# *Authorship Education for Medical Students: a Discussion-Based Workshop*

**Rachel K. Wolfson & Vineet M. Arora**

**Medical Science Educator**

e-ISSN 2156-8650

Med.Sci.Educ.
DOI 10.1007/s40670-015-0185-8


Springer

Med.Sci.Educ.
DOI 10.1007/s40670-015-0185-8

SHORT COMMUNICATION

# Authorship Education for Medical Students: a Discussion-Based Workshop

**Rachel K. Wolfson**[1] · **Vineet M. Arora**[2]



**Abstract** Despite the emphasis on student research at many US medical schools, many students receive no formal training on ethical authorship. We developed an interactive workshop to teach authorship criteria to students. We used fictionalized authorship scenarios to assess students' baseline knowledge, teach the International Committee of Medical Journal Editors criteria for authorship, and generate discussion. The program was evaluated for student satisfaction, retention of knowledge, and behavior change. Most students found the program useful and engaging, and student knowledge improved after the workshop. Participants reported an increased rate of authorship conversations with mentors compared to controls.

**Keywords** Student authorship · Ethical authorship

## Background

The 2014 Association of American Medical College's (AAMC) Graduation Questionnaire reports that 69.3 % of graduates participated in a research project with a faculty member and 42 % were authors on a paper submitted for publication [1]. Despite the prevalence of student authorship on research manuscripts, most students do not receive formal training on authorship criteria. Karani et al. [2] surveyed students participating in a year-long scholarly project funded through the National Institutes of Health (NIH) and found that 66 % reported no formal training in authorship criteria. Even without authorship training, 79 % were authors on a scientific manuscript either completed or in progress.

Abundant literature suggests that authorship is not always correctly attributed. A study of articles published in 2008 in six medical journals with high impact factors found 21 % prevalence of honorary authorship, defined as "individuals who are named as authors but who have not met authorship criteria" or ghost authorship, defined as "individuals who have made substantial contributions to the work reported in an article but who are not named as authors" [3]. Of over 3000 NIH-funded scientists surveyed, 10 % reported "inappropriate assigning authorship credit" [4]. Other literature focuses on medical student integrity related to authorship. A 2010 meta-analysis included 13 studies involving medical student applications to training programs for 10 different specialties. The author re-calculated publication misrepresentation based on uniform criteria, and found an average misrepresentation of 4.9 % per applicant pool, with a range of 0.6 to 11 % [5]. For applications with publications listed, the misrepresentation rate was 15.9 % [5]. Subsequent single-institution reports include a plastic surgery residency program finding 14 % of applicant publications were unverifiable [6]. An anesthesiology program reported 2.4 % of applicant publications as "fraudulent" [7]. A pathology program reported 18 % of applications contained a publication misrepresentation, including "omission of authors, non-authorship, and self-promotion on the author list" [8]. Last, a pain medicine fellowship reported that 5.3 % of publications were fraudulent [9]. Clearly, one cannot discern from these reports whether misrepresentation reflects lack of education or intentional deception. However, in many competitive specialties, matched applicants have more publications, abstracts, and presentations than unmatched applicants [10]. Without deliberate,

✉ Rachel K. Wolfson
rwolfson@peds.bsd.uchicago.edu

[1] Department of Pediatrics, Pritzker School of Medicine, The University of Chicago, 5841 S Maryland Ave, Chicago, IL 60637, USA

[2] Department of Internal Medicine, Pritzker School of Medicine, The University of Chicago, 5841 S Maryland Ave, Chicago, IL 60637, USA

Published online: 07 October 2015

structured education on ethical authorship, this problem is likely to persist or worsen in the face of increasing competitiveness for US residency spots [11].

Despite these data, there was not an existing educational program targeting medical students who engage in research. We created and evaluated an interactive workshop to teach students the International Committee of Medical Journal Editors (ICMJE) criteria for authorship in a way that promoted retention of knowledge and also increased likelihood of authorship conversations between students and mentors.

## Methods

The workshop was developed and implemented at the University of Chicago Pritzker School of Medicine. Participants in the authorship workshop were students engaged in an 11-week summer research program supported by the NIH between the first and second years of medical school. This report of our experience was approved by the University of Chicago Institutional Review Board (IRB 13-0941).

We used Kern's six steps of medical education curriculum development [12] as a framework for needs assessment and program development, implementation, and evaluation. We identified this issue through mentoring our own medical students. In these conversations, students often expressed confusion about not being included as an author or about the author order determined by the mentor. In addition, students were often hesitant to initiate conversations about authorship with their mentors. We supplemented this experience with the literature reviewed in the "Background." Next, we more formally assessed the needs of our students. An anonymous, online survey of second, third, and fourth year students ($n$=205, 82 respondents, dual degree students excluded) revealed that 69 %

**Table 1** Authorship scenarios. Full text of the authorship scenarios presented to students during the workshop, with accompanying questions

| Scenario | Topic | Text of scenario and question |
|---|---|---|
| 1 | Basic authorship criteria | You are working with Dr. Smith for Summer Research after the conclusion of your first year of medical school. Dr. Smith started this project last year, and you spend the summer analyzing data, which you turn over as Excel files to the fellow working on the project with you. You learn at the Winter Break that the paper has been written and submitted, but that you are not listed as an author. You are upset. |
| | | Question: Did you meet authorship criteria? |
| 2 | Basic authorship criteria | You worked on a large clinical trial with Dr. Green for Summer Research after the conclusion of your first year of medical school. You worked diligently to extract patient data from the electronic medical record system and enter it into a spreadsheet, drafted part of the introduction to the paper, and even conducted some preliminary data analysis. An undergraduate was working on the project as well; her role was to consent patients for study enrollment. Dr. Green sends the manuscript to you for review before submission. Your name is on the manuscript, the undergraduate's name is not. |
| | | Question: Did you meet authorship criteria? |
| 3 | Unethical authorship | You want to apply for dermatology. You did not do Summer Research after the first year of medical school, and you return to second year anxious about conducting research that will be well received in this competitive field. You find a mentor for research time at the end of second year, but during the time set aside for research, you cannot begin due to IRB approval. The mentor suggests that you work on a literature review to use as the background section of a planned future manuscript. In March, you learn that the project was completed, the manuscript was published, and your mentor listed you as an author. You are happy to add this to your CV. |
| | | Question: Did you meet authorship criteria? |
| 4 | Author order | Your roommate is working with a senior faculty member to analyze data collected years ago as part of an NIH R01 grant. She also drafts most of the paper, and reviews her mentor's edits prior to submission. She is first author on the paper. You are working closely with a junior faculty member on a new quality and safety project that she developed with her senior mentor as part of an NIH K23 career development award. You collect the data, and like your roommate, you analyze the data, help to draft the paper, and review edits before submission. Your mentor is first author, you are middle author, and a senior faculty member is last author. You are upset. |
| | | Question: Was your mentor in error by NOT giving you first authorship? |
| 5 | Author order | You decide to work in the lab with Dr. Woods. She gives you a project to work on for Summer Research at the end of the first year of medical school, which you complete, and then write the paper. When you leave at the end of the summer, the paper is in draft form. Dr. Woods and her post-docs spend a significant amount of time rewriting the paper, and send you the final version before it is submitted. You are disappointed to note that the post-docs are the first two authors, then you, then the faculty. You were hoping to be first author. |
| | | Question: Why might the post-docs have been listed as the first two authors? |
| 6 | Author order | You work on a Quality and Safety project during dedicated research time in the second year of medical school. You have enough data at the end of this time to submit an abstract to a regional meeting. Abstract submission is on-line and you are nearing the deadline. You put yourself as first author, your mentor as second author, and the senior student who helped you as third author. The next week you give your mentor a printed confirmation of abstract submission. Your mentor tells you there were two other people who should have been included, and that she wanted to be the last author. |
| | | Question: What does the "last author" position signify? |

had not discussed authorship with their research mentors, and 49 % thought instruction on authorship would be valuable.

We reviewed a curriculum designed for junior faculty available on MedEdPORTAL [13] and used it as a springboard to design a discussion-based, 1-hour workshop for medical students, available in its entirety on MedEdPORTAL [14]. We aimed to engage learners in a discussion of actual scenarios that have caused our students concern and to use this as a foundation for presentation of the ICMJE criteria. We created a PowerPoint™ presentation to anchor the discussion and to present the scenarios. In order to gauge students' baseline understanding of authorship criteria and to promote discussion within the group, the program proceeded as follows. After outlining the goals for the session, we presented six scenarios to the students (Table 1). Two covered basic authorship criteria, one presented a case of unethical authorship, and three presented issues regarding author order. We asked students a question at the end of each scenario which students answered anonymously on worksheets, which we then collected. We then discussed the importance of authorship for recognition of scholarly accomplishments and taught the ICMJE criteria for authorship [15]. Last, we revisited the same scenarios presented initially and discussed each in relation to the ICMJE criteria. We encouraged students to ask questions regarding authorship criteria and also practical questions about approaching mentors regarding authorship.

We evaluated student reaction to the workshop 1 week after the program, via an anonymous, online evaluation comprised of seven questions to be answered using a 5-point Likert scale and one open-ended item soliciting comments and suggestions for improvement. We evaluated student learning and behavior change six weeks after the program. Of the six authorship scenarios presented during the workshop, three were routinely answered incorrectly before discussion of the ICMJE criteria (scenarios 1, 3, and 4) (Table 1). To evaluate knowledge retention, we presented students with the same scenarios and questions 6 weeks after the session. We also queried whether students had discussed authorship with their mentor and had students rank the importance of the workshop to preparing for this conversation on a 4-point scale. Statistical analysis used two-sample test of proportions.

## Results

Learner satisfaction for the workshop was high. Of the 60 students who participated in the workshop, 45 (75 %) completed the post-workshop evaluation survey given 1 week after the session. All students (100 %) agreed that they had a clear understanding of authorship criteria after the workshop, compared to only 9 % prior to the workshop ($p<0.0001$).

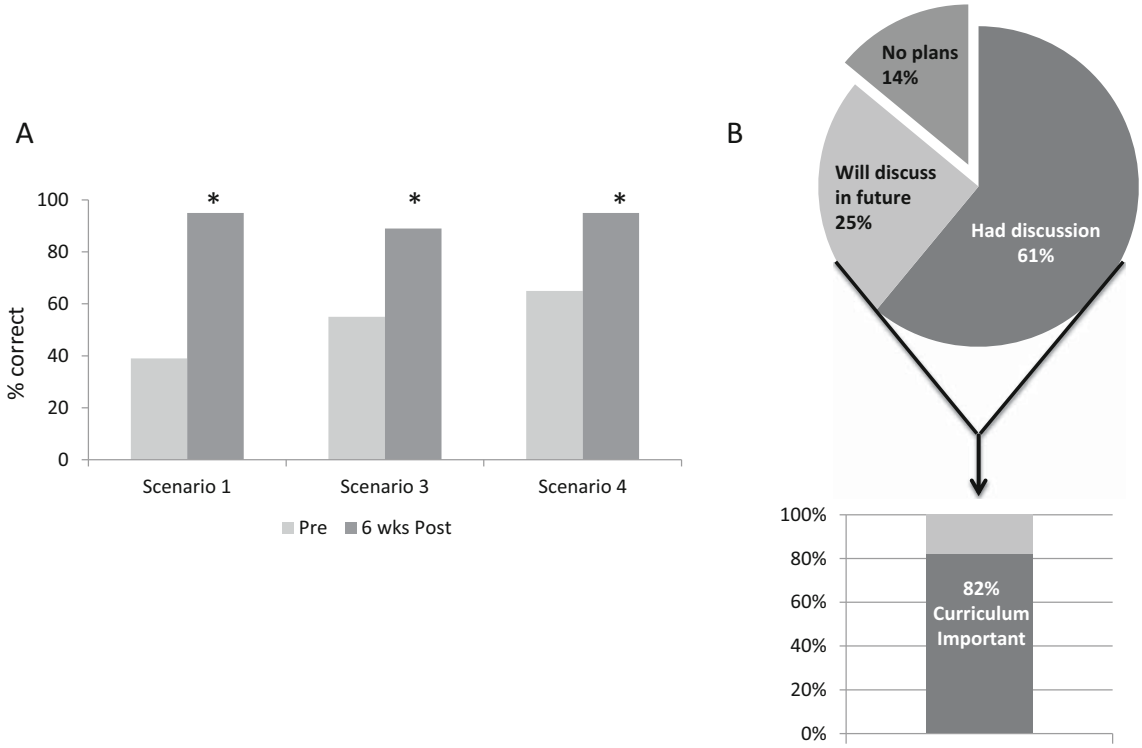


**Fig. 1** Authorship workshop results in retention of knowledge and change in behavior at 6 weeks. **a** The percent of students responding correctly to questions regarding authorship scenarios was significantly improved 6 weeks after the workshop for each of the three scenarios commonly answered incorrectly before the ICMJE criteria were taught ($p<0.0001$ for each, using a two sample test of proportions). **b** Six weeks after the workshop, the majority of students either had an authorship discussion with their mentor or planned to have one and stated that the workshop was important in preparing for this conversation

Eighty-six percent agreed that the scenarios were engaging and provided tools to use in their own discussions about authorship. Most students (82 %) felt that the workshop prepared them to approach their own mentor about authorship, and 73 % reported that they were more likely to initiate a conversation about authorship because of the workshop.

Six weeks after the workshop, we evaluated both student learning and change in behavior that resulted from program participation. Sixty-six students (60 participants, plus 6 non-participants) completed the questions. We examined knowledge retention by again presenting the three scenarios which were routinely answered incorrectly before discussion of the ICMJE criteria (scenarios 1, 3, and 4) (Table 1). The proportion of students answering correctly increased significantly for each of the three commonly missed scenarios (Fig. 1a). We also found a change in behavior as a result of the workshop. Six weeks after the workshop, 61 % of students reported they had discussed authorship with their mentor and 25 % were planning to have a discussion. Of these students, 62 % reported that this workshop was important or very important in preparing the student for an authorship conversation (Fig. 1b). The percent of students who initiated a conversation about authorship (61 %) was significantly greater that found in the control group of more senior students surveyed in our needs assessment (30 %) ($p$=0.0003).

## Discussion

We designed, implemented, and evaluated a discussion-based medical student workshop to teach authorship criteria. Student satisfaction with the program was high. In addition, 100 % of students reported that they had a clear understanding of authorship criteria after the workshop, a marked increase from 9 % prior to the workshop ($p$<0.0001). Students retained the information learned when evaluated 6 weeks after participation in the workshop. Last, student-reported behavior changed 6 weeks after the workshop, with 61 % of students reporting that they had discussed authorship with their mentor, a marked increase from previous ($p$=0.0003).

There are several limitations of this program design and assessment. Every unique situation cannot be addressed in 1 hour, nor did we not allot time for students to role-play broaching the topic of authorship. In addition, our teaching and evaluation were focused on students. A more robust evaluation could include brief review of the ICMJE criteria in mentor orientation materials and a survey of mentors with respect to student initiation of authorship conversations and the quality and content of those conversations. Last, our follow-up evaluation at 6 weeks included the 60 participants plus 6 additional students who had not participated in the workshop, but were expected to view a recorded version of the session online. Despite this, our results achieved statistical significance. In addition, the same scenarios were presented both during the workshop and at 6 weeks, so student responses could reflect recall only, rather than the ability to apply the criteria to novel situations. Last, student self-assessment of knowledge gained may not be accurate.

Despite these limitations, we believe that this concise, interactive workshop has value for medical students. Our program taught the ICMJE criteria in an engaging manner, which led to student satisfaction and sufficient self-efficacy to prompt students to initiate authorship conversations with their mentors. Given the incidence of inaccurate, and therefore unethical authorship attribution noted in the literature [3–9], we believe delivery of a program such as ours is critical to preparing medical students for both honest appraisal of their contribution to scholarly work and conversations with mentors and peers about ethical authorship.

**Acknowledgements** The authors gratefully acknowledge the financial support received through the Pritzker Summer Research Program, funded by National Institutes of Health T35 DK062719 and T35 AG029795-06.

## References

1. Association of American Medical Colleges. Medical School Graduation Questionnaire 2014 All Schools Summary Report. https://www.aamc.org/download/397432/data/2014gqallschoolssummaryreport.pdf Accessed May 15, 2015.
2. Karani R, Ognibene FP, Fallar R, Gliatto P. Medical students' experiences with authorship in biomedical research: a national survey. Acad Med. 2013;88(3):364–8.
3. Wislar JS, Flanagin A, Fontanarosa PB, Deangelis CD. Honorary and ghost authorship in high impact biomedical journals: a cross sectional survey. BMJ. 2011;343:d6128.
4. Martinson BC, Anderson MS, de Vries R. Scientists behaving badly. Nature. 2005;435(7043):737–8.
5. Wiggins MN. A meta-analysis of studies of publication misrepresentation by applicants to residency and fellowship programs. Acad Med. 2010;85(9):1470–4.
6. Chung CK, Hernandez-Boussard T, Lee GK. "Phantom" publications among plastic surgery residency applicants. Ann Plast Surg. 2012;68(4):391–5.
7. Neuman SA, Long TR, Rose SH. Publication misrepresentation among anesthesiology residency applicants. Anesth Analg. 2011;112(3):674–7.
8. Kaley JR, Bornhorst J, Wiggins M, Yared M. Prevalence and types of misrepresentation of publication record by pathology residency applicants. Arch Pathol Lab Med. 2013;137(7):979–82.
9. Thompson KM, Neuman S, Schroeder DR, Moeschler SM, Rho RH, Farrell AM, et al. Misrepresentation in multidisciplinary pain medicine fellowship applications to a single academic program. Pain Med. 2013. doi: 10.1111/pme.12322
10. National Resident Matching Program. Charting Outcomes in the Match. 4th ed: Association of American Medical Colleges; 2011. p. 12. http://www.nrmp.org/data/chartingoutcomes2011.pdf

11. Kirch DG. A Word From the President: Taking a Lesson from the 2013 Match 2013. https://www.aamc.org/newsroom/reporter/june2013/346238/word.html. Accessed May 6 2014.
12. Kern DK, Thomas PA, Hughes MT. Curriculum development in medical education: a six-step approach. Baltimore: The Johns Hopkins University Press; 2009.
13. O'Sullivan P, Chauvin S, Wolf F, Richardson D, Blanco M. Authorship Issues in Publishing and Career Development Workshop. www.mededportal.org/publication/9309. Accessed April 1, 2013.
14. Wolfson R, Arora V. Education on Authorship Criteria– A Curriculum for Medical Students 2014. www.mededportal.org/publication/9689.
15. International Committee of Medical Journal Editors. www.icmje.org. Accessed April 1, 2013.