Comparison of 3 Dilation and Evacuation Technical Skills Models

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Abstract

Background Simulation training may improve patient safety, decrease trainer and trainee anxiety, and reduce the number of cases needed for competency. Complications associated with dilation and evacuation (D&E) have been directly related to provider skill level, yet no low-fidelity model has been formally described or evaluated in the literature for second-trimester D&E training.

Objective We report physicians' assessments of the realism of 3 D&E models to establish a composite training model.

Methods We surveyed experienced providers at 2 national conferences to evaluate 3 D&E models and rate each model's components on a Likert scale.

Results Fifty-five obstetrics-gynecology and family medicine physicians completed the survey. Most respondents rated 4 components of 1 model as somewhat realistic or very realistic. The components rated highest were the fetal parts (82% [45 of 55]) and placenta (60% [30 of 50]). This model was rated as more likely to be used in training by 80% (43 of 54) of participants than the 2 other models, as rated by 28% (15 of 54) and 9% (5 of 54) of participants.

Conclusions A model made from a plastic bottle containing a stuffed fabric form with detachable parts has tactile similarity to a D&E procedure and should be further developed for testing and training.

Editor's Note: The online version of this article contains a table comparing the 3 dilation and evacuation models and photographs of the models.

Introduction

Simulation is becoming the cornerstone for teaching clinical technical skills.[1,2] Although a number of obstetric and gynecologic training models exist, none has been described in the literature for second-trimester surgical abortion or dilation and evacuation (D&E). Because complications associated with D&E have been directly related to provider skill level,[3] preclinical training with an appropriate model may improve patient safety, decrease trainer and trainee anxiety, and reduce the number of cases needed to achieve competency.

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Models can be expensive and may not be available in low-resource settings where the provision of safe abortion services can be life-saving. An easily and inexpensively produced model for use in low- and high-resource settings would be a valuable tool. One low-fidelity model that has been widely adopted for first-trimester uterine aspiration training is the papaya model,[4] which was shown to improve confidence and knowledge base during a medical student workshop.[5] Other simple models exist in family medicine, emergency medicine, and urology.[6–11] No low-fidelity model has been formally described or evaluated in the literature for second-trimester D&E training. A D&E procedure differs significantly from uterine aspiration because it involves mechanical skills beyond sensing uterine texture and a greater understanding of the contours of the uterus and fetal parts.

At the time of this study, 3 standard, low-fidelity D&E models existed. All have been used with trainees, yet the models have not been formally evaluated by experts in the field. We surveyed experienced D&E providers to assess how realistic these models were in simulating a D&E procedure.[12] Our goal was to create an ideal composite model, with the most realistic components from each model.

Methods

Setting and Participants

We administered a cross-sectional survey to second-trimester US-based abortion providers at 2 national

meetings in the spring of 2012. Participants were eligible if they attended the conference and had performed a standard D&E in the past 12 months and at least 50 D&E procedures during their professional careers. We used a convenience sample with the goal of surveying at least 25 participants to distinguish between 25% and 50% of respondents rating model components as "Realistic" compared to "Not Realistic," with an alpha value of .05 and 80% power. Participants received a $10 gift card as an incentive.

The survey was determined to meet criteria for exempt review for minimal risk research by the University of Pittsburgh Institutional Review Board.

Survey and Models

We asked eligible physicians to evaluate 3 D&E models and complete a 10-minute survey about participants' levels of experience with second-trimester abortion, frequency of procedures, and training. The survey was also pilot tested with faculty and residents at the University of Pittsburgh.

Participants rated the realism of each component of each model (cervix, lower uterine segment, fetal parts, calvarium, and placenta) using a 5-point Likert scale (Not Realistic, 1 = very unrealistic, 2 = somewhat unrealistic, 3 = neutral; and Realistic, 4 = somewhat realistic and 5 = very realistic). Likert scales have been used to assess the realistic nature of models in several previous validation studies of models to be used for simulation.[10,12–14] The 3 models tested were developed using commercially available plastic bottles containing a variety of objects: bread, cat toys, and a form made of canvas and Velcro (photographs of models are provided as online material). Model 1 used cat toys attached with Velcro in a large plastic container. The opening to the container, or cervix, was constructed from foam to simulate the resistance of the cervix. Model 2 was constructed from a water bottle with a stuffed form inside that had detachable parts attached with Velcro to the body of the form. It also had a removable cover and a placenta attached by Velcro to the cover at the base of the water bottle. Model 3 was a water bottle containing pieces of baguette bread. The cervix for both Models 2 and 3 was the rigid opening of the bottle.

Data Analysis

We used standard descriptive statistics to represent the data, including frequency and proportion. We used the Fisher exact or χ^2 test as appropriate to assess for association among models, using this categorized variable. We performed additional analyses, including switching the neutral rating (3) from the "Not Realistic" category to the "Realistic" category. Analyses were performed using Stata version 12 software (StataCorp, College Station, TX).

If more than 50% of respondents considered a component of a model to be "Realistic," then we considered that component for inclusion into a composite model. Free text responses and comments regarding models and their components were compiled by frequency of response and summarized by theme.

What was known

Simulation is an important aspect of clinical technical skills training, and it is important to validate simulation models.

What is new

A survey of experienced providers established the realism of 3 dilation and evacuation models.

Limitations

Sample size was small, and all models were low-fidelity, made from existing and found objects.

Bottom line

Assessment of aspects of the models can contribute to the design of a higher fidelity model for use in dilation and evacuation training.

Results

Fifty-five second-trimester abortion providers participated in this study. Most participants were obstetrician-gynecologists trained in family planning fellowship and/or had significant D&E experience, qualifying them as experts in D&E procedures. Most also regularly taught trainees.

Participants categorized more components of Model 2 as somewhat realistic or very realistic than those of the other 2 models (TABLE). The majority of participants rated the cervix for Model 1 as "Realistic" (55% [30 of 55]) and rated all components of Model 3 as "Not Realistic" (≥69% [at least 37 of 54]). Model 2 was the only model that had a representative placenta, which was rated as "Realistic" by 60% (30 of 50) of respondents. When asked if they would like to use each model for teaching/training, 80% (43 of 54) responded yes for Model 2, but only 28% (15 of 54) responded yes for Model 1 and 9% (5 of 54) responded yes for Model 3. Only a small proportion of respondents supplied comments for any of the survey questions.

Discussion

We asked obstetrics-gynecology and family medicine physicians to compare 3 models for D&E training, to ultimately create a single cost-effective, realistic model. Although Model 2 was rated as realistic and acceptable for use in training by a majority of participants, only the fetal parts and placenta were considered realistic. Participants were most interested in the realistic size and texture of the cervix, the lower uterine segment, the tactile similarity of the fetal parts, and the separation of the placenta.

TABLE **Dilation and Evacuation Model Comparisons**

Component	Model 1		Model 2		Model 3		*P* value (χ^2 test)
	Not Realistic No. (%)	Realistic No. (%)	Not Realistic No. (%)	Realistic No. (%)	Not Realistic No. (%)	Realistic No. (%)	
Cervix	25 (45)	30 (55)	25 (45)	30 (55)	37 (69)	17 (31)	.02
Lower uterine segment	35 (65)	19 (35)	28 (52)	26 (48)	38 (72)	15 (28)	.10
Fetal parts	39 (72)	15 (28)	10 (18)	45 (82)	38 (72)	15 (28)	< .001
Calvarium	47 (90)	5 (10)	26 (49)	27 (51)	47 (92)	4 (8)	< .001
Placenta	36 (78)	10 (22)	20 (40)	30 (60)	38 (84)	7 (16)	< .001

Likert scale was categorized as Not Realistic = very or somewhat unrealistic or neutral; or Realistic = somewhat or very realistic.

Suggestions for tactile similarity of the calvarium included use of a ping pong ball or compressible object, such as an egg. For all 3 models, most aspects were rated as "Not Realistic" by the majority of participants. Only Model 2 had more than 1 aspect (fetal parts and placenta) rated as "Realistic" by more than 60% (30 of 50) of participants. Our survey respondents did not identify enough features from the 3 models to create a composite model.

Surgical technology is undergoing rapid advancement while resident work hours are decreasing. Most of the literature pertaining to surgical models discusses the need to expose learners to procedures while protecting patient safety.[1,15,16] Furthermore, learning the steps of a procedure in a calm environment helps to prepare trainees for the experience of performing procedures in both awake and anesthetized patients,[16] which is particularly relevant to the D&E procedure. Creating a realistic model that is low cost and high yield has potential benefits for both trainees and patients.

Limitations of the study include participants' inability to assess the models in actual use in a simulation and the relatively few survey questions on model realism.

Conclusion

We sought to use expert feedback to identify individual realistic model components that could be combined into a composite model. One model was favored more than the others, but a composite model for testing and training in high- and low-resource settings could be created from our findings. Input from experienced providers is important to developing a training model, particularly if it is to be used for evaluation of competency and as a benchmark for training progress. Future studies might incorporate the components of a composite model in assessing other aspects of the model validation, such as improvement in skill before and after use of the models in trainees, as well as measuring progress in acquisition of surgical skills.

References

1 Goff BA. Training and assessment in gynaecologic surgery: the role of simulation. *Best Pract Res Clin Obstet Gynaecol*. 2010;24(6):759–766.
2 Hammoud MM, Nuthalapaty FS, Goepfert AR, Casey PM, Emmons S, Espey EL, et al. To the point: medical education review of the role of simulators in surgical training. *Am J Obstet Gynecol*. 2008;199(4):338–343.
3 Darney PD, Sweet RL. Routine intraoperative ultrasonography for second trimester abortion reduces incidence of uterine perforation. *J Ultrasound Med*. 1989;8(2):71–75.
4 Paul M, Nobel K. Papaya: a simulation model for training in uterine aspiration. *Fam Med*. 2005;37(4):242–244.
5 Steinauer J, Preskill F, Robertson P. Training medical students in intrauterine procedures using papayas. *Med Educ*. 2007;41(11):1099–1100.
6 Matsumoto ED. Low-fidelity ureteroscopy models. *J Endourol*. 2007;21(3):248–251.
7 Wax JR, Cartin A, Pinette MG. The birds and the beans: a low-fidelity simulator for chorionic villus sampling skill acquisition. *J Ultrasound Med*. 2012;31(8):1271–1275.
8 Hong A, Mullin PM, Al-Marayati L, Peyre SE, Muderspach L, Macdonald H, et al. A low-fidelity total abdominal hysterectomy teaching model for obstetrics and gynecology residents. *Simul Healthc*. 2012;7(2):123–126.
9 Grimsby GM, Andrews PE, Castle EP, Wolter CE, Patel BM, Humphreys MR. Urologic surgical simulation: an endoscopic bladder model. *Simul Healthc*. 2011;6(6):352–355.
10 Roca P, Alvarado C, Stausmire JM, Farooq S, Hill-Engstler EA. Effectiveness of a simulated training model for procedural skill demonstration in neonatal circumcision. *Simul Healthc*. 2012;7(6):362–373.
11 Greer JA, Segal S, Salva CR, Arya LA. Development and validation of simulation training for vaginal hysterectomy. *J Minim Invasive Gynecol*. 2013.
12 Bajka M, Tuchschmid S, Streich M, Fink D, Székely G, Harders M. Evaluation of a new virtual-reality training simulator for hysteroscopy. *Surg Endosc*. 2009;23(9):2026–2033.
13 Sweet R, Kowalewski T, Oppenheimer P, Weghorst S, Satava R. Face, content and construct validity of the University of Washington virtual reality transurethral prostate resection trainer. *J Urol*. 2004;172(5, pt 1):1953–1957.
14 Arikatla VS, Sankaranarayanan G, Ahn W, Chellali A, De S, Caroline GL, et al. Face and construct validation of a virtual peg transfer simulator. *Surg Endosc*. 2013;27(5):1721–1729.
15 Macedonia CR, Gherman RB, Satin AJ. Simulation laboratories for training in obstetrics and gynecology. *Obstet Gynecol*. 2003;102(2):388–392.
16 Kneebone R. Evaluating clinical simulations for learning procedural skills: a theory-based approach. *Acad Med*. 2005;80(6):549–553.