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ORIGINAL ARTICLE

Survey of obstetrics and gynecology residents' training and opinions on robotic surgery

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Abstract To investigate obstetrics and gynecology residents' access to training in robotics and their opinions of its utility and future in gynecologic surgery a 31-item questionnaire was developed and distributed to Ob/Gyn residents in the United States via email. Results were tabulated via SurveyMonkey.com©. A total of 470 residents representative of all ACOG districts and PGY levels responded. A total of 72% of residents reported ≥3 staff surgeons performing robotic gynecologic surgery at their institution and 70% had participated in robotic surgery in the past 12 months. Robotic hysterectomy (81%) and oncologic surgery (76%) were the most frequently performed procedures. A total of 79% believe their institution should provide formal training in robotics, but only 38% report access to it. A total of 23% have operated at the surgeon console, and 44% plan to incorporate robotic surgery into their practice after completing residency. A total of 3.6% feel equipped to perform robotic surgery without additional training. A total of 63% believe robotic surgery in gynecology will continue to increase in popularity. Exposure to gynecologic robotic procedures during residency is increasing. Although residents believe robotics has a place in gynecology, many feel formalized training has not been successfully implemented into their residency. Development of a structured program for training residents in robotics merits further investigation.

Keywords Da Vinci® · Gynecology · Laparoscopy · Resident training · Robotics

Introduction

Minimally invasive surgical techniques continue to be incorporated into many surgical specialties. The national proportion of hysterectomies performed laparoscopically has increased from 0.3% in 1990 to 11.8% in 2003 [1]. Since 2005 when the FDA approved the Da Vinci® robotic platform (Intuitive Surgical, Sunnyvale, CA, USA) for gynecology, its use has followed a similar path. As of 2007, 795 units had been shipped worldwide [2] and according to Intuitive Surgical, in 2008 approximately 138,000 procedures utilized the Da Vinci®. Its application in gynecologic surgery continues to expand exponentially and currently includes myomectomy, hysterectomy, and advanced gynecologic–oncologic and urogynecologic procedures.

Several studies have shown comparable results between robotic and laparoscopic procedures for hysterectomy, myomectomy, radical hysterectomy, lymph node dissections, and sacrocolpopexy [3]. When compared with laparotomy, both laparoscopy and robotic surgery are associated with similar patient outcomes, improved blood loss, shorter hospital stays, faster recoveries, and reduced morbidity [4]. Advantages of robotics over laparoscopy include greater dexterity, because of articulation, three-

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dimensional magnification, increased accuracy and precision in complicated dissections, elimination of tremor, and favorable surgeon ergonomics [3, 5]. The constraints and limitations of conventional laparoscopy may be overcome by use of robotics.

Robotic surgery enables gynecologists to offer minimally invasive surgery to a wider variety of patients that may have previously undergone a laparotomy. Payne and Dauterive [6] reported a twofold higher rate of intraoperative conversion to laparotomy in a cohort of laparoscopic hysterectomies (9%) compared with robotic hysterectomies (4%). Robotics has made difficult cases more feasible, and not only are gynecologic subspecialists able to perform complex surgical cases through a minimally invasive approach, general gynecologists are also rapidly incorporating robotics into their surgical repertoire. With the development of robotic gynecologic surgery, residents' training in robotics becomes an important issue, whether or not they choose to pursue further subspecialty training.

The objective of this survey was to investigate residents' participation in robotic cases, their access to formal training in robotics, and their opinions on the utility and future of robotic surgery.

Materials and methods

In March 2009, a 31-item online questionnaire was distributed to program coordinators of all United States ACGME accredited Obstetrics and Gynecology residency programs. Email contacts were obtained from the AMA-Freida website and information provided on individual program websites. The survey was developed and dispersed through SurveyMonkey.com. Program coordinators were asked to forward the email containing an explanation of the study and the survey link to the residents in their respective programs. A second emailing of the survey link occurred in April 2009. This study was exempt from IRB approval.

The questionnaire consisted of 31-items formulated to investigate current practices in training in robotics and residents' opinions regarding robotic gynecologic surgery. This is an unvalidated survey developed on the basis of various published surveys regarding laparoscopic training during residency [7, 8]. Ten questions pertained to demographics and access to robotic procedures, eight questions investigated formal robotic surgical training, five explored residents' current comfort level with robotics and their plans for implementation into practice, and eight questions surveyed residents' opinions regarding the future of robotics in gynecology.

Results were tabulated using SurveyMonkey.com's data-analysis software.

Results

Demographics

We heard from 470 respondents representative of all ACOG districts and PGY levels. Demographic data of respondents is presented in Table 1. District IV (Southeastern United States) composed 21% of the respondent pool, but is representative because of its large number of residency programs. A total of 72% were from university-based programs.

Most residents completing the questionnaire reported exposure to robotics during residency. A total of 72% have ≥3 staff surgeons performing robotic gynecologic surgery at their institution whereas only 9% reported having zero staff surgeons performing robotics. A total of 70% of respondents had participated in robotic surgery in the past 12 months, and 17% had participated in greater than 10

Table 1 Respondent demographic data

	N (%)
Level of training	
PGY I	81 (17)
PGY II	114 (24)
PGY III	142 (30)
PGY IV	133 (28)
ACOG district	
I	50 (10.6)
II	25 (5.3)
III	34 (7.2)
IV	103 (21.9)
V	66 (14)
VI	36 (7.7)
VII	32 (6.8)
VIII	38 (8.1)
IX	32 (6.8)
X	43 (9.1)
Armed forces	11 (2.3)
Training program	
University	340 (72)
Community	130 (28)
Staff surgeons performing robotics	
None	45 (9)
>1–2	89 (19)
3–5	218 (46)
6–10	94 (20)
>10	24 (5)
Formal training in robotics	
Yes	74 (16)
No	396 (84)

robotic cases during that time period. Hysterectomy (81%) and oncologic surgery (76%) were the most frequently performed operations followed by urogynecologic procedures (53%). Respondents estimated that at their institution, 45% of hysterectomies were performed abdominally, 25% vaginally, 21% laparoscopically, and 9% robotically.

Residency training

Despite a large number of respondents having exposure to robotics during residency, 16% reported formal training in robotic surgery through a formalized course or wet laboratory session. Thirty-eight percent reported having access to other forms of training in robotics including lectures (50.8%), web-based courses/videos (44.7%), robotic pelvic trainers (43.6%), and animal/cadaver laboratories (21.8%). A total of 79% reported that formal training in robotics was not required prior to resident case participation. The level at which participation in robotic cases started was equally distributed between PGY 1 (33%), PGY 2 (34%), and PGY 3 (29%).

A total of 79% of respondents feel robotics training should be included in their residency education. Of residents participating in robotic surgery ($n = 320$), 75 (23%) reported having operated at the surgeon console. When filtered by PGY level, this increased to 29% of senior residents operating at the surgeon console. Most residents participate in the conventional laparoscopic portions of the case with 57% performing laparoscopic port placement and 56% assisting at the laparoscopic accessory port. Forty-four percent of respondents report sufficient exposure to robotic surgery during their residency in order to comfortably incorporate robotics in their practice, but only 17 residents (3.6%) are confident enough with their robotic skills to perform cases without additional formal training. An additional 33% are unsure if they will utilize robotic surgery because they have currently not received adequate training in robotics. Of those that have not received training, 23% do not plan to seek training after graduation. The remaining 76% plan to obtain robotic skills by either fellowship training (20%), self-paid course (42%), or colleague mentorship (30%).

Future of robotics

This study also attempted to obtain residents' opinions on the future of robotic surgery in gynecology and its advantages and disadvantages. A total of 63% believe that robotics will continue to increase in popularity in gynecology with 12% stating that it will become the gold standard for many procedures. A total of 3.3% (15 residents) believe robotics will not serve any future role in gynecology.

A total of 64% of residents think that robotics offers advantages over laparotomy, but are neutral regarding its advantages over vaginal and traditional laparoscopic approaches. Residents also hold a neutral opinion when asked whether robotic use should be limited to gynecologic subspecialties and if patients should routinely be offered robotic surgery. When asked to report the most significant advantages (Fig. 1) of robotic surgery, residents reported increased precision/accuracy (39%) and improved recovery/reduced hospital stay (22%) while disadvantages (Fig. 2) were cost (33%) and increased operative time (28%).

Discussion

The objective of this questionnaire was to determine gynecology residents' access to robotic surgery during their training and their attitudes towards robotics. This study found a high percentage of respondents (70%) have participated in robotic cases during residency training and only 9% reported no access to robotic procedures. Similar to other previously published surveys on training in robotics during residency, this survey showed gynecology residents have a marked interest in robotic surgery. Despite increasing robotic exposure, they report limited access to adequate training in robotics. In 2003, a survey of 415 general surgery residents showed that 57% indicated a high interest in training in robotics; although 80% had no formal training [9]. Our results found 79% of residents feel robotics training should be included in their residency education and 67% feel their training is not adequate. Specifically only 3.6% report sufficient time spent at the surgeon console to pursue robotic procedures in practice without additional training.

Residency programs face many challenges when attempting to incorporate robotics into a traditional surgical curriculum. Training in robotics is inherently different from traditional surgical training. Conventional surgical training uses direct hands-on exposure to procedures as a surgical assistant to acquire the necessary surgical skills. In robotics, activities performed while assisting are completely different from those performed at the console as the primary surgeon. Thus many hours of robotics training is needed prior to patient care to gain experience and familiarize surgeons with the robotics platform. The cost per resident for this basic system training becomes an issue that cannot go unnoticed by residency program directors. In addition, the lack of tactile sensation with robotic cases may be a significant limitation for the novice surgeon.

Incorporation of a cost-effective model for training residents in robotics as a method for transferring conventional surgical skills to robotics has yet to be developed.

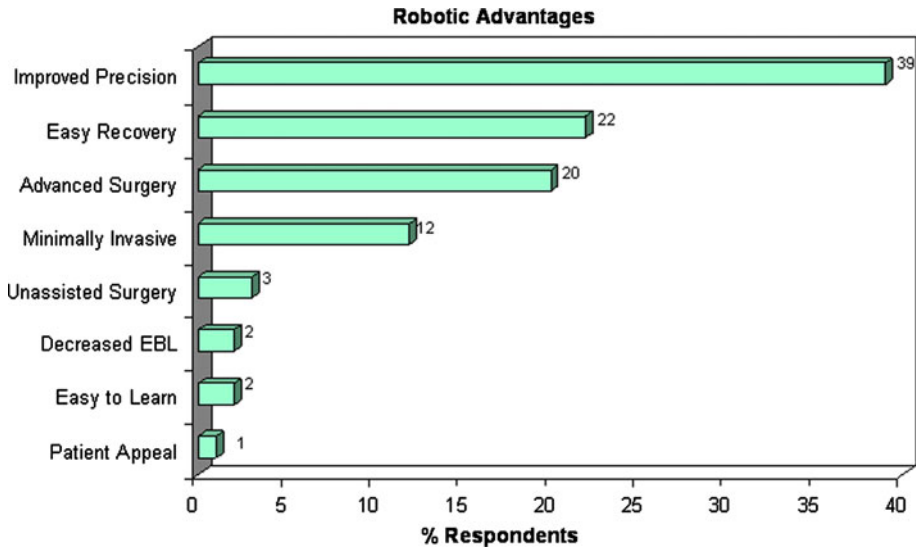

Fig. 1 Advantages of robotics cited by residents

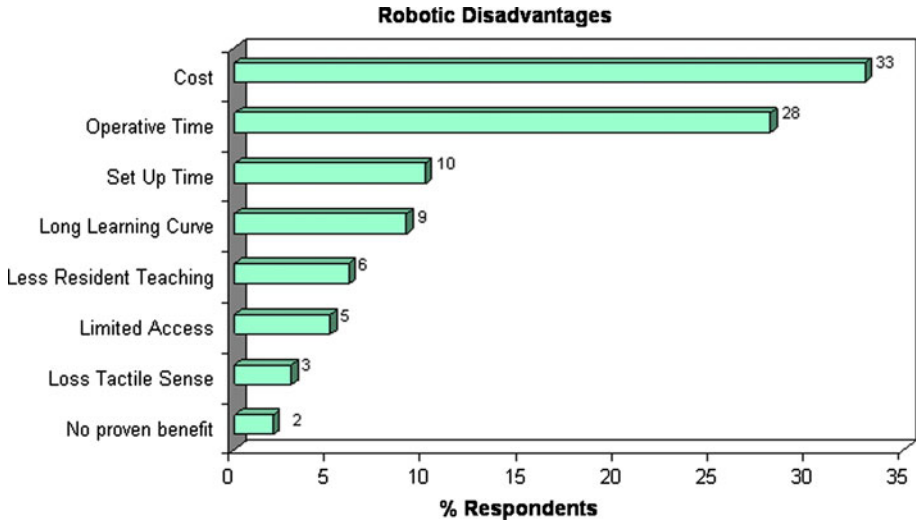

Fig. 2 Disadvantages of robotics cited by residents

Previous models have advocated a stepwise system for training residents in robotics [10, 11]. Initially, residents are exposed to background information and simulators. They then train on the robot itself using animal models. Once proficiency is demonstrated, residents perform live surgery with proctoring. Each operative procedure is divided into "steps" with the residents using the surgeon console for only one step per case. Procedures are recorded so that residents may review them with the attending surgeon after completion. After completion of these training models, resident robotic skills can quickly approach those of an experienced surgeon [10, 12]. These models effectively train residents while keeping operative time and therefore cost to a minimum.

The case load necessary for each resident to be adequately trained in robotic surgery seems greater than that needed for open procedures. As residents learn to perform laparoscopic and robotic hysterectomies, many argue that time is taken away from teaching advanced open and vaginal surgical techniques. Some advocate that training in robotics should occur after residency, in special laparoscopic/robotic fellowships or by dividing residency into separate "tracks" for those interested in more formal surgical training [13]. In our study, 66% of respondents reported participation in robotic cases as a PGY-1 or PGY-2, thus there is sufficient time to complete training models such as that presented above if integrated early into a four-year residency program.

Once out of residency, physicians practice in a manner similar to their training. Urologists were 69% more likely to perform laparoscopic procedures if they were trained during residency versus 34% if they had inadequate laparoscopic experience [14]. In this survey, approximately 44% of respondents that have experienced robotic surgery during residency plan to perform robotics in their practice. Because residents plan to perform these procedures, training programs should be encouraged to provide their

graduates access to effective robotic and minimally invasive surgical training.

The final area explored in this study was residents' views regarding the future use of robotic surgery in gynecology. Most gynecology residents (63%) believe robotics will continue to increase in popularity. Only 3% believe robotics is a "fad" that will be obsolete in 10 years. Minimally invasive techniques are rapidly being incorporated into gynecology and it is likely that robotics will continue to develop and play an important role in the future of gynecologic surgery.

This study had several limitations. As an internet survey, we were unable to accurately determine who completed the survey. The distribution of our survey depended on the motivation of the program coordinators to email the link to their residents. Therefore, it was not possible to accurately count the number of residents that actually received an invitation to complete the survey. Therefore it is possible that our results may be affected by a significant responder bias. Residents that have an interest in robotics may have been more motivated to complete our survey whereas this subject matter may not have appealed to residents receiving little robotic exposure. We also acknowledge that residents with structured programs for training in robotics and adequate robotic exposure may not have felt compelled to complete this survey, whereas those feeling that their programs lacked sufficient training in robotics may have had more interest, in the hope of improving their training experiences. Although our results are limited by respondent bias, this survey took a first look at the status of resident training in robotic gynecology surgery. These results provide insight into the exposure of residents to robotic gynecologic surgery and the need for increased training modalities. Future research comparing our results to those from program coordinators, faculty, and recently graduated physicians may provide applicable information on the most effective way to structure resident training in robotics for use in practice.

The emergence of robotic technology into the field of gynecology has uncovered a need for effective training of residents in robotics. Optimum surgical outcomes rely on well-trained surgeons with access to the newest and reputed "best" technologies. Though its application in gynecologic surgery is still controversial, robotic assistance has been shown to be an effective tool in the hands of skilled and experienced surgeons. We must now address how to best train our future surgeons. The results of this study reveal that although residents are exposed to robotics and believe robotics has a future in gynecologic surgery, many feel that robotic training has not been successfully implemented in their residency program. Development of an adequate and cost-effective robotic training programs for residents merits further investigation.

Conflict of interest None.

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