Case Report ■

Authorship versus "Credit" for Participation in Research: A Case Study of Potential Ethical Dilemmas Created by Technical Tools Used by Researchers and Claims for Authorship by Their Creators

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Abstract   The distinction between authorship and other forms of credit for contribution to a publication has been a persisting controversy that has resulted in numerous guidelines outlining the expected contributions of those claiming authorship. While there have been flagrant, well-publicized deviations from widely accepted standards, they are largely outnumbered by cases that are not publicity-worthy, and therefore remain known to only those directly involved with the inappropriate conduct. We discuss the definition and ethical requirements of authorship, offer a case example of the authorship debate created by a technical tool at our institution, and review parallels that support and dispute the authorship claims of our software developers. Ultimately, we conclude that development of a technical tool that enables data collection does not adequately substitute for contributions to study design and manuscript preparation for authorship purposes. Unless the designers of such a technical tool prospectively participate as a part of the project, they would not have an adequate understanding of the publication's genesis to defend it publicly and cannot be listed as authors. Therefore, it is incumbent upon project members to invite tool developers to participate at the beginning of such projects, and for tool developers to contribute to study design and manuscript preparation when they desire authorship listings.

■ **J Am Med Inform Assoc.** 2007;14:16–18. DOI 10.1197/jamia.M2212.

Introduction

> . . .like claiming credit for writing Hamlet because you furnished Shakespeare with a pencil?[1]

The number of articles cited by PubMed has grown linearly since the 1960s to a total exceeding 16 million at present.[2] The number of papers published and cited by PubMed each year has risen with a doubling time of about 20 years and a total exceeding half a million per year in 2002.[3] From 1980 to 2000 the number of authors per manuscript in the major medical journals grew more than 50% to 6.9 per article, and single-author articles nearly vanished.[4,5] While some of the growth in published scientific articles is the result of the rapid growth in numbers of scientists and engineers, exceeding the growth rate in the U.S. workforce by a factor of nearly five,[3] inevitably questions of propriety of duplicate publication and claims of gratuitous or fraudulent authorship have been raised.[6] Sporadic attempts to limit the number of authors have not caught, however, probably creating as many problems as they have solved.[7]

Disagreements on legitimacy of authorship claims are issues of limited interest or importance to all but a tiny segment of our planet's inhabitants, and they rise to public consciousness only when prominent scientists are enveloped in scandal: An example of newsworthy "fraudulent" authorship was the Darsee affair, in which prominent heads of departments of Harvard and Emory were listed as "authors" of papers in the *New England Journal of Medicine* containing fraudulent data, of which they had little or no knowledge.[8]

In the academic community, however, publication in peer-reviewed journals is of great interest—it is proof of productivity in competition for jobs, promotions, and funding. Although quality of research and the order of authorship are claimed to be the prime factors in determining the value of a publication, the fact is that numbers count. Furthermore, many worthy, underpaid, and hard-working scientists who support the productivity of higher-profile scientists with their essential creativity and industry labor in obscurity unless their names are added to growing lists of "authors" in a publication.

The fundamental problem, of course, is the muddle that results from trying to distinguish authorship of a manuscript from appropriate recognition or credit for involvement in the scholarly pursuits that produced the manuscript. The broad definitions of "author" demonstrate the essence of the muddle: An author is "the person who originates, invents, gives rise to, or causes something"; "a person who authorizes or instigates"; or "the writer of a book, essay, articles, etc."[9]

Journals are, after all, publications: For centuries journals have assumed that authors write manuscripts that describe what they have discovered. But to the critical eyes of those who have

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ghostwritten scientific articles for "authors," careful reading of nearly every issue of major journals shows tell-tale signs of scientific writers ("ghosts") whose efforts make senior scientists more productive.[10,11] We believe that authorship has moved away from the concept of writing about one's work to the broader definition of giving rise, originating, and instigating—and ironically the writing of the manuscript itself is assuming more the role of a craft.[10] In these cases, the author is at least expected to wield final authority for the approval of the article (as well as assuming responsibility for its content), but in reality may sometimes have little input into its content—especially in multi-author papers reporting major clinical trials.[12,13]

We were recently challenged by colleagues who asserted that the traditional concept of authorship may be too narrow. Herein we describe a case report of authorship expectations from the creator of technical tools we used for data collection and discuss the legitimacy of this claim.

Case Description

Our seven-hospital system has developed a user-friendly "result viewer" that makes it possible to access simultaneously multiple clinical databases containing information that has been collected in the routine process of providing patient care. The development of result-viewer software was funded by both intramural and externally obtained grants; the software was not initially intended to be used for research, but was for the sole purpose of increasing clinician productivity. However, its developers quickly recognized the result viewer's potential for research, and they added features that facilitate its use for scholarly inquiry—often helpfully customizing features on request of researchers, at the expense of considerable additional effort and time on their part. Because its intended use was for patient care, it is widely available to any patient care provider in the hospital system who has a legitimate use for it.

The developers of the result viewer assert that they have, in a sense, created a vast potential research database by providing easy searching of otherwise relatively inaccessible clinical information. The database is both historical, reaching back several years, and "real time." For example, one of this paper's authors (JDM) was able to determine, from the convenience of his administrative office, that a patient in the process of being admitted to the emergency department met the inclusion and exclusion criteria for a clinical trial by viewing current and past clinical information; as a result, the patient was successfully enrolled in the trial thirty minutes later, before receiving an antibiotic that could have excluded him from the trial.

The developers assert that the result viewer and the databases that it makes available are their "laboratory." Indeed, without the use of their result viewer many productive, inexpensive, unfunded research projects that are currently ongoing would not be possible. They claim that there is no difference between their "laboratory" (the data accessed by the result viewer) and one managed by a basic scientist who has, through years of work and funding, created a productive immunology laboratory—or a cardiologist who methodically has kept careful patient records in his or her office practice to enable future publishable clinical analyses.

We are studying the accuracy of diagnoses and outcomes of community-acquired pneumonia in our emergency room using the result viewer they developed to identify patients, collect data, and produce a list for subsequent inpatient chart review. Specifically, search tools of the result viewer were used to generate a list of patients who met our inclusion/exclusion criteria. Patients from this list were randomly chosen for further review. This review included obtaining data both from the result viewer as well as a paper chart review performed by the researchers. This use neither required support nor the development of new tools by the result viewer's development team. The result viewer's development team did not participate in our study in any manner other than the contribution of the result viewer. Since the result viewer is available to all clinicians providing patient care at our institution, no special permissions were required prior to use for our study. Our study is unfunded and investigator-initiated, and without the use of their viewer it would be too laborious to be practical. The software developers (who are emergency room physicians at a sister hospital) have requested authorship and right of prior approval of the publications resulting from our study, in accordance with the International Committee of Medical Journal Editors (ICMJE) guidelines.[12]

Discussion

Is their claim legitimate? The ICMJE offers specific criteria for authorship that are most commonly referenced by scientific journals: "Authorship credit should be based on 1) substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data; 2) drafting the article or revising it critically for important intellectual content; and 3) final approval of the version to be published. Authors should meet conditions 1, 2, and 3."[12] There is not, however, uniform agreement with these criteria: The American Chemical Society (ACS), the American Statistical Association (ASA), the Committee on Publication Ethics (COPE), and the National Institutes of Health (NIH) are less specific and allow more freedom in determining the appropriateness of granting authorship.[3] Individual journals may be either less or more strict, and the pharmaceutical industry has its own views.[14]

In favor of granting authorship to our software developers would be that they may have fulfilled item one (acquisition and analysis of data). While the software developers did not "contribute directly to the intellectual content of the paper" (Annals of Internal Medicine guidelines),[15] arguably they could be said to "have participated sufficiently in the work to take public responsibility for appropriate portions of the content" (Journal of the American Medical Association guidelines).[16] Claxton[3] categorized over-crediting of authors into the following useful categories: coercion, mutual support/admiration, gift, and duplicate production authorship. Our concern is that we were at risk of offering a gift or guest authorship.[13]

In considering our colleagues' claims to authorship, we contemplated some analogies that might clarify the ethical issues at stake in their favor. First is the borrowed use of a physical laboratory. In this scenario a medical student has been granted medical school funding for her summer project that requires the use of laboratory equipment, such as gas chromatography. The laboratory equipment has been purchased with grant money and is operated by a medical school professor. The student might just assume that the professor is entitled to authorship, e.g., a gift authorship; in reality, offering of authorship is greatly influenced by the professor's ownership and ability to deny access to the needed equipment (a student with

a more generous grant, of course, might just contract out for the analyses!). The gas chromatograph is similar to the result viewer in that it is required to obtain the study data. In contrast to the physical lab, however, the developers cannot practically limit our access to the result viewer, although it is not unreasonable to assume that they might do so if it were feasible. While the practice of using access to one's laboratory as leverage to obtain authorship in the absence of active involvement is probably coercion authorship and would be considered unethical by many, we suspect it is commonly practiced. Our developers may, therefore, have tradition in their favor.

Another analogy is that of the use of extant research databases. Study databases may be expensive to develop, and appropriately are saved following publication of a study to be periodically queried to answer new questions or to be expanded in future trials; these queries can, of course, result in important new publications. It is reasonable to assume that the researcher who controls access to the database would have the right to approve future manuscripts, and would be offered authorship as a validation of the accuracy of the data, e.g., the Framingham database. In a very practical sense our developers have lost their ability to limit access to the databases since they cannot prevent the use of their clinical software for the answering of research questions, and cannot vouch for the accuracy of our data. If, however, one considers that creating a tool that gives access to an otherwise relatively inaccessible body of data is equivalent to creating the databases, we may be behaving unethically by not offering authorship to the developers.

Finally, there may be parallels that ultimately weaken their claim for authorship. CareScience (CareScience; Philadelphia, PA) and Siemens (Siemens; Munich, Germany) have software products that have been purchased by our system for data analysis, but neither has expressed interest in authorship of publications resulting from their use. Our freedom to publish without prior approval or granting authorship to the developers of these other software applications suggests that granting authorship is not mandatory. In fairness, we use the result viewer not just because it is available as would be the case of the other two products; we use the result viewer because its developers have created features that facilitate its use for research.

While it is our wish to provide recognition to our colleagues for the research use of their patient care software as an acknowledgment, we are concerned that it might not be ethical to grant authorship. We are cognizant of the benefits that may be received by our software development colleagues through acknowledgment as authors; and we are appreciative of the software they have produced, which has enabled us to perform studies previously not possible. Moreover, we might benefit if they received recognition and be better positioned to obtain promotions and additional funding for future enhancements of their software. Nevertheless we believe that we would be guilty of granting a "gift authorship." While gift authorship is undoubtedly common,[17] may also be a "poisoned chalice" that exposes its recipients to unpredictable embarrassment and liability.[8,18] Or, we may be behaving like ill-mannered, ungrateful colleagues.

In lieu of authorship, there are alternative forms of credit that have less restrictive requirements and may be more appropriate. These include formal approaches such as referencing prior

publications by the software development team that describes the functionality of their result viewer, or listing the software and company information in a reference or footnote. As well, the less formal approach of listing the names of the senior members of the development team in the acknowledgment section may offer the deserved credit in an ethical manner.

In summary, our point of view is that the data belong ultimately to the patients, not the software developers; similarly, we believe that access to the result viewer is an unrestricted benefit of our system, which paid for its development. The result viewer was designed primarily to improve the efficiency and quality of patient care, but using it to create a research database is not substantively different from using our hospital's medical records department to access and record data from patient charts. Despite sympathy for the argument that we are using the fruits of their labor, which includes customization of the result viewer to facilitate research, without suitable recognition, we must reject it. We note that they were not involved with our study concept and design, nor the analysis and interpretation of data; they cannot take responsibility for the accuracy of the published results; and we have no need of their involvement in the writing or editing of the paper.

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