

Evidence-based medicine in the era of social media: Scholarly engagement through participation and online interaction

Teresa Chan, HBSc, BEd, MD, MHPE*; N. Seth Trueger, MD, MPH[†]; Damian Roland, BMedSci, BMBS, PhD[‡]; Brent Thoma, MA, MSc, MD[§]

ABSTRACT

The integration of new knowledge into clinical practice continues to lag behind discovery. The use of Free Open Access Medical education (FOAM) has disrupted communication between emergency physicians, making it easy for practicing clinicians to interact with colleagues from around the world to discuss the latest and highest impact research. FOAM has the potential to decrease the knowledge translation gap, but the concerns raised about its growing influence are 1) research that is translated too quickly may cause harm if its findings are incorrect; 2) there is little editorial oversight of online material; and 3) eminent online individuals may develop an outsized influence on clinical practice. We propose that new types of scholars are emerging to moderate the changing landscape of knowledge translation: 1) *critical clinicians* who critically appraise research in the same way that lay reviewers critique restaurants; 2) *translational teachers* adept with these new technologies who will work with researchers to disseminate their findings effectively; and 3) *interactive investigators* who engage with clinicians to ensure that their findings resonate and are applied at the bedside. The development of these scholars could build on the promise of evidence-based medicine by enhancing the appraisal and translation of research in practice.

RÉSUMÉ

Encore aujourd'hui, il s'écoule un certain temps entre les découvertes et l'intégration des nouvelles connaissances dans la pratique clinique. L'arrivée du mouvement Free Open Access Meducation (FOAM) a bouleversé les communications entre les médecins d'urgence, en permettant aux praticiens d'interagir facilement avec des homologues de partout dans le monde pour discuter des derniers travaux de recherche et de ceux qui ont la plus forte incidence. Le mouvement FOAM peut certes combler des lacunes en matière d'application des connaissances, mais son utilisation soulève des préoccupations quant à son influence grandissante : 1) l'application trop rapide des résultats de la recherche peut s'avérer préjudiciable si les constatations sont erronées; 2) la documentation en ligne échappe en grande partie à la supervision

rédactionnelle; 3) des personnes de renom en ligne peuvent finir par exercer une influence trop grande en pratique clinique. Aussi les auteurs de l'article proposent-ils que de nouveaux types d'érudits voient le jour afin de régler le monde en mutation de l'application des connaissances. Ainsi, les *cliniciens critiques* feraient l'évaluation critique de la recherche à la manière des critiques profanes de restaurants; les *formateurs en application des connaissances*, versés dans le domaine des nouvelles techniques, travailleraient en collaboration avec les chercheurs à la diffusion efficace des résultats de leurs travaux; et les *chercheurs interactifs* s'engageraient dans des échanges avec les cliniciens afin de s'assurer que leurs résultats trouvent bel et bien écho dans la pratique clinique. La formation de ces groupes d'érudits pourrait prendre appui sur les grands principes, pleins de promesse, de la médecine factuelle, en permettant d'améliorer l'évaluation des travaux de recherche et leur application en pratique clinique.

INTRODUCTION

Advocates of evidence-based medicine (EBM) continue to mourn the sluggish pace of knowledge translation. The assimilation of research findings into medical practice often takes decades; estimates of the lag time between journal submission and use in routine practice cluster around 17 to 23 years.¹ Reducing the time to the integration of accepted knowledge has been an objective of many professional organizations and academic institutions with varying degrees of success.

A recent *Canadian Journal of Emergency Medicine (CJEM)* editorial reviewed how the Free Open Access Medical education (FOAM or #FOAMed) movement is disrupting communication within emergency medicine.²

From the *Division of Emergency Medicine, Department of Medicine, McMaster University, Hamilton, ON; †Department of Emergency Medicine, Feinberg School of Medicine, Northwestern University, Chicago, IL; ‡Paediatric Emergency Medicine Leicester Academic Group, Leicester University, Leicester, UK; and §Department of Emergency Medicine, University of Saskatchewan, Saskatoon, SK.

Correspondence to: Dr. Teresa Chan, Room 255, McMaster Clinics, 237 Barton St. E., Hamilton, ON L8L 2X2; Email: teresa.chan@medportal.ca

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The impact on knowledge translation by social media-based platforms (such as blogs and podcasts) continues to grow globally.

In this second editorial, we discuss the promise and potential pitfalls of social media with regards to the dissemination and critical appraisal of the medical literature. If harnessed effectively, we believe that the FOAM movement has the potential to engage the medical community in rapid and effective knowledge translation that will enhance patient care.

Much ado about FOAM: Concerns regarding the quality of resources and rapid translation of knowledge

FOAM's low barrier of entry acts as a double-edged sword: although content producers are able to publish analyses of recently published literature quickly, they do not necessarily undergo the editorial oversight required of traditional publications. Tools for evaluating the quality of these secondary resources are emerging (e.g., ALiEM AIR Series³ and AIR Score,⁴ METRIQ,⁵ SMi⁶) but may take time to be adopted into widespread use.

The lack of traditional editorial and peer-review is one of the primary academic criticisms of most FOAM resources.⁷ Some blogs incorporate variants of editorial supervision and prepublication peer review into their practice to increase their scholarly credibility,^{8,9} but these practices are far from standard. Even if online resources improve their pre-publication processes, traditional peer review still has many limitations¹⁰ and has not been sufficient to safeguard against the propagation of bad science or even outright fraud.¹¹

Critics voice concerns that trainees are unduly influenced by producers of online content.¹² Learners may be able to quote blogs and podcasts without demonstrating an understanding of the primary literature. Prominent members of the online community could develop an outsized influence on clinical emergency medicine that could be harmful if and when they are wrong. Post-publication reviews can spot errors and misinterpretations, but these addenda are often found in the less-read comments sections or more ephemeral media (e.g., Twitter). Furthermore, because FOAM often relies on reanalyses of primary research and subsequent collateral FOAM insights, it may be serially misinterpreted en route to the bedside.

Although FOAM resources may decrease the time to knowledge integration, the criticisms of FOAM

dissemination apply to traditional methods as well. Opinion leaders have always had a substantive impact on practice change.^{13,14} The online community is far from the first to place its prominent members on pedestals – the outsized influence of medical opinion leaders can be traced back to Osler, if not Hippocrates. Academic instructors are right to insist that learners should develop a critical understanding of the literature before they integrate it in their practice.

Paradoxically, the increased speed of knowledge translation may raise concerns about new knowledge entering practice before safety and efficacy can be established.¹² While all innovation starts with early adopters, speedy adoption may lead to the utilization of new evidence before debate and further study have been conducted. A single study may prove to be an anomaly, with the realization that these results are spurious only after further studies and higher-order evidence (e.g., meta-analyses). The effect of faster knowledge delivery, while likely beneficial, is not necessarily certain.

The future of evidence-based medicine

Since the push for teaching critical appraisal skills in the 1990s, most medical school and residency curricula have an obligatory EBM component.^{15,16} While teaching the end-user to read critically made sense, these curricular additions predated the dynamic and networking powers of the Internet. Traditional methods of critical appraisal (i.e., individual users personally appraising every piece of literature) may not be sufficient or even practical in the digital age due to the sheer volume of material produced. Fortunately, although the connectedness resulting from social media has contributed to the problem, it may also offer a solution.

Traditionally, the formal critical appraisal of literature that defined the era of EBM was conducted in relative isolation. Physicians read through a paper using a checklist, then decided whether it was applicable to their practice. Some congregated in small groups or local journal clubs to examine literature. Yet in this new age of instantaneous global communication, it makes little sense to ignore the insights and perspectives from the easily accessible, worldwide community of practice. With social media, we can do much more than passively digest information; online journal clubs and other

THREE TYPES OF SCHOLARS FOR A NEW ERA OF EVIDENCE-BASED MEDICINE

1 CRITICAL CLINICIANS



Skilled in the arts of critical appraisal and willing to interact with knowledge producers to provide thoughtful and meaningful critiques of their work. They will also be critical of the studies that they use to inform changes in their practice, engaging in critical appraisal to its full intent. These digitally-active citizens of the scientific community analyze science in the same way that lay reviewers write restaurant critiques: in open forums that allow for debate with others.

2 TRANSLATIONAL TEACHERS



These educators or communications experts will work with scientists to translate new knowledge. They will bring the skill-sets they acquire via additional training (e.g. advanced or graduate-level training in Communication, Design, or Education sciences).

Dedicated to the task of engaging end-users to change their practice, they will use various strategies ranging from education to leadership to make behaviour change occur in clinical practice. Beyond traditional media, continuing professional development sessions, and policy development, they will be adept at using modern techniques such as blogging, podcasting, and social media platforms (e.g. Twitter, Facebook) to assist scientists in translating their work.

3 INTERACTIVE INVESTIGATOR



These researchers do not just produce knowledge but also engage with others to ensure that their findings resonate and are adapted for clinical care. This new form of scientist will not stop after creating a new clinical decision rule or new troponin assay, but listen to and engage with end-users (including bedside clinicians, administrators, and patients) to translate and improve it.

Recently, there has been a big push across academia to encourage scientists to engage with stakeholders and the public.⁽¹⁸⁾ They will be readily available to engage with Critical Clinicians about their work and while they may not need the Translational Teachers to help promote it, they may work synergistically with translation-focused people to magnify their reach.

Figure 1. Three Types of Scholars for a New Era of Evidence-Based Medicine.

Box 1. Articles that can serve as primers for those new to FOAM and social media engagement

Weingart SD, Thoma B. The online hierarchy of needs: a beginner's guide to medical social media and FOAM. *Emerg Med Australas EMA* 2015;27(1):5, doi:[10.1111/1742-6723.12361](https://doi.org/10.1111/1742-6723.12361).

Duque L. How academics and researchers can get more out of social media; 2016. Available at: <https://hbr.org/2016/06/how-academics-and-researchers-can-get-more-out-of-social-media> (accessed 9 July 2016).

Shemer A. Digital Pedagogy Lab. Beyond academic Twitter: social media and the evolution of scholarly publication; 2016. Available at: <http://www.digitalpedagogy.com/hybridped/beyond-academic-twitter/> (accessed 15 July 2016).

Thoma B, Joshi N, Trueger NS, et al. Five strategies to effectively use online resources in emergency medicine. *Ann Emerg Med* 2014; 64(4):392-5, doi:[10.1016/j.annemergmed.2014.05.029](https://doi.org/10.1016/j.annemergmed.2014.05.029).

Melvin L, Chan T. Using Twitter in clinical education and practice. *J Grad Med Educ* 2014;6:581-2, doi:[10.1136/bmjopen-2013-002988.3](https://doi.org/10.1136/bmjopen-2013-002988.3).

Choo EK, Ranney ML, Chan TM, et al. Twitter as a tool for communication and knowledge exchange in academic medicine: a guide for skeptics and novices. *Med Teach* 2015;37(5):411-6, doi:[10.3109/0142159X.2014.993371](https://doi.org/10.3109/0142159X.2014.993371).

constructivist platforms have emerged, harnessing our new connectivity to foster discussions between clinicians around the world.¹⁷ Modern interconnectivity can move us from simply *reading* about novel therapies, treatments, and initiatives to *discussing* them with the scientists who developed them and content experts across the world. This engagement between scientists and learned audience members will keep the scientific community vibrant. Critical participation is key to EBM in the age of knowledge translation facilitated by social media.

This participatory approach to the evidence not only encourages a sophisticated level of learning, but also offers the potential for the co-construction of knowledge between end-user clinicians who take an active, participatory role and the scientists who are using novel and engaging methods to effectively disseminate their key findings in a timely manner.

In addition to requiring traditional critical appraisal skills, we propose that these innovations have led to the evolution of several new types of scholars who will impact the translation of literature (Figure 1).

How to get started

Box 1 provides some introductory primers for readers who are new to FOAM and social media resources.

Ultimately, we believe that active engagement is the most important thing to foster in the readers and writers of *CJEM*. So, whether you are a clinician who

can help critique and discuss research, a scientist who can help work and interact with clinicians and the public, or an educator interested in helping translate another's work, the key to increased quality of online dissemination is for everyone to participate.

Box 2 lists case studies of successes that we have observed online, which may provide examples for how they might interact with others online.

LIMITATIONS

These new breeds of scholars will face limitations and pitfalls. Critical clinicians will need to gain credibility and visibility in the online community if their reviews are to have an impact. Translational teachers are at risk of being biased towards the researchers with whom they work, potentially decreasing the acceptability of the resources that they produce. Interactive investigators are likely to struggle to maintain a high research profile while remaining accessible and to ensure that their research is responsive to the feedback of the online community, given the dramatically different timelines of social media discussions and research publications. Finally, the potential for the growth of these new types of scholars will be stifled if the traditional reward structures of academic and community medical practice are unable to adapt to the recognition of their unique and valuable contributions to scholarship.

As the new roles for social media become defined, there will be conflict and overlap between the demands of

Box 2 | Case Studies

Critical Clinicians

Critical Clinicians have been amongst us for a while. For example, the Best Evidence for Emergency Medicine (BEEM) group has been assisting with knowledge translation by creating continuing medical education courses to teach practicing physicians about the most relevant literature for over a decade.^{18,19} Newer examples that started in the FOAM community include physicians like Ryan Radecki (EM Literature of Note) and Rory Spiegel (EM Nerd), and Ken Milne (Skeptics Guide to Emergency Medicine, SGEM) who make use of blogs and podcasts to share their critical appraisals of the latest literature.

Translational Influencers

Translational Influencers now exists within the online world as well. Dr. Ken Milne, a rural emergency physician, publishes *The Skeptic's Guide to Emergency Medicine*²⁰ HOP (Hot off the Press) series to engage directly with scientists to assist in the translation of their work.²¹ Similarly, the CanadiEM.org website has frequently published infographics disseminating the results of studies published in the Canadian Journal of Emergency Medicine.

Engaged Scientists

Engaged Scientists are also becoming increasingly prevalent. Within Canada, University of Ottawa's Emergency Medicine group is an active department that regularly features novel knowledge translation and dissemination strategies. Under the leadership of Dr. Hans Rosenberg, this group has an active online social media presence on various platforms including their blog (<http://emottawa.blogspot.ca/>), Twitter (@EmergMedOttawa) and Facebook (<https://www.facebook.com/EmergencyMedicineOttawa/>). Some scientists within that group such as the prolific Dr. Ian Stiell (@EMO_Daddy) regularly engage with colleagues via these avenues.²²

More recently, major research studies have also begun engaging physicians, recruitment centres, and readers via social media accounts. The ARISE study team (@ARISEstudy) managed a Twitter account dedicated to their multi-centered randomized trial of early goal directed therapy versus usual care for patients with severe sepsis. The social media account for this study was first established to engage with physicians recruiting for the study (see figure 2), and continues to engage with other Twitter users and FOAM participants to bridge the critical steps of knowledge translation nearly two years after the publication of their primary findings.

Via this account, the research team has highlighted lectures and panels at conferences, engages with FOAM commentators, clinician colleagues, chats with clinicians at the bedside, and regularly tweets about related papers (e.g. ProMISE, as depicted in figure 3).



Figure 2 | A tweet from the ARISE study Twitter account on [2014-04-02, at 20:20](#).



Figure 3 | A tweet from the ARISE study Twitter account on [2014-09-14, at 20:25](#)

This account also reaches out to FOAM participants and commentators to arrange podcasts, retweet blogs about their study, and engage actively with stakeholders.



Figure 4 | A tweet from the ARISE Study Twitter account on [2016-03-02, at 12:50](#)

The influence of these scholars on emergency medicine research

As the online world continues to play an increasingly large role in emergency medicine education, researchers will need to adjust to this reality. Critical Clinicians use online platforms with increasingly frequency, and emergency medicine researchers should anticipate (and hope) that their publications will be discussed and debated on public forums. Not all scientists will be comfortable engaging with these clinicians or promoting their research. We suggest that they invite a *Translational Influencer* to assist with their work. Collaborations with those possessing specialized skills in developing communication strategies for audience engagement, for instance, might provide scientists with insights on how to increase the reach of their research findings. Journals that foster their own translational influencers, as CJEM has done with the SGEM HOP podcasts and CanadiEM infographics, are more likely to become increasingly attractive places to publish for research groups that do not have their own talent in these areas.

expertise in each subfield. New scholars may find that the demands of knowledge translation and communication compete with research and clinical practice. There is only a finite amount of time, effort, and skill. So, a team-based approach, with multiple collaborators taking on different roles will likely be the way forward.

CONCLUSION

There will always be a risk in the adoption of any new finding that subsequent research will demonstrate unexpected fallibilities. Conversely, the delayed introduction of a new technique or system may cause unnecessary patient harm. The emergence of critical clinicians, translational teachers, and interactive investigators will not make these dilemmas any less likely; by incorporating a broader community with new perspectives and diverse skills, we have suggested a methodology to more safely reduce the knowledge translation and implementation gap. Let debates take place in open and public forums, rather than the isolated circles of individual clinicians or local groups. Engagement and participation can usher in a new era of transparency around clinical decision-making, knowledge integration, and evidence-based practice.

Keywords: Social Media, Knowledge Translation, Twitter

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REFERENCES

- Morris ZS, Wooding S, Grant J. The answer is 17 years, what is the question: understanding time lags in translational research. *JRSM* 2011;104(12):510-20, doi:[10.1258/jrsm.2011.110180](https://doi.org/10.1258/jrsm.2011.110180).
- Thoma B, Mohindra R, Artz JD, et al. *CJEM* and the changing landscape of medical education and knowledge translation. *CJEM* 2015;17(2):184-7, doi:[10.1017/cem.2015.16](https://doi.org/10.1017/cem.2015.16).
- Lin M, Joshi N, Grock A, et al. Approved Instructional Resources (AIR) series: a national initiative to identify quality emergency medicine blog and podcast content for resident education. *J Grad Med Educ* 2016;8(2): 219-25.
- Chan TM, Grock A, Paddock M, et al. Examining reliability and validity of an online score (ALiEM AIR) for rating free open access medical education resources. *Ann Emerg Med* 2016;68(6):729-35, doi:[10.1016/j.annemergmed.2016.02.018](https://doi.org/10.1016/j.annemergmed.2016.02.018).
- Chan TM, Thoma B, Krishnan K, et al. Derivation of two critical appraisal scores for trainees to evaluate online educational resources: a METRIQ study. *West J Emerg Med* 2016;17(5):574-84.
- Thoma B, Sanders JL, Lin M, et al. The social media index: measuring the impact of emergency medicine and critical care websites. *West J Emerg Med* 2015;16(2):242-9, doi:[10.5811/westjem.2015.1.24860](https://doi.org/10.5811/westjem.2015.1.24860).
- Brabazon T. The Google effect: googling, blogging, Wikis and the flattening of expertise. *Libri* 2006;56(3):157-67.
- Thoma B, Chan T, Desouza N, et al. Implementing peer review at an emergency medicine blog: bridging the gap between educators and clinical experts. *CJEM* 2015; 17(2):188-91, doi:[10.2310/8000.2014.141393](https://doi.org/10.2310/8000.2014.141393).
- Sidalak D, Purdy E, Luckett-Gatopoulos S, et al. Coached peer review: developing the next generation of authors. *Acad Med* 2016; in press. doi:[10.1097/ACM.00000000000001224](https://doi.org/10.1097/ACM.00000000000001224).
- Smith R. Peer review: a flawed process at the heart of science and journals. *J R Soc Med* 2006;99(4):178-82, doi:[10.1258/jrsm.99.4.178](https://doi.org/10.1258/jrsm.99.4.178).
- Callaway E. Faked peer reviews prompt 64 retractions. *Nature* 2015;785:23-5, doi:[10.1038/nature.2015.18202](https://doi.org/10.1038/nature.2015.18202).
- Cameron P. Pundit-based medicine. *Emerg Physician Int*; 2016. Available at: <http://www.epijournal.com/articles/240/pundit-based-medicine>.
- Carpenter CR, Sherbino J. How does an "opinion leader" influence my practice? *Can J Emerg Med* 2010;12(5):431-4, doi:[10.1016/j.biotechadv.2011.08.021](https://doi.org/10.1016/j.biotechadv.2011.08.021).
- Doumit G, Gattellari M, Grimshaw J, et al. Local opinion leaders: effects on professional practice and health care outcomes (Review). *Cochrane Database Syst Rev* 2007;1:CD000125.
- CACMS Standards and Elements. Standards for accreditation of medical education programs leading to the MD degree; 2015. Available at: https://www.afmc.ca/pdf/CACMS_Standards_and_Elements_June_2014_Effective_July2015.pdf.
- Green ML. Graduate medical education training in clinical epidemiology, critical appraisal, and evidence-based medicine: a critical review of curricula. *Acad Med* 1999;74:686-94.
- Chan TM, Thoma B, Radecki R, et al. Ten steps for setting up an online journal club. *J Contin Educ Health Prof* 2015; 35(2):148-54, doi:[10.1002/chp.21275](https://doi.org/10.1002/chp.21275).
- Duque L. Harvard Business Review. How academics and researchers can get more out of social media; 2016. Available at: <https://hbr.org/2016/06/how-academics-and-researchers-can-get-more-out-of-social-media> (accessed 9 July 2016).
- Carpenter CR, Sarli CC, Fowler S, et al. Best evidence in Emergency Medicine (BEEM) rater scores correlate with publications' future citations. *Acad Emerg Med* 2013; 20(10):1004-12, doi:[10.1111/acem.12235](https://doi.org/10.1111/acem.12235).
- Milne WK. *What is the SGEM? The Skeptics Guide to Emergency Medicine*. <http://thesgem.com/what-is-the-sgem/> (accessed 19 December 2016).
- Luckett-Gatopoulos S, Thoma B, Bond C, Milne WK. Hot off the press: Regional Nerve Blocks for Hip and Femoral Neck Fractures: A Systematic Review. *CJEM* 2016; 18(4):296-300, doi:[10.1017/cem.2016.332](https://doi.org/10.1017/cem.2016.332).
- Chan TM, Rosenberg H, Lin M. Global emergency medicine journal club: social media responses to the January 2014 online emergency medicine journal club on subarachnoid hemorrhage. *Ann Emerg Med* 2014;64(1):88-94, doi:[10.1016/j.annemergmed.2014.05.015](https://doi.org/10.1016/j.annemergmed.2014.05.015).