Regular Article

# Social media in pathology and laboratory medicine: A systematic review

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A B S T R A C T

The use of social media platforms in pathology and medical laboratory science has increased in recent years, revolutionizing the way professionals in these fields interact, disseminate information, and collaborate. To gain an understanding of the current landscape regarding social media use in pathology and medical laboratory science, a novel systematic review was conducted. A search of PubMed, Medline, Embase, and Scopus was performed to identify articles evaluating social media use within pathology and medical laboratory science. Articles published in English within the previous 10 years were searched on December 22, 2022. Inclusion criteria were articles containing information regarding social media utility in pathology or laboratory medicine and related articles that mentioned specific hashtags for pathology. The review process involved analyzing the social media platforms referenced, hashtags mentioned, and the presence of international authors as key endpoints of interest. 802 publications were identified; 54 studies met inclusion criteria. Subspecialties represented were considered, but none were found to be statistically significant. X/Twitter (n = 42) was the most discussed social media platform. The top hashtags discussed were #pathJC (5.1%), #dermpathJC (4.2%), #USCAP2016 (3.4%), and #PathBoards (3.4%). Analysis of these articles provides insights into current trends, including the social media platforms referenced, hashtags used, and involvement of international authors. This review will contribute to a deeper understanding of the role and impact of social media in these fields, highlighting opportunities and challenges for future research and practice in pathology and lab medicine.

*Keywords:* Digital pathology, Laboratory medicine, Medical education, Pathology, Social media

## Introduction

With the exponential growth of social media since the introduction of social networking sites in the late 1990s,[1] it became only natural that pathologists, laboratory professionals, and medical students interested in the specialty would use these platforms for their own reasons. Over the past decade, the use of social media has shifted from instant messenger chats, allowing individuals to message privately between two or more users, and personal journal entries into a dynamic networking tool that can be used for professional development and education. The hashtag

(e.g. #PathTwitter) came onto the social media scene in 2007 and quickly became a part of mainstream culture. Hashtags are used to group posts together by topic, which allows individuals to quickly find related social media content.[2] Their use in pathology and laboratory medicine (e.g. #WeSaveLivesEveryday, #MedicalLaboratory, #MedLabChat, #Lab4Life #Labucate, #Labvocate) has grown and developed into a way for people to communicate about academic conferences in real-time and share educational cases with peers from around the world.[3] Likewise, the ability to measure, analyze, and manage social media metrics and guide the unique nature of social media from traditional media or other online digital media is critical for ongoing productive and scholarly utilization.[4]

As with all virtual technologies, the use of social media to facilitate connection with others exploded in the wake of the coronavirus disease 2019 (COVID-19) pandemic, which had both positive and negative sequelae. The spread of health misinformation seen during the pandemic[5] was met with global, cooperative use of social media by physicians, scientists, and public health organizations as a tool to quickly disseminate helpful information to the public,[6,7] combat misinformation,[8] further medical education,[9,10] and expand networks with peers.[10,11] The COVID-19 pandemic promoted the role of social media in the medical community and, specifically those in pathology and laboratory medicine (PLM). With the continued growth of social media and its role in people's lives, it is increasingly important to understand the use of social media and the part it plays in health and medicine.

While there have been studies on using social media and related tools such as hashtags for medical education and networking, little is known about its overall use and impact in PLM.[12,13]

The goal of this study is to provide readers with a novel evaluation of the evolution of social media in the context of PLM, as well as the benefits and consequences of using social media as pathology professionals, and provide a roadmap of future trends in social media usage for the field.

## Materials and methods

Independent reviewers systematically searched PubMed, Medline, Embase, and Scopus on articles published through December 21, 2022. The following medical subject headings were used to locate articles: "medical laboratory science," "pathology," "social media," "medical technology," and "clinical laboratory personnel." "Pathology" and "medical laboratory science"/"clinical laboratory personnel" were connected by the Boolean operator "OR" and linked to "social media" by the Boolean operator "AND" to ensure that the resulting articles contained all essential keywords.

The inclusion criteria for articles were as follows: (1) digital articles containing information directly pertinent to the utilization of social media within the contexts of pathology and/or medical laboratory science; (2) articles that mentioned the use of different types of social media platforms and/or referenced specific hashtags for pathology, with or without the inclusion of international authors. The references of included articles were manually searched for additional articles for inclusion. Excluded from analysis were articles that did not satisfy these criteria, poster abstracts, studies that were inaccessible or without full-text availability, and those not published in English. Articles were determined for inclusion/exclusion through a consensus process.

The final set of articles undergoing analysis was obtained using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)[14] (Fig. 1). Specifically, data from each included study was manually extracted and collated in a spreadsheet to provide a comprehensive, updated, and detailed review of the existing literature on social media use in pathology and medical laboratory science. Following the identification and removal of duplicates, titles and then abstracts were screened for relevance. All studies meeting the inclusion criteria by title and abstract review underwent full-text review. When reviewing full text, articles were included that reported significant use of or impact of social media in pathology and medical laboratory science. Discrepancies in assessment were resolved by consensus, including the addition of other reviewers.

Given the nature of this study, a retrospective review and analysis of existing literature rather than primary research involving human subjects or personal data, obtaining approval from a local Institutional Review Board (IRB) was not necessary. The primary outcomes of interest in this study were individually referenced social media platforms, with specific hashtags mentioned within the context of pathology and medical laboratory science, and the presence of international authors. Whether articles were related to COVID-19 and subspecialties in pathology and medical laboratory science were included as a secondary outcome of interest.
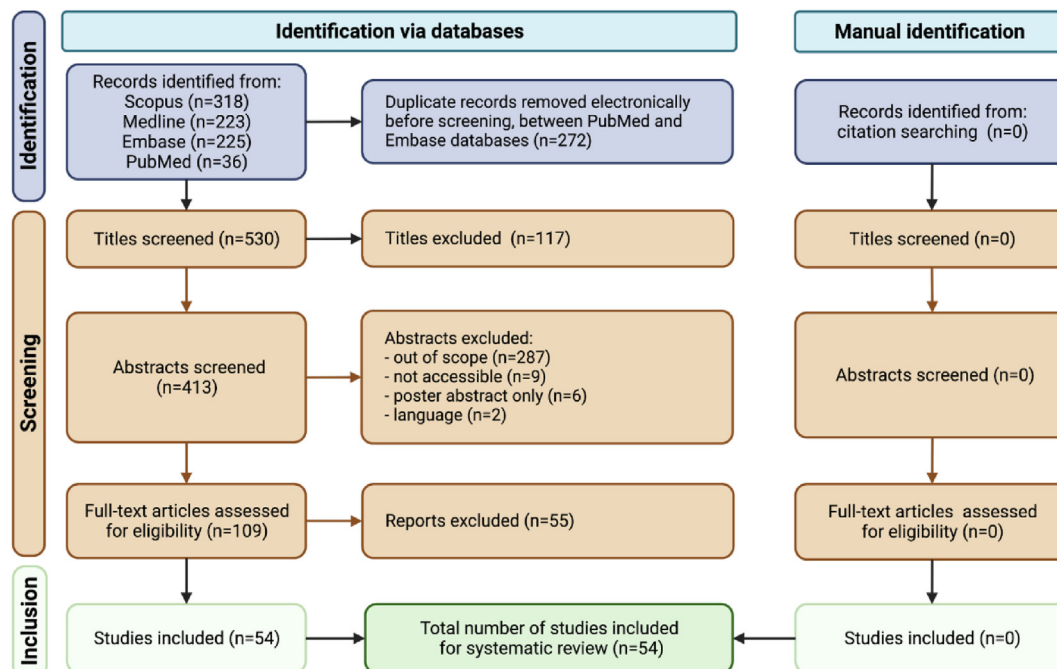


**Fig. 1.** PRISMA flow diagram for the systematic social media in the pathology article search process.

Statistical analysis was conducted per the Cochrane guidelines.[15] To assess statistical significance for categorical variables, a Fisher's exact test was performed for 2 × 2 tables and a Chi-square test for tables size 3 × 2 and larger. For Chi-square tests, Yates's correction for continuity was used when at least one cell in the table had an expected count smaller than 5. The chi-square test was conducted using the statistical software provided by VassarStats (http://vassarstats.net/newcs.html) and the Fisher-exact test was performed on Socscistatistics (https://www.socscistatistics.com/tests/fisher/default2.aspx). Statistical significance was set as a p-value of less than 0.05 for all analyses.

## Results

### Literature search

The initial search of PUBMED, MEDLINE, SCOPUS, and EMBASE resulted in a total of 802 articles identified from database review, with no additional studies found through manual search. Relevant search terms about pathology, medical laboratory science, medical technology, and clinical laboratory personnel were utilized to maximize search retrieval results from each separate database (see Supplemental Table 1 for search terms). Duplicate record removal resulted in 530 identified studies that underwent screening by title and abstract for relevance. The final set of studies included after having their full text analyzed for eligibility was 54 (Fig. 1).

### Study characteristics

Of these 54 studies, 28 (52%) were original research or reviews, 26 (48%) were editorials or commentaries, and all were retrospective. Eleven studies (20%) included international authorship outside of the United States, and 19 countries were represented overall (see Supplemental Table 2 for included articles). Countries of author origin include the United States, Canada, Pakistan, Spain, the United Kingdom, Tunisia, Germany, France, Kuwait, Belgium, Honduras, Italy, Turkey, India, Brazil, Nigeria, Rwanda, Uganda, and Tanzania. Social media platforms mentioned included Twitter (Note: Although Twitter had been changed to "X" in 2023 after study data were analyzed, the platform will be referred to as Twitter throughout this article since the original search was conducted before this change). A recent article by Schukow et al. addresses this evolution of Twitter to X[16], and readers are encouraged to review their article for more information.

Seventeen (31%) articles had a distinct pathology subspeciality focus, with cytopathology representing the most published specialty with five manuscripts, followed by dermatopathology and hematopathology (n = 4 each), forensic pathology (n = 3), and neuropathology (n = 1). While cytopathology was the subspeciality with the most publications about social media; this did not reach statistical significance when compared to other subspeciality papers (p = 0.6801).

### Comparison across platform, subspeciality, hashtag usage and COVID-19

Fifty studies (93%) included information on specific social media platforms. Of these, Twitter was the most discussed social media platform (n = 42), followed by Facebook (n = 27), Instagram (n = 11), TikTok (n = 2), and Reddit (n = 2). When comparing the three leading platforms, X/Twitter was the most used platform in pathology (p < 0.0001). Hashtags were commonly discussed in articles (n = 27). A total of 77 different hashtags were used 118 times, with the top hashtags being #pathJC (5.1%), #dermpathJC (4.2%), #USCAP2016 (3.4%), and #PathBoards (3.4 %) (Fig. 2). The top social media platform usage and subspeciality representation can be seen in Table 1. No statistically significant differences between platform and subspeciality were seen for papers with international authorship (Table 2).

Six studies (11%) were related to the COVID-19 pandemic. These studies trended toward hashtag usage, although this did not reach statistical significance (p = 0.1917) (Table 3). Regarding the year of
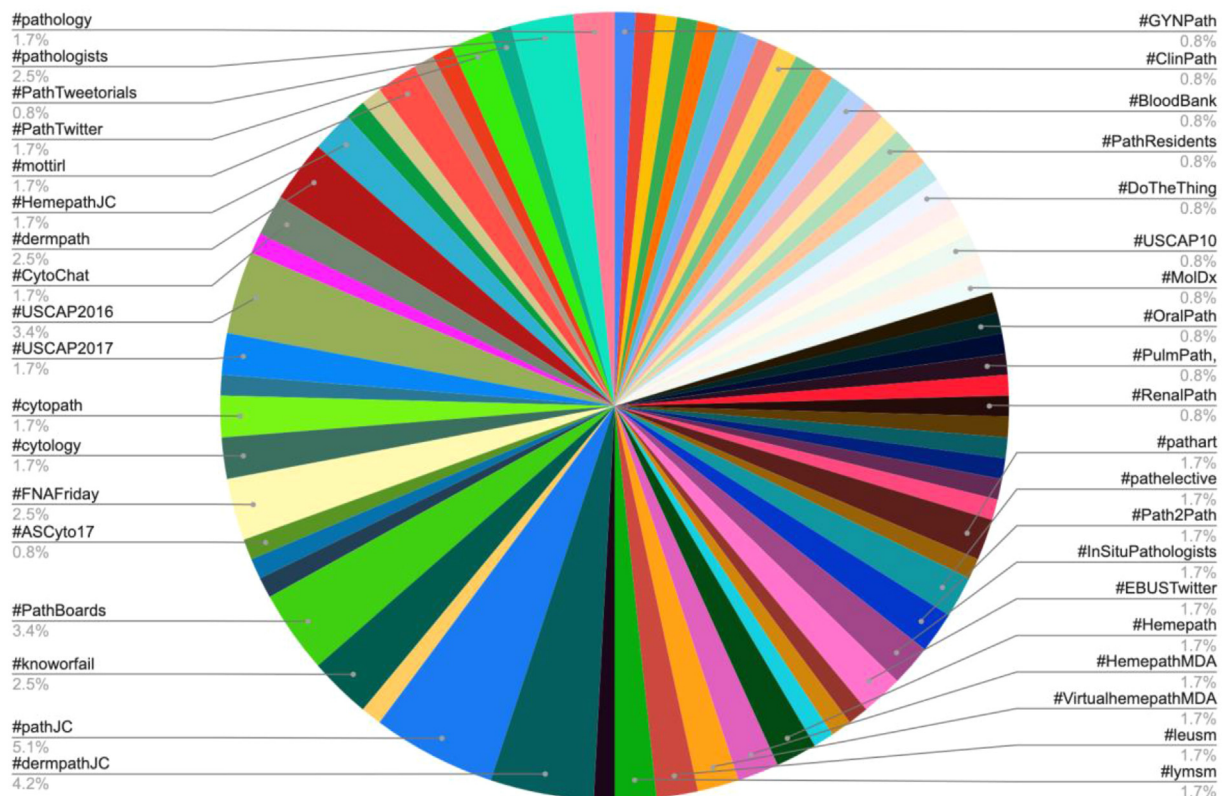


**Fig. 2.** Hashtag usage and distribution among included studies. Complete hashtag results according to the included study is available in Supplemental Table 1.

**Table 1**

Platform usage and subspeciality representation amongst included studies.

| International studies | | | |
| --- | --- | --- | --- |
| | Yes | No | P value |
| Platform | | | |
| X/Twitter | 42 | 8 | **<.0001*** |
| Facebook | 27 | 23 | |
| Instagram | 11 | 39 | |
| Subspeciality | | | |
| Cytopathology | 5 | 12 | 0.6801[†] |
| Dermatopathology | 4 | 13 | |
| Hematopathology | 4 | 13 | |
| Forensics | 3 | 14 | |
| Neuropathology | 1 | 16 | |

Bolded P values are statistically significant. (*) Pearson chi-square, uncorrected for continuity; (†) Yates chi-square, corrected for continuity.

**Table 2**

Platform usage and subspeciality representation amongst included international studies.

| International authorship | | | |
| --- | --- | --- | --- |
| | Yes | No | P value |
| Platform | | | |
| X/Twitter | 9 | 33 | 0.999* |
| Facebook | 5 | 22 | |
| Instagram | 1 | 10 | |
| Subspeciality | | | |
| Cytopathology | 1 | 4 | 0.2857* |
| Dermatopathology | 1 | 3 | |
| Hematopathology | 0 | 4 | |
| Forensics | 0 | 3 | |
| Neuropathology | 1 | 0 | |
| Hashtag usage | | | |
| Yes | 7 | 20 | 0.5007[†] |
| No | 4 | 23 | |

No statistically significant P values are present. (*) Yates chi-square, corrected for continuity; (†) Fisher Exact test.

**Table 3**

Platform usage and subspeciality representation amongst COVID-19-related studies.

| Covid-19 related | | | |
| --- | --- | --- | --- |
| | Yes | No | P value |
| Platform | | | |
| X/Twitter | 4 | 39 | 0.8231* |
| Facebook | 2 | 25 | |
| Instagram | 1 | 10 | |
| Subspeciality | | | |
| Cytopathology | 2 | 3 | 0.9203* |
| Dermatopathology | 0 | 4 | |
| Hematopathology | 0 | 4 | |
| Forensics | 0 | 3 | |
| Neuropathology | 0 | 1 | |
| Hashtag usage | | | |
| Yes | 5 | 22 | 0.1917[†] |
| No | 1 | 26 | |

No statistically significant P values are present. (*) Yates chi-square, corrected for continuity; (†) Fisher Exact test.

publication and COVID-19 relatedness, 24 studies were published from 2020 onwards with 6 involving COVID-19. Comparatively, 14 studies were published from 2021 onwards, with 5 discussing COVID-19 (p = 0.7121).

## Discussion

As the landscape of social media has grown with time, so has its use in the personal and professional lives of pathologists and medical laboratory professionals. Over the past few years, it has evolved from a platform for personal use to a powerful, constantly evolving, new-age networking classroom for people worldwide. Over the past few years, especially during the COVID-19 pandemic, the use of social media for this exact purpose has skyrocketed to involve many different subspecialties within PLM. This change has been quite noticeable for pathologists in all specialties working in various private and academic institutions.[17] In literature, it is noted that the COVID-19 pandemic had a noticeable impact on pathology. Even though statistical significance was not achieved (p = 0.1917), COVID-19-related studies trended toward hashtag usage, as seen in Table 3. Statistical analysis of the current literature, however, does not show a significant difference in any one subspeciality that superseded the others in terms of the impact the pandemic has on social media.

Pathologists do not operate within a vacuum. With advances in the field, a pathologist's evaluation is incomplete without complementary ancillary studies to determine their final diagnosis. Social media has enabled trainees and other pathologists to share their complete thought processes, to include additional digital pathology such as the additional reactions that are needed to make the final diagnosis. Despite the lack of face-to-face interaction, this platform creates a forum for experts, trainees, and medical students to exchange ideas and content while transcending boundaries all across the globe, furthering the democratization of information and learning.

### Hashtags

The use of "hashtags" (represented by the symbol "#") has become an integral part of social media in recent years. Its history can be traced back to its introduction by Twitter in 2007 as a way for individuals to group their tweets based on the topic.[18] Since then, its use has expanded to other social media platforms, including Facebook and Instagram (collectively referred to under the social media brand known as "Meta").[16] Even though the use of the hashtag was originally intended for grouping ideas, over the past few years its utility has expanded to help categorize posts to increase engagement and create support for social and political movements. Essentially, the hashtag has been instrumental in creating a community within vast platforms to tailor the content to the users.[19] As indicated earlier, out of the three main platforms of Twitter, Facebook, and Instagram, Twitter was the most commonly used social media platform for pathology with a p < 0.001. While there was not a statistically significant difference in the use of various subspecialties (p = 0.6801) or hashtags (p = 0.2688) represented in the literature on Twitter, cytopathology was the most commonly discussed subspeciality. Furthermore, with regards to hashtags, two out of the four highest-used hashtags were used to represent online interactive journal clubs ("#dermpathJC" and "#pathJC") while the two were used for annual conference discussion ("#USCAP2016") and ongoing pathology education aimed at pathology residents ("#PathBoards"). All hashtags represented in the literature can be seen in Fig. 2.

### Live tweeting

An aspect of Twitter that proves to be a valuable tool is "live tweeting," which allows attendees to tweet (or "post" now with Twitter's evolution to X) about the content while an event is occurring in real-time by using specific hashtags. This in turn enables individuals who are unable to attend the event in person to virtually be a part of the conversation, learning about the most current research and fostering robust dialogue. Live tweeting at conferences was first observed at pathology-related conferences in 2015 at the United States and Canadian Academy of Pathology (USCAP) Annual Meeting.[3] Their specific hashtag, "#InSituPathologists" eventually went viral on Twitter. Similarly, "tweetorials" (Twitter threads) are widely utilized social media tutorials on Twitter as condensed educational narratives about a specific topic. Due to Twitter's strict 280-character limit (which can be increased with a

paid subscription, please follow the link here for more information: https://help.twitter.com/en/using-x/x-premium), tweets can be posted in a sequence, creating a thread of connected information. These are popular for pathologists in training and those preparing for board exams to learn about a subject from experts in the field through hashtags to categorize the information in specific areas and make it more accessible to users of any generation in any part of the world.[20]

Additionally, other features such as polling and sharing links can be incorporated to increase engagement and interaction. Polls allow users to anonymously respond to questions posed by the authors and see the percentage allocation for the answer choices. Sharing links is a powerful feature of Twitter, which originally set it apart from its other social media counterparts. These links can range from websites and journals to videos or other tweets, further creating a web of virtual interconnectivity and free-flowing exchange of ideas.[21,22] Although Twitter's recent evolution to X may bring operational differences, but its user interface (for the time being) remains wholly similar.[16]

### Social media and education

The COVID-19 pandemic forced educators to think outside the box to find alternative methods of teaching individuals that do not involve face-to-face interactions.[23] Since pathology is a field that relies heavily on visual appearance and features to make a diagnosis, the utilization of social media to help teach pathology in the form of case studies, stories, knowledge, and information greatly expanded during the pandemic. No longer did learners have to rely on traveling to certain locations or utilizing costly, bulky resources. Instead, with the advent of social media, only the internet was required to learn from leaders in the field. #VirtualPath quickly became a community for virtual lectures. The College of American Pathology (CAP) even created #CAPVirtualPath, which caught the attention of a large international audience. Its success can partly be attributed to its "marketing" through social media. Similarly, #VirtualPathGR (for "virtual pathology grand rounds"), created by the American Society for Clinical Pathology (ASCP) became another common outlet for learning, allowing users to obtain continuing medical education (CME) credit. With all the exposure to Pathology online, students and other learners were able to create a virtual student interest group with the hashtag #Path_SIG.

The use of social media in scientific communication has become a regular topic of discussion among PLM professionals when training future PLM colleagues. An explosion in the free exchange of information and ideas, particularly in pathology, is being seen, which has increased interest and engagement with the field. In a time at which the speed of information dissemination is at an all-time high, scientists on social media have utilized this shift to their advantage. As meticulous as the peer review process is, timeliness and limited access to new journals potentially prevents the adequate dissemination of information and new data.[24] Social media essentially plays to that advantage, empowering researchers, clinicians, trainees, and students to exchange interactions faster, creating a tight-knit community based on genuine interest in the content and the field.[25] It has been shown that journal articles shared via Twitter are associated with increased engagement and higher citations (11). The most significant inhibitor to keep in mind, however, is the new importance of fact-checking and becoming more hypervigilant about where one's information is coming from. Furthermore, it is prudent that ethical conduct is always maintained when engaging in online activities (i.e. with "common sense") as inappropriate or unprofessional social media use may break the trust we have as providers with each other and the patients we provide care for.[26]

### Social media and academic journals

With the increased integration of technology and social media into society, its importance is constantly reinforced by the immediate access to information that once would have been unavailable to the general public.

In the past, peer-reviewed journals were kept in a library amongst other literary works and manual searches of journals for relevant articles were time-consuming. Even so, with the complex process of publishing, much time would pass until a reader could obtain up-to-date studies. Since the advent of electronic copies of journals in 1999, however, there has been a shift in the consumption of information, characterized by an increase in accessibility, specificity, and timeliness. No longer do readers have to wait and flip through pages of a journal, they are now able to virtually access information anywhere through the use of their electronic devices.[27]

Additionally, with the affiliation of journals with universities, access to students has exponentially increased, allowing them to have access for free or at a reduced cost. Furthermore, modern-day journal articles have begun incorporating links, videos, and pictures to further maximize the ability to interconnect. With the immediacy of sharing afforded by social media, the metric for determining the influence of a journal or publication has also transitioned. Previously, an impact factor was designated based on a formula that demonstrated the number of times an article was cited over some time. Now, with the use of various social media platforms, "altmetrics" have arisen to reflect the number of views, clicks, downloads, shares, and posts an article generates.[28,29]

### Limitations

A potential limitation of this study is that it was conducted over articles written through December 2022, without the inclusion of information starting in 2023. Nevertheless, we consider the findings to be sufficient for use to draw general conclusions about the use of social media and practices in our field. Future reviews and analyses regarding this subject in 2023 and beyond should be pursued to assess how social media use has expanded within the field since the publishing of this article, including the expansion of social media and hashtag usage within other PLM subspecialties.

## Conclusion

With the exponential growth of social media over the past two decades, it is vital to develop an understanding of its use in the field of pathology and laboratory medicine. Twitter has been the dominant social media platform for pathology, but with the growth of new and competing platforms, this may change in the coming years. Furthermore, time and future peer-reviewed studies will help determine the impact of Twitter's evolution to X on the field. Social media has been widely utilized in the field to foster professional connections, share educational resources, and connect members attending conferences with a wider audience. As new social media platforms continue to arise and the role of social media in daily life continues to be a topic of discussion, so too should our understanding of the use, ethics, and potential of social media in the field.

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## Declaration of competing interest

CPS is an ambassador for Knowledge In Knowledge Out but he does not receive financial compensation for this position. SH is the founder and has ownership equity in Odyssey HealthCare Solutions, Inc. KMM is a founder of PathElective.com but he does not receive financial compensation for this website. The remaining authors have no conflicts of interest.

## Supplementary data

Supplementary data to this article can be found online at https ://doi.org/10.1016/j.acpath.2024.100151.

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