

Agreement of Authorship for Student-Faculty Collaborative Research and Publications: A Literature Review and Call for Action

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ABSTRACT Worldwide, students of healthcare professions attend clinical rotations at medical facilities. Much research, and consequently scientific publications, is produced during their studies, bearing the fruits of student-faculty collaboration. To the best of our knowledge, no previous contract has been proposed detailing the fine print to pre-determine mutual responsibilities and privileges of students and faculty. Our objective was to present such a contract to the relevant students and faculty. We conducted a literature review to study existing proposals and solutions for this dilemma. Appropriate guidelines were also scanned. We included a proposal for a standard contract as the basis for student-faculty agreement for conducting research and publishing collaborative work. Questions regarding the relative contribution of students and subsequent authorship often arise. Vague rules and absent regulations in this realm can, at times, can be disadvantageous to students. We foresee a future role for our proposed agreement.

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The importance of intellectual credit in the form of authorship on scientific publications has been acknowledged historically and frequently is called *the coin of the realm* [1]. Medical students play an increasingly important role in scholarly literature, often providing frontline perspectives in both academic and clinical medicine [2,3]. Promotion of student and faculty research collaborations is therefore paramount [4], yet various factors have unfortunately made it difficult for students to publish [5].

Student research programs are on the rise, over two-thirds of graduating U.S. medical students participate in research and almost half co-author a paper. In fact, medical student collaborative research is associated with a higher acceptance rate at high-impact journals [3] as well having higher H-indexes [6]. Participation is beneficial to the students, the majority believing it is vital to their education [7] and imperative to their future,

particularly those vying for competitive residencies, fellowship programs, and academic positions or promotions [2]. Students reported improved research-related skills, such as critical appraisal of literature, data analysis and scientific writing [8].

Enhancing leadership skills, encouraging teamwork efforts, taking initiative, improving collaboration efforts, and improving problem-solving abilities are indicators for successful research, are strengthened during the research process, and are identical to those required for success in residency and future medical careers. Research collaborations also foster mentor-student relationships, help students with career choices and medical school performance [9], and encourage the development of personal learning networks that can potentially lay groundwork for academic medical career [2]. Research is used in assessing an applicant's competitiveness in almost half of U.S. residency programs [10]. Research exposure can promote postgraduate research productivity [11], with students viewing future research more positively [8]. Research is especially important in specialties that students are not significantly exposed to in medical school.

Published research is a significant indicator of success in all medical careers [12]. Of 4635 publications analyzed by Burk-Rafel et al. [13], only 14.5% included medical students or residents in various authorship positions, further establishing their only modest contribution. The authors concluded that first authorship was the main driver of student participation. Munzer and colleagues [2] found that 45.7% of U.S. institutions had at least one student-authored publication, compared with 17.4% in international institutions.

Notwithstanding, student collaboration adds a layer of complexity to the already intricate issue of authorship. Osborne and Holland [14] concluded that students are valuable researchers, yet historically viewed as cheap labor rather than part of a mentorship model. They also found that the mentor's authority and potential impact on the student's professional future may deter students from reporting authorship-related concerns [14]. Consequently, such concerns are seldom reported, discussed, or even clarified [15]. Therefore, senior researchers should ensure more equitable practices [15] to resolve the power disparity.

Sandler and Russell found that over one-quarter of their study participants reported unethical authorship decisions, yet only a handful were reported. Fear of negative consequences, unfamiliarity of relevant guidelines, self-blame, and lack of importance were among the reasons for not reporting the incident [16].

Authorship issues are common and can be attributed in part to the currently ill-defined definition of *authorship*, despite attempts to set clear authorship criteria [17]. Several surveys have addressed the matter and found that approximately one-third to two-thirds of respondents reported experiencing authorship issues [16,18,19], with women and non-tenured faculty more commonly affected [20]. In addition, only approximately 60% of authors fulfill authorship criteria [21] and many are unfamiliar or disagree with these guidelines [22]. Karani et al. [10] found that inappropriate authorship was awarded in 21% of the authors in six leading journals, and Mowatt et al. [23] found that 39% were awarded in *Cochrane Reviews*. *Lancet* and *BMJ* were first to present and adopt an action plan for tackling authorship issues. *Radiology*, *American Journal of Public Health*, *JAMA*, and *Cochrane Reviews* then followed suit [24].

In some research fields, such as clinical trials involving multi-disciplinary teams, authorship is even more complex, and generalized authorship guidelines are tricky to apply [17]. Implementation of such guidelines has been met by strong opposition, and restrictions make it harder for leading researchers to work together on multicenter clinical trials [25]. The culture of

Publish or Perish is unfortunately still prevalent in the academic community. Presumably, these issues are mainly due to the driving pressure to secure tenure, achieve promotions and visibility, and obtain research funding. Thus, these factors influence authorship disputes and occur at all levels of academia but are particularly prevalent at higher levels. When decisions regarding authorship are made at the beginning of a project, issues regarding authorship, specifically undeserving authorship, decreased significantly: 23% vs. 47%. In her review, Fernandez [26] stated that clear communications and decisions at the start of a project may help to avoid such conflicts, yet she acknowledged that this type of discussion may be uncomfortable for student researchers. In a survey by Karani et al. [10], only 65% of respondents reported that authorship was clear to them. Of those, 72% indicated that it had been clarified to them prior to beginning the project. Most respondents were first authors (85%) and almost of the respondents (99%) reported that their mentors made the decisions regarding authorship orders that occurred at different times during the project. Yet, some students still had concerns regarding authorship. Accurate reflection of each author's relative contribution was the most common concern. Approximately one-third of respondents did not raise the issue with their mentors out of concern it would be solved [10]. Rose and Fischer [27] assessed 19 studies focusing

on the practices and perceptions regarding authorship decisions in student-faculty collaborations and presented similar findings. They stated the fear of negative consequences as the most common reason for refraining from reporting an incident.

Several committees have been founded to attempt to address authorship disputes. These working groups include the International Committee of Medical Journal Editors (ICMJE), the Vancouver guidelines, the World Association of Medical Editors (WAME), and the Committee of Publication Ethics (COPE). Yet, these published guidelines are still insufficient as significant change requires both increased consciousness of the academic community and modification of current guidelines [28]. The results are further strengthened by a study from U.S. National Institutes of Health demonstrating no significant changes following implementation of the current guidelines [29]. Although the data demonstrates that many authors seem to make use of the ICMJE guidelines, it is clear that many are still unfamiliar. Thus, increased awareness would significantly reduce confusion regarding authorship [20].

In their review, Rasmussen and co-authors [30] found that only a minority of accredited universities include recommendations for resolving student-faculty authorship disputes [30]. A Canadian study based in a medical setting indicated that researcher satisfaction may increase with guidelines developed in-house [31].

Rules and regulations aimed at resolving authorship issues are available for faculties to resolve authorship disputes and are offered by several regulatory organizations, including the

MEDICAL STUDENTS PLAY AN IMPORTANT ROLE IN SCHOLARLY LITERATURE, OFTEN PROVIDING FRONTLINE PERSPECTIVES IN BOTH ACADEMIC AND CLINICAL MEDICINE

American Psychological Association (APA), American Educational Research Authority, and the Office of Research Integrity. The APA offers various template contacts that can be used to help resolve and prevent authorship disputes. The ICMJE, a small group of medical journal editors, established a set of criteria that differentiates authors from other contributors. The criteria were revised several times since their introduction in 1985 [32]. The final 2009 revision defines an author as an individual who has made substantial *intellectual* contributions to a scientific investigation.

ICMJE developed three criteria for a person to be included as an author:

- Making substantial contributions to the conception and design, acquisition of data, or analysis and interpretation of data
- Drafting the article or revising it critically for important intellectual content
- Authorizing final approval of the version to be published [33]

All authors should meet the stated criteria, and all who meet the criteria should be listed as authors.

Each author should have participated sufficiently in the work to take public responsibility for its content. Administrative relationships, funding acquisition, data collection, or general supervi-

sion of a research group does not fulfill the criteria for authorship based on the guidelines and should be stated in the acknowledgements [34]. In addition, those who fulfill the first criterion should be given the opportunity to participate in the drafting, review, and final approval of the manuscript thereby not disqualifying them from fulfilling all three criteria. These criteria, which pertain to the definition of authorship, emphasize the intellectual functions relating to the tasks of authorship [35]. All participants must also complete a conflict-of-interest disclosure form.

To address these concerns, the APA policy does not specify an exact number of contributions, nor does it specify which types of contributions will qualify for authorship credit. Instead, the policy incorporates the author's general caution against rigid interpretation of authorship criteria, and the policy reiterates that authorship is based on both substantive activities as

ACADEMIC AUTHORITIES WITHIN MEDICAL INSTITUTIONS SHOULD PROMOTE LITERACY OF AUTHORSHIP GUIDELINES FOR BOTH FACULTY AND STUDENTS

well as the overall contribution. Consistent with the 2007 ICMJE recommendations, the policy also requires that all authors be involved in either drafting or critically revising the manuscript and that all authors provide approval of the manuscript before submission. The policy directly addresses a common issue with authorship and suggests discussion of authorship prior to the start of a project [35].

The Credit (CrediT) Taxonomy guidelines have established the basic foundations, thus enabling students, researchers, publishers, and even readers to clearly identify the various contributing roles of authors in a published manuscript. CrediT was created to allow quantification. Currently, it recognizes 14 types of contribution, including conceptualization, methodology, software, project administration, and data curation. More than two dozen journal publishers, including Cell Press, Public Library of Science, and Oxford University Press, are already using CrediT for at least some titles [36].

Despite the progress that has been made with these guidelines, there still are some limitations. First, although many different guidelines do exist, many naïve students or other researchers are unfamiliar with them. The guidelines also do not address the problem of researchers who have contributed to the work but are not included as authors on the final publication [37]. In addition, most current guidelines, like the ICMJE, do not mandate that all authors communicate exactly what contributions qualify them to be an author. Despite the pitfalls of these guidelines, over 600 international biomedical journals have adopted the ICMJE authorship criteria. This alliance emphasizes the consensus that the integrity of the research publication process is fundamental to the integrity of the research enterprise as a whole [10]. Yet, despite the recognized importance of the ICMJE criteria, the proportion of authors who do not meet the criteria remains relatively high, even in respectable journals [38].

The objective of this review was to create a predefined agreement of authorship and accreditation as a mutually binding contractual understanding between faculty and medical students collaborating on research projects. Soon after its inauguration, the Education Authority at Sheba Medical Center undertook the task of clarifying potential student–faculty authorship disputes in a prophylactic measure: compilation of an agreement of authorship and accreditation document as a call for action.

METHODS AND MATERIALS

For this review article, we performed a systemic literature review of authorships conflicts and guidelines. We assessed electronic databases, academic journals and articles and books. We

first searched publicly available websites with Google scholar's search engine. We also used Sheba Medical Center's

online library as well as PubMed. We searched the following keywords: *ethical authorship*, *authorship guidelines*, *student*, *researcher*, *medical education*, *student–faculty relationships*, *mentorship*, and *ethics*. We included all research papers that discussed the ethics of authorship but did not exclude outdated papers as these were potentially important in documenting the changes in authorship guidelines throughout time.

PRINCIPLES FOR SUGGESTED ACTION

Upfront, clear communications and explicit authorship decisions must be taken prior to research initiation

Based on existing literature and guidelines, making early decisions tends to be less problematic than decisions made after the work is in progress because the conflict potential increases as the rewards of authorship increase and some individuals may lobby for an authorship order change. For this reason, collaboration from all parties from the start is critical as agreements are signed to adhere to the guidelines.

Conflicts must be resolved with reliance on internationally acceptable guidelines

In 1999, an American study documented that only 17% of professional organizations had clear authorship criteria. In Australia, studies demonstrated that even in countries with existing authorship policies, universities failed to comply. Biomedical journals generally declare that they abide by ICJME guidelines yet do not explicitly state this to their authors and therefore are not routinely applied. Suggested solutions for raising awareness and continuing educational efforts include development of authorship policies in medical schools, implementation of departmental guidelines, and creation of national authorship policies. For example, independent authorship policies have been recommended in Australia and Denmark [25].

Academic authorities within medical facilities should promote literacy of authorship guidelines among faculty and students alike

Hren et al. [39] conducted a study to ascertain whether the ICMJE criteria would be more widely recognized and accepted if taught at a systematic level to medical students. A conclusion of the study was that a simple instruction of the ICMJE criteria, specifically to medical students, had a similar effect as years of research experience or medical work. Based on the subsequent data, it was concluded that among students who received instruction regarding authorship guidelines, there was a higher level of congruence between the proposed combinations and the ICMJE criteria.

Our suggested course of action has been drafted by a collaborative work of a student (MB) and faculty member (GS) [Figure 1]. This draft was further revised by an internal peer review of senior physicians and members of the Sheba Medical Center Physician Educator Group. These faculty members are associated with different clinical

disciplines and have experience with collaborative writing and publishing with junior physicians, residents, and students.

CONCLUSIONS

Faculty members have responsibility to students, who are vulnerable due to the power imbalance between them and their mentors. Authorship is a strong currency in terms of both personal satisfaction and professional advancement. Credits, in the form of authorship, are used as important criteria for assessment of tenure positions and promotion. For these few reasons alone, researchers rarely turn down an opportunity to co-author a paper. The notion also exists where gift authorship is offered to more senior researchers by their juniors based on the belief that inclusion of a more experienced colleague increases chances of the publication success. With so much at stake, deciding about authorship can be the most sensitive part of writing a paper.

Collaboration has many obvious valuable benefits in research. However, collaborative effects can also be a mixed blessing. While working together can improve the quality of research, increase productivity, enhance diversity, and encourage creative ideas, it is not free of disadvantages. At times, research teams may find themselves torn by competition, resentment among colleagues, and unethical decisions, which hamper their ability to produce important scientific literature. Authorship disputes, mainly the desire to be the first author, is often at the root of these conflicts. Recognizing this, standard criteria for authorship have been developed.

Education authorities within healthcare institutions should proactively pursue rightful and just authorship agreements among their faculty members and students invited to spend time at their facilities. The current review and call for action could serve as a guideline for academic units in hospitals worldwide.

AGREEMENTS OF AUTHORSHIP AND ACCREDITATION SHOULD BE ADOPTED AND USED BY FACULTY AND MEDICAL STUDENTS

Figure 1. A call for action. agreement of authorship and accreditation

A Call for Action. Agreement of Authorship and Accreditation.
by the Education Authority at the Sheba City of Health.

1. The following principles are agreed between the faculty member _____ and the student _____ working together on research, intended to bear the fruits of future scientific publication.

2. Student's duties include (check relevant):

- ✓ Data collection
- ✓ Data management
- ✓ Drafting the manuscript
- ✓ Statistical analysis
- ✓ Preparing tables and figures

3. Faculty duties include:

- Mentoring students and other trainees through the whole process duration: from research initiation until article submission
- Discussing and agreeing upon authorship prior to starting the project (to be detailed in chapter 4 below)

4. Student rights:

- Respectful learning environment
- Specified working hours detailed: _____
- Authorship detailed: _____

5. Faculty rights:

- Assistance from students and trainees throughout the whole process duration: from research initiation until article submission
- Submission of student work within agreed time frame: _____

6. The order of authorship in this manuscript currently titled _____ is as follows:
first author: _____; second author: _____;
last author: _____; equal contributors as follows: _____;
other authors to be listed: _____;
corresponding author: _____.

7. Acknowledgments will be awarded to: _____
Signed on date: _____; On behalf of Education Authority: _____

The signed agreement will be copied and also saved by the Chaim Sheba Education Authority for any future needs.

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Capsule

Gut bacteria alleviate smoking-related NASH by degrading gut nicotine

Tobacco smoking is positively correlated with non-alcoholic fatty liver disease (NAFLD), but the underlying mechanism for this association is unclear. **Chen** et al. reported that nicotine accumulates in the intestine during tobacco smoking and activates intestinal AMPK α . The authors identified the gut bacterium *Bacteroides xylanisolvens* as an effective nicotine degrader. Colonization of *B. xylanisolvens* reduced intestinal nicotine concentrations in nicotine-exposed mice, and it improved nicotine-exacerbated NAFLD progression. Mechanistically, AMPK α promotes the phosphorylation of sphingomyelin

phosphodiesterase 3 (SMPD3), stabilizing the latter and therefore increasing intestinal ceramide formation, which contributes to NAFLD progression to non-alcoholic steatohepatitis (NASH). These results establish a role for intestinal nicotine accumulation in NAFLD progression and reveal an endogenous bacterium in the human intestine with the ability to metabolize nicotine. These findings suggest a possible route to reduce tobacco smoking, which exacerbated NAFLD progression.

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