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The Short-Term and Long-Term Impact of a Brief Aging Research Training Program for Medical Students

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Summer training in aging research for medical students is a strategy for improving the pipeline of medical students into research careers in aging and clinical care of older adults. Johns Hopkins University has been offering medical students a summer experience of mentored research, research training, and clinical shadowing since 1994. Long-term outcomes of this program have not been described. The authors surveyed all 191 participants who had been in the program from 1994–2010 (60% female and 27% under-represented minorities) and received a 65.8% (N = 125) response rate. The authors also conducted Google and other online searches to supplement study findings. Thirty-seven percent of those who have completed training are now in academic medicine, and program participants have authored or coauthored 582 manuscripts.

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Among survey respondents, 95.1% reported that participation in the Medical Student Training in Aging Research program increased their sensitivity to the needs of older adults. This program may help to build commitment among medical students to choose careers in aging.

KEYWORDS medical students, mentoring, research training

INTRODUCTION

The United States has a shortage of geriatricians, just as the Baby Boom cohort is turning age 65 (Institute of Medicine, 2008). Initiatives that would increase the geriatric medical workforce are needed. Furthermore, there is a shortage of physician-scientists (Ley & Rosenberg, 2005; Schafer, 2009), including those focused on aging-related research. In addition, women (Jagsi & Turnbull, 2009) and minorities (National Advisory General Medical Sciences Council, 2006) are underrepresented in academic medicine and biomedical research (Gibau et al., 2010; Jagsi et al., 2006). Barriers to choosing a research or clinical career in geriatric medicine can include a lack of role models and mentorship during medical education and training (Torrible, Diachun, Rolfson, Dumbrell, & Hogan, 2006), low salaries (Bragg, Warshaw, Meganathan, & Brewer, 2012), and a hidden curriculum (Hafferty, 1998) in academic medicine against the field (Thomas et al., 2003). The first 2 years of medical school are an important time for shaping career choice (Bethune et al., 2007) though career decisions are made throughout medical training (Kolasinski et al., 2007).

To address these shortages, the American Federation for Aging Research (AFAR) began a summer research scholar program in 1994 that enables medical students (after year one of medical training) to spend a summer doing mentored aging research. Even a brief summer research training program offers students extra opportunity to develop personal relationships with mentors and may inspire students to pursue further research training (Schwartz & Hostetter, 2009). Starting in 2005, the National Institute of Aging partnered with AFAR to create the Medical Student Training in Aging Research (MSTAR) program. Since its founding, there have been approximately 1,000 students who have participated in this program through 2010. Selected students have the option of spending the summer at their home institution or going to one of five to 10 national training centers for research training.

No published studies have reported on the long-term effectiveness of the MSTAR program (or other efforts to improve the pipeline of medical students into careers in aging) in getting medical student participants to become geriatricians or pursue careers in aging research after training.

A “white paper” on the MSTAR program found 18% became geriatricians and that most former students thought that the program increased their desire to care for older adults (Bragg et al., 2009). However, only 40% of the MSTAR participants responded to the survey.

Johns Hopkins University has been a national training center for this program, accepting internal and external medical students since 1994. The Johns Hopkins MSTAR students perform research, coursework, and clinical experiences in multiple venues of patient care (Simpson et al., 2005). The framework of research training and feedback from trainees at the Johns Hopkins program and at other programs has been previously described (Jeste, Halpain, Trinidad, Reichstadt, & Lebowitz, 2007; Simpson et al., 2005).

This article describes the careers and productivity of alumni of the Johns Hopkins University national training site for the MSTAR program.

METHOD

Sources of Data and Procedures

After obtaining contact information from AFAR or from a Google search, we surveyed all 191 students who participated in Johns Hopkins MSTAR program from 1994 to 2010. Students who completed the program after 2010 were not surveyed as there has not been enough time to assess their career decisions or success in publishing their summer research. An electronic survey was sent via e-mail to students with e-mail addresses and a paper survey was sent via the U.S. Postal Service to students without an identifiable email address. Efforts to increase the response rate included resending the e-mail message multiple times and sending fax messages.

For those students who did not respond to the survey, career information was obtained from a Google search.

Electronic online searches. A Medline search was performed on MSTAR participants to identify or confirm how many papers they have published. A search of the National Institutes of Health (NIH) RePORTER database was done to identify whether former students were awarded NIH grants. Administrative and survey data from the Johns Hopkins MSTAR program including demographic characteristics were also used. This study was approved by the Johns Hopkins Institutional Review Board. Informed consent was obtained from participants.

Measures

The survey used in this study included 28 items and took about 5 to 6 minutes to complete. The survey reviewed the MSTAR participants' current career stage; career choice; reasons for their career choice; how they distribute

their time among clinical, research, and teaching; and whether they have published the results of research that they completed during the program as well as other publications. The survey included only one open-ended question (those who reported having a career in geriatrics or aging research were asked to describe their current career in aging). Most questions were yes/no, multiple choice, or asking for a number. One hundred and twenty-five (65.8%) former trainees returned a survey.

Analysis

The primary outcome variable is percent of former students who now have careers that include aging-related research or clinical care of primarily older adults. Secondary outcome variables include the number of manuscripts published and the number of NIH grants awarded.

Mainly descriptive statistics were analyzed. Fisher's exact test was used to compare career choice results by gender and by race. Logistic regression to derive odds ratios (ORs) was used to clarify further whether race or gender was associated with career choice (based on choosing a career in academic medicine and based on choosing a career in internal medicine or medicine subspecialties). The logistic regression models were $ACADEMIA = b_{CONSTANT} + b_{Gender}(GENDER) + b_{Race}(RACE)$, and $DISCIPLINE = b_{CONSTANT} + b_{Gender}(GENDER) + b_{Race}(RACE)$. Gender was coded 0 for male and 1 for female, whereas race was coded 0 for White and 1 for non-White. Multicollinearity was assessed by performing the regression omitting one variable each time and determining whether the coefficients and their relevant standard errors changed. Missing data was managed with listwise deletion.

RESULTS

From 1994 to 2010, 191 students participated in this program at Johns Hopkins. More than one half of students were women and approximately 27% were African American or Hispanic (see [Table 1](#) for demographic and career stage data). Seventy percent of students were medical students at schools other than Johns Hopkins University. One hundred and twenty-five (65.8%) returned a survey, of whom 62.2% were female. Fifty-six percent of those who had completed training, 63% of residents/fellows, and 70% of medical students responded to the survey. Respondents were very similar to nonrespondents in gender and race. (Career information including specialty and stage of training for the nonresponders was identified through Internet searches.)

TABLE 1 Demographic and Career Characteristics of Johns Hopkins Medical Student Training in Aging Research: Participants, 1994–2010 ($N = 191$)

Characteristic	Number of students (%)
Female	115 (60.2)
Black	33 (17.3)
Hispanic	19 (9.9)
Osteopathic medical students	32 (16.8)
Johns Hopkins University's own medical students	57 (29.8)
Career stage	
Completed training	80 ^a (41.9)
Fellows	10 (5.2)
Residents	58 (30.4)
Medical students	40 (20.9)
Other	1 ^b (< 1)
Missing	2 (1.0)

^aIncludes two nonpracticing physicians. One student completed medical school and urology residency and then changed careers to health administration. One student completed medical school and internal medicine residency and then switched careers to economic consulting.

^bOne student left medical school to start a career in epidemiology/public health.

Career Choice

Career choices among the participants are summarized in [Table 2](#). Of those who have completed training, internal medicine (17.5%) and internal medicine subspecialties (21.2%) are the most common careers. Thirty-seven percent of trainees who are now practicing physicians work in academic medicine (29 of 78). Three of the four geriatricians who have completed training are in academic medicine. Among the 20 under-represented minority participants who have completed training or are in fellowship, five are geriatricians or geriatric medicine fellows. Among the 16 under-represented minority physicians who have completed their training, eight (50%) are in academic medicine positions. By Fisher's exact test, there is no significant difference between the proportion of women who are in academic medicine and the proportion of men in academic medicine after completing training. Similarly, there is no significant difference between the proportion of Whites in academic medicine and the proportion of under-represented minorities in academic medicine. Logistic regression did not suggest an association between gender or race and a career in academic medicine. The OR for influence of being female on choosing academic medicine was 1.51 (95% confidence interval [CI] [0.57, 4.0]), $p = .41$, whereas the OR for the influence of race on choosing academic medicine was 1.91 (95% CI [0.56, 6.55]), $p = .30$. Logistic regression also did not suggest an association between gender or race, and the odds of choosing a career in internal medicine (IM) or IM subspecialties as opposed to other fields. The OR for influence of being female on choosing a career in internal medicine or a medicine subspecialty

TABLE 2 Careers of Johns Hopkins Medical Student Training in Aging Research: Participants Who Have Completed Medical School

Field	Completed training (N = 80)	Current residents (n = 58)	Current fellows (n = 10)
Internal medicine	14 (17.5%)	21 (36.2%)	
Obstetrics/gynecology	9 (11.2%)	2 (3.4%)	1 (10.0%)
Family medicine	6 (7.5%)	2 (3.4%)	
Anesthesia	6 (7.5%)	5 (8.6%)	
Hematology/oncology	5 (6.2%)		
Geriatric medicine	4 (5.0%)		3 (30.0%)
Other internal medicine subspecialties	8 (10.0%)		3 (30.0%)
Pediatrics	4 (5.0%)	4 (6.9%)	1 (10.0%)
Surgery	3 (3.8%)	2 (3.4%)	
Other surgical specialties	4 (5.0%)	3 (5.2%)	
Ophthalmology	3 (3.8%)	5 (8.6%)	
Medicine/pediatrics	3 (3.8%)	1 (1.7%)	
Emergency medicine	2 (2.5%)	2 (3.4%)	
Neurology	2 (2.5%)	3 (5.2%)	
Radiology	1 (1.2%)	4 (6.9%)	
Dermatology	1 (1.2%)	1 (1.7%)	
Psychiatry	1 (1.2%)		
Preventive medicine	1 (1.2%)		
Physical medicine and rehabilitation	1 (1.2%)		
Pathology		2 (3.4%)	
Radiation oncology		1 (1.7%)	
Geriatric psychiatry			1 (10.0%)
Neuropsychiatry			1 (10.0%)
Other (nonpracticing)	2 (2.5%)		

was 1.27 (95% CI [0.68, 2.38]), $p = .45$, whereas the OR for the influence of race on choosing a career in IM or a medicine subspecialty was 1.47 (95% CI [0.32, 6.83]), $p = .62$. For both regression models, multicollinearity was not significant.

Survey respondents report that the program increased their desire to care for older patients and increased their desire to conduct research in geriatrics (see [Figure 1](#)). Almost all respondents (95.1%) reported that participation in the program increased their sensitivity to the needs of older adults a great deal or a good bit.

Practicing physicians in this cohort on average spend most of their time in clinical care (67.8%, range 0%–100%), and 45.7% (range 0%–95%) of their clinical time is spent in the care of older patients. Physicians in this cohort spend 12.1% of time in educational activities (range 0%–50%) and 12.3% of time in research activities (range 0%–75%) and 5.8% in administrative activities (range 0%–49%). Some researchers spend most or all of their research time on aging-related topics, but many do not.

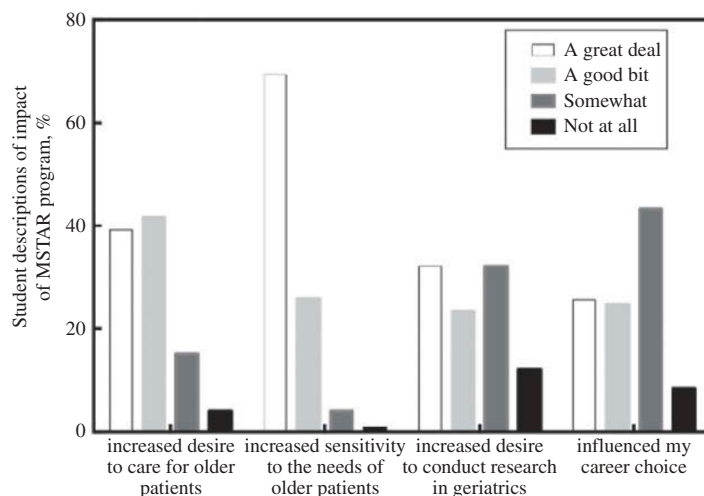


FIGURE 1 Attitudes of former Johns Hopkins Medical Student Training in Aging Research (MSTAR): Trainees toward the MSTAR program ($n = 125$).

Academic Productivity

Academic productivity of the program participants based on the number of manuscripts published is displayed in Figure 2. Participants in this program are coauthors on 582 manuscripts of which 340 are aging-related or at least on age associated diseases (58.4%). Of these publications, the former MSTAR student is first author on 212 and senior author on 95 (senior author is identified as the last listed author in a Medline listing). In addition, members of this cohort have been awarded 11 NIH grants, including three NIH Career Development (K) Awards awards and four NIH Research Project Grants (RO1s). Program participants have gone on to mentor medical students and fellows in aging-related research. Survey respondents reported a total of 45 student mentees and 20 fellows.

Based on survey responses and a Medline search, 24% ($n = 46$) of program participants published results of their summer research. Sixty-two percent of survey respondents chose to participate in further coursework, rotations, or research related to aging after their MSTAR experience.

DISCUSSION

This study was able to ascertain current career information relevant to the goals of the MSTAR program for 99% of program alumni from 1994 to 2010 by using direct survey results and through information available through web

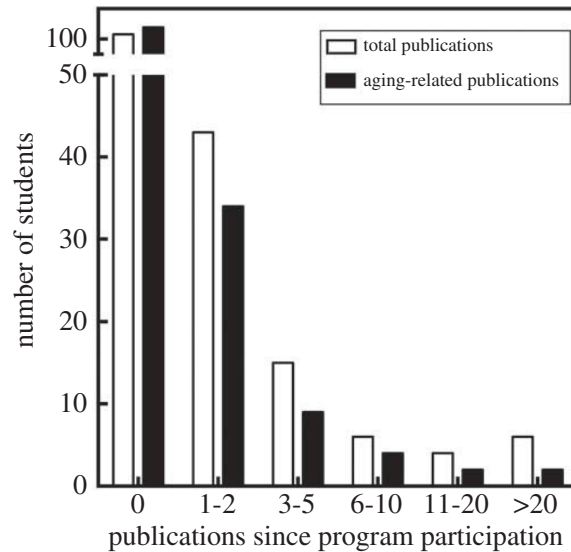


FIGURE 2 Manuscript productivity of Johns Hopkins former Medical Student Training in Aging Research trainees ($n = 191$).

searches. Students report that the program increased their desire and ability to care for older patients.

Nationally, only one half of 1% of active physicians are geriatricians according to the 2011 American Medical Association Masterfile (Association of American Medical Colleges, 2012). A disproportionate number of program participants became or are becoming geriatricians (7.8% of those who have completed training or are in fellowship). Many other former students have entered specialties in which they care predominantly for older patients.

Furthermore, a disproportionate number have entered academic careers. Thirty-seven percent of alumni who have completed training are in academic medicine compared to a national average of approximately 15% of physicians on full-time medical school faculty (Joliff, Leadley, Coakley, & Sloane, 2012). Logistic regression does not suggest any gender or race differences in the impact of the program on career choice. This fairly small cohort has produced more than 500 publications and 11 NIH grants. Non-NIH grants and awards could not be systematically tracked.

There are no appropriate benchmarks for a successful medical student research training program. One survey of students and house staff in Canada suggested that summer research programs are not an effective tool for promoting recruitment into geriatrics (Torrible et al., 2006). However, a similarly designed summer program in cardiothoracic surgery did seem to identify and

motivate a group of students to publish their research and pursue a career in surgery (Allen et al., 2009). A program of summer medical student training in pediatric research found that 36% of alumni who completed the program from 1991 to 1996 were working in pediatrics by 2009, and 29% were in academic pediatrics (Smith, Rogers, Hansen, & Smith, 2009).

This evaluation has limitations. This medical student training program probably attracts students with positive views of older adults and some interest in building research skills. It is unknown how many of these students would have become geriatricians and/or academic physicians without participating in this experience. Also, it is not known how many similar students at the same medical schools chose careers in academic medicine and/or geriatrics. Finally, survey respondents may have been more enthusiastic about program benefits than nonresponders.

This program seems to be highly successful in strengthening a commitment among medical students to provide care for older adults and to consider a research career. Almost all participants including those who ultimately choose specialties other than geriatrics gained from the program an increased sensitivity to the needs of older adults. Because few do become geriatricians, it is critical that other specialties be sensitive to the needs of older adults. Some participants have been very successful in academic medicine, with a large number of publications as well as NIH grant funding and a cadre of mentees. Continued and even enhanced federal and private investment in this program and similar programs seems appropriate.

This article is the first study reporting success of the MSTAR program at one training site. In the future, analysis of program outcomes across multiple sites would be valuable, as would be the identification of predictors of choosing a career in geriatrics or in aging research. Establishing a comparison group of similar medical students who did not participate in the MSTAR program and then examining their careers would be another useful study.

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