Title

Holes in the FOAM: An Analysis of Curricular Comprehensiveness in Online Educational Resources

Journal

AEM Education and Training, 5(3)

ISSN

2472-5390

Authors

Grock, Andrew
Chan, Wendy
Aluisio, Adam R
et al.

Publication Date

2021-07-01

DOI

10.1002/aet2.10556

Peer reviewed

ORIGINAL CONTRIBUTION

Holes in the FOAM: An Analysis of Curricular Comprehensiveness in Online Educational Resources

Andrew Grock, MD[1,2], Wendy Chan, MD[3], Adam R. Aluisio, MD, MSc, DTM&H[4], Carl Alsup, MD[5], Delphine Huang, MD[6], and Nikita Joshi, MD[7]

ABSTRACT

Objectives: We sought to evaluate Free Open Access Medical Education (FOAM), defined as online educational content available free to anyone, anywhere, at any time, by classifying the most impactful FOAM content per the Social Media Index into the topics and subtopics of the American Board of Emergency Medicine's Model of the Clinical Practice of Emergency Medicine. We then analyzed FOAM's comprehensiveness by describing over- and underrepresentation among these topics and subtopics.

Methods: First, we searched for FOAM resources based on the most recent 12 months of relevant content for each organ system from the top 50 Social Media Index sites. Next, we classified all 898 posts into its related topics or subtopics per the American Board of Emergency Medicine's Model of the Clinical Practice of Emergency Medicine. Finally, we analyzed how comprehensively FOAM covered each organ system and the frequency of posts that covered each organ system subtopic as well as identified the subtopics with the most frequent coverage.

Results: The search yielded 898 FOAM posts, of which cardiology and neurology were significantly overrepresented and psychobehavioral; obstetrics and gynecology; and head, ears, eyes, nose, and throat were significantly underrepresented. Among subtopics, acute coronary syndrome had the highest subtopic coverage consisting of 55.5% of all cardiology content. Other highly represented subtopics include renal colic; diabetic ketoacidosis; sepsis; and stroke with 39, 40, 40, and 71% of each of their topic's content, respectively.

Conclusions: Although residents and programs are frequently incorporating FOAM into the educational curriculum, these materials seem to lack comprehensiveness. Educators and learners must be aware of these deficits in creating comprehensive emergency medicine curricula.

For decades the traditional pillars of asynchronous medical education consisted of physical copies of peer-reviewed journals and medical textbooks. With the rise of the Internet, peer-reviewed publications became available through PubMed online and textbooks became available electronically. Likewise, medical educators became able to release their content online. This innovation, known as Free Open Access Medical Education (FOAM), primarily offers the opportunity for increased information dissemination and also fosters collaboration through virtual communities of practice.[1–3] From 2002 to 2013 the number

From the [1]Department of Emergency Medicine, University of California Los Angeles, Los Angeles, CA; [2]and the, VA Greater Los Angeles Healthcare System Wadsworth Anaerobe Laboratory, Los Angeles, CA; [3]the, Emergency Department, Maimonides Medical Center, Brooklyn, NY; [4]the, Department of Emergency Medicine, Brown University Warren Alpert Medical School, Providence, NY; [5]Sierra Nevada Memorial Hospital, Grass Valley, CA; [6]UCSF/ZSFGH Department of Emergency Medicine and Kaiser Permanente, San Francisco, CA; [7]and, Alameda Hospital, Alameda Health System, Oakland, CA.
Received September 15, 2020; revision received November 4, 2020; accepted November 9, 2020.
Reprints will not be available.
Presented at the Council of Emergency Medicine Residency Directors Academic Assembly, Nashville, TN, March 7, 2016.
The authors have no relevant financial information or potential conflicts to disclose.
Supervising Editor: Teresa M. Chan, MD, MHPE.
Address for correspondence: Andrew Grock, MD; e-mail: andygrock@gmail.com.
AEM EDUCATION AND TRAINING 2021;5:1–8.

doi: 10.1002/aet2.10556

of FOAM sites underwent an astronomical 60-fold growth, and, by 2016, that number nearly doubled again.[4,5]

Like many millennials facile in navigating the digital world, emergency medicine (EM) residents today more frequently access FOAM than textbooks due to FOAM's accessibility and concision.[1,2] The volume produced and popularity of FOAM is likely to continue to grow as residents, program directors, and national leadership move to integrate it into the education process.[1,2,6] In fact, novel curricula such as the Academic Life in Emergency Medicine–approved instructional resources series (ALiEM AIR) use solely FOAM content to fulfill Accreditation Council for Graduate Medical Education criteria for individualized interactive instruction.[7,8] Additional resources such as Foundations of Emergency Medicine, provides free, peer-reviewed content for a flipped-classroom and small-group exercises.[9]

The rise of FOAM is not without its critiques. FOAM commonly lacks the typical peer review process. Numerous publications have sought to evaluate and remedy this quality control gap through identifying quality indicators and designing curation tools.[10–19] Second, FOAM's decentralized nature can make it difficult to navigate. FOAM centralization efforts include the ALiEM AIR series and resultant publications, more in-depth systematic reviews, and the two online search engines Numose and FOAM Search.[9,20–25]

The last major critique of FOAM reflects on the potential lack of comprehensiveness among its resources. Editors in chief of traditional textbooks ensure the finished product comprehensively covers the curricula. As such, *Tintanelli's Emergency Medicine,* for example, appears to cover the full breadth of emergency medicine as dictated by the American Board of Emergency Medicine's (ABEM's) Model of the Clinical Practice of Emergency Medicine (MCPEM).[26,27] In contrast, FOAM is produced individually with unknown attention paid to curricular comprehensiveness. As such, FOAM resources are rumored to lack the breadth and depth of core EM knowledge and materials. Thus, residents who rely primarily on FOAM resources could be underexposed or even uneducated about certain topics. Little research has focused on understanding the comprehensiveness of FOAM materials. The only investigation thus far to address this gap found that in a 1-year analysis of FOAM, collected from a search engine of over 160 websites, 71.5% of ABEM topics were represented with almost a third of content focused on procedures alone.[28] Their investigation revealed that the most frequently covered topic was procedures with overrepresentation of airway techniques, ECG interpretation, ultrasonography, resuscitation, and literature interpretation.[28] Hematology, nontraumatic musculoskeletal disorders, and obstetric and gynecologic disorders were the least frequently covered with each receiving 0.6% of the total topics. No topic had all of its subtopics covered.[27]

While the Stuntz et al.[28] study deserves due praise for first investigating FOAM's comprehensiveness, it searched an enormous number of FOAM sites, which may not reflect what learners are actively consuming. As residency leadership and residents increasingly depend on FOAM, describing topic coverage is increasingly important. As such, this study sought to evaluate the comprehensiveness of the most utilized FOAM resources.

METHODS

To better describe what learners are accessing for their knowledge, we focused our search on the most impactful FOAM websites as defined by the Social Media Index (SMI), an impact-based ranking based of FOAM sites.[28,29] Similar to an h-index or journal impact factor, the SMI develops an impact score for a blog based on its focus on EM or critical care content, Alexa score (an Amazon tool to calculate website traffic), Twitter, or Facebook popularity. The SMI has been shown to be a stable indicator of website impact as well as correlate with quality.[29,30]

The AIR Series fit our search criteria perfectly—relevant content per the Council of Emergency Medicine Residency Director's (CORD's) testing schedule is culled from each site in the SMI-50 published within the previous 12 months from the time the search was performed.[8] One author either performed or supervised each organ system's search on a rolling basis every 1 to 1.5 months from 2015 to 2017 with the goal of inclusivity. A secondary analysis was performed to remove content deemed nonrelevant by four members of the ALiEM AIR series' editorial board.

The FOAM resources were reviewed and categorized using ABEM's MCPEM by three of the authors.[27] Another author separately reviewed a random sampling for categorization accuracy and provided feedback when appropriate. Counts for independent

subtopics were performed by two authors with discrepancies resolved through adjudicated consensus. Of note, three specific topics were excluded from the search and data analysis. The MCPEM category of "signs, symptoms, and presentations" had no equivalent category in CORDs testing schedule and was not specifically searched for. Additionally, the first ALiEM AIR search published, hematology, utilized a less rigorous search strategy and was thus excluded from our analysis. Finally, the initial ALiEM search uncovered a large number of diagnostic ultrasound posts of similar quality and did not include these posts in their quality assessment. Hence, diagnostic ultrasound was excluded from our data analysis. This study has been deemed exempt by the Olive View/UCLA Institutional Review Board reference number 924741-1.

Data Analysis

The SMI search described above resulted in 989 unique resources that were categorized per the MCPEM by topic and subtopic. Proportional representation of the FOAM posts based on MCPEM categories were calculated and compared to the ABEM National Qualifying Exam (NQE) categorical representation in an effort to describe FOAM coverage between organ systems (topics) and among subtopics. Significant differences between FOAM post subtopic frequency and the NQE categorical representation were calculated with associated 95% confidence intervals (CI). We created a descriptor titled density to represent numerically the relationship between the number of posts per topic in relation to number of subtopics within that topic as well.

RESULTS

Of the 898 unique FOAM posts collated, the authors found a significant overrepresentation of cardiology and neurology content and a significant underrepresentation of psychobehavioral; obstetrics and gynecology; and head, ears, eyes, nose, and throat (HEENT; Table 1). Specifically, neurology represented 13.3% of the collected posts compared to 5% per the NQE and cardiology had 21.3% compared with 10% per the NQE.

Among subtopic coverage, cardiology and gastrointestinal had the highest percent covered by at least one FOAM post with 75 and 65% of subtopics within

Table 1
ABEM National Qualifying Exam Versus FOAM Breakdown

	ABEM NQE Percent by Topic	FOAM Total Number	FOAM Topic Representation as Percent of Total	95% CI Lower Bound	95% CI Upper Bound	NQE and FOAMPercent Difference
Cardiovascular	10	191	21.27	18.6	24.1	+11.27
Traumatic	10	904	10.47	8.5	12.7	+0.47
Respiratory	8	100	11.14	9.2	13.4	+3.14
Abdominal/GI	8	78	8.69	7	10.7	+0.69
Procedures, skills	8	84	9.35	7.6	11.4	+1.35
HEENT	5	12	1.34	0.7	2.3	−3.66
Nervous system	5	119	13.25	11.2	15.6	+8.25
Toxicology	5	33	3.67	2.6	5.1	−1.33
Ob/Gyn	4	15	1.67	1	2.7	-2.33
Psychobehavioral	4	15	1.67	1	2.7	−2.33
Environmental	3	37	4.12	3	5.6	+1.12
Musculoskeletal (nontraumatic)	3	28	3.12	2.2	4.5	+0.12
Renal/urogenital	3	31	3.45	2.4	4.9	+0.45
Endocrine and metabolic	2	15	1.67	1	2.7	−0.33
Immune disorders	2	19	2.12	1.4	3.3	+0.12
Cutaneous	1	27	3.00	2.1	4.3	+2.01
Signs, symptoms, presentations	9	NA	NA	NA	NA	NA
Hematologic + ID	7	NA	NA	NA	NA	NA
Other	3	NA	NA	NA	NA	NA
Totals	81	898	100%			

ABEM = American Board of Emergency Medicine; FOAM = Free Open Access Medical Education; GI = gastrointestinal; HEENT = head, ears, eyes, nose, and throat; NQE = National Qualifying Exam.

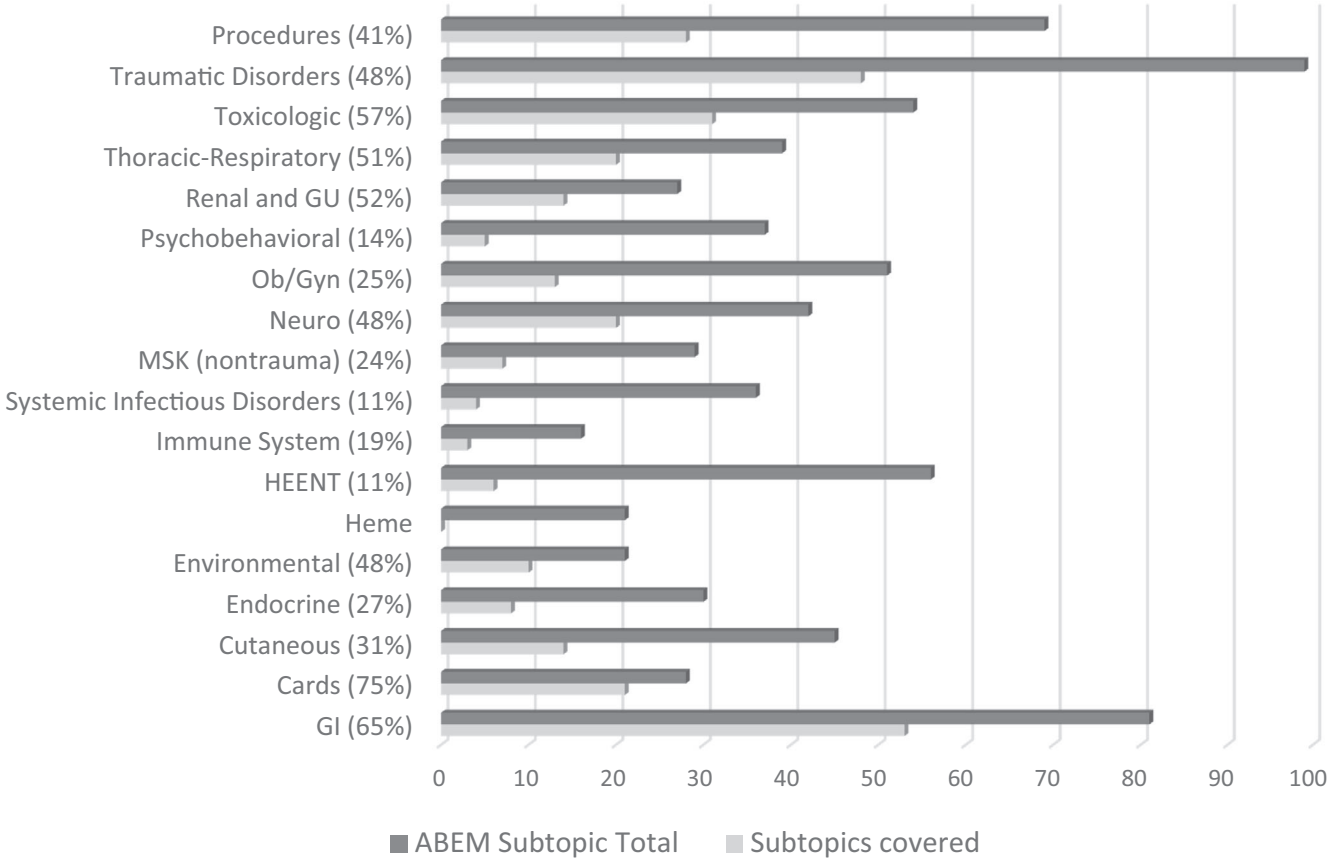

Figure 1. FOAM topic and subtopic coverage per ABEM MCPEM. ABEM = American Board of Emergency Medicine; FOAM = Free Open Access Medical Education; GI = gastrointestinal; GU = genitourinary; HEENT = head, ears, eyes, nose, and throat; MCPEM = Model of the Clinical Practice of Emergency Medicine; MSK = musculoskeletal.

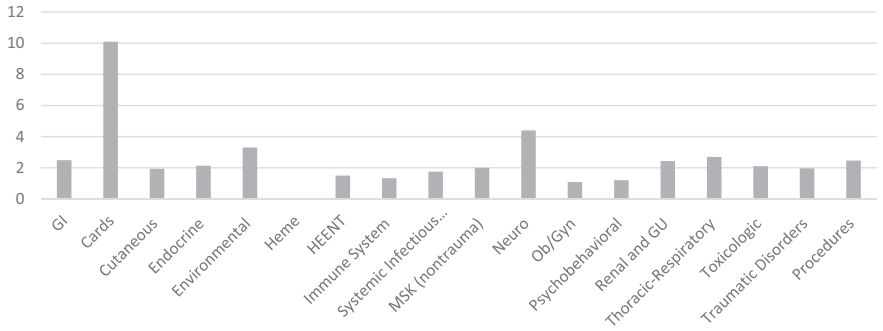

Figure 2. Topic density. GI = gastrointestinal; HEENT = head, ears, eyes, nose, and throat.

those specialties covered, respectively. Psychobehavioral, HEENT, and systemic infectious disorders had the least comprehensive coverage with 13, 11, and 11%, respectively. For systemic infectious disorders, 71% of the posts focused on the sepsis subtopic with limited focus on other subtopics (Figure 1). Overall, only 38% of the subtopics identified by ABEM were covered by at least one FOAM post. Of those 38% of subtopics covered, they received an average of 2.6 posts per topic. Cardiology was the most densely covered topic with over 10 posts on average per subtopic covered (Figure 2). Meanwhile, HEENT and psychobehavioral had the least posts per subtopic coverage (Figure 2).

Other overly represented subtopics include acute coronary syndrome (ACS; 55.5% of the cardiology), renal colic (39% of renal), diabetic ketoacidosis (40% of endocrine), and stroke (40%; Figure 3). Equally

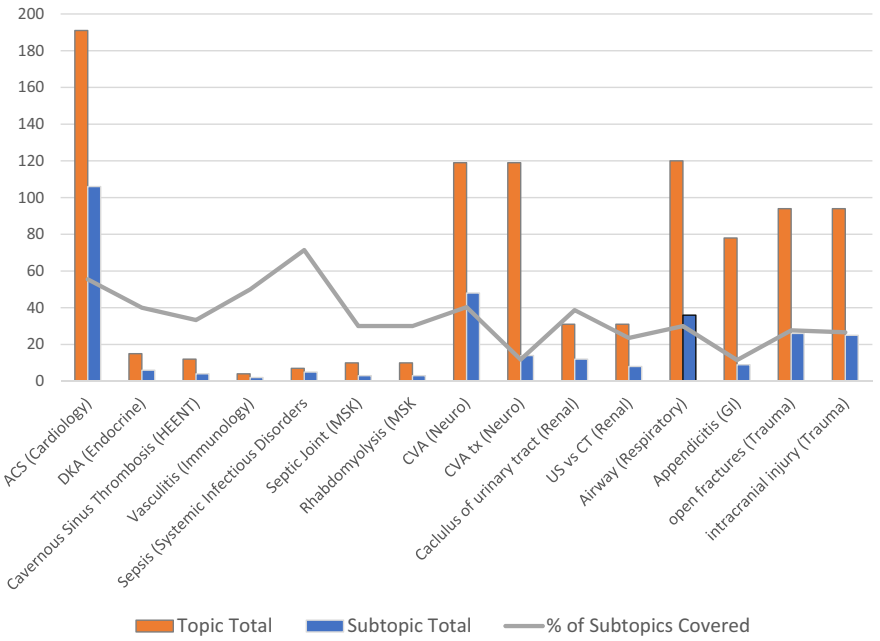

Figure 3. Highest subtopic frequency. ACS = acute coronary syndrome; CVA = cerebrovascular accident; DKA = diabetic ketoacidosis; GI = gastrointestinal; US = ultrasound.

interesting, 23% of renal posts were focused on ultrasound versus CT in the workup of renal colic, most of which directly or indirectly referenced a recently published, highly impactful article on the topic in the *New England Journal of Medicine*.[31]

DISCUSSION

Our data demonstrate an uneven representation of FOAM posts based on organ systems per the NQE breakdown. Educators and learners should be aware that residents who primarily utilize FOAM may specifically need to address knowledge gaps in psychobehavioral, obstetrics and gynecology, and HEENT.

Additionally, the results support the critique that FOAM content tends to focus more on more typically exciting topics such as ACS as well as contentious topics or recently published papers such as stroke, renal colic, and sepsis. Topics with little to no coverage tended toward core content or subtopics with less recently changed or evolving diagnostics, clinical approaches, or treatments. No evidence yet exists to explain why FOAM content is skewed or why FOAM producers, who gain little financially or with academic advancement, expend such extraordinary efforts to produce specific content.[32,33] The noted skew could be motivated by authors gearing their content to increased clicks. In fact, one review of FOAM production and use specifically describes the creation of an "attention economy" in which FOAM producers push for increased dissemination and impact.[34] The more a site is read and shared could relate to increase financial benefit from advertisers or at the very least, represent increased impact. Of note, a recent consensus guidelines for academic promotion from FOAM describes how increased impact, similar to journal publications, should translate into higher value academic production.[33] Another consideration is that FOAM authors are actually striving to fill a needed niche. While textbooks maintain exemplary comprehensiveness and remain high-quality resources, it is impracticable for them to rapidly update with the publication of practice changing articles. Thus, FOAM may serve as an adjunct for learners to stay up to date or for emerging practices, because this information is not found in textbooks. Another potential influence for content could be high medicolegal risk areas such as missed ACS, pulmonary embolism, or stroke. Most recently, experts have recommended increased incorporation of FOAM into EM resident didactics given the COVID-19 pandemic.[35] Given that the data showing FOAM are not comprehensive, limitations to didactics may be of increased concern among educators striving to provide a complete EM education.

Finally, attention to curating recently published literature may be an intentional and valuable niche. Both Stuntz et al.[28] and our results demonstrate a specific skew among FOAM resources toward recently

published content. Over the past few decades, there has been a steady increase in both number of journals and publications per year with about 28,100 active peer-reviewed English-language journals as of 2014, with over 2.5 million articles published per year.[36] This enormous amount of publications per day in medical journals far exceeds any learner or educator's capacity to read and process regularly. If FOAM preferentially focuses on recently published literature, it could serve as a curator that identifies high-impact publications. Studies in fact have shown a concerted effort by FOAM authors to shorten time to knowledge translation in practice changing articles.[37,38] For example, 23% of renal posts focused on ultrasound versus CT in diagnosing renal colic. At that time, a high-impact article was published on this exact topic in the *New England Journal of Medicine*.[31] Specific websites on the SMI contained content either entirely (EM Lit of Note and Skeptics Guide to Emergency Medicine) or partially (REBELEM, ALiEM, and First10 EM) consisted of reviews or descriptions of recently published literature. Often, these FOAM sites describe or critique the articles. Additional FOAM sites now produce simplified infographics to enhance knowledge retention of a publication.[37–40] Besides a primary literature review, FOAM skew could be explained by the authors intentionally producing content not found in textbook. Thomas and Kern's six-step curriculum design start with problem identification/general needs assessment and targeted needs assessment followed by goals and objectives, educational strategies, implementation, and outcome assessment. Perhaps FOAM skew is actually in response to general and targeted needs assessments that identify these specific gaps. Hence, FOAM authors direct their content toward areas intentionally not represented well by textbooks and other commonly consumed resources.

While few resources exist to fully describe EM comprehensiveness, the MCPEM appears credible as it is produced by ABEM. One investigation, limited to an analysis of a single academic site, did demonstrate a mismatch in the MCPEM in comparison to the resident clinical experience.[41] Additionally, as medical content such as determining the best diagnostic test or treatment become more and more easily available online while on shift, educators may want to focus true learning on topics of medicine less accessible such as medical decision making. Additionally, as recertification testing for EM transitions to an open resource model, changes to the MCPEM may be required.[42] For example, ultrasound is only listed as two subtopics lines on the MCPEM, despite it being used for numerous procedural and diagnostic applications in the clinical practice. Meanwhile, FOAM includes an enormous amount of ultrasound content. It remains unclear if FOAM correlates better with the clinical EM experience.

Ultimately, learners and educators must not be seduced by the latest innovation or only read topics that appeal most to them as emergency medicine residents. To deliver excellent patient care in the emergency department and to pass the EM board examination, a broad education is required. They must be aware of the gaps in FOAM curricula and consciously broaden their education to comprehensively learn the full breadth of EM.[43]

LIMITATIONS

This study has limitations. The search was not a systematic review of all the FOAM sites that existed during the data collection period and there may exist selection bias stemming from this. Instead, the search methods were limited to the top 50 sites on the SMI-50. Although less comprehensive, this focused the data to digital sources known to be of the highest impact, and therefore the results likely have accuracy pertaining to the most frequently viewed content. The searches were executed on a monthly basis by topic, which could have potentially missed topic specific spikes in FOAM content as can occur, for example, following the release of a high-impact publication. Finally, the searches and data acquisition were performed from 2015 to 2017 and may not reflect the state of FOAM currently. Despite these limitations, the results from the current data characterize the available FOAM resources during the period of interest and provide important insight into the content distribution, gaps, and area of potential saturation that can be used to inform future evaluation on the trajectory of FOAM comprehensiveness and educational approaches.

CONCLUSIONS

The current data show that the most impactful Free Open Access Medical Education sites are uneven in their comprehensiveness of emergency medicine core knowledge. Educators and learners must be aware of these deficits in creating comprehensive emergency

medicine curricula to properly address content missed in learners using primarily Free Open Access Medical Education resources.

References

1. Purdy E, Thoma B, Bednarczyk J, Migneault D, Sherbino J. The use of free online educational resources by Canadian emergency medicine residents and program directors. CJEM 2015;17:101–6.
2. Mallin M, Schlein S, Doctor S, Stroud S, Dawson M, Fix M. A survey of the current utilization of asynchronous education among emergency medicine residents in the United States. Acad Med 2014;89:598–601.
3. Boulos MN, Maramba I, Wheeler S. Wikis, blogs and podcasts: a new generation of Web-based tools for virtual collaborative clinical practice and education. BMC Med Educ 2006;6:41.
4. Cadogan M, Thoma B, Chan TM, Lin M. Free Open Access Meducation (FOAM): the rise of emergency medicine and critical care blogs and podcasts (2002–2013). Emerg Med J 2014;31:e76–7.
5. Stirling M. FOAM EMCC Blogs 2018. Life in the Fast Lane. 2020. Available at: https://litfl.com/foam-emcc-blogs-2018/. Accessed Sep 11, 2020.
6. Khadpe J, Willis J, Silverberg MA, Grock A, Smith T. Integration of a blog into an emergency medicine residency curriculum. West J Emerg Med 2015;16:936–7.
7. Sadosty AT, Goyal DG, Hern GH Jr, Kilian BJ, Beeson MS. Alternatives to the conference status quo: summary recommendations from the 2008 CORD Academic Assembly Conference Alternatives workgroup. Acad Emerg Med 2009;16:S25–S31.
8. Lin M, Joshi N, Grock A, et al. Approved instructional resources series: a national initiative to identify quality emergency medicine blog and podcast content for resident education. J Grad Med Educ 2016;8:219–25.
9. Grabow-Moore K. Foundations of Emergency Medicine: About Foundations. 2020. Available at: https://foundationsem.com/about-foundations/. Accessed Oct 26, 2020.
10. Azim A, Beck-Esmay J, Chan TM. Editorial processes in free open access medical educational (FOAM) resources. AEM Educ Train 2018;2:204–12.
11. Thoma B, Chan T, Desouza N, Lin M. Implementing peer review at an emergency medicine blog: bridging the gap between educators and clinical experts. Can J Emerg Med 2015;17:188–91.
12. Sidalak D, Purdy E, Luckett-Gatopoulos S, Murray H, Thoma B, Chan TM. Coached peer review: developing the next generation of authors. Acad Med 2017;92:201–4.
13. Desouza N. Introducing Open, Post-Publication, Expert Peer Review on ALiEM. Academic Life in Emergency Medicine. 2013. Available at: http://www.aliem.com/introducing-open-post-publication-peer-review/. Accessed Sep 11, 2020.
14. Colmers IN, Paterson QS, Lin M, Thoma B, Chan TM. The Quality Checklists for Health Professions Blogs and Podcasts. The Winnower. November 2015.
15. Colmers-Gray IN, Krishnan K, Chan TM, et al. The Revised METRIQ score: a quality evaluation tool for online educational resources. AEM Educ Train 2019;3:387–92.
16. Chan TM, Grock A, Paddock M, Kulasegaram K, Yarris LM, Lin M. Examining reliability and validity of an online score (ALiEM AIR) for rating Free Open Access Medical Education resources. Ann Emerg Med 2016;68:729–35.
17. Chan T, 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;17:574–84.
18. Paterson QS, Thoma B, Milne WK, Lin M, Chan TM. A systematic review and qualitative analysis to determine quality indicators for health professions education blogs and podcasts. J Grad Med Educ 2015;7:549–54.
19. Lin M, Thoma B, Trueger NS, Ankel F, Sherbino J, Chan T. Quality indicators for blogs and podcasts used in medical education: modified Delphi consensus recommendations by an international cohort of health professions educators. Postgrad Med J 2015;91:546–50.
20. Grock A, Bhalerao A, Chan TM, Thoma B, Wescott AB, Trueger NS. Systematic online academic resource (SOAR) review: renal and genitourinary. AEM Educ Train 2019;3:375–86.
21. Khadpe J, Morley EJ, Rezaie SR, Grock A. Academic Life in Emergency Medicine (ALiEM) blog and podcast watch: gastrointestinal emergencies. Cureus 2019;11:e5545.
22. Min AA, Jordan J, Swaminathan A, Hennings J, Grock A. Academic Life in Emergency Medicine (ALiEM) blog and podcast watch: renal and genitourinary emergencies. Cureus 2018;10:e3756.
23. Grock A, Wheaton N, Roppolo L, Gaafary C. Academic Life in Emergency Medicine blog and podcast watch: toxicologic emergencies. Cureus 2018;10:e3687.
24. Zahir B. Numose Search Engine. Available at: https://www.blog.numose.com/update. Accessed Sep 11, 2020.
25. FOAM Search. Available at: http://googlefoam.com/#gsc.tab=0. Accessed Sep 11, 2020.
26. Tintinalli JE, Ma O, Yealy DM, et al., editors. Tintinalli's Emergency Medicine: A Comprehensive Study Guide. 9th ed. New York: McGraw-Hill, 2020. https://accessmedicine.mhmedical.com/content.aspx?bookid=2353&sectionid=183421643. Accessed Sep 11, 2020.
27. Beeson MS, Ankel F, Bhat R, et al. The 2019 Model of the Clinical Practice of Emergency Medicine. J Emerg Med 2020;59:96–120.

28. Stuntz R, Clontz R. An evaluation of emergency medicine core content covered by Free Open Access Medical Education resources. Ann Emerg Med 2016;67:649–53.e642.
29. Thoma B, Sanders JL, Lin M, Paterson QS, Steeg J, Chan TM. The Social Media Index: measuring the impact of emergency medicine and critical care websites. West J Emerg Med 2015;16:242–9.
30. Thoma B, Chan TM, Kapur P, et al. The Social Media Index as an indicator of quality for emergency medicine blogs: a METRIQ study. Ann Emerg Med 2018;72:696–702.
31. Smith-Bindman R, Aubin C, Bailitz J, et al. Ultrasonography versus computed tomography for suspected nephrolithiasis. N Engl J Med 2014;371:1100–10.
32. Cabrera D, Vartabedian BS, Spinner RJ, Jordan BL, Aase LA, Timimi FK. More than likes and tweets: creating social media portfolios for academic promotion and tenure. J Grad Med Educ 2017;9:421–25.
33. Husain A, Repanshek Z, Singh M, et al. Consensus guidelines for digital scholarship in academic promotion. West J Emerg Med 2020;21:883–91.
34. Chan TM, Stehman C, Gottlieb M, Thoma B. A short history of Free Open Access Medical Education. The Past, Present, and Future. ATS Scholar 2020;1:87–100.
35. Gottlieb M, Landry A, Egan DJ, et al. Rethinking residency conferences in the era of COVID-19. AEM Educ Train 2020;4:313–7.
36. Plume A, van Weijen D. Publish or Perish? The Rise of the Fractional Author. Research Trends. 2014. Available at: http://www.researchtrends.com/issue-38-september-2014/publish-or-perish-the-rise-of-thefractional-author. Accessed Sep 11, 2020.
37. Milne K.The Skeptics Guide to Emergency Medicine (SGEM). 2015. Available at: https://blogs.bmj.com/ce/2015/07/16/the-skeptics-guide-to-emergency-medicine-sgem-2/#:~:text=Don't%20panic!,to%20less%20than%20one%20year.&text=FOAM%20is%20medical%20education%20for%20anyone%2C%20anywhere%2C%20anytime.%E2%80%9D. Accessed Sep 11, 2020.
38. Lo A.#FOAMed: A Modern Controversy. EMottawa. 2016. Available at: https://emottawablog.com/2016/06/foamed-a-modern-controversy/. Accessed Sep 11, 2020.
39. Martin LJ, Turnquist A, Groot B, et al. Exploring the role of infographics for summarizing the medical literature. Health Prof Educ 2019;5:48–57.
40. Wilson S. Regional Anesthesia in Canadian Emergency Departments. CanadiEM. 2020. Available at: https://canadiem.org/regional-anesthesia-in-canadian-emergency-departments/ Accessed Sep 11, 2020.
41. Bischof JJ, Emerson G, Mitzman J, Khandelwal S, Way DP, Southerland LT. Does the emergency medicine in-training examination accurately reflect residents' clinical experiences? AEM Educ Train 2019;3:317–22.
42. Mallory MN. ABEM Changes in Certification. ABEM Website. 2020. Available at https://www.abem.org/public/docs/default-source/default-document-library/certification-changes-webinar--october-21-2020.pdf?sfvrsn=2558c2f4_0. Accessed Oct 27, 2020.
43. Sandars J. Twelve tips for using blogs and wikis in medical education. Med Teach 2006;28:680–2.