

Attrition During Graduate Medical Education

Medical School Perspective

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Objective: To identify predictors of attrition during graduate medical education (GME) in a single medical school cohort of contemporary US medical school graduates.

Design: Retrospective cohort study.

Setting: Single medical institution.

Participants: Recent US allopathic medical school graduates.

Main Outcome Measure: Attrition from initial GME program.

Results: Forty-seven of 795 graduates (6%) did not complete the GME in their initial specialty of choice. At bivariate analysis, attrition was associated with election to the Alpha Omega Alpha Honor Medical Society, being

an MD-PhD degree holder, and specialty choice (all $P < .05$). Attrition was not associated with graduation year ($P = .91$), sex ($P = .67$), or age ($P = .12$). In a multivariate logistic regression model, MD-PhD degree holder (odds ratio, 3.43; 95% confidence interval, 1.27-9.26; $P = .02$), election to Alpha Omega Alpha (2.19; 1.04-4.66; $P = .04$), choice of general surgery for GME (5.32; 1.98-14.27; $P < .001$), and choice of 5-year surgical specialty including those surgical specialties with a GME training requirement of 5 years or longer (2.74; 1.16-6.44; $P = .02$) each independently predicted greater likelihood of attrition.

Conclusion: Academically highly qualified graduates and graduates who chose training in general surgery or in a 5-year surgical specialty were at increased risk of attrition during GME.

Arch Surg. 2008;143(12):1172-1177

SPECIALTY CHOICE FOR GRADUATE medical education (GME) training involves an extensive decision-making process for most US medical students. During the final year of medical school, after students determine their preferred specialty for residency training, they participate in the residency selection process. The residency selection process is labor-intensive and time-consuming for both applicants and program directors. Applicants seek to identify training programs in preferred specialties that are well aligned

with their personal and career goals, whereas program directors seek to identify applicants most likely to perform well for the duration of the stipulated residency training period. Most US students plan to enter GME immediately after graduation in positions in residency programs accredited by the Accreditation Council for Graduate Medical Education (ACGME) that provide training for the period required for primary specialty board certification eligibility by a member of the American Board of Medical Specialties.^{1,2} These positions include both specialty-specific categorical positions and specialty-specific advanced-level positions, which graduates enter after completion of a designated preliminary training year.

For many reasons, not all residents complete GME training in their chosen specialty. Although it is possible to change specialties during GME, failure of a resident to complete the stipulated period of GME can be a problem for both program directors and residents. Such resident attrition, in which the resident discontinues GME in his or her initial specialty to pursue GME in a different specialty or to discontinue GME entirely, can have widespread ramifications, causing difficulties with program scheduling for remaining trainees and disruption of patient care de-

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with their personal and career goals, whereas program directors seek to identify applicants most likely to perform well for the duration of the stipulated residency training period. Most US students plan to enter GME immediately after graduation in positions in residency

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livery. Program directors may find it challenging to recruit qualified replacement residents to fill vacant positions. Furthermore, with the implementation of hospital-specific limits on the number of resident positions that Medicare will pay for, program directors may have limited flexibility in varying resident numbers at different levels of training in response to changes in residents' plans.³ Discontinuation of GME in the initial specialty of choice to pursue GME in an alternative specialty may mandate a longer period of GME for the resident and delay entry into the practicing physician workforce.

Most studies to date on the nature and extent of attrition during GME training have been limited to a single specialty or related to attrition over a relatively short time and have reflected the program director perspective.⁴⁻⁸ Inasmuch as medical schools often invest considerable resources in providing career counseling and advisory programs to their students, attrition during GME training among their graduates should also be an issue of interest to medical schools as they seek to gauge the effectiveness of their counseling programs. We analyzed specialty-based attrition during GME from a medical school perspective to identify characteristics associated with attrition risk in a cohort of contemporary graduates who planned to pursue categorical or advanced training in a broad range of specialties.

METHODS

Our sample included graduates of our institution from 1994 to 2000 who planned to pursue categorical training in a chosen specialty immediately after graduation or a year of preliminary training followed by entry into an advanced position. Graduates who entered nondesignated preliminary positions only or who did not plan to enter any residency training immediately after graduation were excluded from our study sample. Demographic variables included graduation year, age at graduation, and sex. Academic achievement measures during medical school included election to the Alpha Omega Alpha (AOA) Honor Medical Society and advanced degrees held at graduation (MD; MD-PhD including dual MD-PhD Medical Scientist Training Program graduates and graduates who obtained a PhD degree not as part of the Medical Scientist Training Program; and MD-MA). The GME characteristics included specialty choice for categorical or advanced residency training and specialty-based attrition during GME, defined as discontinuation of GME in the initial specialty of choice before completion of the categorical or advanced training period. For data analysis, we created 5 specialty choice groups to classify graduates' initial specialty choices, as follows: (1) "generalist specialties" including pediatrics, family medicine, and internal medicine, each with a 3-year GME requirement for specialty board certification eligibility; (2) "general surgery," with a 5-year GME requirement for specialty board certification eligibility; (3) "5-year surgical specialties" including urology, plastic surgery, orthopedic surgery, neurologic surgery, and otolaryngology, each with a 5-year or longer GME requirement for specialty board certification eligibility; (4) "4-year surgical specialties" including ophthalmology, and obstetrics and gynecology, with a 4-year GME requirement for specialty board certification eligibility; and (5) "other specialties" including nongeneralist nonsurgical specialties or combined specialties that graduates initially entered including neurology, psychiatry, dermatology, preventive medicine, nuclear medicine, emergency medicine,

anesthesiology, radiation oncology, diagnostic radiology, combined pediatrics and psychiatry, anatomical and clinical pathology, and physical medicine and rehabilitation, each with a GME requirement of at least 3 years for specialty board certification eligibility.²

Instances of attrition were initially identified in 2 ways. First, the American Board of Medical Specialties conducted a database search to identify our 1994-2000 graduates certified by a member board by September 2006 and provided the member board name, certificate, and effective start date for certificates held. Attrition was identified among all board-certified graduates by nonconcordance between specialty choice at graduation and specialty of initial certification. For graduates not board certified, instances of attrition were identified by nonconcordance between specialty choice at graduation and specialty in which GME training was completed or specialty for current GME training as of September 2006. Current specialty for non-board-certified graduates was determined from alumni survey data, direct contact with graduates, information in the public domain, information provided by residency training program directors, and Association of American Medical Colleges GME Track database information.

For each instance of attrition identified, GME records were reviewed to confirm that the graduate had discontinued training in the initial specialty choice before completion of the categorical or advanced training period. We excluded from the attrition group those graduates who completed categorical or advanced training in their initial specialty choice and subsequently entered and completed training in another specialty, regardless of whether they became board certified in the specialty. The Washington University Institutional Review Board approved this study.

Statistical analysis was performed using χ^2 tests to measure associations between attrition and each categorical variable. One-way analysis of variance was used to test for between-group differences in age. Multivariate logistic regression analysis was used to identify independent predictors of attrition from among variables examined in bivariate tests. Tests of significance were performed using commercially available software (SPSS version 13.0; SPSS, Inc, Chicago, Illinois). All *P* values are 2-sided and considered statistically significant at *P* < .05.

RESULTS

We included 795 graduates with complete data, representing 96% of the 829 graduates from our 1994-2000 graduating medical school classes. Thirty-four graduates were excluded from analysis because of missing data for at least 1 variable (*n* = 1) or because they planned to complete only a preliminary year of GME or did not plan to pursue any GME immediately after graduation (*n* = 33). Of the 795 graduates included in the study, 748 (94%) had completed or were pursuing GME training in their initial specialty of choice as of September 2006. Overall attrition was 6% with a minimum of 6 years of follow-up. The mean (SD) age at graduation did not differ significantly between graduates in the attrition group and graduates who completed GME training in the initial program (27.9 [2.3] vs 27.3 [2.1], respectively; *P* = .12). Descriptive statistics for the study sample are given in **Table 1**.

Attrition was significantly associated with advanced degrees held at graduation, AOA election, and specialty choice group. Associations with graduation year, sex, or age were not significant. The 19 graduates who discontinued GME in the generalist specialties group subse-

Table 1. Characteristics of the Study Sample^a

Variable	Total (N=795)	No. (%)		P Value
		Discontinued Training in Chosen Specialty (n=47 [5.9])	Remained in Chosen Specialty (n=748 [94.1])	
Year of graduation				.91
1994	103	7 (6.8)	96 (93.2)	
1995	122	9 (7.4)	113 (92.6)	
1996	114	5 (4.4)	109 (95.6)	
1997	121	8 (6.6)	113 (93.4)	
1998	119	5 (4.2)	114 (95.8)	
1999	114	6 (5.3)	108 (94.7)	
2000	102	7 (6.9)	95 (93.1)	
Sex				.67
Male	467	29 (6.2)	438 (93.8)	
Female	328	18 (5.5)	310 (94.5)	
Advanced degrees at graduation				.02
MD	633	30 (4.7)	603 (95.3)	
MA and MD	48	5 (10.4)	43 (89.6)	
MD and PhD	114	12 (10.5)	102 (89.5)	
AOA election				.03
No	677	35 (5.2)	642 (94.8)	
Yes	118	12 (10.2)	106 (89.8)	
Specialty group				.003
Generalist specialties	402	19 (4.7)	383 (95.3)	
General surgery	43	7 (16.3)	36 (83.7)	
5-y Surgical specialties	99	11 (11.1)	88 (88.9)	
4-y Surgical specialties	58	2 (3.4)	56 (96.6)	
Other specialties	193	8 (4.1)	185 (95.9)	

Abbreviation: AOA, Alpha Omega Alpha Honor Medical Society.

^aNumbers in parentheses are percentages of the row total in the second column.

quently entered training in neurology (n=6), pathology (n=3), ophthalmology (n=2), or dermatology, diagnostic radiology, emergency medicine, or preventive medicine (n=1 each); 4 of the 19 graduates discontinued all GME. The 7 graduates in the general surgery group who discontinued GME subsequently entered training in internal medicine and anesthesiology (n=2 each) and family practice, plastic surgery, and preventive medicine (n=1 each). The 11 graduates in the 5-year surgical specialties group who discontinued GME subsequently entered training in diagnostic radiology (n=3) or dermatology, preventive medicine, plastic surgery, internal medicine, nuclear medicine, general surgery, emergency medicine, anesthesiology (n=1 each). The 2 graduates in the 4-year surgical specialties group who discontinued GME subsequently entered training in diagnostic radiology or radiation oncology (n=1 each). The 8 graduates in the other specialties group who discontinued GME subsequently entered training in internal medicine (n=3) or general surgery, preventive medicine, or diagnostic radiology (n=1 each); 2 graduates discontinued all GME. Four of the 6 graduates who entirely discontinued GME training held MD and PhD degrees and subsequently pursued exclusively research-based careers. Most graduates in the attrition group who continued GME training entered specialties in the other specialties group; this proportion was greater than the proportion of graduates who had initially entered training in the other specialties group (28 of 41 [68%] vs 193 of 795 [24.3%]; $P < .001$).

Information pertaining to years of GME completed before discontinuing training in the initial specialty was available for 39 of the 47 graduates. Twenty-two graduates completed 1 year of training or less, 14 graduates completed 1 to 2 years of training, and 3 graduates completed more than 2 years of training before discontinuation of training in their initial specialty. For many of the 41 graduates who continued GME in different specialties, there was an interval of up to several years before they resumed GME, often because they had pursued research in a desired specialty.

Results of a multivariate logistic regression model to identify independent predictors of attrition among all 795 graduates are given in **Table 2**. Greater attrition risk was associated with MD-PhD degree status, AOA election, and initially entering general surgery and 5-year surgical specialties training programs.

COMMENT AND CONCLUSIONS

Most graduates in our study cohort remained in GME in their initial specialty choice, indicating a high degree of specialty choice stability in this cohort of recent US allopathic medical school graduates. Academic credentials (MD and PhD degrees and AOA election), which may be regarded as desirable attributes by program directors in resident selection, were among the variables associated with increased attrition risk. The increased attri-

tion risk associated with MD and PhD degree holders suggests that they may have particular needs for greater amounts of information about residency and career choices, as was indicated in the results of a national survey of MD-PhD students.⁹ Our finding that AOA election and MD-PhD status were risk factors for attrition should not be construed as implying that these graduates are more likely to be dissatisfied with their initial specialty choice for GME. Rather, highly qualified graduates such as those with MD-PhD degrees and AOA electees may be the graduates who most likely can successfully change specialties during GME, particularly into specialties that were competitive for entry such as dermatology and radiation oncology.¹⁰

Our finding of high attrition risk among general surgery graduates is consistent with other published studies on attrition during general surgery training. Previously reported overall attrition rates of 17% to 23% among residents who entered categorical general surgery positions are similar to the overall 16.3% attrition we noted and indicated that general surgery attrition is not a new problem.^{8,11-13} However, the issue may now command wider attention because of the declining interest nationally in general surgery careers among US allopathic medical students in recent years, as it has likely become more difficult for general surgery program directors to fill positions vacated by residents who leave their programs before completion of their categorical training periods with qualified US allopathic medical graduates.¹⁴⁻¹⁷ A prospective study to collect data pertaining to occurrence of and reasons for attrition among incoming categorical general surgery residents such as that being considered by the Surgical Council on Resident Education would be timely in the context of our findings of general surgery specialty choice as the highest risk factor for attrition in our cohort of US allopathic medical school graduates.¹⁸ Higher attrition risk also was associated with initial choice of 5-year surgical specialties for residency training, although not to the extent observed for general surgery. Unlike general surgery, these 5-year surgical specialties have remained very competitive for entry over the past 10 years. Therefore, while attrition is no doubt also a problem for 5-year surgical specialties program directors, it is likely much easier for directors of these programs, compared with directors of general surgery programs, to recruit highly qualified US allopathic medical graduates to fill vacated positions.

Our finding that most of the 47 residents in the attrition group who did continue GME subsequently entered training in the other specialties group should be considered in the context of recent trends in specialty choice preferences among US medical students.¹⁹ Since the mid-1990s, quality-of-life issues have emerged as important determinants of specialty choice among US medical students.^{15,16,19} Our finding that most residents who changed specialties, regardless of initial specialty choice, entered specialties other than generalist or surgical specialties is consistent with the thesis that quality-of-life issues may become important for many contemporary US graduates during GME even if they were not heavily weighed by the graduate during his or her initial specialty-choice decision-making process.

Table 2. Predictors of Attrition in a Multivariate Logistic Regression Model

Predictor	Adjusted OR (95% CI)	P Value
Year of graduation		
1994	1 [Reference]	
1995	0.90 (0.31-2.66)	.85
1996	0.54 (0.16-1.87)	.33
1997	0.79 (0.26-2.41)	.68
1998	0.495 (0.15-1.69)	.26
1999	0.67 (0.21-2.17)	.50
2000	0.82 (0.26-2.60)	.74
Sex		
Male	1 [Reference]	
Female	0.93 (0.47-1.84)	.84
Age at graduation, y	1.02 (0.86-1.21)	.83
Advanced degrees at graduation		
MD	1 [Reference]	
MA and MD	2.26 (0.77-6.63)	.14
MD and PhD	3.43 (1.27-9.26)	.02
AOA election		
No	1 [Reference]	
Yes	2.19 (1.04-4.62)	.04
Specialty group		
Generalist specialties	1 [Reference]	
General surgery	5.32 (1.98-14.27)	.001
5-Year surgical specialties	2.74 (1.16-6.44)	.02
4-Year surgical specialties	0.69 (0.15-3.14)	.63
Other specialties	0.76 (0.31-1.82)	.53

Abbreviations: AOA, Alpha Omega Alpha Honor Medical Society; CI, confidence interval; OR, odds ratio.

To our knowledge, our study provides a different perspective on attrition risk compared with those of other studies in the literature to date. While medical schools are not directly affected by attrition among their graduates during GME in the manner and to the extent that program directors are, the issue of attrition during GME should merit the attention of career counselors and faculty involved in advising students at the medical school level. In recent years, many medical schools have developed comprehensive longitudinally integrated career advising programs, which are typically specialty choice focused and may use the Careers in Medicine program sponsored by the Association of American Medical Colleges.^{20,21} However, medical schools have not systematically collected information to assess the durability of specialty choice decisions made by their graduates. Graduate attrition during GME may be a useful benchmark for medical schools to use to assess the adequacy of their career counseling programs, in particular as they pertain to the specialty choice decision-making process. Medical school career counseling services should work with faculty advisors to maximize the likelihood that students have well-informed expectations about their specialty choices, in particular because so many of the attrition group graduates in our study decided within the first year of GME to discontinue training in their initial specialty choice. Students should be encouraged to take full advantage of appropriate electives and other opportunities to thoroughly explore the specialties they are contemplating.

Our study has notable limitations. Because it was restricted to analysis of graduates from a single medical school, multi-institutional studies among a group of collaborating US allopathic medical schools could be of value both to medical schools and to program directors to more fully characterize factors associated with US allopathic medical graduates' risk of attrition during GME. Larger, multi-institutional studies such as that being considered by the Surgical Council on Resident Education would also permit exploration of potential confounders of greater attrition risk in specialty-specific models, which should be of particular interest to program directors. Furthermore, although non-US allopathic medical graduates comprise fully one-third of the current ACGME resident workforce, our study pertained to US allopathic medical graduates only; thus, our findings cannot be generalized to all graduates in the ACGME resident workforce. However, because program directors preferentially fill their available positions with US allopathic graduates, an understanding of characteristics associated with attrition risk for this cohort of medical graduates is relevant. We recognize that our study likely provides an underestimate of overall attrition in our cohort from the perspective of the individual program director. It was not our intent to identify graduates who changed training programs but remained in the same specialty, as graduates may do for personal reasons such as a spouse's job change that requires the couple to relocate or a graduate's preference for a different type of training program in the same specialty. While such attrition does not affect the overall size of the resident workforce in the specialty, it poses problems for the program director who is losing the resident even though the resident does not change specialty. Our study also may have overestimated the effect of attrition on program directors in other ways. We were unable to determine the extent to which the specialty changes we observed may have reflected a resident's intentional plans since graduation, in particular among those residents who ultimately pursued training in specialties with multiple GME pathways such as plastic surgery or pediatric neurology. If resident intention to complete only a portion of the categorical years of training was known by the program director when the resident entered training, then the resident's departure before program completion may not have been a problem for the program director in the way that unexpected resident departures likely were.

Another limitation of our study is that we could not identify whether the attrition was voluntary or involuntary. For reasons of confidentiality, program directors typically do not provide this information. However, national data published by the ACGME have consistently indicated that program transfer or program withdrawal rather than program dismissal accounted for most instances of resident discontinuation of training before program completion in recent years.²²⁻²⁴ Inasmuch as most of the graduates in our study had completed their training before implementation of 80-hour workweek regulations in 2003, it was also beyond the scope of our study to determine the possible effect of these regulations on attrition from training programs in those specialties previously characterized by particularly long workweeks. One recently reported study, however, suggests that general

surgery attrition has not been affected by ACGME limits on work hours.²⁵

Finally, the issue of attrition during GME should be considered in the context of the projected physician shortage in the United States and growing concerns about the structure and efficiency of the GME process.^{14,26} The annual rate of attrition from all ACGME-accredited training programs nationally has been about 3% in recent years.^{23,24} Although this national percentage may not seem large, it collectively represents departures of more than 3000 residents annually before program completion. Efforts to redesign unnecessarily circuitous or lengthy specialty-specific training paths and to minimize nondurable specialty choice decisions by our students could enhance the systemwide efficiency of GME at the national level.

Accepted for Publication: September 12, 2007.

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Author Contributions: Dr Andriole had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. *Study concept and design:* Andriole and Jeffe. *Acquisition of data:* Andriole and Hageman. *Analysis and interpretation of data:* Andriole, Jeffe, Klingensmith, McAlister, and Whelan. *Drafting of the manuscript:* Andriole. *Critical revision of the manuscript for important intellectual content:* Andriole, Jeffe, Hageman, Klingensmith, McAlister, and Whelan. *Statistical analysis:* Jeffe. *Administrative, technical, and material support:* Hageman. *Study supervision:* Andriole and Hageman.

Financial Disclosure: None reported.

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INVITED CRITIQUE

Attention from categorical positions in general surgery residency programs is an important problem. Data generated by the American Board of Surgery based on their In-Training Examination suggest that approximately 20% of categorical general surgery residents fail to complete training. The article by Andriole and colleagues is of interest because it identifies surgery residents as being at higher risk for attrition than residents in other specialties. Review of their 1994-2000 medical school graduates revealed that those who entered surgery training programs of 5 years or longer were significantly more likely to not complete them compared with other students. In addition, the choice of general surgery residency was an independent predictor of attrition. Their article, therefore, confirms that the field of surgery has a serious issue to confront.

Two questions that this article raises is whether the surgery residency is inherently more difficult than other residencies and whether medical students are simply not adequately prepared for what they encounter in surgical training. With the general trend over the last few decades to reduce the duration of surgical clerkships, we

may not be exposing students adequately to the environment of surgical training. The American Board of Surgery is working with the Robert Wood Johnson Foundation and the Association of Program Directors in Surgery in an attempt to understand the issues involved in attrition. We have begun a national prospective cohort study of attrition that includes surveys of beginning residents about their expectations in training and surveys of residents in training about how well their actual experience conforms with their expectations. We are conducting interviews with residents who leave training to try to understand their motivating factors. This informative article by Dr Andriole and associates provides a sound rationale for our study and for an attempt to ameliorate this important problem.

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Financial Disclosure: None reported.