



## Evaluation of general surgery residency program websites

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### ARTICLE INFO

#### Article history:

Received 19 June 2018

Received in revised form

21 December 2018

Accepted 31 December 2018

#### Keywords:

General surgery residency program

Website

Match

Residents

### ABSTRACT

**Background:** The purpose of this study was to evaluate the websites of general surgery residency programs in the United States and Puerto Rico.

**Methods:** Electronic Residency Application Service (ERAS) websites (n = 254) were accessed between October 2016 and January 2017 and evaluated for content, including: education, resident and faculty information, program environment and specific recruitment incentives.

**Results:** General information, such as conference information, rotations, and faculty information were available for more than 80% of programs. However, specific details about residents, faculty, and applicant information were noticeably lacking. This included resident biographical data and research, faculty names and research endeavors, alumni locations and fellowship placement. Applicant information, specifically board score requirements, were present in less than half of websites nationally. Regionally, websites from the Midwest were the most detailed in the information they provided, while those from the Northeast were the least informative.

**Conclusions:** As a primary information source for potential future residents, general surgery programs need to maximize the content and utility of their websites in order to attract prospective residents to their programs.

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## Introduction

Usage of the internet as a source of information has grown exponentially in recent years, not only for the general public, but the medical community as well. Medical students are no exception. With the proliferation of hand-held devices, a treasure trove of information is at our fingertips. Given this ease of access, it is one of the easiest and most versatile ways to obtain information.

One of the most important decisions a medical student can make is not only choosing what medical specialty to complete residency in after medical school, but also where to apply. There are several avenues that medical students can gain information about residency programs, such as word of mouth from faculty or other medical students, program documentation, as well as through the residency program websites through the internet. As mentioned, due to the ease and almost instantaneous ability to access

information, residency program websites have fast become a primary source of information about the program. Applying to residency can be a costly endeavor, costing up to \$20,000 during the application and interview process.<sup>1,2</sup> Depending on the specialty, medical students may schedule upwards of 30 interviews, each with inherent costs (travel, lodging, application fees, among others).<sup>1,2</sup> Having an accurate and up to date website can help medical students not only navigate the application process, but also aid in decision making.

Previous studies have assessed residency program websites in several medical specialties, including orthopedic surgery, plastic surgery, otolaryngology, and radiology, among others, as well as fellowship programs.<sup>3–16</sup> Specifically, Oladeji et al.<sup>8</sup> examined orthopedic surgery websites and found variable degrees of information supplied by the websites themselves. Whereas expected general information about the orthopedic residency program, such as education criteria, were present by a vast majority of programs, other areas were lacking, such as specifics regarding the faculty and program environment. Additionally, in an evaluation of plastic surgery websites, Hasmi et al.<sup>4</sup> showed differences in information content based on the region the program was located, although this

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was not statistically significant.

Overall, there appears to be consistent provision of general residency program information, however, more detailed information is lacking. General surgery residency program websites were evaluated by Reilly et al., in 2004.<sup>9</sup> At that time, only 167 of 251 programs (67%) had a link to a website through FRIEDA Online, the AMA Residency & Fellowship Database. They also found a paucity of information available at that time: of 16 content items evaluated, only 6 items were found on  $\geq 50\%$  of program websites.<sup>9</sup> As there has been significant evolution of internet usage since that time, we proposed to evaluate general surgery residency program websites for content in the areas of resident education, resident information, faculty information, recruitment and environment. In addition, we sought to determine if there is variability of this information based on geographic location of the residency program.

## Materials and methods

### Program identification

Since all information obtained and used in this study is within the public domain, the study design was deemed not human subjects research by the University of Kansas School of Medicine-Wichita Institutional Review Board. The Electronic Residency Application Service (ERAS) website was used to create a list of all general surgery residency programs that were open to the residency match during the 2016–17 academic year. A total of 254 programs within the United States and Puerto Rico were identified.

### Website evaluation

The residency program websites were evaluated between October 2016 and January 2017, which corresponded to the interview period for the 2016–2017 academic year. This corresponded to the time when the websites would be accessed by potential candidates. The websites were found through the ERAS website or through a search of the World Wide Web based on a web browser (such as Google) search. The programs were reviewed by two separate reviewers. Discrepancies were addressed by reviewing the program website in question for the specific data point by the reviewers at a joint session. Each website was evaluated for specific content in five general areas: education information, resident information, faculty information, recruitment information and environment information. Within each category, specific information data points were sought that related to each respective category. A positive score was obtained if the data point was present through the general surgery website itself, i.e. resident salary list may be present on a graduate medical education site, but if a link was present through the general surgery residency website, that was accepted as being present.

### Regional characterization

In order to examine potential regional variations in website data provided, states were divided into four geographic locations, based on the US Census Bureau regional mapping Website: [www2.census.gov](http://www2.census.gov) (Table 1). Puerto Rico was placed in the South as it was not included in the US Census Bureau mapping. Although the number of states/territories was relatively similar between the regions, there was a discrepancy in the number of programs in each region, as the West only had 37 programs while the South had 83.

Initially, all program website elements were evaluated by region to examine differences between regions with regard to presence or absence of each element of interest. We then summarized data within each of the five general categories (education information,

**Table 1**  
Regional breakdown of general surgery residency programs.

West	South	Midwest	Northeast
Washington	Oklahoma	North Dakota	Pennsylvania
Oregon	Texas	South Dakota	New York
California	Arkansas	Nebraska	New Jersey
Idaho	Louisiana	Iowa	Connecticut
Nevada	Mississippi	Kansas	Rhode Island
Arizona	Alabama	Minnesota	Massachusetts
Montana	Georgia	Missouri	Vermont
Wyoming	Florida	Wisconsin	New Hampshire
Colorado	Tennessee	Illinois	Maine
New Mexico	Kentucky	Indiana	
Utah	South Carolina	Ohio	
Hawaii	North Carolina	Michigan	
Alaska	Virginia		
	West Virginia		
	Delaware		
	Maryland		
	District of Columbia		
	Puerto Rico		

resident information, faculty information, recruitment information and environment information) between regions. To do this, we first ranked each website element, such as resident names or PGY status, within a category by assigning rankings from 1 (present in the most websites for a region) to 4 (present in the least websites for a region). Then within each category, the rankings were averaged to provide a mean rank between 1 and 4. A rank of 1.0 would indicate that program websites within that region had each element within a category present more often than any other region, and a rank of 4.0 would indicate that the websites within that region had each element within a category absent more often than any other region. Category scores for each of the 5 general categories were then averaged to provide a mean overall rank for each region.

## Results

A total of 254 general surgery residency programs were open to the 2017 residency Match. Of these, 252 of the 254 programs (99.2%) had an active program website, with 2 programs without websites that could be found through ERAS or web browser searches. Given that these two programs were available for the Match, they remained within the study population. They were assigned values of 0 in the regional comparison since we were evaluating the information for residency programs that could be found online.

The pooled data for all programs on a national level showed a wide variety of inclusion on the program websites (Table 2). Specifically, within the education-related items evaluated, a vast majority of programs included information on conferences, such as grand rounds, morbidity and mortality and didactics, as well as resident rotations and research requirements. However, less than 25% of programs included information on call schedules and away rotations.

Specific information on the program residents and faculty were also highly variable. Names and PGY status were present on more than 80% of websites for residents and over 85% had the names and specialty of the faculty. Approximately 70% of programs provided photos of the residents and/or faculty. Program alumni were only marginally included, with 57% of programs providing names and 69% documenting alumni post-graduate positions and/or fellowships. Surprisingly, faculty research information was lacking, with only 40% indicating research interests and 32% providing some degree of a publication list.

In regard to recruitment and program environment, nearly all

**Table 2**  
The proportion of general surgery residency programs that provide specific program information on their website.<sup>a</sup>

Category	Percent	Category	Percent
Education		Faculty Information	
Rotations	88%	Names	89%
Research requirements	85%	Specialty	85%
Didactics	84%	Photos	74%
Morbidity and mortality conference	82%	Education background	73%
Grand rounds conference	81%	Research interests	40%
Rotation schedule	63%	Research publications	32%
Journal club	61%	Awards	19%
Technology (robot, etc)	48%	Research presentations	9%
Elective rotations	47%		
Night float	39%	Recruitment	
Case log data	31%	Program Coordinator info	94%
Call schedule	22%	Resident salaries	64%
Away rotations	22%	Skills lab	64%
		Vacation	63%
Resident information		Interview process	60%
Resident names	83%	Visa status	59%
Resident PGY status	81%	4th year rotations	41%
Individual photo	70%	Desired scores	36%
Alumni positions/fellowships	69%	Equipment list	24%
Alumni locations	67%	Loupes	7%
Medical school	64%		
Alumni names	57%	Environment	
Group photo	22%	Hospitals	88%
Research publications	16%	Neighborhood information	51%
Hometown	15%	Local attractions	43%
Home state	15%	Social events	27%
Research experience	14%	Pictures of social events	20%
Research presentations	8%	Housing options	20%

<sup>a</sup> Percentages are based upon data from 254 websites.

programs (94%) provided program coordinator information and 88% provided information on the hospitals and rotation locations. However, other specific items evaluated were less likely to be included on program sites, particularly in reference to resident social events, housing options, skills lab equipment and loupes, where less than 30% of programs provided this information.

There were notable differences in the specific items provided on the program websites between the regions. In the education category (Table 3), the Midwest provided the most information. Case log data and rotation schedule were provided on 15% more websites in the Midwest region than the next closest region. In the resident information category (Table 4), 93% of programs included the names and 88% had PGY status in the Midwest, while in the Northeast, only 73% of programs had names and/or PGY status. Alumni information was also most prevalent in the Midwest.

**Table 3**  
Education information provided on general surgery residency program websites by region.

Parameter	Region			
	West	Midwest	South	Northeast
Number of observations	N = 37	N = 59	N = 83	N = 75
Didactics	86%	93%	76%	81%
Morbidity and mortality	81%	90%	77%	79%
Rotations	95%	90%	83%	84%
Research requirements	84%	86%	88%	80%
Grand Rounds	85%	85%	75%	80%
Rotation schedule	59%	75%	60%	53%
Journal club	59%	68%	57%	60%
Technology (robot, etc)	41%	53%	51%	44%
Case log data	30%	47%	27%	24%
Elective rotations	57%	46%	46%	45%
Night float	27%	44%	39%	37%
Call schedule	24%	25%	20%	19%
Away rotations	27%	25%	19%	20%

Faculty information was relatively comparable between the regions, with the exception of awards given to faculty, where the West had 32% of programs with this provided, while less than 20% of programs in the other three regions included this on their websites (Table 5). Similarly, recruitment and environment items were close between regions, with 4th year rotations in the West standing out with 68% of programs versus less than 50% in other regions (Tables 6 and 7). The Northeast region provided the least amount of information about the interview process.

In order to evaluate the regional variability of data presented, regions were ranked based on each specific data point collected, with a ranking of 1 being the highest and 4 the lowest. This allowed for each item to be weighted equally, given the wide disparity between regions for certain items and overall inclusion on the websites (Table 8). The Midwest was the highest ranked region in 4 of

**Table 4**  
Resident information provided on general surgery residency program websites by region.

Parameter	Region			
	West	Midwest	South	Northeast
Number of observations	N = 37	N = 59	N = 83	N = 75
Names	76%	93%	84%	73%
Resident PGY status	73%	88%	84%	73%
Individual photo	57%	83%	76%	56%
Alumni fellowships/jobs	65%	78%	58%	73%
Medical school	57%	75%	67%	52%
Alumni locations	62%	73%	57%	71%
Alumni names	49%	64%	52%	57%
Group photo	24%	25%	22%	17%
Research publications	19%	24%	13%	11%
Hometown	16%	22%	17%	8%
Home state	16%	22%	17%	8%
Research experience	22%	15%	10%	13%
Research presentations	16%	8%	5%	8%

**Table 5**

Faculty information provided on general surgery residency program websites by region.

Parameter	Region			
	West	Midwest	South	Northeast
Number of observations	N = 37	N = 59	N = 83	N = 75
Names	89%	88%	90%	84%
Specialty	86%	83%	90%	77%
Education background	76%	71%	80%	63%
Photos	81%	69%	78%	65%
Research interests	49%	39%	47%	25%
Research publications	35%	31%	33%	31%
Awards	32%	17%	19%	9%
Research presentations	11%	14%	11%	3%

the 5 categories, with the lone exception being faculty information, where the West and South were ranked higher in this category. Overall, the Midwest provided the most information, with an average rank of 1.68. The Northeast was ranked the lowest in 4 out of 5 categories and had the overall lowest rank indicating that they provided the least information on their websites among the 4 regions.

### Comments

Internet usage has increased tremendously over the last several decades and the amount of data available for any of a number of topics is voluminous. Medical students are not immune to this transition, with the vast majority (if not all) of medical students owning or having immediate access to not only computers, but hand held devices as well. The ability to find and retrieve information has become considerably easier.

Medical school is an extremely expensive endeavor, costing upwards of several hundred thousand dollars.<sup>17</sup> An added burden to the stress, anxiety and cost of medical school in general comes in the 4th year of medical school during the interview process for residency. Recent studies have shown that the cost of the interview process can be as high as \$20,000.<sup>1,2</sup> With travel, lodging, application fees, among others, there are continual mounting costs with increasing numbers of interviews. The ability to make an informed decision on not only where to apply, but also choosing were to interview once an offer is given, is important. Having enough information to make this decision is vitally important. Gatea et al.<sup>18</sup> found that a vast majority of residency applicants were influenced by residency program websites. It was also shown by Jarman et al.<sup>19</sup> that websites were the most common source of information for general surgery residency program applicants, followed by resident and faculty word of mouth.

**Table 6**

Recruitment information provided on general surgery residency program websites by region.

Parameter	Region			
	West	Midwest	South	Northeast
Number of observations	N = 37	N = 59	N = 83	N = 75
Program Coordinator information	95%	95%	94%	89%
Visa status	54%	68%	55%	56%
Resident salaries	41%	68%	72%	60%
Skills lab	57%	66%	60%	68%
Interview process	73%	63%	61%	49%
Vacation	46%	63%	67%	64%
4th year rotations	68%	47%	39%	21%
Desired scores	30%	39%	29%	43%
Equipment list	24%	36%	18%	20%
Loupes	5%	8%	7%	7%

**Table 7**

Environment information provided on general surgery residency program websites by region.

Parameter	Region			
	West	Midwest	South	Northeast
Number of observations	N = 37	N = 59	N = 83	N = 75
Hospitals	97%	90%	82%	85%
Neighborhood information	41%	59%	48%	49%
Local attractions	43%	47%	42%	39%
Social events	22%	36%	25%	24%
Housing options	24%	24%	17%	19%
Pictures of social events	24%	20%	22%	15%

Previous studies have been conducted evaluating websites for not only residency specialties, but fellowships as well.<sup>3–16</sup> Specifically, Oladeji et al.<sup>8</sup> recently evaluated orthopedic surgery websites and found that while almost all programs (97%) had websites, the data provided were lacking in particular areas, such as call schedules, research, and resident information. However, the overall number of programs and relative amount of information the orthopedic residency program websites provided improved relative to a previous study in 2001.<sup>16</sup> Among other surgical specialties, otolaryngology websites also provided limited information, with only faculty listing, didactics and contact information provided on >75% of websites.<sup>13</sup> Similarly, plastic surgery residency programs were also found to lack useful information. In a study by Hashmi et al.<sup>4</sup> only 25% of programs had >2/3 of the information they sought in the study, with coordinator, faculty and resident information being the most common provided. A previous study had found a similar dearth of data on plastic surgery websites, however, they did show that Midwest programs provided the most information regionally.<sup>11</sup> Neurosurgery residency programs were also found to be lacking in overall data content.<sup>12</sup> Several other studies demonstrated a lack of detailed information on residency websites in other non-surgical specialties.<sup>6,14,15,20</sup> These studies show a broad lack of data provided by residency programs that could be accessible and valuable to potential applicants.

General surgery residency program websites were reviewed in 2004.<sup>9</sup> At that time, only 67% of general surgery residency programs provided links to websites through FRIEDA. As would be expected, the most common content areas found on a majority of websites included: program description, conferences, faculty, case numbers and salary. However, these data only accounted for 5 of 16 content items evaluated. Interestingly, this study also showed that there was variability in website design, which can affect usability. This is significant as a website could have a desired piece of information, but if it is not easily accessible or obvious in its presence, then it basically is the same as if that data was not present at all.

Our study demonstrates that general surgery websites have improved over the last 13 years since the prior study, although deficits in certain areas persist. We sought to expand on previous studies and search for data items that would be relevant to medical students applying for residency, such as talking points that do arise during the interview discussions. As expected, general program content was found in over 80% of websites, which includes faculty and resident listings, rotations, conferences, associated hospitals, and residency program coordinator contact information. These data confirm findings from other studies.<sup>8,13</sup> However, detailed information was lacking, most notably in the area of resident information. Apart from resident names and PGY status, there was a considerable and notable absence of information about the residents themselves, such as little background on where the residents went to college or medical school as well as the research experience they may have had. Alumni information was better represented,

**Table 8**  
Regional category ranking.

Category	Region			
	West	Midwest	South	Northeast
Education	2.27	1.33	3.00	3.40
Resident information	2.60	1.20	2.87	3.33
Faculty Information	1.63	3.00	1.63	3.75
Recruitment	3.08	1.83	2.50	2.58
Environment	2.17	1.67	3.00	3.17
Average	2.43	1.68	2.66	3.25

with around 2/3 of programs providing fellowship information. Collaboratively, this data would be important to each prospective applicant, as the current residents within a program are potential colleagues, and furthermore, alumni accomplishments such as fellowship positions could aid in long-term planning.

Interestingly there was a noted lack of information on faculty research. Large academic programs commonly have residents complete 1 or 2 years of research during residency. In addition, to be competitive for some fellowships, research experience plays a role in the overall strength of resident applicants and approximately 60% of general surgery applicants that preferred a University setting for residency were planning on doing a research year.<sup>19</sup> For those medical students who desire to pursue subspecialty training, knowing the research interests and accomplishments of the faculty are of vital importance.

To further break down program website data, regional variations in the specific item content was evaluated. US Census Bureau regional categories were used to break down the programs into geographic regions, the reasoning being that it would compare programs that would be most similar as well as to compare what would be considered “competing” programs. Overall, the Midwest region was found to provide the most information in their websites. This was true for 4 of the 5 categories evaluated, with the exception of faculty information where the West and South regions tied for providing the most content. The Northeast provided the least content in 4 of 5 categories, although they were next to last in providing recruitment information. Geographic location appears to be important to both medical students and residency programs. Nearly ¼ of categorical general surgery residency slots were found to be occupied by home program graduates, with a majority of these residencies being in states with fewer medical schools.<sup>21</sup> These findings were comparable to other fields.<sup>22–24</sup> Such data could be pooled in future studies and potentially utilized by applicants to help navigate the interview process. All told, these data are important, as it can indicate where a program sits, relative to others in their region.

The findings in this study raise several questions. What is the utility of the website data items that were not present in significant numbers of websites? Certain programs appear to make an effort to provide as much information as possible. Does that information impact website viewers (especially residency applicants) and to what degree? Additionally, as mentioned, there was regional variation in the overall amount of information provided, particularly in the Midwest and in the Northeast. Do programs in the Midwest that have less informative websites lose good applicants due to lack of “curb appeal?” Conversely, do programs in the Northeast with more data heavy websites appear better in the eyes of residency applicants? Future studies should continue to examine the role of a general surgery programs website on the applicant’s overall perception of the program, but also delve into the relative importance of the less frequently provided items.

This study is limited in several areas. First, it represents a single snapshot in time. We selected the interview season at the time to

review the residency program websites in order to reduce the likelihood of updates, however, websites can be updated frequently. In addition, not all websites are designed the same and no single template is used to organize the website. It is possible that specific items we evaluated were overlooked based on website design. This also makes it difficult to compare programs given the discrepancy in information and website structure. Third, programs would be less likely to highlight information that could be perceived negatively, such as low board pass rates, inadequate case volume, attrition (demonstrated by less senior residents than lower level residents), among others. It is difficult to determine if data were intentionally left off of program websites for these or other reasons. Finally, while we strove to be exhaustive in our evaluation of the residency program websites, medical students may not consider items that were minimally found on websites to be important. These exclusions would then have little impact on medical student decision making.

## Conclusions

The use of the internet as an information source is ever increasing. The residency interview process is complicated and expensive and any way to maximize the ability to make informed decisions is imperative. General surgery residency programs should continue to strive to provide the most accurate, complete and up-to-date information about their programs as this is one of the quickest and easiest ways to attract potential applicants. While there has been a marked improvement over the last decade, there is still more work to be done.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.amjsurg.2018.12.060>.

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