LIMEs and LEMONs: Critically Examining the Effect of a Blog Post on Junior Faculty Learners

Anne M. Messman, MD, MHPE[1] , Robert R. Ehrman, MD[1] , and Larry D. Gruppen, PhD[2]

ABSTRACT

Introduction: The usage of asynchronous resources such as blogs and podcasts is pervasive in academic medicine, despite little understanding of their actual effect on learner knowledge acquisition. This study sought to examine the objective effect of a blog post on knowledge acquisition and application among junior faculty in emergency medicine (EM) via randomized controlled study.

Methods: All accredited EM residency programs in the United States and Canada were contacted to identify assistant and associate program directors and medical education fellows for recruitment into this study. Upon enrollment, participants were randomized as to whether they received access to a supplemental blog post prior to listening to a podcast episode. After listening to the podcast episode, all participants completed an assessment that included a test of knowledge application and knowledge acquisition; demographic information was also obtained.

Results: Ultimately, 103 participants completed the study; the study closed for enrollment in July 2019. Data were nonnormally distributed and groups were compared using the Wilcoxon rank-sum test. There were no significant differences between the demographics of the two groups nor was there a significant difference in knowledge between the two groups.

Conclusion: The addition of a supplementary blog post did not increase junior faculty knowledge of a podcast episode.

Asynchronous teaching modalities have been integrated into the core curricula of many residency programs and abundant research has demonstrated the use of blogs and podcasts among medical students and residents.[1–6] "FOAM" or "FOAMed," Free Open Access Medical Education, was coined by Cadogan in 2012 to describe "a means of collating and curating the growing wealth of online education resources which are free and easy to access."[7] Despite the manifest popularity of FOAMed there is little educational research to measure the effect of these asynchronous teaching methods on learning.[3–5,8]

Studies demonstrating the purported "effectiveness" of asynchronous learning resources have largely relied

on learner-reported augmentation of their learning rather than an objectively measured effect on learning.[9] To address this knowledge gap, this study quantitatively measured the effect of a blog post on learners, specifically junior faculty in emergency medicine (EM). This study is one of the first to explore the effect of an asynchronous resource on junior faculty via randomized controlled trial and looks beyond Kirkpatrick level one outcomes, the junior faculty's reaction to the learning, focusing instead on knowledge acquisition and knowledge application, Kirkpatrick level two outcomes.[10]

The study was based on the authors' personal experience with the Key Literature in Medical Education (KeyLIME; https://keylimepodcast.libsyn.com) podcast, a medical education podcast which discusses a medical education article weekly. As educators, we noted that the podcast is very well done but may use terms and concepts unfamiliar to listeners who are more novice medical educators, specifically junior faculty. We hypothesized that if junior faculty were provided with a blog post that explains the more advanced terms and concepts that will be discussed in the KeyLIME podcast episode prior to listening to the podcast episode, this would enhance their ability to understand the podcast episode and thus increase learning. This hypothesis has its roots in Vygotsky's work describing the concept of scaffolding, wherein learners are provided with additional support (scaffolding) to support their learning.[11] The "zone" in which scaffolding is used to support learners is called the Zone of Proximal Development; this is where Vygotsky posited that learning occurs. In this study, the "teacher" providing the scaffolding is the blog post itself with the podcast episode providing the learning activity. This study will explore the hypothesis that the addition of a preparatory blog post will scaffold junior faculty members so that they will learn more from the KeyLIME podcast episode. We therefore created the Key Literature in Education and Medicine Online for Novices (KeyLEMON) blog to provide background, supplemental information of a journal article.

METHODS

Development of the Blog Post and Assessment Tool

A single KeyLIME podcast episode was chosen by one of the study authors (AMM). All KeyLIME episodes prior to September 2018 were considered. KeyLIME episode 150 (http://keylimepodcast.libsyn.com/2017/12), "Faculty Development – We have come so far, and we have so far to go," was ultimately chosen based on the importance of the topic discussed and its relevance to all medical educators. Once the podcast episode was chosen, the accompanying Key Literature in Education and Medicine Online for Novices (KeyLEMON) blog post was written. The blog post (https://keylemon.home.blog/2019/05/09/saemf-grant-blog-post/) was vetted by experts in medical education for clarity and to ensure that it accurately reflected the content presented in the KeyLIME podcast episode and did not present any novel information not presented in the KeyLIME podcast episode. It was additionally edited for clarity and online readability by experts in FOAMed. The final version was published online and password protected during the study period to ensure that only those randomized to receive access to the blog post could view its contents.

The assessment tool was then created by a study author (AMM). The assessment tool is composed of 13 multiple-choice questions: demographic questions; questions to elucidate whether the study participant had previously listened to the KeyLIME podcast episode or read the paper associated with the episode, and to ascertain what percentage of the KeyLIME podcast episode the study participant listened to for the purposes of the study; two knowledge retention questions (KRQs; questions 8 and 10); and four knowledge application questions (KAQs; questions 9, 11, 12, and 13). The KRQs and KAQs were formatted as multiple-choice questions. Some knowledge questions had several correct and incorrect answers from which to choose; in these cases, respondents were asked to select all correct responses. For all questions, participants were awarded one point for every correct response and one point was deducted for each incorrect response. Content-related validation of the assessment tool was obtained from several experts within medical education after which it was piloted among junior faculty members within EM who were not part of the final study cohort. The range of possible scores for the assessment was +13 if all correct and no incorrect answers were chosen and −14 if all incorrect and no correct answers were chosen. The assessment tool can be found as Data Supplement S1 (available as supporting information in the online version of this paper, which is available at http://onlinelibrary.wiley.com/doi/10.1111/acem.10553/full).

Participant Recruitment

We wanted to study those with an interest in medical education but also those that did not likely already possess the background knowledge necessary to fully grasp all of the content of the KeyLIME podcast episode, and therefore chose to target junior faculty with an interest in medical education. For the purposes of this study, we used assistant and associate program directors (PDs) and medical education fellows within EM in the United States and Canada to represent junior faculty members with an interest in medical education. Assistant/associate PDs and medical education fellows were used as a surrogate group representing those likely to be more junior in their career but with a clear interest in medical education.

We created a list of target programs comprising all Accreditation Council for Graduate Medical Education (ACGME)-accredited EM residency programs in the United States and Accreditation of Residency Education (CanERA)-accredited EM residency programs in Canada. All programs were contacted via e-mail in January 2019 and asked: 1) how many assistant/associate PDs does your residency program have, and 2) what is their email contact information. Programs with medical education fellowships were also asked to provide contact information for their medical education fellow. Repeat e-mails were sent twice more over the next month to programs that did not respond. For all programs that did not respond after three e-mails, individualized e-mails were sent until March 2019, when the final list with contact information for assistant/associate PDs and medical education fellows was created.

Study Methodology

The listserv was used to contact potential study participants, who were enrolled on a rolling basis from March to June 2019 and randomized to the blog group (BG) or the no-blog group (NBG) via random-number generator. Those in the BG were asked to read the KeyLEMON blog post then listen to the KeyLIME podcast episode and then complete the assessment, administered via Qualtrics (Seattle, WA); those in the NBG were instructed to listen to the KeyLIME podcast episode and then complete the assessment. Participation in the study was anonymous, voluntary, and uncompensated. This study was granted exemption from the Institutional Review Board at Wayne State University School of Medicine.

Participants were asked to complete the assessment within two weeks. A mass e-mail was sent to all enrolled participants in early July 2019 to request that they complete the assessment, if they had not already. The study closed on August 1, 2019.

Data Analysis

Descriptive statistics are reported for the overall cohort. The BG versus the NBG were compared using medians and interquartile range for nonnormally distributed data and unpaired t-test when data distribution was normal. Categorical differences were analyzed using Pearson's chi-square or Fisher's exact test, where appropriate; when there were more than two categories for a given response, an overall chi-square test was used (i.e., testing global H_0 of equality between groups). The normality assumption for survey responses was assessed using the Shapiro-Wilk test and data were found to be nonnormally distributed. Therefore, individual responses in each group for questions 8 to 13 from the assessment tool were compared using the Wilcoxon rank-sum test. Median total test score (TTS) for all types of assessment questions (questions 8–13; TTS group) and for KAQs (KAQ group) were also compared using the Wilcoxon rank-sum test. A prespecified subgroup analysis, consisting of only participants in their first 5 postresidency years, was performed for the TTS and KAQ question groups. Statistical analysis was performed using SAS version 9.4 (SAS Institute, Cary, NC).

Sample Size Calculation and Power Analysis

A sample size of 62 participants per group was calculated to be sufficient to detect a difference of 20 percentage points in mean score between the BG and NBG with 80% power and an alpha of 0.05, assuming normally distributed response data. Prior data on the expected distribution and variance of participant responses was not available so an effect size of 20% (SD ± 11) was chosen as one which balances an educationally meaningful difference with feasibility of subject recruitment for this preliminary work. Given that response scores were found to be nonnormally distributed, a post hoc power calculation was performed using distributional data from the actual study responses. With the given sample size of 103 subjects (see results section) our study has 30% power to detect a difference in median TTS between the BG and NBG of 1 point, with an alpha of 0.05.

RESULTS

A total of 268 EM residency programs in the United States and Canada (237 ACGME-accredited and 31 CanERA-accredited as of January 2019) were contacted and asked to provide contact information for their assistant/associate PDs and medical education fellows. Ultimately, 430 potential participants were identified. All were e-mailed as described in the Methods, 172 (40%) of whom agreed to participate in the study. Of these, 87 (51%) were randomized to the BG and 85 (49%) to the NBG. Ultimately, of the 172 who agreed to participate, 106 (62%) completed the study; 59 (56%) from the BG and 47 (44%) from the NBG. Three respondents were excluded because they did not meet the inclusion criteria or did not complete the assessment. Final data analysis was performed on the remaining 103 participants (Figure 1).

The majority (92%, $n = 95$) of participants were assistant/associate PDs, with 26% ($n = 27$) holding an advanced degree such as a Master of Science or Master of Medical Education. Participants had been in their current roles for < 1 to 24 years, with a mean (±SD) of 3.67 (±3.74) years; number of years postresidency ranged from < 1 to 35, with a mean (±SD) of 7.71 (±6.15) years.

Full comparison of the BG and NBG is shown in Table 1. The BG and NBG did not differ significantly in terms of their work roles and years therein, number of years postresidency, and percentage with an advanced degree. Most participants in both groups listened to > 75% of the podcast, with a similar percentage having listened to the podcast prior to participating in the study; however, more participants in the BG read some (19% vs. 9%) or all (19% vs. 4%) of the journal article discussed on the KeyLIME episode compared to the NBG ($p = 0.01$).

Comparisons of scores on questions 8 to 13 are listed in Table 2. For the individual questions, only the median score on question 8 was significantly different in the BG compared to the NBG (4 vs. 3, $p = 0.03$). Median TTS was similar in the BG and NBG (7 vs. 6, $p = 0.13$); for KAQs, scores were also similar (3 vs. 2, $p = 0.51$). No significant differences were found in the subgroup analysis that only included faculty members within 5 years of residency completion (early faculty).

DISCUSSION

This study found that the addition of a blog post did not significantly improve junior faculty knowledge of content presented in a podcast episode. Although this
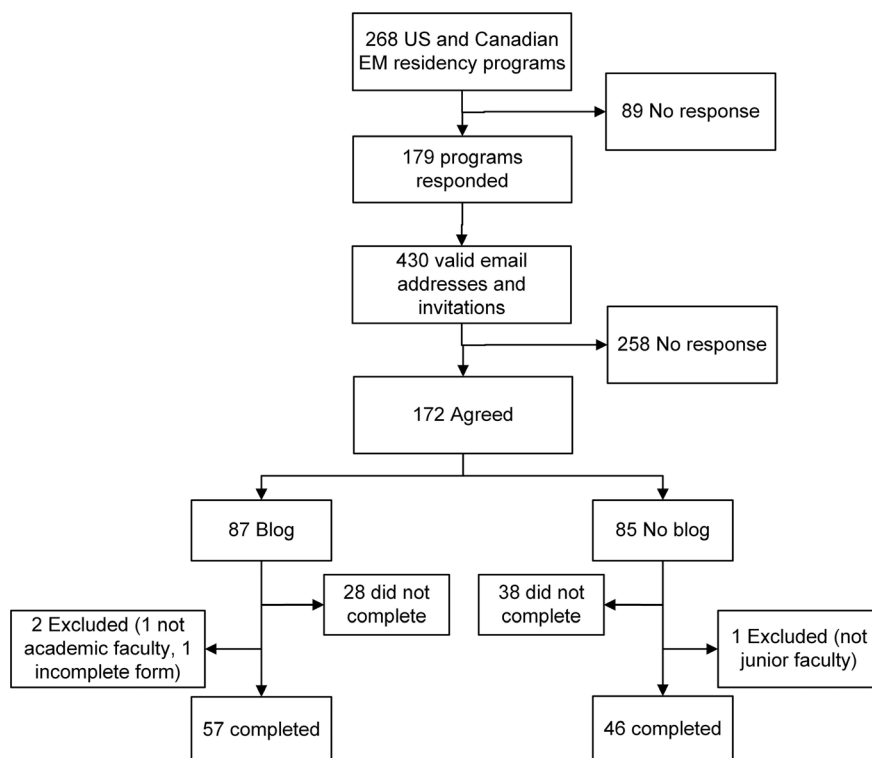

Figure 1. Flowchart of study participants.

Table 1
Comparison Between BG and NBG

	BG (n = 57)	NBG (n = 46)	p-Value
Listened to podcast prior?	20 (35)	19 (41)	0.52
Work role			
APD	51 (89)	44 (96)	0.44
MEF	5 (9)	2 (4)	
APD/MEF	1 (2)	0	
Years in role	3.58 (±3.50)	3.78 (±4.06)	0.78
Years postresidency	7.06 (±5.52)	8.50 (±6.81)	0.24
Holds advanced degree	15 (26)	12 (26)	0.98
To what percentage of podcast did you listen?			
0%–24%	0	1 (2)	0.34
26%–50%	1 (2)	0	
51%–75%	4 (7)	1 (2)	
76%–100%	52 (91)	44 (96)	
Amount of paper read			
None	35 (62)	39 (87)	0.01
Some	11 (19)	4 (9)	
All	11 (19)	2 (4)	

Data are reported as n (%) or mean (±SD).
APD = associate program director; BG = blog group; MEF = medical education fellow; NBG = no-blog group.

Table 2
Score Comparison Between the BG and NBG

	BG (n = 57)	NBG (n = 46)	p-value*
Question			
8†	4 (1)	3 (2)	0.03
9	1 (1)	1 (1)	0.55
10	1 (0)	1 (0)	0.21
11	1 (2)	1 (1)	0.24
12	1 (2)	0 (1)	0.52
13	0 (2)	1 (1)	0.13
TTS (questions 8–13)	7 (3)	6 (3)	0.13
KAQ (question 9, 11–13)	3 (3)	2 (2)	0.51
Early faculty‡			
TTS	30, 8 (3)	18, 5(2)	0.17
KAQ	30, 3(2)	18, 2(2)	0.22

BG = blog group; IQR = interquartile range; KAQ = knowledge application question; NBG = no-blog group; TTS = total test score.
*Kruskal-Wallis test.
†Values are listed as median (IQR).
‡Early faculty: ≤ 5 years postresidency. Data are reported as n, median (IQR).

study tested a single blog post in one type of learner and is not generalizable to all blog posts or all asynchronous resources, to the authors' knowledge it is one of the first randomized controlled trials to examine the efficacy of a blog post on junior faculty and is

hypothesis-generating. It is important to make clear that the intervention under investigation in this study is the blog post, not the podcast episode. The authors chose a podcast episode as the teaching tool because it is free and easily accessible and offered all study participants the same experience without any variability. Also, we chose to study junior faculty in EM specifically because EM has shown early adoption and acceptance of asynchronous resources.[2,3,12]

It was quite unexpected to find that the supplementary blog post did not significantly positively affect study participant's knowledge and understanding of the KeyLIME podcast episode. This was true both when examining raw total scores between the two groups and when comparing scores for the more challenging KAQs, which required higher-order thinking compared to the straightforward KRQs. Additionally, significantly more of those assigned to the BG reported having read some or all of the article discussed in the KeyLIME podcast episode. Despite this potential advantage, the BG still did not outperform the NBG. The authors performed additional post hoc analyses to look for any significant differences in the performances of any subgroups and found none; subgroup analyses included examining a difference between the groups based on years out of residency and on whether a participant possessed an advanced degree.

This lack of difference between the two groups can be interpreted in different ways. One interpretation is that blogs are not helpful in teaching faculty level learners. This is clearly too sweeping of a conclusion to draw after one study, and it could be that this particular blog post alone was not helpful to junior faculty. The authors did put great effort into ensuring that the blog post was of high quality in terms of content and also visually appealing and easy to read on a computer screen.

Another possibility as to why this study did not reveal a difference between the groups is that the assessment tool may be imperfect and not capable of detecting a real difference between the groups. As with the blog post, attention was given in the development of the assessment tool and it was both content validated and piloted. Despite this, it may not have been robust enough to detect a difference between the groups. The authors were aware of the significant time required of participants to complete the study and therefore did not want to create an assessment tool that was onerously long; creating a shorter assessment tool may have come at the cost of gathering more information from the participants.

The authors in no way want to disavow the utility of asynchronous resources. This study does suggest that we need to continue rigorous research into their effect on junior faculty learners' acquisition of knowledge. Future studies should expand to other asynchronous resources and should include different types of learners and learners outside of EM.

LIMITATIONS

The first limitation is low statistical power, with a Type II error probability of 70%. This occurred because participant score distributions differed markedly from the assumptions used in the sample size calculation. A significantly larger study would be needed to detect the observed one-point difference in median TTS—80% power would require 201 participants per group. While the authors did their best to recruit participants into this study, we were unable to achieve that level of participation. Future studies may want to expand the pool of potential participants, recognizing that this may concurrently result in increased heterogeneity of the participants.

Another limitation is our use of assistant/associate program directors and medical education fellows as a surrogate group of "junior faculty." Junior faculty does not have a uniform definition; medical education fellows more than likely just completed their EM residency however assistant/associate program directors may have completed their EM residency decades previously and are not "junior" in the chronological sense of the word. Despite this, they are still in an academic position that is generally considered to be a more junior faculty position, and therefore we chose to include all assistant/associate program directors regardless of chronological age or years since residency graduation. We acknowledge that this inclusive definition may therefore include those that are more senior in their career or even those not actually interested in medical education but working as an assistant/associate program director nonetheless.

CONCLUSION

This study found that the addition of a supplementary blog post did not increase faculty-level learner knowledge retention and application of a podcast episode.

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Supporting Information

The following supporting information is available in the online version of this paper available at http://onlinelibrary.wiley.com/doi/10.1002/aet2.10553/full

Data Supplement S1. Supplemental material.