

Quality indicators for blogs and podcasts used in medical education: modified Delphi consensus recommendations by an international cohort of health professions educators

Michelle Lin,^{1,2} Brent Thoma,^{2,3} N Seth Trueger,⁴ Felix Ankel,^{5,6} Jonathan Sherbino,^{7,8} Teresa Chan^{2,7}

► Additional material is published online only. To view please visit the journal online (<http://dx.doi.org/10.1136/postgradmedj-2014-133230>).

For numbered affiliations see end of article.

Correspondence to

Dr Michelle Lin, Department of Emergency Medicine, San Francisco General Hospital, 1001 Potrero Avenue, Suite 1E21, San Francisco, CA 94110, USA; michelle.lin@emergency.ucsf.edu

Received 30 December 2014
Revised 26 May 2015
Accepted 23 July 2015
Published Online First
14 August 2015

ABSTRACT

Background Quality assurance concerns about social media platforms used for education have arisen within the medical education community. As more trainees and clinicians use resources such as blogs and podcasts for learning, we aimed to identify quality indicators for these resources. A previous study identified 151 potentially relevant quality indicators for these social media resources.

Objective To identify quality markers for blogs and podcasts using an international cohort of health professions educators.

Methods A self-selected group of 44 health professions educators at the 2014 International Conference on Residency Education participated in a Social Media Summit during which a modified Delphi consensus study was conducted to determine which of the 151 quality indicators met the a priori $\geq 90\%$ inclusion threshold.

Results Thirteen quality indicators classified into the domains of credibility ($n=8$), content ($n=4$) and design ($n=1$) met the inclusion threshold.

Conclusions The quality indicators that were identified may serve as a foundation for further research on quality indicators of social media-based medical education resources and prompt discussion of their legitimacy as a form of educational scholarship.

INTRODUCTION

The last decade has seen an explosion of social media-based medical education resources including blogs, microblogs (eg, Twitter), networking websites (eg, Facebook) and podcasts.^{1–2} They are increasingly being used for medical education^{3–5} and integrated into formal curricula.^{6–10} Despite this growth, the quality of social media-based resources has not been defined or standardised.^{11–15} While the research on the quality of eLearning resources is informative,¹⁶ social media resources differ in that they are openly available (ie, not behind a pay wall or login), unstructured (generally not part of a course or curriculum) and unregulated (most are not formally affiliated with institutions or formally appointed instructors). Early attempts at ensuring the quality of social media resources have included introducing prepublication expert peer review of individual blog posts,¹⁷ curation of online content by expert panels⁶ and identifying quality resources by quantifying impact.^{18–19} However, these methods lack validation and are subject to some of the

drawbacks of traditional peer review such as reviewer bias.^{20–22}

While the ultimate goal of social media-based medical education resources is to benefit patient care through enhanced knowledge translation, four stakeholder groups would benefit from a standardised assessment of quality.^{23–25} First, learners may not have the expertise to discern true from erroneous and important from less important content; quality standards would help learners to identify the highest quality resources. Second, educators who are unfamiliar with blogs and podcasts could benefit from quality standards that assess resources, allowing educators to appropriately recommend resources to their learners. Third, content producers could improve the design and delivery of their content by adhering to metrics of quality. Finally, academic leaders, particularly those participating in promotions committees attempting to quantify the impact of social media-based medical education resources, could use these quality standards to better adjudicate a faculty member's education scholarship.^{19–23–26}

The purpose of this study was to identify the most important quality indicators for blogs and podcasts from the perspectives of health professions educators using a modified Delphi consensus process.

METHODS

Participants

A self-selected group of health professions educators attending the 2014 International Conference on Residency Education (ICRE) participated in a pre-conference Social Media Summit. A modified Delphi consensus study was conducted to assess quality markers for social media educational resources. Participants were randomly assigned to two groups (Group A or Group B).

Quality indicators

A previous study identified 151 potential quality indicators for blogs and podcasts through a multi-phase methodology that included: a literature search for publications describing quality indicators for secondary resources; the extraction and qualitative analysis of those quality indicators; and four focus groups held to ensure that no important quality indicators were missed.²⁷ The qualitative analysis divided the quality indicators into three major domains—credibility ($n=53$), content ($n=44$) and design ($n=54$)—each of which had



- <http://dx.doi.org/10.1136/postgradmedj-2015-133300>
- <http://dx.doi.org/10.1136/postgradmedj-2015-133353>
- <http://dx.doi.org/10.1136/postgradmedj-2015-133358>
- <http://dx.doi.org/10.1136/postgradmedj-2015-133612>
- <http://dx.doi.org/10.1136/postgradmedj-2015-133686>



To cite: Lin M, Thoma B, Trueger NS, et al. *Postgrad Med J* 2015;**91**:546–550.

multiple subthemes. These quality indicators were subsequently pilot tested internally by the research team for clarity and content validity. This modified Delphi process was similar to a previous one conducted with expert bloggers and podcasters in the area of emergency medicine and critical care which elicited the priorities of producers of these resources.²⁸ The current study was conducted to determine whether medical educators would prioritise similar quality indicators as content producers.

Delphi survey

Using a modified Delphi methodology,^{29–33} two real-time sequential web-based surveys were completed during a 2 h session as outlined in figure 1. The surveys were hosted on SurveyMonkey.com.

Survey 1 assessed each of the previously identified 151 quality indicators during the first half of the session. For each indicator, individual participants anonymously rated its importance as a measure of quality for blogs and then for podcasts. A 7-point Likert scale was used with 1 labelled 'strongly disagree' and 7 labelled 'strongly agree'. Basic participant demographic data were also captured. To prevent rater fatigue, participants in Group A answered questions 1–73 and those in Group B answered questions 74–151.

The results of Survey 1 were immediately compiled and used to develop Survey 2, which was completed immediately after Survey 1 during the second half of the session. Survey 2 was composed of all quality indicators from Survey 1 that had a mean score of ≥ 5 (out of 7), with the mean scores listed next to each survey item. Instead of a Likert scale in Survey 2, participants were asked whether they endorsed the inclusion of each of the items in the final list of quality indicators by selecting 'include' or 'do not include'.

Data analysis

Descriptive statistics of the participant demographics and survey data were calculated. While consensus can be achieved through

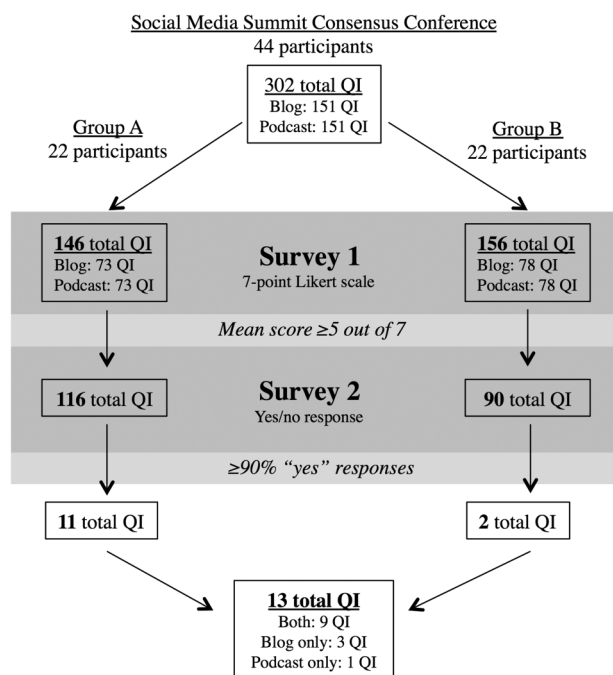


Figure 1 Flowchart demonstrating the modified Delphi consensus process to identify quality indicators (QI) for blogs and podcasts.

a variety of techniques,³⁴ it was determined a priori that $\geq 90\%$ consensus from Survey 2 would provide a concise but meaningful list of quality indicators, based on the previously conducted modified Delphi consensus study of bloggers and podcasters.²⁸

RESULTS

Participants

A total of 44 participants completed both surveys. Table 1 lists the demographic information of the participants. There was a

Table 1 Participant demographic information for health professions educators in Groups A and B (n=22 for each)

	Group A, n (%)	Group B, n (%)	Total, n (%)
Number of years post-residency training			
0–4	5 (23)	4 (18)	9 (20)
5–10	3 (14)	8 (36)	11 (25)
>10	9 (41)	2 (9)	11 (25)
Other*	5 (23)	8 (36)	13 (30)
Specialty			
Emergency medicine	7 (32)	12 (55)	19 (43)
Family medicine	0 (0)	1 (5)	1 (2)
Infectious disease	2 (9)	0 (0)	2 (5)
Informatics	1 (5)	0 (0)	1 (2)
Internal medicine	0 (0)	0 (0)	0 (0)
Medical education	1 (5)	0 (0)	1 (2)
Ophthalmology	1 (5)	0 (0)	1 (2)
Paediatrics	1 (5)	0 (0)	1 (2)
Physical medicine and rehabilitation	1 (5)	0 (0)	1 (2)
Psychiatry	1 (5)	0 (0)	1 (2)
Psychology	0 (0)	1 (5)	1 (2)
Public health	0 (0)	1 (5)	1 (2)
Radiology	2 (9)	0 (0)	2 (5)
Research	0 (0)	1 (5)	1 (2)
Surgery	1 (5)	0 (0)	1 (2)
N/A	1 (5)	5 (23)	6 (14)
No response	3 (14)	1 (5)	4 (9)
Advanced degrees†			
MD	13 (59)	15 (68)	28 (64)
Masters	12 (55)	13 (59)	25 (57)
MBA	0 (0)	1 (5)	1 (2)
PhD	2 (9)	4 (18)	6 (14)
Country			
Australia	0 (0)	2 (9)	2 (5)
Canada	17 (77)	17 (77)	34 (77)
Thailand	1 (5)	0 (0)	1 (2)
UK	2 (9)	0 (0)	2 (5)
USA	0 (0)	3 (14)	3 (7)
No response	2 (9)	0 (0)	2 (5)
Experience with medical education blog			
Have read one	20 (91)	22 (100)	42 (95)
Have contributed one	11 (50)	9 (41)	20 (45)
Own or have owned one	6 (27)	5 (23)	11 (25)
Experience with medical education podcast			
Have listened to one	19 (86)	18 (82)	37 (84)
Have contributed to one	9 (41)	9 (41)	18 (41)
Own or have owned one	4 (18)	2 (9)	6 (14)

*Non-clinician professions listed under 'Other': education technologist, PhD educator, occupational therapist, medicinal education training manager, medical education curricular support.

†Participants may have multiple degrees and thus totals exceed 100%. If an individual had multiple Masters degrees, only one was counted in this table.

preponderance of educators from Canada (77%) specialising in the field of emergency medicine (43%) and holding a Doctor of Medicine (64%) and/or a Masters degree (57%).

Top quality indicators

Of the 151 initially abstracted quality indicators, there was ≥90% agreement on the importance of 13 items (table 2). Figure 1 outlines how these 13 items were derived through the modified Delphi methodology. Nine quality indicators were applicable for both blogs and podcasts with an additional three indicators specific to blogs and one specific to podcasts. The only indicator that resulted in 100% consensus for both blogs and podcasts was transparency by the authorities who created the resource (eg, author, editor, publisher) regarding conflicts of interest. In total, there were eight quality indicators in the domain of credibility (transparency and trustworthiness of authorities), four in content (subject matter) and one in design (presentation, aesthetics and functionality).

The online supplementary appendix lists all of the 151 surveyed quality indicators and the consensus results from Surveys 1 and 2 for both blogs and podcasts.

Credibility

The majority of identified quality indicators were from the credibility domain (9 of 13 indicators). The only item to garner 100% agreement involved the transparency of the authorities (author, editor, publisher) in disclosing conflicts of interest. Other identified items included transparency around the material’s creation and its intent (eg, advertisement vs content, or fact vs opinion). Furthermore, the importance of transparency and clear attribution of materials was endorsed. The author’s, editor’s and publisher’s positive reputation was deemed far less important as a marker for quality. These results suggest that, for credibility on blogs and podcasts, it is most important to be transparent by having identifiable authors, disclosing conflicts of interest and using referenced citations.

Content

Educators consistently valued high-quality, professionally represented and accurate content that was relevant for its intended audience (4 of 13 indicators). In contrast, a conversational tone and entertaining approach both scored poorly. Despite the

nature of social media platforms, which are designed for open conversations, participants did not value interaction between the authority (eg, author or publisher) and the readers/listeners. Notably, peer review was not determined to be a priority.

Design

Only one of the design quality indicators achieved ≥90% consensus among educators, suggesting that high-quality content is valuable largely independent of the aesthetics and presentation design framework. The only indicator that achieved consensus reinforced the importance of podcast resources using technology that is functional for all learners. Issues of mobile-responsive design, intuitive user interface, customisability and high-quality images and audio were not as valuable to educators.²⁸

DISCUSSION

A diverse self-selected group of health professions educators from the 2014 ICRE Social Media Summit identified 13 quality indicators within the domains of credibility, content and design with ≥90% consensus for educational blogs and podcasts using a modified Delphi methodology. These quality indicators provide a foundation for future scholarship to identify quality and critically appraise social media educational resources.

This study builds upon the previous work in this field²⁷ to identify the quality indicators that were felt to be the most important to a group of expert health professions educators. A modified Delphi consensus process conducted with expert emergency medicine bloggers and podcasters endorsed substantially more quality indicators at the >90% level (14 for bloggers and 26 for podcasters).²⁸ This difference may reflect the content producers’ greater fluency about the operational nuances and pitfalls in publishing educational material using social media.

In our study, health professions educators identified four items that were deemed as quality indicators specific for blogs (n=3) or podcasts (n=1), but not both. Interestingly, the educators found it important for bloggers to be content experts on topics they wrote about, but this was not a requirement for podcasters. This may reflect how these two social media modalities are commonly used, with blogs often serving as reference tools and podcasts used to provoke discussion and transmit tacit knowledge. Furthermore, citations, references and coherence of content were important for blogs but were not criteria for

Table 2 Quality indicators for blogs and podcasts with ≥90% consensus among medical education experts within the three domains of credibility, content and design

Quality indicator	Domain/subtheme	Blogs (% consensus)	Podcasts (% consensus)
Do the authorities (eg, author, editor, publisher) that created the resource list their conflicts of interest?	Credibility/bias	100	100
Is the identity of the resource’s author clear?	Credibility/transparency	95	95
Does the resource make a clear distinction between fact and opinion?	Credibility/bias	95	95
Is the information presented in the resource accurate?	Content/academic rigour	94	100
Does the resource employ technologies that are universally available to allow learners with standard equipment and software access?	Design/functionality		94
Does the resource cite its references?	Credibility/use of other resources	93	
Are the resource’s statements consistent with its references?	Credibility/use of other resources	93	
Does the resource clearly differentiate between advertisement and content?	Credibility/bias	91	90
Is the resource transparent about who was involved in its creation?	Credibility/transparency	91	90
Is the content of this educational resource of good quality?	Content	91	90
Is the content of the resource professional?	Content/professionalism	91	90
Is the resource useful and relevant for its intended audience?	Content/orientation	91	90
Is the author well qualified to provide information on the topic?	Credibility/transparency	91	

podcasts. This may represent a difference in expectations around the media as it may be unwieldy to accurately list or mention full citations in audio format (even though most podcasts have a companion website or blog where references can be more easily listed). Specifically for podcasts, educators valued compatibility across all platforms. Because learners often listen to podcasts on their mobile devices, which may run on different operating systems (eg, iOS, Android), compatibility across these different devices is perceived as important to educators. In contrast, compatibility is less critical for blogs, presumably because blogs typically exist on universally accessible and often mobile responsive website platforms.

Traditional prepublication peer review has been the gold standard for quality in scholarship and print journal publications. The absence of peer review is often cited as one of the major weaknesses for digital self-publishing platforms such as blogs and podcasts.^{13–15} However, the peer review process has been faulted as an imperfect and unproven approach to quality assurance, with major limitations including reviewer bias, inconsistent quality in reviews and the inability of peer review to accurately identify academic fraud.^{20–22 35 36} We speculate that these drawbacks, in addition to the time and resources required to implement peer review, may account for the failure of our consensus findings to endorse peer review for blogs and podcasts as a quality marker. Only 69% (blogs) and 53% (podcasts) of the participants endorsed an editorial or peer review process, which was similarly found in a survey of Canadian emergency medicine residents and programme directors.³⁶ Also, only 47% (blogs) and 40% (podcasts) of participants endorsed the inclusion of peer-reviewed citations as references.

These consensus recommendations have several limitations. First, a number of participants have contributed to or owned blogs (11/44) or podcasts (6/44) and all self-selected to attend the Social Media Summit. While this may impart a level of fluency and expertise in our panellists, it introduces bias and may limit the generalisability of our findings to the broader population of health professions educators. Second, the participants consisted of a majority of Canadians and a significant number of emergency physicians. This uneven distribution of countries and specialties probably reflects the location of the meeting (Toronto, Canada) and the popularity of social media-based education in the field of emergency medicine.^{1 3 4 37} The high consensus rate threshold of $\geq 90\%$ agreement may attenuate these biases, as substantial agreement across study participants was needed to endorse a quality marker.

Main messages

- ▶ Thirteen common quality indicators consistently received high consensus agreement ($\geq 90\%$) among health professions educators.
- ▶ Health professions educators value credibility as the most important domain in assessing quality for blogs and podcasts in the form of transparency and trustworthiness.
- ▶ Similar to health professions education resources of all forms, education experts value accurate, professional and audience-specific content for blogs and podcasts.
- ▶ The incorporation of a traditional peer review process did not reach consensus as a quality indicator for health professions educators.

Current research questions

- ▶ Quality indicators for blogs and podcasts have been identified by this international group of health professions educators. What do other stakeholders (eg, learners, content producers, academic leaders) value as high quality and how should differences be resolved?
- ▶ Can stakeholders convert the identified quality indicators into a format that consistently facilitates accurate and timely assessment of quality?
- ▶ Can these quality indicators be used to help academic leaders assess the value of digital scholarship?

Key references

- ▶ Cadogan M, Thoma B, Chan TM, *et al*. Free Open Access Meducation (FOAM): the rise of emergency medicine and critical care blogs and podcasts (2002–2013). *Emerg Med J* 2014;31(e1):e76–7.
- ▶ Thoma B, Chan TM, Paterson QS, *et al*. Emergency medicine and critical care blogs and podcasts: establishing an international consensus on quality. *Ann Emerg Med*. Published Online First: 25 March 2015.
- ▶ Smith R. Scrap peer review and beware of "top journals." *BMJ Blogs* 2010. <http://blogs.bmj.com/bmj/2010/03/22/richard-smith-scrap-peer-review-and-beware-of-top-journals/> (accessed 8 Dec 2014).
- ▶ Thoma B, Chan T, Desouza N, Lin M. Implementing peer review at an emergency medicine blog: bridging the gap between educators and clinical experts. *CJEM* 2015;17:188–91.
- ▶ Brabazon T. The google effect: googling, blogging, wikis and the flattening of expertise. *Libri* 2006;56:157–67.

The next steps should include assessing the views of the other stakeholders, such as different learner groups, a broad range of content producers and a diverse network of academic leaders. Ultimately, the data resulting from these consultations should contribute to the development of practical tools to help stakeholders assess the quality of such resources.

In conclusion, by identifying the quality indicators most important to health professions educators, this modified Delphi study provides 13 quality indicators that may help develop standards, guide development and improve identification of high-quality medical education blogs and podcasts.

Author affiliations

¹Department of Emergency Medicine, University of California, San Francisco, San Francisco, California, USA

²MedEdLIFE Research Collaborative, San Francisco, California, USA

³Department of Emergency Medicine, University of Saskatchewan, Saskatoon, Saskatchewan, Canada

⁴Section of Emergency Medicine, University of Chicago, Chicago, Illinois, USA

⁵HealthPartners Institute for Education & Research, Bloomington, Minnesota, USA

⁶Department of Emergency Medicine, University of Minnesota Medical School, Minneapolis, Minnesota, USA

⁷Division of Emergency Medicine, McMaster University, Hamilton, Ontario, Canada

⁸Clinician Educator, Royal College of Physicians & Surgeons of Canada

Twitter Follow Michelle Lin at @M_Lin, Brent Thoma at @Brent_Thoma, N Seth Trueger at @MDaware, Felix Ankel at @FelixAnkel, Jonathan Sherbino at @Sherbino and Teresa Chan at @TChanMD.

Contributors All authors contributed by interpreting the collected data, drafting and revising the manuscript for important intellectual content, approving the final published version and agree to be accountable for all aspects of the work. Additionally, ML, BT and TC provided a significant contribution in the conception and design of the work. ML, TC and NST contributed by acquiring the data.

Competing interests NST receives a stipend for his work as the Social Media Editor for *Emergency Physicians Monthly* (news magazine).

Provenance and peer review Commissioned; externally peer reviewed.

REFERENCES

- Cadogan M, Thoma B, Chan TM, *et al.* Free Open Access Medication (FOAM): the rise of emergency medicine and critical care blogs and podcasts (2002–2013). *Emerg Med J* 2014;31(e1):e76–7.
- Thoma B, Chan T, Benitez J, *et al.* Educational scholarship in the digital age: a scoping review and analysis of scholarly products. *Winnower* 2014;1:e141827.77297.
- Purdy E, Thoma B, Bednarczyk J, *et al.* The use of free online educational resources by Canadian emergency medicine residents and program directors. *CJEM* 2015;17:101–6.
- Mallin M, Schlein S, Doctor S, *et al.* A survey of the current utilization of asynchronous education among emergency medicine residents in the United States. *Acad Med* 2014;89:598–601.
- Loeb S, Bayne CE, Frey C, *et al.* Use of social media in urology: data from the American Urological Association (AUA). *BJU Int* 2014;113:993–8.
- Grock A. New AIR Series: ALiEM Approved Instructional Resources [online]. *Acad Life Emerg Med* 2014. <http://www.aliem.com/new-air-series-aliem-approved-instructional-resources/> (accessed 8 Dec 2014).
- Scott KR, Hsu CH, Johnson NJ, *et al.* Integration of social media in emergency medicine residency curriculum. *Ann Emerg Med* 2014;64:396–404.
- Bahner DP, Adkins E, Patel N, *et al.* How we use social media to supplement a novel curriculum in medical education. *Med Teach* 2012;34:439–44.
- Benetoli A, Chen TF, Aslani P. The use of social media in pharmacy practice and education. *Res Social Admin Pharmacy* 2015;11:1–46.
- Schmitt TL, Sims-Giddens SS, Booth RG. Social media use in nursing education. *Online J Issues Nurs* 2012;17.
- Grajales III FJ, Sheps S, Ho K, *et al.* Social media: a review and tutorial of applications in medicine and health care. *J Med Internet Res* 2014;16:e13.
- Kirkup G. Academic blogging: academic practice and academic identity. *London Rev Educ* 2010;8:75–84.
- Zanussi L, Paget M, Tworek J, *et al.* Podcasting in medical education: can we turn this toy into an effective learning tool? *Adv Health Sci Educ Theory Pract* 2012;17:597–600.
- Hendricks A. Bloggership, or is publishing a blog scholarship? A survey of academic librarians. *Library Hi Tech* 2010;28:470–7.
- Brabazon T. The google effect: googling, blogging, wikis and the flattening of expertise. *Libri* 2006;56:157–67.
- Ghislandi P, Raffaghelli J, Yang N. Mediated quality: an approach for the eLearning quality in higher education. *Int J Digit Literacy Digit Competence* 2013;4:56–73.
- 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;17:188–91.
- Thoma B. Social media index [online]. *Acad Life Emerg Med* 2013. <http://aliem.com/social-media-index> (accessed 8 Dec 2014).
- 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;16:242–9.
- Smith R. Scrap peer review and beware of “top journals”. *BMJ Blogs* 2010. <http://blogs.bmj.com/bmj/2010/03/22/richard-smith-scrap-peer-review-and-beware-of-top-journals> (accessed 8 Dec 2014).
- Smith R. Peer review: a flawed process at the heart of science and journals. *J R Soc Med* 2006;99:178–82.
- Bohannon J. Who’s afraid of peer review? *Science* 2013;342:60–5.
- Cook DA, Erwin PJ, Triola MM. Computerized virtual patients in health professions education: a systematic review and meta-analysis. *Acad Med* 2010;85:1589–602.
- Cook DA, Levinson AJ, Garside S, *et al.* Internet-based learning in the health professions. *J Am Med Assoc* 2008;300:1181–96.
- Cook DA, Hatala R, Brydges R, *et al.* Technology-enhanced simulation for health professions education. *J Am Med* 2011;306:978–88.
- Bandiera G, LeBlanc C, Regehr G, *et al.* Education scholarship in emergency medicine part 2: supporting and developing scholars. *Can J Emerg Med* 2014;15:56–12.
- Paterson QS, Thoma B, Lin M, *et al.* Quality indicators for medical education blog posts and podcasts: a qualitative analysis and focus group. *Association of American Medical Colleges Medical Education Meeting*, Chicago, 2014.
- Thoma B, Chan TM, Paterson QS, *et al.* Emergency medicine and critical care blogs and podcasts: establishing an international consensus on quality. *Ann Emerg Med*. Published Online First: 25 March 2015.
- Thoma B, Julien P, Rick P, *et al.* Administration and leadership competencies: establishment of a national consensus for emergency medicine. *Can J Emerg Physicians* 2013;15:1–8.
- Penciner R, Langhan T, Lee R, *et al.* Using a Delphi process to establish consensus on emergency medicine clerkship competencies. *Med Teach* 2011;33:e333–9.
- Rowe M, Frantz J, Bozalek V. Beyond knowledge and skills: the use of a Delphi study to develop a technology-mediated teaching strategy. *BMC Med Educ* 2013;13:51.
- Lindsay P, Schull M, Bronskill S, *et al.* The development of indicators to measure the quality of clinical care in emergency departments following a modified-delphi approach. *Acad Emerg Med* 2002;9:1131–9.
- Hasson F, Keeney S, McKenna H. Research guidelines for the Delphi survey technique. *J Adv Nurs* 2000;32:1008–15.
- Von der Gracht HA. Consensus measurement in Delphi studies: review and implications for future quality assurance. *Technol Forecasting Soc Change* 2012;79:1525–36.
- Jefferson T, Rudin M, Brodney Folse S, *et al.* Editorial peer review for improving the quality of reports of biomedical studies. *Cochrane Database Syst Rev* 2007;18:MR000016.
- Purdy E, Thoma B, Bednarczyk J, *et al.* The use of free online educational resources by Canadian emergency medicine residents and program directors. *CJEM* 2015;17:101–6.
- Nickson CP, Cadogan MD. Free Open Access Medical education (FOAM) for the emergency physician. *Emerg Med Australas* 2014;26:76–83.