

## Equal contributions and credit given to authors in anesthesiology journals during a 10-year period

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Received: 28 September 2011 / Published online: 19 November 2011  
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**Abstract** To investigate the prevalence and characteristics of the practice of explicitly giving authors equal credit in publications of major anesthesiology journals. Four major anesthesiology journals (*Anesthesia and Analgesia* (AA), *Anesthesiology*, *British Journal of Anaesthesia* (BJA) and *Pain*) were searched manually to identify original research articles published between January 1st, 2001 and December 31st, 2010 with respect to equally credited authors (ECAs). It was found that all journals explicitly gave authors equal credit, and articles with ECAs accounted for a greater proportion of the total number of articles published in each journal in 2010 versus that in 2000 (AA: 3.3% vs. 0%; Anesthesiology: 7.1% vs. <1%; BJA: 5.7% vs. 0%; Pain: 11.0% vs. <1%). The number of ECAs articles tended to increase significantly yearly in all journals ( $P < 0.0001$  for each journal). The first two authors in the byline received equal credit in most cases. Furthermore, the ECAs articles involved institutions from different countries and regions and were sponsored by various funds. However, no specific guidance concerning this practice was provided in the instructions to authors in the four journals. It is increasingly common to give authors equal credit in original research articles in major anesthesiology journals. Detailed guidelines regarding this practice are warranted in future.

**Keywords** Authorship · Equal contribution · Anesthesiology · Publications

**Mathematical Subject Classification (2010)** 62D05

**JEL Classification** Y10

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## Introduction

Authors who have contributed substantially to a research study should be listed on the byline of the article (Flanagin et al. 2002). Whether the exact position of the authors should be ordered remains debatable, but it is widely accepted that the first and last author positions in a publication's byline hold the special weight (Hinman 1970) and the remaining authors are often listed in decreasing order of contribution (Moulopoulos et al. 1983). As many an institution carries out the policy of linking the number of publications with academic promotion, it is sometimes paradoxical to determine the order of authors, especially when the contributions of two or more authors are so similarly weighted that both could be considered the first authors.

A recent study showed that the practice of explicitly giving authors equal credit is increasingly common in the five general medicine journals with the highest impact factors in the past 10 years (Akhavue and Lautenbach 2010). However, whether this trend is also significant in the anesthesiology field has not been reported. This study was intended to investigate the prevalence and characteristics of designating two or more authors as having "contributed equally" (equally credited authors, or ECAs) in the field of anesthesiology.

## Materials and methods

This study was conducted with the approval and oversight of the Institutional Review Board of the Second Military Medical University in Shanghai, China. We focused specifically on the following four journals with the highest average impact factor (ISI Web of Knowledge) during the past 5 years: *Anesthesia and Analgesia (AA)*, *Anesthesiology*, *British Journal of Anaesthesia (BJA)*, and *Pain*. All original research articles published on the website of the journals between January 1st, 2001 and December 31st, 2010 were read through with special attention paid to the author information, acknowledgement and footnote. Articles with authors who were designated as having "contributed equally" to the work (or any other terminology designed to indicate equal credit) were selected for further analysis. They included original research articles, systematic reviews and meta-analyses but excluded case reports and clinical reviews.

Two reviewers (T. TZ and W.F.) separately extracted data and any disagreement was resolved by discussion. For each journal, we counted the number of the original articles and the articles that met the inclusion criteria per year. Extracted information included: the total number of authors listed, the number of ECAs and their positions in the byline (i.e., the first author, middle author, and last author), affiliation of the corresponding author, fund source, information regarding authors' contributions to the article, and year of publication. Agreement regarding data extraction was assessed using the Kappa statistic.

The annual proportion of articles with ECAs was then calculated for each journal per year. The Cochran–Armitage trend test was used to assess trends in the proportion of ECAs articles for each journal over time. In addition, we calculated a median for both the total number of authors and the number of authors given equal credit per ECAs article for the entire study period. The region origins and funding information of articles with equal credit in the four journals were also investigated. All analyses were performed with SAS for Windows, version 9.1 (SAS Institute, Inc., Cary, North Carolina). Statistical tests were two sided and with a significance level of 0.05.

## Results

It was found that most original research articles in the four journals explicitly gave authors equal credit by using such expressions as (certain authors) “contributed equally to the study, work, manuscript, or article”, “made equal contributions”, or “were co-first authors, co-last authors, or senior authors”. The Kappa value for agreement on data extraction was 0.85.

For all four journals involved, there was a significant increase in the number of original research articles with ECAs against the total number of articles published in 2010 versus those published in 2000: (*AA*: 3.3% vs. 0%; *Anesthesiology*: 7.1% vs. <1%; *BJA*: 5.7% vs. 0%; *Pain*: 11.0% vs. <1%) and *AA* had the lowest incidence of this practice in 2010 (Table 1). There was a significant increasing trend in yearly prevalence of ECAs articles for all journals (*AA*:  $Z = -7.57$ ,  $P < 0.0001$ ; *Anesthesiology*:  $Z = -6.33$ ,  $P < 0.0001$ ; *BJA*:  $Z = -5.23$ ,  $P < 0.0001$ ; *Pain*:  $Z = -8.16$ ,  $P < 0.0001$ ). The position of ECAs listed in the byline varied greatly and the first two authors received equal credit in most cases (Table 2). Among the ECAs articles, the median number of ECAs in each journal was two (Table 3), and the research institutions involved various countries and regions around the world (Table 4). Regarding the fund sources, the ECAs articles received a variety of fund support in each journal, including public funds, industry funds, or both. Totally, 247 ECAs articles were funded by public foundations (74.0%); 21 received funds from commercial companies (6.3%) and 28 from both (8.4%) (Table 5). Finally, in the instructions to authors, only *AA* required authors to disclose their respective roles in the manuscripts, and only *AA* made a clear reference to ECAs saying, “If two authors are to be considered co-first authors, this should be identified as a footnote to each co-first author”.

**Table 1** Number of original research articles with authors given equal credit and annual prevalence

Year	AA	Anesthesiology	BJA	Pain
2001	0/476 (0%)	2/276 (<1%)	0/244 (0%)	2/206 (<1%)
2002	1/494 (<1%)	5/329 (1.5%)	0/183 (0%)	4/232 (1.7%)
2003	2/538 (<1%)	2/302 (<1%)	1/166 (<1%)	4/278 (1.4%)
2004	4/545 (<1%)	7/292 (2.4%)	1/152 (<1%)	7/299 (2.3%)
2005	2/546 (<1%)	11/244 (4.5%)	5/203 (2.5%)	9/301 (3.0%)
2006	2/452 (<1%)	15/237 (6.3%)	1/194 (<1%)	11/219 (5.0%)
2007	9/415 (2.2%)	12/202 (5.9%)	5/190 (2.6%)	13/201 (6.5%)
2008	14/450 (3.1%)	11/193 (5.7%)	6/198 (3.0%)	25/348 (7.2%)
2009	18/422 (4.3%)	19/237 (8.0%)	8/196 (4.1%)	30/255 (11.2%)
2010	11/329 (3.3%)	15/212 (7.1%)	10/174 (5.7%)	30/273 (11.0%)
Total	63/4667 (1.3%)	99/2524 (3.9%)	37/1656 (2.2%)	135/2612 (5.2%)
Trend <sup>a</sup>	$Z = -7.57$ , $P < 0.0001$	$Z = -6.33$ , $P < 0.0001$	$Z = -5.23$ , $P < 0.0001$	$Z = -8.16$ , $P < 0.0001$

*AA* anesthesia and analgesia, *BJA* British Journal of Anaesthesia

*The numerator* represents the number of articles with authors given equal credit; *the denominator* represents the total number of articles published in a certain year and a certain journal

<sup>a</sup> The Cochran–Armitage trend test was used to assess the trend in the proportion of ECAs articles for each journal over time

**Table 2** Number of original research articles with authors given equal credit categorized by byline position

Byline position of authors receiving equal credit	AA ( <i>n</i> = 63)	Anesthesiology ( <i>n</i> = 99)	BJA ( <i>n</i> = 37)	Pain ( <i>n</i> = 135)	Total ( <i>n</i> = 334)
First two authors	48 (76.2%)	91 (91.9%)	34 (91.9%)	88 (65.2%)	261 (78.1%)
First three or more authors	7 (11.1%)	0	0	7 (5.2%)	14 (4.2%)
Last two or more authors	2 (3.2%)	4 (4.0%)	2 (5.4%)	11 (8.1%)	19 (5.7%)
First and last authors	2 (3.2%)	0	0	13 (9.6%)	15 (4.5%)
First two and last two authors	2 (3.2%)	1 (1%)	0	4 (3.0%)	7 (2.1%)
First two (or more) and last authors	0	1 (1%)	0	4 (3.0%)	5 (1.5%)
Middle authors only	0	1 (1%)	1 (2.7%)	1 (<1%)	3 (<1%)
All authors	2 (3.2%)	0	0	0	2 (<1%)
Other	0	1 (1%)	0	7 (5.2%)	8 (2.4%)

AA anesthesia and analgesia, *BJA* British Journal of Anaesthesia

**Table 3** Median total authors and equal authors in original research articles with authors given equal credit, 2001–2010

Author number	AA	Anesthesiology	BJA	Pain
Median (range) number of authors listed in byline	6 (3–12)	7 (3–15)	7 (3–2)	6 (2–22)
Median (range) number of ECAs	2 (2–5)	2 (2–6)	2 (2–2)	2 (2–4)

AA anesthesia and analgesia, *BJA* British Journal of Anaesthesia

**Table 4** Regions in original research articles with authors given equal credit, 2001–2010

Region	AA ( <i>n</i> = 63)	Anesthesiology ( <i>n</i> = 99)	BJA ( <i>n</i> = 37)	Pain ( <i>n</i> = 135)	Total ( <i>n</i> = 334)
Europe	25 (39.7%)	46 (46.5%)	27 (73.0%)	56 (41.5%)	154 (46.1%)
North America	16 (25.4%)	28 (28.3%)	1 (2.7%)	45 (33.3%)	90 (26.9%)
South America	0	0	0	2 (1.5%)	2 (<1%)
Asia	22 (34.9%)	25 (25.3%)	9 (24.3%)	30 (22.2%)	86 (25.7%)
Australia	0	0	0	2 (1.5%)	2 (<1%)

AA anesthesia and analgesia, *BJA* British Journal of Anaesthesia

## Discussion

Our results indicate a significant increasing trend in the practice of explicitly giving authors equal credit for original research published in the four major anesthesiology journals. The authors with equal credit appeared in nearly every position in the byline, and were mostly the first two authors. The ECAs articles involved institutions from different countries and regions and were sponsored by various funds. Our results seemed to indicate that it is difficult to accurately judge the contributions of authors simply based on their byline positions (Shapiro et al. 1994).

Indeed, multiple factors may affect our results, but our major concern is with the involvement of collaborative multi-disciplinary or multi-center teams in conducting

**Table 5** Fund sources in original research articles with authors given equal credit, 2001–2010

Fund source	AA ( <i>n</i> = 63)	Anesthesiology ( <i>n</i> = 99)	BJA ( <i>n</i> = 37)	Pain ( <i>n</i> = 135)	Total ( <i>n</i> = 334)
Public	35 (55.6%)	82 (82.8%)	18 (48.6%)	112 (83.0%)	247 (74.0%)
Industry	6 (9.5%)	4 (4.0%)	7 (18.9%)	4 (3.0%)	21 (6.3%)
Public and industry	6 (9.5%)	10 (10%)	3 (8.1%)	9 (6.7%)	28 (8.4%)
Not specified	14 (22.2%)	3 (3.0%)	8 (21.6%)	8 (5.9%)	33 (9.9%)
None	2 (3.2%)	0	1 (2.7%)	2 (1.5%)	5 (1.5%)

AA anesthesia and analgesia, BJA British Journal of Anaesthesia

research. The potential benefit in such research is obvious, including the ability to achieve adequate sample capacity, the depth and extent of expertise available in the design and conduction of a trial, the ability to attract funding, and increased generalizability of the results (Serwint et al. 2003). However, this type of research often involves professionals from different institutions and disciplines, thus increasing the complexity in determining the authorship in the publication concerned (Dulhunty et al. 2011). It is therefore reasonable to give certain authors equal credit in these studies when the authors had similar contributions.

Another contributing factor to the increasing practice is perhaps the result of including undeserved individuals arbitrarily. Although the authorship of individual collaborators was also highly honored with a publication track record linked to success in research funding, academic merit and promotion (Dulhunty et al. 2011), the first and last authors generally received most of the credit and were commonly used for a measure of research productivity. As paper production by a team is limited, the undeserved first-authorship might be abused as “contributed equally to the work” (Stossel 1987).

Our study showed that this is a common phenomenon regardless of countries and regions. Different cultures between countries, institutions or even departments may have certain influence on the practice of giving authors equal credit. However, whether it is associated with the position of authors with equal credit in the byline is unknown.

The association between fund source and equal credit given to authors is an interesting issue. In the present study, the ECAs articles in each journal received a variety of fund support, including public funds, industry funds, or both. Notably, our data just reflected the proportion of different fund sources in all ECAs articles, and thus the influence of fund support on the practice of giving authors equal credit was inconclusive.

What is more important than just providing ornate credit is that authorship should also bear public responsibility as far the result of the research is concerned. As the first author(s) is (are) always given the first-rank credit, it is granted for him/her to bear the prime responsibility in explaining all results of the research. It is inappropriate to assign co-first authorship as a courtesy or simply for the sake of an academic promotion. To date, a number of journals require that all authors clearly state what their contributions have been (Yank 1999). It was found in our study that only AA requires that authors should specify their contributions and make any reference to ECAs, stating in their author form to permit two authors to be co-first authors. However, none of the four journals has a detailed policy regarding this practice of giving authors equal credit.

An apparent limitation of our study is that we focused only on the four major journals in anesthesiology field and may not be representative of the journals from other disciplines.

Above all, it is increasingly common to give authors equal credit in original research papers in the four major anesthesiology journals. Taking into account the increasing prevalence of this practice, a detailed guideline with regard to this practice of giving authors equal credit should be proposed in future.

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