

Tracking the Careers of Academic General Pediatric Fellowship Program Graduates: Academic Productivity and Leadership Roles

Peter G. Szilagyi, MD, MPH; Robert J. Haggerty, MD; Constance D. Baldwin, PhD; Heather A. Paradis, MD, MPH; Jennifer L. Foltz, MD, MPH; Phyllis Vincelli, BS; Aaron Blumkin, MS; Tina L. Cheng, MD, MPH

From the Division of General Pediatrics, Department of Pediatrics, University of Rochester School of Medicine and Dentistry, Rochester, NY (Dr Szilagyi, Dr Haggerty, Dr Baldwin, Dr Paradis, Dr Foltz, Ms Vincelli, and Mr Blumkin), and Johns Hopkins University, Baltimore, Md (Dr Cheng)

Presented in part at the Pediatric Academic Societies Annual Meeting, Vancouver, BC, May 2010.

Address correspondence to Peter G. Szilagyi, MD, MPH, University of Rochester School of Medicine and Dentistry, Box 777 Strong Memorial Hospital, 601 Elmwood Avenue, Rochester, New York 14642 (e-mail: peter_szilagyi@URMC.rochester.edu).

Received for publication June 3, 2010; accepted February 5, 2011.

ABSTRACT

OBJECTIVE: Little is known about the careers of graduates of academic general pediatric (AGP) fellowship programs. We evaluated the careers of 2 cohorts of AGP fellowship graduates: an early cohort trained during 1978 to 1988, and a later cohort trained during 1989 to 1999.

METHODS: We surveyed all known AGP fellowship graduates in both cohorts by using a confidential mailed survey. We assessed graduates' current professional work and analyzed curricula vitae for principal investigator (PI) grants; first-authored, peer-reviewed publications; and leadership positions.

RESULTS: From the early cohort, 95 of 131 eligible graduates (73%) responded; from the later cohort, 93 of 133 (70%) responded. Two thirds of each cohort remain in academics; of these, nearly half are on tenure tracks and over half have major educational roles within their university. The percentage in the early cohort who have been PI on a research grant by 5, 10, and 15 years postfellowship was 44%, 53%, and 54%, respectively;

in the later cohort, it was 62%, 75%, and 75%, respectively ($P = .004$ vs early cohort). During the 10 years postfellowship, the early and later cohorts averaged 5.5 and 7.4 first-authored, peer-reviewed papers, respectively ($P = .4$). By 10 years, a high proportion of both cohorts had become division chief (19% vs 16%), had other academic leadership positions (43% vs 59%), or were leaders in professional organizations (20% vs 30%; all $P = NS$).

CONCLUSIONS: Graduates of AGP fellowship programs have achieved considerable academic success. Recently trained fellows appear even more successful. The academic outcomes of these AGP fellows bode well for the future of AGP.

KEYWORDS: academic general pediatrics; academic leadership; fellowship programs; follow-up study

ACADEMIC PEDIATRICS 2011;11:216–223

THE FIELD OF pediatrics is more than 150 years old, yet the discipline of academic general pediatrics (AGP) is relatively new and still building the foundations for scholarship.¹ Early on, most academic pediatricians were generalists.² Many subsequently branched into evolving subspecialty disciplines. Between the 1930s and the 1970s, the dramatic rise in pediatric subspecialties, typically supported by discipline-specific fellowship programs, was accompanied by an equally striking reduction in the number of pediatric academic generalists.¹ This evolution led to calls for renewed attention to scholarship in general pediatrics and in pediatric primary care in order to fill the "pipeline" for AGP with productive clinician-scholars.^{2,3}

Since the 1970s, fellowship programs have been created to prepare generalist faculty for research and education, as well as clinical endeavors.³ The Robert Wood Johnson (RWJ) Foundation implemented a 10-year program in 1978 that funded a 2-year general pediatrics academic development program (GPAD) fellowship at 6 universities.² Since 1972, RWJ has funded pediatricians as part of the Clinical

Scholars (CS) academic generalist training program. Two major federal training programs, the Health Resources and Services Administration (HRSA) Faculty Development Program in Primary Care (Title VII)⁴ and the HRSA-National Research Service Award training program,^{5,6} have funded academic generalist fellowship positions for several decades. Several departments of pediatrics have supported their own AGP fellowship programs.

In 2009, the Academic Pediatric Association (APA) launched an AGP fellowship accreditation process (to accredit programs, not fellows) with the goal of strengthening training by promoting improved curricular models and creating national standards for fellowship programs.^{7,8} Even though dozens of AGP fellows are now trained annually, little has been reported about their career successes or perceptions of their fellowship training. Documenting the academic performance of prior AGP fellows can enhance fellowship training by establishing benchmarks of academic productivity for fellowship graduates.

Two previous studies have tracked the performance of past AGP fellows. In 1990,² and again in 1999,⁹ one of the authors (R.J.H.) published results of a survey of RWJ-funded AGP fellowship graduates. The 1999 report evaluated fellows 8 to 18 years after their fellowship and noted modest success in grant funding, publications, and academic promotion. That study also highlighted threats to academic success, particularly inadequate research funding and heavy clinical and teaching demands that limited graduates' time for scholarship. More recent outcomes of AGP fellowship graduates have not been studied.

We therefore conducted a follow-up of the 1999 study of AGP fellowship graduates to compare the academic achievement of the cohort of RWJ-funded AGP fellows trained from 1978 to 1988 with that of a newer cohort of AGP fellows trained from 1989 to 1999 and funded by HRSA or local support. We also aimed to identify components of fellowship training that these graduates believe should be enhanced. We hypothesized that the 2 cohorts, despite similar academic pressures, would achieve comparable, relatively high academic success.

METHODS

The Institutional Review Board of the University of Rochester approved this study.

STUDY DESIGN

We performed a confidential mailed survey of 2 cohorts of former AGP fellows. All received the identical survey instrument.

SUBJECTS

EARLY COHORT

These RWJ-funded AGP fellows, trained between 1978 and 1988, were previously surveyed in 1999. We surveyed the 150 former fellows, who composed the denominator for the 1999 survey (112 completed that survey). Since characteristics and academic achievements of GPAD and CS were similar,⁹ we combined them. We updated addresses from the American Academy of Pediatrics (AAP) database and from Web-based searches. We could not find addresses for 13, 1 was retired, 1 was deceased, and 1 did not complete the fellowship, leaving a denominator of 131 individuals.

LATER COHORT

These AGP fellows trained between 1989 and 1999. We obtained names of potential graduates from program directors of AGP fellowships listed annually in the *Journal of Pediatrics* (all contacted fellowship directors responded) and a list of all pediatric fellows trained by the RWJ Clinical Scholar programs (personal communication, Desmond Runyon, MD, December 2007). We updated addresses as above. Of the 154 names, we could not find addresses for 8, and 13 were identified by Web-based searches to have been non-AGP fellows, leaving a denominator of 133 individuals.

SURVEY INSTRUMENT DESIGN

We designed a mailed survey to assess graduates' current professional activities, career successes and challenges, fellowship training experiences, and reflections on achieving personal/career balance. We pilot tested the survey on 5 former AGP fellows, trained after 1999, for construct and content validity, and refined questions accordingly. Whenever possible, we used questions identical to those on the 1999 survey.

We asked respondents to submit curricula vitas (CV)s for content analysis.

DEPENDENT MEASURES

CURRENT PROFESSIONAL WORK

We assessed current positions and distribution of professional time (direct patient care with or without teaching, other teaching, research, administration, or other). We assessed extent of involvement (major, minor, none) with educational programs, including residency, medical student, or fellowship.

PROFESSIONAL SUCCESSES AND CHALLENGES

We asked graduates to select from a comprehensive list their major satisfactions and challenges during their careers, and to note their single most important satisfaction or challenge.

FELLOWSHIP EXPERIENCES

We asked about research projects, coursework, mentorship during fellowship, and the importance of their training in research, education, and career development. We also asked for suggestions on improving AGP fellowship training.

ACHIEVING BALANCE

We asked graduates to rate their satisfaction with how they balanced essential components of their lives (unsatisfied, marginally satisfied, acceptable, good, or ideal).

ACADEMIC PERFORMANCE

Two authors reviewed all CVs, and differences were resolved by consensus. Content analysis assessed grants, publications, and leadership positions. For each externally funded, principal investigator (PI)-level grant, we recorded dates and type of grant (research, education, service). We were unable to record dollar amounts because this information was not provided by 53% of respondents. We assessed first-authored papers in journals listed as peer-reviewed in *Ulrich's Periodicals Directory*¹⁰ and recorded publication year. We could not assess senior authorship beyond first author. We assessed leadership positions by using 4 categories created a priori: division chief, other academic leadership (eg, residency program director or associate director), professional organization leadership (eg, AAP district chair, APA region chair), and community leadership.

HIRSCH, OR H-INDEX

This index, introduced in 2005,^{11,12} quantifies in a single number both the number of published papers and the

number of citations. It is used to measure the impact of papers and can supplement a simple count of published articles. For an individual, h is the number of published papers, each of which has been cited at least h times. For example, an AGP graduate may have 20 papers, but if he/she has 9, 10, or 11 papers that have been cited at least 9 times, his/her h -index is 9. If he/she has 8 papers cited 9 times, his/her h -index is 8.

INDEPENDENT MEASURES

We compared the academic performance and experience of the early versus the later cohorts.

FIELDWORK

We sent surveys ($n = 264$) to both cohorts between November 29, 2007, and September 23, 2008. We mailed surveys by first-class mail, along with a cover letter and a self-addressed envelope for responses, using Dillman survey methods to optimize response.¹³ We sent 4 rounds of mailings, made 1 round of telephone calls, and sent 2 e-mail reminders for nonresponders.

STATISTICAL ANALYSIS

We used various bivariate techniques to compare responses of the 2 cohorts. For analyses that compared frequencies between the groups, we used Pearson's chi-square tests. For time-to-event analyses (ie, time to first leadership position or promotion), we used the log-rank test. We analyzed the number of grants, papers, and leadership positions across 5-year periods postfellowship. We performed a longitudinal analysis of publications by using a random effects negative binomial model. Finally, we used qualitative content analyses to evaluate responses to the open-ended questions.

RESULTS

From the early cohort of 131 eligible subjects, 95 responded (73%), including 73 of 99 GPAD fellows (74%) and 22 of 32 CS fellows (69%). From the later cohort of 133 eligible individuals, 93 responded (70%), including 50 of 79 GPAD fellows (63%) and 43 of 54 CS fellows (80%). Those who responded were similar to nonresponders with respect to gender and GPAD/CS status. However, compared with nonresponders, respondents had higher h -index scores in both the early cohort (mean h indices of 9.4 vs 3.0; $P < .001$) and later cohort (7.6 vs 1.5; $P < .001$), suggesting that responders were more likely to have published and cited papers.

All fellows in the early cohort had 2-year fellowships; 89% of later cohort graduates had 2-year fellowships; 11% had 3-year fellowships. Gender distribution was similar (46% vs 48% female).

PROFESSIONAL EXPERIENCES OF AGP GRADUATES

Three quarters of graduates remain in academics, and many have secondary appointments in other departments (Table 1). About half are tenured or on tenured tracks. Graduates from both cohorts were promoted at similar

Table 1. Current Activities of Early and Later Cohorts*

Current Activities	Early Cohort (N = 95)	Later Cohort (N = 93)	P Value†
Current position			.12
Academic	64	76	
Practice	11	10	
Other	26	14	
Full-time work	94	86	.08
Appointment‡			.98
Pediatric department only	58	59	
Another department as well	42	41	
Faculty level‡			.59
Tenured	54	33	
Tenure track	9	14	
Not tenure track	57	52	
Clinical settings‡			
Ambulatory clinic	75	84	.17
Practitioner's office	0	4	.11
Community health center or PHC§	7	4	.54
Newborn nursery	15	24	.20
Inpatient	62	52	.27
Other	20	18	.81
Major educational or administrative role in training program			
Medical student	53	41	.15
Residency	30	20	.17
Fellowship	43	41	.77

*Values are percentage unless otherwise indicated.

†P values from Pearson chi-square test.

‡Among graduates who remain in academics.

§PHC = public health clinic.

||Bottom row does not total 100% because respondents could select more than one option.

rates: altogether, 86% became assistant professor by 5 years postfellowship (92% by 10 years), 60% became associate professor by 10 years (74% by 15 years), and 8% achieved professor by 10 years (26% by 15 years and 48% by 20 years).

Although most graduates work in ambulatory settings, many see newborns and inpatients. More than half report major educational or administrative roles in medical student, residency, or fellowship training. The current professional roles of the 2 cohorts are similar.

On average, the early and later cohort graduates spend 32% and 34%, respectively, of their time on patient care ($P = .4$), 22% and 30% of their time on research ($P = .1$), 12% each on teaching, 4% each on advocacy, and 29% and 20%, respectively, on administration ($P = .01$). In the early versus the later cohort, 50% versus 41% of graduates spend one-half day or less per week on research, whereas 15% versus 30% spend at least 2 full days per week ($P = .10$).

TRAINING EXPERIENCES

Fellowship training was similar for the 2 cohorts (Table 2). Most fellows completed and published a fellowship research project and many are still in the same research field. Fewer than half received formal training in education, with a particular dearth of training in curriculum development or evaluation. Nearly 90% had a mentor during fellowship; many are still in contact with this mentor.

Table 2. Fellowship Training Experiences of Early and Later Cohorts*

Fellowship Training Experiences	Early Cohort (N = 95)	Later Cohort (N = 93)	P Value†
Performed a research project during fellowship	100	91.4	.004
Type of project (among those who had one)			
Completed research project	84	88	.40
Published paper	73	86	.03
Still doing research in the same field	30	55	.001
Received some formal training in education	40	47	.35
Type of training (for those who received it):			
Teaching methods	88	81	.44
Evaluation of learners	62	54	.52
Curriculum development	39	42	.76
Evaluation of educational programs	43	39	.75
Mentoring during fellowship			
Had an identified mentor	88	87	.82
Still in contact with mentor	39	72	<.001
Mentoring since fellowship training			
Has consistently had a mentor since fellowship	27	40	.09
Mentoring has been adequate	79	89	.30
Single most important part of fellowship experience‡			.01
Research	38	24	
Nurturing environment	28	19	
Mentor	14	31	
Other	20	26	
Most important additional experience graduate wishes he/she would have had§			.17
Training in career development	64	59	
Mentor	8	21	
Coursework/MPH	15	10	
Other	13	10	

*Values are percentage unless otherwise indicated.

†P values from Pearson chi-square test.

‡Open-ended question, coded and categorized afterward (early cohort, n = 86; later cohort, n = 86).

§Open-ended question, (early cohort, n = 64; later cohort, n = 61).

||MPH = master of public health.

Although far fewer had consistently had a mentor since fellowship, most stated that their mentoring was adequate. Responses to open-ended questions identified the most important parts of fellowship training to be research, a nurturing environment, and mentorship. The most common suggestions for improving current AGP fellowships included training in career development, followed by coursework and a master's degree, and having a mentor.

A high proportion of both cohorts rated specific components within the AGP fellowship training domains of research, education, and general academic development^{7,8,14} as essential or important (Table 3); responses by both cohorts were similar. Of note, a high proportion rated a 3-year fellowship requirement, a master's degree, and training in ambulatory as well as inpatient settings as essential or important.

ACADEMIC PERFORMANCE (REVIEW OF CVs)

Table 4 shows the percentage of graduates who had obtained a research, educational, or service grant within 5, 10, or 15 years of graduation. More than 60% had a grant within 5 years. Most were research grants, although a sizable number were education or service grants. The later cohort had a faster trajectory for obtaining research grants.

Table 5 displays the number of first-authored, peer-reviewed papers published by graduates during their fellowship and in 5-year intervals since graduation. More

than 85% had published at least 1 peer-reviewed paper during their careers. The early and later cohorts averaged 0.55 and 0.74 papers per year, respectively, during their first 10 years postfellowship. Their rates of publication remained steady across the 15 years. The later cohort had a higher publication rate during the first 5 years postfellowship.

As expected, the h-index scores were not normally distributed; some graduates had scores of zero, whereas others had very high scores. The median h-index scores for early and later cohorts were 8 (25th–75th percentile = 3–15) and 5 (25th–75th percentile = 2–11; $P = .11$ by Wilcoxon rank-sum test).

LEADERSHIP POSITIONS

Graduates experienced a progression of increasing leadership over time (Figure), with many becoming division chief or attaining another academic or professional leadership position. The predominant professional organization was the AAP, followed by the APA. The later cohort had more leadership positions.

ADVANCED DEGREES

The later cohort was more likely than the early cohort to receive a master of public health (MPH) or other advanced degree (57% vs 36%; $P = .005$). Graduates (across both

Table 3. Percentage of Graduates Who Rated Specific Components of AGP Fellowship Training As Essential or Important*

Fellowship Training Component	Early Cohort (N = 95)	Later Cohort (N = 93)	P Value
Three-year requirement	66	55	.17
MPH (or similar) degree†	67	64	.63
Clinical training			
Ambulatory	76	64	.07
Inpatient	43	43	.98
Other	71	53	.31
Research training			
Research design	100	100	1.00
Clinical epidemiology	100	100	1.00
Statistical analyses	98	97	.62
Ethics and responsible conduct of research	98	96	.36
Qualitative research	91	85	.24
Analyses of secondary datasets	80	88	.19
Educational research	71	75	.66
Education			
Teaching methods	88	83	.35
Evaluation of learners	82	80	.77
Curriculum development	80	63	.01
Evaluation of educational programs	74	67	.25
Precepting trainees (inpatient or outpatient)	91	79	.02
General academic development			
Career planning and management	96	97	.78
Academic leadership and administration	96	85	.008
Evidence-based medicine	90	84	.20
Scientific communications (writing, presenting)	100	98	.14
Health care organization and financing	86	75	.06
Quality improvement	88	80	.16
Advocacy	84	78	.31
Health policy	86	77	.13
Use of information technology	84	84	.90
Culture, social aspects of medicine	74	78	.56

*Response choices were as follows: essential, important, somewhat important, or unimportant. Values are percentage unless otherwise indicated. AGP = academic general pediatric.

†MPH = master of public health.

Table 4. Percentage of Graduates Who Had One or More Externally Funded Grants, by Interval Since Fellowship*

Percentage of Graduates With at Least 1 Grant	Early Cohort N = 95	Later Cohort N = 93	P Value†
Role on Grant			
Principal investigator grant by:			.01
5 years	52	67	
10 years	60	76	
15 years	63	78	
Coinvestigator grant by:			<.001
5 years	21	42	
10 years	30	59	
15 years	36	68	
Type of Grant			
Educational grant by:			.97
5 years	17	26	
10 years	22	32	
15 years	39	36	
Research grant by:			.004
5 years	44	62	
10 years	53	75	
15 years	54	75	
Service grant by:			.89
5 years	12	25	
10 years	27	28	
15 years	32	32	

*Values are percentage unless otherwise indicated.

†P values from log-rank test.

cohorts) with advanced degrees were more likely than those without degrees to have had grants (87% vs 67%; $P = .002$) or papers (92% vs 71%; $P = .001$), but leadership positions were similar (91% vs 96%; $P = .2$).

REFLECTIONS ON ACADEMIC CAREERS

The top 5 areas of career satisfaction (in order) included patient care, teaching, mentoring, building new programs, and research (each listed by more than 60% of graduates). The top 5 challenges included balancing family and career (52% vs 63%), insufficient mentoring (38% vs 45%), obtaining funding for research (37% vs 42%), insufficient time for academics (35% vs 48%), and obtaining funding for programs (35% vs 38%). Responses were similar between cohorts.

The 2 cohorts expressed similar satisfaction with balance in their lives and appeared more satisfied with balance in their current phase than in their early careers. Regarding early careers, early and later cohorts ($P = NS$) perceived balance to be ideal (8% vs 5%), good (33% vs 41%), acceptable (28% vs 26%), and marginal/unsatisfactory (31% vs 28%). Regarding current careers, early and later cohorts ($P = NS$) perceived balance to be ideal (11% vs 14%), good (51% vs 42%), acceptable (25% vs 25%), and marginal/unsatisfactory (13% vs 19%).

Table 5. Number of First-Authored Peer-Reviewed Papers by Time Interval*

Time Interval	Early Cohort (N = 90)			Later Cohort (N = 83)		
	Mean (SD)	Median (25th–75th Percentile)	Any Grant, %	Mean (SD)	Median (25th–75th Percentile)	Any Grant, %
During fellowship†	0.6 (1.1)	0.0 (0.0–1.0)	31	0.5 (1.1)	0.0 (0.0–1.0)	27.7
First 5 years after graduation†	2.8 (3.0)	2.0 (0.0–4.0)	73.3	4.3 (5.2)	3.0 (1.0–7.0)	82.2
6–10 years after graduation†	3.0 (4.0)	2.0 (0.0–4.0)	70.0	4.0 (4.5)	2.0 (0.0–6.0)	73.5
11–15 years after graduation†	3.0 (4.5)	1.0 (0.0–4.0)	57.8	3.8 (5.1)‡	1.0 (0.0–5.0)	72.5
First 10 years after graduation†	5.5 (6.4)	4.0 (1.0–8.0)	82.2	7.4 (8.9)	4.0 (1.0–10.0)	86.8
Any time (during or after fellowship)§			85.6			89.2

*First-authored papers (senior authorship beyond first author could not be determined). We performed statistical tests comparing means (only one comparison was significant—first 5 years after graduation ($p = .03$)).

†P value from random effects negative binomial model, testing the difference between the number of papers published between the early cohort (N = 90) and later cohort (N = 83) during fellowship and by interval after fellowship.

‡Forty-three observations from the later cohort were not used during this time period because they had not been graduates for a full 15 years.

§P value from chi-square test, testing the difference in means between the two cohorts for any time during or after the fellowship.

DISCUSSION

This study highlights substantial academic achievements of AGP fellowship graduates as judged by traditional academic metrics: remaining in academics, obtaining grants, publishing peer-reviewed publications, and attaining leadership positions. Most graduates are happy with the balance in their lives, although achieving balance between career and family has been a challenge. Our study also suggests strategies to enhance AGP fellowship programs.

ACADEMIC ACHIEVEMENTS OF AGP FELLOW GRADUATES

Most graduates remain in academics, and many are on tenure tracks and devote substantial time to research. Most have significant educational, administrative, or leadership roles. More than two thirds have been PI on grants, and many have had multiple research, education, and service grants. Graduates have a modest number of first-authored, peer-reviewed papers.

The later cohort has had a more rapid trajectory of success in grants (and papers during the first 5 years) than the early cohort, perhaps because they spend more time on research, or alternatively because more grants are now available. The 2 cohorts have similar achievements by most other metrics. These findings suggest that recently

trained AGP fellows (including HRSA-funded fellows) are at least as successful as the original cohort of RWJ-trained fellows.

These AGP fellowship graduates demonstrate at least as much academic success as fellowship graduates reported by the few studies that have tracked productivity of fellowship graduates from other disciplines. These follow-up studies include subspecialty fellowship graduates from Cincinnati Children’s Hospital,¹⁵ graduates of a 1-year primary care faculty development program in Michigan State,¹⁶ and graduates of pediatric environmental health fellowships.¹⁷ It is difficult to compare findings across studies, because they have used different metrics and varying time periods after fellowship. The study most similar to ours¹⁸ followed up a cohort of 146 primary care fellows (31% pediatric) trained by HRSA/HRSA-National Research Service Award fellowships during the same time period as our later cohort. That study noted that 32% had published ≥ 1 paper per year, and 44% were current PIs on grants, achievements similar to AGP fellows in our study.

CHALLENGES IN EVALUATING ACADEMIC PERFORMANCE

Although we counted numbers of grants, we had inadequate data to judge their value or impact. We restricted our

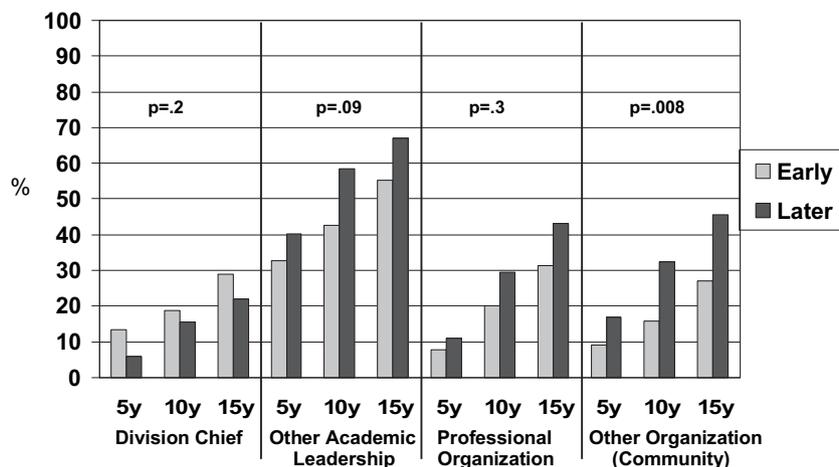


Figure. Percentage of graduates with leadership positions by 5 years, 10 years, and 15 years.

analyses of papers to peer-reviewed, first-authored publications; yet particularly in general pediatrics, non-peer reviewed publications, including book chapters, editorials, published educational products, national peer-reviewed presentations and workshops, and other publications such as project reports, can have substantial impact. Similarly, although many AGP graduates were active in education, their CVs tended to lack educational performance data and meaningful metrics of educational success. In addition, many graduates hold leadership positions in professional or community organizations, but their impact in these roles is difficult to evaluate. Standardization of academic CVs, inclusion of dollar amounts of grants, and supplementation of CVs with educator portfolios^{19,20} or administrative portfolios²¹ would facilitate evaluation of the academic performance of this and other professional groups, and would also help promotion committees in their decisions.

STRATEGIES TO ENHANCE FELLOWSHIP PROGRAMS

One issue involves the length of AGP fellowships.³ Although most AGP fellows completed 2-year fellowships and are successful, nearly two thirds rated as essential or important both 3-year program requirements and an MPH or equivalent degree. The APA accreditation group recommends 3-year fellowships but considers 2-year fellowships for accreditation if they provide sufficient time for academics. Also, the credit requirements of many master's degree programs make it challenging to complete AGP fellowships in 2 years. Although we had an insufficient sample to compare graduates who completed 2 versus 3 years of training, those with MPH or other degrees had more grants and publications than those without degrees.

A second lesson involves the importance of training in all 3 components of the APA AGP curriculum—research, education, and general academic development.⁸ Graduates indicated that formal training in both education and career development (including leadership) was important, even though many did not receive such training. The APA requires training goals in all 3 domains for accreditation.^{7,8} Both the AAP²² and APA²³ have formal training programs in leadership, and the APA has an Educational Scholars Program for young pediatric faculty.²³ Studies are needed to assess optimal methods to train fellows in these areas.

Third, this study highlights the importance of mentorship. Respondents rated mentorship as their most significant fellowship experience, and many are still in touch with their fellowship mentors. A growing literature highlights the value of mentoring in academia,²⁴ and universities and professional organizations are increasingly offering training opportunities in academic mentoring.²⁵ Strategies to foster mentoring include development of guidelines and training experiences for mentors, and providing them with academic credit and salary support.

Our study may have implications with respect to national policy for training AGP fellows. In recent years, significant reductions in HRSA Title VII 747 and RWJ CS funding have threatened the training of AGP fellows.⁴ Our findings demonstrate that these training programs are

producing graduates with successful careers. Continued support of generalist fellowship training programs and graduates in academic faculty positions is warranted.

STRENGTHS AND LIMITATIONS

This is the largest follow-up study of AGP fellows to date, with a relatively high response rate. We used CV analyses to document academic success instead of self-reported achievements. Since the 2 cohorts were inherently different in years since fellowship, we assessed performance during the same periods beyond fellowship for both cohorts.

Nevertheless, we recommend caution with respect to several limitations. First, when we created a denominator listing for the later cohort, we were unable to obtain a list from HRSA. We may have missed some fellows trained during this time period. Second, our sample may have overrepresented high achievers. We found evidence that nonresponders, compared with responders, had a lower publication rate for frequently cited reports (as measured by the h-index). On the other hand, some CVs were incomplete and we may therefore have underestimated the academic success of some respondents. A third limitation is the potential for social desirability bias on some responses. Fourth, we were unable to determine the dollar amounts for grants because of missing data in CVs, despite many attempts at follow-up on grant amounts. Fifth, we created the leadership categories a priori because we could not locate a validated measure of leadership within academics; others may prefer different categories.

CONCLUSIONS AND IMPLICATIONS

AGP fellows trained since the late 1970s have had successful careers as measured by the traditional academic metrics of promotion, grants, publications, and leadership positions at universities and in professional organizations. Recently trained graduates appear even more successful, with a faster trajectory for obtaining grants and writing papers. Most graduates perceived that it is important to train AGP fellows in 3 domains: research, education, and career development. Overall, these findings suggest that federally and locally funded AGP training programs are producing graduates who are making important academic contributions. The academic success of these AGP fellows bodes well for the future of AGP as a discipline that plays a critical role in child health, medical education, and pediatric scholarship.

ACKNOWLEDGMENTS

This project was supported by an internal grant from the Department of Pediatrics, University of Rochester School of Medicine and Dentistry. We thank Michelle Shipley, medical librarian, for performing the h-index search.

REFERENCES

1. Haggerty RJ, Green M. History of academic general and ambulatory pediatrics. *Pediatr Res*. 2003;53:188–197.
2. Haggerty RJ. The academic generalist: an endangered species revived. *Pediatrics*. 1990;86:413–420.

3. Ludwig S. Academic general pediatrics: from endangered species to advanced scholars of general pediatrics: the report of a consensus conference. *Ambul Pediatr.* 2004;4:407–410.
4. DeWitt TG, Cheng TL. The role of Title VII funding in academic general pediatrics fellowships and leadership. *Acad Med.* 2008;83:1103–1106.
5. Steiner JF, Curtis P, Lanphear BP, et al. Program directors' perspectives on federally funded fellowship training in primary care research. *Acad Med.* 2000;75:74–80.
6. National Research Council (US). Committee on National Needs for Biomedical and Behavioral Scientists. Education and Career Studies Unit. *Addressing the Nation's Changing Needs for Biomedical and Behavioral Scientists.* Washington, DC: National Academy Press; 2000.
7. Baldwin CD, Szilagyi PG, Dreyer BP, et al. Strengthening the academic base of general pediatrics fellowship programs: a national program and curriculum development project. *Ambul Pediatr.* 2007;7:340–347.
8. Baldwin CD, Dreyer BP, Szilagyi PG, et al. Academic general pediatric fellowships: curriculum design and educational goals and objectives. *Ambul Pediatr.* 2007;7:328–339.
9. Haggerty RJ, Sutherland SA. The academic general pediatrician: is the species still endangered? *Pediatrics.* 1999;104(1 pt 2):137–142.
10. UlrichsWEB Global Serials Directory Web site. Available at: <http://www.ulrichsweb.com/UlrichsWeb/>. Accessed December 1, 2009.
11. Hirsch JE. An index to quantify an individual's scientific research output. *Proc Natl Acad Sci U S A.* 2005;102:16569–16572.
12. Hirsch JE. Does the H index have predictive power? *Proc Natl Acad Sci U S A.* 2007;104:19193–19198.
13. Dillman DA. *Mail and Internet Surveys: The Tailored Design Method.* 2nd ed. Hoboken, NJ: Wiley; 2007.
14. Academic Pediatric Association AGP Fellowship Accreditation. Available at: http://www.ambpeds.org/education/education_accreditation_AGP.cfm. Accessed March 8, 2011.
15. Balistreri WF, Jobe A, Boat TF. Pediatric subspecialty training fellowships at Cincinnati Children's Hospital Medical Center (CCHMC). *J Pediatr.* 2005;147:277–278.
16. Smith MA, Barry HC, Williamson J, et al. Factors related to publication success among faculty development fellowship graduates. *Fam Med.* 2009;41:120–125.
17. Landrigan PJ, Woolf AD, Gitterman B, et al. The ambulatory pediatric association fellowship in pediatric environmental health: a 5-year assessment. *Environ Health Perspect.* 2007;115:1383–1387.
18. Steiner JF, Lanphear BP, Curtis P, Vu KO. Indicators of early research productivity among primary care fellows. *J Gen Intern Med.* 2002;17:845–851.
19. Chandran L, Gusic M, Baldwin C, et al. Evaluating the performance of medical educators: a novel analysis tool to demonstrate the quality and impact of educational activities. *Acad Med.* 2009;84:58–66.
20. Simpson D, Hafler J, Brown D, Wilkerson L. Documentation systems for educators seeking academic promotion in U.S. medical schools. *Acad Med.* 2004;79:783–790.
21. Seldin P, Higgerson ML. *The Administrative Portfolio: A Practical Guide to Improved Administrative Performance and Personnel Decisions.* Bolton, Mass: Anker Publishing Co; 2002.
22. Leslie LK, Miotto MB, Liu GC, et al. Training young pediatricians as leaders for the 21st century. *Pediatrics.* 2005;115:765–773.
23. Cheng TL, Szilagyi PG. Leadership in academic general pediatrics. *J Pediatr.* 2007;150:451–452.
24. Szilagyi PG. Academic Pediatric Association (APA) presidential address: changing the world for children. *Ambul Pediatr.* 2008;8:273–278.
25. Detsky AS, Baerlocher MO. Academic mentoring—how to give it and how to get it. *JAMA.* 2007;297:2134–2136.