
Early Career Academic Productivity Among Emergency Physicians With R01 Grant Funding

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Abstract

Objectives: The objective was to describe the early academic career activities of emergency physician (EP) scientists with recent Research Project Grant Program (R01) grant funding from the National Institutes of Health (NIH).

Methods: The curricula vitae of all EP scientists in the United States currently funded by the NIH were analyzed for evidence of advanced research training and frequency and type of publication and grant writing. Each investigator was surveyed for demographic features and estimation of protected time during their early career development.

Results: Eighteen investigators were identified. The median length of time from completion of residency to receipt of their first R01 grant was 11 years (interquartile range [IQR] = 11 to 15 years), and the median age of investigators at the time of this award was 43 years (IQR = 39 to 47 years). At the time of their award, researchers were publishing five peer-reviewed manuscripts a year (IQR = 1 to 8 manuscripts) and had already received considerable external funding. Ninety-four percent of those studied had pursued a research fellowship, an advanced degree, or an NIH K-award following residency.

Conclusions: For EPs, receipt of an R01 from the NIH requires more than a decade of work following the completion of training. This period is characterized by pursuit of advanced research training, active and accelerating publication and collaboration, and acquisition of smaller extramural grants.

ACADEMIC EMERGENCY MEDICINE 2011; 18:759-762 © 2011 by the Society for Academic Emergency Medicine

A primary goal of career development for scientists is the acquisition of sufficient funding to support their ongoing research efforts. With rare exceptions, these funds must come from outside of the scholar's institution. The sources and necessary magnitude of this extramural income vary among investigators as a function of the nature and scale of their work and the availability of departmental and institutional contributions to support their research efforts. In anticipation of this need, a common strategy among junior investigators across many academic domains is to develop a sufficient body of experience and published

work to successfully compete for federal research dollars. In emergency medicine (EM), the need for such development is a prerequisite for the long-term extramural support that is shared by physician- and nonphysician scientists and a major goal of one's early academic career. In many instances, the federal agency that will support scientists in EM is the National Institutes of Health (NIH), and the mechanism by which the funding will be provided is the Research Project Grant Program (R01). Enlarging the number of EM scientists with R01 funding has been an ongoing priority of professional organizations in the specialty for several years.¹⁻³ While the expansion of the research base logically involves both physician and nonphysician investigators, physician scientists are the focus of this article.

Receiving an R01 award is not the sine qua non of successful biomedical research career, nor is the NIH the only source of such awards. Many smaller, comparable, and larger types of extramural funding could readily be used to define success. Nevertheless, the NIH R01 is attractive as a criterion standard on the basis of its general prestige in other biomedical fields and the standardized process by which evaluation and award decisions are made. Regardless of one's field of study,

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Received October 18, 2010; revisions received January 12, January 17 and January 31, 2011; accepted February 2, 2011.

Presented at the Society for Academic Emergency Medicine annual meeting, Phoenix, AZ, June 2010.

The authors have no relevant financial information or potential conflicts of interest to disclose.

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the quality of proposed work and the perceived strength of the principal investigator have standard definitions for R01 awards. As such, these grants reasonably might be held as a research career equivalent of an astronomical standard candle. Additionally, successful receipt of R01 funding is a very common prerequisite to permanent membership on standing study sections within the NIH. Increased R01 funding within the specialty is thus an important gateway to increased involvement of EM in scientific peer review at the federal level.

For many investigators in the field, receiving an R01 is a seminal accomplishment and an immense early career milestone. It is also a rare event in EM; the cumulative number of individuals with these awards in the history of specialty until the time of this report is not well documented but apparently very small compared to the number of academic emergency physicians (EPs). An unfortunate result of the very small number of R01 funded investigators is that most young aspiring academic EPs, and most academic chairs of EM, have never had the opportunity to mentor, be mentored by, or to even have daily academic contact with a successfully NIH-funded investigator.

For that reason, in the current report we conducted a survey of currently R01-funded EP scientists in an effort to describe the portion of their career spanning the completion of residency to the acquisition of an R01 award. Our aim was to provide some metric description of what academic activity takes place prior to this funding being achieved. While not proposing to develop a performance benchmark, we nevertheless felt it reasonable to compile a description of how this career path typically evolves in hopes of offering some useful information to junior faculty, mentors, and chairs of EM programs seeking to develop federally funded investigators.

METHODS

Study Design

This was a survey of currently R01-funded physician scientists in EM and was deemed exempt by the local human subjects committee.

Study Setting and Population

Academic EPs in the United States holding R01 awards from any institute within the NIH on or within 1 year prior to June 1, 2010, were sought by three means. First, the NIH RePORTER search engine (<http://projectreporter.nih.gov>) was queried for "emergency medicine" as a key word. Second, all current members of the Association of Academic Chairs of Emergency Medicine were contacted by e-mail to identify members of their departments currently holding R01 awards. Finally, all investigators identified by the above methods were queried for knowledge of any other investigators not previously identified.

Study Protocol

We requested that each investigator provide a copy of their curriculum vitae and complete an e-mail survey regarding their retrospective estimate of what fraction of their work effort was devoted to research versus

other activities such as clinical service, clinical teaching, and administrative tasks.

Measurements

Publication activity was quantified by determining the number of peer-reviewed manuscripts (as classified by the investigator) appearing in the literature in each year of the study interval. Reports were subcategorized as those in which the investigator served as lead or last author and those in which they served in a "middle author" capacity. The number of unique coauthors with whom, and number of unique journals in which, the investigator published were also noted. Similarly, funded intramural and extramural grant awards were noted and classified both by funding agency and by those in which the investigator served as principal investigator and those in which he or she was a coinvestigator.

Data Analysis

Features of investigator curricula vitae and responses to e-mail survey questions were summarized using standard methods. Formal hypothesis testing was not undertaken given the small number of individuals under study.

RESULTS

A total of 18 physician-investigators were identified. All provided their curricula vitae, and 17 responded to questions regarding distribution of career effort, marriage and domestic partnership, and parenting. The investigators originated from 10 academic departments and one division of EM. Nine of 18 recipients were located within four departments. Most were male (15 of 18), and all reported significant protected time from clinical and other administrative duties (median = 50%, interquartile range [IQR] = 25% to 53%). Additional training following residency was the norm. Ten of the 18 (56%) received a K-series career development training grant prior to their R01. Most (17 of the 18) of R01 recipients had completed a K-award, a fellowship, or an advanced degree.

The age at which academic EPs were awarded their first R01 was widely scattered, but was similar to the general population of physician researchers as reported by the NIH, with a median of 43 years (IQR = 39 to 47 years).⁴ The median time from residency to R01 funding was 11 years (IQR = 11 to 15 years).

In the 10 years preceding award, investigators tended to publish at least one first- or last-author paper annually, and all showed accelerating publication rates over time (Figures 1A and 1B). Subjects tended to take lead authorship positions in manuscripts very early in their career, appearing less frequently as contributing authors on others' work. By the time they received their R01 award, investigators were publishing on average five manuscripts a year (IQR = 1 to 8 manuscripts) and had published 38 peer-reviewed manuscripts. The publication record for these investigators also demonstrates an expanding collaborative network and sphere of influence (Figures 1C and 1D). Specifically, these investigators' work appeared in at least one new

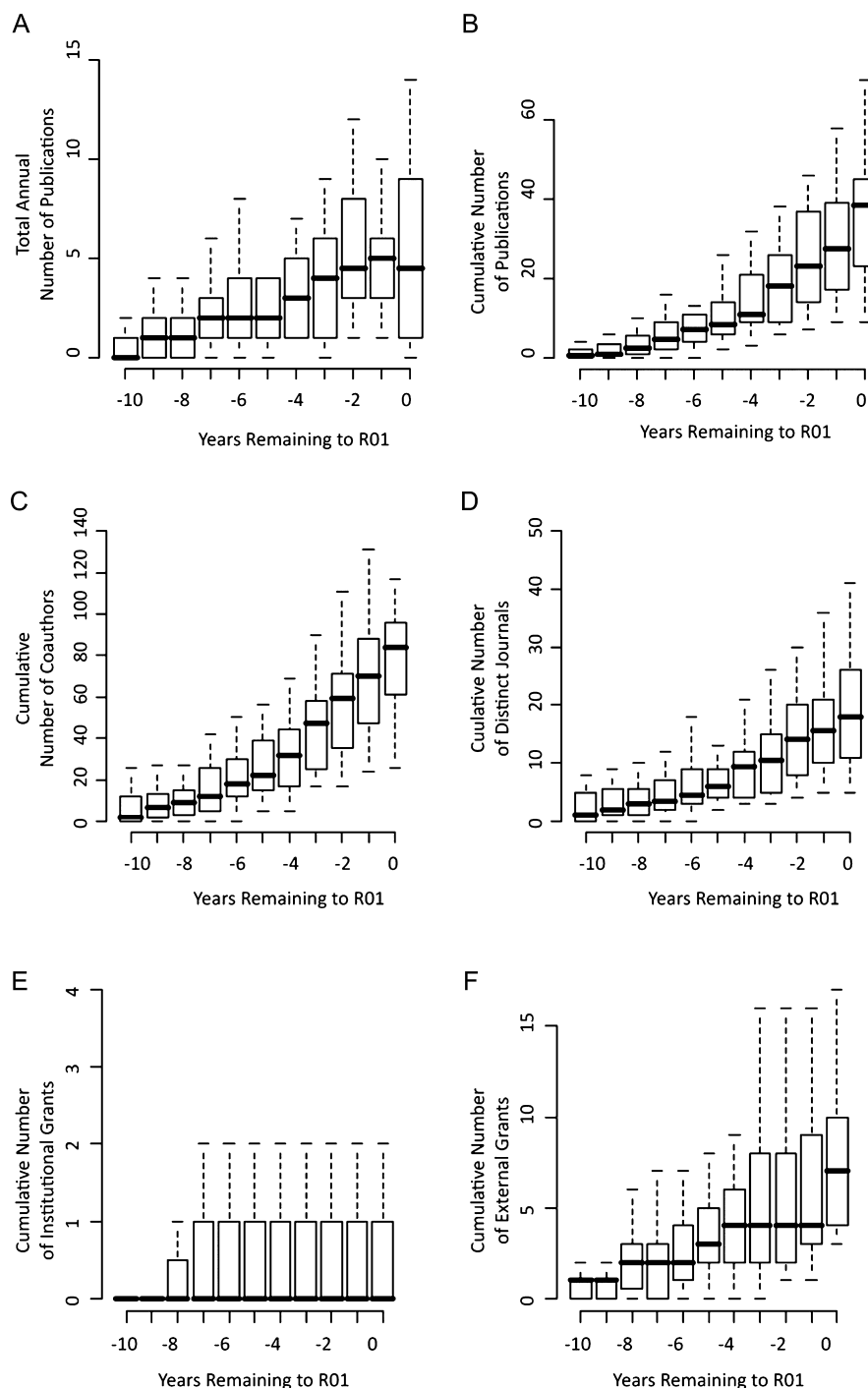


Figure 1. Faculty productivity for the 10 years prior to receipt of an R01 award. (A) Total papers published per year, shown as box-and-whisker plots representing the 5th, 25th, 50th, 75th, and 95th percentile values. (B) Similar plot of cumulative number of publications in the same period. (C) Cumulative number of coauthors. (D) Cumulative number of distinct journals in which the investigators' work appeared. (E) Cumulative number of internal grants received. (F) Cumulative number of external grants, including foundation and local, state, and governmental support.

journal each year. At the time of R01 award, they had published in a median of 18 unique journals and had partnered with a median of 83 coauthors.

Another feature of early activity was acquisition of extradepartmental funding, either intramural or extramural, for research activities (Figures 1E and 1F). Extramural funding predominated. Among grants on

which they served as principal investigators, these scientists received funding from internal sources (median = 1, IQR = 0 to 2, total pre-R01 awards), foundations (median = 4, IQR = 2 to 7), and government grants (median = 5, IQR = 3 to 5). Variations in grant reporting between institutions prevented a specific analysis of the dollar amount of awards over time.

DISCUSSION

We have described academic activities of young U.S. EP scientists who have ultimately developed their research programs sufficiently to receive R01 support from the NIH. The key findings were these: this group acquired additional research-specific training after residency, made a practice of consistent publication (primarily as lead or senior author), collaborated broadly and published in a large variety of journals, and supported their early work with other extramural grants. In general, these individuals benefited from considerable protected time (on average 50%) within their academic unit to get this work done. With one exception, all came from academic departments. Young physician scientists in EM and their department chairs should anticipate more than a decade of work to achieve R01 funding.

The interval between the completion of clinical training and the receipt of an R01 has been noted to be the period of highest risk in terms of abandonment of research careers.⁵ The timeline for R01-funded EP scientists is consistent with the timing of first R01s reported for all physicians by the NIH.^{4,6} It nevertheless is longer than the time spent by most physicians in medical school and residency combined. Although our sample was sufficiently small to prevent the detection of any statistically significant benefit, the fact that 94% of awardees had carried out some postresidency research training (K-award, fellowship, or advanced degree) is powerful additional circumstantial evidence for making such programs a priority for the specialty, as has been noted elsewhere.⁷

LIMITATIONS

We report in essence a case series of EP scientists and acknowledge the weaknesses associated with that study design. In particular, the lack of controls prevents us from commenting on the sufficiency of the academic activity described above to the acquisition of funding. We also acknowledge the inherent limitations of the metrics of productivity we have chosen. Authorship order in particular is often a nuanced decision among collaborators and varies between academic traditions such that "first, middle, and last" categorization does not fully capture author roles. We also limited our focus to physician scientists in EM, excluding nonphysician

investigators. However, our own experience is that the development of junior nonphysician scientists is sufficiently different from the typical trajectory of physicians that the former group warrants separate study.

CONCLUSIONS

At the time of receipt of their first R01 funding, the careers of emergency physician-scientists are characterized by pursuit of advanced research training following residency, vigorous publication habits, and acquisition of numerous internal and external awards. On average, individuals spend a decade following their clinical training developing their careers to the point of being competitive for National Institutes of Health independent funding.

The authors acknowledge the gracious cooperation of the physician scientists who made available their curricula vitae for the conduct of this project.

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