Multiple Authorship

The Contribution of Senior Authors

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Context.—The number of authors per article has increased markedly in recent years. Little is known about the hierarchical order of authorship and its change over time.

Objective.—To assess the change in number and profile of authors of original articles published over a 20-year period in *BMJ*. It was hypothesized that the number of authors increased over this 20-year period and that it was the senior scientists who benefited most.

Design.—Comparative descriptive analysis of the number and academic rank of authors who published original articles in *BMJ* volumes 270 (1975), 280 (1980), 290 (1985), 300 (1990), and 310 (1995).

Main Outcome Measures.—The specific academic rank, order, and number of authors for each original article. Eight categories of authorship were distinguished as follows: 1, professor; 2, department chairperson; 3, consultant; 4, senior registrar; 5, lecturer and/or registrar; 6, medical student; 7, house officer; and 8, miscellaneous.

Results.—The number of original articles published per year decreased from 262 (1975) to 125 (1995). The mean number (SD) of authors per article increased steadily from 3.21 (SD, 1.89) (1975) to 4.46 (SD, 2.04) (1995). Most authors belonged to category 3, and its proportion varied from 24.7% (1975) to 22.6% (1995), while category 1 grew from 13.2% to 20.3%. Category 5 authorship dropped from 24.3% (1975) to 15.8% (1995). With regard to first authorship, category 1 more than doubled from 8.0% (1975) to 16.8% (1995) compared with category 5 whose proportion decreased from 34.0% to 24.8%. Most last authors were from category 1, 20.4% (1975), growing to 29.0% (1995).

Conclusion.—Over the last 20 years the number of *BMJ* authors of original articles increased, mainly because of the rise of authorship among professors and department chairpersons.

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IN RECENT YEARS, the concept of authorship has been the subject of great debate, mainly because of the proliferation of authors over the years.[1] A survey of radiology journals showed a doubling of authorship: from 2.2 authors per article (1966) to 4.4 (1991),[2] a trend most obvious in clinical medicine.[3,4]

The increase of authorship has been documented before, but it is unclear which author category (eg, junior or senior scientists) took most advantage from this proliferation. It might be speculated that because of seniority, senior scientists are better able to influence the decision on authorship. This view is supported by complaints that senior scientists sign for authorship at the expense of junior researchers.[5,6] There are further indications that authorship is granted to chairpersons of departments as a matter of convention or that senior authors are listed just to boost the paper.[7] This survey was conducted to assess the clinical or teaching appointment of individual authors over a 20-year period for *BMJ*. It was hypothesized that in this period authorship would increase with senior authors benefiting most.

METHODS

Setting and Selection of Data Set

The study sample was retrieved from *BMJ* selecting the following volumes (year): 270 (1975), 280 (1980), 290 (1985), 300 (1990), and 310 (1995) and consisted of all individual original articles, including "Papers," "Originals," and "Short Reports" (volume 270 through 290), and "Papers" (volume 300 and 310). Articles reported on behalf of a group (n = 16) were excluded from the study. All individual original articles were examined and information was obtained on (1) number of authors, (2) country of origin for the first author, (3) specific listed clinical or research appointment for each separate author, (4) order of authorship, and (5) separate indication of the author's profession as statistician. The appointments of the authors were divided into 8 categories: 1, professor, assistant professor, associate professor, or reader; 2, department chairperson or director; 3, consultant or senior lecturer; 4, senior registrar or fellow; 5, lecturer, registrar, senior research fellow, research fellow, or re-

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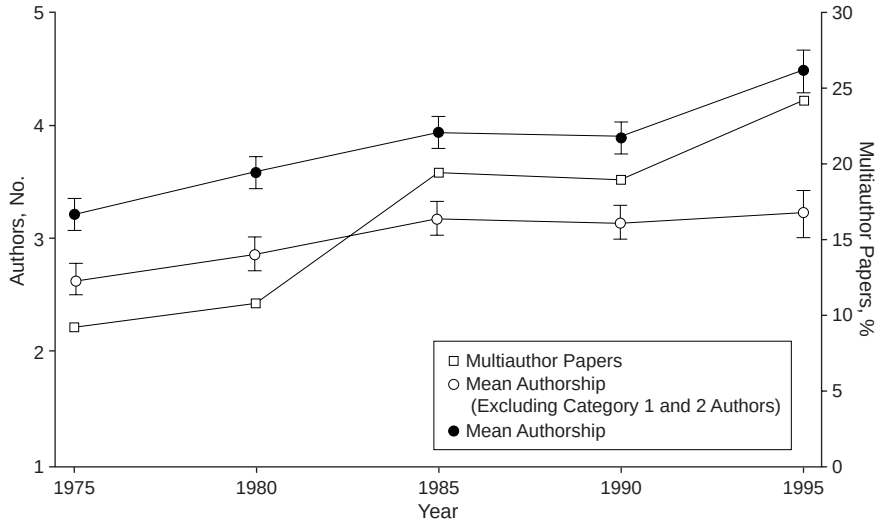

Change in authorship for articles published in *BMJ* from 1975 to 1995. Left axis indicates the total mean number of authors (SEM) for each article and the total mean number of authors (SEM) for each article excluding authors from categories 1 and 2. The right axis refers to the percentage of multiauthor (>6) papers.

Table 1.—Change in the Number of Articles, Number of Authors, and Type of Authors for *BMJ*, 1975-1995

Variable	1975	1980	1985	1990	1995
Articles, No.	262	260	238	186	125
Authors, mean (SD), No.	3.21 (1.89)	3.57 (1.98)	3.92 (1.98)	3.88 (1.76)	4.46 (2.05)
Articles with single author, %	1.22	0.89	1.07	1.53	0.18
Articles with statisticians as author, %	0.36	1.8	1.6	3.9	5.7

search registrar; 6, medical student or research assistant/associate; 7, house officer, senior house officer, or resident; and 8, miscellaneous. If multiple appointments were mentioned, only the first was included.

Statistical Analysis

The χ^2 test was used to assess differences between 1990 and 1995. The 1-way analysis of variance was used to detect significant changes in the mean number of authors per article over time. Data are expressed as mean (SD) or as a percentage.

RESULTS

Description of the Data Set

In the time span studied, the number of original articles decreased. The mean number of authors per article significantly increased and this was most notable for the last 5 years ($P<.001$). In the same period, the number of articles with 6 or more authors increased steadily (Figure), and single authorship was virtually absent (Table 1). There was a steady increase of input by statisticians (Table 1). During the 20 years studied, the contribution from British institutions remained around 77%.

All Authors

Most *BMJ* authors were from category 3, and there was little change over the study period (Table 2). In the last 5 years, there was a large rise of category 1 authors, which coincided with a similar increase of the mean number of authors per article ($P=.003$) (Figure). In contrast, category 5 authorship decreased in that same period ($P=.002$). In 1995, almost 60% of all authors stemmed from 3 categories (categories 1, 3, and 5).

First Authors

There was a doubling for first authors from category 1 in the last 5 years ($P=.03$) (Table 2). This contrasted to category 5 whose proportion decreased by three fourths in the same period. However, even in 1995, most first authors were from category 5. There was a decrease of category 3 first authors for 1975 to 1990, but this recovered slightly in 1995.

Last Author

As might be expected, most last authors were of senior level: category 1 accounted for one fifth of all last authors in 1975 and its proportion grew approximately one third in 1995 ($P<.001$) (Table 2). Category 2 last authorship did not change over time. As was the case with first authorship, category 3 contribution to last authorship initially rose but later fell ($P=.005$). Two thirds of last authors were from categories 1, 2, or 3. In 1995, virtually nobody from category 4 was listed as last author.

COMMENT

This study clearly documents the increase of authorship[8]: each *BMJ* article gained on average 1.25 authors over the last 2 decades, and multiauthor articles have become common. Interestingly, the largest increase occurred in the last 5 years, during which formal authorship criteria were included in the Instructions to Authors. In addition, a considerable shift of authorship was noted: senior researchers, such as professors and chairpersons, were increasingly included as authors. For example, in the last 5 years, the mean number of authors grew by about 50%, but at the same time 75% more professors were added to the authorship listing. By contrast, the proportion of all other, more junior, authors such as lecturers decreased.

There was not only a mere increase of authorship but also a shift in the authorship order. Senior authors (professors and chairpersons) have moved to first authorship at the cost of other categories like consultants and lecturers. As might be expected, the last author position is taken by the senior member of the research team and this position was secured over time.[9]

How can we explain these results? The increase of the absolute number of senior positions in research units during this period might have exceeded that of junior posts. On the other hand, senior scientists might have become more active in initiating and guiding research. Indeed, a study executed in the 1980s among chairpersons of various medical departments showed that those who had been head chairperson for less than 10 years increased their number of articles, last author articles, and coauthors per article over time.[10] This finding suggests that a change in hierarchical status influences authorship patterns. Senior scientists are under great pressure to publish: a number of British departments insist that supervisors are included as author on their students' papers.[11] This practice might lead to gift authorship: granting of authorship to those who did not make any intellectual effort for the study. A recent study showed that the contribution of individual authors was lowest in multiauthor papers.[12] Another survey detected that 26% of authors to these papers did not contribute significantly to the work. One third of these authors were heads of laboratories,

Table 2.—Proportion of Author Categories for *BMJ* Articles, 1975-1995

Category	1975	1980	1985	1990	1995
			All Authors		
1, Professor	13.2	14	13.2	11.5	20.3
2, Chairperson	5.0	5.8	5.9	7.8	7.9
3, Consultant	24.7	23.2	26.7	27.4	22.6
4, Senior registrar	8.0	9.1	6.3	7.2	5.7
5, Lecturer	24.3	22.4	20.3	24.2	15.8
6, Medical student	7.1	5.3	6.4	4.5	6.3
7, House officer	2.9	3.5	4.4	3.6	2.0
			First Authors		
1, Professor	8.0	6.2	8.8	7.0	16.8
2, Chairperson	3.1	4.2	3.8	4.8	6.4
3, Consultant	24.0	20.8	18.5	12.4	16.8
4, Senior registrar	13.4	14.6	11.3	12.9	13.6
5, Lecturer	34.0	38.5	35.3	44.1	24.8
6, Medical student	5.3	3.1	5.0	3.8	4.0
7, House officer	3.8	3.1	6.3	4.8	3.2
			Last Authors		
1, Professor	20.4	21.9	19.7	22.9	29.0
2, Chairperson	9.1	8.9	11.4	9.7	12.1
3, Consultant	28.3	31.2	39.0	41.1	25.8
4, Senior registrar	4.3	4.6	3.5	2.9	0.0
5, Lecturer	14.8	9.7	7.0	9.1	8.9
6, Medical student	5.2	3.8	4.4	2.3	6.5
7, House officer	2.6	1.7	0.4	0.0	0.8

groups, divisions, or departments.[13] These data suggest that authorship is not always a representative measure of actual intellectual achievements.

Changes in the editorial policy of *BMJ* might account for the results; a different editorial policy might lead to acceptance of papers by professors over those written by junior authors. There was a change in editor in May 1991 and, interestingly, the largest shift of authorship profile took place between 1990 and 1995. The *BMJ* attracts different papers now than in 1975; it publishes more epidemiological studies. Initiation, execution, and reporting of epidemiological studies requires seniority, hence, the shift to more senior authors. Further, these large studies need statistical input and this survey documents the increase of statisticians as authors. Besides, statisticians have argued that they should be included as coauthors.[14] This is understandable given the high error rate against statistical methods in medical articles.[15]

This study must be interpreted with several limitations. The data are derived from *BMJ*, and it can be argued that the results are only applicable to the local British situation. The specific author categories are British, but corresponding ranks do exist elsewhere. Because 5-year intervals were chosen, sampling error may influence the results. Despite these restrictions, the data suggest an increase of authorship associated with a proliferation of senior authors.

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