



How Much Are We Spending on Resident Selection?

Aimee K. Gardner, PhD,^{*,†,1} Douglas S. Smink, MD,[‡] Bradford G. Scott, MD,^{*}
James R. Korndorffer, Jr. MD, MHPE,[§] David Harrington, MD,^{||} and E. Matthew Ritter, MD[¶]

^{*}Baylor College of Medicine, Houston, Texas; [†]SurgWise Consulting, Houston, Texas; [‡]Brigham & Women's Hospital, Boston, Massachusetts; [§]Stanford School of Medicine, Stanford, California; ^{||}Alpert Medical School of Brown University, Providence, Rhode Island; and [¶]Uniform Services University, Walter Reed Hospital, Bethesda, Maryland

INTRODUCTION: Rigorous selection processes are required to identify applicants who will be the best fit for training programs. This study provides a national snapshot of selection practices used within surgical residency programs and their associated financial costs.

METHODS: A 17-item online survey was distributed to General Surgery Program Directors (PDs) via the Association of Program Directors in Surgery listserv. The survey examined program characteristics, applicant pool size, and interview day components of the prior match year. PD/coordinator teams also provided hard costs associated with interview day components, as well as time and effort estimations among program faculty, residents, and staff during the past interview season. Effort estimates were translated to dollar values via national salary data reports of hourly wages for faculty and annual wages for administrative staff and residents. Descriptive statistics and one-way analysis of variance via SPSS 24.0 were used to examine the data.

RESULTS: One-hundred and twenty-eight responses were received, reflecting 48% (128/267) of programs in the 2017 match. Average hard costs (\pm SD) were \$8053 \pm 6467, covering food (\$3753 \pm 4042), social sessions (\$3175 \pm 3749), supplies (\$329 \pm 866), hotel (\$328 \pm 1381), room reservations (\$120 \pm 658), shuttle fees (\$84 \pm 403), tour guide fees (\$50 \pm 379), and other (\$146 \pm 824). Costs for personnel effort was \$77,601 \pm 62,413 for faculty, \$12,393 \pm 33,518 for residents, \$6447 \pm 11,107 for coordinators, and \$1294 \pm 1943 for staff. Total average cost associated with the interview

process (hard + effort) was \$100,438 \pm 87,919, with university-based programs (\$128,686 \pm 101,565) spending significantly more than independent-university affiliated (\$61,162 \pm 33,945), independent (\$74,793 \pm 73,261), and military (\$62,495 \pm 38,532) programs ($p < 0.01$). Average cost for each residency program per position being filled was \$18,648 \pm 13,383, and average cost per interviewee was \$1221 \pm 894.

CONCLUSIONS: In an era of declining resources for medical education, PDs must understand the time and effort associated with resident selection. These data reveal that residency programs are spending significant time and resources on the current selection process. Program leaders can use these data to assess their current selection strategies, review faculty and staff time allocation, and identify opportunities for making the process more efficient. (J Surg Ed 75:e85–e90. © 2018 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

COMPETENCIES: Systems-Based Practice, Practice-Based Learning and Improvement

INTRODUCTION

Each year, over 4000 medical students seek to secure a position in a general surgery residency.¹ With only 1200 categorical positions available, this means that programs must put forth substantial effort reviewing and screening applications to determine who may be the best fit for their program. Results of the most recent National Residency Match Program (NRMP) Program Director (PD) survey² indicate that, on average, programs receive 759 applications to fill 5 categorical positions. Although only about 33% of these applications receive an in-depth review,² PDs feel they are able to glean enough information from United

Podium presentation at the Association of Program Directors in Surgery (APDS) Annual Meeting, Austin, Texas, May 3, 2018.

Correspondence: Inquiries to Aimee K. Gardner, PhD, Baylor College of Medicine, MS: BCM115, DeBakey Building, M108K, One Baylor Plaza, Houston, TX 77030; fax: (713)798.7694; e-mail: aimee.gardner@bcm.edu

¹ @AimeeGthePHD

States Licensing Medical Examination (USMLE), letters of recommendation, Medical Student Performance Evaluation (MSPE), and clerkship grades to invite an average of 83 students for on-site interviews. The majority of those interviewed are ranked, and programs across the United States have successfully filled 99.7% of all categorical positions for the past 5 years.³

It is well documented that this process is a substantial burden for medical students, who apply to an average of 50 programs,⁴ interview at an average of 14,⁵ and spend up to \$11,000 on application fees and travel.⁶ However, we do not have similar estimates about the amount of time and resources that programs spend on this process. In an era in which graduate medical education (GME) programs must actively vie for protected time, personnel, and funds, it is critical that we have sound data on the annual costs and resources associated with resident recruitment and selection. Additionally, for those PDs seeking to incorporate more rigorous selection processes to identify high-potential applicants, having baseline data and estimates on current practices is an essential starting point.

The goal of this study is to provide a national snapshot of selection practices used within surgical residency programs and their associated financial costs. Program leaders can use these data to assess their current selection strategies, review faculty and staff time allocation, and identify opportunities for making the process more efficient.

METHODS

A 17-item online survey (Appendix 1) was approved by the Association of Program Directors in Surgery (APDS) Research Committee and distributed to Surgery PDs in July 2017 via the APDS listserv according to IRB protocol. A reminder was sent to all listserv recipients approximately 1 month later.

The survey asked about a number of program characteristics, including PD tenure, type of training program (university-based, independent, independent – university affiliated, military, or other), number of categorical residents per year, and geographical region. Respondents were also asked to complete information about the number of total applications received each year (United States + international medical graduates), number of applications received from United States applicants each year, number of applicants invited to interview each year, and number of applicants who participate in interviews each year.

The survey also asked about a number of details related to conducting on-site interviews during the prior application season, such as number of interview days, length of each interview day, the types of activities included during the on-site visit, and format of the interviews.

PDs were also asked to provide dollar estimates of money spent on a number of items associated with the recruitment and interview process, including food, social sessions, printing and supplies, room reservations, shuttle fees, tour guide fees, hotel accommodations, venue costs, and other items.

Finally, PDs provided the number of individuals, by category (i.e., PD, Associate PD, residency coordinator, etc.) involved in the recruitment and selection process, as well as their average number of hours spent on all activities related to screening, recruitment, preparatory activities, evaluation processes, interview day obligations, and final ranking meetings.

Effort estimates were translated to dollar values via national salary data reports of hourly wages for surgeon faculty⁷ and annual wages for administrative staff⁸ and residents.⁹ Descriptive statistics, one-way analysis of variance, and regression analyses via SPSS 24.0 were used to examine the data.

RESULTS

Sample

One-hundred and twenty-eight responses were received, reflecting 48% (128/267) of programs in the 2017 match. Average program size was 5.5 ± 2.3 and consisted of 71 university-based (55.6%), 37 independent-university affiliated (28.9%), 16 independent (12.5%), and 4 military programs (3.1%). Average PD tenure was 6.97 ± 6.29 years. Program size, program type, and PD tenure are similar to those seen nationally.²⁻³

The majority of programs reported receiving at least 900 total applications per year, with 16.4% of programs receiving 700 to 900, 12.5% of programs receiving 500-700, and 8.6% receiving less than 500 applications. Programs extended an average of 103 ± 38 (range 30 – 300) on-site interviews, with university programs offering more interviews (116 ± 39) than independent – university affiliated programs (93 ± 28), independent (78 ± 30), or military (53 ± 17) programs ($p < 0.05$).

On-site Interview Activities

The majority of programs included a PD introduction (96.9%), tour (93.8%), social session (85.9%), breakfast (76.6%), and lunch (92.2%) during on-site interviews. Others invited applicants to participate in conferences (48.4%) and rounds (2.3%). The most common interview type included one-on-one with faculty (93.8%), PD (77%), residents (64.8%), and Chair (50%). These data by program type are displayed in [Table 1](#). The majority of PD indicated that applicants participate in 3 to 4 interviews (72%) that lasted 15 to 29 minutes (79%).

TABLE 1. Frequency of Interview Day Components and Interview Formats by Program Type

	Interview Day Components				
	All Programs (128)	University (71)	Independent (16)	Independent, University-affiliated (37)	Military (4)
Introduction to program by PD	97%	100%	100%	95%	50%
Tour	94%	96%	88%	97%	50%
Attend conferences	48%	44%	69%	46%	75%
Attend rounds	2%	1%	0%	3%	25%
Breakfast	77%	85%	63%	76%	0%
Lunch	92%	99%	94%	89%	0%
Dinner	37%	38%	38%	38%	0%
Social session	86%	93%	81%	81%	25%
	Interview Format				
One-on-one interview with faculty	94%	96%	100%	87%	100%
Group interview	9%	11%	6%	8%	0%
Faculty panel	2%	3%	0%	3%	0%
Interview with PD	77%	73%	94%	81%	50%
Interview with chair	50%	58%	25%	51%	0%
Interview with coordinator	7%	6%	13%	5%	25%
Interview with hospital staff	3%	1%	0%	8%	0%
Interview with residents	65%	62%	69%	76%	0%
Interview via phone	2%	0%	6%	0%	25%
Interview via facetime	2%	0%	6%	3%	25%

Time

Overall, residency coordinators were estimated to spend the most amount of hours on the resident recruitment and selection process (132 ± 121 hours), followed by PDs (95 ± 75 hours), Associate PDs (42 ± 39 hours), residents (40 ± 87 hours), Chairs (24 ± 27 hours), administrative staff (20 ± 24 hours), faculty (19 ± 19 hours), other departmental staff (3 ± 12 hours), and hospital staff (3 ± 9 hours).

Costs

Average total hard costs (\pm SD) were $\$8053 \pm 6467$, covering food ($\3753 ± 4042), social sessions ($\$3175 \pm 3749$), supplies ($\329 ± 866), hotel ($\$328 \pm 1381$), room reservations ($\120 ± 658), shuttle fees ($\$84 \pm 403$), tour guide fees ($\50 ± 379), and other ($\$146 + 824$) costs. Total costs for personnel effort were $\$77,601 \pm 62,413$ for faculty, $\$12,393 \pm 33,518$ for residents, $\$6447 \pm 11,107$ for coordinators, and $\$1294 \pm 1943$ for staff (Table 2).

Total average cost associated with the interview process (hard + effort) was $\$100,438 \pm 87,919$, with university-based programs ($\$128,686 \pm 101,565$) spending significantly more than independent-university affiliated ($\$61,162 \pm 33,945$), independent ($\$74,793 \pm 73,261$), and military ($\$62,495 \pm 38,532$) programs ($p < 0.001$; Table 3). Neither total cost per categorical position nor total cost per interviewee differed by

program type. Average cost for each residency program per position being filled was $\$18,648 \pm 13,383$, and average cost per interviewee was $\$1221 \pm 894$ (Table 3). When we included PD tenure, program type, number of categorical positions being filled, geographical region, total number of applicants, number of candidates invited to interviews, and number of candidates who attend interviews into a regression equation to predict total costs, the only significant predictor of total costs was number of categorical positions ($t = 3.82$, $p < 0.001$). These data indicated that for every one additional categorical position, the total cost of selection increases by $\$15,632$.

DISCUSSION

This study provides a national snapshot on characteristics and costs associated with selection of general surgery residents. Overall, these data reveal that programs are spending a substantial amount of time and money on resident selection, with the average program spending approximately $\$100,000$ annually. Not surprisingly, we found that university programs and programs with a larger number of positions to fill are spending the most money. When examining amount of time and effort dedicated to applicant screening activities, we found that residency coordinators are shouldering much of this the burden, spending over 132 hours on the process. PDs and APDS,

TABLE 2. Estimated Recruitment Costs Data by Program Type

Cost Component	All Programs	University	Independent	Independent, University-affiliated (Community)	Military
Effort					
Program Director	\$18,251	\$18,76	\$25,683	\$14,410	\$16,405
	(\$1158-96,500)	(\$1158-96,500)	(\$9650-\$77,200)	(\$1158-48,250)	(\$1930-38,600)
Associate Program Director	\$8104	\$8454	\$9353	\$6862	\$6996
	(\$0-50,180)	(\$965-50,180)	(\$1930-30,880)	(\$0-20,844)	(\$1930-14,475)
Faculty	\$3762	\$3709	\$4246	\$3674	\$3538
	(\$579-30,880)	(\$579-30,880)	(\$1351-9650)	(\$579-9650)	(\$965-5790)
Chair	\$4695	\$5300	\$2766	\$4128	\$0
	(\$0-38,600)	(\$0-38,600)	(\$0-7720)	(\$0-14,475)	(\$0)
Coordinator(s)	\$6447	\$9131	\$3039	\$2741	\$1445
	(\$339-77,600)	(\$485-77,600)	(\$970-7275)	(\$339-7760)	(\$485-2425)
Residents	\$12,393	\$15,459	\$9769	\$7173	\$11,713
	(\$0-306,880)	(\$0-306,880)	(\$411-54,800)	(\$616-34,935)	(\$959-\$24,660)
Departmental staff	\$1294	\$1634	\$1293	\$684	\$121
	(\$0-9700)	(\$0-\$9700)	(\$0-3880)	(\$0-3880)	(\$0-242)
Hard Costs					
Food	\$3753	\$4934	\$3040	\$2236	\$4
	(\$0-25,000)	(\$17-\$25,000)	(\$0-10,000)	(\$0-9000)	(\$0-15)
Social sessions	\$3175	\$4216	\$2148	\$1903	\$750
	(\$0-21,000)	(\$0-21,000)	(\$0-)	(\$0-9000)	(\$0-3000)
Printing and supplies	\$329	\$434	\$211	\$215	\$25
	(\$0-8500)	(\$0-8500)	(\$0-1000)	(\$0-1500)	(\$0-100)
Room reservations	\$120	\$111	\$0	\$207	\$0
	(\$0-6000)	(0-2400)	(\$0)	(\$0-6000)	(\$0)
Shuttle fees	\$84	\$107	\$71	\$56	\$0
	(\$0-3800)	(\$0-3800)	(\$0-1000)	(\$0-1100)	(\$0)
Tour guide fees	\$50	\$90	\$0	\$0	\$0
	(\$0-3400)	(\$0-3400)	(\$0)	(\$0)	(\$0)
Hotel accommodations	\$328	\$131	\$853	\$521	\$0
	(\$0-8000)	(\$0-8000)	(\$0-8000)	(\$0-6050)	(\$0)
Venue, A/V, costs	\$67	\$72	\$50	\$74	\$0
	(\$0-2000)	(\$0-2000)	(\$0-500)	(\$0-1800)	(\$0)
Other/Miscellaneous	\$146	\$146	\$0	\$232	\$0
	(\$0-7000)	(\$0-5000)	(\$0)	(\$0-7000)	(\$0)

too, invest significant time into the process as well, contributing an average of 95 and 42 hours on the process, respectively.

These data have a number of implications for surgical training programs. First, these estimates provide PDs with a realistic snapshot of how much time is required

TABLE 3. Total Costs, Cost Per Position, and Cost Per Interview by Program Type

Cost Component	All Programs	University	Independent	Independent, University-affiliated (Community)	Military
Total cost	\$100,438	\$128,686	\$74,793	\$61,162	\$62,495
	(\$600-556,142)	(\$6850-556,142)	(\$800-317,335)	(\$600-\$123,597)	(\$11,336-104,755)
Total cost per categorical position	\$18,648	\$19,743	\$17,974	\$17,391	\$14,121
	(\$86-104,299)	(\$1370-104,299)	(\$200-52,889)	(\$86-35,609)	(\$2267-23,120)
Total cost per interviewee	\$1221	\$1384	\$1201	\$902	\$1201
	(\$5-6135)	(\$105-6135)	(\$21-3967)	(\$5-2182)	(\$227-1843)

Note: Total costs for university programs are significantly higher than all other program types ($p < 0.001$). There were no significant differences between programs for total cost per categorical position or total cost per interviewee.

of program administrative teams during recruitment season, and may help inform requests for additional personnel and resources. Programs seeking to expand the size of their intern class may also be wise to plan for the associated financial increase for recruitment of \$15k per position. Additionally, acknowledgement of how much time these activities require may suggest that less important or less time-sensitive activities may be better suited outside of the October – January timeframe, and can inform annual planning efforts. These data may provide fodder for program leaders to assess the efficacy and efficiency of their current selection procedures and identify additional methodologies for making the process more efficient. Given that the majority of these costs result from the large number of interviews conducted, any effort to reduce the number of on-site interviews would be fruitful. For example, programs can administer customized assessments to eligible applicants early in the process to help identify candidate potential, fit, and alignment with the program's values and expectations. Finally, for those seeking to invest in more comprehensive selection systems, these data provide baseline estimates of how much programs are currently spending to consider the return on investment for other selection methodologies and approaches.

These data also suggest that there may also be additional opportunities for the surgical education community to work together to improve this efficiency. If we were to extrapolate the average program cost to all 267 programs that participated in the match during 2017, resident selection costs would exceed \$26 million annually. National-level efforts may be able to reduce these costs. Adoption of more efficient screening tools, such as online assessments, phone or video interviews, or assessment centers, may help decrease the burden for both applicants and programs. For example, preliminary data from an advanced surgical fellowship has shown that programs can decrease the number of on-site interviews by approximately 1/3 by incorporating customized online assessments aimed at assessing applicant fit and competency.¹¹ Other solutions, such as limiting the number of on-site interviews offered by programs (i.e., 3 interviews per position being filled) or the number of applications submitted by applicants, may also be worthy of investigation.

Of course, this study is not without its limitations. First, these results are based on a retrospective survey, and may not be accurate due to recall bias. Prospective and real-time data capture may provide more accurate estimates of time spent on these tasks. Additionally, these data reflect responses from only 48% of programs in the country. Nonetheless, our response rate does exceed other PD surveys administered by other entities, such as the AAMC and NRMP^{2,3,10} and also aligns with other estimates for resident

selection.¹²⁻¹³ Further, the program characteristics reported here, such as PD tenure, program type, and program size are consistent with national data reports, and thus may serve as a representative sample.¹⁰ We must also note that many of these activities fall under individuals' assigned job duties. Our goal with the manuscript was to identify a specific time and cost value associated with the selection process, and these data may inform efforts to identify how that time may better be spent. Finally, these results reflect only the "input" side of the selection equation, and we are limited in knowing the effectiveness of these various screening techniques and activities. Gathering additional information about the programs, such as attrition rates, match statistics, and fit of those selected, may provide additional insight into how effective the current processes are.

CONCLUSION

Our study reveals that residency programs are spending significant time and resources on the current selection process. Program leaders can use these data to assess their current selection strategies, review faculty and staff time allocation, and identify opportunities for making the process more efficient.

REFERENCES

1. 2017 Number of Applicants to General Surgery. Electronic Residency Application Service. <https://www.aamc.org/download/362126/data/general-surgery-categorical.pdf>. Accessed February 8, 2018.
2. Results of the 2016 NRMP Program Director Survey. National Residency Matching Program. <http://www.nrmp.org/wp-content/uploads/2016/09/NRMP-2016-Program-Director-Survey.pdf>. Accessed March 23, 2018.
3. 2017 Main Residency Match Data. National Resident Matching Program. <http://www.nrmp.org/wp-content/uploads/2017/06/Main-Match-Results-and-Data-2017.pdf>. Accessed March 23, 2018.
4. Historical Specialty Specific Data on ERAS Applicants and Applications. <https://www.aamc.org/services/eras/stats/359278/stats.html>. Accessed February 5th, 2018.
5. Results of the 2017 NRMP Applicant Survey. National Resident Matching Program. <http://www.nrmp.org/wp-content/uploads/2017/09/Applicant-Survey-Report-2017.pdf>. Accessed February 5th, 2018.
6. Cost of Applying to Residency Questionnaire Report. Association of American Medical Colleges. <https://www.aamc.org/download/430902/data/>

costofapplyingtoresidency.pdf. Accessed February 5th, 2018.

7. Physician salary calculator. <http://www.jacksoncoker.com/Static/Resources/Physician-Salary-Calculator/>. Accessed March 23, 2018.
8. Residency coordinator salaries. <http://www1.salary.com/Physician-Residency-Coordinator-salary.html>. Accessed March 23, 2018.
9. Resident salary and debt report 2017. MedScape. <https://www.medscape.com/slideshow/residents-salary-and-debt-report-2017-6008931#3>. Accessed March 23, 2018.
10. ACGME Data Resources Book. Accreditation Council for Graduate Medical Education. <http://www.acgme.org/About-Us/Publications-and-Resources/Graduate-Medical-Education-Data-Resource-Book>. Accessed March 23, 2018.
11. Gardner AK, Dunkin BJ. Pursuing excellence: the power of selection science to provide meaningful data and enhance efficiency in selecting surgical trainees. *Ann Surg*. 2018. <https://doi.org/10.1097/SLA.0000000000002806>.
12. Gardner AK, Grantcharov T, Dunkin BJ. The science of selection: using best practices from industry to improve success in surgery training. *J Surg Educ*. 2018;75(2):278-285. <https://doi.org/10.1016/j.jsurg.2017.07.010>.
13. Brummond A, Sefcik S, Halvorsen AJ, et al. Resident recruitment costs: a national survey of internal medicine program directors. *Am J Med*. 2013;126:646-653.

SUPPLEMENTARY INFORMATION

Supplementary material associated with this article can be found in the online version at <https://doi.org/10.1016/j.jsurg.2018.10.001>.