Published in final edited form as:

Am J Obstet Gynecol. 2015 July ; 213(1): 93.e1–93.e4. doi:10.1016/j.ajog.2015.03.025.

Does the Number of Forceps Performed in Residency Predict Use in Practice?

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Abstract

OBJECTIVE—We aimed to determine if a threshold number of forceps deliveries in residency predicts use of forceps in independent practice.

STUDY DESIGN—We surveyed Obstetrics and Gynecology residency graduates of two academic programs from 2008-12 regarding the use of operative vaginal delivery in practice. At these programs, residents are trained in both forceps and vacuums. Individual case log data were obtained with the number of forceps deliveries performed by each respondent during residency. Respondents were grouped as currently using any forceps or vacuums alone. A logistic regression model estimated the probability of forceps use, predicted by the number of residency forceps deliveries. From the resulting receiver operating characteristic curve we assessed sensitivity, specificity, positive predictive value and area under the curve.

RESULTS—The response rate was 85% (n=58); 90% (n=52) practice obstetrics. Seventy-nine percent (n=41) use forceps in practice. The mean number of forceps performed during residency was 22.3 ± 1.3 (mean $\pm$ standard error) in the any forceps group and 18.5 ± 2.1 in the vacuums only group (p=0.14). While the model performed only moderately (area under the curve 0.61, 0.42–0.81), more than 13 residency forceps deliveries corresponded to a 95% sensitivity (95% CI, 84–99) and a positive predictive value of 83% (95% CI, 69–92) for using forceps in practice. The specificity of this threshold is 27% (95% CI, 6–61).

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The authors report no conflict of interest.

Presented as an oral presentation at the Council on Resident Education in Obstetrics and Gynecology (CREOG) & Association of Professors of Gynecology and Obstetrics (APGO) Annual Meeting, Atlanta, GA, February 25 – March 1, 2014.

Condensation: Performance of at least 13 forceps deliveries in residency has a high positive predictive value for use in independent practice.

CONCLUSION—While exceeding 13 forceps deliveries made it highly likely that obstetricians would use them in practice, further study is necessary to set goals for a number of resident forceps deliveries that translate into use in practice.

Keywords

forceps; operative vaginal delivery; residency training

INTRODUCTION

Over the last 3 decades, the rate of operative vaginal delivery has declined more than two-fold.¹ Additionally, the use of forceps in assisted vaginal deliveries has declined, corresponding to a rise in vacuum delivery rates.²

In July 2012, the Accreditation Council for Graduate Medical Education (ACGME) released newly established minimum thresholds for procedures by Obstetrics and Gynecology residents by the time of graduation.³ These numbers are not meant to indicate competence in a particular procedure, but to establish minimum numbers for program accreditation purposes. For operative vaginal delivery (combined forceps and vacuums), the minimum threshold was set at 15. However, the selection of this threshold was based on national resident experience numbers, not on likelihood to perform in practice. If thresholds are to be set by Residency Review Committees, it would be ideal if the minimum experience numbers correlated with clinical practice. Thus, the purpose of this study was to determine if there is a threshold number of forceps deliveries during residency that translates into performing forceps in independent practice.

MATERIALS AND METHODS

This is an ancillary analysis of a larger operative vaginal delivery survey study, which was sent to the last 8 years of graduates (2004–2012) of four academic Obstetrics and Gynecology residency programs in the United States. These programs were originally selected to encompass a spectrum of training patterns in operative vaginal delivery (from exclusively forceps to almost all vacuums). The current ancillary study was restricted to the last 5 years of graduates (2008–2012) of the two programs that train residents in both forceps and vacuums. Further details regarding survey development and participant recruitment can be found in the original manuscript.⁴ This ancillary study qualified for exempt status under the Colorado Multiple Institutional Review Board.

Basic demographic data including respondent gender, institution and graduation year were collected. Survey respondents were queried about their subjective satisfaction with residency training in forceps. Additionally, respondents were asked if they perform any forceps in their current practices. Graduates no longer practicing obstetrics or operative vaginal delivery were excluded from the analysis. All other participants were grouped as performing any forceps (either forceps alone or both forceps and vacuums) or only vacuums in practice.

Data from individual ACGME case logs were obtained from the residency programs to determine the number of forceps deliveries performed by each respondent by the conclusion

of their four-year residency. Study authors were blinded to delivery numbers for each individual; delivery numbers were associated with individual survey respondents by a third party. For each graduating residency class, the average number of forceps deliveries per graduating resident was also calculated.

A logistic regression model of the probability of any forceps use in practice was estimated, predicted by the number of forceps deliveries during training. In order to assess how well a threshold number of forceps deliveries in training predicts performing forceps in practice, we utilized receiver operating characteristic (ROC) methodology. We assessed sensitivity, specificity, positive predictive value (PPV) and area under the curve of a cut-off for predicting forceps use in practice identified from the ROC curve. Respondent-level demographic characteristics and ACGME-reported measures from residency training (average volume and type of operative deliveries) were compared using chi-square tests for categorical measures. *P* value <0.05 was considered significant. All analyses were performed in SAS 9.3 (SAS Institute Inc., Cary, NC).

RESULTS

Sixty-eight graduates were invited to respond to the survey. The overall response rate was 85% (n=58); 96% of respondents used the email version of the survey (n=55). Differences between responders (n=58) and non-responders (n=10) were not statistically significant, however non-responders proportionately had graduated less recently. Gender and institution were similar between respondents and non-respondents (Table 1).

Ninety percent of respondents currently practice obstetrics, perform operative vaginal deliveries (n=52) and were included in the remainder of the analysis. Forty-one (79%) use forceps in independent practice, and 11 (21%) use vacuums only. There were no statistically significant differences between groups in age, gender, institution or graduation year (Table 2). Additionally, there were no differences between groups in the average number of forceps deliveries per resident in the graduating class (22.8 ± 0.5 any forceps versus 22.0 ± 0.7 vacuums only, *p*=0.33). Overall there were a decreased number of forceps deliveries over time at both institutions (Figure 1). One hundred percent of participants in the forceps group were satisfied with their education in forceps deliveries, versus 27% of the vacuums only group (*p*<0.001).

Examination of the ACGME data revealed an average individual number of forceps deliveries in residency of 22.3 ± 1.3 (mean $\pm$ SE) with a range of 9 to 47, compared to 18.5 ± 2.1 in the vacuums only group (range 7 to 29) (*p*=0.14) (Figure 2).

The probability of any forceps use in current practice was estimated using a logistic regression model, predicted by the number of forceps deliveries during training per ACGME data. More than 13 forceps deliveries in residency corresponded to a sensitivity of 95% (95% CI, 84–99%), for using forceps in independent practice, with a specificity of 27% (6–61%) and a positive predictive value of 83% (95% CI, 69–92%) for using forceps in practice (Figure 3). The AUC of the logistic regression model was 0.61 (95% CI, 0.42–0.81, *p*=0.3), indicating moderate performance.

COMMENT

We found that performance of at least 13 forceps deliveries in residency corresponds to a high likelihood of performing forceps deliveries in independent clinical practice. Extension of this type of analysis to larger groups of graduates for forceps and other procedures may allow educators to set benchmarks for numbers in training anticipated to correlate with use and comfort in practice.

Obstetricians who are comfortable with using forceps, along with vacuums, have increased options for attaining a safe vaginal delivery in women experiencing complications in labor. A survey of residency directors in 1999 found that almost all expected graduates to be proficient in outlet forceps.⁵ This study also demonstrated a decline in teaching more difficult rotational and mid-pelvic deliveries. With the decline in forceps deliveries in the United States, the number of residencies teaching forceps has similarly declined. More recent data examining residency director expectations have not been published.

Literature regarding the number of cases in training that corresponds to competency and/or use in independent practice is lacking. One study of general surgery residents characterized “comfort” with a procedure as a range from assisting to teaching, and found that case volume was associated with comfort level.⁶ Comfort with a procedure in this case serves as a surrogate outcome for competency and willingness to do the procedure in practice. Our survey aimed to more directly assess how number of procedures, specifically forceps deliveries in residency, translates into use in practice. We would like to emphasize that we are not attempting to set a competency threshold with this study.

A study of 4th year obstetrics and gynecology residents asked respondents to estimate the number of forceps deliveries performed in residency. It also assessed whether or not they felt competent to perform the procedure in practice. Thirty-three percent of respondents estimated they had performed 0–10 forceps deliveries and 38% of respondents estimated over 20 deliveries. Approximately half of all respondents felt competent to perform forceps in practice.⁷ However, this study did not correlate the self-reported delivery numbers with the assessment of the graduates' feeling of competency to perform forceps in practice.

During the years our survey respondents trained, simulation training in operative vaginal delivery was not available at these two residency programs. There is evidence that simulation training in forceps deliveries improves trainee skills.⁸ Whether simulation training in residency results in increased comfort and use in practice is unknown. Both programs surveyed now offer simulation training in operative vaginal delivery to their residents.

The use of objective individually-reported data is the major strength of this study. Using ACGME case log data for the number of forceps deliveries performed in residency avoids recall bias. Even if the number of forceps reported during residency is not exact, we anticipate that this would be a much better estimate than asking respondents to recall the number of forceps deliveries performed in residency long after graduation. This is also the first study, to our knowledge, to address whether there is a threshold number of forceps deliveries in residency that translates into use in practice.

Our study has several limitations. We only surveyed graduates from the past 5 years, so the findings may not be generalizable to obstetricians who are further removed from residency. However, we focused on this group in an attempt to best assess the effect of residency on use in practice. We anticipate that other factors more strongly play a role as obstetricians become more remote from training.

Although we surveyed two programs with an even distribution in teaching forceps and vacuums, our study may be biased by regional or institutional patterns that affect how the residents are trained. Despite the high positive predictive value, 13 forceps deliveries had a poor specificity for use in practice. This indicates that there are likely demographic factors and individual attitudes that contribute to whether obstetricians use forceps in practice, which were not measured in this study.

In summary, we present data suggesting that a volume of at least 13 forceps in residency has a high positive predictive value for using forceps in practice. Expansion of this type of study to residency programs across the United States may allow us to set reasonable thresholds for procedures that translate into use in independent practice. This type of quantitative assessment in a larger study population may be helpful to medical educators in varied specialties in the establishment of minimum requirements for graduating trainees based on clinical practice and not simply national resident experience numbers.

Acknowledgments

Financial support: This work was supported by Public Health Services research grant numbers UL1 RR025764 and C06 RR11234 from the National Center for Research Resources, the Agency for Healthcare Research and Quality grant number R24 HS022143-01, and National Institutes of Health/National Center for Research Resources Colorado CTSI grant number UL1 RR025780.

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Figure 1.
Average Number of Forceps Deliveries by Institution

Figure 2.
Number of Forceps in Residency by Use in Independent Practice

Figure 3.
Receiver Operating Characteristic Curve for Forceps Use in Practice Predicted by Number of Forceps in Training

Table 1

Demographic Data of Responders versus Non-Responders

Variable	Responder N=52	Non-responder N=10	P value
Gender			0.60
Male	4 (8)	0 (0)	
Female	48 (92)	10 (100)	
Institution			0.17
#1	34 (65)	4 (40)	
#2	18 (35)	6 (60)	
Graduation Year			0.41
2008	10 (19)	4 (40)	
2009	10 (19)	2 (20)	
2010	10 (19)	2 (20)	
2011	9 (17)	2 (20)	
2012	13 (25)	0 (0)	

Data are n (%) unless otherwise specified. Percentages may not add up to 100% due to rounding.

Table 2

Demographics of Survey Respondents

	Any Forceps N=41	Vacuums Only N=11	P value
Physician age (years, mean $\pm$ SE)	34.4 $\pm$ 0.6	36.0 $\pm$ 1.1	0.23
Gender			0.57
Male	4 (10)	0 (0)	
Female	37 (90)	11 (100)	
Institution			0.07
#1	24 (59)	10 (91)	
#2	17 (41)	1 (9)	
Grad Year			0.61
2008	8 (20)	2 (18)	
2009	6 (15)	4 (36)	
2010	8 (20)	2 (18)	
2011	8 (20)	1 (9)	
2012	11 (27)	2 (18)	

Data are n (%) unless otherwise specified. Percentages may not add up to 100% due to rounding.