



Concerns about the pathology job market dominate a popular online pathology forum and likely deterred American medical students from pursuing pathology residency



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ABSTRACT

From 2010 to 2019, 40.5% fewer senior students from United States (US) allopathic medical schools pursued pathology in the Main Residency Match. To possibly explain this trend, we sought to identify major concerns about pathology which were made during this time. Because the Student Doctor Network (SDN) website is widely used by students at American medical schools during the residency application process, SDN has been shown to influence career decisions. So, the 50 all-time most-viewed SDN pathology threads (as of February 2018) were analyzed. The words “job” and “jobs” were used in the title of 11 of the 50 (22%) threads, which altogether received more than 400,000 views. However, the term “job(s)” was rarely used by 14 other major medical specialties. Seven of the 11 (63.6%) job-related threads were created from 2009 to 2011, corresponding with the start of the decline in medical students pursuing pathology residency. It was reasoned that job-market concerns within SDN threads may have discouraged students from pursuing pathology. To test this hypothesis, 5 pathology residents were asked to read all 11 threads and then complete a survey. Most thread reviewers agreed that commenters, which included medical students, were concerned about the pathology job-market and that medical students who viewed the threads would be less likely to pursue pathology residency. Because more than 85% of SDN users are from the US, the threads likely had a greater impact on American medical students compared to foreign students. In conclusion, job-market concerns over the past decade are so prominent in the SDN pathology forum that they likely contributed to fewer seniors from US allopathic medical schools pursuing pathology residency. As of 2019, there are 12 job-related threads among the 50 all-time most-viewed, including threads created in 2016 and 2017. To improve recruitment, the pathology community should carefully review and address concerns about employment opportunities. Due to conflicting reports, additional studies are needed to determine if a mismatch in workforce supply and demand warrants prompt and thoughtful intervention.

1. Introduction

Using the Electronic Residency Application Service (ERAS) [1], medical students can apply to residency training programs they feel can lead to a satisfying and lucrative career. Upon invitation, applicants interview for positions. Finally, applicants and residency programs independently use the Registration, Ranking, and Results (R3) System to rank their top choices [2]. Usually, applicants and residency programs do not rank undesirable choices. The Main Residency Match (MRM), operated by the National Resident Matching Program (NRMP), uses the Rank

Order Lists (ROLs) to provide the best fit for medical students and residency programs [3].

A recent study of pathology residency outcomes over the past decade revealed a major demographic shift [4]. From 2008 to 2010, the number of senior students from US allopathic medical schools that ranked at least one pathology residency program participating in the Main Residency Match (MRM) increased by 11.3% (from 326 in 2008 to 363 in 2010) [3]. However, from 2010 to 2019, the number decreased by 40.5% (from 363 in 2010 to 216 in 2019) [3]. This occurred despite a 19.5% increase in the number of available pathology positions (from 503 in 2010 to 601 in

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2019) [3]. The reasons for this steep decline are unknown [4].

Why are fewer seniors from US allopathic medical schools pursuing pathology residency? According to the NRMP, “specialty competitiveness” is measured, in part, by the percentage of residency positions filled by seniors from US allopathic medical schools [5]. In the 2019 MRM, pathology had the lowest percentage, compared to major medical specialties (excluding preliminary residency programs) offering more than 30 residency positions [5]. Thus, by this metric, pathology is losing its competitiveness. Identifying the causes of this trend can surely help leaders in the field of pathology improve recruitment and avoid the projected shortage of pathologists in the US [6, 7].

This study sought to identify major pathology-related concerns over the past decade that might help explain why fewer seniors from US allopathic medical schools pursued pathology residency over the past decade. Because studies have shown that the Student Doctor Network (SDN) website [8] is widely used by students at American medical schools during the residency application process [9, 10, 11, 12, 13], SDN can influence career decisions. So, the SDN pathology forum was analyzed in this study. SDN is a non-profit organization created in the 1990s to assist students throughout their training and transitions into practice [8]. SDN is used by students, residents, fellows, and attending physicians. The SDN website receives more than 10 million page views per month and is in the top 2000 of the most-viewed websites in the US [14]. SDN forums are conveniently categorized by medical specialty (ex. pathology). Each forum contains threads, which are specific discussion topics, created by SDN members. SDN membership is required to post comments within a thread, but membership is free.

Because some may be unfamiliar with online discussion forums, key definitions are provided here. A “viewer” is someone who reads a specific thread. Viewers can be categorized as either “commenters,” who post a comment on a thread, or as “non-commenters.” “Moderators” ensure that commenters comply with SDN forum rules and policies. “Thread reviewers” are persons recruited for this study to read and analyze specific SDN threads. A forum contains two types of threads. “Sticky threads” are fixed at the top of the forum homepage by a moderator, usually to increase the views of those specific threads, while “normal threads” do not have a priority position at the top of the forum.

In this study, the titles of the 50 all-time most-viewed normal threads in the SDN pathology forum were input into an online automated text analyzer [15]. Surprisingly, the words “job” and “jobs” were used in the title of 11 of the 50 (22%) threads, which contained more than 2,000 comments and received more than 400,000 views. In contrast, “job(s)” was rarely used in thread titles of 14 other major medical specialties. Because all 11 threads were active at some time from 2009 to 2016, all had the potential to affect medical students’ residency interests over the past decade. Thus, none were excluded from the study. Based on the thread titles, it was hypothesized that most comments in these threads were complaints about the pathology job-market and that these complaints likely deterred medical students from pursuing pathology residency. To test this hypothesis, 5 pathology residents, blinded to the study hypothesis, acted as thread reviewers by reading all 11 threads and then completing a survey about recurring themes in the threads.

2. Methods

2.1. Student Doctor Network pathology forum

On February 17, 2018, the SDN pathology forum threads [16] were sorted by views. The 50 all-time most-viewed pathology thread titles were saved as a portable document format (PDF) file. This process was repeated for 14 major medical specialties: anesthesiology, dermatology, emergency medicine, family medicine, internal medicine, neurology, obstetrics and gynecology, orthopedic surgery, otolaryngology, pediatrics, physical medicine and rehabilitation, psychiatry, radiology, and surgery. For the pathology threads, additional information was saved: the date of the first and last comment for each thread and the number of

views for each thread. The dataset is accessible through Mendeley Data (DOI: 10.17632/fzyhh7nhc8.4).

2.2. Automated text analyzer

For each medical specialty, the titles of the 50 all-time most viewed threads were input into an online automated text analyzer [15]. The 3 most-frequently used words for each of the 15 medical specialties were then recorded. Also, the number of times that the words “job” or “jobs” were used for each of the 15 medical specialties was recorded. To validate the accuracy of the automated text analyzer, the “find” function (Control + F) was used to locate the word “job” in each of the 15 medical specialty PDFs. The number of times that “job” was identified using the “find” function was the same as when using the automated text analyzer for all 15 medical specialties (data not shown). So, the text analyzer was deemed accurate.

2.3. Review of the threads

Five pathology residents currently enrolled in combined anatomic and clinical pathology (AP/CP) programs in the US agreed to act as thread reviewers for this study. None of the residents had applied for a pathology job (other than fellowships) prior to starting this project. Each thread reviewer agreed to work independently and to not discuss the project with anyone. Each reviewer read all 11 job-related threads and then summarized the major themes in one paragraph. This review occurred from February to May of 2018. Importantly, the survey about the threads was not distributed until after all single-paragraph summaries were collected, to prevent the survey from influencing the thread reviewers.

2.4. Survey about the threads

Two pathologists, who were not thread reviewers, each read all 11 job-related threads. Independently, they recorded major and minor themes of the threads. Next, they merged their lists of themes and, in July of 2018, constructed a survey about themes within the threads. Then, thread reviewers were asked to respond to survey statements using the Likert scale’s 5-option responses (strongly disagree, disagree, neutral, agree, strongly agree). The definition of each response was created by the survey creators and was provided to the thread reviewers. The reviewers completed that task from July to August of 2018.

2.5. Approval to publish data from SDN and the NRMP

The SDN and NRMP provided written approval to include their data in this manuscript.

3. Results

3.1. Most frequently used words in the pathology thread titles

The 3 most frequently used words in the titles of the 50 all-time most-viewed pathology threads were “pathology”, “job”, and “thread”, respectively (Table 1). While use of the words “pathology” and “thread” was expected, it was surprising to see the word “job” used so frequently: “Job” was used 9-times, and “jobs” was used 2-times. Thus, “job(s)” was used in 11 distinct pathology thread titles (22% of the titles). In contrast, “job(s)” was rarely used in thread titles of the other 14 major medical specialties (Fig. 1).

3.2. Timing of the pathology threads

Job-related threads could only deter medical students from pursuing pathology residency if they were created prior to the year 2011 (Fig. 2), the first year that fewer students pursued pathology residency [3, 4]. In

Table 1

The most frequently used words in the titles of the 50 all-time most-viewed SDN threads for each medical specialty. The words “is”, “to”, “of”, “vs”, “in”, “a” were not included in this table. Occasionally, several words tied for the most common usage.

Specialty	#1 most used word (# of times used)	#2 most used word (# of times used)	#3 most used word (# of times used)
Pathology	Pathology (21)	Job (9)	Thread (6)
Anesthesiology	Anesthesiology (16)	Thread (10)	Official (9)
Dermatology	Dermatology (18)	Derm (13)	Interview (11)
Emergency Medicine	Thread (20)	Emergency (14)	Medicine (14)
Family Medicine	Family (16)	Medicine (14)	Residency (7)
Internal Medicine	Official (28)	Thread (25)	IM (11)
Neurology	Neurology (24)	Interview (11)	Neurologist (7)
Obstetrics/ Gynecology	OB/GYN (20)	Interview (10)	Interviews, Invites, Residency, Thread (5)
Orthopedic Surgery	Ortho (19)	Orthopedic (9)	Residency (7)
Otolaryngology	ENT (22)	Otolaryngology (7)	Residency (5)
Pediatrics	Interview (20)	Peds (18)	Thread (13)
Physical Medicine & Rehabilitation	PM&R (24)	Interview (14)	Invites (7)
Psychiatry	Psychiatry (20)	Thread (18)	Interview (18)
Radiology	Radiology (33)	Thread (10)	Interview (7)
Surgery	Surgery (22)	General (12)	Interview, Surgeon, Surgical, Thread (5)

year 2009, 2 of the 11 job-related threads were created (Fig. 3). Then, in 2010, 3 of the 11 job-related threads were created – the most for any year. Thus, 5 of the 11 job-related threads were created immediately preceding the 2011 MRM. Then, in 2011, 2 more job-related threads were created, which means 7 of the 11 job-related threads (63.6%) were created from year 2009 through 2011. In contrast, only 28.2% of the 39 threads without “job(s)” in the title were created during this time span. Thus, the job-related threads correlate with the start of the decline in seniors from US allopathic medical schools ranking pathology residency.

Later, a thread was created in 2013 and another in 2014.

3.3. Views and comments on the pathology threads

The 11 job-related threads contained more than 2,000 comments and received more than 400,000 views (Table 2). Many thread commenters were pathology fellows and attendings who described their experiences pursuing pathology jobs. Presumably, many of the thread views came from these individuals. In 2012, it was estimated there were 17,913 pathologists in the US [17]. Even if all 17,913 pathologists viewed all 11 threads, this would only amount to 197,043 views, which is less than half of the views received by these threads. Because students at American medical schools heavily use SDN [9, 10, 11, 12, 13], it is likely that medical students interested in pathology residency accounted for many of the thread views.

3.4. Major and minor themes of the threads

Five AP/CP pathology residents in the US, blinded to the research study hypothesis, served as thread reviewers. These 5 residents read all 11 job-related threads and then each wrote a single-paragraph summary of the major themes of the threads (supplemental Figure 1). All five thread reviewers described the job market as the central theme of the 11 threads. Importantly, all single-paragraph summaries were collected before the survey was distributed, to prevent the survey from influencing the reviewers. Thread reviewers were asked to complete a survey about the threads in order to obtain a consensus about the major and minor themes. The reviewers responded to the survey statements using the Likert scale's 5-response options (Table 3). In brief, a response of “strongly agree” meant that the survey statement was a major theme of the threads, while a response of “agree” was considered a minor theme.

Most thread reviewers agreed or strongly agreed that the commenters were concerned about the pathology job market, in terms of the scarce quantity and low-quality (ex. salary) of pathology jobs (Fig. 4). Most agreed or strongly agreed that commenters who identified themselves as medical students were concerned about the poor pathology job market. Most also agreed or strongly agreed that medical students who viewed the threads would be less likely to pursue pathology residency. Overall, most thread reviewers agreed or strongly agreed that the threads leave viewers with a negative impression of the pathology job market.

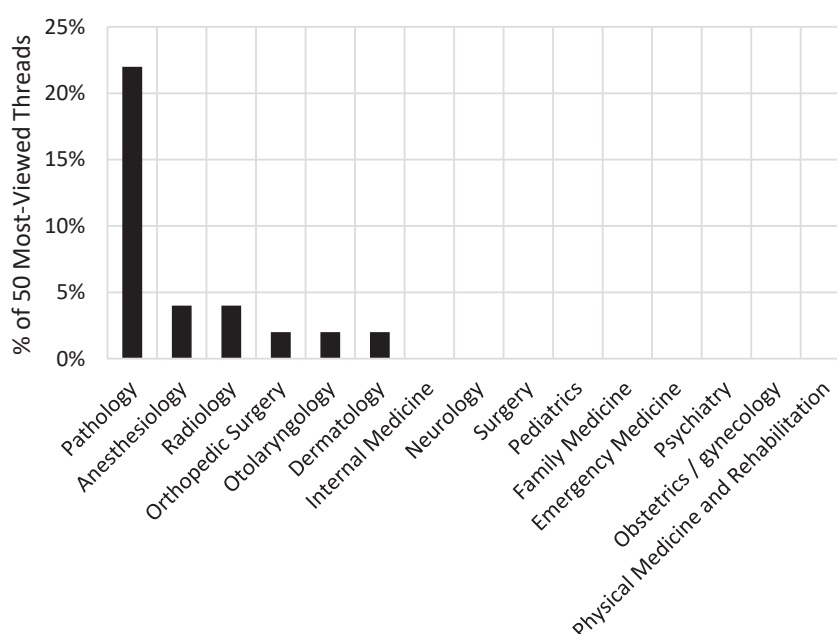


Fig. 1. The number of times that the term “job(s)” was used in the titles of the 50 all-time most-viewed SDN threads for each medical specialty.

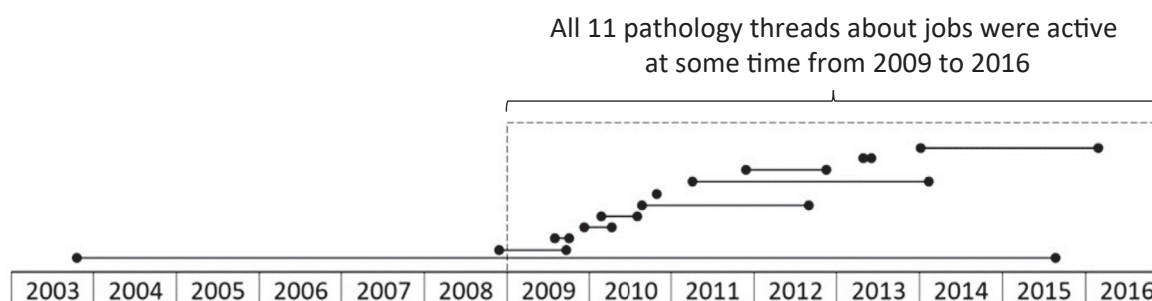


Fig. 2. The dates of the first and last comment for all 11 SDN pathology threads about jobs.

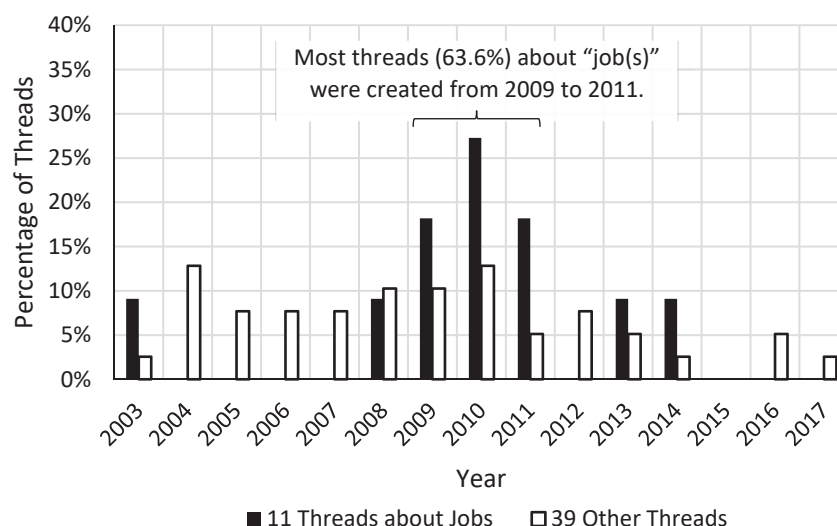


Fig. 3. The start dates of the 50 all-time most-viewed SDN pathology threads.

Table 2

View counts for the 11 SDN pathology threads about jobs.

All-Time Views Rank	Views	Comments	Thread Title
4	88,838	418	Job market for pathologists
7	61,971	344	Pathology Job Search 2011–2012
18	42,850	338	No Jobs!
23	37,774	217	Pathology Job Market
30	32,885	183	Poor job market
36	28,825	212	Hemepath fellow cannot find a job.
40	27,070	19	Pathology job outlook
44	25,427	181	Great jobs in pathology (new)
47	24,037	182	I can't get a job!
49	23,018	123	Tales from the job search
50	22,381	155	Bad job market
TOTAL:	415,076	2,372	

4. Discussion

The purpose of this study was to identify major pathology-related concerns that might help explain why fewer seniors from US allopathic medical schools pursued pathology residency over the past decade. Because medical students heavily utilize SDN during the residency application process [9, 10, 11, 12, 13], SDN can influence career decisions. This study found that 11 of the 50 (22%) all-time most-viewed SDN pathology forum threads used "job(s)" in the thread title. In contrast, "job(s)" was rarely used in the thread titles of 14 other major

Table 3

Definitions of Likert scale 5-option responses that thread reviewers were given to complete the survey about the 11 job-related threads.

Strongly agree	You feel that comments directly supporting the statement were in the SDN threads and that the statement is a major ¹ theme of the threads.
Agree	You feel that comments directly supporting the statement were in the SDN threads and that the statement is a minor ² theme of the threads.
Neutral	You feel that comments directly supporting the statement were in the SDN threads, but were not at least a minor ² theme of the threads.
Disagree	You feel that comments directly supporting the statement were not in the SDN threads.
Strongly disagree	You feel that comments indirectly supporting the statement were not in the SDN threads.

¹ Major Theme – Most likely what you wrote in your one paragraph summary of the 11 SDN threads.

² Minor Theme – Most likely what you would write, if you were asked to write an additional paragraph describing the 11 SDN threads.

medical specialties. All 11 job-related threads were active at some time from 2009 to 2016, and these threads had more than 2,000 comments and more than 400,000 views. Because more than 85% of visitors to the SDN website are from the US [14], medical students at American, rather than foreign, medical schools would be more likely to read – and be influenced by – these threads. Thus, the job-related threads were further evaluated.

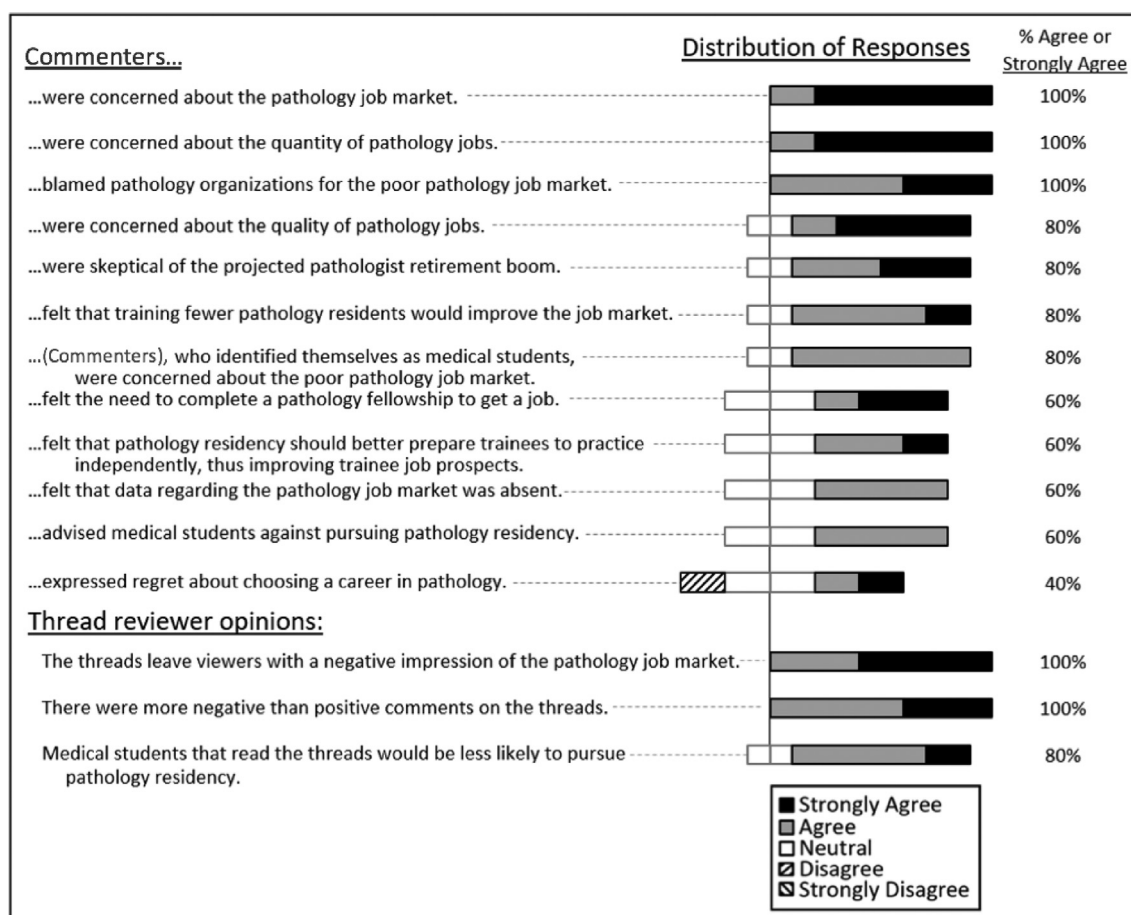


Fig. 4. Survey responses regarding the 11 threads about jobs, provided by the five thread reviewers.

More than 63% of the job-related threads were created from year 2009 through 2011, a correlation not found for the 39 other threads (of the 50 most-viewed). The threads created from 2009 to 2010 likely coincide with a declining pathology job-market. So, these threads likely served as “bad press” for pathology, contributing to the decline in medical students pursuing pathology residency in the MRM. The threads created in 2011, 2013, and 2014 likely reflect persistent problems with the pathology job market, further contributing to the “bad press.” Of note, there were no job-related pathology threads created from 2015 to 2018 among the 50 all-time most viewed, when such information was collected for this study in February 2018. Subsequently, the list of most-viewed pathology threads changed. As of August 2019, twelve (24%) of the 50 all-time most viewed pathology threads on SDN use “job(s)” in the thread title. One thread that is new to the most-viewed list is titled “No JOBS in pathology” which was created in February 2016, with more than 40,000 views [18]. Another new thread is titled “Current fellows: how’s the job hunt this year?” which was created in February 2017, with more than 30,000 views [19]. Thus, the pathology job market remains a major discussion topic in the SDN pathology forum.

By organizing the survey statements that most thread reviewers agreed with, we can better understand the perspectives of the commenters. Mostly pathology fellows and attendings used the threads to describe their personal difficulty finding a fulfilling job. Commenters were disappointed by the scarce number of pathology jobs and their low-quality (ex. salary). Commenters felt that the main problem with the job market was that too many pathologists were being trained for the number of jobs, and many cited websites deriding the oversupply of pathologists [20, 21, 22]. In addition, commenters felt that pathology organizations persistently forecast an eminent “retirement boom” [6, 23, 24] as justification for training so many pathologists. Commenters also wanted

residency programs to prepare residents to practice independently upon graduation [25, 26], thus improving their competitiveness in the job market. Commenters felt that fellowships were necessary not only to learn to practice independently, but also because obtaining a job immediately after residency was difficult [24, 27, 28, 29, 30]. Overall, the survey results support the hypothesis that most job-related pathology threads were negative and discouraging.

This study has several limitations. One limitation is that only one pathology forum was analyzed. However, the SDN pathology forum was selected because the authors believe it is the largest online American pathology forum. A second limitation is that only threads with “job(s)” in the thread title were analyzed. The strict focus on the job market was warranted because this topic attracted significant discussion and viewership. Additionally, the analysis of the themes in the threads was limited to the opinions of just five thread reviewers from one pathology residency program. It is possible that thread reviewers from other institutions across the US would have different views of the threads. However, one can clearly see, by looking at the thread titles (ex. “Bad job-market” and “I Can’t Get a Job!” and “No Jobs!”) that concerns about the pathology job market were the major theme. Another limitation was that thread reviewers evaluated all 11 threads as a single entity. Although each thread could have a slightly different ratio of negative to positive comments regarding the job-market, the threads seemed to consistently reflect the same 14 survey statements (themes) that most thread reviewers agreed with. This may be explained by the same SDN members, possibly a vocal minority of dissatisfied pathologists, commenting on multiple pathology job-related threads. Another limitation was that this study could not quantify how many medical students viewed the threads because such data are not available. However, previous studies have shown that medical students heavily utilize SDN during the residency

application process [9, 10, 11, 12, 13]. Furthermore, because the threads were viewed more than 400,000 times, it is likely that many medical students viewed them. Lastly, this study did not seek to prove or disprove claims made about the pathology job market because objective data regarding the pathology job market are often missing. In fact, most thread reviewers agreed that commenters felt job-market data were lacking. Regardless of the true state of the pathology job market in the past, the job-related threads were overwhelming negative.

It is important to note that concerns about the pathology job market are not limited to SDN. Similar commentary is also found in discussion forums of other social media websites, such as Reddit [31, 32, 33]. Additionally, it is likely that medical students who completed pathology rotations (over the past decade) heard pathology fellows or attending physicians complain about the job market. Some may have been bluntly advised to avoid pathology [24]. Unlike verbal commentary, the benefit of the online discussion forums is that they serve as a time-stamped archive of informal commentary.

There are mixed signs regarding the recent/current pathology job market. In 2017, a member of the American Society for Clinical Pathology (ASCP) Resident Council published the manuscript “Shift Your Anxieties Elsewhere: There Will be Jobs” [24]. This article describes “current perceptions of the job-market” using many of the themes found in the SDN threads such as (1) a “highly competitive” pathology job market, (2) skepticism of the “retirement cliff,” and (3) how some pathologists “advise medical students to avoid pathology” [24]. However, the author describes an optimistic outlook based on his pathology colleagues’ success in the recent job market. In 2018, an analysis of 5-years (2012–2016) of College of American Pathologists (CAP) job market surveys was published [27]. The study covered survey results of “CAP junior members and fellows in practice 3-years or less who have actively searched for a non-fellowship position” and found that 73% of respondents received at least one job offer [27]. However, 81% reported difficulty finding a job and 93% of these respondents stated that there were “too few jobs available” [27]. Another article noted similar results [26]. A 2015 study in the state of New York found that pathology was the medical specialty in least demand (25th out of 25 specialties evaluated) [30]. Thus, it appears that the pathology job market remains challenging for some.

A research study published in 2018 found that 2nd-year pathology residents had the highest rate of career regret (32.7%), compared to 19 other major medical specialties [34]. The study also found that pathology had the 2nd-highest rate of medical specialty regret (12.2%). However, the study had several key limitations. Only 49 pathology residents were surveyed in the study [34]. In addition, 2nd-year residents, rather than independently practicing pathologists, were surveyed about career and specialty regret [34]. Despite the limitations of the study, it suggests that a significant subset of pathology residents regret choosing pathology as a career. However, this study did not seek to determine the underlying reasons for specialty regret. It is possible that the subset of pathology residents that regret choosing pathology are ultimately disappointed in their pathology job-market prospects. This is supported by our survey results, which show that 40% of the thread reviewers agreed or strongly agreed that commenters expressed regret about choosing a career in pathology in the 11 job-related threads. However, additional studies will be needed to determine the underlying causes of regret.

To improve medical student recruitment, some pathologists/pathology organizations may petition SDN to remove old threads which were critical of the job-market, on the basis that they provide outdated and misleading information. However, SDN states that its “volunteer staff do not independently delete posts unless they violate our Terms of Service, such as spam, doxing, trolling or pornography” and “even if the volunteer team can remove a post, that post is often permanently cataloged in sites like Google or the Internet Archive” [35]. Thus, there is no guarantee that SDN will agree to delete such content. Also, SDN threads critical of the job market continue to be created. For example, the SDN thread dramatically titled “WOW NO JOBS IN PATHOLOGY” was created on July 24, 2018 and has more than 15,000 views [36]. Furthermore,

negative pathology job-market comments are also present on other social media websites such as Reddit [31, 32, 33]. Thus, there are significant challenges to removing such content.

To combat the steady stream of negative comments on SDN about the pathology job market, one SDN member created a thread titled “Open positions” [37]. Since January 2011, this member has consistently posted job openings to the SDN pathology community through the present day (most recent post August 7th, 2019). To support this effort, the pathology forum moderator made this thread a sticky thread, which has a priority position at the top of the pathology forum. Consequently, this thread has received 111,000 views.

As in the example above, we feel an effective way to improve recruitment is for the pathology community to disseminate positive information about our specialty and the job market. For example, pathology residents, fellow, and attendings can tell medical students that 73% of newly graduated pathologists received at least one job offer [27]. In addition, forensics has an ongoing workforce shortage [38], and a pathology workforce shortage is projected through year 2030 [6–7]. Pathologists can also tell students that the average annual compensation for pathologists is \$308,000, which was the 16th-highest amount out of 29 medical specialties [39]. Likewise, 66% of pathologists feel “fairly compensated” – tied for the 3rd-highest rate [39]. In addition, pathology tied for the 5th-highest level of happiness at work (31%) and the 3rd-lowest rate of physician “burn out” (33%) [40]. Pathologists can also describe the positive aspects of pathology that medical students often overlook. For example, pathology is a technologically advanced medical specialty which includes molecular genetics, digital pathology (and artificial intelligence), informatics, and therapeutic pathology [41]. Pathology organizations can help disseminate such information. Additionally, they can improve the visibility [41] of our field to 1st-year medical students, most of whom have not yet set their minds on a specific medical specialty.

Because of conflicting reports about the state of the pathology job market, more studies are needed [24, 41]. We feel that a comparison of the current pathology job market to other major medical specialties would be especially useful. If data indicate that there is a significant oversupply of pathologists for the number of available jobs, then corrective action should be taken. Pathology organizations could orchestrate an effort to balance the number of training slots to workforce demand [41]. It is worth mentioning that it is difficult to project workforce demand due to advances in technology [6, 41], which can significantly improve worker efficiency. Thus, annual surveys of pathology employers and job seekers may be helpful to balance workforce supply and demand. Lastly, data show pathologists who were international medical graduates (IMGs) have more difficulty finding a job, compared to US medical graduates (USMGs) [27]. If additional studies find similar results, then pathology organizations should provide IMGs more personalized job-placement support and resources.

5. Conclusion

This study found that 11 of the 50 all-time most-viewed SDN pathology threads discussed the pathology job market. Such threads attracted significant attention (more than 400,000 views), with most threads created from 2009 to 2011. These threads temporally correlate with the start of the decline in seniors from US allopathic medical schools ranking pathology residency in the MRM, which began in 2011. It is likely complaints about the job market contributed to fewer seniors from US allopathic medical schools pursuing pathology residency over the past decade. Because pathology residency continues to have the lowest percentage of US allopathic medical students, it is possible concerns about the job-market continue to impede recruitment of students into our field. To more effectively attract [42, 43, 44] seniors from US allopathic medical schools, pathology residents, fellows, attendings, and organizations should publicize positive job-market data and related information to medical students. However, more studies are needed to determine if

there is currently a mismatch in workforce supply and demand.

Declarations

Author contribution statement

Ryan Philip Jajosky: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Mara Banks: Performed the experiments; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Audrey N. Jajosky: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Competing interest statement

The authors declare the following conflict of interests: Dr. Ryan Jajosky is the CEO and part-owner of Biconcavity Inc. Biconcavity Inc. is a biotechnology research and development company exploring drug-linked-erythrocytes. Biconcavity does not have any interest in pathology residency recruitment. Visit www.biconcavity.com for more information. MB and AJ declare no conflict of interest.

Additional information

Data associated with this study has been deposited in Mendeley data under the accession number <https://doi.org/10.17632/fzyhh7nhc8.4>.

Supplementary content related to this article has been published online at <https://doi.org/10.1016/j.heliyon.2019.e02400>.

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