

Conceptual Frameworks for Social Media in Graduate Medical Education

Jesper Ke¹, BA

Mathew Alexander², MD, MPP

Joshua M. Liao, MD, MSc

In May 2023, Bryan Carmody, MD, a pediatric nephrologist and associate program director for Eastern Virginia Medical School's Pediatrics Residency, generated buzz on X (formerly known as Twitter) with this post: "Last week, Tennessee passed legislation to allow international medical graduates to obtain licensure and practice independently *without* completing a U.S. residency program. This is BIG news. So you know what that means. Time to break it down, Winners & Losers style."¹

Dr. Carmody's lead post on this topic generated 1 million impressions on X. His influence on social media reflects a growing trend of residents, fellows, and faculty utilizing digital media platforms to engage with both academic and general audiences.^{2,3} For example, "tweetutorials," or short post threads on X, educate followers on clinical topics.⁴ But applications of social media in graduate medical education (GME) have diversified beyond medical knowledge alone. Residents and fellows leverage social media for public health awareness, mental health advocacy, and policy change.⁵ Similarly, GME programs and faculty utilize social media to publicize program updates, share application tips, and offer career advice.^{6,7} In plastic surgery alone, 84 of 88 accredited programs run an Instagram account.⁸

As social media platforms change their user experience, trainees, faculty, and GME programs have expressed interest in learning about other platforms,⁹ including Mastodon, Bluesky, and Threads (TABLE 1). But whether a trainee wants to explain cutting-edge papers to peers or a program director wants to recruit new applicants, distinguishing between social media platforms helps achieve these aims.

Social network theory can help evaluate the utility of social media platforms. This is an established academic field that identifies and classifies the nature of relationships and how they influence behavior.¹⁰ We apply a novel interpretation of social network theory to offer a framework for trainees, faculty, and program leaders to effectively conceptualize and use social media platforms for GME applications.

Three factors set the stage for this framework: density, diffusion, and complexity.^{11,12} Density refers to the extent to which members of a network know each other. Diffusion refers to the degree to which information can spread through and even outside a network, or "virality." And complexity refers to the multiple ways in which a social network serves different functions; in this case, it correlates to features like commenting, direct messaging, live streaming, or video calling.

These 3 concepts allow us to distinguish platforms via a framework—"network" vs "topic-based" dissemination—that can guide trainees, faculty, and GME programs in choosing a platform based on audience and impact. For example, we describe Facebook, LinkedIn, Instagram, and Clubhouse as "network-based," where content primarily circulates among users with established connections (such as family or friends), indicating a high network density. However, these networks exhibit more limited diffusion capability, or reach, to individuals outside one's network. This is a tradeoff of their focus on sharing information within one's own network, as seen in example GME applications (TABLE 2). These networks also demonstrate moderate complexity, generally limiting individuals to features like commenting or replying to comments, though some offer capabilities for livestreaming and video posts.

On the other hand, "topic-based" dissemination platforms, including TikTok, YouTube, X, Threads, Mastodon, Bluesky, and Reddit, prioritize content based on users' interests. Personal connections still influence what one sees, as on X. However, platforms predominantly facilitate information sharing through topic alignments, like Reddit's thematic "subreddits" and TikTok's algorithm that prioritizes users' demonstrated interests. Thus, this design promotes high diffusion capacity, allowing trainee/faculty/program reach beyond immediate networks (TABLE 2). But these platforms typically have lower network density; interactions are more public and less personal. Functions like direct messaging exist but are secondary to the focus on topic-driven content sharing, marking moderate complexity, like network-based platforms.

DOI: <http://dx.doi.org/10.4300/JGME-D-23-00812.1>

TABLE 1

Common Social Media Platforms

Name	Year Founded	Functions	No. of Monthly Active Users ¹⁶
Facebook	2004	Create profiles, connect with friends, share posts (and interact with posts), direct message, and follow pages/groups of interest	2.9 billion
Instagram	2010	Create profiles, connect with friends, share posts (images only with accompanying text), and direct message	2.2 billion
YouTube	2005	Upload, watch, and react to user-uploaded videos	2.2 billion
TikTok	2016	Upload, watch, and react to short-form videos	1 billion
Reddit	2005	Create discussion threads and share posts	430 million
LinkedIn	2003	Create professional profile, connect with colleagues, share posts, and direct message	250 million
X	2006	Post 280-character messages, comment/share/react to others' posts, and follow users	217 million
Clubhouse	2020	Audio-only chatrooms with up to 5000 individuals ¹⁴	10 million (weekly)
Threads	2023	Microblogging platform from Meta (Facebook's parent company), similar to X	8 million (daily) ¹⁷
Bluesky	2021	Decentralized social network with 300-character posts, but no direct messaging functionality	>4 million (total) ¹⁸
Mastodon	2016	Decentralized social network (unlike X) with 500-character posts; comment/share/react to others' posts and follow users, as on X	1.8 million ¹⁹

Note: Not all social media platforms are included in this analysis.

Applications for GME

Trainees, faculty, and GME programs can leverage this framework to appropriately select a social media platform and optimize their engagement, based either on broad “categories” (network vs topic-based dissemination) or smaller “factors” (density, diffusion, and complexity). Below, we offer examples of how this framework applies to GME, or “use cases.”

For trainees, applying this framework can tailor educational and professional use cases of social media. For example, a cardiology fellow who wants to disseminate recent paper findings to new audiences should utilize topic-based platforms such as X or TikTok that facilitate greater diffusion outside personal networks. On the other hand, a graduating family medicine resident seeking advice from acquaintances on public health advising opportunities should use a network-based platform like LinkedIn. At a granular level, this framework can allow better understanding of platforms with new engagement approaches. For example, Clubhouse emphasizes real-time interaction, allowing members to join live chatrooms of up to 5000 individuals and engage in audio-only conversations.¹³ This live dialogue-based platform offers high complexity, given the live audio interactions. But greater complexity comes at the expense of decreased

diffusion capability, as chatrooms have limited capacity. Ultimately, trainees will need to consider the tradeoffs between density, diffusion, and complexity in each platform.

Trainees also need to consider another tradeoff: deep versus shallow engagement on social media. In this case, deep engagement could mean building an Instagram following to feature high-yield educational medical content, while shallow could mean reading and commenting on one video on YouTube about medical myths. While deep engagement can impact a larger audience, it requires significant commitment, meaning trainees must tailor their level of engagement to their interests and capacity.

From a faculty or GME program standpoint, this framework drives additional use cases in recruitment and education, allowing them to target and inform desired audiences. A program director interested in publicity, whether for applicant recruitment, faculty achievements, or recent program publications, should utilize topic-based networks that allow higher diffusion capability to target audiences outside direct networks. For instance, platforms like X or Bluesky may best serve this goal, while Facebook or Instagram could be better suited for sharing internal program-related news or connecting current residents with alumni. With technology evolving, faculty can even

TABLE 2
Graduate Medical Education Applications for Social Media Platforms

Platform Type	Potential Uses	Use Case Examples
Network-based dissemination ▪ Clubhouse ▪ Facebook ▪ Instagram ▪ LinkedIn	▪ Engage personal networks ▪ Engage in a lengthier discussion with others about your views ▪ Convince local community members	Facebook: A program director shares news about a new residency faculty position to a Facebook group of alumni. Several alumni comment on the post and reach out to the program director via Facebook Messenger. Instagram: A resident shares a picture of them getting the COVID-19 vaccine on their Instagram story. Three hundred followers (college friends, family, co-workers) view the story and respond with emojis and direct messages.
Topic-based dissemination ▪ Bluesky ▪ Mastodon ▪ Reddit ▪ Threads ▪ TikTok ▪ X ▪ YouTube	▪ Reach as many people as possible ▪ Reach strangers who one may not know ▪ Get out a one-time message	TikTok: A pediatrics resident makes an educational video explaining negative health effects of e-cigarettes for teens. The video is primarily viewed by people with whom the resident has never met. The resident interacts with viewers through replies to comments. Reddit: A first-year fellow posts a multipart thread about his recent fellowship application cycle, including application and interview tips. Fellow Redditors comment in the discussion thread, none of whom the fellow is connected with on Reddit. The fellow also interacts with these users through comments/replies to comments.

employ advanced AI tools to streamline the creation of engaging and informative posts, such as crafting captions or post ideas to maximize engagement.

Another use case centers on program education. Faculty can invite guest speakers to lead discussions on GME social media applications, whether regarding patient advocacy or medical education. These sessions could focus on best practices or case studies of clinicians who have successfully leveraged social media. Programs also can learn from their own residents, some of whom have engaged with social media in a robust and meaningful way. But based on our experience, given limited bandwidth, we recommend faculty and programs keep “deep” engagement to 1 or 2 platforms, whether in education or in recruitment.

Along with these opportunities come well-known pitfalls in social media. Engagement requires a learning curve, which not all trainees, faculty, and program leaders can commit to given clinical demands. Social media platforms contain medical misinformation as well as “trolling” activities, in which other users provoke arguments via personal attacks. This can discourage trainees and faculty from social media engagement. Finally, maintaining professional standards

remains an evergreen concern on social media platforms.¹⁴

Nonetheless, the trend of trainees and faculty worldwide utilizing social media to access and act on information shows no signs of slowing. Especially as social media platforms continue to evolve rapidly—with some platforms now crossing the boundary between network and topic-based dissemination¹⁵—trainees and faculty can play a pivotal role in modeling new digital media use cases through a focus on GME. Applying this framework, derived from social network theory, may lead to more effective GME program and trainee use of rapidly changing social media.

References

1. @JBCarmody. Last week, Tennessee passed legislation to allow international medical graduates to obtain licensure and practice independently *without* completing a U.S. residency program. This is BIG news. So you know what that means. Time to break it down, Winners & Losers style. Posted May 23, 2023. Accessed April 10th, 2024. <https://twitter.com/jbcarmody/status/1661018572309794820?lang=en>

2. Thoma B, Murray H, Huang SYM, et al. The impact of social media promotion with infographics and podcasts on research dissemination and readership. *CJEM*. 2018;20(2):300-306. doi:10.1017/cem.2017.394
3. Chan TM, Dzara K, Dimeo SP, Bhalarao A, Maggio LA. Social media in knowledge translation and education for physicians and trainees: a scoping review. *Perspect Med Educ*. 2020;9(1):20-30. doi:10.1007/s40037-019-00542-7
4. Breu AC, Abrams HR, Manning KD, Cooper AZ. Tweetorials for medical educators. *J Grad Med Educ*. 2021;13(5):723-725. doi:10.4300/JGME-D-21-00767.1
5. Doctor works through crucible of mental health pain, stigma. *UW Medicine Newsroom*. Published October 17, 2023. Accessed February 19, 2024. <https://newsroom.uw.edu/blog/doctor-works-through-crucible-mental-health-pain-stigma>
6. @mayoclinicdermresidency. On Thursdays over lunch, we dive deep into cases at Dermatology Clinical Grand Rounds to provide the best possible care for our patients. Instagram. May 26, 2023. Accessed February 18, 2024. <https://www.instagram.com/mayoclinicdermresidency/p/C2iMLZKR0Q0/?hl=en>
7. Dr. Andrew Gutwein YouTube page. Residency Interview Tips—Update 2023. Accessed February 19, 2024. <https://www.youtube.com/watch?v=hi2CbN9Re3U>
8. American Medical Association. Murphy B. The latest influencers on Instagram? Physician residency programs. Published December 26, 2023. Accessed February 18, 2024. <https://www.ama-assn.org/medical-students/preparing-residency/latest-influencers-instagram-physician-residency-programs>
9. Henderson J. Med-Mastodon gains users amid uncertainty. *MedPage Today*. Published November 18, 2022. Accessed September 12, 2023. <https://www.medpagetoday.com/special-reports/exclusives/101836>
10. Isba R, Woolf K, Hanneman R. Social network analysis in medical education. *Med Educ*. 2016;51(1):81-88. doi: 10.1111/medu.13152
11. Al-Taie MZ, Kadry S. Information diffusion in social networks. In: *Python for Graph and Network Analysis*. Springer; 2017:165-184.
12. Heaney CA, Israel BA. Chapter 9: Social networks and social support. In: Glanz K, Rimer BK, Viswanath KV, eds. *Health Behavior and Health Education*. 4th ed. Jossey-Bass; 2008:189-203.
13. Kelly H, Tiku N. Clubhouse 101: what you should know about the invite-only, audio social app. *Washington Post*. Published February 10, 2021. Accessed September 12, 2023. <https://www.washingtonpost.com/technology/2021/02/10/what-is-clubhouse-faq/>
14. Kind T. Social media milestones: entrusting trainees to conduct themselves responsibly and professionally. *J Grad Med Educ*. 2014;6(1):170-171. doi:10.4300/JGME-D-13-00439.1
15. Bond S. Facebook is making radical changes to keep up with TikTok. *NPR*. Published July 26, 2022. Accessed September 12, 2023. <https://www.npr.org/2022/07/26/1113724820/facebook-is-making-radical-changes-to-keep-up-with-tiktok>
16. Walsh S. The top 10 social media platforms. *Search Engine Journal*. Published May 30, 2022. Accessed September 12, 2023. <https://www.searchenginejournal.com/social-media/biggest-social-media-sites/#close>
17. Perez, S. Threads' web launch did little to bring in more users, new data suggests. *TechCrunch*. Published August 31, 2023. Accessed September 12, 2023. <https://techcrunch.com/2023/08/31/threads-web-launch-did-little-to-bring-in-more-users-new-data-suggests/?guccounter=1>
18. Silberling, A, String A, Corral C. What is Bluesky? Everything you need to know about the app trying to replace Twitter. *TechCrunch*. Published February 8, 2024. Accessed February 18, 2024. <https://techcrunch.com/2024/02/08/what-is-bluesky-everything-to-know-about-the-app-trying-to-replace-twitter/>
19. Perez, S. Mastodon actually has 407K+ more monthly users than it thought. *TechCrunch*. Published October 9, 2023. Accessed October 10, 2023. <https://techcrunch.com/2023/10/09/mastodon-actually-has-407k-more-monthly-users-than-it-thought/>



Jesper Ke, BA, is a 4th Year Medical Student, University of Michigan Medical School, Ann Arbor, Michigan, USA; **Mathew Alexander, MD, MPP**, is a Recent Graduate of Virginia Commonwealth University School of Medicine, Richmond, Virginia, USA; and **Joshua M. Liao, MD, MSc**, is Professor and Chief, Division of General Internal Medicine, and Executive Lead, Program on General Internal Medicine Research and Educational Scholarship, University of Texas Southwestern Medical Center, Dallas, Texas, USA.

Corresponding author: Jesper Ke, BA, University of Michigan Medical School, Ann Arbor, Michigan, USA, jesperk@umich.edu, X @Jesper_Ke