Teaching Vaginal Surgery to Junior Residents: Initial Validation of 3 Novel Procedure-Specific Low-Fidelity Models

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OBJECTIVE: Competency-based surgical education relies on operative models to teach surgical skills within a curriculum. Low fidelity simulation has been shown to improve surgical performance. Our objectives were: to develop procedure-specific models to teach anterior repair (AR), posterior repair (PR), and vaginal hysterectomy (VH) to junior residents; to establish model reliability and validity.

DESIGN: Residents were randomized to control (no training) and intervention (model training) groups. They were filmed while performing a series of tasks. Experts were also filmed. Each video was scored by 2 blinded raters.

SETTING: Multicenter collaboration within the Western Society of Pelvic Medicine (Vancouver, Calgary, and Edmonton). Face and content validity were evaluated. A standard scoring tool was developed for performance evaluation. Interrater reliability was assessed using intraclass correlation coefficient. Cronbach α was calculated for internal consistency. Jonckheere-Terpstra test verified whether the scores increased with operator skill level.

PARTICIPANTS: A total of 14 junior gynecology residents, 2 urogynecology fellows, and 3 staff urogynecologists were rated by a total of 6 gynecologic surgeons who scored 42 videos each.

RESULTS: Experienced pelvic surgeons from 3 participating sites agreed the models captured essential elements of real surgical skills (face validity) and of the true procedures (content validity). Intraclass correlation coefficient was adequate (AR = 0.86, PR = 0.90, and VH = 0.87). Cronbach α for the total scores was adequate (AR = 0.85, PR = 0.8, and VH = 0.71). Performance score increased with operator skill level for all 3 procedures (AR, $p = <0.001$; PR, $p = 0.008$; and VH, $p = 0.007$).

CONCLUSIONS: Our low fidelity procedure-specific vaginal surgery models had adequate initial validity. Future research will investigate transferability of acquired skills to the operating room. (J Surg Ed 73:157-161. © 2015 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: low fidelity simulation, vaginal surgery, junior residents

COMPETENCIES: Practice-Based Learning and Improvement, Medical Knowledge, Interpersonal and Communication Skills

INTRODUCTION

Competency-based medical education has become a priority for the Royal College of Physicians and Surgeons of Canada, who invited a partnership of international collaborators to examine its pros and cons.[1] They defined competency-based medical education as "an outcomes-based approach to the design, implementation, assessment, and evaluation of medical education programs, using an organizing framework of competencies."[1] Within this framework, acquisition of expertise is goal-oriented, progressive, and centered on the learner. Surgery is traditionally a field of medicine where learning heavily relies on experiences encountered in the operating room, with subjective assessment being the norm. However, the development of surgical expertise, just like exceptional mastery in other domains such as sports, chess, or music, requires deliberate practice.[2] Elements of deliberate practice include training with specific goals in mind as well as the opportunity for repetitive practice and

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immediate expert feedback.[3] Acquisition of surgical skills lends itself well to deliberate practice on surgical models. The most extensively validated low fidelity model for learning technical skills outside the operating room, the McGill Inanimate System for Training and Evaluation of Laparoscopic Skills (MISTELS), has shown transferability of acquired skill to laparoscopic cases in the real operating room.[4] MISTELS has developed a pass-fail evaluation system taking into account task time and errors; this system can be used for both formative and summative feedback. Unfortunately, in surgical specialties other than laparoscopy, there are few assessment tools for learner selection and for monitoring progress.[5] More specifically, in Obstetrics and Gynecology residency training programs, where obstetrical practice and coverage occupies a large proportion of residency time, residents have significantly fewer purely surgical training months per year when compared with their counterparts in other surgical disciplines (4.9 vs 8.5 mo; $p = 0.001$).[6] Therefore, it is particularly important for gynecology residents to engage in deliberate practice outside the real operating room to acquire the necessary surgical competencies before graduation. To this effect, we developed low fidelity, procedure-specific models to teach 3 vaginal surgery procedures: anterior repair (AR), posterior repair (PR), and vaginal hysterectomy (VH) to junior gynecology residents. In parallel, we developed an assessment tool based on a list of competencies deemed necessary for vaginal gynecologic surgery. For an assessment tool to be useful for progress monitoring, it must show face validity (model realism), content validity (essential elements of the procedure), interrater reliability (correspondence of scores between different evaluators), internal consistency (concordance between components of the test), and construct validity (correlation of scores with different levels of surgical ability).[7,8] Our objective was to investigate these aspects of our vaginal surgery models. This validation study is part of an ongoing multicenter randomized controlled trial aiming to investigate transferability of technical skill acquired during supervised practice on low fidelity, procedure-specific models to performance in the real operating room.

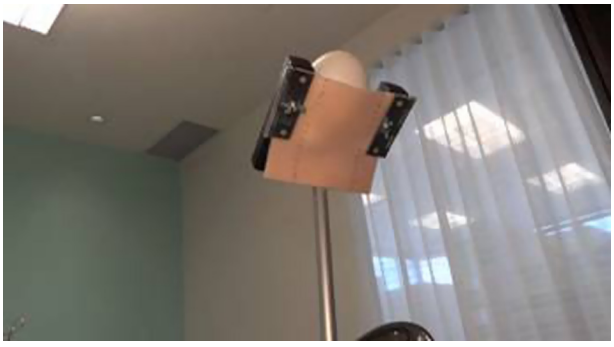

FIGURE 1. Anterior repair model.

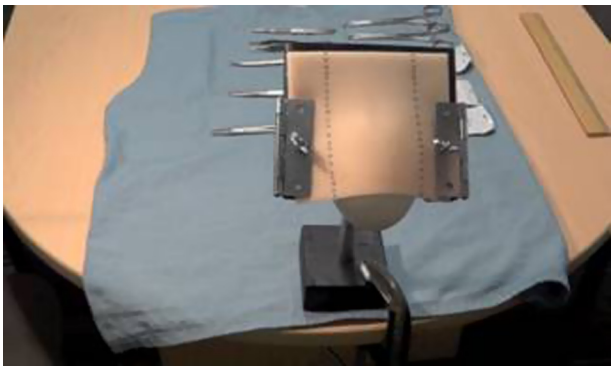

FIGURE 2. Posterior repair model.

MATERIAL AND METHODS

The 3 models were developed specifically for this trial and teach index procedures of AR, PR, and VH to junior gynecology residents (Figs. 1-3). Models are cheap and easy to assemble. They use silicone skin mounted on a clamp that secures the model to the table. Other than the silicone skin, the model components can all be purchased at a hardware store. Each model was developed to teach specific surgical skills necessary for vaginal surgery and for each index procedure. We sought to reproduce the angles and depths of vaginal surgery. Participants perform the index procedure following a series of relevant tasks. For example, for VH, one of the required tasks is to suture and tie knots in a deep space. In addition, adequate basic surgical skills applicable to all procedures, such as handling an instrument or cutting, are reinforced. Residents are randomized to intervention and control groups using a web-based randomization scheme. Residents in the intervention group receive training via procedure-specific didactic online modules, followed by deliberate practice on the surgical models. This involves supervised instruction, immediate feedback, and repetitive individual practice guided by a surgical mentor (a staff gynecologic surgeon). The mentor decides when performance has improved enough to allow a resident to

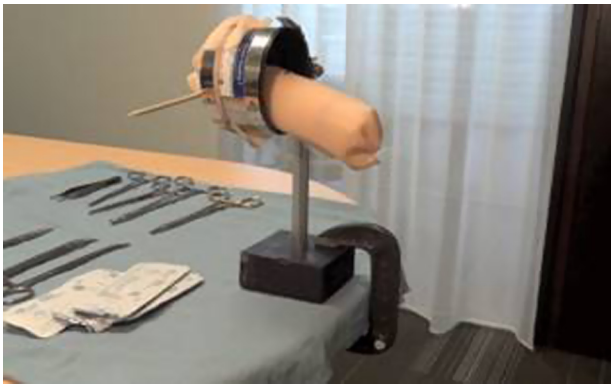

FIGURE 3. Vaginal hysterectomy.