Mind the Gap: Representation of Medical Education in Cardiology-Related Articles and Journals

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ABSTRACT

Background Cardiology fellowship programs are at the interface of medical education and the care of patients suffering from the leading cause of mortality in the United States, yet there is an apparent lack of research guiding the effective education of fellows.

Objective We sought to quantify the number of publications in cardiology journals that pertained to the education of cardiology trainees and the number of cardiologists participating in education research.

Methods For the period between January and December 2012, we cataloged cardiology-specific and general medical/medical education journals and sorted them by impact factor. Tables of content were reviewed for articles with an educational focus, a cardiology focus, or both. We recorded the authors' areas of medical training, and keywords from each cardiology journal's mission statement were reviewed for emphasis on education.

Results Twenty-six cardiology journals, containing 6645 articles, were reviewed. Only 4 articles had education themes. Ten general medical and 15 medical education journals contained 6810 articles. Of these, only 7 focused on medical education in cardiology, and none focused on cardiology fellowship training. Among the 4887 authors of publications in medical education journals, 25 were cardiologists (less than 1%), and among the 1036 total words in the mission statements of all cardiology journals, the term "education" appeared once.

Conclusions Published educational research is lacking in cardiology training, and few cardiologists appear to be active members of the education scholarship community. Cardiology organizations and academic journals should support efforts to identify target areas of study and publish scholarship in educational innovation.

Introduction

Medical education is a recognized area of specialization, with an academic community and peer-reviewed journals. Occasionally, influential education research is published in general medical journals, but it is more typically confined to journals with medical education as their priority. Previous reviews have noted that education research has been traditionally weighted toward undergraduate medical education,¹ but changes in trainee duty hours, evolution in program accreditation, and the tenuous balance of federal funding with anticipated physician workforce shortages create a need for data-driven reform of graduate medical education (GME).^{2,3}

Cardiology fellowships are a specific cohort within GME programs. Due to the morbidity and mortality of heart disease, fellowship training in cardiology has a high potential for impact on population health in the United States. Cardiology is among the most prolific areas in medical research, producing new knowledge in clinical and translational science. In

stark contrast, research describing educational innovations in cardiology appear to be rare. We hypothesize that few cardiologists engage in medical education research as their primary career interest, and that medical education research is rarely published in high-impact cardiology journals.

To serve as a needs assessment for the promotion of cardiology-specific medical education research, we (1) quantified medical education research published in cardiology journals; (2) quantified medical education research pertaining specifically to cardiology training; (3) quantified cardiologists participating in medical education research; and (4) estimated the priority of publishing medical education research within cardiology journals.

Methods

Compilation of Journal Lists

Two lists of journals arranged by impact factor (IF) were assembled in the fall of 2013. One list represented cardiology journals (CAJs) and the second was a combined list of general medical journals (GMJs) and medical education journals

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(MEJs). There are fewer journals in the MEJ category, and there is occasional crossover representation of education-themed articles in prominent general medical journals. The IF is derived annually from the June release of Thomson Reuters' Journal Citation Reports.⁴ IFs were compiled from the 2013 release of the Journal Citation Reports and reflected scores for the 2012 publications. The listings are seen in TABLE 1.

Publication and Author Search

After the 2 lists were finalized, 3 authors (C.A., S.A., A.J.A.) searched the tables of content (TOCs) for each journal, including regular and supplemental issues, for the 2012 calendar year using the journal websites.

Each TOC item was screened for a cardiology or medical education theme (defined using the search terms of student, resident, education, curriculum, development, teaching methods, evaluation, learning, training, fellowship, and technology).⁵ Our search excluded letters to the editor, book reviews, and creative writing. Information about each author listed in the abstract was screened to determine the area of training. Authors were classified first as physician or nonphysician, and each physician was categorized by his or her medical specialty. If categorization was not apparent by the author's degree and/or the article's correspondence information, an additional search was performed using Google, Bing, or Yahoo to determine his or her medical specialty. If this was unable to be determined, the author's specialty was listed as unknown. Authors were counted for each appearance in an abstract. We did not collect information on the total number of 2012 publications for each author, and the results in each category reflect the overall number of listed author names, not the number of actual authors.

All information regarding publications and authors was tracked using a spreadsheet available to the 3 researchers through a shared document on Google Drive. Articles that shared themes of cardiology and medical education were flagged during the search for later review by the authors.

Review of Cardiology Journal Mission Statements

In an effort to estimate the priorities of each CAJ, and by extension, interest to publish future work of educational scholarship in cardiology, the mission statement of each cardiology publication was obtained from their informational webpage. Each statement was captured verbatim and the text was pasted into a free online word cloud generator (tagcrowd.com).⁶ This generated a display that visually demonstrated the frequency of each keyword proportional to the font size (larger = more frequent)

What was known and gap

Education research could inform the training of cardiologists to enhance the care of patients suffering from cardiac disease.

What is new

There is a paucity of empirical publications guiding the effective education of cardiology fellows.

Limitations

Search was limited to published articles and may have overlooked relevant research not published in peer-reviewed journals.

Bottom line

Published educational research is lacking in cardiology training, and specialty organizations and academic journals should identify study areas and publish scholarship in educational innovation.

in addition to a numerical count. Specific attention was paid to any keywords pertaining to education or education-related topics. Nonrelevant words, such as articles, aspects, including, manuscripts, papers, provide, publishes, related, studies, system, topics, welcome, were omitted. This quantitative approach to textual analysis produced a graphical result, allowing the reader to "quickly uncover the 'essence' of [the] text."⁷

The above methods were categorized as research involving the collection of existing publicly available data, and were thus exempt from review by The Ohio State University Institutional Review Board.

Results

Medical Education Publications in Cardiology Journals

There were 26 cardiology journals included in the search (TABLE 1). A total of 387 issues and 24 supplements containing 6645 articles were screened. Only 4 articles (less than 1%) were education-themed. The 4 articles were authored by 10 individuals (8 cardiologists, 1 family physician, and 1 nonphysician). Two articles dealt with training in the United States, and 2 discussed training in the United Kingdom. Only 1 article was original survey-based research, describing the prevalence of structured training in preventive cardiology among fellowship programs. The other 3 were commentary pieces without a specific focus on cardiology trainees.

Cardiology Publications in General Medical and Medical Education Journals

Our search included 10 GMJs and 15 MEJs (TABLE 1). A total of 398 issues and 15 supplements containing 6810 articles were screened, including a total of 1279 educational articles (18.8%), 753

TABLE 1

Cardiology, General Medical, and Medical Education Journals Included in Search

Ranking	Journal	IF	Subject	Journal	IF	Subject
1	<i>Circulation</i>	14.73	CA	<i>N Eng J Med</i>	53.29	GM
2	<i>J Am Coll Cardiol</i>	14.15	CA	<i>Lancet</i>	38.27	GM
3	<i>Eur Heart J</i>	10.47	CA	<i>JAMA</i>	28.88	GM
4	<i>Int J Cardiol</i>	7.078	CA	<i>Ann Intern Med</i>	16.73	GM
5	<i>JACC Cardiovasc Imaging</i>	6.98	CA	<i>BMJ</i>	14.09	GM
6	<i>JACC Cardiovasc Interv</i>	6.80	CA	<i>JAMA Intern Med</i>	11.46	GM
7	<i>Circ Arrhythm Electrophysiol</i>	6.46	CA	<i>CMAJ</i>	8.22	GM
8	<i>Circ Heart Fail</i>	6.28	CA	<i>Am J Med</i>	5.43	GM
9	<i>Circ Cardiovasc Genet</i>	6.10	CA	<i>Acad Med</i>	3.52	ME
10	<i>Circ Cardiovasc Interv</i>	6.05	CA	<i>Med Educ</i>	3.17	ME
11	<i>Circ Cardiovasc Imaging</i>	5.94	CA	<i>J Gen Intern Med</i>	2.83	GM
12	<i>JACC Heart Fail</i>	5.43	CA	<i>Adv Health Sci Educ Theory Pract</i>	2.08	ME
13	<i>Prog Cardiovasc Dis</i>	4.93	CA	<i>Postgrad Med J</i>	1.93	GM
14	<i>Circ Cardiovasc Qual Outcomes</i>	4.90	CA	<i>Simul Healthc</i>	1.83	ME
15	<i>Eur J Heart Fail</i>	4.89	CA	<i>Adv Physiol Educ</i>	1.54	ME
16	<i>Am Heart J</i>	4.65	CA	<i>J Contin Educ Health Prof</i>	1.52	ME
17	<i>J Heart Lung Transplant</i>	4.33	CA	<i>J Surg Educ</i>	1.37	ME
18	<i>Heart</i>	4.22	CA	<i>Eval Health Prof</i>	1.23	ME
19	<i>Heart Rhythm</i>	4.10	CA	<i>Med Teach</i>	1.21	ME
20	<i>J Cardiovasc Magn Reson</i>	3.71	CA	<i>BMC Med Educ</i>	1.15	ME
21	<i>Am J Physiol Heart Circ Physiol</i>	3.70	CA	<i>Focus on Health Prof Educ</i> ^a	0.88	ME
22	<i>J Am Soc Echocardiogr</i>	3.70	CA	<i>J Cancer Educ</i>	0.76	ME
23	<i>J Card Fail</i>	3.66	CA	<i>Teach Learn Med</i>	0.74	ME
24	<i>Am J Cardiol</i>	3.36	CA	<i>Clin Teach</i>	0.44	ME
25	<i>Can J Cardiol</i>	3.35	CA	<i>J Grad Med Educ</i> ^b	N/A	ME
26	<i>J Cardiovasc Electrophysiol</i>	3.06	CA			

Note: Journal titles are abbreviated according to National Library of Medicine titles (www.ncbi.nlm.nih.gov).

Abbreviations: IF, impact factor; CA, cardiology journal; GM, general medical journal; ME, medical education journal; N/A, not applicable.

^a Abbreviations not listed on National Library of Medicine journal database.^b No impact factor as of 2013 Journal Citation Report.

cardiology articles (11.1%), and 7 educational articles with a focus on cardiology (less than 1%). All 7 cardiology-specific medical education articles were published in MEJs. Three articles were original research, in which educational interventions were designed to investigate skills in electrocardiogram or echocardiogram interpretation in students or attending physicians, and 4 described development or pilot use of models to teach cardiac physiology to students. Two of the 7 articles were written by authors in the United States, and none of them were trained cardiologists. None of the articles focused on cardiology fellowship training.

Cardiologists as Authors in Medical Education Journals

Within the 25 GMJs and MEJs included in the search, there were a total of 5584 authors, with 697 (12.5%)

in the GMJ group and 4887 (87.5%) in the MEJ group. In the total combined group, there were 128 cardiologists (2.3% of all authors). Of that cohort, only 25 cardiologists were among the 4887 total authors of medical education-themed publications (less than 1%). The complete representation of medical education authors can be seen in TABLE 2.

Review of Cardiology Journal Mission Statements

There were 1036 total words included in the combined mission statements of each cardiology journal, and the top 50 keywords are displayed in the FIGURE. The term “educational” appeared once, in the *European Heart Journal*. The top 5 keywords were “clinical” (used 27 times), “research” (22 times), “cardiovascular”/“disease” (19 times), “heart” (16 times), and “review” (10 times).

TABLE 2
Medical Education Authors and Their Areas of Medical
Training

Author Discipline	No. of Authors (%)
Nonphysician	1954 (39.9)
General internal medicine	761 (15.6)
Surgery	523 (10.7)
Medical subspecialties other than cardiology	363 (7.4)
Unknown	258 (5.3)
Family medicine	226 (4.6)
Pediatrics	214 (4.4)
Obstetrics-gynecology	126 (2.6)
Emergency medicine	103 (2.1)
Anesthesia	90 (1.8)
Psychiatry	83 (1.7)
Neurological surgery	27 (0.55)
Neurology	26 (0.53)
Cardiology	25 (0.51)
Urology	23 (0.47)
Radiology	22 (0.45)
Otorhinolaryngology	19 (0.39)
Pathology	18 (0.37)
Dermatology	15 (0.31)
Physical medicine and rehabilitation	7 (0.14)
Ophthalmology	4 (0.08)
Total No. of authors	4887 (100)

Discussion

Cardiology is a prolific field within medical literature, but our data show that it appears to have largely ignored medical education scholarship. Within cardiology journals, there were exceptionally few education-themed articles in 2012, and only 1 journal mentioned education as a priority in their mission statement. Finally, the amount of cardiology-specific educational articles in general medical/educational journals and the number of cardiologists that were found to publish educational scholarship were very small.

Is it possible that cardiologists are not interested in education? This seems unlikely. National cardiology organizations routinely utilize physician volunteers for their educational committees and events, and cardiologists are frequently engaged in educational efforts at their institutions. This apparent conflict demonstrates an important distinction: that involvement in educational research and/or scholarship as a scientific career interest is separate from routine engagement in educational activities.

It is not known how many cardiologists focus on medical education as their primary research interest,

FIGURE
Keywords Taken From Cardiology Journal Mission
Statements as Reflection of Publishing Priorities

Note: The top 50 words are displayed with their frequency of repetition being directly related to font size and the number of mentions located in parentheses to the right of each individual term. Journal mission statements were captured verbatim and pasted into a free online word cloud generator (tagcrowd.com).⁶

but it appears to be a minority. One could postulate that cardiologists lack adequate mentorship, training, or resources to perform educational research. Currently, there is little training on how to conduct medical education research in most fellowship programs, and funding options for faculty with an educational focus are limited.^{1,8,9} Education scholars in cardiology also may have difficulties publishing their work within their field. With the charter of flagship cardiology journals prioritizing novel manuscripts that have the potential to “impact the management of disease,”¹⁰ it is not surprising that the roughly 10% of submissions they accept do not contain many educational research manuscripts. Finally, the lack of medical education scholarship within cardiology does not appear to be a unique problem, as the findings for many other medical and surgical subspecialties appear similar (TABLE 2).

One example that illustrates the need for education science in cardiology training is the recent update to the American College of Cardiology Core Cardiovascular Training Statement,¹¹ which serves as the outline for fellowship directors, the Accreditation Council for Graduate Medical Education, and the American Board of Internal Medicine as they structure, accredit, and certify cardiology training. It

is a product that results entirely from expert consensus, rather than educational research. Though it has made great strides from its original draft in 1994, considerations such as the length of training in areas of cardiology and procedural volumes required for competency remain arbitrary.

This review of the literature has several limitations. Our technique of utilizing publicly available information was designed to answer a set of specific questions, but online search engines can be inaccurate, potentially leading to misclassification of data, such as an author's training background, and the medical specialty of 5% of the authors in our study was not known. The large amount of articles screened constrained our search to a review of titles in tables of content, rather than full articles, which may have led to some pertinent articles being missed. Finally, our study did not assess how many education-oriented manuscripts are received by cardiology journals and subsequently rejected during the review process.

Conclusion

In a review of all 2012 publications from the 26 cardiology, general medical, and medical education journals with the highest impact factors, there were very few cardiology articles with a focus on education, and very few cardiologists who published works of educational scholarship. In addition, flagship cardiology journals did not appear to prioritize education in their posted mission statements. These findings highlight the “cardiology gap” between the specialty's prolific clinical research and limited educational research.

We hope this will be a call to action for current and future cardiologists to engage in the exploration of medical education and the scholarship required in its necessary advancement. In raising awareness, we want to encourage cardiologists to pursue careers in medical education, and cardiology journals to review and accept their work. Initial first steps would entail consolidation of a focused community within cardiology, and identification of high-yield projects where research would advance the effectiveness of educational efforts. National organizations with education as their mission should collaborate with like-minded physicians and expert educators to provide resources and support.

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