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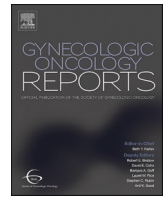
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Perspectives of gynecologic oncology fellowship training and preparedness for practice

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ABSTRACT

We aimed to examine the preparedness of recent gynecologic oncology fellowship graduates for independent practice. We conducted a web-based survey study using REDCap targeting Society of Gynecologic Oncology (SGO) members who graduated gynecologic oncology fellowship within the last six years. The survey included 52 items assessing fellowship training experiences, level of comfort in performing core gynecologic oncology surgical procedures and administering cancer-directed therapies. Questions also addressed factors driving participants' selection of fellowship programs, educational experience, research and preparedness for independent practice. A total of 296 participants were invited to complete the survey. Response rate was 42% with $n = 124$ completed surveys included for analysis. The highest ranked factor for fellowship selection was fit with program 36% ($n = 45$). Upon completing fellowship, most were uncomfortable performing ureteral conduit formation 84% ($n = 103$), ureteroneocystostomy 77% ($n = 94$), exenteration 68% ($n = 83$), splenectomy 67% ($n = 83$) and lower anterior resection 41% ($n = 51$). Most were comfortable managing intraoperative complications 85% ($n = 104$) and standard cancer staging procedures (range: 61%–99%). Majority were comfortable providing cancer directed therapies with chemotherapy 99% ($n = 123$), immunotherapy 84% ($n = 104$), and poly ADP-ribose polymerase (PARP) inhibitors 97% ($n = 120$). Upon completing fellowship, 77% ($n = 95$) report having mentorship that met their expectations during fellowship and 94% ($n = 116$) felt they were ready for independent practice. Majority of fellowship graduates were prepared for independent practice and felt comfortable performing routine surgical procedures and cancer directed treatment. However, most are not comfortable with ultra-radical gynecologic oncology procedures. Maximizing surgical opportunities during fellowship training and acquiring early career mentorship may help.

1. Introduction

Over the past decade there has been a growing emphasis on the preparedness of obstetrics and gynecology residents for subspecialty fellowship training (Urban et al., 2019,2018; Guntupalli et al., 2015; Doo et al., 2015). Urban et al revealed perspectives of current and former gynecologic oncology fellows with nearly 30% reported a lack of confidence in surgical skills entering fellowship. Furthermore, nearly a quarter of fellows reported concerns about insufficient medical knowledge when entering gynecologic oncology fellowship (Urban et al., 2019,2018). These studies have brought to light the importance of resident training preparation for gynecologic oncology fellowship.

Although readiness for fellowship training has garnered attention, few studies have addressed how current gynecologic oncology fellowship training is preparing gynecologic oncologists for clinical practice. Studies on the gynecologic oncology fellowship experience have focused on work satisfaction and work life balance during fellowship training (Scribner et al., 2001; Szender et al., 2016), however there remains little known on current and recent fellows' perceived clinical experiences and readiness for clinical practice upon completion of fellowship training. In a survey study nearly two decades ago, gynecologic oncology fellows reported their perceived comfort level in performing select surgical procedures during their fellowship training (Scribner et al., 2001). However, as practice and educational trends have shifted, these findings

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may no longer reflect the experiences of current graduating gynecologic oncology fellows.

As the armamentarium of cancer directed therapies has expanded rapidly, with recent advancements in cancer biology, medical therapy developments with the advent of novel and molecular therapies, development of new radiation techniques, and surgical advances, gynecologic oncologists have more knowledge to master. Additionally, as the radicality of surgical procedures has been influenced by more data regarding neoadjuvant chemotherapy and sentinel or individualized node dissection, surgical practice patterns have also shifted (Jones et al., 2018). These changes have likely affected gynecologic oncology practices and skills as well as impacted the fellowship training experience (Wallace et al., 2010; Hoffman et al., 2019; Hoffman et al., 2020; Martin et al., 2021). Thus, it is important to obtain real time perspectives of fellowship training in order to identify potential existing and evolving educational opportunities for improvement in gynecologic oncology fellowship training.

We hypothesized that these changes in the field of gynecologic oncology have had considerable effects on newly graduated fellows' readiness for gynecologic oncology practice. To gain understanding of this, we sought to assess the perceived fellowship experience and preparedness for gynecologic oncology practice of recent gynecologic oncology fellowship graduates upon completion of fellowship training.

2. Methods

We conducted a cross-sectional observational web-based survey study. Members of the Society of Gynecologic Oncology (SGO) who were listed as graduates from a gynecologic oncology fellowship in the United States between the years 2015 and 2020 were invited to complete the web-based survey. All survey invitations were sent to the listed email addresses (n = 297), via de-identified survey links using the University of California, Davis Institutional Research Electronic Data Capture (REDCap), a secure electronic web-based research study application. Email addresses of participants returned as undelivered were considered an invalid email address and excluded. Email invitations to participate in the survey were distributed over a six-week period between September 2020 through October 2020. Participants were sent an initial email invitation and non-responders were sent follow up email invitations during weeks two and four of the study period. This study was reviewed and determined exempt by the University of California, Davis Institutional Review Board.

We developed a survey consisting of 52-items assessing fellowship training experiences and level of comfort in performing core gynecologic oncology surgical procedures and administering cancer-directed therapies upon completion of gynecologic oncology fellowship. Clinical experience questions included management of obstetrical hemorrhage (cesarean or peripartum hysterectomy), intra-operative complications (bowel injury, ureteral injury, vascular injury) and management of post-operative complications (wound complications, take back to operating room for visceral injuries). Additional questions addressed factors driving participants' selection of fellowship programs, educational experiences during fellowship, research experience and their perception of preparedness for independent practice. Demographics included region of fellowship training, training site, and the participant's current gynecologic oncology practice settings.

Responses using the Likert scale were grouped into categories and reported as dichotomous responses, for example responses of "very comfortable" and "comfortable" were combined and reported as "comfortable", while responses of "uncomfortable" and "very uncomfortable" were grouped as "uncomfortable". Incomplete surveys were omitted and statistical analyses were performed using descriptive statistical methods and Chi-square test with a p value ≤ 0.05 considered statistically significant.

3. Results

There were 297 email invitations sent to participants meeting the study criteria. One email address was determined to be invalid, with a total of 296 survey invitations sent. One hundred and thirty-one respondents initiated the survey, seven only partially completed the survey and were excluded, resulting in 124 completed surveys included for a response rate of 42%. Most respondents were within four years out from completion of fellowship training. The regional location of fellowship training was proportionally represented amongst respondents and a majority (77%) trained at a university-based hospital only and (21%) at both university and community-based hospitals (Table 1). Half of the respondents reported working as a gynecologic oncologist at a university-based academic practice and a third (33%) at a community-based academic practice at the time of completing the survey.

The top ranked factor that influenced fellowship selection was 'fit with the program' 36% (n = 45) and the least ranked was for 'research opportunities' 5% (n = 6). Factors highly selected as one of the top three reasons for fellowship selection included the program's surgical cases and volume 69%, fit with the fellowship program 68% and fellowship faculty 61% (Fig. 1). Additional factors listed by respondents in an open-ended question regarding what other influences affected their fellowship selection are listed in (S2).

Gynecologic oncology surgical procedures that recent fellowship graduates reported feeling comfortable or uncomfortable performing are provided (Fig. 2). Majority of respondents (92%) were comfortable with ovarian cancer debulking procedures, (76%) radical hysterectomies and (84%) open staging procedures. However, there were lower rates of comfort to independently performing ultra-radical debulking procedures including splenectomy (34%), lower anterior resection with bowel anastomosis (59%) and diaphragmatic stripping (66%). Urologic procedures were associated with the highest rates of respondent reporting to be uncomfortable performing, with 84% and 77% of respondents uncomfortable performing ureteral conduits and ureteroneocystostomies, respectively. Additional procedures that respondents were uncomfortable performing include pelvic exenterations (68%) as well as minimally invasive *para*-aortic lymph node dissection (40%). All respondents were comfortable performing minimally invasive (MIS) hysterectomies. Procedures with the highest rates of respondents being uncomfortable performing did not differ by year of fellowship graduation for most procedures (S3). This was with the exception of those who graduated in later years reporting being more comfortable with minimally invasive *para*-aortic lymph node dissection (p = 0.0049).

Upon graduating fellowship, most respondents were comfortable managing intra-operative and post-operative surgical complications as

Table 1
Cohort characteristics.

N = 124 (%)	
Graduation year	
2015–2016	50 (40.3%)
2017–2018	38 (30.7%)
2019–2020	36 (29.0%)
Regional location of fellowship	
West	22 (17.7%)
Midwest	33 (26.6%)
Northeast	35 (28.2%)
South	34 (27.4%)
Fellowship affiliation	
University-based hospital only	95 (76.7%)
Community-based hospital only	3 (2.4%)
Both university and community hospital	26 (20.9%)
Current gynecologic oncology practice	
University-based/academic	62 (50%)
Community-based/academic	41 (33.1%)
Community-based	13 (10.5%)
Private	8 (6.5%)

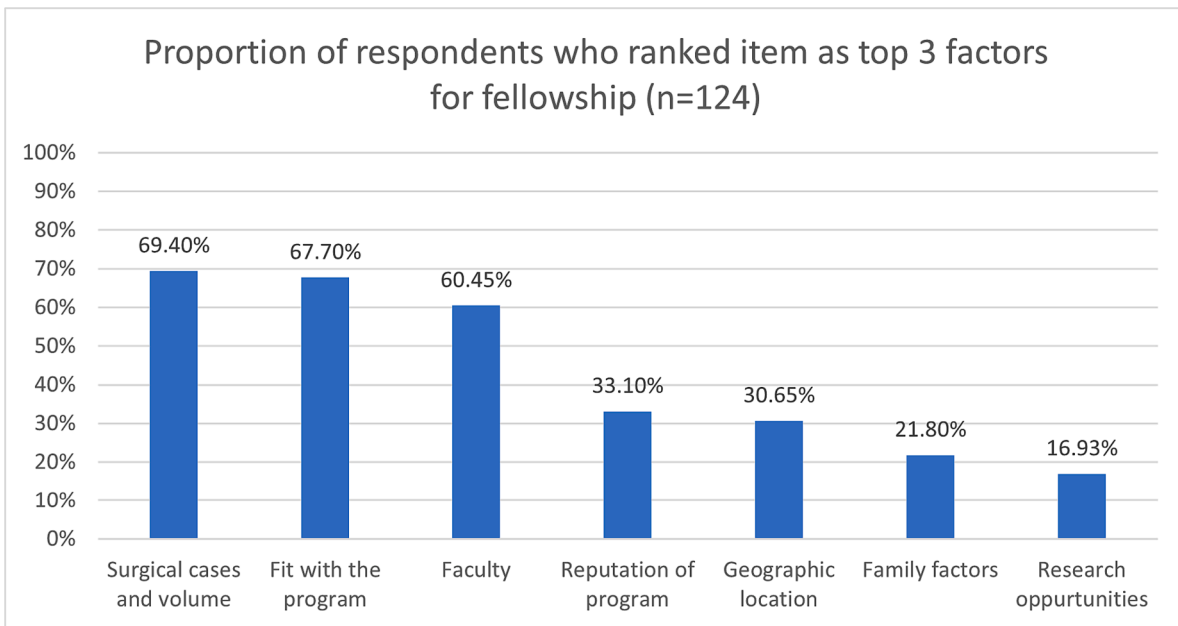


Fig. 1. Factors that respondents selected as their top three reasons that influenced fellowship program selection.

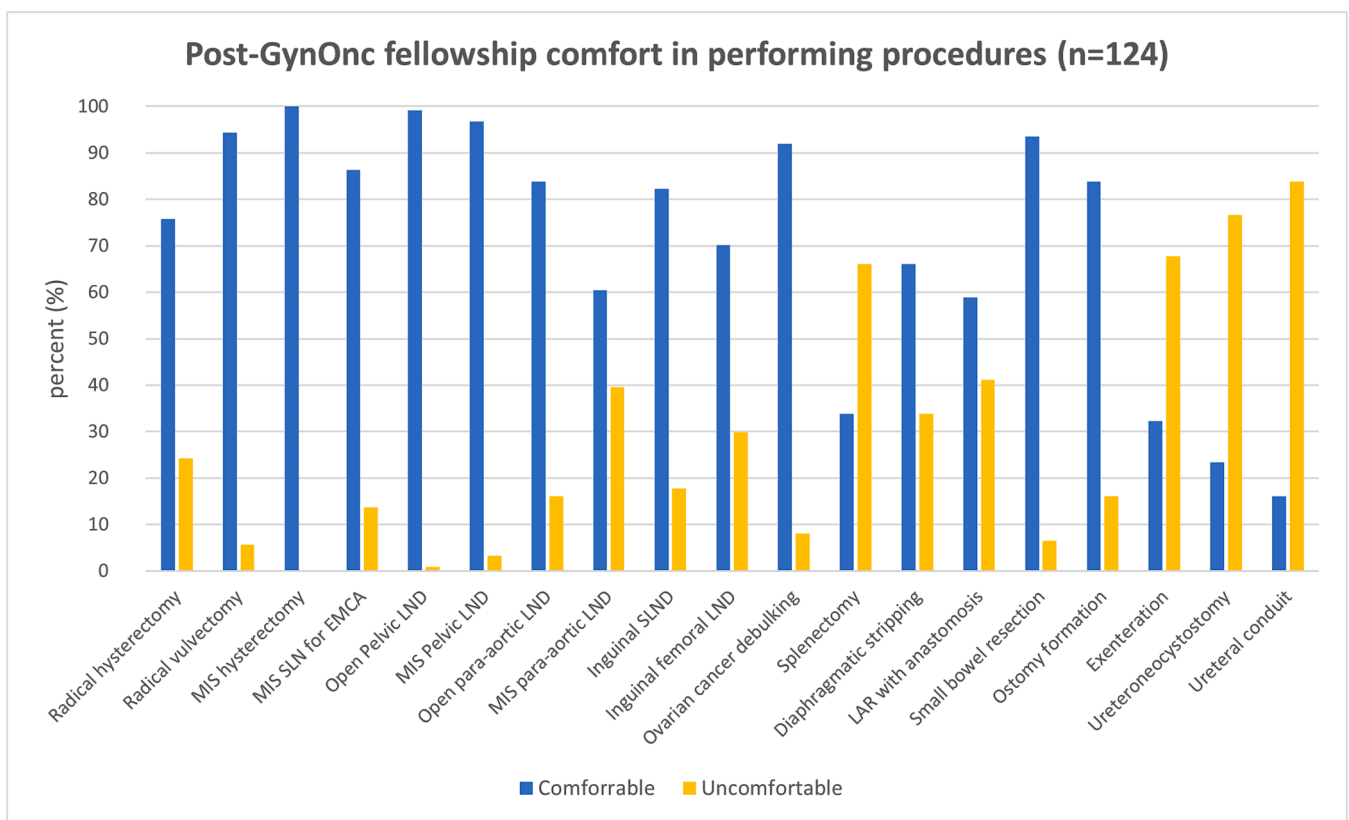


Fig. 2. List of gynecologic oncology procedures respondents felt comfortable performing after completion of gynecologic oncology fellowship.

well as routine gynecologic oncology clinical practices (Table 2a). Over 90% reported treating patients with cancer directed therapies in their current practice. Majority were comfortable with treating patients with chemotherapy (99%), immunotherapy (70%) and PARP inhibitors (97%) as well as the management of treatment side effects (Table 2a). Eighty one percent reported learning cancer directed therapy treatments primarily from gynecologic oncologists while 19% learned from both

gynecologic and hematologic/medical oncologists. Most respondents (94%) felt prepared to practice independently as a gynecologic oncologist upon completion of fellowship.

Fellowship educational and research experiences were evaluated (Table 2b). Eighty two percent of respondents reported having adequate dedicated didactics experiences in fellowship. Two thirds of respondents felt confident that their thesis project was or will be suitable for

Table 2a
Fellowship clinical experiences.

N = 124, n (%)	
Upon completing fellowship, responders reported feeling comfortable with:	
Management of OB hemorrhage	110 (88.7%)
Management of intra-operative complications	105 (84.7%)
Management of post-operative complications	117 (94.4%)
Leading goals of care discussions	124 (100%)
In fellowship, responders reported learning cancer directed therapy treatments from:	
Gynecologic oncologists	101 (81.5%)
Hematologic/medical oncologists	0
Both gynecologic and hematologic/medical oncologists	23 (18.6%)
Upon completing fellowship, responders reported feeling comfortable with:	
Treating patients with chemotherapy	123 (99.2%)
Managing side effects of chemotherapy	123 (99.2%)
Treating patients with immunotherapy	104 (83.9%)
Managing side effects of immunotherapy	87 (70.2%)
Treating with PARP inhibitors	120 (96.8%)
Managing side effects of PARP inhibitors	117 (94.4%)
Do you treat patients with cancer directed therapies in your current practice?	
Yes	113 (91.1%)
No	11 (8.9%)
Respondents feels prepared to practice independently as gynecologic oncologist upon fellowship graduation	117 (94.4%)

Table 2b
Fellowship academic experience.

N = 124, n (%)	
During fellowship, respondents' training experience included dedicated experience/rotation with:	
Surgical simulation-based training	55 (44.4%)
Surgical oncology service	23 (18.6%)
Urology/urologic oncology service	20 (16.1%)
Colorectal surgery service	35 (28.2%)
Intensive care unit (ICU) service	60 (48.4%)
Palliative care service	46 (37.1%)
Radiation oncology service	89 (71.8%)
Respondents reported adequate didactics experience in fellowship	102 (82.3%)
Respondents reported mentorship during fellowship met expectations	96 (77.4%)
Respondents feels prepared to take gynecologic oncology subspecialty oral boards upon completing fellowship	97 (78.2%)
Respondent reported completing thesis project with:	
Laboratory project	75 (60.5%)
Clinical project	33 (26.6%)
Both laboratory and clinical based project	13 (10.5%)
Neither laboratory or clinical based project	3 (2.4%)
Respondents reported experience with thesis project:	
My research project was assigned to me	46 (37.1%)
I was given options and selected what interest me	34 (27.4%)
I developed my project based on my interests	44 (35.5%)
Respondents reported feeling confident their thesis project will be suitable for oral boards defense	82 (66.1%)
Respondents feels prepared to continue clinical research	100 (80.7%)

subspecialty boards defense and 78% felt prepared to take the gynecologic oncology subspecialty oral boards. Dedicated educational rotations and experiences outside of the gynecologic oncology subspecialty during

fellowship training were less likely experienced in urology/urologic oncology (16%), surgical oncology (19%) and colorectal surgery (28%). Of those who did not have off service rotations in fellowship, more than half reported that they would have preferred off-service rotation experiences in urologic oncology 57%, surgical oncology 58% and colorectal surgery 73% (S4). Respondents expressed additional preferences regarding additional off service experiences they would have liked having more exposure to during fellowship training in an open-ended response listed in (S5).

4. Discussion

Importantly, our results suggest that recent fellowship graduates feel prepared to practice independently as gynecologic oncologists. It appears we are doing a lot of things right. Most reported being comfortable in performing routine gynecologic oncology procedures such as staging procedures. Most also felt prepared to handle intraoperative complications, and obstetric hemorrhage, some of the more emergent and stressful surgical experiences there are. It was also interesting that proficiency with MIS lymph nodes increased significantly over a relatively short survey time period.

However, there was consistently a perceived deficiency of comfort level regarding more ultra-radical cancer debulking procedures, such as splenectomies, diaphragmatic stripping, and low anterior bowel surgeries. Reasons for this may be inherent to the trends in ovarian cancer treatment paradigms, particularly with an increased use of neoadjuvant chemotherapy which has shown to be non-inferior to primary debulking surgery and is associated with less radical procedures at the time of debulking (Patel et al., 2021; Vergote et al., 2010; Fagotti et al., 2020). Additionally, advancements in radiotherapy and targeted therapy have provided additional treatment options for cervical cancer recurrences, conceivably contributing to less pelvic exenterations with diverting urologic procedures. A comparison of historical to current data on the prevalence of ultra-radical procedures performed in gynecologic oncology would help gain insight into this. Recent fellows may be exposed to fewer ultra-radical procedures in training and subsequently have less experience performing these procedures as junior faculty. At least half of responders preferred off service experiences which could increase exposure to these more radical procedures before independent gynecologic oncology practice.

Given the changes in surgical practice in gynecologic oncology, it seems evident that experiences of gynecologic oncology training would be affected. A recent study looking at a 20-year trend in gynecologic oncology fellowship training surgical volume highlighted a decline in radical surgeries and potential implications in training (Hoffman et al., 2019). Furthermore, Hoffman and colleagues (Hoffman et al., 2020) reviewed concerns in future training that would need to be addressed to accommodate the shifts in the field, especially surgical experience. These articles along with findings in our study is not to criticize current training in gynecologic oncology, but rather to identify areas in surgical training that need innovative approaches to compensate for potential deficits in radical surgical training due to the changing field of gynecologic oncology. This highlights the potential value of junior faculty to seek surgical mentorship early in their career which could help expand confidence and their skill set in this portion of their practice. Regarding other aspects of clinical practice, most respondents were comfortable with cancer directed treatments including chemotherapy, immunotherapy and PARP inhibitors. However, with continued innovations of novel treatments, the practice of gynecologic oncology remains to be immersed with targeted therapies which will necessitate ongoing education for its application, both for trainees as well as practicing gynecologic oncologists.

Strengths to our study include a comprehensive survey and a decent response rate. Weaknesses include the subjectivity of recall bias and the survey did not capture those who are not registered as a SGO member. In addition, 58% of gynecologic oncologists who did not respond were not

reflected in the results of this study. Potential confounding factors include the unknown number of faculty, fellows and procedures performed in fellowship which could reflect differences in reported comfort levels of procedures. Additionally, imposter syndrome or other personal experiences may influence comfort level.

Our results suggest that the academic experience during fellowship were perceived to be appropriate for preparation to be a gynecologic oncologist. We found that most respondents had adequate didactics, felt confident that their thesis is suitable for oral boards and were prepared to continue clinical research post-fellowship. Furthermore, most feel prepared to take the gynecologic oncology subspecialty oral board exam. These results suggest that the focus on research and education continue to be fostered in current gynecologic oncology fellowship specialty training. Cohen et al (Cohen et al., 2012) previously showed the importance of mentorship during gynecologic oncology fellowship and research productivity. Over 77% of respondents had satisfactory mentorship, which may be an influential factor for the positive fellowship academic experience observed in this study.

In conclusion, this study provides an update of the perception of readiness for gynecologic oncology practice after fellowship training. The data identified that graduates are prepared for independent practice, while also identifying opportunities for improved training in the evolving field of gynecologic oncology. Further studies are needed to identify strategies to address this during and post fellowship training to allow for early career gynecologic oncologists to feel as competent as possible.

Author Contributions: Nancy T. Nguyen: Conceptualization, methodology, data collection, interpretation of data, writing original draft, writing review and editing; Allyson M. Jang: methodology, data collection, writing review and editing; Tali Pomerantz: writing review and editing; Gerald S. Zavorsky: writing review and editing; Gary Leiserowitz: writing review and editing; Rebecca A. Brooks: Conceptualization, methodology, supervision, writing review and editing.

CRedit authorship contribution statement

Nancy T. Nguyen: Writing – original draft, Writing – review & editing, Conceptualization, Methodology. **Allyson M. Jang:** Methodology, Writing – review & editing. **Tali Pomerantz:** Writing – review & editing. **Gerald S. Zavorsky:** Writing – review & editing. **Gary Leiserowitz:** Writing – review & editing. **Rebecca A. Brooks:** Conceptualization, Methodology, Writing – review & editing, Supervision.

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Rebecca A. Brooks disclosure: Speaker's bureau for AstraZeneca and advisory board for Merck which are unrelated to the topic of this manuscript. Nancy T Nguyen, Allyson M Jang, Tali Pomerantz, Gerald S Zavorsky and Gary Leiserowitz all have nothing to disclose.

Appendix A. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.gore.2023.101319>.

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