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Ascertaining severe perineal trauma and associated risk factors by comparing birth data with multiple sources

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ABSTRACT

Objectives

Population data are often used to monitor severe perineal trauma trends and association of risk factors. Within NSW, two different datasets can be used; the Perinatal Data Collection (‘birth’ data), or a linked dataset combining birth data with the Admitted Patient Hospital Data Collection (‘hospital’ data). Severe perineal trauma can be ascertained by birth data alone, or by hospital ICD-10-AM diagnosis and procedure coding in the linked dataset. The aim of this study is to compare rates and risk factors for severe perineal trauma using birth data alone, with those using linked data.

Methods

The study population consisted of all vaginal births in NSW 2001-2011. As perineal injury coding in birth data was revised in 2006, data were analysed separately for 'earlier data' and 'more recent data'. Rates of severe perineal injury over time were compared in birth data alone, and in linked data. Kappa and agreement statistics were calculated. Risk factor distributions (primiparity, instrumental birth, birthweight≥4kg, Asian country of birth and episiotomy) were compared between women with severe perineal trauma identified by birth data alone, and identified by linked data. Multivariable logistic regression was used to calculate the adjusted odds ratios of severe perineal trauma.

Results

Among 697,202 vaginal births, 2.1% were identified with severe perineal trauma by birth data alone, and 2.6% by linked data. The rate discrepancy was higher among earlier data (1.7% for birth data, 2.4% for linked data). Kappa for earlier data was 0.78 (95% CI 0.78, 0.79), and 0.89 (95% CI 0.89, 0.89) for more recent data. With the exception of episiotomy, differences in risk factor distributions were small, with similar adjusted odds ratios. Adjusted odds ratio of severe perineal trauma for episiotomy was higher (1.34 95% CI 1.27, 1.41) using linked data compared with birth data (1.03 95% CI 0.97, 1.09).

Conclusions

While discrepancies in ascertainment of severe perineal trauma improved after revision of birth data coding in 2006, higher ascertainment by linked data was still evident for recent data. There were also higher risk estimates of severe perineal trauma with episiotomy by linked data than by birth data.

KEY POINTS

- Severe perineal trauma can be ascertained by birth data or by linked data
- In the context of rising rates, issues around data quality are important
- Ascertainment of severe perineal trauma increases when a linked dataset is used compared with birth data alone
- Agreement between the data sets is higher for data collected since 2006, however possible under-reporting by birth data remains a concern
- Differences translate into different risk estimates of severe perineal trauma for episiotomy

INTRODUCTION

Major perineal tearing occurs at childbirth when a spontaneous tear or an episiotomy extends to include the anal sphincter musculature (third degree tear), or further to include the anal mucosa as well (fourth-degree tear). These tears are collectively known as severe perineal trauma, and are distressing adverse outcomes of some vaginal births with short and potential long term consequences for women.[1-3] With reports of rising rates in both New South Wales (NSW)[4] and internationally[5-8], the importance of severe perineal trauma identification and monitoring as a gauge of safe and appropriate care has been recognised with its inclusion as one of fifty-five quality indicators by the Australian Institute of Health and Welfare (AIHW) in 2009.[9] Population health data, with their advantage of no sampling bias, are often used to monitor trends of severe perineal trauma and assess the association with risk factors.[4, 5, 7, 10] The accuracy and reliability of population health data are typically reported by validation studies from which assessments of the data quality can be made.[11-15]

Severe perineal trauma can be ascertained from two different population datasets in NSW; the NSW Perinatal Data Collection (PDC, or birth data), and the Admitted Patient Data Collection (APDC, or hospital data). Both these datasets have information relating to the same delivery, and a researcher has the option of using either data collection, or a combination of both. As the hospital data contain information regarding all hospitalisations, both maternity and non-maternity related, the hospitalisation related to the birth needs to be identified. If a researcher uses hospital records alone, there is the potential that some of the maternity hospitalisation records may be missed.[16] Linkage between the hospital and birth datasets can accurately identify births and associated complications.[17] Deidentified information from both data sources can be combined into a single record for each birth. While birth data alone can be used for research, the combination with hospital data provides more detailed information regarding diagnoses and procedures, and can increase the reliability and accuracy of reporting around labour and delivery.[13] However, linked data are not typically available until 12-18 months after the availability of birth data alone, and hence there is a slight trade-off between timeliness and reliability/accuracy.

By its nature, a linked dataset has more complexity as some clinical information will be available from multiple sources and in differing formats. Once the data sources have been linked, severe perineal trauma can be identified from the birth data, or hospital data, or a combination of both. A previous validation study has shown that identification from hospital data alone, with reporting by either ACHI procedure code (16573-00, suture of third or fourth tear of the perineum) or ICD-10-AM diagnosis codes (O70.2, third degree perineal laceration; or O70.3, fourth degree perineal laceration) is the most reliable and accurate method of ascertaining the incidence in NSW.[13] While some Australian studies have ascertained severe perineal trauma by this method,[4, 18, 19] others have used birth data.[20, 21]

As some risk factor variables will be recorded in both data collections, a linked dataset provides researchers the opportunity to use those from the most reliable and accurate source as evidenced by previous validation studies. The aim of this study is to compare severe perineal trauma trends, and the association of risk factors, using birth data alone versus using a linked dataset containing birth and hospitalisation data.

METHODS

The study population consisted of all vaginal births occurring in NSW from 2001 to 2011, with deidentified information provided in a linked dataset containing data from the NSW Perinatal Data Collection (PDC, or 'birth data') and the Admitted Patient Data Collection (APDC, or 'hospital data'). The former is a statutory collection of all NSW hospital and home births which occur at ≥20 weeks gestation or ≥400g birthweight, and includes data regarding maternal characteristics, medical and obstetric information as well as information on labour, birth and infant condition.[22] Information is recorded by the attending midwife or doctor. The APDC is a census of all hospital admissions, and is collected from the hospital medical record once a patient has been discharged from hospital. Each record relates to a single hospital admission. In addition to administrative and demographic data, the hospital data contain clinical diagnosis and procedure information which have been coded per the International Classification of Diseases Australian Modification (ICD-10-AM)[23] and the Australian Classification of Health Interventions (ACHI).[24] Each linked record contained information from both data collections for each woman – 'birth' data from the PDC, 'hospital' data from the APDC. 'Linked' data were from probabilistically linked birth and hospital data. Where a multiple pregnancy occurred, we included data pertaining to the firstborn.

The birth data collection form was revised in 2006, and as a result the recording of perineal status changed during the study period (Figure 1). Using the older version of the form, a woman with severe perineal trauma and an episiotomy would be coded as 'both tear and episiotomy', as would a woman with a less severe tear and episiotomy. The newer version separated information regarding spontaneous tearing and episiotomy into two separate variables, distinguishing severe perineal trauma from other tears in the presence of an episiotomy. Both versions were in use during the 2006 calendar year as individual hospitals introduced the new form at different times throughout this year. We have defined data collected on the older version as 'earlier data' (comprising all pre 2006 data and the data collected by the older version during 2006), and data collected on the newer version as 'more recent data' (data collected by the newer version during 2006 and all post 2006 data). In contrast to birth data, the diagnosis and procedure codes in the hospital data did not change, and in keeping with the results of a previous validation study[13], we identified severe perineal trauma from the linked data by ICD-10-AM O70.2 or O70.3 or procedure coding 16573-00.

[INSERT FIGURE 1]

To compare the sources of severe perineal trauma identification, we calculated the rates over time for birth data alone, and for linked data. Kappa and agreement statistics were then used to compare severe perineal trauma identified from birth and from linked data, for both periods of data collection. Discordant cases were described. As women with a diagnosis code for either a third degree or a fourth degree tear (severe perineal trauma) would require a suturing procedure, agreement would be expected between a diagnosis and a procedure code. We investigated if any discrepancy existed by calculating the agreement and Kappa statistics between these codes.

To ascertain the impact of data source on risk estimates, we compared the distributions of primiparity, instrumental birth, infant birthweight ≥4kg, Asian maternal country of birth and episiotomy, which are all known to be associated with severe perineal trauma,[4, 25] for two scenarios: a) using birth data alone, and b) using linked data. Information regarding parity, birthweight, instrumental birth and country of birth were identified from birth data, while episiotomy was identified if present in either birth or hospital data.[13] Distributions of risk factors from the discordant records were also examined.

Two multivariable logistic regression models were then built, one for each scenario. The adjusted odds ratios (aORs) of severe perineal trauma for risk factors were calculated for each scenario, and compared. We restricted analyses of risk factors to the more recent data, as the older collection form did not have the ability to discriminate severe perineal trauma occurring with or without episiotomies. As episiotomy has previously been reported as varying in association with severe perineal trauma according to type of delivery,[4, 7] we also performed a sensitivity analysis comparing the aORs for women with episiotomies for delivery type (non-instrumental, forceps and vacuum).

All analyses were undertaken using SAS (version 9.3, SAS Institute, Cary, NC, USA). This study was approved by the NSW Population and Health Services Research Ethics Committee.

RESULTS

From 2001 to 2011 there were 697,202 vaginal births. Rates of severe perineal trauma differed between birth data and linked data (Figure 2). Overall, the rate was 2.1% ascertained by birth data, and 2.6% by linked data. Differences in ascertainment are reflected in a relative increase in rates from 2001 to 2011 of 115.4% in birth data, and 58.5% in linked data. The severe perineal trauma rate recorded by the earlier version of the birth data form was 1.7%, which compared with a rate of 2.4% recorded by linked data for these same women. This discrepancy decreased with the introduction of the more recent form, with a birth data rate of 2.5% and linked data rate of 2.9%.

[INSERT FIGURE 2]

Within the linked data over the whole time period there was high agreement between diagnosis and procedure coding (agreement 99.8%; Kappa=0.96, 95% CI 0.95, 0.96).There were a total of 1474 discordant cases (0.2% of total births). There were 1109 women coded with a third or fourth degree tear diagnosis but not with the associated suturing procedure (6.2% of diagnosed tears); while 365 women had a suturing code but no diagnosis code (2.1% of recorded suturing procedures).

As reflected in the rates, agreement between linked and birth data coding was lower among the earlier data (Kappa=0.78 95% CI 0.78, 0.79), compared with the more recent data (Kappa=0.89 95% CI 0.89 0.89) (Table 1). Among the 8242 women with severe perineal trauma identified by linked data in the earlier data, there were 2,679 (32.5%) discordant cases in which women were not coded as having severe perineal trauma by birth data. Among these, 1,082 (40.4%) had been coded as 'both tear and episiotomy' by the older birth data collection form; 586 (21.9%) as 'first degree tear/graze; 532 (19.9%) as 'episiotomy'; 389 (14.5%) as 'second degree tear'; 52 (1.9%) as 'other'; and 33 (1.2%) as 'intact'. The coding 'other' refers to an unspecified perineal tear, vulval or perineal haematoma. Among the more recent data, 1,588 out of 9916 women (16.0%) were coded with severe perineal trauma by linked data but not birth data. Birth data coding for these women reported 873 (55.0%) as 'other'; 395 (24.9%) 'second degree tear'; 276 (17.4%) 'first degree tear'; and 43 (2.7%) as 'intact'.

[INSERT TABLE 1]

Among the more recent data, the distributions of primiparity, instrumental birth, birthweight ≥4kg, or Asian maternal country birth were similar for women identified with severe perineal from birth data and women identified from linked data (Table 2). Discordant cases in which severe perineal trauma was identified by linked data but not birth data also had similar distributions for primiparity (75.8%), higher rates of instrumental delivery (45.0%), fewer infants ≥4kg (15.4%), and fewer Asian born women (20.4%). However, using only birth data, 35.4% of women identified as having severe perineal trauma were coded with an episiotomy, compared with 40.2% in linked data.

The adjusted risk estimates for parity, instrumental delivery, birthweight and Asian country of birth were similar when severe perineal trauma was identified by birth data and by linked data (Table 2). In contrast, episiotomy was not significantly associated with severe perineal trauma when only birth data were analysed (aOR 1.03 95% CI 0.97, 1.09), but was associated in linked data (aOR 1.34 95% CI 1.27, 1.41). Analysis depending on the type of delivery revealed episiotomy as a risk factor for non-instrumental birth and protective for forceps delivery in both scenarios. However, among vacuum births the aOR for episiotomy was 0.77 (95% CI 0.70, 0.85) when birth data were used; and non-significant (aOR 1.02 95% CI 0.93, 1.11) using linked data.

[INSERT TABLE 2]

DISCUSSION

We have demonstrated that ascertainment from birth data alone results in lower reported severe perineal trauma rates compared to ascertainment from linked data. As we had no validated dataset with which to compare our results, we cannot quantify if higher ascertainment may have been due to false positive results within the linked data. However, we are reassured by a previous validation study which reported that the combination of procedure or diagnosis codes from hospital data results in highest positive predictive value (PPV) of 99.7 compared with birth data alone (PPV=75.7).[13]

Following the introduction of the recent birth data collection form, agreement between severe perineal trauma reporting by linked and birth data improved. For birth data collected on the older version, a woman with severe perineal trauma and episiotomy could not be counted in the severe perineal trauma group as documentation did not specify the tear type. Forty percent of discordant cases in the older data were coded for ‘both tear and episiotomy’; and exclusion of this group would have partially contributed to lower reporting in the birth data compared with the linked data. However, even after the introduction of the newer form, linked data still identified more cases of severe perineal trauma than birth data. We cannot determine the reason, but this finding may be influenced by coding practices and the timing of recording.

It is of interest to note that there was a spike in severe perineal trauma reporting for 2007 birth data after introduction of the new form, however for the remaining years this spike was not maintained and the difference between linked and birth data remained fairly constant. The different recorded rates by data source impacted on the change in incidence over time, with birth data reflecting a much larger increase than linked data. We would recommend that if a researcher did not have access to linked data and was using birth data, rates of severe perineal trauma should be determined from data collected on the recent form with acknowledgement that under-ascertainment is still likely.

Any differences in distributions of discordant cases were not influential enough to have a major effect on the adjusted risk estimates for parity, instrumental delivery, infants ≥4kg and Asian country of birth. However, episiotomy was not significantly associated with severe perineal trauma using birth data alone, but was associated in linked data. This suggests that by using birth data alone, researchers may underestimate the overall association of episiotomy with severe perineal trauma.

CONCLUSION

We have shown that the use of linked data results in higher ascertainment of severe perineal trauma than birth data, reflected in higher overall rates. With the revision of the birth data collection form, allowing separate recording of perineal tears and episiotomy, agreement between rates calculated from birth data and linked data improved, however possible under-reporting of severe perineal trauma by birth data remained. These differences have an impact when describing the changes in rates of severe perineal trauma over time. The differences in distributions of episiotomy as reported by birth data, compared with reporting linked data translated into significant differences in adjusted risk estimates.

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Figure 1 – Versions of the birth data collection form

OLDER FORM (pre 2006 revision)	NEWER FORM (post 2006 revision)
Perineal status Intact ☐ 4th deg. tear ☐ 1st deg. tear/graze ☐ Episiotomy ☐ Both tear and episiotomy ☐ 2nd deg. tear ☐ Other ☐ 3rd tear ☐	**Perineal status** Intact ☐ 3rd tear ☐ 1st deg. tear/graze ☐ 4th deg. tear ☐ 2nd deg. tear ☐ Other ☐ **Episiotomy** Yes ☐ No ☐

Figure 2 - Comparison of severe perineal trauma rates among vaginal births from birth data and from linked data

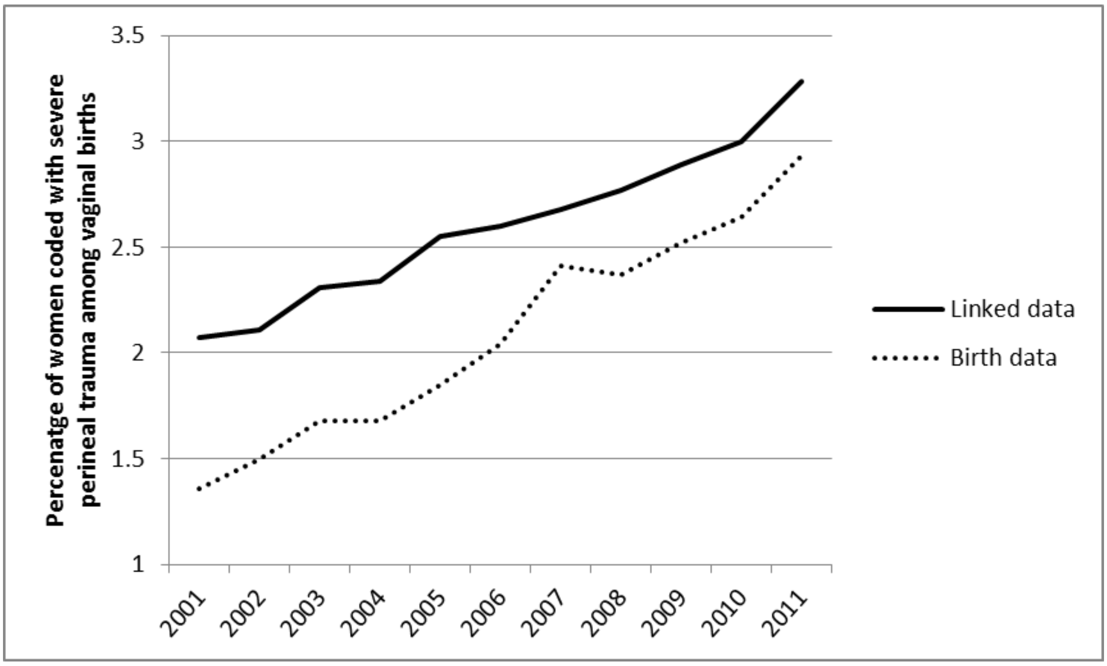

Table 1– Comparison of severe perineal trauma (SPT) coding by linked data with different versions of birth data collection form among vaginal births

		Linked data		**Total (%)**	**Agreement**	**Kappa (95% CI)**
		SPT recorded n (total %)	SPT not recorded n (total %)			
Earlier birth data	SPT recorded	5563 (1.6)	314 (0.1)	5877 (1.7)		
	SPT not recorded	2679 (0.8)	340843 (97.6)	343522 (98.3)		
	Total	8242 (2.4)	341157 (97.6)	349399 (100.0)	99.1%	0.78 (0.78, 0.79)
More recent birth data	SPT recorded	8328 (2.4)	406 (0.1)	8734 (2.5)		
	SPT not recorded	1588 (0.5)	337481 (97.0)	339069 (97.5)		
	Total	9916 (2.8)	337887 (97.2)	347803 (100.0)	99.4%	0.89 (0.89, 0.89)

SPT=severe perineal trauma

Table 2 – Distributions of factors and association with severe perineal trauma (SPT) by data source (2006-2011)

	Scenario 1 Birth data only		Scenario 2 Linked data	
	SPT recorded in birth data N=8734 (2.5%)	aOR (95% CI) [a]	SPT recorded in hospital data N=9916 (2.8%)	aOR (95% CI) [a]
[b]Parity				
Primip	6582 (75.4)	3.55 (3.36, 3.74)	7483 (75.5)	3.41 (3.24, 3.59)
Multip	2143 (24.5)	Reference	2422 (24.4)	Reference
Missing	9 (0.1)		11 (0.01)	
[b]Instrumental				
Yes	3658 (41.9)	2.32 (2.20, 2.45)	4182 (42.2)	2.11 (2.01, 2.22)
No	5076 (58.1)	Reference	5734 (57.8)	Reference
[b]Birthweight				
≥4kg	1589 (18.2)	2.45 (2.31, 2.59)	1753 (17.7)	2.33 (2.20, 2.46)
<4kg	7144 (81.8)	Reference	8161 (82.3)	Reference
Missing	1 (<0.1)		2 (<0.1)	
[b]CoB				
Asian	2496 (28.6)	2.33 (2.21, 2.44)	2761 (27.8)	2.16 (2.06, 2.27)
Non-Asian	6175 (70.7)	Reference	7077 (71.4)	Reference
Missing	63 (0.7)		78 (0.8)	
[c]Episiotomy				
Yes	3091 (35.4)	1.03 (0.97, 1.09)	3986 (40.2)	1.34 (1.27, 1.41)
No	5642 (64.6)	Reference	5930 (59.8)	Reference
Missing	1 (<0.01)			

SPT=severe perineal trauma
aOR=adjusted odds ratio
[a]Adjusted for all factors in table
[b]Identified by birth data
[c]Identified by birth data alone for Scenario 1; Identified if recorded in birth or in hospital data for Scenario 2