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Basic science pharmacy faculty publication patterns from research-intensive US Colleges, 1999–2003

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Abstract

Objectives: The purpose of this paper was to determine publication patterns of basic science faculty (medicinal chemistry, pharmaceutics, and pharmacology) in research-intensive US colleges of pharmacy utilizing the Science citation index (SCI) database. A secondary purpose was to determine the sensitivity of our SCI search method in identifying basic science faculty publications.

Methods: We searched SCI for publications by basic science faculty from five randomly selected health sciences-based, public colleges of pharmacy for each of the years 1999–2003. The search strategy involved searching individual faculty by state, year and author name. *Results:* Our search strategy had a false-positive error rate of approximately 2%. Basic science faculty published an average of 3.6 + 4.25 publications per year (95% CI 3.2–4.0) for the years 1999–2003. Approximately 15% of the faculty published 50% of the total publications. Full professors ($n = 215$) averaged significantly higher publications per year (4.77) compared to associate professors ($n = 135$) at 2.75, and assistant professors ($n = 120$) at 2.59. Pharmacology faculty ($n = 114$) averaged significantly lower publications per year (2.60), compared with pharmaceutics faculty ($n = 178$) at 3.90 and medicinal chemistry faculty ($n = 172$) at 4.11.

Conclusion: These data provide normative values to compare publication rates among research-intensive basic science pharmacy faculty. However, simple publication counts such as these provide no insight into the quality or importance of the published information.

Keywords: *Pharmacy faculty, publications, basic sciences, center-based colleges*

Introduction

Scholarship has traditionally been defined as basic research (Amerson, 1992). Boyer (1990) has recently expanded this definition to include a total of four areas of scholarship. In addition to the historical domain of the scholarship of discovery, Boyer added the scholarship of integration, application and teaching. Scholarship also plays a major role in the tenure and promotion process. The essential hallmark of scholarship is the peer-reviewed publication (Nahata, 1991). Publications provide the archival records that allow for the advancement of a scientific discipline (Cloyd, 1988; Kennedy, Gubbins, Luer, Reddy, Light, 2003). Thus, identifying publication patterns for faculty can provide a normative value against which other faculty can be compared during the tenure and promotion process.

The purpose of this paper was to determine publication patterns of basic sciences faculty (medicinal chemistry, pharmaceutics, and pharmacology) in research-intensive United States colleges of pharmacy utilizing the science citation index (SCI) database. A secondary purpose is to determine the sensitivity of our SCI search method in identifying basic science faculty publications.

Methods

A current listing of schools and colleges of pharmacy was obtained from the American association of colleges of pharmacy (2004). Public, health science center based colleges of pharmacy were selected for this study as previous research has

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shown these colleges have higher publication rates and tend to be more research-intensive (Mathys and Thompson, 2000). From this list, five colleges were randomly chosen for each of the years 1999–2003. The AACP roster of faculty was searched for individual faculty names for the years selected. Searches were conducted on a calendar year period. To be included in the study, faculty names had to appear in both the preceding academic year roster and the following academic year roster. For example, faculty member Smith JA has to appear in the 1999–2000 roster and the 2000–2001 roster to be included in the 2000 calendar year search of publications. Social and administrative faculties and pharmacy practice faculty were excluded from this study. Part-time faculty was also not included. Basic science faculty with a "dean" title (assistant dean, associate dean, etc.) were excluded, although department head or chairs were included. Basic science faculty was required to have a Ph.D and be at an academic rank of assistant professor or higher to be included in the study.

SCI was utilized to determine publication rates for individual faculty, as it provides one of the best science and technology databases for searching the basic pharmaceutical sciences. SCI covers approximately 5,900 major journals in the area of science, technology and basic science.

The Web of Knowledge online access was utilized to search SCI. The search was conducted by first selecting just the SCI expanded index and deselecting the *social sciences citation index* and the *arts & humanities citation index*. A specific search year was then selected. The advanced search feature was then selected to search by state and author, for example: [ad = oh AND au = Smith JA] searches for author JA Smith with the address of the state of Ohio. Every citation identified by this procedure was visually verified for department address and for title and subject of the paper. If no publications were identified for an author, the last name of the author was searched with no initials to determine if incorrect initials might have been recorded in the roster. No language restraints were used in the search and no restriction on publication type was employed.

Data were categorized by individual faculty per year and by academic rank and discipline. Frequency distributions were constructed by counting the number of times similar publication counts were observed with individual faculty. The Kruskal-Wallis analysis of variance for nonparametric data was utilized to assess differences between disciplines (medicinal chemistry, pharmaceutics and pharmacology) and academic rank (assistant professor, associate professor, or professor). Dunn's test was utilized for pair-wise comparisons to evaluate differences between subgroups. The *a priori* level of significance was set at ($p < 0.05$).

Results

The initial search strategy revealed 1747 publications. On further review, 41 publications were not associated with the pharmaceutical sciences faculty being searched. The search strategy employed had a sensitivity of about 98% (1706/1747). False positive publications were more likely to occur if a common name was searched or the pharmacy school was located in a highly populous state.

For the years 1999–2003, basic science pharmacy faculty published an average of $3.6 + 4.25$ publications (95% CI 3.2–4.0). The median was 2 publications with an average absolute deviation of 2.8. Individual faculty publications ranged from a high of 27 in one year to a low of zero. Figure 1 is a frequency diagram of all faculty publications over the 5-year period. Full professors account for all but one of the data points on the frequency bar labeled $>$ 16 publications per year. Forty percent of faculty published 0 or 1 publication per year over this period. Approximately 15% of the faculty produced 50% of the publications. Table I lists the publication data by academic rank. Professors averaged significantly higher publications per year than assistant or associate professors ($p < 0.05$). Table II provides descriptive statistics by academic discipline. Pharmacology faculty averaged significantly less publications per year than faculty in medicinal chemistry or pharmaceutics ($p < 0.05$).

While all publication types were searched in this study, we evaluated the 1999 data for professors to see what percentage of these publications were articles as defined by exclusion as not a meeting abstract, editorial, letter, note, or review (although from our observations the designation of a review article does not appear to be consistently applied). Approximately 73% of the total publications in this subgroup were classified as articles.

Discussion

Much of the literature on publication patterns in the health sciences have examined numbers of publications needed for academic promotion. Gjerde and

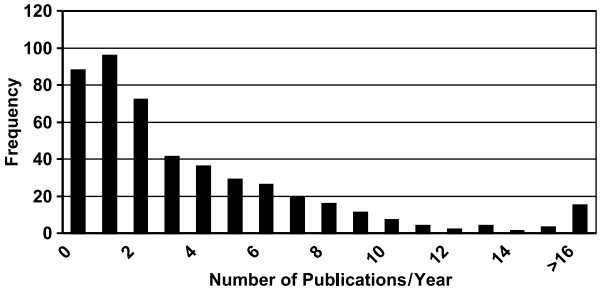

Figure 1. Frequency diagram of individual faculty publications per year 1999–2003.

Table I. Publications per year by Academic Rank (1999–2003).

	Assistant professor ($n = 120$)	Associate professor ($n = 135$)	Professor ($n = 215$)
Mean	2.59	2.75	4.77*
(Standard Deviation)	(2.70)	(2.85)	(5.29)
Median	2.00	2.00	3.00
(Average Deviation)	(1.79)	(2.04)	(3.73)
Range	0–17	0–15	0–28

* Publications per year by full professors were significantly different ($p < 0.05$) from assistant professors and associate professors.

colleagues (1994) found in a national survey of family medicine faculty that assistant professors averaged a total of 2.7 publications, associate professors averaged 6.7 publications, and full professors averaged 13.8 publications at the time of promotion. Bateshaw, Plotnick, Petty, Woolf, Mellits (1988) compiled data on promoted and non-promoted medicine faculty at Johns Hopkins University. These authors found that promoted assistant professors had an average of 23.4 publications at the time of review, compared with 10.6 publications for assistant professors who were not promoted.

Mathys and Thompson (2000) developed a normative baseline of publication rates by pharmacy faculty by examining SCI listings for colleges of pharmacy over a 22-year period (1976–1992). These authors found that health-sciences center-based colleges and public colleges were significantly more prolific than non-health sciences center-based colleges or private colleges. They also found that over half of the colleges were minimally productive and generated less than 0.5 publications per faculty per year.

Krumland, Will, Gorry (1979) assessed the quality and quantity of publications from the Baylor College of Medicine in 1979. These authors found a wide variation in the number of publications yielded by faculty, with 22% publishing nothing over the four years of the study while 10% of the faculty published 50% of the total publications. Our data provide a strikingly similar pattern to the Krumland et al.(1979) data as shown in Table III.

It is noteworthy that the professorship position led all academic ranks in publications. Critics of tenure argue that it may decrease incentive for faculty to be productive. These data suggest those faculty who have progressed through the ranks to professor continue to be highly productive in scholarship and continue to lead junior faculty in these activities. The weaker performance of pharmacology faculty compared to medicinal chemistry or pharmaceutics faculty is difficult to explain. Medicinal chemistry and pharmaceutics are academic areas specific to pharmacy and there is a larger number of faculty representing these disciplines in this study. Pharmacology faculty in the US is often shared between colleges of pharmacy and medicine. Whether this has anything to do with the lower publication numbers seen with pharmacology faculty is not known.

SCI is an excellent database for science and technology research. While SCI may cover most journals in which pharmaceutical scientists may publish, it should not be considered comprehensive. Other databases such as MEDLINE, EMBASE, International Pharmaceutical Abstracts and others could provide a more complete picture of all publications by a faculty member. SCI alone would not be an appropriate database for the administrative sciences or the clinical sciences; hence these faculty were not included in this study.

The publication numbers reported in this paper should not be considered normative for all basic science pharmacy faculty. It is clear from our methods that we have purposefully chosen a biased

Table II. Publications per year by Academic Discipline (1999–2003).

	Medicinal chemistry ($n = 172$)	Pharmaceutics ($n = 178$)	Pharmacology ($n = 114$)
Mean	4.11	3.90	2.60*
(Standard Deviation)	(4.88)	(4.22)	(3.16)
Median	2.00	2.00	2.00
(Average Deviation)	(3.15)	(2.94)	(2.09)
Range	0–27	0–20	0–16

* Publications per year by pharmacology faculty were significantly different ($p < 0.05$) from medicinal chemistry faculty and pharmaceutics faculty.

Table III. Comparison of the data from Krumland et al. (1979) and the current study.

Authors	Type of faculty	Number of year examined in study	Percentage of faculty publishing 50% of the total publications	% of Faculty Publishing Zero Papers
Krumland et al. (1979)	Medicine	4	10	22
Current Study	Pharmacy	5	15	19

sample of colleges which tend to be more research intensive. Therefore, these publication numbers are skewed toward the higher end of publication rates and may be normative for research intensive faculty only.

Simple publication counts such as these provide no insight into the importance or significance of the research being conducted. Indeed, splitting important research into the "least publishable unit" to improve publication counts is not desirable in an era of information overload. Therefore, emphasis on counts rather than quality can be misleading in terms of the ultimate outcome of research, which should be about the discovery of truth and the advancement of a scientific discipline. Further limitations of the methods of our study involve faculty publishing under an inconsistent name (i.e. J Smith versus JA Smith). Our search method would not identify all publications of an author who was inconsistent in their published name. If authors' names were misspelled on their publication, or perhaps misspelled in the SCI database, then those publications would not be picked up in our search method. Similarly, if the state of residence were misreported by the publication or the SCI database, a faculty member's total contribution would not be compiled.

Conclusion

Scholarly publications are the archival record for most academic disciplines. Publications are also an important part of successful academic promotion and tenure. Our goal was to develop normative values for publication rates by research-intensive basic science faculty. These data suggest that a relatively small number of faculty account for a large percentage of the total scholarly publications produced. Faculty at the rank of full professor publish significantly more than assistant or associate professors, and pharmacology faculty publish significantly less than their colleagues in medicinal chemistry and pharmaceutics. It is important to emphasize however, that publication numbers should not be the focus of scholarly excellence and simple publication counts provide no insight into the significance of the work that was done.

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