RESEARCH CONCEPTS

The Impact of Environmental Factors on Emergency Medicine Resident Career Choice

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Abstract. **Objective:** To evaluate the impact of environmental factors on emergency medicine (EM) resident career choice. **Methods:** Program directors of all U.S. EM residencies were surveyed in November 1997. A 22-item questionnaire assessed resources allocated to research, fellowship availability, academic productivity of faculty and residents, and career choices of residency graduates. **Results:** The response rate was 83%. The program director (mean ± SD) estimates of resident career choice were as follows: 27.8 ± 19.1% pursued academic positions with emphasis on teaching, 5.4 ± 9.8% pursued academic positions with emphasis on research, and 66.8 ± 23.1%, pursued private practice positions. In addition, 5.70 ± 6.13% of the residency graduates were estimated to seek fellowship training. Univariate analyses demonstrated that increasing departmental funding for research, having substantial resource availability (defined as having at least two of the following: dedicated laboratory space; support for a laboratory research technician/assistant, a clinical research nurse or study coordinator, a statistician, or an assistant with a PhD degree), a greater number of peer-reviewed publications by residents (r = 0.22; p = 0.08), and a greater number of peer-reviewed publications by faculty (r = 0.26; p = 0.04) positively correlated with the percentage of graduates who pursue academic research careers. Using multiple regression, however, increasing intramural funding and the presence of substantial resource availability were the only variables predictive of resident pursuit of an academic research career. **Conclusion:** Modification of the EM training environment may influence the career choices of graduates. Specifically, greater commitment of departmental funds and support of resources for research may enhance the likelihood of a trainee's choosing an academic research career. **Key words:** academic emergency medicine; career choice; environmental factors; residents. ACADEMIC EMERGENCY MEDICINE 1999; 6:262–270

THE DRAMATIC growth of the specialty of emergency medicine (EM) during the past 25 years is a result of the widely recognized need for improved care of ED patients. Thus, the specialty has developed with a strong clinical orientation and a proportionately smaller focus on academics and research. This has generally been the case even at those institutions that have supported EM residency programs. A 1994 study by Gallagher et al.[1] demonstrated that only 30% of EM residency programs were closely affiliated with an academic medical center, and that within the leading academic medical centers there was an inverse relationship between an institution's acceptance of EM and the institution's academic standing.

If EM is to fully develop its academic potential, it will be necessary to shift from a predominantly clinical focus to a balance between clinical and academic missions. There is evidence that this process has already begun. In the past six years, 32 new academic departments and 36 new residency programs have been established in EM. Thirty-eight percent of the newly established departments and 30% of the newly established residency programs are at research-intensive academic medical centers as defined by the level of NIH funding. Success of academic departments and their individual faculty at these research-intensive medical centers will be measured by their research productivity, rather than clinical endeavors. Hence, if EM is to progress and ultimately flourish in these highly competitive academic arenas, it is important to systematically develop mechanisms to expand our research productivity. Most fundamen-

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tally, this will require the recruitment and training of a greater number of emergency physicians (EPs) dedicated to a career in research and academics. A study by Gallery et al.,[2] however, demonstrated significant manpower shortages in academic EM as well as difficulty in recruiting such faculty.[2] In addition, very few EM residency graduates pursue postgraduate training, especially in the area of research. The latter is particularly notable in view of data from the Association of American Medical Colleges (AAMC) demonstrating that postgraduate research training significantly enhances the likelihood of success in an academic career.[3]

The development of a better understanding of how environmental factors and academic exposure during residency training might affect resident career choice may be helpful in recruiting and developing more EPs dedicated to a career in academic medicine with an emphasis on research. Data from other medical specialties suggest that training in an environment supportive of research may enhance the likelihood of a resident choosing a research career.[4–6] Therefore, the purpose of this study was to evaluate the impact of environmental factors, including resource availability, departmental commitment to research, and program director attitudes toward postgraduate training, on EM resident career choice.

METHODS

Study Design. This was a cross-sectional, observational study that used a survey instrument.

Study Population. The target cohort was program directors of all U.S. EM residency training programs as of November 1997.

Survey Content and Administration. A 22-item questionnaire was faxed to program directors of all U.S. EM residency training programs in November 1997. Nonresponders were contacted by phone and the surveys were faxed a second time. This effort was coordinated by the office of the Society for Academic Emergency Medicine. The questionnaire evaluated resources allocated to research, fellowship availability, faculty profile and productivity, program directors' attitudes toward the importance of research fellowship training for success in an academic career, resident academic productivity, and the career choices and postgraduate positions of residency graduates. The questionnaire specifically assessed availability of the following resources for research: average annual intramural, extramural, and resident research funding; the availability of dedicated laboratory research space; support for a laboratory research technician/assistant, a clinical research nurse or study coordinator, a statistician, and an assistant with a PhD degree. To assess the characteristics and academic productivity of the core teaching faculty at each institution, respondents were asked how many faculty completed fellowship training and in what fields, how many faculty participated in original research, and the number of faculty publications within the preceding three years. Similarly, resident academic productivity was assessed through an estimate of the number of resident publications within the preceding three years. Program directors' perceptions of the importance of fellowship training in research for success in academics were assessed using a ten-point Likert scale in which responses were framed on a disagree–agree continuum with "10" indicating strong agreement. We assessed program director attitudes toward the importance of fellowship training because previous studies have identified the latter as a marker for the pursuit of and success in an academic career.[3,7] In addition, program directors were asked how well they believed their residency program prepared its graduates for an academic position that required original research. This was assessed using a five-point scale in which "1" represented "unprepared" and "5" represented "well prepared." Program directors were also asked to estimate the percentage of graduates who pursued an academic teaching position (defined as primary involvement in clinical and/or didactic teaching of students and residents), an academic research position (defined as primary involvement in the performance and publication of original research, laboratory or clinical), and a private practice position. In addition, respondents were asked the number of graduates who sought fellowship training during the preceding five years.

Intramural, extramural, and resident research funding levels were categorized on the survey instrument as follows:

Average annual intramural research funding:

1 = \$0–10,000; 2 = \$11,000–50,000;
3 = \$51,000–100,000; 4 = >\$100,000

Average annual extramural research funding:

1 = \$0–50,000; 2 = \$51,000–250,000;
3 = \$251,000–500,000; 4 = >\$500,000

Average annual resident research funding:

1 = \$0–5,000; 2 = \$6,000–10,000;
3 = \$11,000–20,000; 4 = >\$20,000

Data Analysis. Data were summarized and statistically analyzed using SAS (SAS Institute, Inc., Cary, NC) software. Program directors' responses to the question assessing the perceived importance

TABLE 1. Faculty Characteristics and Resource Availability of Programs with Fewer than Three Graduated Classes (Excluded from Final Analysis) and Programs with at Least Three Graduated Classes (Included in Final Analysis)

	Excluded (n = 25)	Included (n = 77)	p-value
Faculty characteristics—mean (±SD)			
Number of core teaching faculty	16.5 (±5.9)	15.9 (±8.1)	0.717
Percent of faculty doing original research	51.8 (±26.3)	51.4 (±26.3)	0.948
Percent of faculty with peer-reviewed publication*	45.7 (±25.7)	56.3 (±50.5)	0.188
Percent of faculty with fellowship training	20.8 (±17.7)	15.2 (±15.2)	0.134
Total* number of peer-reviewed publications by faculty	18.6 (±25.3)	17.0 (±14.7)	0.778
Total* number of publications by faculty	47.7 (±44.8)	43.1 (±35.6)	0.624
Program director perception of research fellowship importance (1–10)	6.1 (±2.0)	6.2 (±2.3)	0.941
Resource availability			
>$50,000 annual intramural funding	20.0%	23.0%	0.757
>$250,000 annual extramural funding	32.0%	21.3%	0.279
>$10,000 annual resident research funding	22.7%	25.0%	0.828
Dedicated research space and technician	36.0%	32.9%	0.776
Support for clinical research coordinator	60.0%	47.4%	0.273
Support for statistician	40.0%	34.2%	0.600
Support for PhD-level assistant	40.0%	30.3%	0.368
Fellowship training available	32.0%	55.3%	0.044

*In the preceding three years.

of fellowship training for success in an academic career were included as a continuous variable or were dichotomized into strong agreement (7–10) vs not (1–6), where appropriate. Responses to the question assessing preparedness of graduates for an academic position that requires original research were also dichotomized with 4 and 5 considered well prepared and 1–3 considered not well prepared. Frequency distributions and summary statistics were calculated for variables of interest. The chi-square statistics were used to assess associations of categorical variables. The t-test and analysis of variance were used to detect a difference in means between groups, and the Pearson correlation coefficient (r) was calculated for association between two continuous variables. The analyses focused on evaluating the environmental factors of residency programs that affect the percentage of residents who pursue academic research and academic teaching, as well as the percentage who seek fellowship training. The normality assumption was checked for all variables, and multiple regression was used for all analyses. If the normality assumption was violated, the dependent variables were dichotomized appropriately and logistic regression analysis was performed. For ease of understanding and presentation, since the dependent variables are expressed in percentages, the multiple regression models are emphasized. Logistic regression was used only to confirm the primary findings of the multiple regression analysis. The most parsimonious model for each dependent variable was chosen for the final results.

Since our primary outcome measure focused on residency graduate career choice, the final data analysis included only those programs that had graduated three or more classes of residents to ensure stabilization of faculty and resident pool, as well as establishment of departmental resources.

RESULTS

The surveys were sent to 115 program directors, and 102 (89%) responded. Of the responders, 25 were from residency programs that had graduated fewer than three classes, leaving 77 responses for final data analysis. The response rate was 83% for programs that graduated three or more residency classes. With the exception of fellowship availability, the characteristics of the programs that graduated fewer than three classes and hence were excluded from analysis were not different from those of the programs that graduated three or more residency classes and were included (Table 1).

The program director estimates (mean ± SD) for the percentage of residents pursuing the various career options were as follows: 27.8 ± 19.1% pursued academic positions with emphasis on teaching and 5.4 ± 9.8% pursued academic positions with emphasis on research, while the majority, 66.8 ± 23.1%, pursued private practice positions. The program director estimates for the percentage of residents who pursued fellowship training was 5.70 ± 6.13%.

Table 2 shows residency program characteristics across different institute types. Although there is no statistically significant difference, there is a

TABLE 2. Residency Program Characteristics by Different Institute Types*

	University (n = 37)	Community (n = 20)	County/Public Health (n = 16)	Military (n = 4)
Faculty characteristics—mean (±SD)				
Percent doing original research	57.4% (±29.0)	48.0% (±21.3)	47.4% (±25.1)	29.5% (±8.8)
Percent with fellowship	19.2% (±16.2)	12.2% (±14.7)	12.0% (±13.0)	4.7% (±3.7)
Annual funding				
>$50,000 intramural	28.6%	26.3%	12.5%	0.0%
>$250,000 extramural	33.3%	5.3%	18.8%	0.0%
>$10,000 resident research	22.9%	31.6%	21.4%	25.0%
Resident publications†—mean (±SD)				
Total	16.2 (±13.5)	12.0 (±7.0)	19.9 (±12.4)	4.5 (±1.3)
Peer-reviewed resident publications	5.1 (±4.5)	6.4 (±4.8)	7.4 (±6.7)	2.3 (±1.0)
Graduate characteristics—mean (±SD)				
Percent who seek fellowship training	6.4% (±7.7)	5.8% (±4.7)	5.2% (±3.4)	0.8% (±1.6)
Percent who seek academic teaching positions	28.0% (±17.9)	25.3% (±20.4)	32.0% (±23.1)	22.5% (±2.9)
Percent who seek academic research positions	7.3% (±10.6)	5.8% (±11.6)	1.3% (±3.5)	1.8% (±2.4)

*Chi-square statistics showed no difference ($p > 0.05$) in any of the above characteristics by institute types.
†Total in the preceding three years.

trend toward increased extramural funding at university programs and greater funding for resident research at community-based programs. Because institute type was not found to be statistically associated with any of the assessed variables, post-hoc statistical comparisons were not performed.

Table 3 compares the residency program characteristics of three-year vs four-year programs. Faculty profile, resident productivity (as measured by the number of publications), and resource availability were similar except with regard to amount of intramural funding; three-year training programs had a higher level of intramural funding as compared with four-year programs (8.0% vs 30.6% having more than $50,000/year of intramural research funding). In addition, a significantly higher percentage of graduates of four-year programs (36.3%) pursued academic teaching positions as compared with graduates of three-year training programs (23.8%). These data must be interpreted carefully however, since 65% (13 of 20) of county/public health or military hospitals are four-year programs as compared with only 22.8% (13 of 57) of university or community hospital programs ($p = 0.003$). Hence, much of the observed differences may be due to the difference in institute types rather than program lengths.

Univariate analysis demonstrated positive associations between increasing intramural, extramural, and resident research funding levels and the percentage of graduates who pursued an academic research career (Table 4). Univariate anal-

TABLE 3. Residency Program Characteristics by Program Length (Three-year vs Four-year Program)*

	Three-year Program (n = 51)	Four-year Program (n = 26)	p-value
Faculty characteristics—mean (±SD)			
Percent doing original research	53.8% (±27.5)	46.9% (±23.6)	0.278
Percent with fellowship	17.1% (±15.6)	11.4% (±13.9)	0.123
Annual funding			
>$50,000 intramural	30.6%	8.0%	0.029
>$250,000 extramural	22.5%	19.2%	0.746
>$10,000 resident research	27.1%	20.8%	0.564
Resident publications†—mean (±SD)			
Total	15.5 (12.8)	15.1 (10.8)	0.894
Peer-reviewed	5.5 (5.2)	6.2 (5.2)	0.620
Graduate characteristics—mean (±SD)			
Percent who seek fellowship training	5.4% (±5.7)	6.4% (±7.0)	0.496
Percent who seek academic teaching positions	23.8% (±16.0)	36.3% (±22.4)	0.019
Percent who seek academic research positions	5.2% (±9.1)	5.9% (±11.4)	0.768

*Chi-square statistics showed no difference ($p > 0.05$) in any of the above characteristics by program length.
†In the preceding three years.

ysis also revealed a positive correlation between the percentage of graduates who pursued an academic research career and programs having substantial resource availability (i.e., as defined as having at least two of the following: dedicated laboratory space; support for a laboratory research technician/assistant, a clinical research nurse or study coordinator, a statistician, or a PhD-level assistant) (Table 4). There was also a positive correlation between the percentage of graduates who pursued an academic career in research and the number of peer-reviewed publications by residents ($r = 0.22$; $p = 0.08$) and the number of peer-reviewed publications by faculty ($r = 0.26$; $p = 0.04$) (Table 5). There was no association between the percentage of residents participating in research and the pursuit of an academic research career ($r = -0.08$; $p = 0.52$). Using multiple regression, however, level of intramural funding and having substantial resource availability were the only statistically significant variables predictive of pursuit of an academic career with emphasis on research (Table 6). Every one-level increase in intramural funding was associated with an estimated 2.8% increase in the percentage of residents who pursued an academic research position, after adjusting for resource availability. Similarly, 3.8% more graduates from programs identified as having substantial resource availability were estimated to seek academic positions with an emphasis on research, after adjusting for the effect of intramural funding. Since the length of the training program (three-year vs four-year) was also associated with the level of intramural funding (Table 3), we included this variable in the regression model to control for potential confounding effects. The inclusion of program length did not change the parameter estimates for intramural funding or resource availability. Because 51% of the program directors indicated that none of their residents pursued an academic research position upon completion of residency, the normality assumption was violated. Hence, the data were also analyzed via logistic regression; intramural funding and resource availability remained positive predictors of having graduates who pursued an academic research position.

Univariate analysis revealed a positive associ-

TABLE 4. Association of Career Choices and Pursuit of Fellowship Training with Funding Levels and Resource Availability—Mean (±SD)

	% Academic Research	% Academic Teaching	% Fellowship
Intramural funding level*			
1	1.67 (±3.24)	24.87 (±18.76)	4.01 (±4.71)
2	4.70 (±5.99)	29.17 (±22.65)	5.34 (±4.79)
3	6.25 (±9.46)	43.25 (±22.04)	6.89 (±5.00)
4	12.08 (±14.40)	27.46 (±12.65)	9.97 (±10.00)
p-value for linear trend	0.0001	0.4320	0.0037
Extramural funding level†			
1	2.39 (±4.84)	25.18 (±19.87)	4.22 (±4.15)
2	7.67 (±12.27)	32.11 (±23.77)	4.91 (±4.82)
3	4.67 (±7.79)	29.14 (±13.04)	8.24 (±9.45)
4	14.78 (±15.38)	29.22 (±8.90)	10.90 (±9.59)
p-value for linear trend	0.0009	0.4364	0.0018
Resident research funding level‡			
1	3.27 (±6.34)	22.87 (±16.42)	3.46 (±3.14)
2	3.15 (±3.66)	28.10 (±22.39)	5.52 (±6.07)
3	12.21 (±17.62)	33.14 (±18.88)	7.59 (±5.75)
4	11.25 (±10.31)	42.50 (±24.66)	14.59 (±9.72)
p-value for linear trend	0.0064	0.0236	0.0001
Substantial resource availability§			
Yes	9.38 (±12.76)	30.91 (±18.65)	7.27 (±7.31)
No	2.32 (±4.84)	25.48 (±19.33)	4.54 (±4.86)
p-value for t-test	0.0052	0.2282	0.0731
Offers fellowship			
Yes	7.69 (±11.86)	31.90 (±18.78)	7.27 (±6.90)
No	2.88 (±5.84)	23.12 (±18.90)	3.39 (±3.96)
p-value for t-test	0.0294	0.0513	0.0033

*Annual intramural research funding: 1 = $0–10K; 2 = $11K–50K; 3 = $51K–100K; 4 = >$100K.
†Annual extramural research funding: 1 = $0–50K; 2 = $51K–250K; 3 = $251K–500K; 4 = >$500K.
‡Annual resident research funding: 1 = $0–5K; 2 = $6K–10K; 3 = $11K–20K; 4 = >$20K.
§Having at least two of the following: dedicated laboratory space, support for a laboratory research technician/assistant, a clinical research nurse or study coordinator, a statistician, or a PhD-level assistant.

TABLE 5. Correlation of Career Choice and Fellowship Training with Faculty and Resident Publication—Pearson Correlation (p-value)

	% Academic Research	% Academic Teaching	% Fellowship
No. peer-reviewed resident publications	0.22 (0.08)	0.20 (0.10)	0.24 (0.05)
No. peer-reviewed faculty publications	0.26 (0.04)	0.14 (0.26)	0.31 (0.01)

TABLE 6. Multiple Regression Models for Percentage Pursuing Academic Research Positions, Academic Teaching Positions, and Fellowship Training

	Estimate	t	p > |T|
Model for percent pursuing academic research position			
Intercept	−2.48	−1.347	0.183
Annual intramural funding level*	2.83	3.38	0.001
Substantial resource availability†	3.79	2.03	0.046
Model for percent pursuing academic teaching position			
Intercept	18.36	5.55	0.000
Total peer-reviewed publications by residents	0.64	1.62	0.109
Program length (four years)	14.04	3.30	0.002
Model for percent pursuing fellowship training			
Intercept	−0.29	−0.21	0.837
Department offers fellowship training	2.06	1.63	0.109
Annual resident research funding‡	2.49	3.67	0.000

*Intramural funding levels: 1 = $0−10K; 2 = $11K−50K; 3 = $51K−100K; 4 = >$100K.
†Having at least two of the following: dedicated laboratory space, support for a laboratory research technician/assistant, a clinical research nurse or study coordinator, a statistician, or a PhD-level assistant.
‡Resident research funding levels: 1 = $0−5K; 2 = $6K−10K; 3 = $11K−20K; 4 = >$20K.

ation between resident research funding, but not intramural or extramural funding, and pursuit of an academic teaching career (Table 4). Multiple regression analysis, however, demonstrated the percentage of graduates pursuing an academic career with emphasis on teaching to be positively associated with program length as well as the number of peer-reviewed publications by residents, with the latter variable being marginally significant (Table 6). Approximately 14% more graduates of four-year training programs were estimated to pursue academic teaching positions as compared with graduates of three-year programs. In addition, the model estimated that each additional peer-reviewed resident publication was associated with a 0.64% increase in residents who pursue an academic career with an emphasis on teaching.

Program directors' mean ratings of the importance of fellowship training in research for success in an academic career was 6.16 ± 2.28 on the ten-point Likert scale. Forty-eight percent of the program directors indicated that they believed fellowship training was very important, a rating of 7−10 on the ten-point scale, for success in an academic career. Although fewer than half of program directors indicated that they believed fellowship training was important, when asked to rate research skills of residency graduates, only 29% indicated that their residents were well prepared for an academic career that requires original research.

Univariate analyses demonstrated that all funding variables were positively associated with the percentage of graduates seeking fellowship training, with the resident research funding level being the most significant variable (Table 4). The number of peer-reviewed faculty publications (Table 5) and fellowship availability at the training institution (Table 4) were also significantly associated with the pursuit of fellowship training. Using multivariate analysis, however, the resident research budget and the availability of fellowship training were found to be the only significant variables associated with the percentage of graduates who pursued postgraduate training, with the latter being marginally significant (Table 6). The model estimated that for every level increase in the resident research budget, there was an associated 2.49% increase in the percentage of residents who sought fellowship training. In addition, the model estimated that 2.06% more graduates of programs that offer fellowship training sought postgraduate training as compared with graduates of programs that did not offer such training (Table 6).

DISCUSSION

Data from this study demonstrate that only an estimated 5.4% of graduating EM residents pursue an academic career with an emphasis on research.

The data suggest, however, that modifications in the training environment may influence career choice and therefore provide a method of increasing this number. In this study, greater departmental commitment to research as measured by the annual intramural funding budget and support of laboratory space and/or research personnel were associated with a greater percentage of graduates who pursue an academic research career. This is consistent with studies from the radiology and EM literature.[4,8] Hillman et al.[4] surveyed radiology residents and practicing radiologists to determine which factors most influenced their choices of a research career. In that study, publication of a research article, having a dedicated research fellowship at the resident's training institution, having dedicated research facilities, and access to intramural funding to support research were factors associated with the choice of a research career. Similarly, Sanders et al.[8] surveyed academic and nonacademic practicing EPs with regard to the most important factors influencing their career decisions. In this study, availability of research funding, research facilities, and travel support to present research during residency were positively associated with pursuit of a research career. Hence our data and the previous studies support the concept that an appropriate milieu during training enhances the likelihood of a resident's choosing an academic research career.

Literature from other medical specialties as well as EM suggests that exposure to research role models during training is also positively associated with pursuit of an academic research career.[6,8–10] Sanders et al. observed that EPs who chose academic careers were more likely to have had research advisors and research role models during training as compared with nonacademic faculty.[8] Similarly, studies from pediatrics, psychiatry, and pulmonary medicine cite exposure to research role models and encouragement from faculty as important influences in career choice.[6,9,10] The current study did not survey residents and therefore cannot directly assess the effect of faculty role models on resident career choice. However, one might consider the number of peer-reviewed publications by faculty as an indirect or surrogate measure of the presence or availability of research role models. Our data did demonstrate a weak positive relationship between the number of peer-reviewed publications by faculty and the percentage of residents who pursue an academic career involving research. This relationship did not hold, however, after controlling for the effects of intramural funding and resource availability.

Our data differ from those of previous studies demonstrating a positive association between resident involvement in research and pursuit of a research career [4,5,8]; in the current investigation the percentage of residents who participated in research was not related to choice of an academic career. The contrasting findings between the current and previous studies may reflect the fact that previous studies did not control for the effects of intramural funding or resource availability. In addition, our survey instrument measured and correlated the percentage of residents from each program involved in research with the percentage who pursued the three career options; unlike previous investigations, this survey did not directly correlate individual involvement in research with individual career choice. We considered that resident productivity, as measured by the number of peer-reviewed publications, may be a similar but potentially more sensitive predictor of career choice. Although univariate analysis demonstrated a positive association between the number of peer-reviewed resident publications and the percentage of residents who choose an academic research career, this relationship did not hold after adjusting for the effects of intramural funding and resource availability. The weak association between the number of peer-reviewed publications by residents and pursuit of an academic research career may reflect the fact that research performed during residency often does not result in publication beyond that of an abstract, and when a manuscript is submitted it is usually not completed until after graduation due to time constraints. And again, our survey instrument measured the overall number of peer-reviewed publications and correlated these with the percentage who pursued the three career options, rather than individual publication records and individual career choices.

A troubling aspect of this study is the data regarding fellowship training. Only an estimated 5.7% of the graduating residents pursued postgraduate training of any type. This includes those who sought fellowships in administration, emergency medical services, pediatrics, and toxicology, as well as research. Although the survey instrument did not measure the percentage of residents who specifically sought postgraduate research training, one can assume that this number is significantly lower than 5.7%. In addition, only 29% of the program directors indicated that they believe their residents are well prepared for an academic research career, yet fewer than 50% of the program directors perceive fellowship training in research to be important for success in an academic career with emphasis on research. A study conducted by the AAMC, however, demonstrated that having two or more years of postdoctoral training, which included formal course work in the fundamental sciences pertinent to the investigator's area of concentration, significantly enhanced

the likelihood of obtaining funding for research and of success as an academic researcher.[7] Data from a larger study of 12,000 faculty also demonstrated a positive association between postgraduate research training and the success of an investigator; in the latter study, faculty with research training were more likely to publish and obtain funding for research.[3] The cause of the low percentage of EM residency graduates who pursue fellowship training is likely multifactorial. First, EM residents may not perceive a need for fellowship training since the majority of faculty role models, including those in academic research positions, have not had such training. Similarly, if the majority of program directors do not believe fellowship training is important for an academic career, this attitude will likely be conveyed to the residents. In addition, since postgraduate training delays a graduate from obtaining the typical practicing EP salary, there is significant financial disincentive. And, finally, as demonstrated by Chernow et al.[11] and Gallery et al.,[2] there is a significant shortage of academic faculty and it is difficult to recruit and fill these positions. Hence, an EM graduate with minimal research or academic experience and a desire to pursue such a position will be highly sought-after, despite the fact that his or her credentials may be marginal. Although the number of EM residency graduates who pursue fellowship training is disappointingly low, our data do suggest that there are program characteristics that can be modified to increase this number. Specifically, increased departmental commitment to research in the form of funding for resident research, and the provision of and exposure to fellowship opportunities may provide a mechanism by which to increase the percentage of residents who pursue postgraduate training.

Prior studies have assessed the influence of demographic background, medical school characteristics, academic achievements during medical school and residency, financial obligations, and resident attitudes and personal values on career choice. The current study, however, is the first to directly measure resource availability and departmental commitment to research and correlate these data with a profile of resident career choice at each institution. Importantly, our data do suggest that increased resource availability for research and departmental commitment to research may enhance the likelihood of a trainee's choosing an academic career.

Limitations and Future Questions

There are several limitations to this study. First, there are potential sources of error inherent in our method of data collection. The data were self-reported by program directors and therefore may contain inaccuracies or biases. Second, one must be cautious when interpreting the results. One cannot attribute direct causality between any of the independent variables studied and the primary outcome measure, distribution of graduate career choice. Rather, one can only note that there are significant associations between specific environmental characteristics and resident career choice. It seems likely that an academically oriented training program will attract a greater percentage of academically oriented medical school graduates, and the degree to which training in an environment supportive of research is an independent influence on career choice cannot be determined from this study. Given a preselection bias, however, the data from the current and previous studies suggest that the appropriate use of resources may increase the likelihood that a trainee will choose a research career. To better assess the impact of environmental factors on resident career choice, future studies might prospectively follow residents through their training and assess initial and final career choices.

Conclusions

Our data suggest that modification of the EM training environment may influence the career choices of graduates. Specifically, greater commitment of departmental funds and support of resources for research may enhance our ability to develop future academicians. Since the future of EM may depend on the further development of physician scientists dedicated to a career in academic research, allocation of department resources for this purpose is crucial. In addition, the data demonstrate that although the majority of program directors believe their residents are inadequately prepared for an academic career with emphasis on research, fewer than half perceive postgraduate research training to be important for success in such a position. Senior-level faculty of our specialty need to be informed of the importance of fellowship training and the data demonstrating the benefit it provides.

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