

## SPECIAL CONTRIBUTIONS

# National Institutes of Health Support for Individual Mentored Career Development Grants in Emergency Medicine

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### Abstract

**Objectives:** Individual mentored career (K) awards made by the National Institutes of Health (NIH) are an important way for medical researchers to develop their research skills. This study determined the number of individual mentored (K) awards awarded to emergency medicine (EM) faculty over a 6-year period and compared it with six other specialties.

**Methods:** The NIH database of both submitted and funded K01, K08, and K23 applications was queried and crossed with the departmental affiliation of the principal investigator. The results were further analyzed with data from the Association of American Medical Colleges to determine the relationship between the number of awards and the size of the teaching and research faculty.

**Results:** From 2008 to 2013, there were a total of 45 career development submissions from principal investigators affiliated with departments of EM. Of these, 27 (60%) were successful. This success rate is the third lowest of the seven specialties in this analysis. Emergency physicians submit relatively few grants compared to the size of their faculty, and the funding rate, \$1,959 per EM resident, was the second lowest of the six specialties examined.

**Conclusions:** Although success rates are reasonable, EM investigators submit very few individual mentored career development applications. They should take greater advantage of this mechanism to further their research training.

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The individual mentored career development awards program at the National Institutes of Health (NIH) supports biomedical scientists and clinicians early in their careers. The goal of the program is to produce capable researchers who are ready to launch independent research careers. Within the mentored career development program there are three award types. These are supported by most of the institutes and centers at the NIH, and they account for about 20% of the career development awards and funding. In fiscal year 2013 the NIH made a total of 178 new K01, K08, and K23 awards at a total cost of \$28.5 million.<sup>1</sup>

There are three mentored career development awards made in this category. The K01 mechanism provides support for up to 5 years for an intensive, supervised career development experience in the biomedical,

behavioral, or clinical sciences leading to research independence.<sup>2,3</sup> Some institutes limit eligibility to individuals with a PhD or equivalent degree. The K08 mechanism provides support for medical scientists to develop into independent investigators in the areas of biomedical and behavioral research and aids in filling the academic faculty gap in areas in which there is a shortage within the health profession. The K23 award was introduced in 1999 and is aimed at those with health professional doctoral degrees interested in patient-oriented and clinical research. It supports 3 to 5 years of mentored study and research for those with clinical training who have the potential to develop into clinical investigators. There is some flexibility within institutes about using these awards, but for most emergency physicians (EPs) who wish to focus on clinical research, the K23 mechanism is

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most appropriate. The K23 is also the mentored training mechanism most commonly used by EPs. This study examines the success rates and funding of EPs applying for these individual mentored career development awards and compares them to five other clinical specialties, four of which were used in prior comparisons of NIH funding.<sup>4</sup>

## METHODS

The Query/View/Report (QVR) database was searched for K01, K08, and K23 submissions for the years 2008 through 2012 that were submitted by a principal investigator (PI) from departments of emergency medicine (EM), family medicine, internal medicine, obstetrics and gynecology, pediatrics, psychiatry, and surgery. The QVR database is designed for use across the Department of Health and Human Services and access is limited to staff with log-in credentials. Unlike the publicly available RePORT database that describes NIH-supported projects, QVR includes data about all submitted applications, including those that were not funded. Analysis was limited to grants submitted to the NIH and does not include those supported by the Agency for Healthcare Research and Quality.

From the QVR data, duplicate submissions or duplicate funded applications were removed. The official NIH reporting definitions were followed and excluded from the calculation of the success rates were those applications that were withdrawn by applicants prior to review or returned or administratively withdrawn by either the NIH Center for Scientific Review or an NIH institute or

center and not peer-reviewed by an Initial Review Group. Official data on the success rates for K applications are taken from the NIH Office of Extramural Research, Division of Statistical Analysis and Reporting, Table 204.<sup>1</sup>

Data for the size of teaching and research faculty positions were taken from the 2012 Physician Specialty Data Book.<sup>5</sup> Data for the categories of internal medicine and surgery included subspecialties, such as infectious disease and cardiovascular disease for the former and orthopedic and thoracic surgery for the latter. Data for the number of residency positions were taken from the National Resident Matching Program, Results and Data for 2012.<sup>6</sup> Data on the number of mentors and their departmental affiliations were taken from the biographies submitted as part of the K submissions.

## RESULTS

Over the 6 years from 2008 through 2013, there were a total of 45 career development submissions from PIs who were affiliated with departments of EM (Table 1). Of these, 27 (60%) were successful. This success rate is the third lowest of all the seven specialties in this analysis. The funding rate per resident for EM was the second lowest of the specialties examined.

The success rates for each of the three mechanisms are shown in Table 2. EM applications were most successful when they used the K23 mechanism, with a rate of success for that mechanism that was the second highest of the seven specialties studied. There were very few submissions that used the K01 and K08 mechanisms,

**Table 1**  
Individual Mentored Career Development (K) Awards at NIH, 2008–2013

| Departmental Affiliation of Principal Investigator | Competing Submissions | Funded Submissions | Success Rate | Total Funding | Funding per Incoming Resident* |
|--|-----------------------|--------------------|--------------|---------------|--------------------------------|
| Emergency medicine                                 | 45                    | 27                 | 60%          | \$3,331,830   | \$1,959                        |
| Family medicine                                    | 33                    | 20                 | 61%          | \$2,426,217   | \$935                          |
| Internal medicine                                  | 1,506                 | 1,032              | 69%          | \$125,698,863 | \$24,041                       |
| OB-GYN   | 48                    | 27                 | 56%          | \$3,474,255   | \$2,841                        |
| Pediatrics   | 495                   | 292                | 59%          | \$34,451,390  | \$14,102                       |
| Psychiatry   | 435                   | 294                | 68%          | \$42,663,765  | \$39,177                       |
| Surgery  | 148                   | 94                 | 64%          | \$11,861,764  | \$8,220                        |

\*Based on matched residency numbers for 2012.

**Table 2**  
Success Rate of Individual Mentored Career Development (K) Awards by Mechanism, 2008–2013

| Departmental Affiliation of Principal Investigator | K01       |        |         | K08       |        |         | K23       |        |         |
|--|-----------|--------|---------|-----------|--------|---------|-----------|--------|---------|
|  | Submitted | Funded | Success | Submitted | Funded | Success | Submitted | Funded | Success |
| Emergency medicine                                 | 5         | 1      | 20%     | 7         | 4      | 57%     | 33        | 22     | 67%     |
| Family medicine                                    | 15        | 10     | 67%     | 5         | 3      | 60%     | 13        | 7      | 54%     |
| Internal medicine                                  | 322       | 224    | 70%     | 534       | 377    | 71%     | 650       | 431    | 66%     |
| OB-GYN   | 10        | 5      | 50%     | 17        | 7      | 41%     | 21        | 15     | 71%     |
| Pediatrics   | 44        | 27     | 61%     | 236       | 146    | 62%     | 215       | 119    | 55%     |
| Psychiatry   | 162       | 110    | 68%     | 50        | 39     | 78%     | 223       | 145    | 65%     |
| Surgery  | 18        | 11     | 61%     | 101       | 67     | 66%     | 29        | 16     | 55%     |

**Table 3**  
Submissions and Funding for Emergency Medicine Individual Mentored Career Development (K) Award by Institute, 2008–2013

| Institute | K01       |        | K08       |        | K23       |        | Total Submitted | Total Funded | Most Recent Year of New Award |
|-----------|-----------|--------|-----------|--------|-----------|--------|-----------------|--------------|-------------------------------|
|           | Submitted | Funded | Submitted | Funded | Submitted | Funded |                 |              |                               |
| NIA       |           |        |           |        | 14        | 10     | 14              | 10           | 2013                          |
| NHLBI     | 1         | 0      | 3         | 1      | 9         | 6      | 13              | 7            | 2013                          |
| NIAID     | 1         | 1      | 1         | 0      | 3         | 2      | 5               | 3            | 2012                          |
| NIGMS     |           |        |           |        | 2         | 2      | 2               | 2            | 2009                          |
| NCI       |           |        | 1         | 1      |           |        | 1               | 1            | 2008                          |
| NIDA      |           |        |           |        | 1         | 1      | 1               | 1            | 2009                          |
| NIBIB     |           |        | 1         | 1      |           |        | 1               | 1            | 2009                          |
| NICHD     |           |        |           |        | 1         | 1      | 1               | 1            | 2012                          |
| NINDS     |           |        | 1         | 1      | 2         | 0      | 3               | 1            | 2009                          |
| NIAAA     |           |        |           |        | 1         | 0      | 1               | 0            | N/A                           |
| NCCAM     | 1         | 0      |           |        |           |        | 1               | 0            | N/A                           |
| FIC       | 2         | 0      |           |        |           |        | 2               | 0            | N/A                           |
| Total     | 5         | 1      | 7         | 4      | 33        | 22     | 45              | 27           |                               |

NIA = National Institute on Aging; NHLBI = National Heart, Lung, and Blood Institute; NIGMS = National Institute of General Medical Sciences; NCI = National Cancer Institute; NIDA = National Institute on Drug Abuse; NIBIB = National Institute of Biomedical Imaging and Bioengineering; NICHD = National Institute of Child Health and Human Development; NINDS = National Institute of Neurological Disorders and Stroke; NCCAM = National Center for Complementary and Alternative Medicine; FIC = Fogarty International Center

**Table 4**  
Expected and Actual Rates of Submission for Individual Mentored Career Development (K) Award by Department, 2008–2013

| Departmental Affiliation of Principal Investigator | Teaching and Research Faculty Positions 2010* | Faculty Size Compared to EM | Size of Submissions Relative to EM | Expected Number of Submissions | Actual Number of Submissions |
|--|---|-----------------------------|------------------------------------|--------------------------------|------------------------------|
| Emergency medicine                                 | 425   | Referent                    | N/A                                | N/A                            | 45                           |
| Family medicine                                    | 1,847   | 4.3                         | 0.7                                | 69                             | 33                           |
| Internal medicine <sup>†</sup>                     | 10,875  | 25.6                        | 33.5                               | 138                            | 1,506                        |
| OB-GYN   | 637   | 1.5                         | 1.1                                | 32                             | 48                           |
| Pediatrics <sup>‡</sup>                            | 1,824   | 4.3                         | 11.0                               | 65                             | 495                          |
| Psychiatry <sup>§</sup>                            | 1,651   | 3.9                         | 9.7                                | 29                             | 435                          |
| Surgery <sup>  </sup>                              | 1,357   | 3.2                         | 3.3                                | 38                             | 148                          |

\*Data from the Association of American Medical Colleges 2012 Physician Specialty Data Book.<sup>5</sup>

<sup>†</sup>Includes subspecialties such as gastroenterology, dermatology, and neurology.

<sup>‡</sup>Includes neonatal–perinatal medicine.

<sup>§</sup>Includes child and adolescent psychiatry.

<sup>||</sup>Includes subspecialties such as orthopedics, vascular surgery, and neurosurgery.

and EM applications had the lowest and second lowest funding rates for these two mechanisms, respectively.

Table 3 shows the breakdown of applications from departments of EM and funding by institute. Of the 27 awards made over the 6-year study period, 10 were from the National Institute of Aging; seven from the National Heart, Lung and Blood Institute (NHLBI); and three from the National Institute of Allergy and Infectious Diseases.

The expected number of submissions from each specialty was also calculated, based on the relative size of teaching and research faculty, using the Association of American Medical Colleges (AAMC) data.<sup>5</sup> For example, there are about four times as many pediatric faculty positions as there are for EM. On this basis it would have been expected that there would be about four times as many K submissions when compared to EM. However, there were actually 11 times the number of EM submissions. Other than family medicine, each of

the specialties submitted more K proposals than would have been expected from their relative sizes (Table 4).

Finally, for K submissions from EPs, the numbers of primary and secondary mentors from departments of EM were tabulated (Table 5). Of the 27 funded applications, seven (26%) had primary mentors affiliated with departments of EM, and an additional five (18%) had co-mentors from EM departments. In over half of the funded K awards (15 out of 27, 55%), there were no EM mentors.

## DISCUSSION

This review of submissions for individual mentored grants at NIH reveals that investigators from departments of EM have an overall success rate of 60%, but when compared to other specialties, EM submits relatively few training proposals. There are several possible explanations for this. One is that because there is no

**Table 5**  
Use of Mentors from Departments of Emergency Medicine for Individual Mentored Career Development (K) Awards 2008–2013

| Outcome     | Total Number | n (%) With a Primary EM Mentor | n (%) With Only an EM Comentor | n (%) With Both an EM Primary and an EM Comentor | n (%) With No EM Mentors |
|-------------|--------------|--------------------------------|--------------------------------|--|--------------------------|
| Not awarded | 18           | 12 (66)                        | 2 (11)                         | 2 (11)   | 4 (22)                   |
| Awarded     | 27           | 7 (26)                         | 5 (18)                         | 1 (3)  | 15 (55)                  |

specific institute or center for EM at NIH, the specialty is at a disadvantage when competing for funding. Other specialties can more easily find a natural home for their work, and this gives them an advantage in the competitive arena. For example, between 2008 and 2013, the National Institute for Child Health and Human Development (NICHD) funded 215 individual mentored K awards. Of these, 51 (24%) were from departments of pediatrics, and only one was from EM (data not shown). Similarly, and over the same period of time, the National Institute of Mental Health (NIMH) funded 1,095 individual mentored awards, of which 436 (40%) were from departments of psychiatry (data not shown). Not a single grant application was received by NIMH from a PI with an EM affiliation over this period of time. Further support for the suggestion that a lack of a primary institute puts an EM investigator at a disadvantage is suggested by the data from investigators from family medicine. Of the six specialties reviewed, family medicine underperformed EM in terms of the number of grants it submitted relative to the number of residents it trains, and family medicine, like EM, has no institute of its own at NIH.

A second explanation for the relatively poor performance of EM is a lack of suitable mentors for those applying. The K23 mentored career development award requires that a mentor be identified who "should be an active investigator in the area of the proposed research and be committed both to the career development of the candidate and to the direct supervision of the candidate's research."<sup>7</sup> A candidate may seek a mentor outside of his or her department, but that mentor must be active in the proposed area of research. It may be argued that EM lacks a cadre of such mentors, and this discourages EM candidates from submitting applications. This explanation is supported by the fact that in 42% of individual K submissions from EPs, there is not a single mentor from a department of EM (Table 5).

However, the explanation that EM lacks suitable mentors does not fully explain this finding. Since the first board certification examinations for EM were held almost 35 years ago, it is difficult to argue that EM is a new specialty,<sup>8</sup> neither is it the case that EM has only a few successful researchers and mentors. There are over 40 EM faculty with NIH research (R) funding or cooperative agreements (U) from 25 institutions across the United States, and yet in 2013 the NIH received only nine new individual mentored award funding requests. In addition, in response to the 2010 request for applications from NHLBI for institutional research career development (K12) programs, 18 submissions were received, although there were funds to support only five programs.<sup>9</sup> This suggests that at least this many institutions were capable of providing mentorship and research training.

Instead, the reason a large number of EM research trainees choose mentors outside of their specialty may be a pragmatic one. Because trainees seek funding from an institute with a focused mission (whether that mission addresses a specific disease or population), it is in their interest to demonstrate that their mentors are aligned with both the research project and the mission of the funding institute. For example, consider an EP applying for an individual mentored K award who wishes to study the geriatric population. Such an application is likely to be reviewed by those with expertise in geriatric care, and if the grant is well scored, it would likely be funded by the National Institute on Aging (NIA). Given this background, it is understandable to profile a geriatrician as a primary mentor, perhaps along with, or instead of, an EP. In fact, of the 14 applications to NIA, only seven used primary EM mentors, and in only three applications were the primary mentors exclusively from EM (data not shown). These data may of course be interpreted as there being a lack of qualified EM mentors in the field, but it is no less plausible to suggest that the decision to include those from outside the field is an expression of "grantsmanship," rather than scientific need.

Finally, NIH places an emphasis on basic and mechanistic research, and this may influence junior EM faculty, who are often focused on clinical rather than basic research.<sup>4</sup> However, the overall success rate of EPs who apply for a clinically focused K23 mechanism (67%) should remind potential applicants that mentored clinical research is indeed valued and supported by NIH.

Whatever the factors are that are behind the numbers, there is no doubt that individual mentored career development grants are a critical training tool for those who wish to pursue careers in academic EM. A 2011 NIH report on its career development awards program concluded that researchers who had prior K01, K08, or K23 awards were more likely than comparable unfunded applicants to apply for subsequent NIH research awards. In addition, they had a significantly higher R01 award success rate compared with individuals with no prior career development support.<sup>3</sup>

In an acknowledgement that there are few federally funded EM investigators, in 2010 the NHLBI funded an institutional (K12) research career development program. This program, which expanded as a result of demand to fund six sites, educates scholars to become clinician-investigators in EM, and a stated goal of the program is that scholars will transition to individual K awards or independent NIH research funding.<sup>9</sup> This 5-year K12 support represents an investment of \$20.79 million and provides tailored mentoring in addition to funding for a 2-year research degree. It is the only NIH institutional training program for EPs. The program is a very important

part of addressing the needs of junior EP researchers, and it has already resulted in K23 funding for its trainees. However, funding for the program will end in 2016, and in the present financial climate it is by no means certain that a similar program will be supported.

## LIMITATIONS

Some EM faculty may serve in a division of medicine or surgery, without EM having departmental status. This may result in EM investigators being underrepresented in the results that were obtained by searching for those with primary appointments in departments of EM. A second limitation is the use of AAMC data for the overall size of the research faculty, since it is junior faculty that most commonly apply for individual mentored career development grants. However, it is not feasible to review the faculty listings for the hundreds of departments of medicine, pediatrics, psychiatry, family medicine, obstetrics, and EM that would be required and then determine the junior faculty based on their academic rank. Even if such a list could be compiled, it would not easily distinguish between those with adjunct or clinical appointments and those who were primarily dedicated to research.

## CONCLUSIONS

Among the six specialties reviewed, emergency medicine had the fifth lowest number of submissions for individual mentored NIH career training awards. It receives very little funding in proportion to the number of residents it trains, but its success rate is comparable to the other specialties. Junior faculty in emergency medicine should be encouraged to submit more training proposals and to compete with the pool of other specialties for these important federally funded programs.

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