Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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General surgery chief residents' perspective on surgical education during the coronavirus disease 2019 (COVID-19) pandemic

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ABSTRACT

Background: The coronavirus disease 2019 pandemic has negatively affected the training of general surgery chief residents during the last trimester of their residency. Our goal was to evaluate the educational concerns of graduating general surgery chief residents during the coronavirus disease 2019 pandemic.

Methods: An anonymous web-based survey was distributed between March 31 and April 7, 2020 to all current general surgery chief residents from 6 academic medical centers in Boston, Massachusetts. Interviews were also conducted with attending surgeons from participating institutions.

Results: A total of 24 of 39 general surgery chief residents participated in our survey (61.5% response rate). General surgery chief residents were most concerned about the potential delay in the date of board examinations, followed by not feeling adequately prepared for the board examinations and a possible delay in the graduation date. Whereas not having enough cases to feel ready for fellowship or job and not achieving a sufficient number of cases to meet the requirements for graduation were only moderately concerning to chief residents, attending surgeons stressed a greater importance on the loss of the operative experience as nearly all (93.3%) of them suggested a personalized approach for additional general surgery training during fellowship or job onboarding.

Conclusion: In addition to the dramatic impact on public health, the coronavirus disease 2019 outbreak has also caused unprecedented changes to surgical education. Therefore, creative interventions are needed to help general surgery chief residents successfully transition into the next phase of their surgical career.

Introduction

Recognizing the rapidly evolving challenges faced by hospitals during the coronavirus disease 2019 (COVID-19) outbreak, on March 13, 2020, the American College of Surgeons recommended healthcare institutions and surgeons to curtail elective surgical procedures to allow for resources to be reallocated toward caring for the coronavirus patients.[1] Furthermore, following the Accreditation Council for Graduate Medical Education (ACGME) guidelines,[2] in early April 2020 many of the residency programs in Boston declared a Stage 3 pandemic emergency status, which allows more flexibility for the workflow of residents to best care for patients during the pandemic. To minimize coronavirus exposure, many general surgery residency programs have instituted a shift-based schedule that allows residents to alternate between an equal number of clinical work days and days off.[3–5] In addition, many surgery residents are now directly involved in the medical care of COVID-19 patients.

As an unintended consequence of these necessary changes, the operative education of the surgical residents has undoubtedly been affected. Although the epidemic affects the surgical training of every resident, it particularly affects the chief residents as they get ready to complete the last trimester of their residency, prepare for

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the American Board of Surgery examinations, and move on to fellowship training or a job.

The objective of this study is to evaluate the concerns of general surgery chief residents regarding the impact of the COVID-19 pandemic on their readiness to complete the residency training and transition into the next phase of their surgical career.

Methods

A list of possible survey questions was generated from interviews with general surgery chief residents. Survey validity was assessed via a 30-minute focus group session with 5 general surgery chief residents. After the survey was pilot-tested in a small group of 5 general surgery chief residents, we modified the survey questions based on their feedback.

Using an internet-based survey tool (SurveyMonkey.com; SurveyMonkey, San Mateo, CA), a questionnaire was distributed to all 39 current general surgery chief residents (both women and men) from 6 academic medical centers in Boston, Massachusetts. The survey was distributed between March 31 and April 7, 2020, and was composed of 10 questions and associated responses that consisted of the "best choice" answer or ranking on a 5-point Likert scale (Table 1).

To improve the response rate, subsequent follow-up emails were sent 2 and 5 days after the initial query. The survey response tool was set up such that each participant was able to respond only once to the survey. All the data were collected in accordance with the requirements of our Institutional Review Board after an exemption status was obtained.

Completion of the survey was voluntary, and anonymity was ensured by not requiring any personal identifiers. Reviewers were blinded to the respondent's academic program. Only surveys with >80% of questions completed were included in the analysis.

Interviews were also conducted via phone calls and e-mails with 30 attending surgeons, including 2 program directors and 4 assistant program directors from the 6 academic institutions in Boston to evaluate their recommendations for addressing the impact of the COVID-19 pandemic on the training of their chief residents.

Results were calculated based on the number of responses received to each individual question. The Mann-Whitney rank sum test was used to compare ordinal scale variables. Data are presented as mean (± standard error of the mean) or median and interquartile range (Q1–Q3) where appropriate. A P value of <.05 was considered statistically significant.

Table I
Survey questions

1. What is your age group?
   a. 30-34 years old
   b. 35-39 years old
   c. 40-45 years old
   d. Older than 45 years
   e. Prefer not to say
2. What is your gender?
   a. Female
   b. Male
   c. Prefer not to say
   d. Prefer to describe myself:
3. What is your marital status?
   a. Single, never married
   b. Married or domestic partnership
   c. Widowed
   d. Divorced
   e. Separated
   f. Prefer not to say
4. How many total major cases have you performed and/or logged on the ACGME website?
5. How many "surgeon chief" cases have you performed and/or logged on the ACGME website?
6. Are you pursuing a fellowship after graduation?
   a. Yes
   b. No
   c. Prefer not to say
7. If yes, what kind of fellowship are you pursuing?
   a. Breast surgery
   b. MIS/bariatric surgery
   c. Cardiothoracic surgery
   d. Pediatric surgery
   e. Plastic surgery
   f. Surgical oncology
   g. Trauma/surgical critical care
   h. Vascular surgery
   i. Other:
8. If you are not pursuing a fellowship, what type of surgical practice are you planning to join?
   a. Academic
   b. Private
   c. Other:
9. On a scale of 1 to 5 (1 = least concerning; 5 = most concerning), what is your concern level caused by each of the following situations as related to the COVID-19 impact on your surgical training?
   a. Not having a sufficient number of cases to meet the ACGME requirements for graduation
   b. Not having enough cases to feel ready for fellowship or job
   c. Potential delay of the graduation date
   d. Not feeling adequately prepared for the board exams
   e. Potential delay in the date of board exams
10. In light of the impact of COVID-19 on your final year of residency training, what changes, if any, would you propose to make up for the loss of the operative experience?
    a. No changes; continue graduation and move onto fellowship/job as scheduled
    b. Delay graduation and fellowship/job start date
    c. Move on to fellowship/job as scheduled but provide additional general surgery training during the fellowship/job onboarding process
    d. Other

MIS, Minimally invasive surgery.

Results

Over a collection period of 7 days, a response rate of 61.5% (24/39 chief residents) was achieved. Both female (54% [13/24]) and male (46% [11/24]) chief residents participated in our survey.

The mean number of total major cases performed during their residency was 1113 (±39), whereas the mean number of cases performed as chief residents was 222 (±12), meeting the minimum ACGME requirement of 850 total and 200 chief cases.

Most chief residents (87.5% [21/24]) surveyed are planning to pursue a fellowship, with the top 3 choices being cardiothoracic surgery, surgical oncology, and pediatric surgery. Furthermore, the majority of chief residents (62.5% [15/24]) plan to pursue an academic career.

The most significant concern related to the COVID-19 impact on their surgical training was a potential delay in the date of board examinations (median 4.0 points [Q1–Q3: 2.0–5.0]), followed by not feeling adequately prepared for the board examinations (3.0 points [Q1–Q3: 2.0–3.0]), a possible delay in the graduation date (3.0 points [Q1–Q3: 1.0–3.0]), not having enough cases to feel ready for fellowship or job (2.0 points [Q1–Q3: 1.0–3.0]), and not achieving a sufficient number of cases to meet the ACGME requirements for graduation (1.0 points [Q1–Q3: 1.0–1.0]) (Table 2).

When asked about ways to address the loss of the operative experience as a result of the COVID-19 outbreak, the majority of chief residents (75% [18/24]) proposed to continue graduation and start their fellowship/job as scheduled without any specific changes. Fewer respondents agreed with continuing graduation as scheduled but providing additional general surgery training during the fellowship/job onboarding process (16.7% [4/24]) or the delay of graduation and the start of fellowship/job (8.3% [2/24]) (Fig 1).

Table II
Chief residents' concerns related to the COVID-19 impact on their surgical training

Concern	Median Likert scale points	Interquartile range (Q1–Q3)	Variance
Potential delay in the date of board exams	4.0	2.0–5.0	2.3
Not feeling adequately prepared for board exams	3.0	2.0–3.0	1.5
Potential delay in the graduation date	3.0	1.0–3.0	1.5
Not having enough cases to feel ready for fellowship/job	2.0	1.0–3.0	1.8
Insufficient number of cases to meet ACGME requirements	1.0	1.0–1.0	0.7

Interviews with attending surgeons from participating institutions revealed that 28 out of 30 (93.3%) agreed with continuation of graduation for chief residents as scheduled and to use an individualized approach to providing additional general surgery experience and mentorship during fellowship or job onboarding, based on factors such as operative case logs and the type of fellowship or practice. Only 2 attending surgeons (6.7%) were in favor of delaying their chief residents' graduation to improve their operative experience.

Discussion

Our study evaluates the impact of the COVID-19 pandemic on general surgery chief residents, with specific concerns regarding graduation, board examination, and preparedness for fellowship or job.

Our survey revealed that surveyed chief residents were not as concerned with the ACGME case requirements but were more concerned in the potential delay in the date of board examinations and inadequate preparedness for these examinations. Recent changes to the American Board of Surgery whereby they now accept a 10% decrease in the number of total operative cases required for residency graduation may have played a role in these data.[6] More importantly, although the total number of major cases and surgeon chief cases required for graduation are 850 and 200, respectively, the chief residents participating in our study had already exceeded these requirements by achieving an average of 1113 and 222 cases, respectively.

Although the loss of operative experience during the last trimester of the general surgery residency was only a moderate concern for the surveyed chief residents, it was given a much greater importance by their attending surgeons. Near all attending surgeons interviewed (93.3%) suggest offering a personalized approach for additional general surgery training during fellowship or practice. This is in line with reported differences in the perceptions of readiness to practice independently between general surgery chief residents and attending surgeons.[7–12]

The literature suggests that most graduating general surgery residents feel confident in their skills.[7,8] Most chief residents are pursuing fellowships not because of the perceived lack of confidence in their general surgery ability but because of a perceived need for their subspecialty training, especially in esophageal, hepatopancreatobiliary, and vascular surgery.[8–11]

However, the literature does indicate that attending surgeons increasingly perceive graduating general surgery residents as inadequately prepared to enter subspecialty fellowship training or independent practice.[12,13]

The impact of COVID-19 outbreak on chief residents' education is not limited to the quantitative loss of operative experience. During these challenging times, other critical components of chief residents' education that could be affected include graduated responsibility in patient care, maturation of clinical judgment,

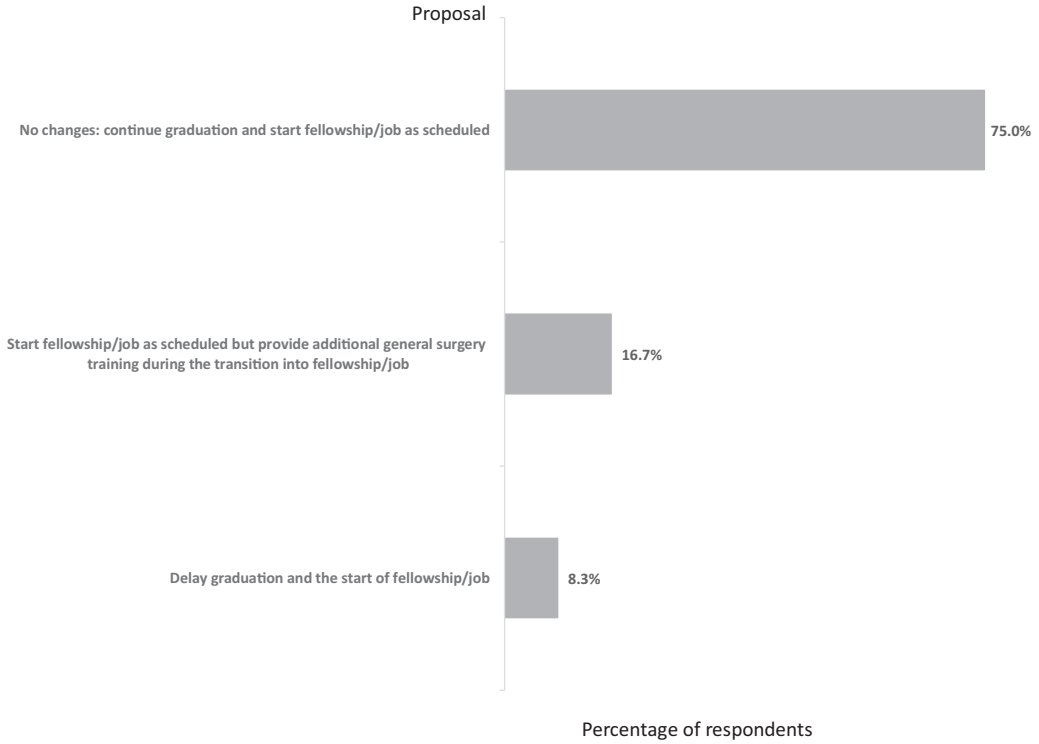

Fig 1. Chief residents' proposals to address effects of COVID-19 on their operative experience.

teaching, and leadership skills. Therefore, intake assessments of graduating general surgery residents during the fellowship or job onboarding processes may play a role in identifying specific gaps that require targeted interventions.

The importance of intake assessments of newly trained surgeons is well recognized by surgical leaders.[14] However, standardized processes to assess the knowledge and skills of graduating surgical trainees are less well delineated. In 2012 the American College of Surgeons Division of Education, in collaboration with ACGME, organized a National Consensus Conference on Transition to Practice in Surgery with the goal to develop strategies to address various challenges relating to the transition from surgical training to surgical practice.[14] Specific recommendations for intake assessments included reviewing case logs from the period of resident training; evaluating reports from the residency program director; direct communication with the residency program; assessments in simulated environments; and global, 360-degree evaluations of clinical and technical skills, judgment, communication skills, professionalism, teamwork, and systems-based practice.[14] Based on the intake assessment during the onboarding process, specific interventions could then be instituted to address the needs of graduating general surgery residents.

Although the operative experience during the COVID-19 outbreak is limited to emergency or urgent operations, general surgery residency programs in Boston, like many other programs throughout the country, are engaging their residents in virtual education, including simulated oral board examinations, didactic sessions, journal clubs, technical and clinical skill sessions in simulation centers, and weekly quizzes on the Surgical Council on Resident Education portal.[15] Continuing surgical education during these challenging times is also helpful in preparing the chief residents for their board examinations, which was one of their major concerns reported in our survey.

Several chief residents also expressed concerns about the possibility that the COVID-19 pandemic continues beyond the graduation and well into the fellowship or practice, thus affecting the transition from residency, which is a critical time in a surgeon's career. Therefore they would benefit from continued support throughout the entire duration of the coronavirus pandemic.

The present study has several important limitations. First, the number of participants in our study was small, consisting of 24 general surgery chief residents and 30 attending surgeons. Although small sample sizes are common in surgical education research, we attempted to minimize the effect of small sample size on the validity and generalizability of our findings by including participants from 6 independent academic institutions. Second, despite the multi-institutional nature of our study, all participating institutions are located in the Boston area. Geographic differences could exist such that the training profile of the participating Boston area surgery programs could be different than other programs in the United States. For instance, the proportions of surveyed chief residents who are entering a fellowship (87.5%) or ultimately pursue an academic career (62.5%) are higher than the national rates.[16,17] Future research could usefully examine the impact of the COVID-19 pandemic on the education of general surgery chief residents across the country. Third, with a response rate of 61.5%, there are unaccounted perspectives, but we assume the responses collected are representative of the whole. By querying 6 distinct training programs in an anonymous manner, we aimed to minimize the response bias; however, this remains an inherit limitation to all survey studies.

Fourth, the survey was entirely anonymous, and we were blinded to the respondent's academic program. This prevented us from tracking the data back to individual institutions to perform comparisons among different surgery programs with regard to operative logs and preparedness for the board examinations.

Despite these important limitations, we hope that our study will improve our understanding of the educational challenges faced by chief general surgery residents during the COVID-19 pandemic. Our findings should stimulate further discussions by chief residents and attending surgeons to identify creative solutions for addressing the loss of operative education in their final, critical year of residency.

In conclusion, the COVID-19 outbreak is an unprecedented event, and its impact on surgical training should be matched by a historical response from our surgical leaders and educators. Our data suggest the need to establish a special surgical education task force to facilitate the transition of current general surgery chief residents into the next phase of their surgical career.

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Conflict of interest/Disclosure

The authors report no proprietary or commercial interest in any product mentioned or concept discussed in this article.

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