

# Authorship and Publication Matters: Credit and Credibility

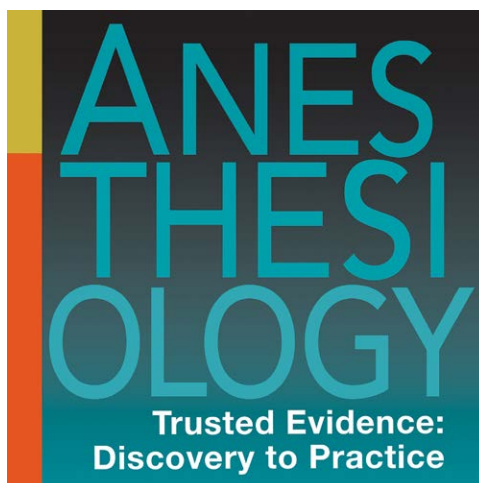
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Anesthesiology periodically updates our Instructions to Authors and communicates the changes broadly. This Editorial aims to provide brief summaries, background information, justifications, and applicability of the Journal policy updates, which are effective with this issue. These updates address the importance of recognizing the role of collaborators in research and mechanisms in ANESTHESIOLOGY for doing so, qualifications for authorship in ANESTHESIOLOGY, unacceptable types of authorship, salami publication *versus* appropriate use of segmented publication, acceptability of limited text recycling, and other elements of scientific integrity.

## Authorship: What Counts, Who Counts, Who Cares?

Appropriate recognition for contributions to basic, clinical, and population research is an important aspect of scholarly publication.

ANESTHESIOLOGY strongly endorses the practice of appropriately crediting contributions to research publications toward the goals of giving proper recognition, fairness, and transparency for authors and readers, ensuring contemporary Journal best practices, and clarity of communication. ANESTHESIOLOGY has for years provided multiple ways to offer appropriate credit on articles and communicate that credit through commensurate means of attribution and will continue to do so.



**“ANESTHESIOLOGY has for years enabled multiple ways to offer appropriate credit on articles and communicate that credit through commensurate means of attribution, and will continue to do so.”**

What constitutes authorship is one of the most vexing problems in contemporary scholarly publishing, in part because there are no universal definitional standards of authorship. The *sine qua non* of authorship is a substantial intellectual contribution. Authorship denotes credit. Equally important is that authorship also denotes responsibility and accountability. Authorship credit and accountability are inseparable. Authorship is one form of credit, but other forms are more appropriate for work done that does not include all the necessary elements of authorship.

Scholarly publications serve a dual purpose—one for which they were created and the other an unintended byproduct. The former is scientific communication, and the latter is use by institutions for assessment and reward.<sup>1</sup> Authorship is used in science to communicate research findings to peers and the

public, denote credit and responsibility, document personal accomplishment, and advance careers, while it is used outside science by institutions whose interests often differ, such as for promotion and tenure processes, metrics of faculty productivity, and ranking institutional programs and reputations.<sup>2,3</sup> In both embodiments, communication and academia, authorship is “the currency of the political economy of scientific practice.”<sup>4</sup> That primary currency of scientific credit (“coin of the realm”) is reward assigned through peer

Image: None (Journal icon).

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review (reputation, prizes, tenure, membership in societies, etc.) not transacted according to the logic of economies and markets.<sup>5</sup> That is, authorship must be intellectual, not transactional.

Escalating author counts in science are a longstanding phenomenon. The average number of authors per published article has risen steadily for decades.<sup>6–9</sup> From the 1930s to the 1970s, the average number of authors on a published article was 2 and since then has escalated sharply.<sup>10</sup> Between 1970 and 2010, the number of articles with 6 to 10 authors increased more than 10-fold. By 2000, the average number was 7, and the number of articles with 11 to 20 authors increased more than 20-fold.<sup>8,10</sup> Multiauthorship (more than 10 authors) and hyperauthorship (more than 100 or even 1,000 authors) are now common.<sup>11,12</sup> Biomedical science (basic and clinical), however, accounts for a disproportionate share of scientific articles with high author counts,<sup>11</sup> and such author plurality was recognized more than a decade ago as a defining feature of life sciences research.<sup>13</sup>

The cause of increased coauthorship is multifactorial. It is due in part to the increasing complexity of science, the growth of multi-/inter-/cross-/trans-disciplinary and team science, the size and complexity of clinical trials, and the benefits and ease of collaboration. Articles reporting collaborative research are published in higher impact journals and are cited more frequently.<sup>14</sup> Such collaboration is a sign of success. Nevertheless, while coauthorship may be considered evidence of collaboration, the converse, that collaboration automatically merits coauthorship, is incorrect. Collaboration is a process and descriptor of work performed, while authorship is a metric of intellectual contribution, with specific norms and guidelines. Collaboration, if simply involving ancillary activities such as simple data collection for a multicenter trial, should not be equated with authorship.<sup>15</sup>

The increase in author numbers is due not only to increasing research complexity (technical sophistication of research process and attendant specialization of individual researchers) and collaboration but also to increasing competition. This competition includes pressures from evaluative criteria such as grants, patents, publications, and article citation rates that directly affect hiring, promotion, and tenure and indirectly affect social capital among colleagues, as well as pressures from scarce resource allocation (extramural grants, institutional support, compensation), and promotion, tenure, and recognition (prizes, awards).<sup>16</sup> An analysis of the first 50 original articles published in the *Journal of the American Medical Association*, the *New England Journal of Medicine*, and the *British Medical Journal* each decade from 1960 to 2010 concluded that increasing research complexity and effort was an inadequate explanation for authorship growth.<sup>17</sup> Instead, the better explanation was increasing academic pressure to publish, and the paucity of incentives to reduce multiple authorship—that is, author inflation.<sup>17,18</sup> Another

analysis also examined whether growing coauthorship was due to increasing complexity or increasing competition.<sup>16</sup> It concluded that both complexity and competition contribute to higher author counts, but the role of complexity was steady or declining, while that of competition increased markedly. Another, game theory–based, analysis suggested that pursuit of the *h*-index (which grows with author numbers) was a “rational behavior” consequence of the current academic reward system.<sup>19</sup> Thus, authorship growth is being driven in part by the academic reward system and attendant pressures. This is unfortunate, if not detrimental. Indeed, the pressures from institutional metrics have spawned an entire ecology of academic misconduct and manipulation.<sup>1</sup> This is particularly problematic from a journals perspective because they have become involuntary victims of the struggle by universities to solve their own intractable problems regarding promotion and reward processes, which are perhaps most acute with biomedical sciences and clinical faculty.

A corollary of author inflation is author perceptions of contribution. Authors may overestimate their contribution to science.<sup>20</sup> When coauthors of multiauthored articles were asked to estimate their fractional contribution to multiauthor articles, the sum exceeded 100% (it was 168%). When asked again, with a reminder that the sum cannot exceed 100%, the sum still remained greater than 100% (133%). Researchers had estimated their role as greater than it probably was and greater than what their collaborators thought it was.<sup>20</sup> Disagreements about authorship naming are unfortunately common, and the most important factor leading to author disagreements is “measuring or valuing contributions,” which can affect scientific integrity, reputations, wellbeing, team cohesion, and future collaborations.<sup>14</sup>

Authorship is a matter of scholarly integrity. Author plurality *per se* is not at issue. Author inflation is problematic and disconcerting, but the inclusion of gift and guest authors is truly unethical and rampant. Such authorship practices are considered a type of research fraud.<sup>21</sup> *Gift* (honorary, courtesy) authorship is offered from a sense of obligation, tribute, dependence, or respect to an individual who did not contribute to the work in return for anticipated benefit (e.g., a department chair) or to a junior intending to advance their career. This is perceived to be the most prevalent type of authorship fraud. *Guest* (celebrity, prestige, complementary) authorship is granted in the belief that expert standing of the guest will increase the likelihood of publication or the credibility or status of the work or the authors. Gift and guest authorship are often referred to interchangeably. One-fourth to one-third of published original research articles in six leading medical journals had one or more honorary authors.<sup>22,23</sup> More than one-third of Cochrane reviews had gift authors,<sup>24</sup> and authorship criteria were probably not met by all authors in more than half of the reviews with more than 15 authors.<sup>25</sup> Among the major various types of research fraud, gift authorship was perceived to be the most prevalent by faculty at U.S.

research-intensive universities<sup>21</sup> and by Chinese faculty who had recently worked in China and were working at European universities when surveyed.<sup>26</sup>

What is the harm of a few extra authors? Why not a few “guests”? Why not hand out some “gifts”? Why not keep the boss happy—make them an author? Why not give authorship to a trainee who was essentially uninvolved but could certainly use a citation or two on their CV to “help” their career? Why not include the nice clinical fellow who collected a blood sample while on call? What about a surgeon who “requires” coauthorship as the “price” to enroll “their patient” in a clinical study?

The answer is integrity and trust in published evidence. The entire research and publication process relies on trust. Proper authorship enhances confidence in the validity of published research. As stated by Papadakis and Zirngibl, “*Authorship abuse is not a victimless crime. If scientists or clinicians are prepared to lie about the people involved with a research project or a publication, why should we expect them to be any more honest about their findings?*”<sup>27</sup> Authorship practices and misbehavior influence not just manuscript and research group integrity but more broadly the culture of institutional research integrity, and there is an association between authorship conflicts and other research misbehaviors.<sup>28</sup>

How authorship is determined and how credit is apportioned today are “highly subjective, open to abuse, and often determined more by laboratory politics or seniority than by actual effort or contribution.”<sup>10</sup> Unethical authorship practice, or misuse, while acknowledged as misbehavior, may be dismissed as “normal misbehavior,” “a marginal issue”, or “peripheral incidents of self-aggrandizement” that are common, mundane, and of little consequence for the advance of science.<sup>14</sup> We disagree. Authorship is not a “marginal” issue but rather one of scientific integrity, justice, fairness, equity, and collegiality. Issues and disagreements about naming and ordering of authors are distressingly common—reported by one-third to one-half of survey respondents.<sup>14,29</sup> Authorship issues are perceived more frequently in medical sciences than in natural sciences and engineering (*i.e.*, differing by discipline), by more vulnerable early/midcareer than tenured academics (*i.e.*, differing by faculty rank), and more often by women than men (*i.e.*, differing by sex).<sup>14,30</sup> Authorship misbehavior is learned behavior. Trainees learn it from their supervisors<sup>14</sup> and from the “hidden curriculum” of unethical practices about assigning authorship<sup>28</sup> and may later transmit it to their trainees.

Unjustified authorship dilutes and detracts from the deserved credit accrued to qualifying authors. It also dilutes responsibility and accountability.<sup>31</sup> Moreover, from the career advancement perspective, it creates an inflationary cycle. More authors on papers leads to institutions “upping the bar” for promotion, which in turn increases the pressure for more authorship on more publications. In addition, “if faculty are promoted based on approaches that

overemphasize and overvalue “collaboration” over more in-depth scholarly involvement, this could have detrimental effects on the scientific and ethical standards of academic institutions.”<sup>15</sup>

The definitions and criteria for authorship have been debated for decades, if not centuries.<sup>5</sup> Authorship criteria differ widely across disciplines, fields, institutions, labs, journals, and historically between various countries and cultures, and they have evolved over time (*e.g.*, traditions of offering gift authorship to academic superiors are hopefully waning). Different disciplines variously value technical and intellectual contributions.<sup>2</sup> Humanities and social sciences differ from science, technology, engineering, and math; particle physics and astronomy have vastly different authorship norms than biomedical science; and universities may have their own authorship guidelines.

We focus here on the biomedical sciences, which have comparatively more homogeneous authorship criteria, especially in the fields of perioperative, critical care, and pain medicine. Various organizations representing publishers, journals, and editors have recommended policies and standards regarding authorship, but these recommendations differ in some substantive ways. They also defer to institutions in some areas and recommend that institutions create their own authorship policies and standards. Nonetheless, only 24% of U.S. doctoral institutions assessed had a publicly available authorship policy.<sup>28</sup> Authors at institutions that do have research policies may not be aware of or actively use them.

The above considerations, in the interest of clarity, consistency and transparency, and service to authors, readers, editors, and reviewers, and to the goal of trusted evidence, underpin the longstanding authorship policies of ANESTHESIOLOGY, as communicated in our Instructions to Authors. ANESTHESIOLOGY bases policies on a synthesis of the best recommendations of the International Committee of Medical Journal Editors, Committee on Publication Ethics, World Association of Medical Editors, and Council of Science Editors.<sup>32–35</sup>

Whereas ANESTHESIOLOGY authorship criteria remain mostly unchanged (see box for highlights of changes), the above discourse is intended to educate investigators about the importance of authorship, recognizing meritorious contributions to team science, and giving appropriate recognition to those not qualifying for authorship. Contributors who do not meet all five of the ANESTHESIOLOGY authorship criteria should not be listed as authors but can be recognized. Activities that alone (without other contributions) do not qualify a contributor for authorship include acquisition of funding; general supervision of a research group; general administrative support; mentoring; collecting samples; providing reagents, animals, patients, or other study materials; writing assistance; technical editing; language editing; and proofreading.<sup>32</sup> One mechanism for recognition is listing as a collaborator, which is listed in the published article and indexed in PubMed.

## Highlights of Updates to the ANESTHESIOLOGY Instructions to Authors

### Authorship

Authorship requires a substantial intellectual contribution and signifies credit, responsibility and accountability. Authorship in ANESTHESIOLOGY must satisfy all of the following five criteria:

1. Scholarship: Substantial intellectual contributions to research conception or design, execution, data analysis, or interpretation of the results; AND
2. Authorship: Drafting the manuscript or revising it critically for important intellectual content; AND
3. Approval: Final approval of the version to be published; AND
4. Ethics: Agreement to be accountable for all aspects of the research and manuscript; AND
5. Integrity: Ensuring that questions related to the accuracy or integrity of any part of the research and manuscript, even ones in which the author was not personally involved, are appropriately investigated, resolved, and communicated (where needed).

All authors must meet all five criteria, and all who meet the five criteria should be authors.

ANESTHESIOLOGY continues to encourage appropriately crediting contributors who do not meet all five authorship criteria as collaborators (listed in the published article and indexed in PubMed) or in the Acknowledgments section of the published article.

Unacceptable forms of authorship include:

- Gift (honorary, courtesy) authorship: Offered from a sense of obligation, tribute, dependence, or respect to an individual who has not contributed to the work in return for anticipated benefits. The most prevalent type of authorship fraud.
- Guest (celebrity, prestige, complementary) authorship: Granted in the belief that expert standing of the guest will increase the likelihood of publication or the credibility or status of the work.
- Ghost authorship: Failure to identify someone who merited authorship.

### Text Recycling

ANESTHESIOLOGY will permit text recycling (reuse of text in a new document that is identical or substantively equivalent to the published source and where at least one author is also an author of the prior publication), exclusively in a Methods section (not elsewhere) to describe a standard laboratory method or clinical protocol, in limited amounts, and with proper citation to the original publication.

### Segmented Publication

Inappropriately dividing research that would form one meaningful manuscript into multiple different manuscripts ("salami" publication) is unacceptable. ANESTHESIOLOGY does recognize that segmenting a large study into two or more manuscripts may sometimes be most appropriate. Such examples are provided in the Instructions to Authors. Transparency of reporting, citation, and clarity to prevent double-counting are of paramount importance. Authors are welcome to submit multiple manuscripts derived appropriately from a single investigation and are encouraged to submit them at the same time. Reports of secondary outcomes should be accompanied by the manuscript (published or unpublished) describing the primary outcome or analysis. Authors are encouraged to submit primary and secondary manuscripts at the same time.

### Integrity

Authors must provide their institutional affiliation, institutional title or position, and institutional email address. Noninstitutional email addresses are not acceptable unless there is no institutional email address.

Another is an Acknowledgment, which is listed in the published article. These types of recognition are common and appropriate in large and multicenter clinical trials, registries, observational database work, and genetic research.

### Scientific Integrity

Two problems that are fortunately rare but are also forms of author misconduct are fictitious (fake) authorship and false affiliations.<sup>36,37</sup> Fake authors do not exist. Fake authorship may be particularly problematic with preprints,<sup>37</sup> further undermining their credibility, a problem not addressed when preprints were recently visited in this Journal.<sup>38</sup> Justification for fake authorship is often opaque<sup>37</sup> but may

be portrayed as rightful social protest or civil disobedience.<sup>39,40</sup> An extreme example is the case of Camille Noûs, a purely fictitious researcher with nearly 200 publications.<sup>40</sup> If an author does not exist, there is no trust or credibility in the research or publication.

False author affiliations similarly undermine trust and credibility in research and publication. A statement of author affiliation in an article denotes that the author was employed there and that the institution bears some responsibility for the integrity of the article. Claiming false affiliation may be done in an effort to boost the credibility of an article, which is fraud. In addition, journals occasionally need to contact authors and institutional officials where authors are affiliated, sometimes for reasons of integrity. False affiliations



preclude this journal responsibility. The inability to validate author affiliations was surprisingly common and may indicate misrepresentation if not misconduct.<sup>41</sup> False affiliation is a form of research falsification, which is scientific misconduct. To protect the integrity of articles, their authors, and ANESTHESIOLOGY, we will require that authors provide their institutional affiliation, institutional title or position, and institutional email address. If one is an unpaid employee, visiting scholar, or visiting student, both the home institution and the institution at which the work was done should be listed as affiliation and each clearly identified as such.

In addition to the complex issue of authorship, ANESTHESIOLOGY would like to update the readership on two other important issues regarding our content: text recycling and salami *versus* appropriately segmented publications.

## Text Recycling

Whereas every published research article must stand alone, sequential manuscripts describing standard laboratory methods or clinical protocols may find it challenging or impractical to describe them uniquely, particularly without dilution, adversely changing meaning, or reducing comprehension. Said differently, “there are only so many different ways that anyone can describe how they make a peanut butter sandwich.”

ANESTHESIOLOGY routinely uses software to screen submitted manuscripts for duplication of published or posted articles. Plagiarism (of others’ work) is unequivocally unacceptable and considered scientific misconduct. Rewording text just to disguise previously published material or avoid detection by plagiarism software is not a solution. In the past, ANESTHESIOLOGY considered reusing text from one’s own publications to be self-plagiarism and hence unacceptable. Not only is self-plagiarism not considered to be misconduct (including under U.S. federal law), but attitudes and beliefs about limited text recycling (as it is now known, because plagiarism is a pejorative term) have changed, thanks in large part to the excellent work of Cary Moskowitz and the Text Recycling Research Project.<sup>42–44</sup> In some circumstances, for example the above consideration of laboratory and clinical protocols, limited text recycling may be appropriate or even preferable. ANESTHESIOLOGY now provides guidance to authors on how and when to use limited text recycling, specifically limited to describing research methods. As a caution, however, endorsement of appropriate limited text recycling is not permission or encouragement of either duplicate publication or plagiarism, which remain unacceptable.

## Salami and Segmented Publication

Divided or “salami” publication, or “least publishable unit,” is the inappropriate dividing of research that would form one meaningful manuscript into multiple different manuscripts.<sup>45</sup> It is different from (but may have elements of)

redundant or duplicate publication. Salami publication is considered unacceptable, including by the U.S. Office of Research Integrity,<sup>46</sup> the Committee on Publication Ethics, and others. Salami publication can lead unsuspecting readers to believe that data in each slice (*i.e.*, each article) are independently derived from a different study or subject sample and can confound reviews and meta-analyses if subjects are counted more than once. Salami publication may be particularly problematic when secondary outcomes are published before the full study and primary results. ANESTHESIOLOGY has long discouraged authors from salami publication; a single comprehensive manuscript is preferable.

ANESTHESIOLOGY does recognize, however, that segmentation may sometimes be the most meaningful approach to research dissemination. Examples of when two or more manuscripts may be appropriate include too much information for a single manuscript, complex clinical trials with multiple aims or outcomes, longitudinal studies with initial results and long-term follow-up, prespecified interim analyses of clinical importance, planned or unplanned secondary analyses of original trials that are important enough to justify separate publication, and reanalysis of data using a novel technique not available at the time of publication. Transparency of reporting, reference to previous or copublications, and clarity to prevent double-counting in subsequent systematic reviews or meta-analyses are of paramount importance when publishing multiple manuscripts. Multiple manuscripts emanating from a single investigation are best submitted and published together when possible, because this increases transparency, improves statistical evaluation, decreases redundant publication, enables evaluation by the same reviewers, and often increases the impact of all the publications. Special attention should be paid to any need to adjust for multiplicity and appropriate interpretation of secondary outcomes when there are multiple comparisons across multiple papers. Concerns of multiplicity and type 1 error are just as valid across manuscripts as they are within manuscripts.

ANESTHESIOLOGY welcomes multiple manuscripts derived appropriately from a single large investigation. A practical test for appropriate segmentation is whether there are completely separate hypothesis or research questions, but not when there are the same or closely related hypotheses, research questions, populations, or results, or splitting purely by outcomes. The following applies to such manuscripts:

- Authors are encouraged to submit multiple manuscripts from the same investigation to ANESTHESIOLOGY at the same time (excepting interim analyses and long-term follow-up studies) with explanation in a cover letter. Authors must clearly disclose at submission if another manuscript derived from the same investigation or using the same database has been published previously, has been submitted elsewhere, or will be submitted to another journal.
- Authors may submit secondary outcomes, analyses, and long-term follow-up of clinical trials, with explanation

in a cover letter. These must be accompanied by the manuscript (published or unpublished) describing the primary outcome or analysis. Secondary outcomes and analyses and long-term follow-ups must explicitly state (in the Abstract, Introduction, Methods, Results, and Discussion) that they are part of a larger whole or primary (or interim) analysis or previously reported database and cite that article. They are usually only published after acceptance or publication of the primary outcome or analysis. Authors are encouraged to submit primary and secondary manuscripts to *ANESTHESIOLOGY* at the same time, when feasible.

## Conclusions

Authorship, author integrity, text recycling, and segmented publication affect the validity and trustworthiness of the articles and evidence that *ANESTHESIOLOGY* publishes. As a leading journal in the field, with a mission to publish trusted evidence and also to serve our authors and the scientific community with the highest possible ethical standards, we create policies, keep them updated, and communicate them in the form of Instructions to Authors. To aid in author education and facilitate their preparation of manuscripts, we also provide information in our new Author Resource Center. In part through periodic reexamination and updating of the Instructions for Authors, *ANESTHESIOLOGY* strives to live up to its motto, "Trusted evidence: discovery to practice." Biomedical science is not a static endeavor, and the standards surrounding authorship, text recycling, and the segmenting of publications have changed over time as described in this article. By carefully and fairly applying these evolving standards, we strive to maintain and improve the high standards of quality that our readership expects.

## Competing Interests

Dr. Kharasch is Editor-in-Chief of *ANESTHESIOLOGY*. Drs. Avram, Bateman, Clark, Culley, Davidson, Houle, Jiang, Levy, London, Sleight, and Vutskits are Editors of *ANESTHESIOLOGY*. Dr. Bateman indicates financial relationships with Pacira Pharmaceuticals, Inc. (Parsippany-Troy Hills, New Jersey), GlaxoSmithKline (Brentford, United Kingdom), Eli Lilly and Company (Indianapolis, Indiana), Takeda Pharmaceutical Co. (Tokyo, Japan), Aetion, Inc. (New York, New York), and the Alosa Foundation (Boston, Massachusetts). Dr. Clark indicates financial relationships with Teikoku Pharma USA (San Jose, California). Dr. Houle indicates financial relationships with Eli Lilly and Company and StatReviewer.

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