

Determining the Effect of External Stressors on Laparoscopic Skills and Performance Between Obstetrics and Gynecology Residents [☆]

Gaby N. Moawad, MD,* Paul Tyan, MD,[†] Dipti Kumar, MD,[‡] Jill Krapf, MD,[§] Cherie Marfori, MD,* Elias D. Abi Khalil, MD,* and James Robinson, MD[¶]

*Department of Minimally Invasive Gynecologic Surgery, George Washington University, Washington, DC; [†]Department of Obstetrics and Gynecology, George Washington University, Washington, DC; [‡]Department of Obstetrics and Gynecology, Tufts Medical Center, Boston, Massachusetts; [§]Women's Health Department, Baylor All-Saints Medical Center, Fort Worth, Texas; [¶]Department of Obstetrics and Gynecology, National Center for Advanced Pelvic Surgery, MedStar Washington Hospital Center, Georgetown University School of Medicine, Washington, DC; and Department of Urology, National Center for Advanced Pelvic Surgery, MedStar Washington Hospital Center, Georgetown University School of Medicine, Washington, DC

STUDY OBJECTIVE: To evaluate the effect of stress on laparoscopic skills between obstetrics and gynecology residents.

DESIGN: Observational prospective cohort study.

DESIGN CLASSIFICATION: Prospective cohort.

SETTING: Urban teaching university hospital.

PARTICIPANTS (PATIENTS): Thirty-one obstetrics and gynecology residents, postgraduate years 1 to 4.

INTERVENTION: We assessed 4 basic laparoscopic skills at 2 sessions. The first session was the baseline; 6 months later the same skills were assessed under audiovisual stressors. We compared the effect of stress on accuracy and efficiency between the 2 sessions.

MEASUREMENTS AND MAIN RESULTS: A linear model was used to analyze time. Under stress, residents were more efficient in 3 of the 4 modules. Ring transfer (hand-eye coordination and bimanual dexterity), $p = 0.0304$. Ring of fire (bimanual dexterity and measure of depth perception), $p = 0.0024$ and dissection glove (respect of delicate tissue planes), $p = 0.0002$. Poisson regression was used to analyze the total number of penalties. Residents were more likely to acquire penalties under stress. Ring transfer, $p = 0.0184$

and cobra (hand-to-hand coordination), $p = 0.0487$ yielded a statistically significant increase in penalties in the presence of stressors. Dissection glove $p = 0.0605$ yielded a non-significant increase in penalties.

CONCLUSION: Our work confirmed that while under stress residents were more efficient, this translated into their ability to complete tasks faster in all the tested skills. Efficiency, however, came at the expense of accuracy. (J Surg Ed ■■■■■. © 2017 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: laparoscopy, simulation, education, residents, residency, stress

COMPETENCIES: Practice-Based Learning and Improvement, Systems-Based Practice

INTRODUCTION

The benefits of minimally invasive surgery have been clearly demonstrated in multiple studies.¹ Minimally invasive surgery is recommended by many authorities whenever possible to avoid the morbidity of laparotomy.² Consequently, laparoscopy has become the standard surgical approach for most gynecologic procedures. Basic laparoscopic skill acquisition is typically achieved in simulation centers in many residency training programs. Simulation training has been shown to help prepare trainees and develop their skills before transitioning to the operating room.³ A formal laparoscopic skills curriculum in obstetrics

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Correspondence: Inquiries to Paul Tyan, Department of Obstetrics and Gynecology, George Washington University, 900 23rd St NW, Washington, DC 20037; e-mail: Pryan@gwu.edu

TABLE 1. Effect of Stress on Efficiency

Parameter	Operating Time (S)			
	Estimate	Lower 95%	Upper 95%	Pr > Z
Ring transfer	-35.52	-67.67	-3.36	0.0304
Ring of fire	-29.10	-47.91	-10.28	0.0024
Cobra	-4.94	-34.41	24.54	0.7428
Dissection glove	-58.68	-89.13	-28.22	0.0002

Pr, Probability

and gynecology (Ob-Gyn) can help increase laparoscopic competency, which has been shown to translate into improved patient outcomes and a decrease in perioperative morbidity.⁴

Despite this growing body of literature, no standardized gynecologic laparoscopy training program has been adopted in the United States. The lack of a comprehensive laparoscopic surgical curriculum in gynecology translates to a widely varying level of training among institutions, which may affect the level of skill of the future providers. A recent study on accredited North American Obstetrics and Gynecology residency programs revealed that 25% did not have a laparoscopic training curriculum, and that more than 40% were dissatisfied with their current laparoscopy training.⁵ Since the Halstedian principles of surgery were first described a century ago, most residency programs still rely on a system where trainees are taught under direct supervision in the operating room.⁶ This is achieved by a gradual increase in autonomy after demonstrating task-specific competency. We now know, however, that the specific skills and psychomotor abilities required in laparoscopic surgery are different from those used in conventional surgery. This has been demonstrated in a study showing a failure of transfer of a skill set from the open surgical experience to laparoscopy.⁷

Stress has been shown to negatively affect cognitive functioning, information processing, effective communication, and skill-based surgical motion leading to a significant detrimental effect on performance.⁸⁻¹⁰ Little is known about the effects of stress on laparoscopic surgical performance in practice. Many studies address the influence of stress on psychomotor function and laparoscopic surgery in the simulated setting and show that stressful situations can be effectively reproduced in simulation labs.^{11,12} In light of the considerable amount of basic laparoscopic teaching that occurs in the setting of real patients in operating rooms across the United States, we determined that there was an imperative to study what effect stress might have on laparoscopic surgical skill acquisition and development in this environment.

MATERIALS AND METHODS

Institutional Review Board approval was obtained and all Ob-Gyn residents at a large urban university residency

training program were invited to participate. The study was conducted during 2 scheduled didactic sessions on laparoscopic training 6 months apart. "session 1" was the baseline skill assessment session and "session 2" was the intervention session. In total, 31 residents participated in all components of the study. To use resident data for the project, the resident must have been present at session 1 and session 2. Residents who were unable to be at all events were allowed to participate in the training sessions to gain laparoscopic skills but were not included in the statistical analysis.

Residents participated in 4 fundamentals of laparoscopic surgery inspired laparoscopic training modules. The training protocol consisted of 4 distinct simulated skill stations designed to evaluate bimanual dexterity, depth perception, fine movement precision, and hand-eye coordination (Table 1).

For each of the modules the resident was briefed on the scenario through use of a standardized script (Table 2) detailing the task and stating the penalties to be evaluated. This was followed by a short demonstration of each task by the attending physician present. Residents were given up to 5 minutes to complete each task, and failure to complete the task was recorded.

The first session was conducted to establish baseline performance data. Six months later, the "intervention session" was conducted. We chose a gap of 6 months to eliminate resident recall and familiarity with task from the first session. Given how Ob-Gyn residency is divided among obstetrics, operative gynecology, and clinic we believed that in a 6 months period we would still be able to compare the baseline with the intervention session as the residents were not solely focused on acquiring laparoscopy skills. In the intervention session, the same laparoscopic modules were presented with the addition of audiovisual

TABLE 2. Effect of Stress on Accuracy

Parameter	Total Number of Penalties			
	Estimate	Lower 95%	Upper 95%	Pr > Z
Ring transfer	1.57	1.08	2.28	0.0184
Ring of fire	0.83	0.65	1.06	0.1286
Cobra	1.53	1.00	2.34	0.0487
Dissection glove	1.45	0.98	2.15	0.0605

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