# Make new friends but keep the old: Minimally invasive surgery training in gynecologic oncology fellowship programs

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## Abstract

**Objectives**—To evaluate the role of minimally invasive surgery (MIS) in gynecologic oncology fellowship training and fellows' predictions of their use of MIS in their future practice.

**Methods**—All fellows-in-training in American Board of Obstetrics and Gynecology-approved training programs were surveyed in 2012 through an online or mailed-paper survey. Data were analyzed and compared to results of a similar 2007 survey.

**Results**—Of 172 fellows, 69 (40%) responded. Ninety-nine percent of respondents (n=68) indicated that MIS was either *very important* or *important* in gynecologic oncology, a proportion essentially unchanged from 2007 (100%). Compared to 2007, greater proportions of fellows considered laparoscopic radical hysterectomy and node dissection for cervical cancer (87% vs 54%, $p<0.0001$) and trachelectomy and staging for cervical cancer (83% vs 32%, $p<0.0001$) appropriate for MIS. Of respondents, 92% believed that *maximum* or *some emphasis* should be placed on robotic-assisted surgery(RAS) and 89% on traditional laparoscopy during fellowship training. Ten percent rated their fellowship training in laparoendoscopic single-site surgery as *very poor*; 44% said that the question was *not applicable*. Most respondents (60%) in 2012 performed at least 11 procedures per month, whereas most respondents (45%) in 2007 performed 6 to 10 procedures per month ($p$=0.005). All respondents at institutions where robotic surgery was used were allowed to operate at the robotic console, and 63% of respondents reported that in RAS cases when a fellow sat at the robot, the fellow performed *more than 50%* of the case at the console.

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**Conclusions—**These findings indicate that MIS in gynecologic oncology is here to stay. Fellowship programs should develop a systematic approach to training in MIS and in individual MIS platforms as they become more prevalent. Fellowship programs should also develop and apply an objective assessment of minimum proficiency in MIS to ensure that programs are adequately preparing trainees.

## Introduction

The utilization of minimally invasive surgery (MIS) in gynecologic oncology continues to expand in terms of the number of procedures performed, the types of procedures performed, and the platforms being utilized. Traditional laparoscopy (TL), robotic-assisted surgery (RAS), and laparoendoscopic single-site surgery (LESS) have all been shown to be feasible and safe in the treatment of endometrial (1–8) and early-stage cervical cancer (9–14), and the 3 MIS approaches produce similar oncologic outcomes. In addition, although LESS has not been studied extensively in early-stage ovarian cancer, both TL and RAS have been shown to be feasible and safe in the treatment of early-stage ovarian cancer, and the 2 approaches produce similar clinical outcomes in patients with this disease (15–19).

As technology changes, fellowship programs are faced with the challenge of incorporating new surgical techniques to best prepare trainees for a career in gynecologic oncology. In 2003 and 2007, fellows-in-training in gynecologic oncology fellowship programs were surveyed about their exposure to MIS techniques (20, 21). In 2007, 100% of fellows stated that laparoscopy was important or very important in gynecologic oncology practice, and 95% stated that much or maximum emphasis should be placed on laparoscopic training. Between 2003 and 2007, there were significant increases in both the number of laparoscopic procedures fellows performed monthly and the quality of laparoscopic training as perceived by fellows (21). While the 2003 and 2007 surveys evaluated training in TL, neither evaluated training in RAS or LESS in detail.

Several studies have evaluated the incorporation of RAS into fellowship training and addressed the need for fellows to have formal training in robotics before participating in RAS in the operating room (22, 23). LESS is the most recent advance in MIS and offers improved cosmesis as well as potentially decreased morbidity by decreasing the number of incisions utilized in laparoscopic surgery (24). While LESS is gaining popularity in gynecologic oncology, fellows-in-training have levels of exposure to LESS depending on institutional and independent practitioners' utilization of this new platform.

Given advances in MIS since 2007, as well as the increasing emphasis on MIS in fellowship training, we hypothesized that fellows in gynecologic oncology fellowship programs surveyed in 2012 would report increased exposure to MIS in general as well as exposure to a more diverse set of procedures than in 2007. To evaluate this hypothesis, we conducted a new survey among gynecologic oncology fellows-in-training to gauge their current exposure to MIS, and we compared the responses to the responses to the aforementioned 2007 survey.

## Materials and Methods

After obtaining Institutional Review Board approval and approval from the Society of Gynecologic Oncologists, we obtained a full mailing list of all gynecologic oncology fellows-in-training in American Board of Obstetrics and Gynecology-approved training programs. Surveys were mailed to all 172 of these fellows-in-training using US postal mail between January and April 2012. Respondents were given the option to complete either the paper version or an online survey. To encourage participation, all fellows were sent 3 mailings of the survey and a reminder mailing. Neither the paper surveys nor the internet surveys had names associated with the responses.

All of the data collected were stored by an institutional research department at the institution of one of the authors. Respondents were asked about demographic characteristics, including the current focus of their fellowship (mostly clinical or mostly research), the year of expected fellowship completion, and their gender. Respondents were asked about the quality of their training in MIS and the number of MIS procedures they performed monthly. Respondents were also asked their opinions regarding the role of MIS in gynecologic oncology and the proper emphasis on different types of MIS during fellowship training. Finally, respondents were asked to predict their patterns of use of MIS in their own future practices.

The collected data were analyzed using frequency distribution tests. The relationships between categorical variables of interest were assessed using Fisher's exact test. Statistical analyses were performed with SAS 9.3 for Windows (SAS Institute Inc., Cary, NC). Data from the 2007 and 2012 surveys were compared with $p < 0.05$ considered statistically significant (2-sided p values reported). Only questions with identical wording in the 2007 and 2012 surveys were compared.

## Results

### Demographics

Of the 172 fellows-in-training, 69 (40%) responded to the survey. Most respondents (82%) were in the clinical portion of their fellowship. There were similar numbers of men and women participating in the fellows surveys in 2007 and 2012 (p=0.6, Table 1).

### Opinions Regarding the Role of MIS

Ninety-nine percent of respondents (n = 68) indicated that MIS was either *very important* or *important* in gynecologic oncology, a proportion essentially unchanged from 2007 (100%). The majority of respondents believed that MIS *always* or *usually* had a role in early-stage endometrial cancer (99% [n = 68]) and early-stage cervical cancer (87% [n = 59]). However, 82% (n = 53) believed that MIS *rarely* or *never* had a role in advanced-stage ovarian cancer. Compared to 2007, there were significant increases in the proportions of respondents who considered laparoscopic radical hysterectomy and node dissection for cervical cancer (from 54% to 87%, *p*<0.0001) and trachelectomy and staging for cervical cancer (from 32% to 83%, *p*<0.0001) appropriate procedures for MIS (Table 2).

### Experience with and Opinions about MIS Training

When respondents were asked to state the proportions of their oncology cases performed with different types of surgery, 26% of respondents stated that they performed at least 50% of cases with RAS, and 11% stated that they performed at least 50% of cases with TL. RAS and TL training were rated as *very good* or *good* by 85% and 75% of respondents, respectively (Table 3). LESS training was rated as *very poor* by 10% of respondents, and 44% said that the question was *not applicable*. Ninety-two percent of respondents believed that *maximum* or *some emphasis* should be placed on RAS and 89% on TL during fellowship training. Respondents were almost evenly split on the emphasis that should be placed on LESS in fellowship training: 50% advocated *limited* or *minimum emphasis,* and 42% advocated *maximum* or *some emphasis*.

Between 2007 and 2012, the number of laparoscopic procedures respondents performed each month increased significantly. In 2007, the majority of respondents (45%) were performing 6 to 10 procedures per month, whereas in 2012, the majority of respondents (60%) were performing 11 or more procedures per month (*p*=0.005, Table 4). Most respondents to the 2012 survey stated that they had the opportunity to participate in animal-based training (66% [n = 43]) or laparoscopic simulation training (78% [n = 50]) at least annually. These rates were not significantly different from those reported in 2007, when 76% of respondents had the opportunity to participate in animal-based training at least annually (*p*=0.27) and 65% had the opportunity to participate in laparoscopic simulation training at least annually (*p*=0.14).

### Predicted Use of MIS after Fellowship

When asked how they planned to apply MIS techniques in their practice upon completion of fellowship, all respondents (100% [n = 64]) indicated that they planned to incorporate robotic surgery, and 89% (n = 57) predicted that robotics would be *very essential* (61% [n = 39]) or *essential* (28% [n = 18]) to their practice. When respondents were asked to envision the amount and type of MIS they planned to perform upon completion of fellowship, most predicted that they would perform a *moderate* or *extensive* amount of RAS (85%) and a *moderate* or *extensive* amount of TL (73%) (Table 5). Forty percent predicted that they would not utilize LESS in their practice.

### RAS Training

In 2012, almost all respondents (98% [n = 63]) indicated that RAS was being performed for gynecologic malignancies at their institution. All respondents at institutions where RAS was used indicated that they were allowed to operate at the robotic console, 86% (n = 54) indicated that fellows were involved in more than 50% of robotic cases, and 63% indicated that in RAS cases when a fellow sat at the robot, the fellow performed *more than 50%* of the case at the console.

Eighty-five percent of respondents rated their fellowship training in RAS as *very good* or *good* (Table 3). Sixty-eight percent of respondents (n = 43) indicated that more than half of the faculty in their fellowship program were currently using the robot, and 65% (n = 42) believed that more than 75% of the faculty in their program were competent in MIS. The

vast majority of respondents (92%) indicated that *maximum* or *some emphasis* should be placed on RAS during fellowship training (Table 3).

### LESS Training

Fifty percent of respondents felt that *limited* or *minimal emphasis* should be placed on LESS training, and 42% felt that *some emphasis* (34%) or *maximum emphasis* (8%) should be placed on LESS training (Table 3). Only 12% of respondents predicted that they would perform a *moderate* or *extensive* amount of LESS after fellowship. Sixty-two percent predicted that they would perform 25% or fewer of their cases with LESS, and 31% did not know how many cases they would perform with LESS (Table 5).

## Discussion

Our findings show that fellows continue to perceive training in MIS to be a very important component of gynecologic oncology fellowship training. The results show that fellows were performing significantly more MIS procedures each month than they performed in 2007. The results also show that the list of procedures for which fellows considered MIS appropriate expanded between 2007 and 2012.

Responses to the 2012 survey confirmed increased use of robotic surgery in gynecologic oncology. Data indicated an increase in the prevalence of fellows being allowed to sit at the console during robotic surgery and the majority of fellows rated their fellowship training in RAS as very good or good. Furthermore, almost all 2012 respondents planned to incorporate robotic surgery into their practice after fellowship, compared to 62% of respondents in 2007 (21). Despite this, 37% of fellows still reported performing less than 50% of the case at the console during robotic cases. While our survey did not capture details of why fellows were not involved in more than 50% of robotic cases, possible explanations include that faculty are still becoming comfortable with the technology or that fellows feel comfortable and residents are completing the hysterectomy. This raises the question of whether utilization of RAS may interfere with fellow participation and training, in that with RAS, only 1 surgeon at a time is actively involved in the case.

In general, respondents to our 2012 survey felt that RAS should be emphasized more than TL and LESS during fellowship training. Sixty percent of fellows rated their training in RAS as very good, compared to 38% for TL and 8% for LESS. In addition, 33% of fellows predicted that they would perform at least 50% of cases utilizing RAS, whereas only 12% predicted that they would perform at least 50% of cases utilizing TL. These differences suggest that fellows have more exposure to RAS than TL in fellowship training. While RAS does offer advances including wristed instrumentation and 3-dimensional visualization of the operative field, this platform has limitations, including higher cost and loss of haptic feedback (25). Furthermore, the only study evaluating surgeon pain in gynecologic oncology did not support improved ergonomics for surgeons with the robotic system: in fact, gynecologic oncologists reported increased pain with use of the robotic system (26). Several studies have shown that TL is more cost-effective than RAS and open laparotomy for the treatment of endometrial cancer (27, 28). Barnett et al showed that laparoscopic hysterectomy was associated with an average cost savings of $1347 compared to robotic-

assisted hysterectomy and $2719 compared to open hysterectomy. Given changes in the American healthcare system, we expect increasing emphasis will be placed on cost-effective, quality gynecologic oncology care. As such, physicians will need to be well versed in all the available surgical techniques, including TL.

The majority of respondents to our 2012 survey reported some form of simulation training: 66% reported participating in animal-based training and 78% in laparoscopic simulation training at least annually. Despite this, there is no standardized curriculum for simulation training in gynecologic oncology fellowship training programs. Numerous studies, including randomized controlled trials, have shown that simulation improves intraoperative skills for learners (29–31). In addition, one study showed that skills were retained 5 months following completion of simulation (31). While these studies were performed mainly in residency programs, where residents were learning the basics of laparoscopy, simulation initiatives could also be applied to training in advanced laparoscopic techniques, including radical surgery and retroperitoneal dissection. Programs may not have the resources to develop a simulation program involving animal and cadaver models; however, objective improvement in surgical skills was seen even with simple box trainers. As technology progresses, the development of standardized simulation programs would allow for all fellows to receive some basic level of training to help equalize the experience received across fellowship programs and adequately prepare fellows for the operating room.

Another important issue in fellowship training is the objective assessment of surgical skills in the operating room and the definition of a minimum skill set required to successfully complete a gynecologic oncology fellowship. At present, the American Board of Obstetrics and Gynecology does not require a certain number of procedures in TL, RAS, or LESS for the successful completion of fellowship, and there are no objective assessments of the individual fellow's surgical skill. Sandadi et al showed in a retrospective study that fellows in an academic gynecologic oncology fellowship program participated in a median of 16 cases prior to completing a robotic-assisted hysterectomy and that based on operative times, fellows needed to complete at least 33 cases to become proficient (32). Further studies such as this need to be completed to help define the minimum number of procedures needed to become proficient in both MIS and open procedures. The exact number of procedures needed for a fellow to feel comfortable with a given procedure will inevitably vary from one fellow to another; however, defining a minimum number required will help to standardize the skill set of graduating gynecologic oncology fellows.

One limitation of our study is the response rate of only 40% among fellows-in-training. The experiences and beliefs of the respondents may not be representative of experiences and beliefs of fellows-in-training across the country. In addition, there may be a selection bias, in which fellows most interested in MIS completed the survey, which may make the results not representative of fellows-in-training in general. However, overall, our results show an increased utilization of MIS in fellowship training as well as an increase in the amount of MIS fellows predict they will perform once they complete fellowship, consistent with practice patterns across the country.

Fellowship programs need to develop a systematic approach to MIS training in general and training in the individual MIS platforms as they become more prevalent in gynecologic oncology. If programs are committed to training fellows in the use of TL, RAS, or LESS, they must at some point allow fellows to act as surgeon for more than 50% of the case in order for the fellow to be an independent surgeon at the conclusion of fellowship. Fellowship programs should also define and develop an objective assessment of minimum proficiency in MIS to ensure that fellowship programs are adequately preparing trainees for careers in gynecologic oncology.

## Acknowledgments

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**Table 1**

Demographic characteristics of respondents

| Characteristic | 2012 (N = 69) n (%) | 2007 (N = 78) n (%) | p value |
|---|---|---|---|
| Sex | | | |
| Male | 22 (33) | 30 (38) | 0.6024 |
| Female | 44 (67) | 48 (62) | |
| Expected year of completing fellowship | | | |
| 2012/2007 | 20 (29) | 23 (30) | |
| 2013/2008 | 24 (36) | 28 (36) | |
| 2014/2009 | 16 (24) | 20 (26) | |
| 2015/2010 | 7 (10) | 6 (8) | |
| Classification of current fellowship | | | |
| Mostly clinical | 54 (82) | | |
| Mostly research | 6 (9) | | |
| Other | 6 (9) | | |

[*] Not all respondents answered all questions.

**Table 2**

Percentage of respondents who believe various surgical procedures are appropriate for MIS

| Procedure | 2012 (N = 69) n (%) | 2007 (N = 78) n (%) |
|---|---|---|
| Diagnosis of adnexal mass | 65 (94) | 77 (99) |
| Uterine cancer | | |
| Laparoscopic hysterectomy and staging | 60 (87) | 72 (92) |
| Staging of unstaged disease in incidental uterine cancer | 62 (90) | 76 (97) |
| Cervical cancer | | |
| Laparoscopic total or radical hysterectomy and node dissection | 60 (87) | 42 (54) |
| Staging for locally advanced cancer | 39 (57) | 42 (54) |
| Trachelectomy and staging | 57 (83) | 25 (32) |
| Ovarian cancer | | |
| Placement of intraperitoneal catheters | 51 (79) | 58 (74) |
| Staging of unstaged disease in incidental ovarian cancer | 50 (77) | 72 (92) |
| Tumor debulking | 2 (3) | 76 (97) |

**Table 3**

Experience with and opinions about training in MIS

| Question and possible ratings | No. (%) of respondents | | |
|---|---|---|---|
| | RAS | LESS | TL |
| How would you rate your fellowship training [in each type of MIS]? | | | |
| Very good | 39 (60) | 5 (8) | 25 (38) |
| Good | 16 (25) | 9 (15) | 24 (37) |
| Neither good nor poor | 7 (11) | 7 (11) | 11 (17) |
| Poor | 1 (2) | 8 (13) | 4 (6) |
| Very poor | 0 (0) | 6 (10) | 0 (0) |
| N/A | 2 (3) | 27 (44) | 1 (2) |
| Total responses | 65 | 62 | 65 |
| During fellowship training, how much emphasis should be given? | | | |
| Maximum emphasis | 35 (55) | 5 (8) | 25 (40) |
| Some emphasis | 24 (38) | 22 (34) | 31 (49) |
| Neither too much nor too limited emphasis | 4 (6) | 5 (8) | 6 (10) |
| Limited emphasis | 1 (2) | 20 (31) | 1 (2) |
| Minimum emphasis | 0 (0) | 12 (19) | 0 (0) |
| Total responses | 64 | 64 | 63 |

**Table 4**

Number of MIS procedures performed monthly

| No. of procedures per month | 2012 (N = 62) | 2007 (N = 78) |
|---|---|---|
| | n (%) | n (%) |
| None | 5 (8) | 4 (5) |
| 5 | 7 (11) | 14 (18) |
| 6–10 | 13 (21) | 35 (45) |
| 11–20 | 23 (37) | 19 (24) |
| >20 | 14 (23) | 6 (8) |

**Table 5**

Predicted future practice patterns

| Question and possible ratings | No. (%) of respondents | | | |
|---|---|---|---|---|
| | Open | RAS | LESS | TL |
| How much MIS are you planning to perform upon completion of training? | | | | |
| Extensive | — | 18 (27) | 1 (2) | 12 (19) |
| Moderate | — | 39 (58) | 7 (11) | 34 (54) |
| Minimal | — | 6 (9) | 16 (25) | 14 (22) |
| None | — | 1 (2) | 26 (40) | 0 (0) |
| Don't know | — | 3 (5) | 15 (23) | 3 (5) |
| Total responses | — | 67 | 65 | 63 |
| After fellowship, what percent of your cases do you envision will be? | | | | |
| 25% | 19 (28) | 11 (16) | 40 (63) | 28 (42) |
| 26%–49% | 34 (51) | 31 (46) | 2 (3) | 29 (43) |
| 50% –75% | 11 (16) | 20 (30) | 2 (3) | 5 (8) |
| >75% | 1 (2) | 2 (3) | 0 (0) | 3 (4) |
| Don't know | 2 (3) | 3 (5) | 20 (31) | 2 (3) |
| Total responses | 67 | 67 | 64 | 67 |