Computerized Residency Interview Scheduling: A Randomized Controlled Trial of Categorical General Surgery Applicants

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OBJECTIVE: Scheduling interviews can be stressful and time-intensive for general surgery applicants and program coordinators. The objectives of this study were to determine whether computerized scheduling program (CSP) would decrease time to schedule interviews, reduce workload for residency coordinators, and improve applicant satisfaction.

DESIGN: A prospective randomized controlled trial of 2 interview-scheduling methods was conducted. All categorical general surgery applicants selected to interview for the 2017 match were randomized to either standard e-mail/phone scheduling or CSP using *InterviewBroker*. Time required to schedule an interview, number of communications, reschedules, withdrawals, and cancellations were all recorded. Additionally, applicants completed a voluntary, anonymous 9-question paper survey on their interview date. The program director and interviewers were blinded to the experimental groups.

SETTING: A single general surgery residency program.

PARTICIPANTS: Participants in the study included all categorical general surgery applicants selected for an interview in the 2017 match cycle (N = 62 standard group, N = 62 CSP group).

RESULTS: The CSP group took less time to schedule interviews (9 minutes vs. 80 minutes; $p < 0.01$), had fewer e-mail/phone communications (3 vs. 1; $p < 0.01$), and more total rescheduling events (26 vs. 4; $p = 0.03$) when compared to the standard group. Survey responses showed that 55% of applicants used CSPs at 5 or fewer other programs. The CSP group reported increased overall satisfaction (80% vs. 56% very satisfied; $p = 0.02$) and access to preferred interview dates (80% vs. 53% very satisfied; $p = 0.02$). Overall, 77% of applicants responded that CSPs should be widely adopted among general surgery residency programs.

CONCLUSIONS: CSPs expedited interview scheduling, decreased workload for program coordinators, and improved general surgery applicant satisfaction. However, despite the benefits of CSPs for programs and applicants, CSP use is not widespread among general surgery residency programs. Adoption of CSPs by all programs could greatly improve interview-scheduling processes for applicants and programs. (J Surg Ed 76:36–42. © 2018 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: Interview, Applicant, General surgery residency, Online, Scheduling

COMPETENCIES: Interpersonal and Communication Skills, Systems-Based Practice

INTRODUCTION

Interaction with faculty and residents during the interview experience is cited as the most important factor in ranking of categorical general surgery applicants.[1-3] Increasing competition has resulted in applicants applying to more programs and attending more interviews in order to maximize the likelihood of matching in a categorical general surgery residency program spot.[4,5] The financial concerns of applicants are already considerable, with general surgery candidates spending an average of $5400 on the overall interview process to attend an average of 13 interviews.[6] An increased number of

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interviews per applicant create additional logistical and financial strain on applicants, resulting in more potential scheduling conflicts and inability to optimize travel schedules.

Facing similar increases in competition, general surgery residency programs are generating longer rank lists with an average of 12.7 ranked applicants per available position in the 2017 match, up from 6.9 ranked applicants in the 2002 match.[7] In the 2016 to 2017 match cycle, programs on average received 759 applications, offered 83 interviews, and interviewed 63 applicants for an average of 5 available positions.[3] As the number of interviews increases, more resources are required to coordinate interview dates, which in turn strain the workload of residency program coordinators and staff. While alternate interview methods such as asynchronous video or Skype interviews have been described, these suggestions have not gained widespread interest or acceptance in US residency programs for evaluating categorical general surgery residency applicants.[8,9]

One hypothesized solution, the use of computerized scheduling programs (CSPs), has been heralded as a method for streamlining the interview-scheduling process, as well as reducing time and cost for programs and applicants. A number of CSPs exist, including the Electronic Residency Application Service (ERAS), InterviewBroker, Thalamus, Eventbrite, and 3rdFriday. Previous studies have demonstrated the efficacy of CSPs in scheduling residency interviews for emergency medicine, and obstetrics and gynecology.[10-12] Additionally, a study performed in 2016 at our institution for pediatric surgery fellowship applicants demonstrated that CSPs decreased the time to schedule interviews, and improved applicant satisfaction with the interview-scheduling process.[13] To date, all published studies regarding CSPs have been retrospective in nature. Furthermore, no studies have evaluated the efficacy of CSPs for general surgery residency applicant interviews. This study aims to prospectively evaluate CSPs in scheduling general surgery residency interviews and elucidate applicant opinions regarding their experience with CSPs in the interview process.

MATERIALS AND METHODS

Study Design

We conducted a prospective randomized controlled trial of general surgery residency applicant interview processes, comparing CSPs to direct e-mail and phone communication, the standard method used by our program to schedule interviews. For the 2017 match cycle, all applicants to the categorical general surgery program at our institution were evaluated in the same manner by the interview selection committee. No changes were made to the methods from previous years used by the interview selection committee to evaluate applicants. The interview selection committee invited applicants to interview in 5 waves, in order to accommodate the application review process. Each wave of selected applicants was immediately randomized to either the standardized interview-scheduling group via e-mail and phone communication or to the CSP group using InterviewBroker (The Tenth Nerve LLC, Lewes, Delaware). InterviewBroker was selected based on its low cost and institutional familiarity with the program due to its use in another specialty. Randomization was performed by drawing slips of paper from an envelope. These paper slips were equally divided between those labeled CSP and those labeled standard. For each wave of applicants, a matching number of paper slips were placed into an envelope, ensuring that a 1:1 ratio between the groups was maintained throughout the process. Applicant demographics of gender, ethnicity, US citizenship, and medical school region (Northeast, Midwest, South, West, and Foreign) were compared between groups.

Once an applicant was randomized, an interview invitation e-mail was sent to the applicant with instructions on how to schedule an interview. Applicants who were offered an interview could choose between the remaining open slots on 7 different interview dates. In order to ensure equity, the interview slots were kept separate between study groups for initial scheduling purposes. All applicants selected for an interview were provided with information about the study and its processes. Applicants randomized to the CSP group were given the same access to program coordinator contact information as the standard interview group and were not prohibited from using phone or e-mail to contact the program coordinators should any issues arise. The program director and all study members involved with interviewing applicants were blinded to the randomization status and to any data collected for the study until after the program's final rank list had been submitted and certified. This study was approved by our Institutional Review Board, IRB# 16359.

The time from invitation to finalization of the initial interview date, number of e-mail or phone communications required to schedule an interview, number of rescheduling events, application withdrawals, and interview cancellations were recorded for each participant. All open interview slots created by cancellations or withdrawals in both experimental groups were backfilled with visiting students, internal applicants, or alternate applicants selected for an interview using standard scheduling methods. Figure 1 depicts the study protocol.

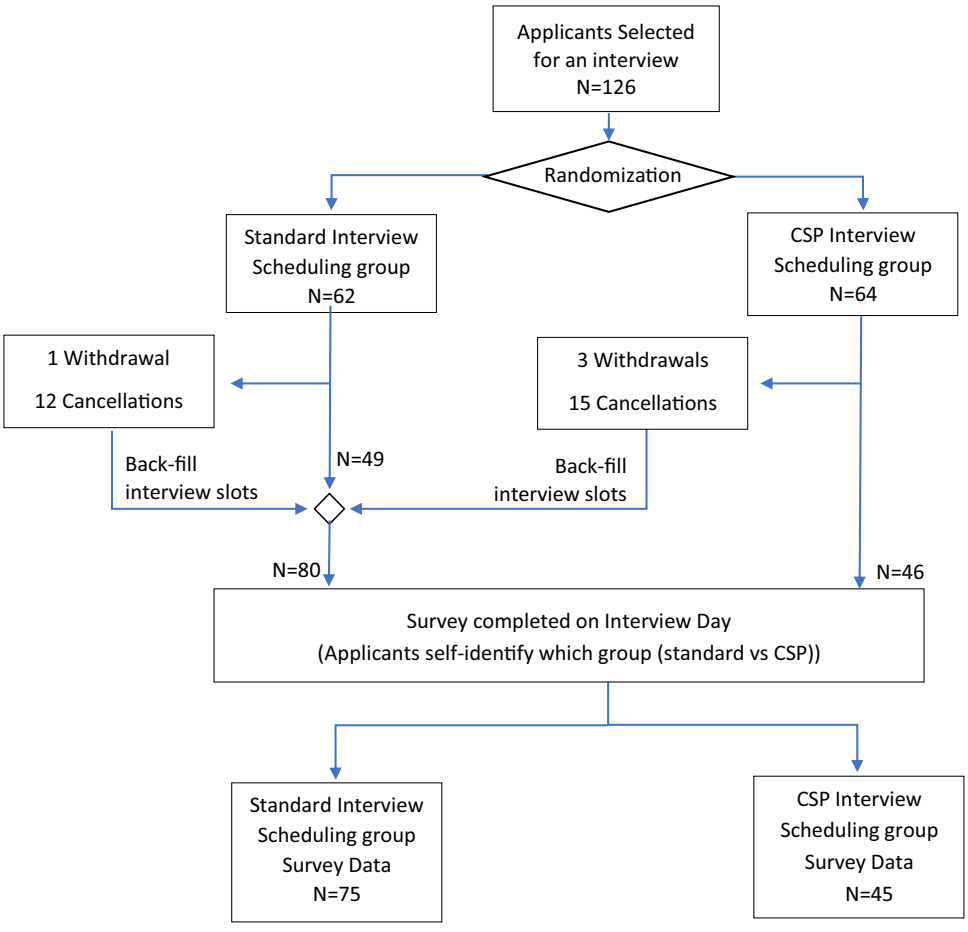

FIGURE 1. Study design.

Survey

All applicants who arrived on their interview day were given a voluntary anonymous 9-question paper survey to complete. Data collected included self-reported applicant study group, whether any help scheduling interviews was sought from family or friends, the number of total programs that they interviewed with that used CSPs, specific CSPs used by other programs, the longest amount of time to schedule any interview, satisfaction with the interview process, as well as opinion regarding broader use of CSPs for interviews by general surgery residency programs. Anonymous free-text comments regarding the applicants' overall opinions of the interview-scheduling process were grouped into themes.

Statistical Methods

Continuous and ordinal variables were compared using a Mann–Whiney U test (Microsoft Excel, Redmond, Washington). All categorical variables were compared using a chi-squared test (Microsoft Excel, Redmond, Washington). Alpha significance level was set at <0.05.

RESULTS

Selection, Randomization, and Interview-Scheduling Data

Out of over 1400 applicants, 126 were chosen for an interview in 5 separate applicant review cycles over the course of 5 weeks. Overall, there were 64 applicants randomized to the CSP group, and 62 applicants randomized to the standard interview-scheduling group. There were no differences in gender ($p = 0.49$), ethnicity ($p = 0.84$), US citizenship ($p = 0.38$), or medical school region ($p = 0.73$) between groups, indicating effective randomization.

No data from backfilled spots vacated by withdrawal and cancellations were included in the comparison of CSP to standard methods. The median time to schedule an interview in the CSP group (9 minutes, interquartile range 5-33 minutes) was significantly faster than in the standard interview group (80 minutes, interquartile range 46-1058 minutes; $p < 0.01$). The median number of e-mails and phone calls was also significantly lower ($p < 0.01$) in the CSP group (1, range 1-4) than in the

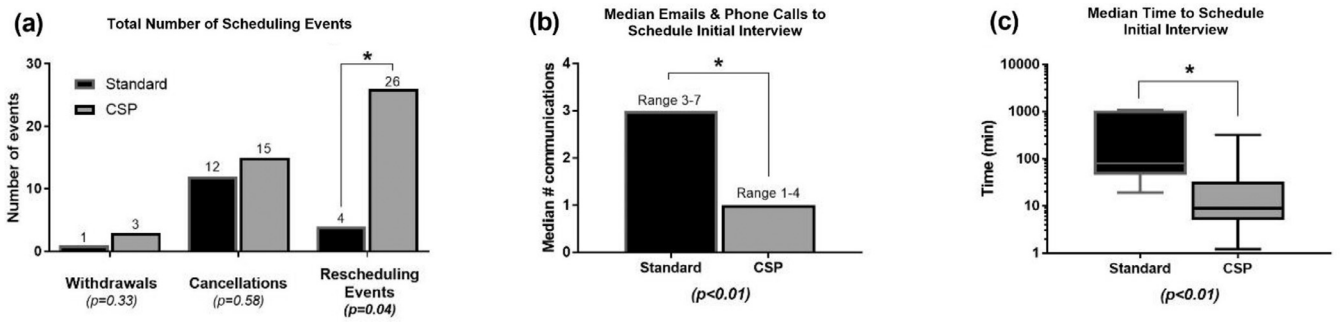

FIGURE 2. Key differences in interview-scheduling data collected between standard and CSP groups. N = 62 for standard group. N = 64 for CSP group. "*" denotes a statistically significant difference. (a) Total number of scheduling events per experimental group with significantly more rescheduling events in the CSP group; (b) median communications per applicant in experimental group, which was significantly less in the CSP group; (c) box and whisker plot of median time to schedule the initial interview, which was significantly less in the CSP group.

standard group (3, range 3-7; $p < 0.01$). The total number of rescheduling events in the CSP group was significantly higher than the standard group (26 vs. 4; $p = 0.04$).

There were no significant differences in withdrawals ($p = 0.33$) or cancellations ($p = 0.58$) between experimental groups (Fig. 2). There were 3 withdrawals and 15 cancellations in the CSP group with a median notice of 10 days (range 1-25 days). In the standard group, there was 1 withdrawal and 12 cancellations with a median notice of 8 days prior to the interview date (range 4-86 days). Two applicants in each group cited scheduling conflicts as the reason for cancellation. Other reasons for cancellation included personal or financial hardship, and an applicant's significant other not being offered an interview.

A total of 31 empty slots were created by withdrawals and cancellations, all of which were backfilled using the standard interview-scheduling methods. This process resulted in an increase of the total number of applicants that interviewed using standard scheduling methods to 80, with a decrease in the number of applicants interviewed that were scheduled using CSP to 46 (Fig. 1). Alternate applicants were offered only 1 to 3 interview dates, depending on availability. It took a median of 149 minutes (range 7 minutes to 3 days) and a median of 3 phone or e-mail communications (range 3-7) to schedule a backfilled interview slot.

Survey Data

The survey response rate was 98% in the CSP group, with 45 out of 46 possible responses, and 94% in the standard group, with 75 out of 80 possible responses. The majority of applicants primarily scheduled their own interviews. Both groups reported satisfaction with the interview-scheduling process. However, the CSP group was significantly more satisfied with the overall interview process, with 80% reporting that they were very satisfied compared to 56% in the standard group ($p = 0.02$). The CSP group was also more satisfied with access to preferred interview slots than the standard group (80% vs. 53% very satisfied; $p = 0.02$; Table). There were no significant differences in satisfaction regarding difficulty in scheduling the interview, speed at which the interview date was finalized, speed to book additional travel accommodations, or ability to coordinate time away from home institution.

Applicants reported that the longest time to schedule an interview at any program was widely variable, with a range of 1 to 14 days and over 33% of applicants reporting wait times of >5 days. The majority of applicants encountered CSPs at 5 or fewer residency programs (Fig. 3b). In total, 100 applicants reported using InterviewBroker to schedule interviews at another residency program, 50 applicants reported using ERAS, 50 used Thalamas, 14 used 3rdFriday, and 11 used Eventbrite to schedule residency interviews (Fig. 3c). Significantly more applicants in the CSP group felt that CSPs should be widely adopted (89%) as compared to the standard group (69%, $p = 0.026$). Overall, 77% of applicants felt that CSPs should be widely adopted for general surgery residency interviews (Fig. 3a).

Free-Text Responses Regarding Scheduling Methods

The majority of applicants voiced positive experiences with using CSPs. Positive themes included liking the convenience of rescheduling with CSPs (n = 5), preferring the immediate confirmation of their interview date with CSPs (n = 4), and liking the flexibility of CSPs (n = 3). In addition, some applicants reported that both standard and CSP methods for scheduling interviews were easy (n = 3).

TABLE. Survey Data of Applicant Satisfaction With the Interview-Scheduling Process

Applicant Survey Question	Study Group	Applicant Response VD (%)	D (%)	N (%)	S (%)	VS (%)	Statistical Test Results
Overall satisfaction with interview-scheduling process	CSP	0.0	0.0	2.2	17.8	80.0	p = *0.02*
	Standard	1.3	0.0	6.7	36.0	56.0	
Satisfaction with ease of scheduling the interview	CSP	0.0	0.0	6.7	17.8	75.6	p = 0.13
	Standard	0.0	1.3	6.7	33.3	58.7	
Satisfaction with access to preferred interview slots	CSP	0.0	0.0	6.7	13.3	80.0	p = *0.02*
	Standard	0.0	2.7	6.7	37.3	53.3	
Satisfaction with speed in which interview date was finalized	CSP	0.0	2.2	0.0	20.0	77.8	p = 0.26
	Standard	0.0	0.0	2.7	32.0	65.3	
Satisfaction with speed in regards to ability to book accommodations	CSP	0.0	0.0	6.7	33.3	60.0	p = 0.41
	Standard	0.0	1.4	11.1	34.7	52.8	
Satisfaction with ability to coordinate time away from home institution	CSP	0.0	2.2	11.1	22.2	64.4	p = 0.81
	Standard	0.0	0.0	10.8	23.0	66.2	

N = 45 for CSP group, N = 75 for standard group. Responses to questions are listed as the percentage of applicants who selected choices for each question on a 5-point Likert scale with 1 = very dissatisfied (VD), 2 = dissatisfied (D), 3 = neither satisfied nor dissatisfied (N), 4 = satisfied (S), and 5 = very satisfied (VS). Responses between the standard and the CSP group were compared using a Mann–Whitney U test, with p values listed in the right-hand column. NOTE: a *p-value* depicted in italics indicates a significant difference between groups.

A few applicants reported preferring standard communication methods (n = 6): 2 were concerned that interview spots fill up faster with CSPs, 1 found the waitlist feature on CSPs more difficult, 1 found learning new software a burden, 1 preferred the personal connection with residency coordinators, and 1 did not list a reason. Concerns raised about specific CSPs included 4 applicants experiencing difficulty with the ERAS application

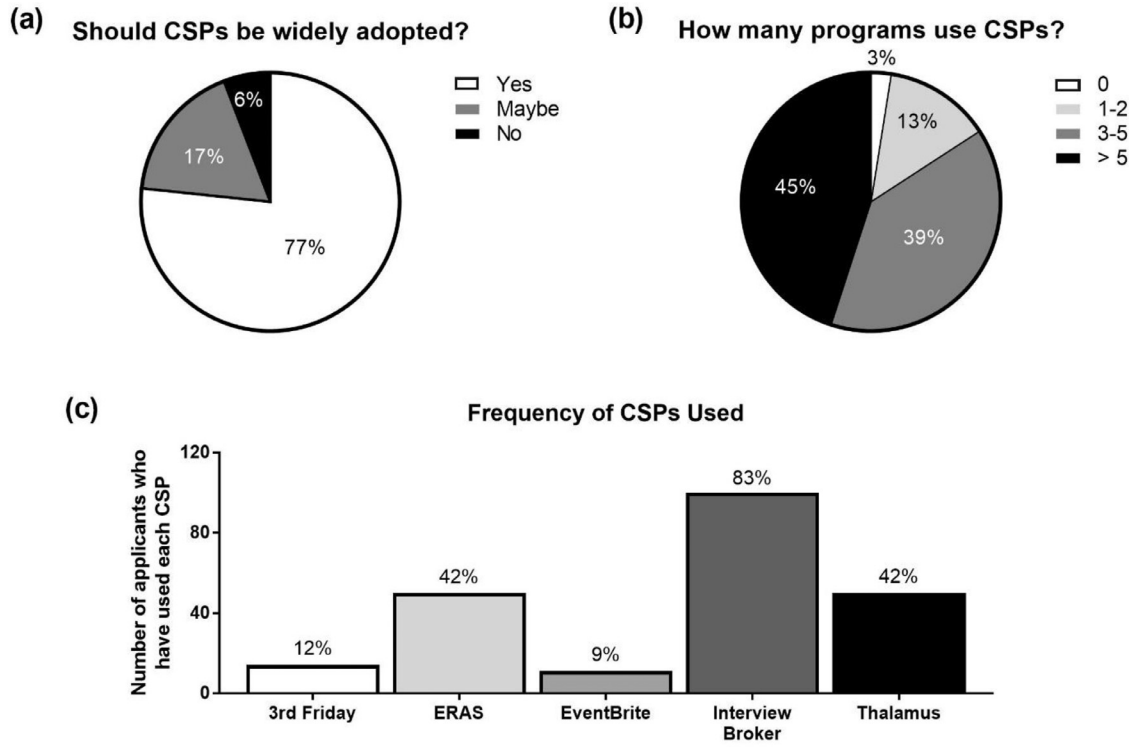

FIGURE 3. Key results of applicant survey regarding CSPs. There were a total of 120 survey responses, with 75 responses in the standard group (94% response rate) and 45 in the CSP group (98% response rate). (a) Responses to whether CSPs should be widely adopted for purposes of residency interview scheduling. (b) Responses regarding prevalence of use of CSPs at other residency programs. (c) Responses regarding specific CSPs used at other residency programs.

functionality and mobile device compatibility, 2 expressing frustration with the time required to set up an account on Thalamus, and 1 applicant finding the InterviewBroker interview invitation e-mail confusing.

DISCUSSION

This is the first randomized trial, to our knowledge, comparing traditional scheduling methods to CSPs for residency interviews. We found that not only did applicants using CSPs report significantly increased satisfaction with the interview process, CSPs also allowed applicants to confirm interview dates quicker and use less e-mail and phone communication with residency program coordinators. The cost of InterviewBroker ($153 for 64 applicants in the CSP group) was offset by 130 less phone calls and e-mails required by residency coordinators to schedule interviews for the CSP group compared to the standard scheduling group. Estimating 6 minutes to attend a phone or e-mail communication and return to alternate tasks, 12.5 hours of program coordinator time was saved in the CSP group after accounting for the 30 minutes needed to setup the InterviewBroker account. These results support the widespread use of CSPs in scheduling general surgery residency interviews, with benefits for both applicants and surgery residency programs. Furthermore, these results are similar to previous retrospective studies in obstetrics and gynecology,[12] emergency medicine,[10] and pediatric surgery,[13] indicating that the results of this study may be generalizable to other specialties.

Our results also indicate that applicants appreciated the immediate confirmation of interview dates and flexibility in scheduling and rescheduling that CSPs provide. There were 6.5 times more rescheduling events in the CSP group as compared to the standard group. Hypothesized reasons for this difference include the ease of rescheduling interview dates using software, and the anonymity which CSPs provide resulting in a perceived decrease in the burden on program coordinators compared to e-mails or phone calls.

Survey data demonstrates that other general surgery programs are using CSP software, and that there are at least 5 different CSPs currently used by general surgery residency programs (InterviewBroker, ERAS, Thalamus, 3rdFriday, and Eventbrite). However, despite multiple studies demonstrating decreased workload and increased applicant satisfaction, many programs are still using e-mail and phone communication to schedule interviews. Given that the majority (55%) of applicants in this study used CSPs at 5 or fewer programs and previously published studies demonstrating an average of 13 interviews per applicant,[6] we estimate that only around half of general surgery residency programs are using CSPs. Reasons for lack of widespread adoption of CSPs may include lack of awareness of the software programs available or perceived negative aspects regarding software cost, setup, and functionality.

While our data indicate that CSPs are generally beneficial to applicants, the lack of standardization among CSPs used may add additional complexity, as it results in applicants utilizing multiple software programs to plan and schedule interviews. Furthermore, programs must address applicant concerns with CSPs, including the time barrier to setup accounts (Thalamus) and lack of mobile functionality (ERAS) when transitioning to a CSP for interview scheduling.

The interview process is stressful and interview scheduling is time-sensitive, as interview slots fill up quickly. Interview invitation e-mails sent to applicants will require additional e-mail or phone communication in the event of issues with CSP functionality. However, the few concerns expressed by applicants regarding CSPs and the need for programs to field questions about CSP functionality could be managed through the adoption of 1 CSP by all general surgery programs. In doing so, programs would streamline the process of coordinating interviews and potentially assist in decreasing the burden placed on applicants by the match system.

Our study did not reproduce the benefits seen by Stephens et al. with regard to CSPs relieving scheduling conflicts, improving coordination of time off for interviews, or arranging other travel accommodations.[13] As that study dealt with pediatric surgery fellowship interviewees, the observed difference could be due to innate differences in schedule flexibility between medical students in our study applying for residency versus general surgery residents applying for fellowship. Differences may also be due to the larger number of interview dates available for our residency interviews compared to fellowship interviews in the paper by Stephens et al. (7 vs. 3). Finally, variations in program coordinator response time in handling applicant e-mail and phone communications might also contribute to the variance.

Limitations of this study include variation between the initial randomized applicants offered interviews and the survey data due to backfilling last-minute interview slots by the standard scheduling method. Alternate applicants were given limited interview date options, which may have influenced their satisfaction with the interview-scheduling process leading to possible information bias into our survey data. Additionally, although this was a randomized trial, this study was limited to 1 general surgery residency program. Replicability of our results at different institutions may be impacted by the number of interview days offered or if a different CSP was used to schedule interviews. However, the majority of our

applicants were exposed to multiple CSPs at other programs and still supported the use of CSPs over standard interview-scheduling methods. Additionally, the applicant pool offered an interview at any one institution may not be fully representative of the national general surgery applicant pool. Potential selection bias also exists in the survey results, as only those who appeared for an interview were surveyed, although similar percentages of applicants initially randomized were interviewed in each group (72% in the CSP group vs. 61% in the standard group). Lastly, although observer bias may have influenced residency coordinators to respond e-mails more promptly than previous years, this is likely nondifferential as elimination would only enhance the difference between CSPs and traditional scheduling means.

CONCLUSIONS

CSPs reduced the time and effort required to schedule categorical general surgery residency interviews for both applicants and residency program coordinators. Despite benefits for both programs and applicants, standard interview-scheduling methods are still used by a large number of general surgery residency programs. The use of *different* CSPs by the general surgery programs that do utilize them adds to the complexity of the scheduling process for applicants. Widespread adoption of a single CSP among all general surgery residency programs would be advantageous and greatly enhance the interview-scheduling process for our future trainees.

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