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FOAM authorship: Who's teaching our learners?

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Abstract

Background: Free open-access medical education (FOAM) is extremely popular among learners and educators despite lacking the traditional peer review process. Despite the potential for inaccurate, low-quality, or biased content, little has been published describing FOAM authors.

Methods: We performed a cross-sectional analysis of 12 months of content from the top 25 blogs in the 2020 Social Media Index from August 2020–2021. We recorded the number of posts per site and descriptive characteristics of authors, including gender affiliation, conflicts of interest (COI) statements, and type of practice (academic, community, or hybrid).

Results: We identified 2141 posts by 1001 authors. More than half were produced by six websites: EM Docs (266), Life in the Fast Lane (232), EMCrit (188), ALiEM (185), Don't Forget the Bubbles (181), and Rebel EM (174). Most content (1680 posts, 78.5%) lacked a COI statement. Authors were mostly academic (89%), mostly held MD degrees (67.4%), and were mostly men (59.7%). Geographically, most FOAM authors reside in the United States (59.5%), Canada (22.42%), or the United Kingdom (9.4%).

Conclusions: Of all the posts in the top 25 sites in 2020, more than half came from six sites, and authors were largely North American men in academics with MD degrees. Learners, content creators, and educators should consider the ways in which a more diverse authorship pool might bring value to the FOAM educational experience.

INTRODUCTION

Since it arose in 2002, free open-access medical education online resources (FOAM) has exploded in production, emergency medicine resident utilization, and even incorporation into formal curricula.^{1–8} FOAM presents different challenges to users than traditional resources such as journal articles and textbooks. FOAM often lacks the traditional peer review process, is decentralized, and generally lacks curricular comprehensiveness.^{9–11} Numerous programs have sought to provide postpublication quality assessment^{12–17} given that

individual gestalt performs poorly in FOAM evaluation^{18,19} and the enormous quantity of FOAM production exceeds the capacity for complete expert curation.

Given these limitations, and a medium on which anyone can publish anything on a blog without oversight or correction, thinking critically about FOAM requires we ask questions about the credibility of authors. In fact, the identity of the author and their conflicts of interest (COI) are key components of contemporary FOAM critical appraisal tools.^{12–14,20,21} Little has been published, however, about who is producing FOAM content. In fact, we were only able to identify one

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study that focused on 11 established FOAM creators' path to create FOAM.²² The literature is lacking a description of the backgrounds and qualifications of FOAM authors more broadly. Given their broad influence on the education of so many EM learners, describing the broader FOAM authorship group is a necessary step in the ongoing exploration of validity and quality in online content. Recognizing that our backgrounds influence our writing, we sought to describe the demographic characteristics of FOAM authors from the most popular blogs to better understand the voices influencing learners who consume FOAM. To further understand the quality practices of FOAM authors, we secondarily investigated broader FOAM blog and authorship production, including established quality metrics like COI and use of references.

METHODS

We performed a cross-sectional analysis of FOAM authorship from 12 months of popular emergency medicine and critical care blog posts. To investigate the most impactful FOAM authors, we focused our search on the top 25 blogs in the 2020 Social Media Index (SMI). Developed initially in the early 2010s, the SMI uses various measures of viewership including Alexa, Twitter, and Facebook numbers to calculate the impact or popularity of a post.²³ It has also shown to correlate with quality.²⁴ Of note, after the initial search was completed, the new digital impact factor supplanted the SMI as one of the SMI's components was retired.²⁵ A single author (TF) reviewed each site's previous 12 months of posts, starting with Life in the Fast Lane on August 28, 2020, and finishing with Total EM on February 23, 2021. This author abstracted data into Microsoft Excel including author; number of posts per author; and author gender, title, affiliation, degree, location of practice, and type of practice (academic, community, or hybrid). These factors were chosen based on data available on the FOAM publication itself or with a simple online search. Gender was determined based on the "genderchecker" website (<https://genderchecker.com/pages/search-engine>), a UK-based site created in 2008 that consists of 102,240 authenticated names that have undergone cross-referencing against several other online resources. Additionally, all author names were cross-checked with another reputable website (genderapi.com) to attempt to verify accuracy. We recognize that these websites do not identify gender-fluid or nonbinary authors and that gender is best assessed by a person's self-identification. That being said, we sought to provide the best data possible based on information available on the FOAM site itself. Affiliation, degree, location of practice, and practice environment (academic vs. nonacademic) was documented directly as described on their website. If not documented on their post, a web search was performed. For practice environment, if the author worked at both academic and nonacademic sites, they were classified as academic. Secondarily, we also recorded COI statements and number of references, known indicators of quality of blog writing.^{12,14} To ensure accurate data extraction, an additional author reviewed 10% of the posts as identified by a random number generator. The inter-rater reliability between both extractors was 99.5%.

RESULTS

Our search yielded a total of 2141 unique FOAM posts produced by 1001 authors across 22 of the most impactful FOAM sites (Table 1). Three sites—Emergency Ultrasound Podcast, EM Basic, and Total EM—did not have a post within the previous 12 months at the time we searched. The number of authors per site varied from one to 224 with a mean of 40 authors per website (median 9, IQR1 2, IQR3 47; Table 1). The name checker identified a male author predominance (59.7%) versus female (40.2%) and one unknown (0.1%). When all authors were put in the genderapi.com site, we discovered 2.5% of authors were identified as a different gender or unknown compared to genderchecker.com. COI statements were largely absent (78.4% of posts), and no COI (13.7%) was much more common than a COI declaring a conflict (7.9%). The majority of posts had a single author (75.2%) though this ranged depending on the site from 33% to 100% solo authored. Productivity varied greatly across the top 25 blogs. The most productive blogs were EMDocs with 266 (12.4% of all posts) posts, followed by LIFTL with 232 (10.8%). ALiEM had the most authors with 224 (22.4% of total authors). The Skeptics Guide to EM had the most productive individual authors with Ken Milne (88 posts) and Kirsty Challen (86 posts) producing 159 posts in total compared to ALiEM who had 224 authors produce 185 posts. Some blogs favored co-authorship such as CanadiEM (67%), Dr Smith's ECG blog (66%) ALiEM (65%), and EMCases (56%), while many sites had all posts single-authored including EMS 12 Lead, SGEM, St.Emlyn's Blog, Flight Bridge ED, ICN, FOAMCast, EM Lit of Note, and Resus ME.

Authors were overwhelmingly academic with 89% academic, 10.8% nonacademic, 0.3% not listed. Authors predominantly held MD degrees (65.8%) versus DO (6.6%; Table 2). In regard to author origin, the United States had the most authors (59.5%) followed by Canada (22.4%) with the rest of the distribution relating to the training of the country of origin of the author (Figure 1). Many FOAM authors during the study period only created a single post (Figure 2).

Among the 25 most impactful blogs during the study period, the most productive authors are described in Box 1.

DISCUSSION

In this study of over 2100 blog posts by over 1000 unique authors, we found that authors were largely North American men academics with MD degrees. One notable pattern not included in our initial objectives is the method by which different FOAM sites present authorship. Generally speaking, post author identification varies across blogs. Some remain unidentified, some are identified by a username for whoever creates the post (EMCases, EMUpdates, EMLitofNote, ResusMe, TamingtheSru), some by having an "author box" that contains the author information (LIFTL, SGEM, EMCrit, First10inEM, ALiEM, EMDocs, CanadiEM, St.Emlyn's blog, Don't Forget the Bubbles, CoreUS); and lastly, some have a separate post that lists the various authors and their information (RebelEM,

TABLE 1 Total authors and COI statement.

SMI 50	Total posts	Total authors	Solo versus co-authored		COI statement			
			Solo	Multiple	Present + COI	Present - COI	Not present	
1	LITFL	232	56	209	23	1	0	231
2	EMCrit	188	35	173	15	1	177	10
3	ALiEM	185	224	65	120	2	0	183
4	Rebel EM	174	38	158	16	0	1	173
5	EM Docs	266	195	176	90	0	4	262
6	EM Cases	61	62	27	34	1	32	28
7	First 10 EM	71	7	70	1	0	67	4
8	CanadiEM	159	136	53	106	0	0	159
9	Dr Smith's ECG blog	137	16	46	91	0	0	137
10	EMS 12 Lead	1	1	1	0	0	0	1
11	The Skeptics Guide to EM	159	2	159	0	124	0	35
12	FemInEM	26	28	22	4	0	0	28
13	St.Emlyn's blog	82	17	82	0	3	2	79
14	Dont Forget the Bubbles	181	105	159	22	1	0	180
15	Flight Bridge ED	47	4	47	0	0	0	47
16	Intensive Care Network	8	8	8	0	0	0	8
17	EM Updates	8	7	6	2	0	0	7
18	Core US	15	9	13	2	0	0	15
19	FOAMCast	37	2	37	0	37	0	0
20	EM Lit of Note	11	1	11	0	0	11	0
21	Resus ME	1	1	1	0	0	0	1
22	Taming the SRU	92	47	88	4	0	0	92
Totals		2141	1001	1611	530	170	294	1680

Abbreviation: COI, conflict of interest.

EMDocs, FemInEM, Dr. Smith's ECG blog). Our data firstly describes the demographic data for each blog's authorship. As the practice of medicine is influenced by the national standards in each individual country, the country of origin of each blog's authorship is important to learners. The most impactful FOAM sites appear to have a western predominance with 97.1% of authors coming from four countries: United States (59.5%), Canada (22%), the United Kingdom (9.4%), and Australia (6.2%). Additionally, our data would ideally inspire authors in underrepresented countries to provide their specific viewpoints based on their own experiences. Given the low bar for entry for FOAM compared to publications or textbooks, it may serve as an easy entry point for education, academic work, and information sharing for underresourced nations, programs, and faculty.

While women have parity in medical school currently, they make up only 37.1% of active U.S. physicians.²⁶ Women comprise 29% of practicing EM physicians, 41.3% of academic EM faculty, 35%–39% of EM residents, and only 12% of academic emergency medicine chairs.^{27–29} Among the most impactful FOAM authors, 40% of authors are women, implying that the gender bias so prevalent in EM

advancement and other aspects of medicine are not found in FOAM production. Notably, there appears to be a sharp decline in academic promotion among women EM physicians with women comprising nearly half (46.7%) of instructors, to 39.6% of assistant professors, to 28.9% of associate professors (28.9%), and finally, only 18.1% of full professors.^{26,28–30} It may be worthwhile for academic emergency medicine leadership to examine FOAM author recruitment and motivation to uncover strategies for lessening the effect of sexism among academic promotion. We believe learners would benefit from a diverse pool of authors for their educational materials. A mostly White, men author, for example, could perpetuate inequalities and biases, while a primarily academic authorship pool may not recognize how variable resources and access to specialists may influence their practices.

The preponderance of academic (89.2%) versus nonacademic (10.9%) is expected to some degree given the productivity pressures among academicians as well as the possible extra enthusiasm for education among academic faculty.³¹ Although there are obviously many lessons to be learned from our nonacademic colleagues,

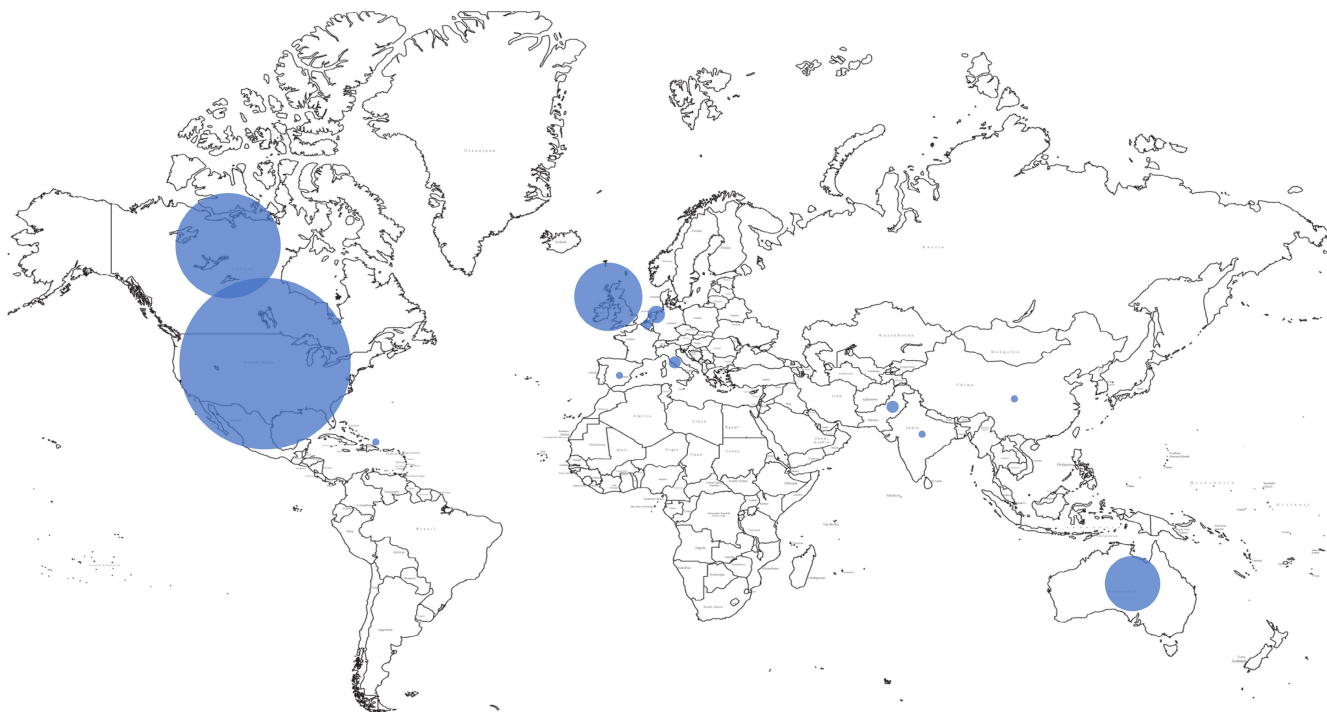


FIGURE 1 Author frequency by country.

we hope these data could help direct the most impactful blogs to recruit more nonacademic authors. FOAM authors publish an average of 2.1 posts per year, though the numbers varied significantly. Interestingly, the 14 highest producing authors created 909 posts (42.4% of total). The concern that FOAM may contain anonymous authors appears to be less accurate among our data set from the most impactful blogs. A large number of FOAM is produced by a select few well-known authors. On the other hand, most FOAM authors (710, 71.1%) only published one post. These “one-offs” are especially interesting as one main barrier to FOAM production is creating and maintaining a website. Lin et al.³² recently noted a decrease in the number of FOAM sites of 40.4% over the past 10 years. They described this decrease as fitting the Christensen *Theory of Disruptive Innovation* and described financial and academic sustainability as potential reasons. The addition of our data to theirs creates a more nuanced picture. While early FOAM sites consisted of one or a few authors creating a site and then producing all its content, our data indicate that many sites are recruiting new authors for a small number of posts each. With this method, these sites can maintain their output without relying on one or a few people, which would decrease the productivity limitations for the site's creator. At the same time, recruiting these one-off authors enables those authors to bypass the financial and creative barriers to creating and maintaining a site. Additionally, they can feature their content on a high impact site which likely increases their impact compared to publishing it on a self-created site. One noted pitfall of FOAM is its decentralized nature. Our data suggest that FOAM may be self-centralizing to the most popular sites. Among all

authors, the overall average production was 3.1 posts and a median of one post. If we eliminate the one-offs, the higher producing authors averaged 8.1 posts each with a median of 8. The question of quality for more productive versus less productive authors remains unknown. Theoretically, one would expect the more productive authors to create higher quality work given their experience. Yet, one-off authors may receive significant mentorship in their pieces that would increase quality. Further studies are needed to evaluate quality in this newly discovered population of one-off blog authors versus the more experienced authors. Of note, blogs varied greatly in their focus on content production from one to two authors—FOAMCast, Resus Me, EM Lit of Note—versus recruiting more one-offs (the Intensive Care Network, EMDocs, ALIEM, and CanadiEM). Though no studies were performed on this early in the FOAM movement, anecdotally, this is a progression from 10 to 15 years ago when a site primarily published posts by a small number of founding authors. Given the decentralized nature of FOAM, having new FOAM authors publish on an already impactful site instead of creating their own would be beneficial toward learners struggling to navigate FOAM. The large number of one-off authors may also indicate a saturated space where many blogs compete for the same audience, a saturation of topic where FOAM has adequately or even overcovered much of the emergency medicine curriculum, or a decrease in the popularity and thus motivation to produce FOAM.

The low rate of a COI statement (78.4% lacking) is especially concerning. A COI statement is required for all CME-related activity and is seen as a sign of transparency and trustworthiness among lectures and traditional peer-reviewed publications. Additionally, it

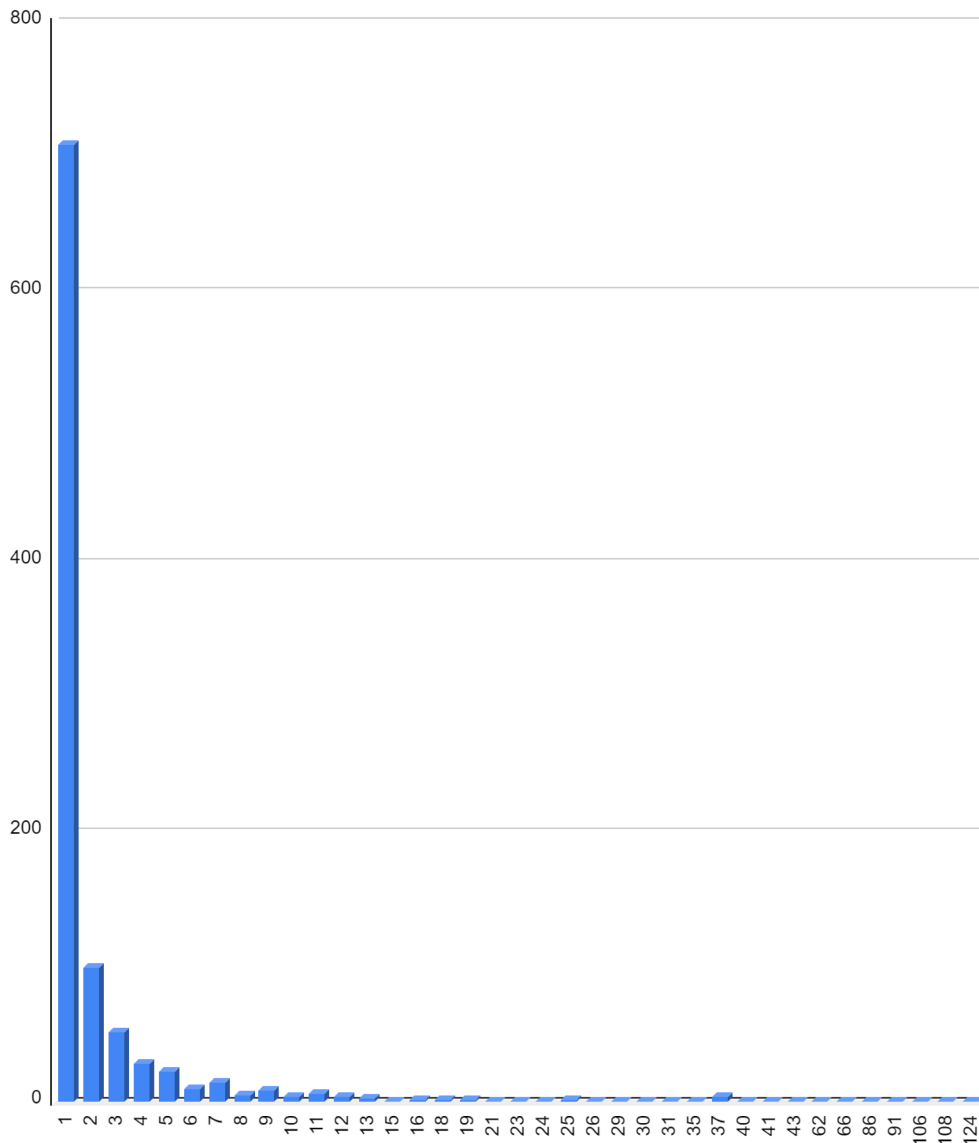


FIGURE 2 Frequency of post publication per author.

was included as a component in the revised METRIQ score in 2019 and the revised ALiEM AIR score in 2021, though it was not a part of the earlier AIR score, METRIQ 8, and METRIQ 5.¹²⁻¹⁴ Of note, of the 462 posts with COI statements, the top five sites contained 95% of the total—178 (39%) were from EMCrit, 124 (27%) from SGEM, 67 (13%) from First10inEM, 37 (8%) from FOAMCAST, and 33 (7%) from EMCases. While it remains unknown why COI statements were found so much more often in the top sites. They could be a primarily contributing factor toward their increased impact or may represent an increased attention to quality and transparency. We hope our low documentation of COI as well as the recent inclusion of COI in FOAM curation tools spurs FOAM authors to more frequently include COI statements. Lastly, with the sharp rise in misinformation online, we do recognize that bad faith actors with COI statements, full name, credentials, and affiliations may produce inaccurate, ignorant, or malignant online content. While these features are markers of quality, they do not guarantee it.

LIMITATIONS

While we sought to accomplish our primary and secondary objectives as accurately as possible, our data were extracted by a single author, although our high (99.5%) IRR on a randomly selected 10% of posts does indicate some reliability in the accuracy in our extraction. The search for academic affiliation was based on author self-stating it on their blog or an internet search that may have been out of date. Additionally, the genderchecker website may lack 100% accuracy and authors' gender may have changed since the publication of their work. Nonetheless, when looking at FOAM authorship broadly, it seems logical to assume that the general frequency of man and woman authorship classification is generally correct presuming any changes or incorrect answers are equally distributed among all gender categories. Lastly, our objectives included only an analysis of the most impactful FOAM sites and may not be generalizable to the rest of FOAM.

BOX 1 Most productive authors

Ken Milne (124 posts)
 Ken Grauer (108 posts)
 Josh Farkas (106 posts)
 Salim Rezaie (91 posts)
 Stephen Smith (86 posts)
 Justin Morgenstern (66 posts)
 Oliver Flowers (62 posts)
 Scott Weingart (43 posts)
 Simon Carley (41)
 Anton Helman (40 posts)
 Lauren Westafer (37 posts)
 Jeremy Faust (37 posts)
 Anand Swaminathan (37 posts)
 Theresa Chan (31)

CONCLUSIONS

A majority of authors on the most impactful free open-access medical education websites were male, academic, and from the United States and Canada. They mostly produced content with a single author, without a conflict of interest statement. These data should encourage free open-access medical education gatekeepers to expand the diversity of the authorship pool through recruiting more inclusively, while also spurring teachers and learners to be more informed and intentional in their use of online educational resources.

AUTHOR CONTRIBUTIONS

Andrew Grock and Jeffrey Riddell developed the study design. Tiffany Fan performed the search and initial classification. Andrew Grock and Max Berger reviewed the initial classification. All authors contributed to the writing of the paper.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest. All authors had full access to all the study data and had final responsibility for the decision to submit for publication.

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