery as the method for preserving perineal function (see, e.g., Pomeroy, 1918; DeLee, 1920; Gainey, 1943). Episiotomy is justified on several grounds, most of which has been challenged recently. First, it is believed to prevent pelvic floor function (Klein, 1994), but studies have shown that in this regard, episiotomy itself is a major

¹ The definition of 3rd and 4th degree obstetric lacerations proposed by AHRQ and used in this research include: ICD-9: 66420,1,4 and 66430,1,4 (TRAUMA TO PERINEUM AND VULVA DURING DELIVERY, THIRD DEGREE PERINEAL LACERATION); and (TRAUMA TO PERINEUM AND VULVA DURING DELIVERY, FOURTH DEGREE PERINEAL LACERATION)

source of injury in that it cuts muscles and nerves (Signorello, et al., 2000; Signorello, Harlow, Chekos & Repke, 2001). Here, the 'pelvic floor function' refers to the ability of muscles supporting the pelvic organs to perform activities such as urinating, having bowel movements, and sexual intercourse, in coordination with bladder and rectum muscles. Secondly, episiotomies are supposed to reduce delivery-related pain but a recent systematic review of major studies of episiotomy from 1950 to 2004 rejects that claim (Viswanathan, Hartmann, Palmieri, 2005). Third, some episiotomies are done for facilitating the healing & recovery process. However research shows that deep tears caused by episiotomies are actually more difficult to repair than the minor ones that may occur when no episiotomy is done (McGuinness, Norr & Nacion, 1991). Fourth, episiotomy before operative vaginal delivery is advocated for facilitating instrument assisted deliveries, in particular with forceps (Ecker, 1997; Helwig, Thorp & Bowes, 1993; Thompson, 1987). Yet the use of episiotomy in cases of vacuum extraction also increases the likelihood of severe perineal trauma (Robinson, Norwitz, Cohen, McElrath & Lieberman, 1999). Fifth, the use of episiotomy is usually recommended when shoulder dystocia is anticipated or it has occurred. However because the obstruction to shoulder delivery is at the pelvic inlet, rather than the soft tissues of the perineum, episiotomy itself therefore does not overcome shoulder dystocia (Argentine Episiotomy Trial Collaborative Group, 1993; Klein, 1992; Piper & McDonald, 1994; Sleep, 1984). Episiotomy does not affect the incidence of brain hemorrhage or a low APGAR score either (Lobb, Duthie & Cooke, 1986; The, 1990).

In 1983, the comprehensive literature review of episiotomy by Thacker and Banta (1983) renewed interest in the subject of perineal management, for, having examined the quality of literature available on the subject, they concluded that the research to test the benefit of the procedure lacked in general, and sporadically published studies used inadequate design and execution. However, controversy has remained as to whether there is a relationship between the perineal condition after birth and long-term perineal muscle function. Several investigators have addressed this issue, finding that there is a general decline in muscle function after birth in all women regardless of the degree of perineal trauma sustained during birth; this change was noted most significantly after a primigravid birth (Allen, Hosker, Smith, & Warrell, 1990; Snooks, Swash, Mathers & Henry, 1990; Sultan, Kamm & Hudson, 1994). In general, these investigators concluded that there are no overall differences in perineal muscle performance or signs

of pelvic relaxation, most notably stress incontinence, based on perineal condition following childbirth.

In a comprehensive review of literature conducted since 1980, Woolley (1995) concluded that there was no evidence that episiotomy reduces the normal loss of pelvic floor muscle strength usually experienced after vaginal delivery. Studies since then have shown that episiotomy is actually perilous in that it increases the rate of perineal infection, blood loss, pain during healing, and risk of injury to the anal sphincter. It is argued that allowing the perineum to tear on its own results in less pain after childbirth than an episiotomy, and that women who don't tear, or who tear naturally, resume sexual relations sooner than women with episiotomies (Rockner, Henningson, Wahlberg & Olund, 1988; Simpson, Thorman, 2005).

In 2005, a major government review of episiotomy concluded that the benefits of the procedure don't outweigh the harm (Viswanathan, Hartmann & Palmieri, 2005). Nonetheless, episiotomy is still routinely performed, with 716,000 performed in 2003 in the United States (National Hospital Discharge Survey, 2003). While some episiotomies may still be medically necessary, the concept of an episiotomy for every woman may no longer be valid. Research shows that episiotomies typically cause and do not prevent serious tears. Tears into the anal or upper vaginal regions almost never occur in the absence of midline episiotomy (Klein, 1992). Mediolateral episiotomies on the other hand "neither cause nor prevent" chronic tears (Carroli & Bellizan, 2000).

Rather than preventing obstetric trauma, episiotomies have been associated with a myriad of postpartum and long term complications, including persistent chronic pain and dyspareunia (Klein, 1994), hemorrhaging (Combs, Murphy & Laros, 1991), rectovaginal fistulae which are generally precipitated by episiotomy infections, extensions or a combination of both (Haadem, 1987; Homsy, 1994; Walsh, 1996), uterine prolapse and perpetuating cases of urinary incontinence (Klein, 1994), and post-partum anal incontinence resulting in fecal and flatus incontinence, and excessive blood loss (Haadem, 1987; Signorello, et al., 2000; Sarfati, Marechaud, & Magnin, 1999; Walsh, 1996).

Despite two decades of evidence to the contrary, most practitioners still cling to the liberal use of episiotomy. Although episiotomy use has decreased over time, the recent rate of 39 per 100 vaginal deliveries remains higher than evidence-based recommendations for optimal patient care (Weber & Meyn, 2002). More recent national rates indicate a slight decline but still one in three vaginal deliveries in the U.S. from 1995 to 2003 involved

episiotomies. Rates vary across states, with slightly under 40% for women delivering in the Northwest, and 27% of women living in Western states (Boyles & Salynn, 2006; Graham, Carroli, Davies & Medyes, 2005).

If episiotomy lacks scientific rationale, what then drives its use? According to Robbie Davis-Floyd, episiotomy reinforces beliefs about the inherent defectiveness and untrustworthiness of the female body and the dangers this poses to women and babies (1992). Furthermore surgery holds the highest value in the hierarchy of Western medicine, and obstetrics is a surgical specialty. Episiotomy transforms normal childbirth into a surgical procedure (1992) thus relegating it to a ritual function that serves no credible medical purpose. Accordingly, empirical evidence shows that obstetricians are more than twice as likely to perform episiotomy as general physicians (Allen, Richard & Hanson, 2005).

The prevalence of episiotomies has decreased significantly, from 56% in 1979 to 39% in 1997, as indicated by the U.S population study by Weber & Meyn (2002). Based on national hospital discharge data Hartmann et al. found that incidence of episiotomy decreased from just over 35% in 1999 to 33% in 2000 (Viswanathan, et al., 2005). According to an even more recent evaluation, episiotomies have declined from more than 1.6 million in 1992 in the United States to 716,000 in 2003 (National Hospital Discharge Survey Data, 2003). It now appears that a new era without episiotomy is dawning with medical parishioners and obstetricians finally being swayed by the rationale offered against the procedure. In April 2006 a new clinical management guideline by American College of Obstetricians and Gynecologists (American College of Obstetrics and Gynecology, 2006) recommended that episiotomies be restricted. The bulletin emphasized restricted use of episiotomy during labor, with physicians encouraged to use clinical judgment to decide when the procedure is necessary.

Data and Methods

For this research, we used data from the Nevada State Health Division for 2000 through 2005, from two unique databases -- Nevada Birth Certificate, and Nevada Inpatient Hospital Discharge Data, maintained by the Center for Health Data and Research. The Inpatient Discharge Data includes information related to diagnosis codes, procedure codes, DRG, and provider identification (i.e. hospital, county). Information related to birth parents, birth methods, complications, place of birth, type of attendant, and antepartum procedures is available in The Birth Certificate Data. Record level linkage of these two databases was performed using

probabilistic linkage software. In order to make the comparisons across various categories of deliveries, we removed records involving multiple births and cesarean deliveries, thus leaving the total number of vaginal births (and mother's hospitalizations) to 106,461 births, whose hospital discharge records were matched with their baby's birth records for the years 2000-2005.

Our primary research question was: Is episiotomy associated with increased probability of obstetric injury/trauma? The primary explanatory variable, episiotomy status, was defined as an incision made during childbirth to the perineum, the muscle between the vagina and rectum, to widen the vaginal opening for delivery (Pregnancy Today, 2006), was operationalized using the following ICD-9 Codes, as recommended in previous research (Weber & Meyn, 2002):

1. Episiotomy: ICD-9-CM codes of 721.0, 722.1, 723.1, 727.1 and 73.6
2. Other Instrument Assisted Deliveries: ICD-9-CM codes 720.0, 722.9, 723.9, 724.0, 725.1, 725.3, 726.0, 727.9, 728.0, and 729.0
3. All other vaginal deliveries not involving use of instrument.

Cases of obstetric trauma (3rd or 4th degree lacerations) were identified using the definitions provided by the CDC's Agency for Healthcare Research and Quality (AHRQ) as PSI 18 and PSI 19. We combined the two patient safety indicators to operationalize our dependent variable. Since both PSI 18 and 19 have the same numerator, the two PSIs cannot be treated separately as independent variables. Furthermore, when combined, their denominators account for all vaginal deliveries. We performed logistic regression analysis to test our primary research hypothesis: episiotomy is associated with a significant increase in obstetric trauma even when other risk factors of trauma are statistically controlled for. In addition, we used chi-square tests of independence to examine bivariate relationships.

Results

In Nevada, over five percent births involved obstetric trauma associated with 3rd or 4th degree lacerations in the year 2000 and the rates have declined since then. Figure 1 depicts the six-year trends in episiotomy rates, 3rd or 4th degree lacerations, and induction of births. Episiotomy rates experienced a sharp decline for each of the six years. There was also a steady decline in the rates of lacerations. Together, the figure portrays a positive correlation between episiotomy rates and obstetric trauma. Overall birth induction rates have also declined during this period.

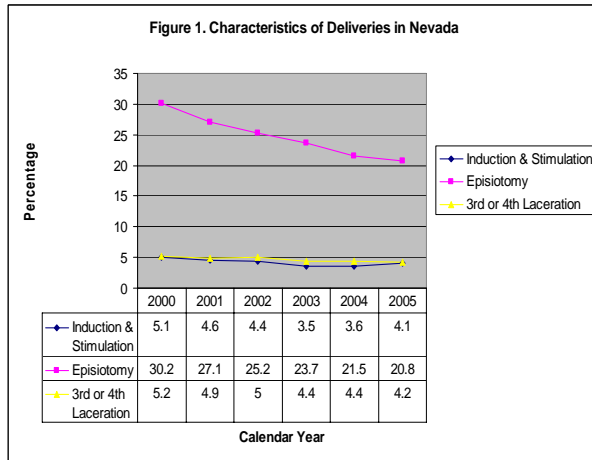


Figure 1. Percentage of Deliveries Inductions, episiotomies and 3rd or 4th degree lacerations, Nevada, 2000-2005.

Table 1 shows the frequency and percentage distribution of discharges by their various characteristics. Episiotomy was performed on 24.8% of the vaginal births. The last known national rates of 33% were found for 1997 (Graham, et al., 2005). Although national rates for the comparable period are not readily available, rates in Nevada seem to follow national trends with a steady decline year over year. Another 5.9% of the births involved use of instruments but no episiotomy, with remaining 69.3% not involving any instrument.

Table 1. Frequency distribution of hospital discharges for vaginal deliveries, Nevada, 2000-2005 (N=106,461)

Variable	Frequency	Percent
DRG - Diagnosis Related Group for Vaginal Deliveries (VD)		
372 – VD with complications	9,596	9.0%
373 – VD w/o complications	94,440	88.7%
374 – VD with Sterilization &/or Dilation & Curettage	2,344	2.2%
375 – VD with other operating room procedures	81	0.1%
Episiotomy Status of Vaginal Deliveries		
Episiotomies	26,383	24.8%
Non-episiotomy (w instrument)	6,256	5.9%
Non-episiotomy (no instrument)	73,822	69.3%
Urban vs. Rural County of Mom’s Residence		
Urban	94,029	88.3%
Rural	12,432	11.7%

County of Hospital’s Location		
Urban	98,532	92.6%
Rural	7,929	7.4%
Type of Birth Attendant		
Midwife or Other	8,341	7.8%
MD	98,120	92.2%
Attending Physicians Specialty		
Family Practitioner or Other	25,144	23.6%
ObGyn	81,317	76.4%
Teaching hospital?		
No	63,641	59.8%
Yes	42,820	40.2%
Parity		
Nulliparous	39,459	37.1%
Multiparous	65,879	61.9%
Missing	1,123	1.0%
Birth Induced/stimulated?		
No	101,952	95.8%
Yes	4,509	4.2%

Of all vaginal deliveries, 9% had complications (Table 1). Complications of deliveries are of relevance because they can have a serious impact on the outcome of interest – obstetric trauma. Demographic characteristics of the patients as well as their geographic location are likely to have a bearing on both episiotomy performance and the obstetric trauma -- third and fourth degree lacerations. Mother’s county of residence was urban for 88.3% of births. A large majority of births, 92.2% occurred in urban hospitals. MDs attended most of the births with only 7.8% of the births attended by paramedics who were non-MDs such as midwives and nurses.

Regarding the specialty of the birth attendants, 76.4% were Obstetricians and Gynecologists, the remaining 23.6% were general practitioners or others paramedics. The majority of the births, i.e., 59.8% occurred in non-teaching hospitals, whereas a substantial minority, 40.2%, occurred in teaching hospitals. A large proportion of births, 37.1% were to first time mothers, referred to as nulliparous (in Table 1). Birth induction rate was 4.2 per 100 live births with vaginal deliveries.

Determinants of Episiotomy

Prior to exploring the primary research question, we examined variation in episiotomies by mother’s demographic characteristics.

Table 2. Bivariate percent distribution of deliveries by patient characteristics and the Episiotomy status of deliveries, Nevada, 2000-2005 (N=106,461)

Hospital/Birth Characteristics	Episiotomy Status		
	Vaginal deliveries without an instrument	Episiotomy	Instrument-Assisted (non-episiotomy)
County of Hospital's Location			
Urban	69.4%	24.7%	5.9%
Rural	68.5%	25.7%	5.8%
Teaching Hospital?*			
No	65.7%	28.1%	6.3%
Yes	74.8%	19.9%	5.3%
Parity*			
Nulliparous	52.1%	40.4%	7.5%
Multiparous	79.5%	15.6%	4.9%
Type of Birth Attendant - MD vs. Other*			
Midwife or others	82.7%	13.9%	3.4%
MD	68.2%	25.7%	6.1%
Urban vs. Rural County of Mother's Residence *			
Urban	69.0%	25.1%	5.9%
Rural	71.8%	22.6%	5.5%
Induction or Stimulation of Labor*			
No	69.5%	24.6%	5.8%
Yes	65.1%	28.3%	6.5%

*p < 0.01 (based on Chi-square test)

Our bivariate analysis indicates that with the exception of county of hospital's location, all covariates (Table 2) had a significant relationship with likelihood of episiotomy. Parity was among the most crucial determinant of whether episiotomy is performed. There was a remarkable difference between episiotomy rates of nulliparous women (women with no prior birth), 40.4% and those with a previous birth, 15.6%. Consistent with this were rates of instrument assisted deliveries – higher for nulliparous mothers 7.5% than multiparous 4.9%. It is noticeable however, that parity is a better predictor of episiotomy than use of instruments for other purposes during the delivery. This is consistent with the notion that for first time mothers, pelvic muscles are less flexible than those who already had given birth, increasing the chance of lacerations for nulliparous mothers. Episiotomies were higher in cases involving birth induction (28.3%) compared with those of non-induced births (24.6%); the difference was statistically significant.

The rate of episiotomy was slightly lower in hospitals located in the urban counties – 24.7% in urban as opposed to 25.7% in rural hospitals; the difference was statistically non-significant. The rate of instrument assisted deliveries was higher in non-teaching hospitals. The rate of episiotomies was considerably lower in the teaching hospitals – 19.9% as opposed to 28.1% in non-teaching. Similar difference in episiotomy rates also exists by urban

25.1% or rural 22.6% status of mothers' county of residence.

Births attended by MDs had considerably higher rates of episiotomy when compared to non-MD – 25.7% versus 13.9%. This should not lead to a false conclusion that if episiotomies are to be reduced, fewer MDs should be attending the deliveries, primarily because the difference in rates between two types of birth attendants is not adjusted for other risk factors of episiotomy.

Risk Factors for Obstetric Trauma -- Bivariate Analysis of third and fourth degree lacerations

Episiotomy was among the most significant of risk factors of obstetric trauma. While 9.4% of all deliveries with episiotomy had 3rd or 4th degree lacerations, only 2.7% of deliveries with no instrument had such injuries. Instrument-assisted deliveries not involving episiotomies also had lower rates 8.1% of lacerations compared to deliveries involving episiotomies.

Parity was the most influential factor associated with maternal trauma. Nulliparous women had a 10.2% rate of 3rd and 4th degree lacerations, a rate which was more than seven times higher than that for women with higher parity 1.4%.

Table 3. Bivariate percent distribution of 3rd and 4th Degree Laceration (PSI18 and PSI19) by patient characteristics, including the Episiotomy status of deliveries, Nevada, 2000-2005. (N=106,461)

Variable	Had 3 rd or 4 th Degree Lacerations	
	No	Yes
County of Hospital's Location*		
Urban	95.2%	4.8%
Rural	97.3%	2.7%
Teaching hospital?*		
No	95.0%	5.0%
Yes	95.7%	4.3%
Parity*		
Zero (No Previous Birth)	89.8%	10.2%
One or higher	98.6%	1.4%
Type of Birth Attendant - MD vs. Other*		
Midwife or others	97.6%	2.4%
MD	95.1%	4.9%
Urban vs. Rural County of Mother's Residence *		
Urban	95.1%	4.9%
Rural	97.1%	2.9%
Induction or Stimulation of Labor*		
No	95.4%	4.6%
Yes	94.0%	6.0%

Episiotomy Status*		
Vaginal deliveries w/o an instrument	97.3%	2.7%
Episiotomy	90.6%	9.4%
Instrument-Assisted (non-episiotomy)	91.9%	8.1%

*p < 0.01 (based on Chi-square test)

Urban hospitals had slightly lower -- 4.8% -- yet statistically significant rates of lacerations than hospitals in rural counties, 2.7%. Higher rates of lacerations occurred when mothers' county of residence was urban 4.9%, than rural 2.9%.

Risk of lacerations was also slightly, but statistically significantly higher for induced births compared to non-induced births, 6.0% and 4.6% respectively. Lacerations rate was also slightly higher for deliveries attended by MDs, when compared with those attended by non-MD paramedics, 4.9% versus 2.4%. As in the case of episiotomies, the difference was due to the fact that MDs are more likely to attend births with more complications. The trend was reversed when the effect of other risk factors are controlled for statistically (see Figure 2 and Table 4).

Multivariate Analysis of Risk Factors for Third and Fourth Degree Lacerations

Table 4 shows the results of our forward stepwise logistic regression model. The explanatory variables in the model resulted in a combined Nagelkerke R-Squared of 0.865, indicating that these variables explained 86.5% of variation in the dependent variable, "Third or fourth degree lacerations."

Our results indicate that episiotomy status was among the most important risk factor for the third and fourth degree laceration. After controlling for other variables in the model, births with Episiotomy were 2.2 times (0.515/0.233) more likely to be associated with obstetric injury. Deliveries with instrument use other than episiotomy were even at a greater risk of obstetric trauma, 4.3 times greater risk compared with deliveries not involving any instrument and nearly double the risk compared with episiotomy deliveries. The difference in risk of trauma between episiotomies and other instrument-assisted deliveries was statistically significant.

All other variables in the model were also significant predictors of lacerations. Among the remaining categorical variables, parity was the most discriminating, as the odds of 3rd and 4th degrees lacerations were 6.8 times higher (1.0/0.146) for nulliparous women compared to those with higher parity. If the birth attendant was a Mid-wife or other non-MD paramedic, the odds of laceration were (1 to 0.59) 1.7 times higher compared to the risk for births

attended by MDs, after controlling for all other factors; the difference being statistically significant. Odds ratio after recalculations from logistic regression table (Table 4) are shown in Figure 2.

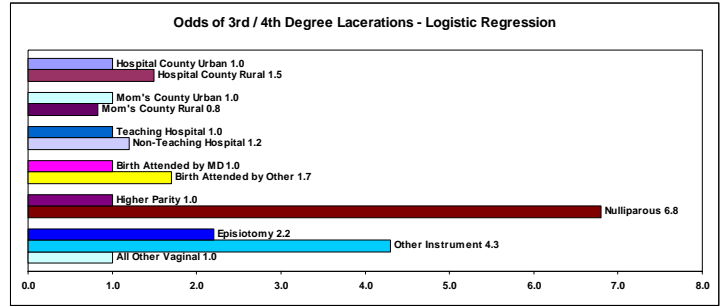


Figure 2. Odds of Obstetric Trauma from Logistic Regression Analysis, Nevada, 2000-2005.

County of hospital's location was the next most important variable. After controlling for other variables, births in hospitals located in rural counties were (1.0/0.666) or 1.5 times more likely to have lacerations during deliveries as opposed to urban hospitals. Interestingly though, the opposite was true about Mom's county of residence. After controlling for other factors, deliveries to mothers residing in the urban county were 1.2 times more likely to involve lacerations as compared to mothers in rural areas.

Table 4. Logistic Models to Predict Maternal Trauma as a Function of Episiotomy Status and Other Characteristics of discharges.

Explanatory and Control Variables	Wald Chi-square	Logistic Regression Coefficient		
		Exp (B)	Confidence Interval	
County of Hospital's Location (Urban =1; Rural=0)	19.971*	.666	.558	.796
Mom's County of Residence (Urban =1; Rural=0)	5.397**	1.203	1.029	1.407
Teaching Status of Hospital (Teaching =1; Non-teaching = 0)	40.762*	.815	.765	.868
Birth Attendant (MD=1; Midwife or other = 0)	116.967*	.590	.536	.649
Age of Mother in years (Continuous)	7.395**	.994	.989	.998
Birth Weight in Grams (Continuous)	11.131*	1.000	1.000	1.000
Parity (nulliparous=0; higher parity = 1)	2,430.371*	.146	.136	.158
EPISIOTOMY STATUS (NATURE OF DELIVERY)	1,298.939*			

No Instrument Episiotomy	1,150.319*	.233	.214	.254
Instrument-Assisted (non-episiotomy) (Reference Category)	239.852*	.515	.473	.560

*p < 0.01, **p < 0.05

After controlling for other factors, the risk of lacerations was higher in non-teaching hospitals. The odds of lacerations were 1 to 0.815; that is, 1.2 times higher in non-teaching hospitals. Both of the continuous variables -- mothers' age was statistically significantly associated with the risk of lacerations to mother during pregnancy. However, baby's birth-weight was not statistically significant after controlling for other factors.

Conclusions and Discussion

This study is one of a series of studies conducted by the National Association of Health Data Organization (NAHDO) in collaboration with other IC-BRIC partners, under the AHRQ/BRIC project aimed at promoting comparative research in the Intermountain Region. The primary purpose of this research was to examine the relationship between episiotomy and birth trauma. The notion that episiotomy prevents obstetric trauma has been popular until the last few decades. In order to examine this relationship in Nevada, we needed variables from both birth data (e.g. parity) and inpatient hospital discharge data. To this end, we performed record level probabilistic linkage of two datasets from the Nevada State Health Division for calendar years 2000 through 2005 – (a) Nevada Birth Certificate Data; and (b) Nevada Inpatient Hospital Discharge Data. We removed records involving multiple births and cesarean deliveries, leaving the total number of vaginal births at 106,461. Birth trauma was defined as third or fourth degree lacerations, as proposed by the Agency for Healthcare Quality and Research (AHRQ) Patient Safety Indicators (PSIs) 18 and 19.

Our analyses indicated that obstetric trauma rate during births in Nevada Hospitals declined from 5.2% of vaginal deliveries in 2000 to 4.4% in 2005. Episiotomies were performed on 24.8% of all vaginal births which is a lower rate than the national average of 33% for the recently available years.

Our bivariate analyses revealed interesting variations in episiotomy. Parity was the most crucial determinant of episiotomy with 40.4% of nulliparous births involving episiotomies; comparative rate for mother with previous births was 15.6%. Rate of episiotomy also differed significantly by whether the birth was induced, type of birth attendant, teaching status of the hospital, and urban versus. rural status of

county of hospital location and rurality of mother's residence.

Bivariate determinants of obstetrics trauma, in the order of importance were episiotomy status, parity, whether the birth was attended by an MD, residence in urban county, location of hospital in urban county, and induction of births.

Results of logistic regression analysis showed that births with Episiotomy were 2.2 times more likely and other instrument assisted births 4.3 times more likely to have obstetric injury than those through vaginal deliveries without instruments. Parity was the most discriminating variable, as the odds of 3rd and 4th degree lacerations were 6.8 times higher for nulliparous women compared to multiparous. In addition, non-MDs as birth attendants, rural hospitals, urban county residence of mother, and non-teaching hospitals were associated with elevated risk of obstetric trauma.

The eight variables in our regression model resulted in a combined R-Squared of 0.865, indicating that these variables explained 86.5 percent of variation in the dependent variable, 'obstetric trauma measured by third or fourth degree lacerations'. In public health data sets, such explanatory power of a multivariate model is considered exceptionally good. The high R-Squared implies that the important determinants of the obstetric trauma were available through the hospital discharge data and the birth certificate data, linked through probabilistic linkage at record level. An implication for research is that record-level linkage of administrative data with other data on the same individuals offers the opportunity to answer research questions not possible from a single data source.

The prevalence of episiotomy procedure in Nevada is at par with its National level rates. However, rejection of the hypothesis that episiotomies prevent laceration at birth and our findings that episiotomy is actually associated with increased risk of obstetric trauma can be interpreted to mean that episiotomies should only be performed if necessary to avoid other serious complications. Evidence from existing body of literature suggests that, among other things, education and awareness regarding risks and benefits of episiotomy and documentation of procedure indication is an important determinant of modification in practice, and thus reduction in rates of episiotomy (Lowenstein, Drugan, Gonen, Itskovitz-Eldor, Bardicef & Jakobi, 2005; Goldberg, Purfield, Roberts, Lupinacci, Fagan & Hyslop, 2006). Variation of both obstetric trauma and episiotomy by hospital character and mother's demographic attributes can be used to guide practices aimed at

reducing unnecessary episiotomies and in turn, risk for obstetric trauma.

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