Variation in Obstetric Intervention Rates across Hospitals in Sardinia

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Abstract Episiotomy is one of the most widespread obstetric procedures but its practice highly varies among institutions and practitioners. The objective of this study is to assess the extent of variation in the use of episiotomy across hospitals and to evaluate how much of this variation can be explained by case-mix factors. Using data from hospital facilities located in the Italian region of Sardinia, we fit a multilevel logistic model which shows that almost half of the variation in episiotomy rates remains unexplained after conditioning on well-recognized indicators for episiotomy use and socio-demographic factors.

1 Introduction

In this section we introduce the relevant literature on episiotomy use and present our contribution. Episiotomy is defined as the incision of perineum in vaginal childbirth. Obstetrics literature usually recommends an episiotomy when there is risk of severe perineal tears or concern for damage of fetal head [1]. While in the past decades episiotomy was largely practiced in Western hospitals, more recently its routine use in vaginal deliveries has been seriously questioned. Individualization is now generally advocated instead of routine use of episiotomy. Indeed, several studies rose doubts on its ability to prevent severe tears and also highlighted the negative effects associated with its liberal use [4,5,7]. Despite these criticisms, episiotomy remains one of the most used obstetric procedures. Official U.S. statistics estimated that it occurs in more than 35% of all vaginal deliveries. It should be emphasized that total rates can be misleading as indicators of episiotomy incidence since great variation exists across hospitals and practitioners [6,7]. It has been suggested that the use of episiotomy is heavily driven by local professional norms, experience in training, and individual

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clinician's preference [7]. Using data from eighteen maternal hospitals, Webb et al. [6] observed that the large differences existing in the rates of episiotomy were difficult to justify since they did not positively correlate with better maternal outcomes.
However, only few published articles explicitly address the topic and little is known about the extent, the effects and the determinants of the variation in episiotomy rates. In this study, using data from maternal deliveries in the Italian region of Sardinia, we attempt to clarify whether differences across hospital rates can be justified considering differences in case-mix factors. Using a two-level logistic model we show that case mix factors accounting for both medical indications and socio-demographic characteristics can explain only 50% of the total variation in episiotomy use across hospitals.

2 Data and Methods

We consider a data set containing information on deliveries occurred in the 23 hospitals of the Italian region of Sardinia in the year 2008. The data set merges individual information contained in two official sources: the hospital discharge sheet (SDO) and the "Certificato di Assistenza al Parto" (CeDAP). While the former is the international standard for collecting medical information While the former is the international standard for collecting medical information using the ICDM-9 coding system, the latter has been designed for capturing additional information on social and demographic characteristics of the family. These two sources were linked using the mother's taxpayer code as the matching key and lead to a sample containing 5463 individuals that were eligible for episiotomy divided in 23 groups, corresponding to the hospitals of the region. Rates of episiotomy vary across hospitals from a minimum of 0.16 to a maximum of 0.80. In order to explain the difference in the use to episiotomy we relied on a set of case mix factors that can be classified as medical or social. In the first class we have medical factors usually considered to be an indication for the use of episiotomy in the medical literature, e.g.: multi-parity, shoulder dystocia, large baby [1] while in the second class we have socio-demographic variables whose impact is evaluated for the first time like mother's age, mother's education and mother's employment condition. It is possible that not all the factors that contribute to the decision of cut an episiotomy have been observed: in particular we are concerned with unobserved variables which do not vary at the hospital level, like obstetrician practice, preferences of the physician working in the same hospital and guidelines promoting or restricting the liberal use of episiotomy. In order to assess the importance of these variables we modelled the likelihood of an episiotomy using a two level logistic model with individual predictors at the lowest level of the hierarchy and a random intercept at the hospital level, taking in account all unobserved predictors at the hospital level.

Using the latent response formulation, the model can be written as:

$y_{ij}^{*} = \beta_0 + \beta_1 x_{1j} + \beta_2 x_{2j} + ... + \beta_k x_{kj} + \varsigma_j + \varepsilon_{ij}$, where y_{ij}^{*} is the propensity of observing $y_{ij} = 1$; this happens if an episiotomy has been performed in the patient *i* in the hospital *j*; $x_{1j}, ..., x_{kj}$ are the clinical and socio-demographic predictors for the individual *i*, whereas ς_j is the random intercept at the hospital level where the individual *i* has been admitted. In this framework we have

to remark that random intercept is normally distributed. This specification setting allows us for considering clinical indications to predict episiotomy within each hospital and allows also for underlining systematic differences between hospitals.

3 Results

Table 1: Estimated coefficient of the multilevel logistic regression model for the likelihood of episiotomy.

Variable	***OR***	***Std. Err.***	***Sig.***
Age (ref. > 39)			
<20	1.233	0.317	
20-24	0.862	0.150	
25-29	0.849	0.126	
30-34	0.930	0.128	
35-39	1.007	0.140	
Marital status (ref. other)			
Single	0.856	0.181	
Married or cohabiting	0.734	0.156	
Education (ref. university)			
Secondary	1.021	0.096	
Middle	1.196	0.122	*
Primary or less	2.341	0.540	***
Employment status (ref. employed)			
Unemployed	1.080	0.133	
Student	0.768	0.171	
Housewife	1.059	0.080	
Parity (ref. 1)			
>1	2.665	0.196	***
Newborn's weight	0.999	0.000	***
Gestational age	0.948	0.023	**
Oligodramnios	3.156	2.340	
Premature rupture of membranes	0.716	0.092	***
Diabetes mellitus	0.312	0.185	**
Shoulder distocya	1.737	1.991	
Sigma hosp	1.757	0.291	
ρ	0.484	0.082	***
Number of Observations	5646		
Number of Hospitals	23		
Wald Test	145.27		***

***** pvalue<0.01; ** 0.01<pvalue<0.05; * 0.05<pvalue<0.10**

The model can be estimated by simulated maximum likelihood. We used STATA 11 to perform all calculations [3]. The estimates of the parameters are shown in Table 1.

From a general point of view it is easily seen that clinical indications for episiotomy are significant while social variables seem not important determinants of

an episiotomy with the exception of education: patients with lower education are more likely to undergo an episiotomy. Conversely, parity greater than one is a strong predictor of episiotomy such as gestation age, the absence of diabetes mellitus and of the premature rupture of membranes. However, in this study we are not particularly concerned with the impact of individual-level variables themselves but rather on estimating the variance of the random intercepts, i.e. in estimating the quota of the total variance that cannot be explained by individual-level variables. Following the latent-response approach [3], the estimate of the intra-class correlation coefficient $\rho = Corr(y^*_{ij}, y^*_{i'j} \mid x_{ij}, x_{i'j})$ expresses the within-hospital correlation in predicting episiotomy due to unobservable factors. In this case $\hat{\rho}$ is equal to 0.48 meaning that almost half of the total variation in rates of episiotomy is due to unobserved hospital-level covariates. More accurate information would be needed in order to bring light on the determinants of this variation.

4 Conclusion

About half of the variation in episiotomy rates remains unexplained by case mix factors. Variation in rates of diagnoses and medical interventions is well-known in literature with respect to obstetric interventions. In particular a consistent variation has been reported in rates of induction of labor, which remains unexplained after conditioning on medical indications [2], questioning the opportunity of some inductions. This study shows that episiotomy belongs to the procedures for which great variation does exist. More accurate data would be needed in order to bring light on the determinants of the variation. In particular, it would be important to determine whether variation is due to different “hospital cultures” or it depends on practitioners' styles.

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