



The influence of the attending midwife on the occurrence of episiotomy: A retrospective cohort study

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ABSTRACT

Background: Episiotomy at the time of vaginal birth can result in short- and long-term complications for women. Therefore, it is important to study factors that influence the occurrence of episiotomy.

Aim: To examine to what extent the individual factors of clinical midwives in the same working conditions contribute to variations in episiotomy.

Methods: A retrospective cohort study was performed at a secondary care hospital in Amsterdam, the Netherlands, using data from women who were assisted by a clinical midwife during birth in 2016. The clinical midwives filled out a questionnaire to determine individual factors. The predictive value of the individual factors of the clinical midwives was examined in a multiple logistic regression model on episiotomy.

Results: A total of 1302 births attended by 27 midwives were included. The mean episiotomy rate was 12.7%, with a range from 3.2% to 30.8% among midwives ($p = 0.001$). When stratified for parity, within the primipara group there was a significant variation in episiotomy among midwives with a range from 7.9% to 47.8% ($p = 0.006$). No significant variation was found in the occurrence of third/fourth degree tears or intact perineum. There was a significant difference in episiotomy for maternal indication among midwives ($p = 0.041$). Predictors for an episiotomy were number of years since graduation and place of bachelor education of the clinical midwife.

Conclusion: This study shows that individual factors of clinical midwives influence the rate of episiotomy. Predictors for an episiotomy were the number of years since graduation and place of bachelor education. This shows that continuous training of clinical midwives could contribute to reducing the number of unnecessary episiotomies. Since suspected fetal distress is the only evidence based indication to perform an episiotomy, there is room for improvement given the variation in the number of episiotomies performed for maternal indication.

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Introduction

Perineal damage is a common complication after vaginal birth. This damage can occur spontaneously but can also be the result of an intervention by the caregiver, i.e. an episiotomy. Perineal damage, including episiotomy, causes pain and discomfort and can delay recovery of women after childbirth.

Perineal tears are classified into four categories. First- and second-degree tears are the most common, they comprise the skin and muscle layer and are usually associated with little morbidity (Aasheim et al., 2017). With third-degree tears the anal sphincter is affected, classified as 3a when less than 50% of the external anal sphincter is torn, 3b when more than 50% of the external sphincter is torn, and 3c when both internal and external anal sphincter are torn. Fourth-degree tears include both the anal sphincter and the anal epithelium (Aasheim et al., 2017; Dudding et al., 2008). Obstetric anal sphincter injuries are related to short- and long-term maternal complications like pain, fecal incontinence, pelvic floor prolapse, sexual dysfunction, and a reduced quality of life (Elvander et al., 2015; Evers et al., 2012; Handa et al., 2007). Mul-

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tiple factors associated with perineal damage, such as maternal age and parity, have been studied (Albers et al., 2005; De Jonge et al., 2010). Factors related to obstetric anal sphincter injuries are birthweight, instrumental delivery, fetal position, duration of second stage of labor and gestational age at birth (Andrews et al., 2006; de Leeuw et al., 2001; Dudding et al., 2008; Groutz et al., 2011; Twidale et al., 2013).

There is conflicting evidence about the use of episiotomy to prevent serious perineal damage. Where some studies showed a protective effect, others showed that an episiotomy itself is an independent risk factor for anal sphincter injuries (Andrews et al., 2006; Shmueli et al., 2017; Verghese et al., 2016). Meta-analyses show that routine use of this intervention is not justified by current evidence in an uncomplicated vaginal birth (Jiang et al., 2017). Only in case of an instrumental delivery, the increased risk for anal sphincter injuries seems to be countered for by an episiotomy (Jiang et al., 2017; Schmitz et al., 2014). Therefore, the use of this intervention must be carefully weighed since an episiotomy itself also causes perineal damage with the associated complications.

The type of birth attendant is found to be associated with the chance of episiotomy (Albers et al., 2005; Gerrits et al., 1994; Low et al., 2000). A prospective multicentre cohort study in the Netherlands showed that women who opted for a homebirth had fewer episiotomies and were more likely to have an intact perineum (Bolten et al., 2016). In 2016 the episiotomy rate was 8.9% in primary midwife-led care and 28.7% in secondary obstetrician-led care. For primipara the chance of an episiotomy was 18.5% in primary midwife-led care and 45.7% in secondary obstetrician-led care, compared to 4.8% and 13.2% for multipara respectively (Perined, 2018). This means that the risk for an episiotomy is higher in obstetrician-led care. Not only a difference in population, also the type of birth attendant is of influence on the chance of an episiotomy. However, a growing number of midwives are employed in hospitals, which has led to an increase in births attended by a midwife in hospitals (Wiegers & Hukkelhoven, 2010). In 2012 in 77% of the hospital, mid- to high-risk births, the clinical midwife was partially or solely responsible for the management of care during labor and birth (Cronie et al., 2012).

In addition to the distinction between midwives and doctors, it has been shown that the episiotomy rates vary widely and significantly between individual care providers. An Italian study among clinical midwives showed a range from 5.6% to 73.9% (Cromi et al., 2015). Similar results were found in American studies with ranges from 2% to 43% and 13.3% to 84.6% (Gossett and Dunsmoor Su, 2008; Low et al., 2000). Therefore, it might also be useful to look at the individual care provider when it comes to the risk for episiotomy, next to the distinction between midwifery-led and obstetrician-led care. Individual care providers can use different methods during the second stage of labor. The most studied method is the distinction between “hands-on” and “hands-off” management. A Cochrane systematic review shows decreased use of episiotomy in the hands-off group and no benefits of hands-on management when it comes to third or fourth-degree tears (Aasheim et al., 2017). In addition, a randomized controlled trial performed by Rezaei et al. (2014) showed higher rates of third/fourth degree tears and significantly more episiotomies among the hands-on group, compared to the hands-off group.

In the Netherlands, there has been an increase in referral rates from primary midwife-led care to secondary care over the past years (Offerhaus et al., 2013; Perined, 2018). The increase in referral rates could lead to more episiotomy use due to the increased risk in secondary care. In order to ensure that as few women as possible experience complaints as a result of an episiotomy, it is important to study factors that influence its occurrence. Since it has been shown that the individual care provider is a predictor for an episiotomy, it is important to investigate differences between

care providers in the same working conditions, caring for the same population of pregnant women. (Cromi et al., 2015; Gossett and Dunsmoor Su, 2008). Therefore, the aim of this study is to determine whether there is an association between the individual factors of the clinical midwife that attended birth and the occurrence of an episiotomy.

Methods

Design

A retrospective cohort study was performed to examine the difference in the individual rate of episiotomy between clinical midwives. This cohort study was conducted in OLVG-west, a secondary care hospital in Amsterdam the Netherlands with a multicultural population, where births from a gestation of 32 weeks onwards take place. Data were used derived from all spontaneous vaginal births assisted by a clinical midwife in 2016. Women with an instrumental delivery, breech delivery or multiple gestation were excluded, since these births have an increased risk for an episiotomy and were most likely attended by an obstetrician or resident. Fetal deaths were excluded as well, assuming that there is no indication for an episiotomy in this context. Midwives who attended fewer than 20 births over the year 2016 were excluded ($n=2$) to minimize percentages based on coincidence. Assuming an episiotomy rate of 5%, a minimum of 20 births is required for performing one episiotomy.

Setting

The OLVG-west hospital had the ambition to develop into the ‘most physiological hospital’ for maternity care in Amsterdam and surroundings. A physiological approach considers birth as a natural event and is therefore based on the lowest possible percentage of interventions. The hospital has a relatively stable staff of midwives, who are responsible for attending the majority of vaginal births. In the Netherlands, it is not common to work with junior or senior midwives. This means that no distinction is made in the tasks or the work schedule for each midwife. Per shift there are two midwives working on the labor ward. Women are encouraged to adopt different positions during labor and birth. For example, the use of a birthing stool, bath or shower is possible. For medicinal pain relief women can opt for remifentanyl-PCA or an epidural. There is a restrained policy when it comes to the use of episiotomy, however, no clear indications are given in what circumstances an episiotomy is recommended. It is up to the judgement of the attending midwife whether an episiotomy is required. When an episiotomy is applied, it is performed with the mediolateral technique.

Data collection

Data concerning maternal and birth characteristics were collected from the electronic database that is used within the hospital. In addition to data on perineal damage, data were collected on maternal age, parity, gestational age, duration of second stage, birthweight and fetal positions. The indication for an episiotomy was recorded as well. Indications for episiotomy were dichotomized in fetal indication, which meant suspected fetal distress, or maternal indication, which meant any other indication such as slow progress of second stage or the prevention of tears. Parity was divided into three groups, namely parity zero, parity one and parity two or more to reduce the chance of an alpha or beta error due to small subgroups. Because only few children were born in different positions than occipito-anterior, other fetal positions were merged as one group for analyses.

Table 1
Characteristics of women that gave birth attended by a clinical midwife at OLVG-west Hospital in 2016.

		Total n=1302 (%)
Parity	0	712 (54.7)
	1	353 (27.1)
	≥2	237 (18.2)
		31.74 (4.65)
Age in years, mean (±SD)		280 (271;285)
Duration of pregnancy in weeks + days, median (IQR)		
Birthweight in grams, mean (±SD)		3.433 (0.4729)
Duration of second stage of labor in minutes, median (IQR)		25 (11;52)
Fetal presentation	Occipito-anterior	1265 (97.2)
	Other fetal position	37 (2.8)
Labial tear		300 (23.0)
Perineal damage excluding episiotomy wound ^{1,2}	Intact perineum ³	424 (36.7)
	Vaginal wall tear	114 (9.9)
	1st degree tear	145 (12.6)
	2nd degree tear	419 (36.3)
	3a degree tear	33 (2.9)
	3b degree tear	18 (1.6)
	3c degree tear	0 (0)
	4th degree tear	2 (0.2)
	Other	3 (0.3)
	Total	166 (12.7)
Episiotomy	Fetal indication	112 (67.5)
	Maternal indication	54 (32.5)

SD: standard deviation

IQR: interquartile range

¹ If more than one type of perineal damage was registered, only the highest gradation tear was counted.

² Women with some degree tear in addition to an episiotomy are included.

³ Intact perineum can be combined with labial tear.

All missing values were manually searched and completed by searching at other places in the electronic system or in the manually kept files. Unlikely values such as values above 100 min for the duration of second stage of labor were manually checked and adjusted if necessary. In this way it was ensured that all data was as correct and complete as possible. The OLVG Medical center Ethical Committee provided ethical approval for the study under registration number 18.019.

Beside data on maternal and birth characteristics, data were collected on the individual factors of the midwives. The midwives were asked to complete a questionnaire to obtain information regarding duration of employment, years of (clinical) experience, age, midwifery school of their bachelor education, current level of education and hands-off or hands-on management. Furthermore, the midwives were asked to estimate their own episiotomy percentage. All included midwives gave their informed consent and agreed with the data collection and analyses.

Analyses

Depending on the distribution, continuous variables were presented as mean with standard deviation (SD) or median with interquartile range (IQR). Categorical or dichotomous variables were presented as frequencies and percentages.

First, the variation in episiotomy rate, the variation in third/fourth degree tears and intact perineum between the midwives was examined. Next, differences in indications for an episiotomy among the midwives were investigated. Differences between midwives were investigated using ANOVA. A two-sided *p*-value below 0.05 was considered to be statistically significant.

Multiple logistic regression was used to analyze the explanatory power of the individual differences of the clinical midwives on the odds for episiotomy, on top of the maternal independent variables. First, it was checked whether there was a linear relation between the dependent variable and the independent variables. If this was not the case, the independent variable was examined in

quartiles. Then, the prediction model was made using the forward selection method, adding all variables one by one to the model. In order to gain insight into the selection process, it was decided to select the variables manually. A cut-off value of 10% based on the Wald-statistic was used for a relevant contribution, and also was assessed whether the variable made a valuable contribution on the basis of the -2-Log-likelihood. First, the strongest predictor was added, then was examined which variable was still of added value. This process was repeated until all associated variables were added and the final model emerged. Episiotomy was analyzed as the primary dependent variable. Statistical software SPSS (IBM SPSS Software, version 24.0) was used for all analyses.

Results

A total of 1302 births attended by 27 midwives were included. Table 1 presents the characteristics of the women who gave birth in 2016 and were attended by a clinical midwife. Table 2 presents the characteristics of the 27 included clinical midwives who worked at the OLVG-west hospital in 2016.

The mean episiotomy rate was 12.7%, with a significant variation among individual midwives with a range from 3.2% to 30.8% (*p* = 0.001). Most episiotomies (67.5%) were applied on fetal indication. The rate of episiotomy among primipara was the highest with 19.4%, compared to 7.1% for a second birth and 1.3% for a third or more birth (*p* = <0.001).

When stratified for parity, within the primipara group there was a significant variation in episiotomy rate among the 27 midwives with a range from 7.9% to 47.8% (*p* = 0.006). For multipara the range was 0% to 15.4% (*p* = 0.425). The distribution of episiotomy percentages among the midwives in primipara and multipara are shown in Fig. 1.

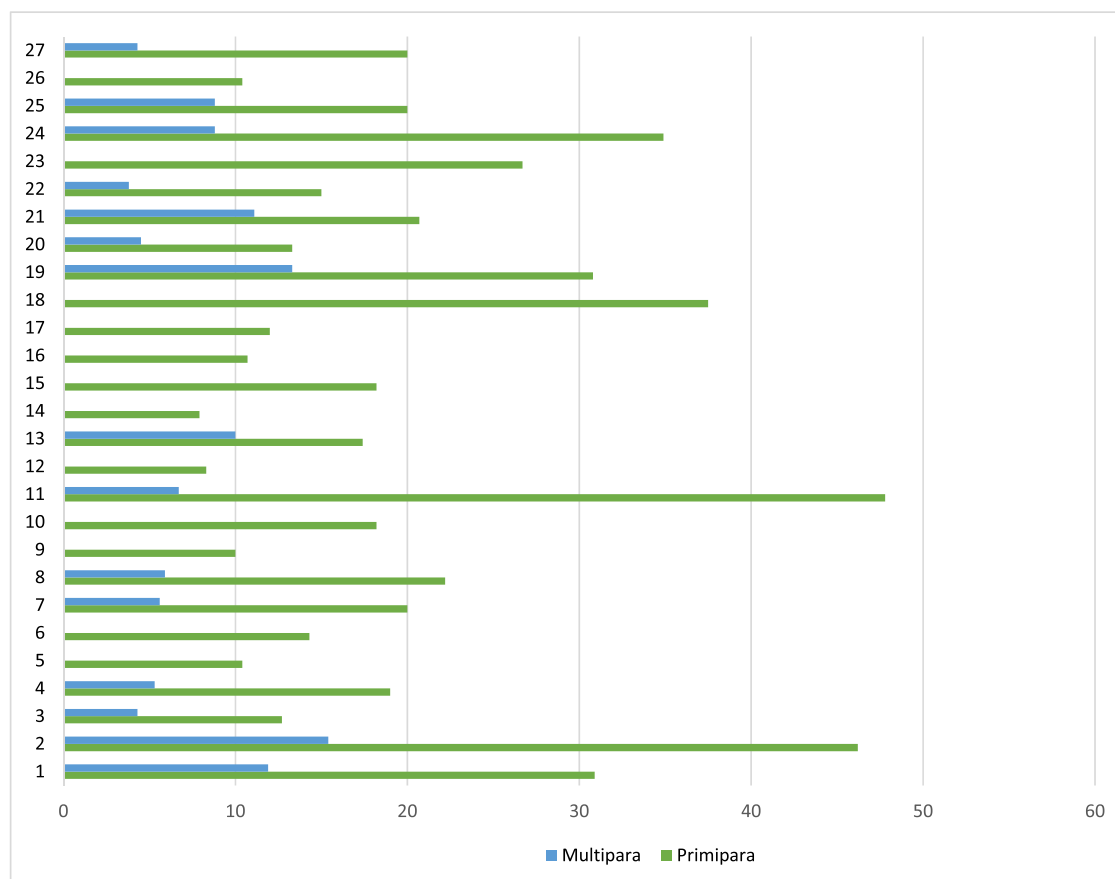
Of the 166 women with an episiotomy, 22 women (13.3%) also had a perineal tear. In order not to count women twice, Table 1 presents perineal damage excluding episiotomies. A total of 53 women (4.1%) had a third/fourth degree tear, with a range from

Table 2
Characteristics of the included clinical midwives from OLVG-west Hospital.

		Total n=27 (%)
Age mean ($\pm$ SD)		41.67 (10.69)
Place of bachelor education	Amsterdam/Groningen	18 (66.7)
	Rotterdam	2 (7.4)
	Maastricht	3 (11.1)
	Abroad	4 (14.8)
Current educational level	Bachelor	10 (37)
	Physician Assistant (in training)	11 (40.7)
	Master (in training)	6 (22.2)
Years since graduation, median (IQR)		11 (6;22)
Previous experience as a community midwife in years, median (IQR)		4 (2;7)
Previous experience as a clinical midwife in years, median (IQR)		6 (3;13)
Employment at OLVG-west Hospital in years, median (IQR)		4 (1;7)
Workhours per week, mean ($\pm$ SD)		31.85 (4.44)
Level of hands-off or hands-on management	Usually hands-on	13 (48.1)
	Just as often hands-on as hands-off	4 (14.8)
	Usually hands-off	10 (37)
Percentage of episiotomy, mean ($\pm$ SD)		12.67 (6.87)

SD: standard deviation

IQR: interquartile range

**Fig. 1.** Episiotomy rate per midwife (n = 27).

0% to 11.1% among midwives ($p = 0.21$). The number of women with an intact perineum was 424 (32.5%) with a range from 21.4% to 49.4% among midwives ($p = 0.23$).

The majority of midwives was educated in Amsterdam/Groningen and more than half followed additional education such as a master degree or had already completed it. There was

a large variation in working experience as a community midwife and as a clinical midwife, with a range in both from 0 to 27 years.

In the questionnaires, the midwives were asked to give an estimation of their own performed episiotomy percentage. Four midwives did not answer this question. Of those who did answer, the majority (69.6%) underestimated their own percentage of epi-

Table 3
Quartile groups based on episiotomy percentages.

Quartile	Episiotomy rate	Episiotomy on maternal indication	Third/fourth degree tear	Intact perineum
	mean (range)	mean	mean	mean
1	5.78 (3.2 – 6.8)	22.2	4.8	30.0
2	8.85 (7.1 – 11.5)	16.1	4.6	32.3
3	13.51 (11.6 – 15.2)	31.0	3.9	32.2
4	22.87 (17.0 – 30.8)	42.7	3.0	35.7

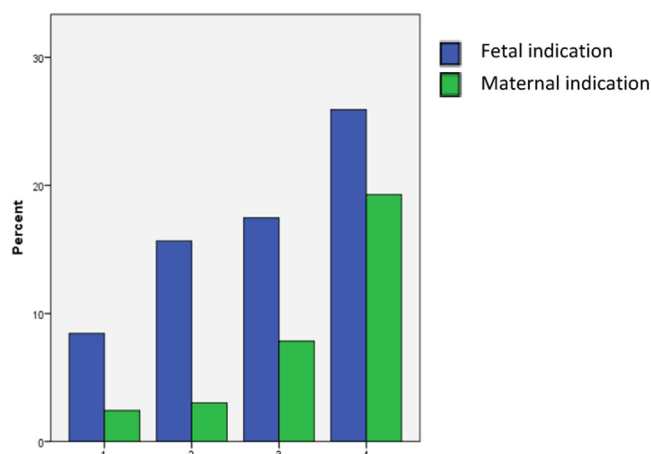


Fig. 2. Episiotomy indication per quartile group.

siotomy. Almost all estimated their own episiotomy rate to be less than ten percent. Also the midwife with the highest percentage of episiotomy (30.8%) estimated her own episiotomy rate being five to ten percent. Five midwives gave an estimate that was more or less correct, and two midwives overestimated their actual percentage.

Based on the midwives' individual episiotomy rate, the midwives were classified into quartiles in increasing order to investigate the indications for an episiotomy in groups. The four groups consisted of six to eight midwives with a total amount of episiotomies between 18 and 75 per group. An overview of percentages of the groups is shown in Table 3. A distinction was made between fetal indication and maternal indication for episiotomy. The percentage of episiotomy based on maternal indication varied between the groups from 16.1% to 42.7% ($p = 0.041$). The distribution of maternal and fetal indication for episiotomy is shown in Fig. 2.

No correlation was found between the episiotomy rate and third/fourth degree tear, $r(1301) = -0.037$; $p = 0.18$. No correlation was found between the episiotomy rate and intact perineum, $r(1301) = 0.031$; $p = 0.26$. Despite the fact that Table 3 shows that fewer third/fourth degree tears seemed to occur under the high percentage group, this difference was not statistically significant ($p = 0.67$). The same applies to the difference in intact perineum ($p = 0.496$). Level of hands-on/hands-off management also showed no correlation with the use of an episiotomy.

A prediction model was developed regarding episiotomy, which is shown in Table 4. Both maternal factors and individual factors of the midwives were added to the model. A strong predictor for an episiotomy was duration of second stage of labor. The risk of an episiotomy increased with a longer duration of the second stage. A fetal position other than occipito-anterior also increased the risk, while every subsequent birth reduced the risk for an episiotomy. With regard to the variables of the midwives, years since graduation showed a linear relation and was a strong predictor for an episiotomy, as shown in the prediction model. More years since graduation were associated with increased odds of an epi-

siotomy. The age of the midwives was strongly related with years since graduation, the influence of both variables was equally great. Compared to the midwives that had their bachelor education in Amsterdam/Groningen, the odds of an episiotomy was decreased for midwives that were educated in Rotterdam. No difference was found for other places of education. Nevertheless, adding this variable to the model led to a significant improvement on the -2-log-likelihood.

Discussion

This study aimed to determine whether there is an association between the individual factors of the clinical midwife that attended birth and the occurrence of episiotomy. Therefore, the focus in this section will be on the individual factors of the clinical midwives, and the maternal predictors found in this study will be left out of consideration. This study confirms that there is an association between the clinical midwife that attended birth and the occurrence of an episiotomy. Moreover, there is a significant variation in episiotomy use among midwives who work in the same hospital, caring for the same population of pregnant women. This means that the attending midwife is an important determinant in the likelihood of having an episiotomy for women who give birth in the same clinical setting. Individual factors of the midwives that turned out to be predictors for an episiotomy were the number of years since graduation and place of bachelor education. No significant variation was found in the occurrence of third/fourth degree tears or intact perineum among clinical midwives, but that might be due to the relatively small study population.

The mean episiotomy rate of 12.7% for midwife attended births in a clinical setting found in this study is low compared to the national average of 28.7% for hospital births and approaches the mean of 8.9% for midwife attended births in primary care (Perined, 2018). This can partially be explained by the fact that only births attended by midwives were included, and instrumental deliveries were excluded. Regional variation in episiotomy rates can also be a possible explanation for the low mean episiotomy rate found in this study (Seijmonsbergen-Schermer et al., 2018). Additionally, previous research has shown that the episiotomy rates vary widely between hospitals. Research among 18 hospitals in the United States has shown a range from 20.3% to 73% (Webb and Culhane, 2002). A possible explanation for this could be a certain departmental culture that partly determines a midwife's habits and ideas. As described earlier, this study took place in a hospital that had the ambition to develop into the 'most physiological hospital' for maternity care, so a departmental culture that strives for the lowest possible percentage of interventions is likely. Beside, research among 108 Dutch hospitals has shown that the episiotomy rate is lower in large hospitals where more births take place (Zondervan et al., 1995). This study took place in a large Dutch hospital with over 3000 births per year.

This study showed a significant variation in episiotomy percentages between clinical midwives, ranging from 3.2% to 30.8% for all women and from 7.9% to 47.8% for primipara only. This is in line with previous research of Cromi et al. (2015) that showed a signif-

Table 4
Regression coefficients for predicting episiotomy.

	Logistic coefficient β	SE	p-value	OR	95%CI
Maternal predictors					
Duration of second stage of labor in minutes	0.012	0.002	0.000	1.01	1.01 – 1.02
Occipito-anterior	Ref.				
Other fetal position	1.477	0.424	0.000	4.38	1.91 – 10.05
Parity 0	Ref.				
Parity 1	-0.875	0.250	0.000	0.42	0.26 – 0.68
Parity ≥ 2	-2.603	0.603	0.000	0.07	0.02 – 0.24
Individual factors of midwives					
Years since graduation	0.038	0.009	0.000	1.04	1.02 – 1.06
Bachelor education Amst/Gron	Ref.				
Bachelor education Rotterdam	-1.064	0.403	0.008	0.36	0.16 – 0.76

icant variation among Italian clinical midwives. There are several explanations for these variations in episiotomy use among clinical midwives. First, this study shows a significant variation in episiotomy on maternal indication. These cases of maternal indication episiotomy are questionable, as an episiotomy is only indicated in case of suspected fetal distress (Jiang et al., 2017). As this study shows an increased risk for midwives performing an episiotomy when they are more years since graduation, one could recommend continuous training of midwives. Additional interventions targeting healthcare professionals for reducing unnecessary episiotomies should be developed and reviewed, as has already been done successfully for cesarian section percentages (Chen et al., 2018). It is important that healthcare professionals reflect on how they work. To review their actual incidence of episiotomy may be a start, since this often does not match their own estimation.

Second, mutual preferences among midwives for certain patient characteristics could have made a small contribution to the variation in episiotomy. At the start of the shift the patients are divided among two midwives, where they can indicate their preference. Perhaps some midwives prefer multiparous women or low risk patients with a normal cardiotocography (CTG). As this study shows, there is not only a variation in maternal indicated episiotomy, but also in fetal indicated episiotomy. In a homogeneous population this variation is unexpected. It is possible that the more experienced midwives attend more high risk births, which could explain the higher episiotomy rates in this group. Furthermore, it is possible that the least experienced midwives are more likely to consult the obstetrician in case of slow progress or suspected fetal distress compared to other midwives. This could result in an unequal distribution among midwives in instrumental deliveries, and can therefore have made a contribution to the variation in episiotomy rates found in this study and for the linear relationship between episiotomy use and years since graduation.

Last, the variation in episiotomy rate found in this study may also be explained by the mutual preferences among midwives for different perineal management techniques and different birthing positions. Multiple studies show that there is an increased risk for an episiotomy when the “hands-on” technique is practiced (Aasheim et al., 2017; Bulchandani et al., 2015; Pierce-Williams et al., 2021; Rezaei et al., 2014). This study did not show a correlation between the level of hands-on/hands-off management and the use of an episiotomy. However, it was retrospectively examined what method the midwife used in general, and it was unknown which technique was applied in individual cases. When it comes to different birthing positions, literature is unambiguous in the fact that the risk for an episiotomy is greater in a supine position (De Jonge et al., 2010; Elvander et al., 2015; Warmink-Perdijk et al., 2016). In this study it was not possible to take the birthing position into account.

The large variations in episiotomy rates internationally, regionally and among midwives in the same working conditions can

be a sign of both overuse or underuse (Brownlee et al., 2017; Seijmonsbergen-Schermers et al., 2018). It shows that there is no overall consensus about the indications for an episiotomy, which is remarkable since use without a medical indication may cause avoidable harm. The linear relation between episiotomy use and years since graduation of the midwife, could also be explained by the fact that the opinions on the indications for an episiotomy have changed throughout the years. It was not until the 80's that scientific literature was published on episiotomy and until that time the episiotomy was frequently applied because of the idea that it would reduce the risk of a third/fourth degree tear, prevent damage to the pelvic floor and would reduce stress for the child (Thacker, 2000). Scientific literature revealed adverse effects of episiotomy, and as a result routine use came up for discussion and its use declined (Hartmann et al., 2005; Jiang et al., 2017; Thacker, 2000). It is possible that midwives who already graduated or worked as a midwife before that time, were educated with a more frequent use of episiotomy. These midwives then played a role in the training of new midwives. Beside, behavioral change is complex and takes time (Davis et al., 2015). The results of this study are however in line with the findings of an American study that found a significant increase in episiotomy with an increased number of years in practice (Gossett and Dunsmoor Su, 2008). Mainly physicians participated in this study and not only midwives, so perhaps there is a more complicated explanation behind this relation. A Dutch qualitative study has shown that a care providers' underlying vision on episiotomy and child-birth is an important contributor to the large variations in episiotomy use, whereby clinical expertise is found to be more important in decision-making than the literature (Seijmonsbergen-Schermers et al., 2021). These remarkable findings underline the importance of continuous training of obstetric care providers to prevent overuse.

Strengths and limitations

This is the first study that examined the influence of the individual factors of the clinical midwife on the occurrence of episiotomy. It is also the first study that found a significant variation in the episiotomy on maternal indication. To increase reliability of the study, it was ensured that all data were complete and correct by supplementing and adjusting manually.

Some limitations of this study need to be discussed. Unfortunately, the birthing position, pain relief and perineal management techniques are poorly registered, and were therefore impossible to be included in this study. Moreover, the level of hands-on/hands-off management is self-reported and retrospectively collected, and may be biased. Recall bias may have occurred when the midwife has changed her type of management over time. It was unknown which perineal management technique was applied in individual cases. Due to technical possibilities the obstetrical history

could not be taken into account in this study, as a result of which women with a previous cesarian section were included as multiparas. However, when stratified for parity, among primipara there was an even greater variation in episiotomy among midwives.

Another limitation of this study lies in the number of inclusions. Stratified for parity, among multipara no significant variation was found. The chance of an episiotomy is small in multiparous women, so stratification led to small groups when divided over 27 midwives. Given the significant variation found among primipara, it is likely that similar variations could be found among multipara in a larger study group. Regarding the midwives, the significant difference in the use of episiotomy that is found between Amsterdam/Groningen educated midwives and midwives from Rotterdam can be questioned since the last group only consisted of two. Further research is needed to investigate if this result remains significant in a larger study population. Data from different hospitals could be combined, although other working conditions could influence the results.

Conclusion

This study shows a significant variation in episiotomy use among midwives who work in the same hospital, especially among the primipara population. The variation in episiotomy use can partially be explained by a significant variation in maternal indicated episiotomy. Predictors for an episiotomy were the number of years since graduation and place of bachelor education of the clinical midwife. Continuous training of clinical midwives could contribute to reducing unnecessary use of episiotomy. Further research is recommended on a larger scale to confirm the findings from this study. It is recommended to include birthing position, pain relief, obstetrical history and perineal management techniques in future research.

Ethical approval

The OLVG Medical center Ethical Committee gave ethical approval for the study under registration number 18.019.

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Declaration of Competing Interest

None declared.

CRediT authorship contribution statement

Renate Simmelink: Conceptualization, Methodology, Formal analysis, Project administration, Writing – original draft. **Etelka Moll:** Validation, Writing – review & editing. **Corine Verhoeven:** Conceptualization, Methodology, Supervision, Project administration, Validation, Writing – review & editing.

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