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The Evolution of Internal Medicine Chief Residents: A 20-Year Multicenter Study



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Funding: See last page of article.

Conflict of Interest: See last page of article.

Authorship: See last page of article.

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INTRODUCTION

Chief residency is a prestigious position within academic internal medicine that is considered a stepping stone for future academicians.¹⁻⁸ However, the chief resident (CR) position has evolved concomitant with the growth and advancement of graduate medical education; what began as a clinical and teaching position has transformed into a supervisory educational role with significant administrative responsibilities.⁹⁻¹⁶ CRs are now deeply involved with the recruitment and mentorship of trainees and effectively serve as the outward face of their training programs.¹³⁻¹⁶ Additionally, there are now innovative role-specific positions (e.g., ambulatory, quality improvement/patient safety [QI/PS] CRs) that complement the traditional general and inpatient CR positions.^{17,18}

Despite deep roots in medical education and prominence of the chief residency position, limited data exist on internal medicine CRs or their career paths.^{6,13,14,19} Partly due to the lack of positional oversight by the Accreditation Council for Graduate Medical Education (ACGME) and the absence of a national CR data repository,^{6,13,14,16} this limitation results in institutional variability in the selection, training, and job responsibilities of CRs across the country, hinders CR professional development, and undermines diversity efforts.^{6,8,13-15,19-22} The authors studied a large cohort of former CRs from diverse academic internal medicine residency programs to describe trends in gender, types of CR positions, and subsequent career choices over a 20-year period.

METHODS

Participating Programs

We recruited site investigators from 22 academically-affiliated internal medicine residency programs using the Veterans Affairs (VA) Academic Hospitalist Work Group.²³ The residency programs were geographically dispersed and varied in size (range: 34-209 residents during academic year [AY] 2020-2021, median: 146 residents; Figure 1). We coded residency program by size: small (<100 residents); medium (100-150 residents); or large (>150 residents).

Data Sources

Site investigators created a comprehensive registry of 2,061 CRs who served at their respective residency programs between AYs 2001-2002 and 2020-2021 (median: 82 CRs from each residency program, range: 38-208; Figure 1), including the following data from each residency program: CR names, year of chief residency, CR position (ambulatory, inpatient, general [combined ambulatory and inpatient roles], QI/PS, other), and number of residents during AY 2020-2021.

We created separate REDCap surveys with prescribed categories that site investigators used to abstract data for each of the CRs from their residency programs, using multiple, publicly accessible online resources between August 1 and November 30, 2021. We used the Centers for Medicare and Medicaid Services National Plan and Provider Enumeration System National Provider Identifier (NPI) registry to abstract self-identified gender (female/male).²⁴ We used the Alpha

Omega Alpha Honor (AOA) Medical Society member database to collect AOA membership data (yes/no).²⁵ We used academic program, departmental, and practice websites and professional search engines (e.g., Doximity, LinkedIn) to determine current institution (private, academic, other), academic rank (instructor, assistant, associate, or full professor at a US medical school), current clinical practice (hospitalist, primary care physician, subspecialist, other) and subspecialty (e.g., cardiology, nephrology) or secondary residency training (e.g., dermatology, pathology). Subspecialty choices included 13 subspecialties plus an "other" category. Pulmonary medicine, critical care medicine, and pulmonary/critical care medicine were combined into one category (pulmonary & critical care medicine [PCCM]). We were unable to collect data for one CR, resulting in a final cohort of 2,060 CRs. The University of Washington Institutional Review Board deemed the study exempt from research oversight.

Statistical Analysis

We used descriptive statistics to examine annual distributions over the 20-year time-period for gender, AOA membership, CR positions, and the number and type of subspecialist training after chief residency. For time-dependent trends, we used linear regression to model the effect of year of chief residency on the proportion of individuals with outcomes of interest (e.g., proportion of female CRs over time).

PERSPECTIVES VIEWPOINTS

- Despite deep roots in medical education, limited data exist on Internal Medicine chief residents or their subsequent career choices.
- Our study reveals that the majority of chief residents pursue subspecialty training and remain in academic medicine.
- We also found improved gender representation amongst IM chief residents, more role-specific chief resident positions, and an evolving landscape of clinical practice concomitant with the hospitalist movement.

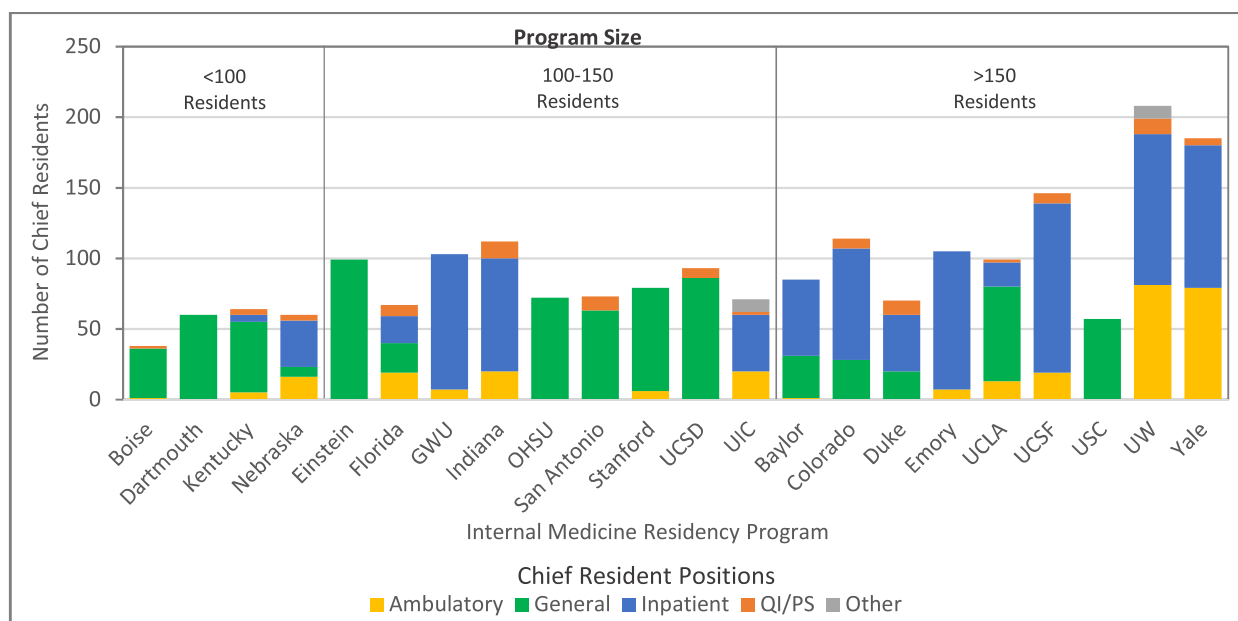


Figure 1 Number and position of chief residents by participating internal medicine residency program, AYs 2001-2020 ($n = 2060$). GWU: George Washington University; OHSU: Oregon Health & Science University; QI/PS: quality improvement/patient safety; UCLA: University of California Los Angeles; UCSD: University of California San Diego; UCSF: University of California San Francisco; UIC: University of Illinois Chicago; USC: University of Southern California; UW: University of Washington.

We used Chi-square tests to assess whether distributions of outcome variables such as CR position, subspecialty training, or current clinical practice varied by gender or AOA membership and whether career path choices varied by CR position. We set significance at a P value of .05. We performed all analyses using STATA version 14.2 (Stata Corp, College Station, Texas).

We excluded any CR from current clinical practice analyses if current clinical practice or position could not be ascertained ($n = 3$) or if the CR had died ($n = 4$). We also excluded CRs who were in fellowship training at the time of data collection from all academic analyses ($n = 238$).

RESULTS

Across the 22 internal medicine residency programs, the annual number of CRs increased by 38% over the 20-year period of analysis ($n = 89$ to $n = 123$; Figure 2), with the median number of CRs per program increasing from three to five. In AY 2020-2021, the average CR to resident ratio was 1:24 (range = 1:11-1:55). Overall, 46% ($n = 952$) of CRs were female; despite year-to-year variability there was progression towards gender parity (min: 37%, max: 56%; delta = 0.4% per year, $P = .05$). Thirty-four percent ($n = 706$) of all CRs were AOA members, which did not significantly change over time, and there were equal proportions of female (35%, $n = 331$) and male CR (34%, $n = 375$) members.

Figure 1 shows the number and position of CRs by program. The proportions for each type of CR position included: inpatient (43%, $n = 889$), general (37%,

$n = 768$), ambulatory (14%, $n = 294$), QI/PS (4%, $n = 91$), and other (1%, $n = 18$). There was a strong association between residency program size and CR position differentiation, with smaller programs having more general CRs (small: 68%, $n = 152$; medium: 47%, $n = 315$; large: 26%, $n = 301$) and larger programs having more inpatient (small: 17%, $n = 38$; medium: 35%, $n = 235$; large: 53%, $n = 616$) and ambulatory CR positions (small: 10%, $n = 22$; medium: 11%, $n = 72$; large: 17%, $n = 200$; $P < .001$).

Figure 2 shows the evolution of proportions of each CR position over 20 years ($P = .004$). Ambulatory and QI/PS CR positions increased in prevalence (12% to 17% and 0% to 13%, respectively), while both inpatient and general CR positions decreased (47% to 41% and 40% to 27%, respectively). The distribution of CR positions varied by gender; a greater proportion of ambulatory CRs (63%, $n = 184$) were women as compared to general (47%, $n = 358$), inpatient (41%, $n = 363$), and QI/PS CRs (43%, $n = 39$; $P < .001$).

A total of 2,053 CRs were included in current clinical practice analyses. Figure 3 shows current clinical practice by CR position and Figure 4 shows the evolution of current clinical practice over the 20-year study period. Sixty-four percent ($n = 1,307$) of CRs pursued subspecialty training, with annual proportions ranging from 52% to 74% over the 20-year period of analysis, though without a clear time dependent-trend. A greater proportion of male CRs (71%, $n = 784$) pursued subspecialty training as compared to female CRs (55%, $n = 522$; $P < .001$). Similarly, a greater proportion of inpatient (73%, $n = 647$), general (62%,

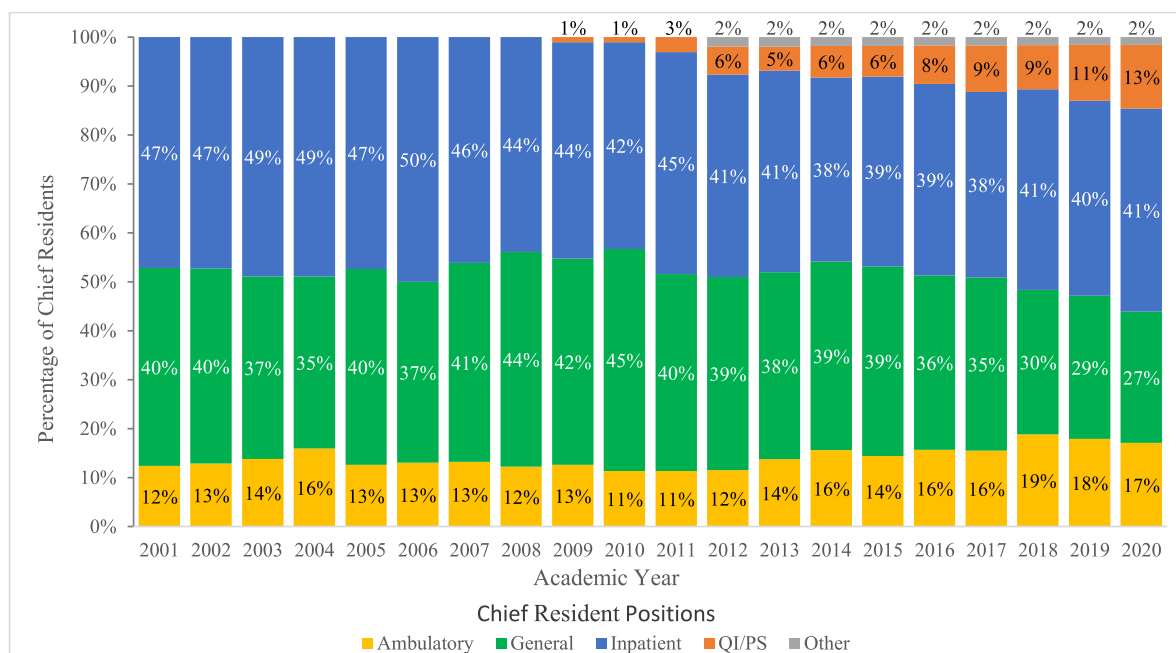


Figure 2 Evolution of chief resident positions, 2001-2020 ($n = 2060$). QI/PS: quality improvement/patient safety.

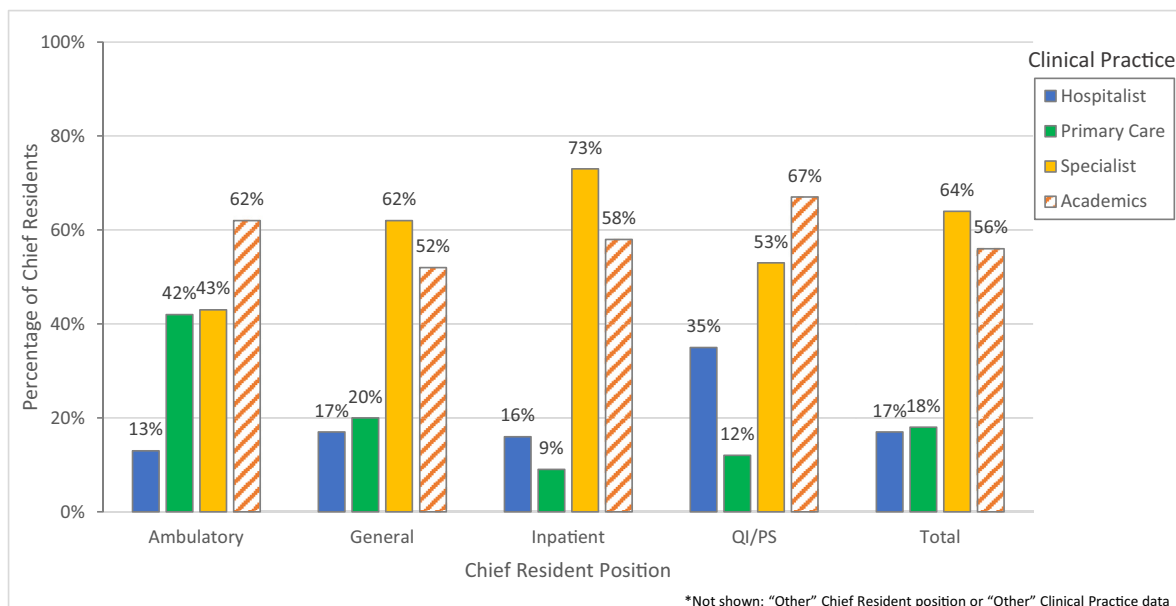


Figure 3 Chief resident current clinical practice by chief resident position, AY 2001-2020 ($n = 2053$). QI/PS: quality improvement/patient safety.

$n = 473$), and QI/PS (53%, $n = 48$) CRs pursued subspecialty training as compared to ambulatory CRs (43%, $n = 125$; $P < .001$).

Figure 5 shows the distribution of subspecialty training that CRs pursued; 129 completed more than one subspecialty training program, resulting in a total of 1,440 fellowships. The most prevalent subspecialties included ($n = 1307$ CRs): cardiology (25%, $n = 323$), PCCM (18%, $n = 240$), gastroenterology (14%, $n =$

180), hematology/oncology (heme/onc; 13%, $n = 174$), infectious disease (ID; 8%, $n = 109$) and nephrology (6%, $n = 78$). An increasing proportion of CRs pursued PCCM (7% to 25%, $\Delta = 0.7\%$ per year, $P < .001$) and heme/onc (9% to 21%, $\Delta = 0.4\%$ per year, $P = .03$) training over the 20-year study period, while a decreasing proportion pursued ID (9% to 7%, $\Delta = -0.3\%$ per year, $P = .03$) and nephrology (12% to 4%, $\Delta = -0.4\%$ per year $P < .001$).

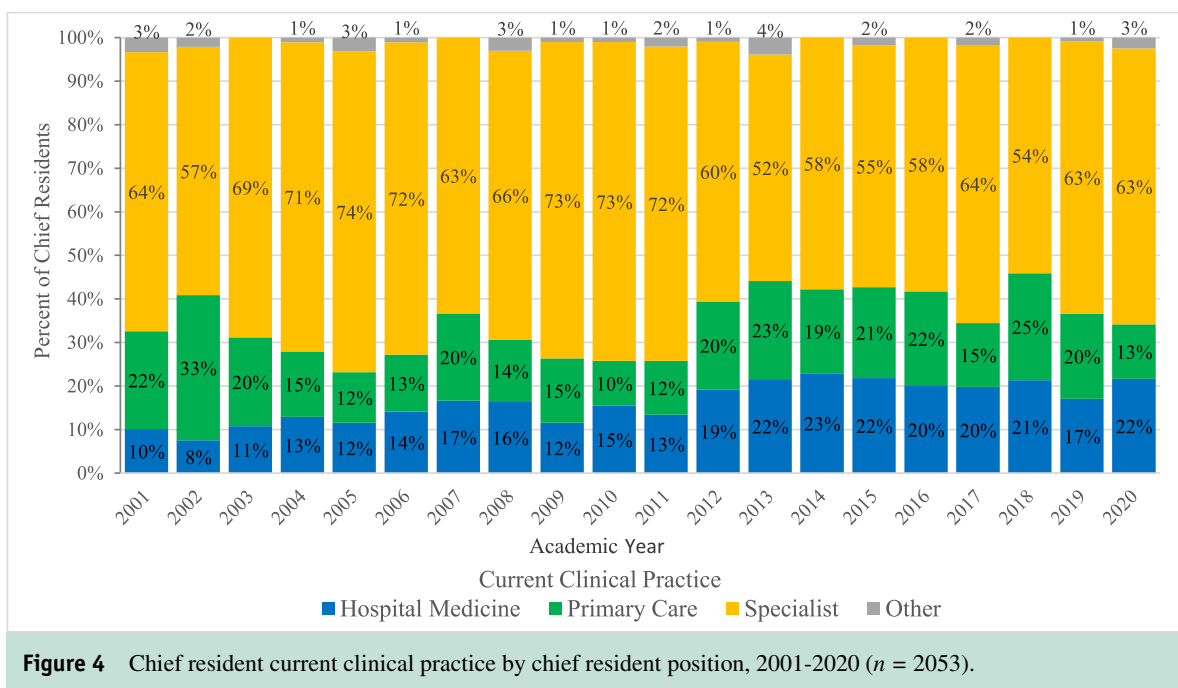


Figure 4 Chief resident current clinical practice by chief resident position, 2001-2020 ($n = 2053$).

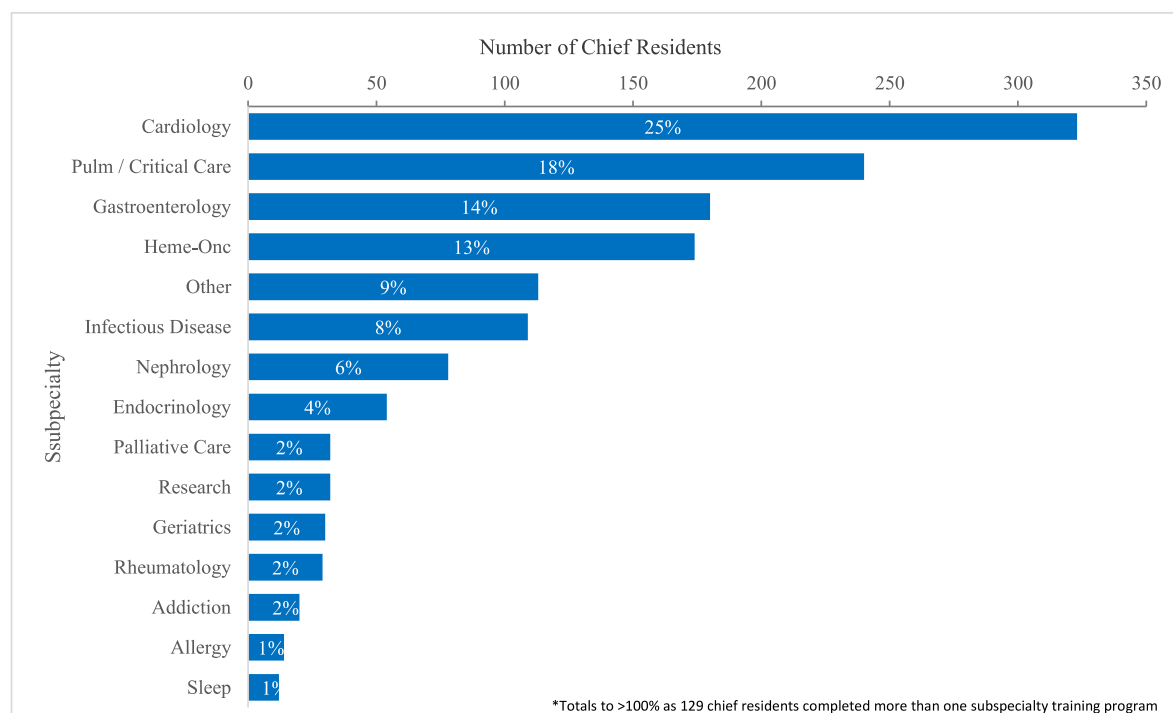


Figure 5 Distribution of subspecialty training, AY 2001-2020 ($n = 1307$). Addiction: Addiction Medicine; Allergy: Allergy & Immunology; Heme-Onc: Hematology-Oncology; Pulm/Critical Care: Pulmonary & Critical Care Medicine; Sleep: Sleep Medicine.

Thirty-six percent ($n = 746$) of CRs pursued careers in internal medicine, equally split between primary care (18%, $n = 374$) and hospital medicine (17%, $n = 342$), with the remainder ($n = 30$) practicing in other arenas. Over the 20-year study period, an increasing proportion of CRs pursued careers in hospital medicine

(10% to 22%, $\Delta = 0.7\%$ per year, $P < .001$), while the proportion who pursued primary care was highly variable (range = 10% to 33%) without a significant time dependent-trend. There were significant differences in current clinical practice by gender, with a greater proportion of female than male CRs pursuing careers in

both primary care (25%, $n = 239$ versus 12%, $n = 135$; $P < .001$) and hospital medicine (18%, $n = 175$ versus 15%, $n = 167$; $P < .001$). Current clinical practice also significantly differed by CR position, with a greater proportion of ambulatory CRs (42%, $n = 124$) practicing primary care than general (20%, $n = 155$), inpatient (9%, $n = 81$), and QI/PS CRs (12%, $n = 11$; $P < .001$). In contrast, a greater proportion of QI/PS CRs (35%, $n = 32$) pursued careers in hospital medicine as compared to ambulatory (13%, $n = 38$), general (17%, $n = 146$), and inpatient CRs (16%, $n = 124$; $P < .001$).

Overall, 56% ($n = 1021$) of CRs remained in academic medicine, and the proportion increased over time (51% to 82%, delta 1.5% per year, $P < .001$). There were group differences for who remained in academic medicine by gender (female: 61%, $n = 511$; male: 52%, $n = 510$; $P < .001$); AOA membership (members: 65%, $n = 402$; non-members: 52%, $n = 619$; $P < .001$); CR position, with the highest proportion among QI/PS CRs (67%, $n = 45$) followed by ambulatory (62%, $n = 167$), inpatient (58%, $n = 442$) and general CRs (52%, $n = 360$; $P = .004$); and current clinical practice, with the highest proportion among hospitalists (68%, $n = 233$) followed by primary care physicians (57%, $n = 213$) and subspecialists (53%, $n = 565$; $P < .001$). Last, 54% ($n = 550$) of CRs remained at the academic institution at which they trained, with proportions significantly differing by CR position: QI/PS CRs (73%; $n = 33$); ambulatory (59%; $n = 99$); inpatient (52%; $n = 232$), and general CRs (52%; $n = 186$; $P = .04$).

DISCUSSION

This large, 20-year multicenter study is the first to provide data on the career choices of internal medicine CRs and insights into the evolution of gender composition and role-specific CR positions. Our results reveal that a consistent majority of CRs pursue subspecialty training and substantiate the assumption that chief residency is an effective stepping-stone for a future career in academic medicine.¹⁻⁸ Our results also show significant improvement in gender parity and an increasing prevalence of role-specific positions (e.g., ambulatory and QI/PS CRs) in concordance with the growth of residency training programs nationally.²⁶

Our results confirm that a majority (63%) of CRs pursue subspecialty training after chief residency, which is consistent with prior studies that surveyed current CRs about their future career plans. However, our study is the first with corroborating data about their careers after chief residency.^{2,13,14,27} Cardiology, PCCM, gastroenterology, and heme/onc were the most prevalent subspecialties, with greater proportions pursuing PCCM and heme/onc and fewer pursuing ID or nephrology over time. Additionally, a greater proportion of male CRs pursued subspecialty training than

female CRs. These results are comparable with the percentages and proportions of internal medicine residency graduates who pursue subspecialty training.²⁷⁻³⁰

Given these similarities, it is important to reconsider whether chief residency continues to provide a mark of distinction when applying to fellowship programs.^{6,31} A recent National Resident Matching Program (NRMP) Fellowship Program Director survey designed to elucidate the factors that program directors use to offer interviews and rank applicants did not mention chief residency.³² Furthermore, the Electronic Residency Application Service (ERAS) does not have a specific field of entry for chief residency.³³ This lack, together with the lack of positional oversight by ACGME, makes it difficult to track CR data, further perpetuating ambiguity and disparities within the position.^{6,13-16} While our data confirms that chief residency is used as a stepping-stone for a career in academic medicine, the benefits for fellowship application are less well-defined and likely more dependent on the goals of the fellowship programs (i.e., physician scientist or clinician-educator training).

Fifty-six percent of CRs in our study remained in academic medicine compared to 15% of internal medicine residency graduates who completed training between 2012 and 2021.³⁴ With the majority (72%) of internal medicine residency training programs in the United States either university-based or academically-affiliated, our cohort's four-fold increase in academic appointments supports chief residency as a pipeline for future academicians.^{1-8,16,35} Additionally, the majority (54%) of CRs who remained in academic medicine did so at the institution at which they trained, underscoring the natural predisposition for CRs to become faculty at their home institution.³⁶⁻³⁸

Our results also reveal increasing interest in hospital medicine, concurrent with the hospitalist movement throughout healthcare.³⁹ Reassuringly, the proportions of CRs who went on to practice primary care remained stable over time, largely driven by female and ambulatory CRs, and somewhat counter to concerns about retention within general internal medicine.^{27,29} Greater proportions of both hospitalists and primary care physicians from our cohort remained in academic medicine, reinforcing that chief residency is an important step towards academia, regardless of the specialty.^{7,8,17}

The results reveal significant improvement in gender parity among CRs over time. Overall, 46% of the CRs in the cohort were female, and there was clear improvement in gender representation over the 20-year timeframe. These data are consistent with small, survey-based CR studies; however, our study is the first to assess for, and demonstrate, longitudinal improvement.^{6,13,14} Our data reveals equal gender representation for AY 2020-2021 (52% female), and a greater proportion of female CRs (61% vs 52% of male CRs) remaining in academic medicine. In

contrast, significant gender disparities persist in residency (43%), fellowship (39%), throughout the field of internal medicine (39%), and across academic medicine (41%).^{26,36,40,41} We hope that the increasing proportions of women CRs constitute a pipeline that does not leak for future academic leadership positions.^{36,42}

This study has several limitations. The cohort was comprised of former internal medicine CRs from academic or academically affiliated institutions across the United States. Despite being a large, national, multi-center study of residency programs of disparate sizes and geographic regions, the results may not be applicable to CRs from community programs. We were limited in our ability to collect demographic data for CRs as there is no national repository of data. We were only able to obtain self-identified gender; other demographic data (e.g., age, race, ethnicity) were not available. Additionally, we obtained self-identified gender from the NPI registry, which at the time only allowed for the binary categories of female or male. Last, we only obtained current clinical practice information between August 1 and November 30, 2021; prior clinical practice data (clinical practice and/or academic affiliation) was unavailable. Thus, we were unable to represent longitudinal clinical practice data (e.g., prior academic affiliations, transitions in clinical practice, etc.).

In conclusion, we found that most CRs pursue subspecialty training and that chief residency is an effective stepping-stone for future careers in academic medicine. This study also reveals that internal medicine chief residency has advanced over time, with improved gender representation and the establishment of role-specific positions. We hope that our study will be useful to inform future advancements within internal medicine chief residency to ensure alignment of the purpose and goals of chief residency between residency programs and the CRs themselves.⁴³

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Funding: None.

Conflict of Interest: The named authors have no conflict of interest, financial, or otherwise.

Authorship: Each named author had access to the data and substantially contributed to the drafting this manuscript. TJA: Conceptualization, Writing - original draft. HS: Writing - original draft. WH: Writing - original draft. JA: Writing - original draft. NA: Writing - original draft. JCB: Writing - original draft. MAC: Writing - original draft. JC: Writing - original draft. LC: Writing - original draft. EE: Writing - original draft. SEA: Writing - original draft. JE: Writing - original draft. KEF: Writing - original draft. MG: Writing - original draft. AG: Writing - original draft. POG: Writing - original draft. MTH: Writing - original draft. ADJ: Writing - original draft. CK: Writing - original draft. BK: Writing - original draft. J-HP: Writing - original draft. ES: Writing - original draft. RS: Writing - original draft. NS: Writing - original draft. AS: Writing - original draft. MT: Writing - original draft. WT: Writing - original draft. JV: Writing - original draft. PBC: Conceptualization, Writing - original draft.