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### Free Open-Access Medical education (FOAM) and critical care



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This article describes the nature of FOAM (Free Open-Access Medical education), its strengths and weaknesses, and how it can be used effectively by critical care clinicians, educators, and students.

*"...and to teach them this art — if they desire to learn it — without fee and covenant."* —  
excerpt from the Hippocratic Oath

FOAM, or 'Free Open-Access Medical education', is not just social media. FOAM is a dynamic collection of online tools and resources, an ethos, and a thriving global interdisciplinary community of students and clinicians (Nickson and Cadogan 2014).

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### Rise of FOAM

The term 'FOAM' bubbled into existence as a reaction to social media's frivolous connotations in the minds of many doctors. Social media refers to the creation and exchange of user-generated content via virtual networks using internet applications (Nickson and Cadogan 2014). However, to many of us it is just YouTube videos of cute kittens, Tinder 'hook ups', and the 'alternative facts' of a post-truth Trumpian era. This prejudice prevents

us from sharing ideas, disseminating and curating information, networking, and engaging with others using these tools. Which is why, so legend has it, my colleague Dr. Mike Cadogan stopped to drown his sorrows at a Dublin pub before speaking on this topic at the 2012 International Conference on Emergency Medicine (ICEM). Lo and behold, he found the answer at the bottom of a pint of Guinness and “FOAM” was born (Nickson and Cadogan 2014). Whatever you think of the term, it sticks in the mind and has helped the FOAM concept go viral. FOAM has grown rapidly since Mike’s Dublin epiphany. There are now hundreds of blogs and podcasts using the FOAM banner in the critical care specialties (Cadogan 2016; Cadogan et al. 2014). Examples of useful critical care FOAM resources are featured in **Table 1**.

**Table 1.** A selection of useful critical care FOAM resources

Critical Care Reviews <a href="http://criticalcarereviews.com">http://criticalcarereviews.com</a>	An extensive resource that includes newsletters, videos, and curated collections of research articles created by Rob Mac Sweeney.
Deranged Physiology <a href="http://DerangedPhysiology.com">http://DerangedPhysiology.com</a>	Alex Yartsev’s extensively researched website targeted at preparation for the College of Intensive Care Medicine’s Second Part Exam.
Emcrit.org <a href="http://emcrit.org">http://emcrit.org</a>	A high impact blog and podcast created by Scott Weingart, with a focus on resuscitation and emergency department critical care.
Essential Critical Care <a href="http://www.essentialcriticalcare.com">http://www.essentialcriticalcare.com</a>	Interview-based podcasts covering all aspects of intensive care by Todd Fraser. Includes podcasts from the Society for Critical Care Medicine (SCCM).
ICM Case Summaries <a href="https://icmcasesummaries.com">https://icmcasesummaries.com</a>	A blog that features expanded case summaries created by intensive care trainees in the United Kingdom.
ICS blog <a href="https://blog.ics.ac.uk">https://blog.ics.ac.uk</a>	The blog of the United Kingdom’s Intensive Care Society, including news, opinions, and events.
INTENSIVE <a href="http://intensiveblog.com">http://intensiveblog.com</a>	An education and knowledge translation blog and podcast provided by the Alfred intensive care unit. Key topics include extracorporeal membrane oxygenation (ECMO) and simulation resources.
Intensive Care Network <a href="https://intensivecarenetwork.com">https://intensivecarenetwork.com</a>	Diverse podcasts, blogs, and other resources from the Australasian-based Intensive Care Network.
International Fluid Academy <a href="http://www.fluidacademy.org">http://www.fluidacademy.org</a>	An extensive multimedia resource created by Manu Malbrain on all aspects of fluid therapy in the critically ill.
Life in the Fast Lane <a href="http://lifeinthefastlane.com">http://lifeinthefastlane.com</a>	A comprehensive emergency medicine and critical care website featuring blogs, podcasts, an ECG Library, the Critical Care Compendium, and numerous curated resources.
Maryland CC Project <a href="http://maryland.ccproject.com">http://maryland.ccproject.com</a>	High quality video lectures from the University of Maryland critical care residency programme.
Mastering Intensive Care <a href="http://masteringintensivecare.libsyn.com">http://masteringintensivecare.libsyn.com</a>	A podcast, created by Andrew Davies, comprised of interviews with intensive care leaders discussing non-technical skills, wellbeing and creating productive, sustainable careers.
PulmCCM.org <a href="http://pulmccm.org">http://pulmccm.org</a>	A comprehensive multi-author pulmonary critical care blog that includes research updates and topic reviews.
ScanCrit <a href="http://www.scancrit.com">http://www.scancrit.com</a>	Thomas Dolven’s and Daniel Kornhall’s blog on critical care from a Scandinavian perspective.
SMACC (Social Media and Critical Care) <a href="http://www.smacc.net.au">http://www.smacc.net.au</a>	Free-to-access audio and video podcasts from the SMACC series of conferences.
The Bottom Line <a href="http://www.thebottomline.org.uk">http://www.thebottomline.org.uk</a>	A website with multinational contributors featuring peer-reviewed critical appraisals of important critical care research.
Women in Intensive Care Network <a href="http://www.womenintensive.org">http://www.womenintensive.org</a>	The website of the Women in Intensive Care Medicine Network, which is dedicated to improving the gender balance in Australasian intensive care medicine through advocacy, research and networking.

Aside from the multiplicity of available resources, there are numerous other indicators of the growing impact of

FOAM. Page views and podcast downloads are surrogates for user engagement and, in some cases, indicate massive global consumption. For instance, the cumulative downloads of the Social Media and Critical Care (SMACC) podcast now exceed 2.5 million downloads and **Lifeinthefastlane.com** had 35 million page views over the past year. A controversial Social Media Index, analogous to a journal's impact factor, has even been created using social media metrics (Thoma et al. 2015). FOAM resources are becoming increasingly mainstream; some—such as Academic Life in Emergency Medicine and Simulcast—have developed collaborations with traditional medical journals (Academic Life in Emergency Medicine 2017; Brazil 2017), and many journals, including the New England Journal of Medicine (New England Journal of Medicine 2017), now have their own free-to-access blogs and podcasts. Furthermore, some colleges and professional bodies, such as the Australasian College for Emergency Medicine (ACEM CPD Committee 2017), now allow the use of FOAM resources for continuing professional development (CPD). Digital and social media scholarship is recognised by the Mayo Clinic for academic promotion and tenure (Cabrera 2017), and some institutions have incorporated FOAM resources into their training programmes; examples include the Maryland Critical Care Project and the Alfred Intensive Care Unit's INTENSIVE website. FOAM resources, especially critical appraisal websites like The Bottom Line and Critical Care Reviews, are also part of an emerging post-publication peer review paradigm for published research. There are even instances of FOAM blog posts leading to corrections in major medical journals (Intensive Care Network 2013). Unfortunately, although anecdotes about the benefits of FOAM for learning and improving patient care abound, there is still no research that establishes the benefits (or harms) of FOAM.

## All a Twitter about FOAM

Despite the derision, social media is a potent catalyst for disseminating FOAM resources. Twitter, perhaps surprisingly, has had a central role. Twitter is free to use and allows people with useful ideas or content to be selectively followed. It also allows those who 'blow too much hot air' and anyone who behaves badly to be selectively unfollowed and blocked. Tweets are, notoriously, limited to just 140 characters. Yet this forced brevity is often a boon as it ensures users must be concise and efficient when communicating. The key to using Twitter effectively is to create a personal learning network out of trusted individuals who act as filters for information (Ankel and Swaminathan 2015). When this is not done, filter failure occurs, leading to information overload as the signal becomes swamped by noise (Nickson 2015).

Twitter users can also follow topics rather than individuals when tweets are labeled with a hashtag. Thus FOAM tweets can be found by searching for the #FOAMed hashtag (not #FOAM, which seems to be used to tag tweets involving partying teens in rooms filled with bubbles). In addition to #FOAMed, there are now 'subspecialty' FOAM hashtags such as #FOAMcc (critical care), #FOANed (nursing education), #FOAMus (ultrasound), and #FOAMsim (simulation-based education), to name a few.

Twitter does have limitations, however. In particular, the medium is poorly suited to meaningful conversation and is even worse for attempts at reasoned argument. It turns out that the telephone and even good old-fashioned face-to-face communication still have their place!

## FOAM community and ethos

FOAM resources are easily shared between users, who can interact freely with resource creators. A lively global interdisciplinary community has emerged from these activities (**Table 2** lists ten tips for getting involved). Evidence that FOAM truly is a community of practice comes from network centrality analysis of FOAM Twitter users (Roland et al. 2017). This virtual community reinforces a very real physical community, and vice versa, creating a virtuous cycle. This was the aim of the SMACC conference, for example, which provides a face-to-face meeting for an online community, "like a reunion with friends we never met" (Nickson 2013). Iterative virtual and face-to-face interactions within the FOAM community have led to numerous collaborations and 'real-world' opportunities for those willing to embrace them.

**Table 2.** Ten tips for FOAM beginners (Nickson 2017)

1. Sign up to Twitter
2. Register as a FOAM user
3. Be identifiable, don't be anonymous
4. Be professional
5. Be active—don't let anyone be wrong on the Internet!
6. Be generous with your criticism and with what you share
7. The more you put in, the more you get out
8. Use the key FOAM resources mentioned in this article to get started
9. Use filters to beat information overload, and be a filter yourself
10. Have fun and don't take it too seriously!

Ultimately, the FOAM community is united by the ethos that high-quality medical education resources and interactions should be free and accessible to everyone in healthcare (Nickson and Cadogan 2014). The movement's ongoing success—despite a lack of traditional motivators such as academic status or financial reward—has grown from open sharing, collaboration, and the attribution and recognition of the work of others (Nickson and Cadogan 2014).

All healthcare professionals must maintain their professionalism when using social media, whether or not they are involved in FOAM. The amplifying nature of social media means that indiscretions tend to be magnified and may even echo in eternity. Anonymity online offers little protection, as real identities are usually discoverable. Best practice for health professionals active in social media is to avoid anonymity (General Medical Council 2013). Finally, in FOAM, patients should always come first and patient confidentiality is sacrosanct.

## **FOAM is a useful adjunct for education**

FOAM does not replace existing approaches to medical education. On the contrary, FOAM supplements and complements other effective educational strategies. There is a danger that unguided learners that lack the background knowledge or clinical experience to appreciate the context and nuances of FOAM resources may go astray. For this reason, the bedside mentor is still a necessity.

Education does not happen unless learners are engaged, and social media is increasingly where the learners are (Mallin et al. 2014). Social media interactions facilitate peer-assisted learning within virtual communities of practice (Roland et al. 2017). Researchers, educators and organisations hoping to close the knowledge-translation gap between research and clinical practice need to engage these communities (Young et al. 2013). However, early adoption also carries the risk of new unvalidated research being put into practice too early (Young et al. 2013). An educated, critical thinking community that is willing to speak up may help mitigate this risk, a goal exemplified by the Skeptics Guide to Emergency Medicine (SGEM) podcast on the Vitamin C cocktail for sepsis (Skeptics Guide to Emergency Medicine 2017).

FOAM resources have applications beyond self-directed learning and peer-assisted learning. Teachers can leverage the engagement of FOAM resources by using them to trigger group discussions and to foster critical thinking skills when appraising information sources. Such guidance helps learners put information in context, so they can understand how it is used in different settings and by clinicians of varying expertise. One useful strategy is the use of 'FOAM prescriptions' to consolidate bedside learning (Carley 2016).

The integration of FOAM resources as reusable learning objects (RLOs) within training programmes has other advantages. They can be used for pre-learning to allow time and space for interactive group sessions rather than didactic lectures, as part of a 'flipped classroom' (Prober and Heath 2013). They allow learners to benefit

even when they cannot attend face-to-face teaching sessions at the same time (asynchronous learning). Finally, concise and accessible FOAM resources are well suited to ‘just-in-time’ knowledge delivery (Davenport and Glaser 2002). For example, the Alfred Intensive Care Unit has created FOAM resources with this purpose for tasks such as priming an ECMO circuit (Anderson 2016).

FOAM resources also fill a niche by allowing tacit knowledge sharing (Panahi et al. 2015). Experiential ‘know how’ that is often neglected by textbooks and research articles can be shared and discussed using FOAM. This includes practical ‘on-the-job’ solutions that can be adapted for local use. However, there is a danger that trainees may adopt techniques that are untested or beyond their level of expertise. Which is why, once again, FOAM is just an adjunct to, and not a replacement of, the bedside mentor.

## The FOAM quality conundrum

Common criticisms of FOAM are that it lacks peer review and that the quality is variable and unregulated. Many FOAM resources do have these limitations, yet we must not throw out the baby with the bathwater. After all, traditional peer review has many well-documented flaws and is a tarnished gold standard (Smith 2006). Yet we do not dismiss all peerreviewed research just because peer review has limitations, nor because most published research findings are false (Ioannidis 2005), nor because high-profile research findings are commonly contradicted by subsequent, superior studies—a phenomenon termed ‘medical reversal’ (Prasad et al. 2013).

The accuracy of FOAM resources is yet to be formally studied, although Wikipedia sets a precedent, proving that online resources created by volunteers can match the veracity of established resources produced by professionals (Giles 2005). Nevertheless, it is inevitable—through human error or the progress of time—that inaccuracies will be found in FOAM resources. Their impact may be mitigated by the existence of an active FOAM community that promotes rapid correction through post publication peer review.

Information, regardless of the source, can be wrong. As health professionals we must develop the critical thinking skills needed to accurately appraise information from any source. **Table 3** highlights an eight-step approach to judging the quality of FOAM resources, and similar quality indicators have been identified by Lin et al. (2015).

**Table 3.** An eight-step approach for assessing the quality of a FOAM resource (Nickson 2017)

Step	Comments
Is the author identifiable?	As a rule of thumb, anonymous sources of information should be disregarded.
What are the author’s qualifications?	This does not mean a student’s blog should be ignored, but knowledge of expertise and experience helps put it in context. At the other extreme, we must beware of ‘Arguments from Authority’ that lack any other basis.
Are there conflicts of interest?	Beware of financial conflicts of interest in particular, especially Big Pharma’s influence on published medical research.
Does what I know check out?	Be reassured if the author’s work on other topics that you have expertise in was accurate – however, be wary of ultracrepidarians: an expert in one sphere is not necessarily an expert in another!
Is it logical?	Is the information logically coherent? Does it make sense? Does the author commit logical fallacies?
Is it referenced?	Claims should be referenced appropriately so they can be verified.
Is it supported by trusted	Do other people I trust rate the resource highly?

recommendations?	
How does the author respond to criticism?	No one is right all the time – be reassured by authors that respond to constructive feedback openly and are willing to make improvements as part of a post-publication peer review process.

## Conclusion

FOAM is a dynamic collection of free-to-access online medical education resources, from which a vibrant learning community united by an ethos of sharing has grown. FOAM is an exciting adjunct to established educational strategies and promotes engagement, knowledge dissemination, networking and collaboration. FOAM, however, does have limitations. Resources must always be critically appraised to determine their quality, and students still need guidance from their teachers. For this reason, clinician educators need to be aware of the available FOAM resources and their pros and cons. Despite the challenges, FOAM continues to evolve and has considerable scope to benefit health professionals and their patients.

## Conflict of interest

The author has no financial conflicts of interest. He is co-creator of the following FOAM projects: Life in the Fast lane (<http://lifeinthefastlane.com>), SMACC (<http://smacc.com.au>), INTENSIVE (<http://intensiveblog.com>), and the Resuscitator's Awesome Guide to Everything (<http://ragepodcast.com>).

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