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Assessing Authorship Rates over Time in Original Radiologic Research Publications

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Conflicts of interest are listed at the end of this article.

See also the editorial by Arrivé in this issue.

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Background: Previous studies have shown an increase in the number of authors on radiologic articles between 1950 and 2013, but the cause is unclear.

Purpose: To determine whether authorship rate in radiologic and general medical literature has continued to increase and to assess study variables associated with increased author numbers.

Materials and Methods: PubMed/Medline was searched for articles published between January 1998 and October 2022 in general radiology and general medical journals with the top five highest current impact factors. Generalized linear regression analysis was used to calculate adjusted incidence rate ratios (IRRs) for the numbers of authors. Wald tests assessed the associations between study variables and the numbers of authors per article. Combined mixed-effects regression analysis was performed to compare general medicine and radiology journals.

Results: There were 3381 original radiologic research articles that were analyzed. Authorship rate increased between 1998 (median, six authors; IQR, 4) and 2022 (median, 11 authors; IQR, 8). Later publication year was associated with more authors per article (IRR, 1.02; 95% CI: 1.01, 1.02; $P < .001$) after adjusting for publishing journal, continent of origin of first author, number of countries involved, PubMed/Medline original article type, study design, number of disciplines involved, multicenter or single-center study, reporting of a priori power calculation, reporting of obtaining informed consent, study sample size, and number of article pages. There were 1250 general medicine original research articles that were analyzed. Later publication year was also associated with more authors after adjustment for the study variables (IRR, 1.04; 95% CI: 1.03, 1.05; $P < .001$). There was a stronger increase in authorship by publication year for general medicine journals compared with radiology journals (IRR, 1.02; 95% CI: 1.01, 1.02; $P < .001$).

Conclusion: An increase in authorship rate was observed in the radiologic and general medical literature between 1998 and 2022, and the number of authors per article was independently associated with later year of publication.

Supplemental material is available for this article.

The International Committee of Medical Journal Editors recommends that individuals should only be listed as an author of a scientific article if they have fulfilled the following four criteria for authorship: substantially contributing to the concept, design, execution, or interpretation of the work; participating in writing the manuscript or revising it critically; approving the final version to be published; and taking responsibility for the entire work (1). Although these criteria are meant to ensure authorship is designated appropriately and ethically, sometimes they are violated, resulting in unwarranted authorship (2–4). Previous work has shown a substantial increase in the number of authors per article in radiologic literature between 1950 and 2013 (5–9). However, it is unclear whether this is caused by growing research complexity or whether there has been a rise in unwarranted authorship practices that led to authorship inflation (ie, authorship rate has increased independently of increasing research complexity). Note that there is no uniformly accepted definition of research complexity. Research complexity can be determined by variables that influence labor intensity and/or time consumption of the work performed. To the best of our knowledge, it is also unknown whether the trend of increasing authorship has further increased since 2013. Therefore, the objective of this study was to determine whether authorship rate in the radiologic and general medical literature has continued to increase and assess study variables associated with increased author numbers.

Materials and Methods

Ethics committee approval was not required for this bibliometric study.

Literature Search and Study Selection

PubMed/Medline was searched for articles published between January 1998 and October 2022 in either general radiology journals or general medical journals with the top five highest current impact factors (IFs). The general radiology journals included in this study were *Radiology*

Abbreviations

IF = impact factor, IRR = incidence rate ratio

Summary

An increase in authorship rate was observed in the radiologic and general medical literature between 1998 and 2022, and later publication year was independently associated with more authors per article.

Key Results

- Analysis of 3381 radiologic research articles showed lower authorship rate per article in 2013 (median, eight articles; IQR, 4) versus in 2022 (median, 11 articles; IQR, 8).
- Later publication year was associated with more authors (adjusted incidence rate ratio [IRR], 1.02; 95% CI: 1.01, 1.02; $P < .001$), after adjustment for research complexity–related variables.
- Analysis of 1250 general medicine research articles showed a later year of publication was independently associated with more authors (adjusted IRR, 1.04; 95% CI: 1.03, 1.05; $P < .001$).

(IF of 29.15), *European Radiology* (IF of 7.03), *American Journal of Roentgenology* (IF of 6.58), *Academic Radiology* (IF of 5.48), and *European Journal of Radiology* (IF of 4.15). The general medicine journals included in this study were *The Lancet* (IF of 202.73), *New England Journal of Medicine* (IF of 176.08), *Journal of the American Medical Association* (IF of 157.38), *British Medical Journal* (IF of 96.22), and *Annals of Internal Medicine* (IF of 51.60).

The search strings are displayed in Appendix S1. To ensure only original research articles were included, PubMed/Medline article types were restricted to clinical study, clinical trial, comparative study, multicenter study, observational study, randomized controlled trial, and technical report. All articles from radiology journals were eligible for inclusion, and a random selection of 1250 articles from general medicine journals were included (random numbers function was used to obtain a random selection of 50 articles per publication year between 1998 and 2022; Excel, Microsoft). Articles that were not original research and articles for which the full-text version could not be retrieved were excluded.

Data Extraction

The following variables were extracted from each of the included articles: number of authors, publication year, journal in which the article was published, continent of origin of first author, number of countries involved, PubMed/Medline article type, study design (prospective or retrospective), the number of disciplines involved (number of extracted disciplines was based on the number of disciplines as listed in the author affiliations section of each included article), multicenter or single-center study, whether a priori power calculation was performed, whether it was reported that informed consent was obtained, study population size, and number of article pages.

Data were manually extracted by a research fellow (R.K.) who was supervised by a radiologist (R.M.K., with more than 15 years of research experience). No computerized process was used for data extraction. In any equivocal cases, a radiologist (R.M.K.) was consulted by the research fellow to make a final decision regarding the extracted variable. Another radiologist (T.C.K., with more than 15 years of research experience) assessed a random sample of 100 articles from the general radiology journals and a random sample of 100 articles from the general medicine journals to assess interobserver reproducibility. Interobserver reproducibility in data extraction was evaluated by calculating Cohen κ coefficients and intraclass correlation coefficients. The strength of agreement for κ values is as follows: less than 0.20, poor; 0.21–0.40, fair; 0.41–0.60, moderate; 0.61–0.80, good; and 0.81–1.00; very good (10). The strength of agreement for intraclass correlation coefficients is as follows: less than 0.50, poor; 0.50–0.74, moderate; 0.75–0.89, good; and 0.90 or more, excellent (11).

Statistical Analysis

Generalized linear models were used to explore the association between publication year (from 1998 to 2022) and authorship rate (positive integer). Adjusted incidence rate ratios (IRRs), representing the multiplicative change in authorship rate with every one-unit change in the predictor variable, were calculated with 95% CIs. The analysis was adjusted for other extracted variables by including them as fixed effects. These included the journal in which the article was published, continent of origin of first author (North America, Europe, Asia, Australia, or other), number of countries involved (positive integer), number of disciplines involved (positive integer), multicenter or single-center study, reported a priori power calculation (yes or no), reported informed consent obtained (yes or no), study sample size (positive integer, log transformed to reduce skewness), and number of article pages (positive integer). To account for differences in study type, interactions between PubMed/Medline primary article type and study design (prospective, retrospective, prospective and retrospective, or unclear) were included as a fixed effect.

Separate analyses were performed for the articles that were published in the major general radiology journals and for the articles that were published in the major general medicine journals. The association between the research field (radiology or general medicine) and authorship rate was evaluated by using mixed-effects regression analysis on the combined data set of radiology and general medicine articles. In this analysis, random intercepts were added to adjust for journal differences within each research field. The modeling approach (Poisson or negative binomial regression) was selected based on the presence of overdispersion in the data, opting for negative binomial regression when overdispersion was observed. Multicollinearity was checked using the variance influence factor; a value greater than 10 indicated a statistically significant variance. Wald tests were used to evaluate whether predictors were significantly associated with the number of authors on publications; $P < .05$ after Bonferroni correction indicated statistical significance.

IF Trends

Statistical analyses were performed (C.R.) by using software (R version 4.2.2; R Foundation for Statistical Computing). An additional generalized linear regression analysis was performed to compare trends in IF between major radiology journals and

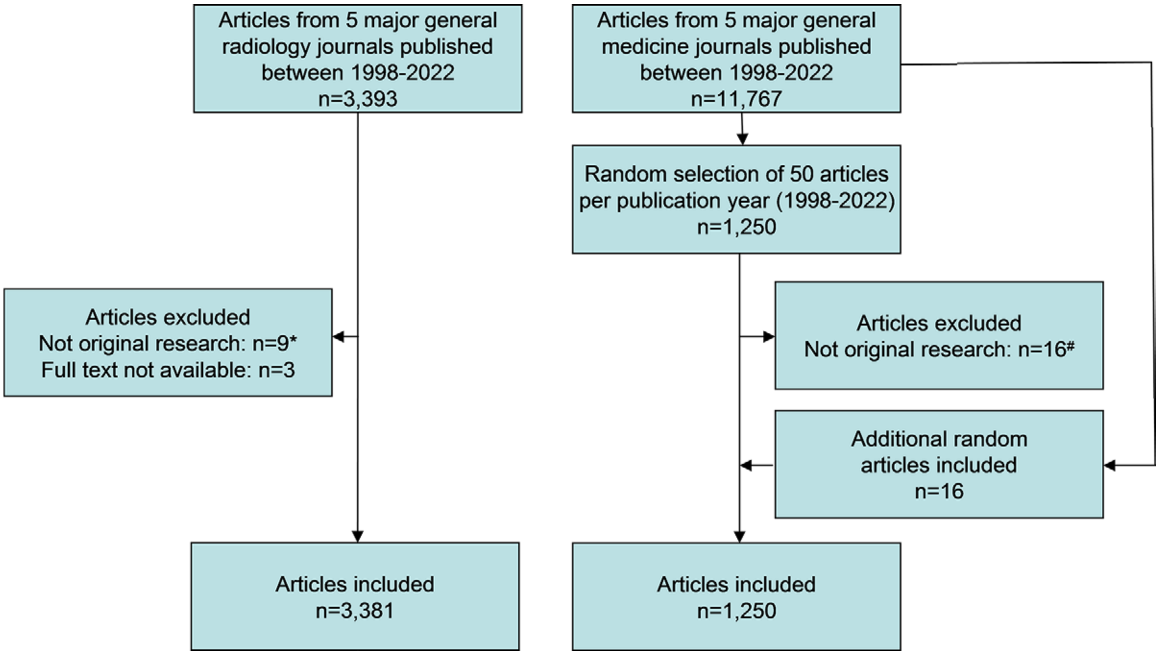

Figure 1: Flowchart of the article selection process. * Four articles were a guideline or position statement, two articles reported only the design of a study, two articles were a commentary on a study, and one article was a meta-analysis. # Ten articles were a commentary on a study, two articles were a patient summary of a study, two articles were a meta-analysis, one article was a review, and one article reported only research methods.

general medicine journals. These journals were included in the analysis. This analysis used a continuous linear regression model, distinguishing it from the count-data models used in the other aforementioned analyses.

To capture nonmonotonic trends over time, a thin-plate spline was included for the year in which the IF was assigned (from 1988 to 2022). Because of the multiplicative nature of IFs (as a ratio of citations and recent publications), the IF was log-transformed before regression. Random intercepts by journal corrected for differences in initial IF. An interaction between year and research field (radiology or general medicine) was evaluated using a Wald test to assess whether the trend in IF differed between radiology and general medicine journals. The adjusted R^2 was calculated to assess the fit of the regression, with 0 indicating no predictive value and 1 indicating perfect predictive value.

Results

Study Selection and Characteristics

The flowchart of the article selection process is in Figure 1. The PubMed/Medline search yielded 3393 articles from the major radiology journals. Of these, nine articles were excluded because they were not original research (four articles were a guideline or position statement, two articles reported only the design of a study, two articles were a commentary on a study, and one article was a meta-analysis) and three articles were excluded because the full-text version could not be retrieved. Eventually, 3381 original research articles were included (Table 1). Most articles were published in *Radiology* (30.2%; 1022 of 3381), came from Europe (46.2%; 1562 of 3381), were clinical trials (58.9%; 1990 of 3381), had a prospective design (66.7%; 2254 of 3381), and were single-center studies (63.1%; 2132 of 3381). Interobserver reproducibility in data extraction ranged from good to very good or excellent (κ = 0.77–1.00; intraclass correlation coefficient, 0.93–0.99) (Table S1).

The characteristics of the 1250 general medicine articles that were included are in Table 2. Most articles were published in the *New England Journal of Medicine* (29.4%; 367 of 1250) and *The Lancet* (28.2%; 353 of 1250), came from North America or Europe (both 43.4%; 543 and 542, respectively, of 1250), were clinical studies (46.3%; 579 of 1250), had a prospective design (97.0%; 1213 of 1250), and were multicenter studies (81.4%; 1017 of 1250) (Table 2). Interobserver reproducibility in data extraction ranged from borderline moderate to very good or excellent (κ = 0.61–1.00; intraclass correlation coefficient, 0.49–0.99) (Table S2).

Authorship Rates in Radiologic Literature

Authorship rates increased from 1998 (median, six authors; IQR, 4) to 2013 (median, eight authors; IQR, 4) to 2022 (median, 11 articles; IQR, 8). Initial Poisson regression identified data overdispersion, and negative binomial regression was therefore adopted. Later publication year was associated with a larger number of authors per article (IRR, 1.02; 95% CI: 1.01, 1.02; P < .001) independent of the journal in which the article was published, continent of origin of first author, number of countries involved, PubMed/Medline original article type, study design, number of disciplines involved, multicenter or single-center study, reporting of a priori power calculation, reporting of obtaining informed consent, study sample size, and number of article pages (Fig 2, Table 3). The number of countries involved (IRR, 1.08; 95% CI: 1.07, 1.09; P < .001), number of disciplines

Table 1: Characteristics of the Original Research Articles from Major Radiology Journals

Parameter	Original Research Articles (*n* = 3381)
Median no. of authors	7 (4) [1–80]
Publishing journal	
Radiology	1022 (30.2)
European Radiology	888 (26.3)
American Journal of Roentgenology	744 (22.0)
European Journal or Radiology	492 (14.6)
Academic Radiology	235 (7.0)
Continent of origin of first author	
North America	1011 (29.9)
Europe	1562 (46.2)
Asia	767 (22.7)
Australia	20 (0.6)
Other	21 (0.6)
Median no. of countries involved	1 (0) [1–45]
PubMed/Medline primary article type	
Clinical study	24 (0.7)
Clinical trial	1990 (58.9)
Comparative study	147 (4.3)
Multicenter study	675 (20.0)
Observational study	380 (11.2)
Randomized controlled trial	152 (4.5)
Technical report	13 (0.4)
Study design	
Prospective	2254 (66.7)
Retrospective	1105 (32.7)
Prospective and retrospective	18 (0.5)
Unclear	4 (0.1)
Median no. of disciplines involved	2 (2) [1–12]
Centers involved	
Single center	2132 (63.1)
Multicenter	1249 (36.9)
A priori power calculation	
Yes	347 (10.3)
No	3034 (89.7)
Informed consent obtained	
Yes	2182 (64.5)
No	1199 (35.5)
Median study sample	79 (175) [1–6 440 281]
Median no. of pages	8 (3) [1–20]

Notes.—Categorical data are presented as numbers of studies with percentages in parentheses. Continuous data are presented as medians with IQRs in parentheses and ranges in brackets.

Table 2: Characteristics of the Original Research Articles from Major General Medicine Journals

Parameter	Original Research Articles (*n* = 1250)
Median no. of authors	11 (10) [1–82]
Publishing journal	
The Lancet	353 (28.2)
New England Journal of Medicine	367 (29.4)
Journal of the American Medical Association	207 (16.6)
British Medical Journal	199 (15.9)
Annals of Internal Medicine	124 (9.9)
Continent of origin of first author	
North America	543 (43.4)
Europe	542 (43.4)
Asia	69 (5.5)
Australia	61 (4.9)
Other	35 (2.8)
Median no. of countries involved	1 (2) [1–52]
PubMed/MEDLINE primary article type	
Clinical study	579 (46.3)
Comparative study	495 (39.6)
Clinical trial	120 (9.6)
Multicenter study	40 (3.2)
Observational study	14 (1.1)
Technical report	2 (0.2)
Study design	
Prospective	1213 (97.0)
Retrospective	35 (2.8)
Prospective and retrospective	2 (0.2)
No. of disciplines involved	2 (1) [1–9]
Centers involved	
Single center	233 (18.6)
Multicenter	1017 (81.4)
A priori power calculation	
Yes	715 (57.2)
No	535 (42.8)
Informed consent obtained	
Yes	1152 (92.2)
No	98 (7.8)
Median study sample	482 (1402) [1–8 930 000]
Median no. of pages	8 (4) [1–16]

Notes.—Categorical data are presented as numbers of studies with percentages in parentheses. Continuous data are presented as medians with IQRs in parentheses and ranges in brackets.

involved (IRR, 1.07; 95% CI: 1.06, 1.08; $P < .001$), multicenter study (IRR, 1.22; 95% CI: 1.17, 1.27; $P < .001$), and number of article pages (IRR, 1.04; 95% CI: 1.03, 1.05; $P < .001$) were also independently associated with a larger number of authors per article. However, articles from *European Radiology* (IRR, 0.91; 95% CI: 0.87, 0.95; $P < .001$), *American Journal of Roentgenology* (IRR, 0.85; 95% CI: 0.81, 0.89; $P < .001$), and *Academic Radiology* (IRR, 0.86; 95% CI: 0.80, 0.92; $P = .001$) were independently associated with a lower number of authors per article. Variance inflation factors of the variables in the multivariable regression ranged between 1.09 and 2.29, indicating no concerning degree of multicollinearity.

Authorship Rates in General Medicine Literature

Authorship rates in the general medicine literature increased between 1998 (median, seven authors; IQR, 5) and 2022 (median,

Table 3: Overview of the Negative Binomial Regression Analysis for Articles Published in the Five Major Radiology Journals

Parameter	IRR (95% CI)	*P* Value
Intercept	2.98 (2.35, 3.80)	…
Publication year (after 1998)	1.02 (1.01, 1.02)	<.001
Multicenter	1.22 (1.17, 1.27)	<.001
Study sample size (log)	1.00 (0.99, 1.02)	.99
Informed consent reported	1.04 (1.00, 1.08)	.99
Article pages	1.04 (1.03, 1.05)	<.001
No. of disciplines	1.07 (1.06, 1.08)	<.001
No. of countries	1.08 (1.07, 1.09)	<.001
A priori power calculation	1.02 (0.97, 1.07)	.99
Continent		
North America	Ref	Ref
Europe	1.06 (1.02, 1.10)	.2
Asia	1.07 (1.02, 1.11)	.6
Australia	0.92 (0.76, 1.11)	.99
Other	0.88 (0.72, 1.07)	.99
Journal		
Radiology	Ref	Ref
European Radiology	0.91 (0.87, 0.95)	<.001
American Journal of Roentgenology	0.85 (0.81, 0.89)	<.001
European Journal of Radiology	0.91 (0.86, 0.96)	.06
Academic Radiology	0.86 (0.80, 0.92)	.001
Study type		
Prospective clinical study	Ref	Ref
Retrospective clinical study	1.13 (0.80, 1.60)	.99
Prospective clinical trial	1.21 (0.97, 1.52)	.99
Retrospective clinical trial	1.15 (0.91, 1.44)	.99
Prospective/retrospective clinical trial	1.51 (1.08, 2.12)	.99
Unclear—clinical trial	0.87 (0.45, 1.70)	.99
Prospective multicenter study	1.24 (0.98, 1.56)	.99
Retrospective multicenter study	1.18 (0.94, 1.50)	.99
Prospective/retrospective multicenter study	0.87 (0.58, 1.30)	.99
Unclear—multicenter study	0.63 (0.18, 2.18)	.99
Prospective observational study	1.14 (0.91, 1.44)	.99
Retrospective observational study	1.18 (0.94, 1.49)	.99
Prospective/retrospective observational study	0.89 (0.38, 2.13)	.99
Prospective comparative study	1.31 (1.03, 1.67)	.99
Retrospective comparative study	1.01 (0.78, 1.29)	.99
Prospective/retrospective comparative study	0.86 (0.33, 2.25)	.99
Prospective technical report	1.07 (0.73, 1.55)	.99
Retrospective technical report	1.02 (0.48, 2.13)	.99
Prospective randomized controlled trial	1.11 (0.88, 1.41)	.99
Retrospective randomized controlled trial	1.26 (0.98, 1.64)	.99

Notes.—Incidence rate ratios (IRRs) represent the multiplicative increase in number of authors for a unit increase in each predictor variable. Data in parentheses are 95% CIs. *P* values were adjusted for multiple comparisons using Bonferroni correction. Ref = reference.

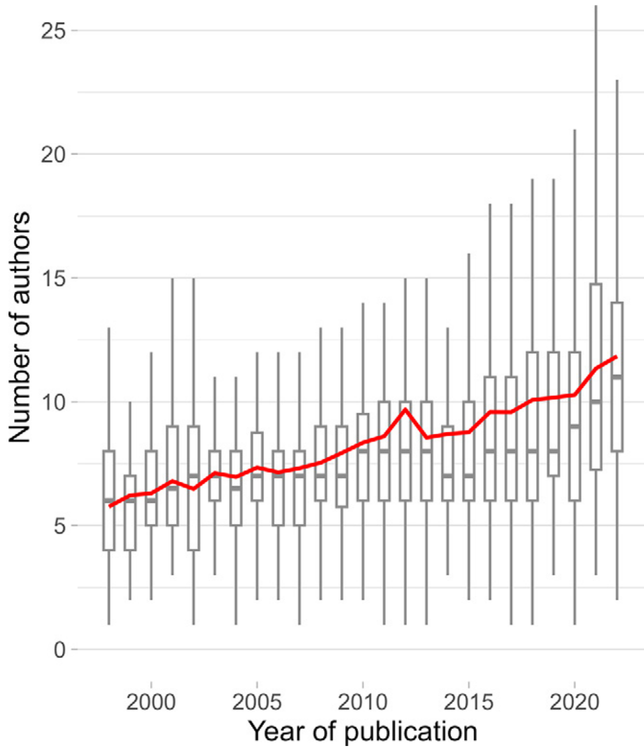

Figure 2: Box plots showing the observed numbers of authors per article in major radiology journals in each publication year between 1998 and 2022, with the regression line for the negative binomial model (red line). Later publication year was associated with a larger number of authors per article (incidence rate ratio, 1.02; 95% CI: 1.01, 1.02; *P* < .001).

20 authors; IQR, 18), which is similar to the radiologic literature. In multivariable negative binomial regression analysis, later publication year was also independently associated with a larger number of authors per article (IRR, 1.04; 95% CI: 1.03, 1.05; *P* < .001) (Fig 3, Table 4). Mixed-effects negative binomial regression analysis showed a stronger temporal increase (IRR, 1.02; 95% CI: 1.01, 1.02; *P* < .001) in authorship rate for articles published in general medicine journals compared with articles published in radiology journals. Variance inflation factors of the variables in the multivariable linear regression ranged between 1.07 and 2.78, indicating no concerning degree of multicollinearity.

IF Trends

Generalized linear regression revealed an association between IF and year (β = .16; 95% CI: .10, .23; *P* < .001; Fig 4). The IF of general medicine journals exhibited faster growth compared with radiology journals (β = .02; 95% CI: .02, .03; *P* < .001; adjusted R^2 = 0.97).

Discussion

Previous studies (5–9) have shown an increase in the number of authors on radiologic articles between 1950 and 2013 but the cause is unclear. Our study aimed to investigate whether the authorship rate in radiologic literature has continued to increase, to compare authorship rate with the general medical literature,

Table 4: Overview of the Negative Binomial Regression Analysis for Articles Published in the Five Major General Medicine Journals

Parameter	IRR	*P* Value
Intercept	3.53 (2.91, 4.28)	…
Publication year (after 1998)	1.04 (1.03, 1.05)	<.001
Multicenter	1.07 (0.98, 1.17)	.99
Study sample size (log)	1.02 (0.98, 1.05)	.99
Informed consent reported	1.27 (1.11, 1.46)	.08
Article pages	1.05 (1.04, 1.06)	<.001
No. of disciplines	1.09 (1.07, 1.12)	<.001
No. of countries	1.02 (1.01, 1.03)	.001
A priori power calculation	0.95 (0.89, 1.02)	.99
Continent		
North America	Ref	Ref
Europe	0.92 (0.86, 0.98)	.99
Asia	0.96 (0.84, 1.10)	.99
Australia	0.82 (0.72, 0.95)	.99
Other	0.97 (0.82, 1.16)	.99
Journal		
Lancet	Ref	Ref
New England Journal of Medicine	1.00 (0.92, 1.08)	.99
Journal of the American Medical Association	0.96 (0.88, 1.06)	.99
British Medical Journal	0.95 (0.84, 1.08)	.99
Annals of Internal Medicine	0.85 (0.76, 1.95)	.7
Study type		
Prospective clinical study	Ref	Ref
Retrospective clinical study	0.79 (0.43, 1.45)	.99
Prospective clinical trial	0.94 (0.84, 1.06)	.99
Retrospective clinical trial	0.90 (0.66, 1.23)	.99
Prospective multicenter study	0.69 (0.55, 0.86)	.1
Retrospective multicenter study	0.48 (0.33, 0.69)	.01
Prospective/retrospective multicenter study	0.35 (0.12, 1.02)	.99
Prospective observational study	0.92 (0.67, 1.26)	.99
Retrospective observational study	0.60 (0.27, 1.34)	.99
Prospective/retrospective observational study	0.64 (0.18, 2.30)	.99
Prospective comparative study	0.94 (0.88, 1.01)	.99
Retrospective comparative study	1.38 (0.82, 2.30)	.99
Prospective technical report	0.71 (0.35, 1.45)	.99

Notes.—Incidence rate ratios (IRRs) represent the multiplicative increase in number of authors for a unit increase in each predictor variable. Data in parentheses are 95% CIs. *P* values were adjusted for multiple comparisons using Bonferroni correction.

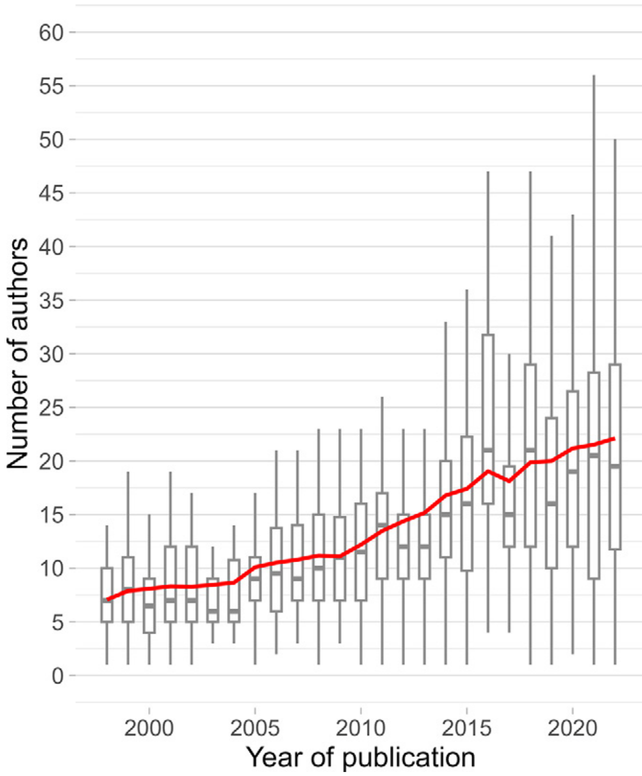

Figure 3: Box plots showing the observed numbers of authors per article in major general medicine journals in each publication year between 1998 and 2022, with the regression line for the negative binomial model (red line). Later publication year was associated with a larger number of authors per article (incidence rate ratio, 1.04; 95% CI: 1.03, 1.05; *P* < .001).

and to assess study variables associated with increased author numbers. Of the 3381 original radiologic research articles that we included, authorship rate was lower in 2013 (median, eight authors; IQR, 4) than in 2022 (median, 11 authors; IQR, 8) (*P* < .001). Later publication year was associated with a larger number of authors per article (incidence rate ratio [IRR], 1.02; 95% CI: 1.01, 1.02; *P* < .001) after adjustment for variables related to research complexity. Analysis of 1250 original general medicine research articles also showed later publication year was associated with a larger number of authors per article after adjustment of variables related to research complexity (IRR, 1.04; 95% CI: 1.03, 1.05; *P* < .001). This result suggests that authorship growth is not limited to radiologic research. Accordingly, a study (12) that included 121 397 articles published between 2005 and 2017 in clinical journals of 23 medical specialties, including radiology, also found an increase in the number of authors per article. However, it should be noted that this study did not adjust for study complexity. In our study, we found that authorship growth in both general radiology (IRR, 1.02; 95% CI: 1.01, 1.02; *P* < .001) and general medicine journals (IRR, 1.04; 95% CI: 1.03, 1.05; *P* < .001) remained after adjustment for variables related to study complexity.

Our finding that authorship rate has increased after adjustment of variables-related research complexity in both general radiology (IRR, 1.02; 95% CI: 1.01, 1.02; *P* < .001) and general medicine journals (IRR, 1.04; 95% CI: 1.03, 1.05; *P* < .001) concurs with a previous analysis (13) of original research articles that was published in three major general medical journals (*Journal of the American Medical Association*, *New England Journal of Medicine*, and *British Medical Journal*) between 1960 and

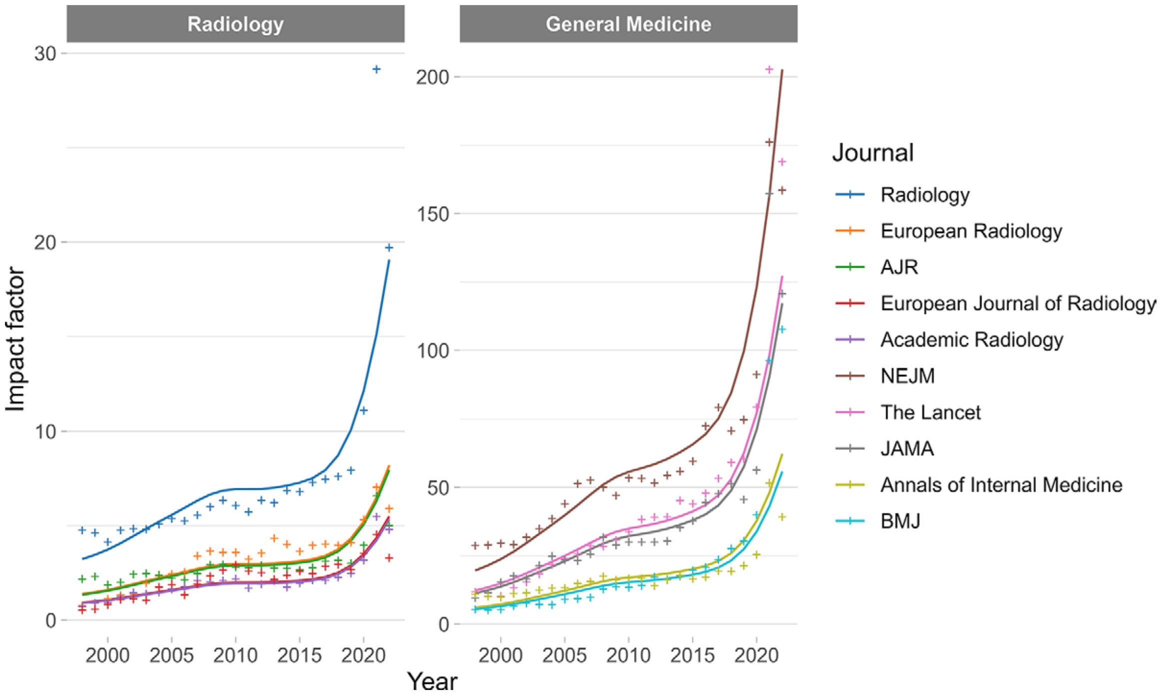

Figure 4: Scatterplots showing the impact factors (IFs) for major radiology journals (left) and major general medicine journals (right), with regression lines for the trend in IF for each journal derived from generalized linear regression. The regression captured the nonmonotonous IF trend using a spline. There was a positive association between IF and year (β = .16; 95% CI: .10, .23; *P* < .001). AJR = *American Journal of Roentgenology*, BMJ = *British Medical Journal*, NEJM = *New England Journal of Medicine*.

2010. That study found a more than threefold increase in the number of authors per article after adjusting for study type and study population (13). Accordingly, another study that included randomized clinical trials and nonrandomized clinical studies published between 1985 and 2005 showed that the number of authors increased by 0.8 per decade after adjusting for topic and other determinants (14).

In a recent survey (4) among corresponding authors of articles published in general radiology journals in 2021, 40.6% of corresponding authors declared having a coauthor on any of their publications in the past 5 years who did not deserve authorship based on the International Committee of Medical Journal Editors criteria. Notably, the problem of unwarranted authorship in radiologic research was already exposed by an earlier survey that was published in 2011, showing a 26.0% rate of perceived unwarranted authorship (3). Similarly, our study found an annual IRR of 1.02 for articles published in radiology journals, which translates to a 16% increase over 10 years and a 35% increase over 20 years. For general medical journals, these figures were higher at 48% and 119%, respectively. Whether this was because of unwarranted authorship was not investigated in the current study. The trend of increasing authorship rates over time may also be explained by greater acknowledgment of so-called ghost authors—that is, individuals deserving authorship based on the International Committee of Medical Journal Editors criteria who were previously not listed as authors.

Two notable observed associations warrant further discussion. First, journals with a relatively lower IFs (*European Radiology*, *American Journal of Roentgenology*, and *Academic Radiology*) were independently associated with fewer authors per original research article compared with the journal *Radiology* ($P \le .001$). This result may suggest that unwarranted authorship increases as a journal's IF increases. However, it could also be possible that journals with a high IF require more expertise, which increases the likelihood of finding more authors. Further research is needed to investigate this. Second, the number of authors by publication year showed a stronger increase for general medicine journals than for radiology journals ($P < .001$). We speculate that this may be because the IFs of the general medicine journals also showed a stronger increase over time than the radiology journals that were investigated ($P < .001$). Because scientific output, particularly in high-impact journals, is a major criterion for academic promotions and prestige (15), it has probably become even more attractive over the years to publish in the general medicine journals that were analyzed in our study.

Our study had some limitations. First, to our knowledge, there is no uniformly accepted definition of research complexity. Therefore, there is no predefined set of variables shown to be associated with complexity and/or amount of scientific work. The variables we extracted in our study were based on personal experience and conjecture. In addition, there may have been other variables related to complexity and/or amount of scientific work that we did not account for in multivariable linear regression analysis. For example, it may require more work to obtain medical ethical approval before starting a study due to increased bureaucracy (16). Furthermore, growth in team science and the use of more sophisticated technologies and statistical models in more recent studies could account for some degree of rise in authorships. Second, for practical reasons, we included only five major general radiology journals. A future, larger study may be needed to determine whether our findings are generalizable to more journals in the field of radiology and to further investigate whether increased authorship is more prevalent in high-impact journals. Third, the variable “number of disciplines involved” was based on the number of disciplines as they were listed in the author affiliations section of each included article. This variable would not necessarily include all disciplines. For instance, if a radiology department has a biostatistician or someone trained in finance (as an author), but their affiliation is a radiology department, that would not be a different discipline according to our method of extraction. However, individual job titles of authors were typically not mentioned in the author affiliations section of the included articles. Finally, the variable multicenter or single-center study was based on a simplified, binary approach. Precisely defining the number of participating centers in a multicenter study would have been a more refined approach.

In conclusion, our study shows that authorship rate in radiologic literature increased between 2013 and 2022, and the number of authors per article was independently associated with later year of publication. Future work is needed to determine the exact reasons for this observation and to investigate the proportion of authorship that is undeserved.

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