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OBJECTIVE: We sought to characterize General Surgery residency program directors’ (PDs) baseline perspective on how the COVID-19 mandated changes to the recruitment and interview processes impacted how the PDs evaluated and recruited the applicants.

DESIGN: An anonymous cross-sectional questionnaire survey.

SETTING: A large, mid-western academic general surgery residency program.

PARTICIPANTS: 47 PDs of Accreditation Council for Graduate Medical Education (ACGME) accredited General Surgery residency programs.

RESULTS: During the virtual-only interviews during the COVID-19 pandemic-era 2020-21 General Surgery residency application cycle, PDs shifted their focus to virtual outreach efforts and bolstered social media presences to recruit strong applicants. Also, our study found statistically significant changes to the increased value of letters of recommendation (LORs) for the PDs when assessing an applicant’s commitment to surgery. These findings suggest that the necessity of adapting to the virtual-only interview format significantly altered how the PDs recruited and evaluated applicants for the General Surgery residency match.

CONCLUSIONS: A complete replacement of the in-person interviews with virtual-only interviews may serve as an avenue to maximize the benefits of the virtual interview format. Furthermore, COVID-19 pandemic has normalized the growing social media presence of residency programs, adding to the changing landscape of recruiting and interviewing applicants for General Surgery residency match.

INTRODUCTION

National Residency Matching Program (NRMP) along with the Electronic Residency Application Service (ERAS) support residency applicants and programs in the match process annually. Programs invest significant financial resources, personnel, and time in their efforts to advertise their strengths and to identify and attract the strongest candidates. For the interview process alone, an estimated budget of $60,000-$100,000 was reported for general surgery residency programs in 2017.

Coronavirus disease 2019 (COVID-19) pandemic has disrupted medical education in innumerable ways due
to nationwide travel restrictions and social distancing measures. As these restrictions remained in place well into 2020, the inevitable change to a virtual residency match process for the 2020-2021 cycle became evident. Coordinated efforts from medical schools, residency programs, and various national medical provided guidance for residency programs in conducting virtual interviews and the subsequent match process. While literature reports overall user satisfaction with recently conducted virtual fellowship interviews for both fellowship interviewers and applicants, it is still too early to determine if virtual can replace in-person interviews.

Even prior to the changes necessitated by the COVID-19 pandemic, questions had been raised regarding the residency recruitment process. Specifically, virtual interviews using teleconferencing and video-conferencing had been explored to mitigate the significant cost and time constraints on both residency programs and applicants with overall positive responses from applicants. In addition, other recruitment strategies utilizing social media has been garnering increased interest as social media has significantly changed how applicants and residency programs gain access to one another. Prior literature has focused on applicants’ experiences and perspectives, and limited work currently exists on the residency programs’ perspective on these recruitment strategies.

In this study, we investigated the general surgery program directors’ baseline perspective on how COVID-19 mandated changes the interview process and distanced recruitment strategies impacted how PDs would evaluate applicants. Specifically, we sought to identify any novel or updated recruitment strategies that can be incorporated into future practices.

**METHODS**

An anonymous cross-sectional questionnaire survey was utilized on a secure web-based platform (Qualtrics, Provo, UT, USA). Inclusion criteria for participants was the PDs of Accreditation Council for Graduate Medical Education (ACGME) accredited general surgery programs. The survey questionnaire was generated as an iterative process which included the input from various members of our institution’s surgical education research group and several revisions in terminology and layout of the survey questionnaire. The questionnaire was pilot tested with a surgery attending at our institution in order to ensure that questions were worded appropriately, the Likert scale’s anchors were not ambiguous, and the survey questionnaire on Qualtrics did not lead to any technical errors. Adherence to the guidelines from Survey Design Checklist was assured. The instrument consisted of 10 questions requiring approximately 5 minutes to complete and was created with the intention of minimizing study break-off by keeping the questionnaire length succinct.

The instrument gathered demographic data of residency program characteristics including the region of the residency program, type of training program (university-affiliated academic, independent academic, military, community, other), number of categorical residents per year, and the required length of training. PDs were asked to assess the value of the listed factors in determining the applicants’ commitment to surgery during application cycles prior to and during the COVID-19 pandemic. PDs rated each factor on a 5-point anchored Likert scale with 0 representing no added value to 4 representing extremely valuable. Lastly, PDs assessed the importance of recruitment activities utilized by their program such as their program website and meet & greet sessions at national conferences to attract applicants during application cycles prior to and during the COVID-19 pandemic. Participants had the option to write in additional information and assess its value as well.

This survey was approved by the Association of Program Directors in Surgery (APDS) - Research Committee to be distributed electronically through the APDS listserv which includes approximately 280 PDs, and data collection occurred from December 2020 to January 2021 which included two reminders that were a week apart. The Institutional Review Board at the Cleveland Clinic reviewed this study and found it exempt.

Descriptive statistics were used to analyze the demographic data of the respondents. Wilcoxon signed rank test was utilized to analyze the differences in the value of factors utilized by the PDs to assess applicants’ commitment to surgery before and after the COVID-19 pandemic. Similarly, Wilcoxon signed rank test was used to analyze the difference in the mean value of importance in recruitment activities enacted by PDs to attract strong applicants before and after the COVID-19 pandemic. All data analyses were performed using R Statistics 4.0.2 (R Foundation for Statistical Computing, Vienna, Austria). Two tailed values of p <0.05 were considered statistically significant.

**RESULTS**

A total of 47 PDs completed the instrument. The demographic information is summarized in (Table 1). Wide geographical representation were achieved from the responses: 6 western, 3 southwestern, 10 mid-western, 9 southeastern, and 19 northeastern programs. Of the 47 responses, program type consisted of 32 academic-university affiliated, 7 academic-independent, 2 hybrid
community-academic, and 6 community programs. The program duration ranged from 5 to 7 years. The median number of the categorical residents in the program was 5 residents (range 2-12).

When asked to rate the value of each application factor listed to determine an applicant’s commitment to surgery, PDs rated interview day impression and letters of recommendation (LORs) as the two most valuable factors during applications before and during the COVID-19 pandemic. While the average value for interview day impression changed from before the COVID-19 pandemic to during the COVID-19 pandemic (3.57, 3.17, p < 0.001), the value for LORs increased from the before COVID-19 to the during COVID-19 pandemic (2.83, 3.04, p = 0.02) (Table 2).

Respondents also had the opportunity to write-in additional application factors not listed in the question that their programs utilized to determine an applicant’s commitment to surgery. These additional responses by 17 PDs were organized into six major themes and presented in (Table 3).

PDs were then asked to rate the importance of 6 recruitment activities listed for application cycles before and during the COVID-19 pandemic. Away rotations was rated as the top 2 most important recruitment activities prior to the COVID-19 pandemic (2.28). For the application cycle during the COVID-19 pandemic, PDs reported the program website as the most important recruitment activity (3.2). PDs’ reported away rotations and meet & greet events at national conferences as recruitment efforts significantly decreased for the application cycle during the COVID-19 pandemic compared to before. The importance of program website, social media, virtual formal information sessions, and virtual informal meet & greet sessions as recruitment efforts increased significantly during the COVID-19 pandemic (p < 0.001).

PDs also had the opportunity to write-in additional recruitment activities not listed in the question that their program utilize during the COVID-19 pandemic. 7 PDs’ responses reported virtual outreach efforts such as open invitations to virtual conferences and lab meetings; virtual away rotation; institution-initiated efforts such as hospital video tours, direct outreach efforts to medical schools, and word-of-mouth referrals from former residency graduates. Not all factors that were written-in included a rating value and therefore, the filled in factors were not included in the quantitative statistical analysis.

**TABLE 1.** Survey Respondents’ Demographic

| Program region, n (%) | n = 47 |
|-----------------------|--------|
| Western               | 6 (13%)|
| Southwestern          | 3 (6%) |
| Midwestern            | 10 (21%)|
| Southeastern          | 9 (19%) |
| Northeastern          | 19 (41%)|

| Program type, n (%) | n = 47 |
|---------------------|--------|
| Academic – University-affiliated | 32 (68%) |
| Academic – Independent    | 7 (15%) |
| Hybrid community – Academic | 2 (4%)  |
| Community              | 6 (13%) |

| Program duration, n (%) | n = 47 |
|-------------------------|--------|
| 3 years                 | 41 (87%)|
| 6 years                 | 1 (2%)  |
| 7 years                 | 5 (11%) |

**TABLE 2.** Factors Utilized by Program Directors to Determine Applicants’ Commitment to Surgery

| Pre-COVID (mean±std) | During COVID (mean± std) | p-value |
|----------------------|--------------------------|---------|
| Interview day impression | 3.57± 0.65               | 3.17 ± 0.89 | <0.001* |
| Letters of recommendation  | 2.83 ± 0.94              | 3.04 ± 0.83 | 0.02* |
| Personal Statement     | 1.96 ± 0.98               | 2.04 ± 1.02 | 0.16 |
| Research experience    | 1.93 ± 1.03               | 2.02 ± 1.11 | 0.16 |
| Extracurricular activities | 2.04 ± 1.06             | 2.13 ± 1.08 | 0.40 |
| Surgery clerkship and sub-internship evaluation | 2.46 ± 1.10 | 2.52 ± 1.10 | 0.49 |

Numbers reported as mean values on a Likert Scale. (0=No added value, 4 = extremely valuable)
Std: standard deviation
**DISCUSSION**

With the virtual interviews replacing traditional in-person interviews for the 2020-2021 general surgery residency application cycle, our study found that PDs shifted their focus to virtual outreach efforts and to bolster social media presence to recruit strong applicants. Also, our study found statistically significant changes to what the PDs’ value when assessing an applicant’s commitment to surgery during the virtual interview season. These findings suggest that the necessity of adapting to the virtual interview format significantly altered how the PDs recruited and evaluated applicants for the general surgery residency match compared to the in-person interview format. Better understanding of this perspective will aid both applicants and PDs as the discussion continues to determine the permanency of virtual interviews in the residency match.

Based on our study’s findings, PDs placed less value on their virtual interview day impression of the applicants when determining an applicant’s commitment to surgery during the virtual interviews compared to in-person interviews. Previously, PDs reported that interview day factors such as interview day interactions with faculty and residents played more important roles than USMLE scores or LORs in how applicants were ranked by the programs. Drawing insight from the fellowship interviews from earlier in the COVID-19 pandemic, fellowship PDs reported that they felt confident in creating rank lists based on virtual interviews alone; however, fellowship PDs generally agreed with the statement that virtual interviews allowed for accurate representation of the candidates. In the past, PDs have relied on other factors from the interview day such as how applicants interact with program administrators and current residents, and how they conducted themselves with other applicants to determine character attributes that can be challenging to deduce from information presented on paper or virtually.

With decreased emphasis on interview day impressions, our study suggests that PDs may choose to rely on other variables such as LORs and USMLE scores as well as non-applicant factors such as reputation of medical schools during the virtual interview cycle. Another study similarly found that interviewers believed that greater emphasis would be placed on USMLE scores in this format. While USMLE scores may correlate with the applicants’ medical knowledge as residents and subsequently their performance on the American Board of Surgery exams, interviews provide an opportunity to observe the applicants’ interpersonal and communication skills as well as professionalism that cannot be garnered from other aspects of the application. These intangible characteristics play an even greater role than objective measures such as grades and USMLE scores in an applicant’s ability to succeed in a surgical residency.

With nationwide shutdowns and limits on in-person activities during the COVID-19 pandemic, residency PDs were not only tasked with coordinating logistics to prepare for virtual interviews, but also with modifying recruitment strategies within the confines of social distancing guidelines. Traditional methods such as away rotations and meet & greet events at national conferences became almost irrelevant this year as in-person activities were curtailed. Based on our study’s findings, a significant increase in the residency programs’ online presence through social media, virtual meetings with PDs and current residents as well as updating and bulking up the program’s website became ever more important. Even before the COVID-19 pandemic, social media had begun to alter how residency programs and prospective applicants gained access to one another and interacted. The COVID-19 pandemic has propelled residency programs to take a more formal approach to how residency program can connect with applicants on social media platforms. This trend has led applicants to urge PDs to display a genuine portrayal as opposed to a “polished” image of the program.

Moving forward, it is unclear if virtual interviews will have a permanent place in the residency interview...
process. Virtual interviews offer benefits such as flexibility in scheduling for both applicants and interviewers leading to greater accessibility as well as relieving financial burden and environmental impact associated with travel. Generally, a large proportion of applicants and interviewers reported satisfaction with their ability to convey themselves adequately during the virtual interviews. However, both groups reported limited personal interactions during virtual-only interviews as a notable downside. Following the fellowship interviews, programs felt that virtual interviews limit the applicants’ ability to appreciate the training program’s culture or the atmosphere of the training program and hospital. Applicants similarly harbor these concerns believing that the opportunities to gain insight and “feel” the program’s culture may not be adequate with virtual-only interviews.

The more likely outcome from the insight gained from the virtual-only interview format would be moving towards a hybrid model of virtual and in-person interviews. Studies prior to the COVID-19 pandemic concluded that applicants and interviewers have hesitation with virtual interviews replacing in-person interviews; however many concluded that virtual interviews may be an effective adjunct to screen applicants prior to in-person interviews.

**Limitations**

Our study should be interpreted within the context of its limitations. Due to the small sample size from a small response rate, the potential for type II error is possible. The responses demonstrated a disproportionally large representation of the academic programs; therefore, the findings from our study may not be representative of all program types. The survey distribution period was halfway through the 2020-2021 interview cycle in December. While our group’s intent was to ensure that recruitment efforts and application review were fresh in the PDs’ minds to minimize recall bias, the value placed on application factors may have changed by the end of the application cycle and our survey was unable to capture this.

**Future Directions**

The implications of virtual interviews for general surgery residency match during 2020-2021 application cycle will not be immediate. Long-term follow up of the residents who matched during this application cycle will provide further insight into how the reality after they begin their residency training compares to the perception created by the programs in the virtual setting. As for the PDs, the consistency between how the incoming residents were portrayed virtually and the in-person encounters once they start their residency training will provide a testament to how effectively virtual interviews represent candidates. Future studies will need to identify effective methods of conducting virtual interviews. Using in-person interview strategies during virtual interviews would be similar to using open surgery techniques during laparoscopic surgery with the expectation of achieving the outcome. PDs will need to adapt their strategies to be better equipped with the appropriate recruitment methods to maximize the potential of virtual interviews.

**CONCLUSION**

A complete replacement of in-person interviews with virtual interviews may be challenging unless there is buy-in from the key stakeholders in the surgical community. Our study highlights the PDs’ hesitation in assessing candidates’ commitment to surgery from virtual interviews alone. Incorporating virtual interviews as a part of the screening process for applicants may serve as an avenue to maximize the benefits of the virtual interview format. Furthermore, COVID-19 pandemic has normalized the growing social media presence of residency programs, adding to the changing landscape of recruiting and interviewing applicants for general surgery residency match.

**ACKNOWLEDGMENTS**

We thank Cleveland Clinic Surgical Education Research Group for their input in the study design.
APPENDIX A. PRE-COVID RESIDENCY RECRUITMENT

Q1 1) What region is your residency program located in?

- West (CA, WA, OR, AK, HI, NV, UT, CO, WY, ID, MT) (1)
- Southwest (AZ, NM, TX, OK) (2)
- Midwest (ND, SD, NE, KS, MO, IA, MN, IL, IN, MI, WI, OH) (3)
- Southeast (LA, AR, MS, AL, TN, KY, GA, FL, SC, NC, VA, WV) (4)
- Northeast (PA, MD, DE, NJ, NY, CT, RI, MA, VT, NH, ME) (5)

Q2 2) What is your residency program type?

- Academic - university-affiliated (1)
- Academic - independent (2)
- Community (4)
- Military (5)
- Other (6)

Q3 3) What is the required length of your general surgery residency program?

- 5 years (1)
- 6 years (2)
- 7+ years (3)

Q4 4) In the past 5 years, how many of those empty spots were you able to fill? (total over 5 years; number only, 0 for none)

Q5 5a) For application cycles PRIOR TO COVID pandemic, how valuable were these factors for your program to determine an applicant’s commitment to surgery?

| No added value (0) | Slightly valuable (1) | Moderately valuable (2) | Very valuable (3) | Extremely valuable (4) |
|-------------------|-----------------------|--------------------------|------------------|-----------------------|
| Personal statement (1) | | | | |
| Surgery clerkship and sub-internship evaluation (2) | | | | |
| Extracurricular activities (3) | | | | |
| Letters of recommendation (4) | | | | |
| Research experience (5) | | | | |
| Interview day impression (6) | | | | |

Q6 5b) For the upcoming application cycle DURING COVID pandemic, how valuable are these factors for your program to determine an applicant’s commitment to surgery?

| No added value (0) | Slightly valuable (1) | Moderately valuable (2) | Very valuable (3) | Extremely valuable (4) |
|-------------------|-----------------------|--------------------------|------------------|-----------------------|
| Personal statement (1) | | | | |
| Surgery clerkship and sub-internship evaluation (2) | | | | |
| Extracurricular activities (3) | | | | |
| Letters of recommendation (4) | | | | |

(continued)
Q7 Please add additional factors used by your program if not mentioned and indicate level of value (slightly/moderately/very/extremely valuable)

| Research experience | No added value (0) | Slightly valuable (1) | Moderately valuable (2) | Very valuable (3) | Extremely valuable (4) |
|---------------------|--------------------|-----------------------|-------------------------|------------------|------------------------|
| Interview day impression | No added value (0) | Slightly valuable (1) | Moderately valuable (2) | Very valuable (3) | Extremely valuable (4) |

Q8 6a) For application cycles PRIOR TO COVID pandemic, how important were these activities for your program to attract the strongest applicants?

| Program website | Not used/not important (0) | Slightly important (1) | Moderately important (2) | Very important (3) | Extremely important (4) |
|-----------------|---------------------------|------------------------|-------------------------|------------------|------------------------|
| Meet & greet at national conferences | o | o | o | o | o |
| Social media (Twitter, Instagram, Doximity, etc) | o | o | o | o | o |
| Virtual formal information sessions | o | o | o | o | o |
| Virtual informal meet & greet with residents (not associated with interview day) | o | o | o | o | o |
| Away rotations at your program | o | o | o | o | o |

Q9 6b) For application cycle DURING COVID pandemic, how important are/were these activities for your program to attract the strongest applicants?

| Program website | Not used/not important (0) | Slightly important (1) | Moderately important (2) | Very important (3) | Extremely important (4) |
|-----------------|---------------------------|------------------------|-------------------------|------------------|------------------------|
| Meet & greet at national conferences | o | o | o | o | o |
| Social media (Twitter, Instagram, Doximity, etc) | o | o | o | o | o |
| Virtual formal information sessions | o | o | o | o | o |
| Virtual informal meet & greet with residents (not associated with interview day) | o | o | o | o | o |
| Away rotations at your program | o | o | o | o | o |

Q10 Other activities utilized by your program? Please include rating of value.
APPENDIX B. AAPOR STANDARD DISCLOSURE FORM

| Survey/Data Collection Supplier | Qualtrics, Provo, UT, USA |
|---------------------------------|--------------------------|
| Sample size                     | 47                       |
| Mode of data collection         | Anonymous survey         |
| Type of sample                  | Probability              |
| Probability/non-probability     |                          |
| Start and end dates of data collection | December 16th, 2020 – January 4th, 2021 |
| Margin of sampling error for total sample | N/A                     |
| Margin of sampling error for key subgroups | N/A                     |
| Are the data weighed            | No                       |
| Contact for more information    | Amy Y. Han, MD           |
|                                 | Digestive Diseases and Surgery Institute, Cleveland Clinic |
|                                 | 9500 Euclid Avenue, A-100 |
|                                 | Cleveland, OH 44195, USA  |
|                                 | 216-970-7693             |
|                                 | hana@ccf.org             |

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