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The Power of Social Media in Medicine and Medical Education: Opportunities, Risks, and Rewards

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Tweets. Hashtags. Blogs. Hangouts. Podcasts. Wikis. What do these social media platforms and verbiage have to do with education, and why should you care? Social media is used on a daily and even hourly basis as a modality to rapidly and effectively communicate, educate, and learn. Some medical specialties have quickly adopted and embraced social media, particularly in the fields of emergency medicine, family medicine, and pediatrics. Other fields, including laboratory medicine and pathology, have had a much slower uptake that may directly correlate with the amount of patient–physician interaction. The specialties that have a high rate of use have also catalyzed implementation of social media into medical education and residency program curriculum, and used it as a modality to recruit physicians and staff at all levels. In addition, the free open-access movement (FOAM)[9] has altered how medical education resources and content are accessed by physicians and patients, ultimately shifting and removing geographical and income barriers across the globe.

Laboratorians and pathologists have a unique opportunity to move outside the 4 walls of the laboratory and engage other physicians, residents, and even patients in a way that has never been done before. Perhaps it is time we communicate beyond the results reported in the electronic medical record, and instead discuss the value and contributions that our laboratories provide every day. Here, 6 experts in the social media field share their thoughts on social media use, challenges, and opportunities.

What are the primary forms of social media you use from a professional and educational standpoint, and how long have you been using them? How has your profession and/or colleagues responded (i.e., fast or slow adopters) to using social media? What do you believe are the primary contributing factors to this response?

Shannon Haymond: My primary format for this purpose is Twitter. I have been using Twitter as a news source and way to collate information since 2010. However, it was only after I saw a lecture by Dr. Seth Trueger (@MDAware) called "Number Needed to Tweet: How Social Media Is Changing Medical Education" that I became brave enough to use it to share my own thoughts and disseminate information.

The professional response in our field has been slow, but I am seeing more and more laboratorians engaging, which is fantastic.

I think a barrier to faster adoption is that people are not sure of the value or level of professionalism (i.e., they assume it is all about pop culture and celebrity feuds) and may be apprehensive to put their opinions out into the public conversation. Social media users experience a bit of a learning curve, requiring time and dedication to

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[9] Nonstandard abbreviations: FOAM, free open-access movement; ECG, electrocardiogram.

hone this new skill. Without recognizing the benefit, it is difficult to justify the time needed to add to and keep up with one more thing in an already packed life. Social media platforms are also constantly evolving: Several options exist with more being added all the time; their functionality changes; and trends in popularity among specific groups of users shift relatively quickly.

Stephen Smith: The primary forms of social media that I use are Facebook and Twitter. I find Facebook by far the most useful. I frequently look at electrocardiograms (ECGs) on the Facebook ECG club, where I learn from and teach others. Every time I post on my own ECG blog, I share it on multiple Facebook pages, aside from my own, including other ECG, cardiology, paramedic, and internal medicine pages. Another useful way to share information is through blogs. Because I use Google Blogger, I am automatically part of Google+, which has given me great exposure. Until a year ago when they stopped tabulating Google+ pages, I was getting 40 000 page views a day and had 37 million page views.

I believe many of my colleagues do not use social media nearly as much as I do, and I think the major factor is lack of time. Those who want to disseminate information are much more likely to use social media. I use it primarily because I have a lot of content to distribute. If you are using social media only to be updated, I think it is inefficient, especially if you subscribe to many different feeds. You can spend an enormous amount of time following all your Twitter feeds without a whole lot of direct benefit.

Simon Carley: I started using social media seriously in 2012 with Twitter, developing a personal presence and leading the online virtual hospital St. Emlyn's. Now we cover most mainstream platforms, WordPress blogs, podcasts, Facebook, Tumblr, and, more recently, Instagram. Emergency and critical care medicine have embraced social media under the free open-access medical education (#FOAMEd) movement that seeks to share knowledge as widely as possible and for free. Initially there was a lot of skepticism, but I think that has largely passed. In the UK, many emergency medicine physicians find it a useful resource for learning, although there is a big gap between awareness and involvement, and many physicians are not engaged at all. Emergency medicine has adopted social media at a much faster pace than most specialties owing to the ability of social media to engage individuals across the breadth of our specialty, despite the chronological and geographical challenges that typify our practice.

Michael Berkwits: The JAMA Network, a family of 13 clinical journals, has been using social media since the end of 2011. Our efforts focus on Facebook, Twitter, and Google+, with selective posting on Pinterest and LinkedIn. Growth in followers has been steady because we have committed to posting everything we publish on these platforms regularly. User engagement on the platforms sends a clear signal that we are appealing to clinicians, allied health professionals, students and trainees, and the lay public who are already using the platforms for personal and informational purposes.

Jonathan Sherbino: I use 3 social media platforms regularly in my role as a medical educator. I edit a blog (International Clinician Educator, ICEnet.royalcollege.ca) that connects a global community of health professions educators. The blog has 8 contributing authors and 4500 subscribers representing 125 countries—and started just 4 years ago. Posts are published twice weekly and include reviews of emerging literature and commentaries on issues of importance to the health professions education community. The tone is informal and conversational, and the pieces are brief (i.e., digestible in <5 min) with links to additional resources for the interested reader.

I also cohost a biweekly 20-min podcast called Key Literature in Medical Education (keylimepodcast.royalcollege.ca). A single article from the recent health professions education literature is discussed with attention to the methodological rigor and the educational impact of

the article. The KeyLIME podcast was started 5 years ago.

Finally, I have a professional (i.e., associated with my interest in health professions education) Twitter account that I began using 5 years ago and utilize in 3 ways. I use Twitter as an aggregator to condense numerous online conversations relevant to health professions education into a single stream. By monitoring the stream, I can identify emerging issues to investigate more fully. I also use Twitter to disseminate and share resources that I have discovered or assisted in developing. This platform allows rapid exponential dissemination of a resource that may benefit the broader health professions education community. Finally, I use Twitter as a "help desk," submitting inquiries to my social network, where solutions or next steps are regularly provided.

Within health professions education, I think we are now at a tipping point from the early adopters to the early majority, largely a function of a generational shift with early career educators promoting and modeling the professional use of social media. I cochair the International Conference on Residency Education, and even 5 years ago we did not have a hashtag. Now we have Twitter monitors for every session to curate virtual and physical audience interactions with the speaker. We livestream plenary sessions with remote viewing parties and online discussion from around the world. Finally, we have introduced virtual posters, where video presentations of research abstracts are hosted on a blog platform with questions and answers posed via the comments section, allowing a researcher to access an audience beyond onsite conference attendees. However, my suspicion is that these social media platforms are more widely embraced by younger generations. My opinion may be influenced by a medical education fellowship that I codirect. We use a social media platform (Slack.com) to enable asynchronous dialog among cohorts of trainees. Uptake and ease of use are routinely stratified by year of birth.

One of many factors that has influenced the adoption of social media among early career educators is access to virtual communities of practice. The health professions education community is small compared with other clinical disciplines. Access to individuals with shared interests and, of particular importance, access to specialized mentorship in education can be challenging if limited by geographical boundaries. Social media removes these physical barriers, allowing an individual to participate in a richer community. Familiarity with the technological platforms for personal use (e.g., Facebook to keep up with friends) allows easy cross-purposing of the platform for professional networking.

Marie Ennis-O'Connor: Although I use a variety of social media, Twitter is my go-to platform for keeping up to date with research, networking with peers, and taking the pulse of what is topical in healthcare. I started a healthcare blog in 2009 and joined Twitter, LinkedIn, and Facebook in a personal capacity. In the past 5 years I have turned my focus increasingly toward using social media to enhance my professional goals. I was an early adopter in some respects in the healthcare field, but my profession and my peers are catching up. I believe adoption of social media in healthcare has been largely driven in response to the increase of more engaged healthcare consumers.

What are the advantages to being active in social media, from either an educational or professional standpoint? How has it altered your career and/or redefined how you work daily?

Michael Berkwits: Social media allows publishers to distribute information to readers in the work flow and spaces they are already using. With innumerable options, most people direct-access only a handful of website homepages (usually for sports scores or news) and instead use social media platforms as way to curate "tables of contents" of people, interests, and sources they want to keep up with. From a publisher's perspective, the platforms have multiple advantages over core websites: They facilitate amplification through social sharing; they permit user targeting by interest; and they can help ranking in search, a less social but critical way users find and access information.

Social media opportunities have not redefined the work of journal publishing, but the JAMA Network has evolved a system to publish articles to social media platforms, just as it publishes to print and online platforms.

Jonathan Sherbino: For early adopters of social media, there was an obvious scholarship opportunity as educators investigated the adoption of social media to promote learning. I was fortunate to collaborate with other education researchers to investigate the use of social media in health professions education, making this a minor theme in my program of scholarship. However, this space is increasingly occupied with the novelty of social media as an emerging phenomenon being replaced with lines of inquiry that take advantage of the principles of social media: open access, interconnectivity, asynchronous dialog, and crowdsourcing.

Currently, social media has increased my professional connectivity. I have made virtual introductions and collaborated on research projects with individuals I have yet to meet in person. I am cosupervising a cohort of medical education fellows from across North America over an academic year without ever meeting any of them in person.

Simon Carley: I am more up to date than my peers who do not engage. I am a better physician as a result, and I truly believe that my patients receive better care because of this. Professionally I find it intellectually satisfying, as I am forced to constantly learn and reflect on my current practice. It has created opportunities to join research and educational groups across the globe with interactions through #FOAMed, leading to journal publications and numerous invitations to speak at national and international conferences. My personal learning network of experts is no longer limited to those in my department or hospital, and I regularly learn from those in other countries and health economies.

Marie Ennis-O'Connor: Social media has literally changed my life. That may sound like a dramatic statement, but I have changed the entire direction of my career as a direct result of social media. My interest in using social media in healthcare was born from my experience as a breast cancer patient. When I discovered how social media could give me access to information and support, I was hooked. I now work as a social media marketing consultant, specializing in providing services to the healthcare industry. Social media opened a whole new world of possibilities that has driven my work both in patient advocacy and healthcare marketing.

Shannon Haymond: It is certainly a way to stay up to date on rapidly changing fields and to connect with a diverse set of people who share your interests. This is particularly true for finding those interested in your area of expertise but from a completely different perspective. I continually use social media to find and save ideas for improving the content and delivery of my lectures and educational sessions. I have also found that it is a great way to connect "pearls" that we teach to real-life experiences and to others who are experts in a given area.

Social media is an important mechanism for communicating about science with the public. According to data from the Pew Research Center, 65% of American adults use social media sites. Use is higher among younger demographic groups. Despite the tremendous benefits, including free access and wide distribution of information, the quality of online scientific information is variable. Social media is a great way for laboratory medicine professionals to vet and contribute to the content relevant to our area of expertise. This includes sharing your own personal work and opinions in addition to commenting on that of others, while advocating for the broader role of our profession.

Stephen Smith: As implied earlier, the greatest benefit that I have gleaned from social media is in distribution of my own work and ideas, with Facebook being by far the most important social media site for me. When I put up a new post and share it on Facebook, I receive between 30 000 and 80 000 views on Facebook, and then Facebook generates a huge amount of traffic directly to my blog site. Since I began using Facebook more efficiently this year, it has doubled visits to my site to >250 000 per month.

The amount of information generated in different social media modalities can be overwhelming. What tools are available for curating massive amounts of information?

Simon Carley: Content overload is a symptom of filter failure. We all need filters to control the flow of information and guide us to the high value content. I use personal learning networks, curation sites, and apps to help me track and collate useful content. I have developed a personal learning network of individuals who collate and curate special interest areas. These are individuals who have a special interest in an area (e.g., airway management) and who share the most important updates in that area. I use them as filters in areas relevant to my practice, and I act in the same capacity in areas for which I have expertise. You cannot follow everyone, so find and follow the high return, high quality individuals or sites that filter content for you. I also follow sites that act as clearing houses for social media content, which create a weekly digest and e-mail it to your inbox. I also use filters and e-reader programs that collate different websites (e.g., Feedly) to aggregate content on any device in an easily accessible form. Personal collation again requires a solution such as Evernote and Pocket to store and automatically reference content for future use. I closely follow Scott Weingart's (@EMCRIT) strategy to manage information overload.

Marie Ennis-O'Connor: It is true! As Mitchell Kapor said, "Getting information off the Internet is like taking a drink from a fire hydrant." I set up Google Alerts for specific terms and use aggregator tools like Flipboard and Feedly to keep up to date. I also rely on Evernote to organize and archive links for easy retrieval, and use Scoop as a curator hub.

Jonathan Sherbino: Social media is imitating a trend in biomedical research, a deluge of information that requires significant culling to identify usable information.

McKibbon has dubbed this ratio of "information to relevant information" the NNR (number needed to read). There are 2 key tips that I recommend to manage the deluge of social media noise. First, the tagging feature common to all social media platforms allows the identification of a subthread. Establishing automated searches based on a specific hashtag restricts the amount of information to be attended to by a user. Second, I pay more attention to superusers (individuals or organizations with a personally vetted record of high quality information) than any member within my network. These superusers typically provide aggregated and curated opinions. A quasi-analysis of one's social media network can readily identify these superusers.

Shannon Haymond: Yes, this is absolutely a challenge. There are tools within the social media apps that can help. With Twitter, for example, depending on the diversity of the accounts one follows, using lists or saved searches are effective ways to further refine posts by topic, group, or event. I like Pocket for saving and categorizing links or articles that I either want to read (or have read to me) in more detail later or that I know I will want to reference in the future. I use Hootsuite and Buffer help to filter the massive amount of posts, find relevant content from other sources, and to manage scheduled posts.

What do you believe are some of the major "dos and don'ts" when using social media?

Stephen Smith: Of course, this is my opinion, but I think social media is used too much for trivial stuff. I think you should be judicious about what you post on social media. It should be extremely high quality. Although it need not be peer-reviewed, it should be as reliable as peer-reviewed. This means you need to be an expert in what you are talking about. There are too many people who are distributing information that is not well-founded. This leads to excessive information overload. Because there is so much information, we should try to limit what we post to only those things that are both important and accurate, to the best of our knowledge. We should not be posting things for our own ego, to be able to say how many followers one has, or how many posts one has put up.

Marie Ennis-O'Connor:

- Don't simply add to the noise online. When you share a link to an article, go beyond the headline to add your insight.
- Do create useful content and provide links to information that will be of value to others.
- Do listen twice as much as you talk—social media is a conversation.
- Don't get drawn into public arguments on social media. If someone wants to argue with you on Twitter, either ignore them or—if they have a genuine grievance—take it offline and deal with it in the appropriate way.
- Do be transparent. If you tweet an idea or opinion that originated with someone else, always give the original source credit.

Michael Berkwits: Use visual assets like multimedia (i.e., video, audio, gifs) or standard static formats (e.g., scientific illustrations, figures, stock images). Develop an online voice and engage users looking to interact with you or your material through the platform. Respond to current events and find opportunities to resurface older material that may be newly relevant. If your target audience is scientists or physicians, recruit a peer to participate; don't cede management of social media activity completely to marketing or communications professionals. Don't publish compromising images of patients, no matter how scientific.

Shannon Haymond: DO: create a profile with a picture, craft your posts in a professional manner and consider their potential impact, make new connections and follow accounts outside of your direct area of interest, and use tools to better manage content and posts.

DON'T: only post your own content, forget that this is a public forum and that, as with e-mail, text-only communication may be misconstrued.

Simon Carley: For the Dos, I would say be kind and supportive, never miss the opportunity to thank others, share what you know freely and widely, help others whenever you can, and remain remorselessly positive. There are plenty of angry people on the Internet, but there are never any good reasons to join them.

The best advice for Don'ts is what Mike Cadogan (founder of #FOAMed) told me back in 2012: don't lie, don't pry, don't cheat, can't delete, don't steal, don't reveal. Don't go full frontal (i.e., be very careful about what you post online in any setting).

What are the risks involved with using social media from a professional standpoint?

Jonathan Sherbino: One risk that I would draw attention to is trolling. This phenomenon has been coopted from the popular use of social media. Although the use of pseudonyms on social media platforms in medical education is rare, the potentially large audience for online discussions does allow for some degree of anonymity by peripheral users within a community of practice. This permits a minority of users to aggressively challenge discussions using ad hominem attacks. Responding to such

comments and policing such behavior can be challenging in social media, particularly if a balanced answer must be limited to 140 characters.

Michael Berkwits: From a publisher's perspective, there are few to no risks. Social media posts can always be interpreted out of context but are easily edited or deleted if someone is paying attention to user responses.

Simon Carley: I think risks are overstated. Social media will expose your beliefs, views, research, and ability to a wide audience and that can lead to difficult conversations, but they are not fundamentally different from those that take place through traditional routes. The only difference is that social media shares your views with a wider audience. If you act inappropriately and unprofessional in real life, then more people will know it. Similarly, if you are a diligent clinician, researcher, and academic, then more people will find out.

Stephen Smith: I think the main risk is putting up information that is inaccurate. It is easy to believe something to be true without verifying. On social media, you can put up anything that is passing through your mind; you can publish your own stream of consciousness. To guard against this, one must be extremely self-critical.

Shannon Haymond: The risks are related to the public nature of the platform and each platform's policies around handling harassment. This may include problems related to false information or misrepresentation, breaches in patient privacy, and violations of personal–professional boundaries. Depending on the severity of a public-facing gaffe, one's professional image may be damaged. To help with this, most institutions and some professional organizations have developed guidelines for professional use of social media.

Frequently, patient cases are presented within social media forums for educational purposes and often these cases include visual images (e.g., ECG, imaging). What are the ethical issues involved with posting specific information about a patient?

Michael Berkwits: The JAMA Network obtains signed patient consent to publish any remotely identifiable patient image and appearing in our articles, precluding ethical issues involved with posting patient information.

Marie Ennis-O'Connor: Although individual pieces of information may not alone breach patient confidentiality, the sum of published information online could be sufficient to identify a patient or someone close to them. Even if they, their case, symptoms have been anonymized, there is still the chance of identification. It is my belief that no content on publicly viewable social networking sites should ever reference patients or their specific case.

Stephen Smith: You need to be careful that what you are saying cannot be traced back to a patient, except by healthcare workers who specifically know that patient. In other words, if someone who already has access to the private protected information recognizes that patient, it is OK. But no one else should recognize the patient. Fortunately, for ECGs, it is impossible to recognize someone by an ECG unless you already know the patient's medical record. I rarely speak what hospital a patient comes from, and I rarely give an exact age. I limit symptoms and other information and provide the most vague but necessary details.

Jonathan Sherbino: Ethical practice is never defined by a technological platform or context. All the usual ethical principles apply to social media, including consent, educational value, and patient and institutional privacy. Additionally, compliance with institutional and regulatory protocols must be met. Figure1.com is a social media platform that has successfully addressed these ethical issues to provide deidentified patient cases to the global medical community specifically for promoting learning.

Social media has already had a major impact in science, medicine, and education. How do you foresee the role of social media changing in the future?

Marie Ennis-O'Connor: Social media is changing the ways that patients interact with healthcare providers and the healthcare system. It is increasingly common for patients to use information technology to gain access to information and control their own healthcare. Web technologies and applications are radically transforming established notions of what it means to be a patient. We are entering a new era of networked knowledge, meaning knowledge—ideas, information, wisdom—has broken out of its traditional clinical confines and now exists in a hyperconnected online state. Increased access to the Internet and mobile communication will bring public health information to many more people, more quickly and directly than at any time in history. Social media will widen access to those who may not easily access health information via traditional methods, such as younger people, ethnic minorities, and lower socioeconomic groups.

Shannon Haymond: Social media has essentially defined how younger generations connect and interact. Its value in professional or medical education settings is slowly being realized. Therefore, as younger generations enter medical school and join our profession and as access in-

creases through wearables, we will see increased use and access of social media at work. Currently many organizations block social media sites, presumably because of perceived lack of professional or educational value. We will see more examples of live or streaming video applied for educational purposes, to teach procedures and to demonstrate collaborative interactions or information exchange, for example. More research projects will be crowdsourced and crowdfunded using social media. Social media will continue to push and facilitate important efforts for free online medical education and public scientific communication.

Stephen Smith: Like everything else, the future of social media is in artificial intelligence. Those who are cutting edge will have robots to figure out exactly what they should read in social media. I am not sure how this will work.

Simon Carley: We are already seeing social media bring research groups together and become a subject of research in its own right. We are also seeing the power of social media in postpublication review as a direct challenge to the known flaws in the traditional peer-review process. Social media in education will increasingly become a way to connect learners who are geographically and chronologically dispersed and will allow learners to guide and access their own content. Educators will increasingly lose control of educational content and will need to understand how and where their learners gain knowledge. To quote my friend Rob Rogers, we will change from those who give out knowledge to those who coordinate it. Social media will develop us all into "learning choreographers."

Jonathan Sherbino: I will take my cue from Nils Bohr, "prediction is very difficult, especially if it's about the future." A decade ago who would have anticipated the influence of an amateur podcast in reestablishing the hierarchy of opinion leaders in emergency medicine (my clinical discipline)? No longer are the giants of the field identified by their textbooks, citation rates, or leadership roles; rather, my residents and fellows are influenced by the scope of an educator's social media brand.

Nonetheless, I am interested to see how crowdsourcing, a phenomenon made possible by social media, influences scholarly peer review (a fundamental aspect of scientific inquiry) in the coming decade.

Michael Berkwits: Social media systems integrated with electronic medical records could lead to efficiencies in health system and health provider communications. Social media could take the leap from two-dimensional flat screens to virtual environments and play a large role in medical simulation and education. Finally, the ability of the platforms to "know" about its users, through submitted information and platform behaviors, could lead to a role in early disease detection and diagnosis.

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