

Timing and Predictors of Subspecialty Career Choice Among Internal Medicine Residents: A Retrospective Cohort Study

Jingkun Yang, MD
Surbhi Singhal, MD
Yingjie Weng, MPH
Jason P. Bentley, PhD
Neel Chari, MD

Teresa Liu, MD
Karina Delgado-Carrasco, MA
Neera Ahuja, MD
Ronald Witteles, MD
Andre Kumar, MD, MEd

ABSTRACT

Background Internal medicine residents face numerous career options after residency training. Little is known about when residents make their final career choice.

Objective We assessed the timing and predictive factors of final career choices among internal medicine residents at graduation, including demographics, pre-residency career preferences, and rotation scheduling.

Methods We conducted a retrospective study of graduates of an academic internal medicine residency program from 2014 to 2017. Main measures included demographics, rotation schedules, and self-reported career choices for residents at 5 time points: recruitment day, immediately after Match Day, end of postgraduate year 1 (PGY-1), end of PGY-2, and at graduation.

Results Of the 138 residents eligible for the study, 5 were excluded based on participation in a fast-track program for an Accreditation Council for Graduate Medical Education subspecialty fellowship. Among the remaining 133 residents, 48 (36%) pursued general internal medicine fields and 78 (59%) pursued fellowship training. Career choices from recruitment day, Match Day, and PGY-1 were only weakly predictive of the career choice. Many choices demonstrated low concordance throughout training, and general medicine fields (primary care, hospital medicine) were frequently not decided until after PGY-2. Early clinical exposure to subspecialty rotations did not predict final career choice.

Conclusions Early career choices before and during residency training may have low predictability toward final career choices upon graduation in internal medicine. These choices may continue to have low predictability beyond PGY-2 for many specialties. Early clinical exposure may not predict final career choice for subspecialties.

Introduction

Internal medicine residents have numerous career choices, including 23 distinct Accreditation Council for Graduate Medical Education (ACGME) subspecialty fellowships and careers in general internal medicine (GIM).¹⁻³ Currently, internal medicine residents apply for subspecialty fellowships at the beginning of their third postgraduate year (PGY-3). The 3-year training period of internal medicine represents a challenge for program directors to ensure that trainees have achieved core competencies, while simultaneously promoting career exploration.

Previous studies have demonstrated significant fluctuations in career choices among internal medicine residents throughout postgraduate training,^{2,3} and initial investigations revealed that demographics, lifestyle preferences, and trainee attitudes were not strong predictors.⁴⁻⁸ Several gaps of knowledge remain, as there are no longitudinal studies that follow trainee career choices between medical school and the end of residency. It is unknown if an initial subspecialty preference reliably predicts a resident's final choice, and few studies have examined whether the timing of specific rotations influences subspecialty choice.^{9,10}

In this brief report, we investigate whether initial career choices and timing of career-relevant rotations predict a trainee's career choice upon completion of residency training. In addition, we examine the frequency by which postgraduate career choices change over the course of residency training and the potential factors associated with this change.

DOI: <http://dx.doi.org/10.4300/JGME-D-19-00556.1>

Editor's Note: The online version of this article contains outcomes of Match Day career preferences versus final graduation choice, decision tree analysis predicting the 7 most common career choices upon graduation, career choices of residents at each time point compared with final career choice, logistic regression for factors associated with residents' ultimate clinical decision choice at graduation, a full program description of the internal medicine residency, and the survey used in the study.

TABLE
Demographics by Final Career Choice at Graduation^a

Demographics	Total	Cardiology	GI	Heme/ Onc	Hospital Medicine	Primary Care	Other Subspecialties	Other	P Value
No. of residents, n (%)	133	28 (21)	17 (13)	19 (14)	31 (23)	17 (13)	14 (11)	7 (5)	
Gender, n (%)									.035 ^b
Female	59 (44)	7 (25)	8 (47)	5 (26)	13 (42)	14 (82)	8 (57)	4 (57)	
Male	74 (56)	21 (75)	9 (53)	14 (74)	18 (58)	3 (18)	6 (43)	3 (43)	
Graduation year, n (%)									.37
2014	33 (25)	7 (25)	4 (24)	4 (21)	9 (29)	3 (18)	2 (14)	4 (57)	
2015	34 (26)	5 (18)	4 (24)	6 (32)	9 (29)	6 (35)	2 (14)	2 (29)	
2016	33 (25)	6 (21)	6 (36)	2 (11)	10 (32)	3 (18)	5 (36)	1 (14)	
2017	33 (25)	10 (36)	3 (18)	7 (37)	3 (10)	5 (29)	5 (36)	0 (0)	
Continuity clinic sites, n (%)									.18
Community	19 (14)	4 (14)	0 (0)	1 (5)	5 (16)	4 (24)	2 (14)	3 (43)	
Academic	59 (44)	16 (57)	8 (47)	9 (47)	15 (48)	6 (35)	3 (21)	2 (29)	
VA	54 (41)	8 (29)	9 (53)	9 (47)	11 (36)	6 (35)	9 (64)	2 (29)	

Abbreviations: GI, gastroenterology; Heme/Onc, hematology-oncology; VA, Veterans Affairs Affiliated Clinic.

^a “Other Subspecialties” in this analysis include endocrinology, geriatrics, infectious diseases, nephrology, palliative care, pulmonary and critical care medicine, and rheumatology. “Other” includes nonclinical career choices after graduation (eg, bioinformatics, chief residency). Fisher’s exact test was performed for categorical variables on cells with low frequencies.

^b $P < .05$.

Methods

Study Participants and Setting

We assessed career choices among categorical residents who graduated between 2014 and 2017 at an academic internal medicine residency program (full program description provided as online supplemental material). Those participating in a fast-track program for expedited entry into subspecialty fellowships were excluded.

Outcomes and Definition of Career Choice

Our primary outcome was residents’ career choices at graduation, classified as either ACGME-accredited subspecialty fellowships, GIM, or other (TABLE). The most common career choices of graduates from our program—cardiology, gastroenterology, and hematology/oncology—were previously known and analyzed individually. Other clinical subspecialties (endocrinology, geriatrics, infectious diseases, nephrology, palliative care, pulmonary and critical care medicine, and rheumatology) were analyzed as a group due to their low prevalence. Hospital medicine and primary care were categorized together as GIM fields and analyzed separately from the other specialties (TABLE). Secondary measures included demographics, clinical rotation schedule, and career choices before residency, during PGY-1, and at the end of PGY-2.

Measurements

Participants were sent surveys that assessed their career choices (provided as online supplemental material) and asked them to rank their top career choice. The surveys were distributed via Qualtrics (Qualtrics LLC, Provo, UT) at 5 time points: recruitment day, immediately after Match Day, end of PGY-1, end of PGY-2, and at graduation. The recruitment day survey was required to match applicants with interviewers who had shared interests; subsequent surveys were part of required information collected by the residency program to optimize the residents’ schedules each year.

Our Institutional Review Board deemed this study to be exempt.

Statistical Analysis

Conditional inference trees (a type of decision tree) were fit using the `ctree` function R (Vienna, Austria) to identify the major predictor(s) of residents’ final career choice. All trees were fit using Bonferroni pruning at $\alpha = 0.05$. Area under the curve was calculated via `multiclass.roc` function in the `pROC` package. Post hoc logistic regression was conducted to evaluate the strength of the associations between the strongest predictor from the survey responses identified by the conditional inference trees and the binary categorization of the final career choice at graduation (subspecialty versus GIM), adjusting for resident demographics, continuity clinic sites, and

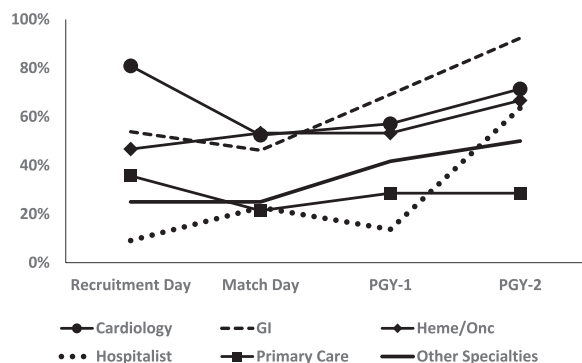


FIGURE
Concordance Rates Over Time by Career Choice

Abbreviations: GI, gastroenterology; Heme/Onc, hematology/oncology; PGY, postgraduate year.

Note: Specialty concordance rates are calculated as the percentage of residents (y-axis) expressing the same career choice at any survey time point compared with their final career choice at graduation. "Other Specialties" in this analysis include endocrinology, geriatrics, infectious diseases, nephrology, palliative care, pulmonary and critical care medicine, and rheumatology.

rotation schedules. To determine correlations between initial and final subspecialty choice (including disparate subspecialties), Kappa statistics and corresponding 95% confidence intervals (CIs) were reported.

Results

Participants' Final Career Choices

Of the 138 residents eligible for the study, 5 were excluded based on participation in a fast-track program for an ACGME subspecialty fellowship. Among the remaining 133 residents, the survey response rates were 100%. Seventy-eight residents (59%) pursued subspecialty fellowships on graduation, 48 (36%) chose careers in GIM, and 7 (5%) made other career choices (TABLE). Approximately 77 of 78 (99%) matched into a subspecialty fellowship on first application.

Timing and Concordance Rates of Career Choices

Concordance rates (defined as percentage of residents expressing the same career choice at any survey time points versus their choice on graduation) are shown in the FIGURE. Concordance rates on recruitment day (42.3%; odds ratio [OR] = 0.39; 95% CI 0.24–0.63; $P < .001$), Match Day (47.9%; OR = 0.49; 95% CI 0.33–0.74; $P < .001$), and PGY-1 (50.6%; OR = 0.55; 95% CI 0.35–0.85; $P = .008$) were modest to low among all career choices (FIGURE; additional information provided as online supplemental material). Notably, among the subspecialties for PGY-2, the concordance rates were high for gastroenterology (94.1%) and cardiology (78.6%). Additionally,

concordance rates for GIM remained low throughout all survey time points, and only 29% (5 of 17) of residents who ultimately pursued primary care upon graduation expressed similar intent during PGY-2. Residents changed their career choice a mean 1.32 (SD = 1.18) times from recruitment to graduation.

Factors Associated With Final Career Choice at Graduation

The PGY-2 career choices were the most predictive of final career choice upon graduation, with an area under the curve of 0.67 ($P < .001$; online supplemental material). In multivariate logistic regression, PGY-2 choice was significantly associated with final career choice (OR = 9.3; 95% CI 3.1–28.6; $P \leq .001$). Early exposure to elective subspecialty rotations during PGY-1 did not correlate with graduation career choice on logistic regression (provided as online supplemental material). Chi-square analysis revealed significant gender differences among the subspecialties ($P = .002$), with further analysis revealing the greatest disparity in primary care (82.4% in primary care versus 38.8% in subspecialties; 95% CI 23.4–63.7; $P = .002$). Other demographic factors were not significantly associated with subspecialty versus GIM career choice on logistic regression. Decision tree analysis of the major career choices suggested similar results (provided as online supplemental material).

Discussion

In this study, early career preferences during recruitment, Match Day, and PGY-1 had poor concordance with graduation career choices for internal medicine. This timeline contrasts with findings from other specialties, such as pediatrics, in which career choices may have already been decided prior to residency.^{11,12} Our study represents one of the first attempts to longitudinally examine internal medicine resident career choices starting from residency recruitment.

There is considerable fluctuation in career choices of internal medicine residents prior to and during residency training. Although residency programs collect data regarding subspecialty interests from recently matched applicants to arrange mentorship or elective scheduling, the predictive utility may be low, and it remains uncertain whether such exposure increases the likelihood that a trainee will pursue a given subspecialty.^{2,6} Nevertheless, decisions not to pursue a planned subspecialty may be influenced by early rotations.^{9,10}

Certain career choices (eg, cardiology, gastroenterology) demonstrated more robust longitudinal

concordances, but the decision to pursue GIM occurred much later in training. These findings may have implications for categorical programs seeking to support residents pursuing GIM.^{13–15} Less than a third of our graduates pursuing primary care expressed a desire to do so at the end of PGY-2. Categorical programs facing a similar issue could consider offering greater flexibility to pursue primary care experiences during PGY-3. Our data also accentuate the established gender differences in resident career choices.^{13,16–18} Previous studies demonstrated the potential effects of discrimination, decreased work satisfaction, income disparities, and dissatisfaction in achieving professional goals for decreased female interest in subspecialty training.^{16–18}

We acknowledge several limitations. As a single institution study, generalizability is limited, particularly to training programs with additional tracks, such as primary care. We did not differentiate residents who pursued a short working period in GIM prior to applying to fellowships from those without subspecialty training plans and, therefore, may have overestimated the number of residents pursuing GIM training. Since our surveys were developed for scheduling purposes, they were not anonymous and did not measure residents' personal opinions, research endeavors, or loan burden.^{19–22}

Conclusions

Career decisions within internal medicine are complex. Early career choices, as expressed from surveys during recruitment, Match Day, and PGY-1, may have low predictability of graduation career choices. The choice to pursue GIM fields may occur later in training, and early clinical exposure may not predict final career choice for subspecialties.

References

1. Accreditation Council for Graduate Medical Education. Internal Medicine. <https://www.acgme.org/Specialties/Overview/pfcatid/2/Internal-Medicine%20on%2020%20September%202018>. Accessed February 14, 2020.
2. West CP, Dupras DM. General medicine vs subspecialty career plans among internal medicine residents. *JAMA*. 2012;308(21):2241–2247. doi:10.1001/jama.2012.47535.
3. Smith LG, Feit E, Muller D. Internal medicine residents' assessment of the subspecialty fellowship application process. *Acad Med*. 1997;72(2):152–154. doi:10.1097/00001888-199702000-00026.
4. Hauer KE, Durning SJ, Kernan WN, Fagan MJ, Mintz M, O'Sullivan PS, et al. Factors associated with medical students' career choices regarding internal medicine. *JAMA*. 2008;300(10):1154–1164. doi:10.1001/jama.300.10.1154.
5. Ratelle JT, Dupras DM, Alguire P, Masters P, Weissman A, West CP. Hospitalist career decisions among internal medicine residents. *J Gen Intern Med*. 2014;29(7):1026–1030. doi:10.1007/s11606-014-2811-3.
6. Garibaldi RA, Popkave C, Bylsma W. Career plans for trainees in internal medicine residency programs. *Acad Med*. 2005;80(5):507–512. doi:10.1097/00001888-200505000-00021.
7. Dorsey ER, Jarjoura D, Rutecki GW. Influence of controllable lifestyle on recent trends in specialty choice by US medical students. *JAMA*. 2003;290(9):1173–1178. doi:10.1001/jama.290.9.1173.
8. Dorsey ER, Jarjoura D, Rutecki GW. The influence of controllable lifestyle and sex on the specialty choices of graduating US medical students, 1996–2003. *Acad Med*. 2005;80(9):791–796. doi:10.1097/00001888-200509000-00002.
9. Blyth DM, Barsoumian AE, Yun HC. Timing of infectious disease clinical rotation is associated with infectious disease fellowship application. *Open Forum Infect Dis*. 2018;5(8):ofy155. doi:10.1093/ofid/ofy155.
10. McFarland DC, Holland J, Holcombe RF. Inpatient hematology-oncology rotation is associated with a decreased interest in pursuing an oncology career among internal medicine residents. *J Oncol Pract*. 2015;11(4):289–295. doi:10.1200/JOP.2015.003798.
11. Freed GL, Dunham KM, Jones D, McGuinness GA, Althouse LA. Longitudinal assessment of the timing of career choice among pediatric residents. *Arch Pediatr Adolesc Med*. 2010;164(10):961–964. doi:10.1001/archpediatrics.2010.172.
12. Macy ML, Leslie LK, Boyer D, Van KD, Freed GL. Timing and stability of fellowship choices during pediatric residency: a longitudinal survey. *J Pediatr*. 2018;7(198):294–300. doi:10.1016/j.jpeds.2018.03.034.
13. Meyers FJ, Weinberger SE, Fitzgibbons JP, Glassroth J, Duffy FD, Clayton CP, et al. Redesigning residency training in internal medicine: the consensus report of the Alliance for Academic Internal Medicine Education Redesign Task Force. *Acad Med*. 2007;82(12):1211–1219. doi:10.1097/ACM.0b013e318159d010.
14. DeWitt DE, Curtis JR, Burke W. What influences career choices among graduates of a primary care training program? *J Gen Intern Med*. 1998;13(4):257–261. doi:10.1046/j.1525-1497.1998.00076.x.
15. Stanley M, O'Brien B, Julian K, Jain S, Cornett P, Hollander H, et al. Is training in a primary care internal medicine residency associated with a career in primary

- care medicine? *J Gen Intern Med.* 2015;30(9):1333–1338. doi:10.1007/s11606-015-3356-9.
16. Capranzano P, Kunadian V, Mauri J, Petronio AS, Salvatella N, Appelman Y, et al. Motivations for and barriers to choosing an interventional cardiology career path: results from the EAPCI Women Committee worldwide survey. *EuroIntervention.* 2016;12(1):53–59. doi:10.4244/EIJY15M07_03.
 17. Burke CA, Sastri SV, Jacobsen G, Arlow FL, Karlstadt RG, Raymond P. Gender disparity in the practice of gastroenterology: the first 5 years of a career. *Am J Gastroenterol.* 2005;100(2):259–264. doi:10.1111/j.1572-0241.2005.41005.x.
 18. Limacher MC, Zaher CA, Walsh MN, Wolf WJ, Douglas PS, Schwartz JB, et al. The ACC professional life survey: career decisions of women and men in cardiology. A report of the Committee on Women in Cardiology. American College of Cardiology. *J Am Coll Cardiol.* 1998;32(3):827–835. doi:10.1016/s0735-1097(98)00319-2.
 19. Hauer KE, Alper EJ, Clayton CP, Hershman WY, Whelan AJ, Woolliscroft JO. Educational responses to declining student interest in internal medicine careers. *Am J Med.* 2005;118(10):1164–1170. doi:10.1016/j.amjmed.2005.03.050.
 20. Rosenthal MP, Diamond JJ, Rabinowitz HK, Bauer LC, Jones RL, Kears GW, et al. Influence of income, hours worked, and loan repayment on medical students' decision to pursue a primary care career. *JAMA.* 1994;271(12):914–917.
 21. Newton DA, Grayson MS, Thompson LF. The variable influence of lifestyle and income on medical students' career specialty choices: data from two US medical schools, 1998–2004. *Acad Med.* 2005;80(9):809–814. doi:10.1097/00001888-200509000-00005.
 22. Rosenblatt RA, Andrilla CHA. The impact of US medical students' debt on their choice of primary care careers: an analysis of data from the 2002 medical school graduation questionnaire. *Acad Med.* 2005;80(9):815–819. doi:10.1097/00001888-200509000-00006.



All authors are with Stanford University School of Medicine. **Jingkun Yang, MD**, is Clinical Assistant Professor, Department of Medicine; **Surbhi Singhal, MD**, is Clinical Assistant Professor, Department of Medicine; **Yingjie Weng, MPH**, is a Statistician, Quantitative Sciences Unit; **Jason P. Bentley, PhD**, is a Statistician, Quantitative Sciences Unit; **Neel Chari, MD**, is a Resident, Internal Medicine Residency Program; **Teresa Liu, MD**, is a Resident, Internal Medicine Residency Program; **Karina Delgado-Carrasco, MA**, is Senior Program Coordinator, Internal Medicine Residency Program; **Neera Ahuja, MD**, is Clinical Associate Professor, Department of Medicine; **Ronald Witteles, MD**, is Clinical Associate Professor, Department of Medicine; and **Andre Kumar, MD, MEd**, is Clinical Assistant Professor, Department of Medicine.

Funding: The authors report no external funding source for this study.

Conflict of interest: The authors declare they have no competing interests.

Corresponding author: Andre Kumar, MD, MEd, Stanford University School of Medicine, 300 Pasteur Drive, Stanford, CA 95401, 650.723.2300, akumar3@stanford.edu

Received August 8, 2019; revisions received October 24, 2019, and January 27, 2020; accepted January 28, 2020.