SCIENTIFIC PAPER JSLS

Robotic Surgery Training in Gynecologic Fellowship Programs in the United States

Soorena Fatehchehr, MD, Ghazaleh Rostaminia, MD, Michael O. Gardner, MD, MPH, Elisa Ramunno, JD, Nora M. Doyle, MD, MPH, MSc

ABSTRACT

Background and Objectives: The increasing use and acceptance of robotic platforms calls for the need to train not only established surgeons but also residents and fellow trainees within the context of the traditional residency and fellowship program. Our study aimed to clarify the current status of robotic training in gynecologic fellowship programs in the United States.

Methods: This was a Web-based survey of four gynecology fellowship programs in the United States from November 2010 to March 2011. Programs were selected based on their geographic areas. A questionnaire with 43 questions inquiring about robotic surgery performance and training was sent to the programs and either a fellow or the fellowship director was asked to complete. Participation was voluntary.

Results: We had 102 responders (18% respond rate) with an almost equal response rate from all four gynecologic fellowships, with a median response rate of 25% (range 21–29%). Minimally Invasive Surgery (MIS) and Gynecologic Oncology (Gyn Onc) fellowships had the highest rate of robotic training in their fellowship curriculum—95% and 83%, respectively. Simulator training was used as a training tool in 74% of Female Pelvic Medicine and Reconstructive Surgery (FPMRS); however, just 22% of Reproductive Endocrinology and Infertility fellowships had simulator training. Eighty-seven percent of Gyn Onc fellows graduate with >50 robotic cases, but this was 0% for Reproductive Endocrinology Infertility fellows.

Conclusion: Our study showed that the use of a robotic system was built into fellowship curriculum of >80% of MIS and Gyn Onc fellowship programs that were entered in our study. Simulator training has been used widely in Ob&Gyn fellowship programs as part of their robotic training curriculum.

Key Words: Robotic surgery, Ob&Gyn, Fellowship, Training.

Atlanta Center for Special Minimally Invasive & Robotic Surgery and Reproductive Medicine, Nezhat Medical Center, Atlanta, GA, USA (Dr. Fatehchehr).

University of Oklahoma Health Sciences Center, Oklahoma City, OK, USA (Drs. Rostaminia, Gardner, Ramunno, Doyle).

Address correspondence to: Soorena Fatehchehr, MD, Nezhat Medical Center, Atlanta Center for Special Pelvic Surgery & Reproductive Medicine, 5555 Peachtree Dunwoody Rd NE, Atlanta, GA 30342. E-mail: Soorena.Fatehchehr@gmail.com

DOI: 10.4293/JSLS.2014.00402

INTRODUCTION

The robotic surgical system was introduced to the medical field in the late 1990s. It was approved by the U.S. Food and Drug Administration for gynecologic surgery in April 2005. With the advent of this system, many surgeries that would have previously been done using an abdominal incision are now being performed with minimally invasive techniques using the robotic system. This technique has become a tool to allow surgeons to offer patients complex surgeries that previously may have required a large, invasive incision through several significantly smaller port sites, resulting in faster patient recovery. Nezhat et al noticed improved dexterity, coordination, and visualization with robot-assisted laparoscopy.[1] It provides three-dimensional vision and easier suture capability without tremor.[1] Because of such advancements, the surgeon is able to progress quickly along the learning curve and accomplish tasks such as intracorporeal suturing and knot-tying, ureterolysis, lymphadenectomies, and lysis of dense adhesions with ease and improved visualization.[2,3] However, its disadvantages included its cost, bulkiness, lack of tactile feedback or vaginal access, and availability of the robot in different hospitals.[1,4]

The increasing use and acceptance of robotic platforms calls for the need to train not only established surgeons but also residents and fellow trainees within the context of the traditional residency and fellowship program. It seems logical that to keep up with emerging technology, residents and fellows should undergo robotic training. Many studies have been done to evaluate the best teaching method for the robotic system,[5–7] but there are scarce data about the current status of this training in residency and fellowship programs. Our study aimed to clarify the current status of robotic training in United States gynecologic fellowship programs.

MATERIALS AND METHODS

The study was approved by our institutional review board at the University of Oklahoma. The study was performed from November 2010 to March 2011. Female Pelvic Medicine and Reconstructive Surgery (FPMRS), Gynecologic Oncology (Gyn Onc), Minimally Invasive Surgery (MIS), and Reproductive Endocrinology and Infertility (REI) fellowships were selected as our target fellowships. Maternal-Fetal, Pediatrics and Adolescent, and Family Planning fellowships were not included in the study because potentially operative Gyn fellowship programs were included. Fellowship programs were selected based on their geographic location in the United States to avoid selection bias. We categorized geographic areas as Northeast, Midwest, South Atlantic, East South Central, West South Central, and West. In each following area, all of the potential fellowship programs were selected: Northeast (Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont), Midwest (Wisconsin, Michigan, Illinois, Indiana, Ohio, Missouri, North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa), South Atlantic (Delaware, Maryland, Washington DC, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida), East South Central (Kentucky, Tennessee, Mississippi, Alabama), West South Central (Oklahoma, Texas, Arkansas, Louisiana), and West (Idaho, Montana, Wyoming, Nevada, Utah, Colorado, Arizona, New Mexico, Alaska, Washington, Oregon, California, Hawaii). The fellowship programs' contact information was obtained from the Council on Resident Education in Obstetrics and Gynecology Home Page on the American College of Obstetricians and Gynecologists Web site.

We used SurveyMonkey, a Web-based survey, for our study. Participation in the survey was voluntary. In each program, the fellowship director or a fellow was asked to complete the questionnaire anonymously.

Questionnaire

There are two methods of administrating a questionnaire: (1) self-administered and (2) interviewer-administered. Our questionnaire was self-administered. The most common methods of self-administered questionnaire distribution are through either traditional mail or electronic distribution. Our survey was Web based. SurveyMonkey was used as our Web-based survey site.

An email was sent to each program's coordinator, and we asked for the program's director and fellows to participate in our survey.

We created a questionnaire with 43 questions, which were designed based on the senior authors' experiences and similar descriptive studies. Ten questions pertained to the program's demographic information and 19 questions asked about robotic surgery performance; the last 14 questions were about the program's robotic training curriculum. Questions for evaluating robotic training curriculum were designed based on similar studies. Dedicated hours, percentage of hands-on experience, use of a simulator, and number of robotic surgeries performed by each fellow upon graduation were included in the questionnaire.

Statistical Methods

Descriptive statistics were used to summarize the distribution of the program's characteristics.

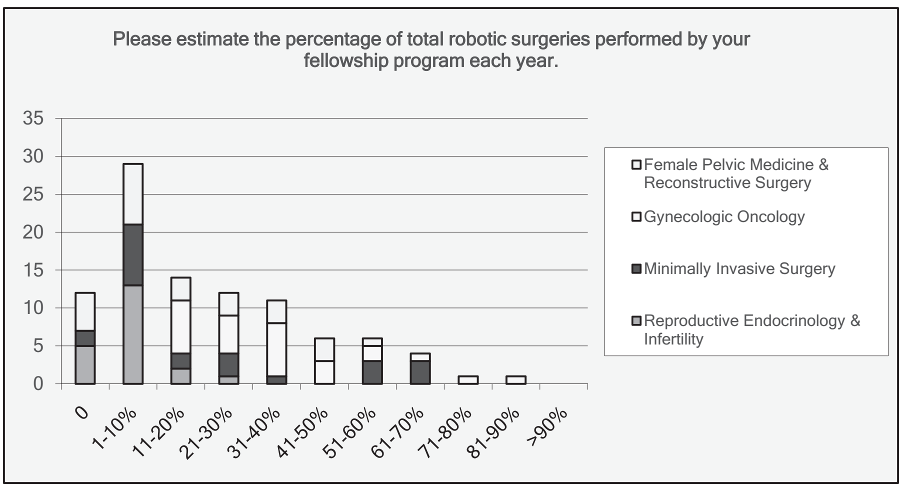

Figure 1. The estimated percentage of total robotic surgeries performed by each fellowship per year.

RESULTS

The survey was sent to 155 programs. We received 102 (18.68%) responses; 67% and 33% of our responders were fellows and fellowship directors, respectively. Our responses were equally distributed from all four fellowships surveyed, with a median response rate of 25% (range, 21%–29%). The geographic distribution of responders was as follows: East South Central (5%), West (7.9%), West South Central (11.9%), South Atlantic (18.8%), Midwest (24.8%), and North East (31.7%). The estimated percentage of total robotic surgeries performed by each fellowship per year is shown in **Figure 1**. Program directors and fellows were asked about their robotic approach to performing hysterectomy, sacrocolpopexy, myomectomy, tubal anastomosis, endometriosis, and adhesiolysis (**Table 1**).

Table 1.
Percentage of Robotic Techniques Used for Specific Gynecologic Surgeries in Each Fellowship Entered in Our Study

Surgeries Performed by Robot	FPMRS (N = 27)	Gyn Onc (N = 29)	MIS (N = 23)	REI (N = 22)
Hysterectomy	34%	23–34%	28%	14%
Prolapse (POP)	27%	N/A	19%	N/A
Sacrocolpopexy	40%	N/A	36%	N/A
Myomectomy	N/A	N/A	31%	15%
Tubal reanastomosis	N/A	N/A	33%	12%
Endometriosis	N/A	N/A	33%	5%
LOA (Lysis of Adhesions)	15%	10%	73%	9%

FPMRS, Female Pelvic Medicine & Reconstructive Surgery; Gyn Onc, Gynecology-Oncology; LOA, Lysis of Adhesions; MIS, Minimally Invasive Surgery; REI, Reproductive Endocrinology & Infertility.

Robotic training was built into the curriculum of 95% and 83% of MIS and Gyn Onc fellowships, respectively (**Figure 2**). The rate of robotic surgeries done in programs was almost equal (median, 34%; range, 33%–34%). Simulator training was used in 74%, 67%, 57%, and 22% of FPMRS, Gyn Onc, MIS, and REI fellowships, respectively. Details of the training curricula are summarized in **Table 2**. Although 87% of Gyn Onc fellows will graduate with >50 robotic cases, this was 0% in REI fellowship. Twenty-five percent of programs dedicated >25 hours per year to robotic training, whereas 19% of programs dedicated no hours at all (**Figure 3**).

DISCUSSION

Our study showed that use of the robotic surgical system is finding its place among Ob&Gyn fellowship training programs in the United States. It has been built into the fellowship curricula of >80% of MIS and Gyn Onc fellowship programs who were included in our study. Although robotic surgery training in these two fellowship programs seems to reach a significant number of hands-on surgeries, FPMRS and REI fellowship programs participating in our survey could not reach that level of training. Our study also showed that simulator training is used widely in Ob&Gyn fellowship programs as part of their robotic training curriculum. Fellowship training may offer the time and resources to teach the skills vital to robot-assisted surgery. Hoekstra et al in 2009 reported that fellow surgical training underwent a dramatic change with the intro-

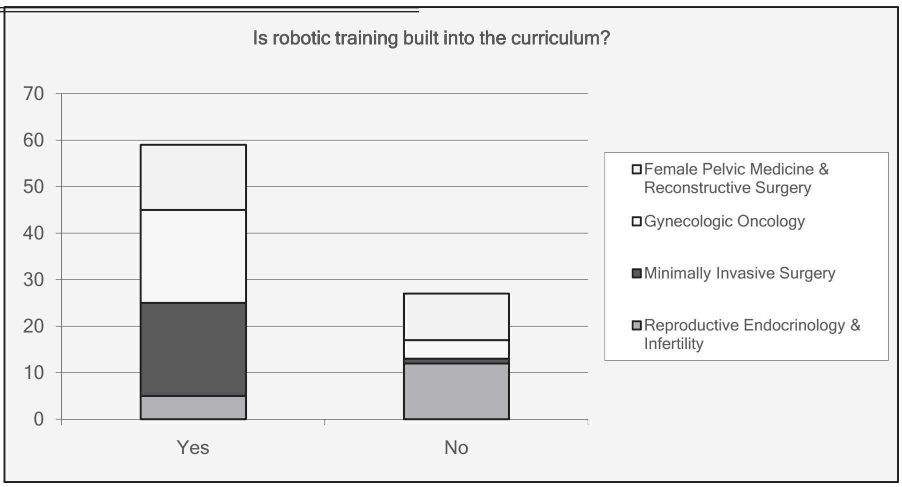

Figure 2. Robotic training in each fellowship's curriculum.

duction of a robotic surgery program. The management of endometrial and cervical cancers was impacted the most by robotic surgery.[8] In another report, Smith et al evaluated the dual-consult robotic surgery compared with laparoscopy with respect to surgical outcomes in their Gyn Onc fellowship program and reported that incorporating fellow education into robotic surgery does not adversely affect outcomes when compared with traditional laparoscopic surgery.[9] A significant concern is how to incorporate robotic surgery into a training program without compromising teaching or patient safety and to determine the ideal methodology for educating trainees to use this innovative technology. Structured robotic surgical education has been described in general surgery and urology residency programs, which have described organized surgical training approaches for both residents and fellows with robotic surgery.[11,12] However, establishing methodology to educate and train fellows and residents in robotic techniques seems to be the aim of most studies; the realistic view of robotic training status is of the utmost importance. Our study using an advanced Web-based survey was successful to gather information from 100 different fellows and directors and to draw a picture of the current robotic surgery training status in the United States.

Table 2.
Robotic Training Status in Each Ob&Gyn Fellowship

	FPMRS, n (%)	Gyn Onc, n (%)	MIS, n (%)	REI, n (%)
Fellowship director as responder (34)	10 (37%)	5 (17%)	14 (61%)	5 (23%)
Fellow as responder (68)	18 (63%)	25 (83%)	9 (39%)	16 (77%)
Response rate	28 (27%)	30 (29%)	23 (23%)	21 (21%)
Curriculum	58%	83%	95%	29%
Didactic >25 hours	27%	30%	33%	6%
>50% Hands-on	48%	73%	75%	33%
Simulator training	74%	67%	57%	22%
Graduating with >50 robotic cases	36%	87%	48%	0%

Our study has certain limitations. This was an Internet survey, which may have created a bias toward those who use e-mail and/or who may be more likely to embrace technological advances such as the robot. However, the self-administered mode only requires questionnaire distribution and is less susceptible to information bias but has a greater chance of having no-response items. The main advantages of self-administered questionnaires are that they can reach a large sample size, they cover a wide geographical area and possibly a population that is sometimes difficult to reach, they are excellent for capturing sensitive topics, and they are cheaper to administer compared with other methods. Also electronic and Web-based questionnaires use the latest techniques in questionnaire administration; they can be designed to filter and screen the participant's response and check for input error, and range and skip patterns can be incorporated to prevent significant typing and data format error.[8] The actual numbers of robotic cases performed is not easily verified and may be under- or overestimated by responders. However, our study's accepted response rate, its large population number, and its covering four different Ob&Gyn fellowship are the strong points of our study.

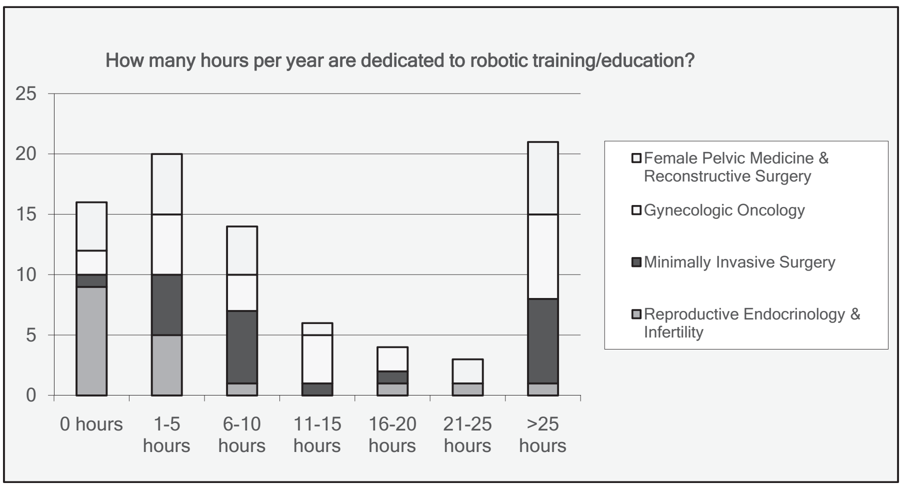

Figure 3. A bar graph representing hours per year dedicated to robotic training distribution in each fellowship's program.

We believe that this study adds valuable information to the growing body of literature concerning the use of the robotic surgical system. Our results clarified the current status of robotic surgery training in Ob&Gyn fellowship programs.

CONCLUSION

Robotic surgery as a bridge between exploratory laparotomy and advanced laparoscopic procedures offers new advantages in the field of gynecology.

Building an organized universal robotic surgical training curriculum by incorporating both simulator trainer and surgical hands-on experience is the initial necessary step to guarantee the needed training for future surgeons. Furthermore, standardized evaluation of essential robotic surgical knowledge and skills would play a vital role in ensuring the expertise and competency of the trained surgeons.

References:

1. Nezhat C, Saberi NS, Shahmohamady B, Nezhat F. Robotic-assisted laparoscopy in gynecological surgery. *JSLS.* 2006;10(3): 317–320.

2. Weinberg L, Rao S, Escobar PF, et al. Robotic surgery in gynecology: an updated systematic review da Vinci(R) single-site platform: anthropometrical, docking and suturing considerations for hysterectomy in the cadaver model. *Obstet Gynecol Int.* 2011;2011(2):852061.

3. Escobar PF, Knight J, Rao S, Weinberg L. da Vinci(R) single-site platform: anthropometrical, docking and suturing considerations for hysterectomy in the cadaver model. *Int J Med Robot Comput Assist Surg.* 2012;8(2):191–195.

4. Nezhat C, Nezhat F, Nezhat C. Evolving role and current state of robotics in minimally invasive gynecologic surgery. *J Minim Invasive Gynecol.* 2009;16(5):661–662.

5. Chowriappa AJ, Shi Y, Raza SJ, et al. Development and validation of a composite scoring system for robot-assisted surgical training—the Robotic Skills Assessment Score. *J Surg Res.* 2013;185(2):561–569.

6. Lenihan JP Jr. Navigating credentialing, privileging, and learning curves in robotics with an evidence and experienced-based approach. *Clin Obstet Gynecol.* 2011;54(3):382–390.

7. Borahay MA, Haver MC, Eastham B, Patel PR, Kilic GS. Modular comparison of laparoscopic and robotic simulation platforms in residency training: a randomized trial. *J Minim Invasive Gynecol.* 2013;20(6):871–879.

8. Hoekstra AV, Morgan JM, Lurain JR, et al. Robotic surgery in gynecologic oncology: impact on fellowship training. *Gynecol Oncol.* 2009;114(2):168–172.

9. Smith AL, Krivak TC, Scott EM, et al. Dual-console robotic surgery compared to laparoscopic surgery with respect to surgical outcomes in a gynecologic oncology fellowship program. *Gynecol Oncol.* 2012;126(3):432–436.

10. De Ugarte DA, Etzioni DA, Gracia C, Atkinson JB. Robotic surgery and resident training. *Surg Endosc.* 2003;17(6):960–963.

11. Rashid HH, Leung YY, Rashid MJ, Oleyourryk G, Valvo JR, Eichel L. Robotic surgical education: a systematic approach to training urology residents to perform robotic-assisted laparoscopic radical prostatectomy. *Urology.* 2006;68(1):75–79.

12. Chitwood WR Jr, Nifong LW, Chapman WH, et al. Robotic surgical training in an academic institution. *Ann Surg.* 2001; 234(4):475–484; discussion 84–86.