

Gender, Race, and Ethnicity in Critical Care Fellowship Programs in the United States From 2016 to 2021

IMPORTANCE: A diverse and inclusive critical care workforce is vital to the provision of culturally appropriate and effective care to critically ill patients of all backgrounds.

OBJECTIVES: The purpose of this study is to determine the trends in gender, race, and ethnicity of U.S. critical care fellowships over the past 6 years (2016–2021).

METHODS: Data on gender, race, and ethnicity of critical care fellows in five Accreditation Council on Graduate Medical Education-accredited training programs (internal medicine, pulmonary and critical care, anesthesiology, surgery, and pediatrics) from 2015 to 2016 to 2020–2021 were obtained from the joint reports of the American Medical Association (AMA) and Association of American Medical Colleges published annually in the *Journal of the AMA*.

RESULTS: From 2016 to 2021, the number of U.S. critical care fellows increased annually, up 23.8%, with the largest number of fellows in pulmonary critical care medicine (60.1%). The percentage of female critical care fellows slightly increased from 38.7% to 39.4% ($p = 0.57$). White fellows significantly decreased from 57.4% to 49.3% ($p = 0.0001$); similarly, Asian fellows significantly decreased from 30.8% to 27.5% ($p = 0.004$). The percentage of Black or African American fellows was not statistically significantly different (4.9% vs 4.4%; $p = 0.44$). The number of fellows who self-identified as multiracial significantly increased from 52 (1.9%) to 91 (2.7%) ($p = 0.043$). The percentage of fellows who identified as Hispanic was not significantly different (6.7% vs 7.5%; $p = 0.23$).

CONCLUSIONS: The percentage of women and racially and ethnically minoritized fellows (Black and Hispanic) remain underrepresented in critical care fellowship programs. Additional research is needed to better understand these demographic trends in our emerging critical care physician workforce and enhance diversity.

KEY WORDS: critical care medicine; diversity; fellowship; training; workforce

A diverse and inclusive critical care workforce is vital to the provision of culturally appropriate and effective care to critically ill patients of all backgrounds. Increased patient satisfaction and higher levels of trust are additional benefits. Three previous studies examined various components of diversity in U.S. critical care fellowship training programs (1–3). Stone et al (1) found the percentage of women in pulmonary critical care medicine (PCCM) fellowships increased from 16.2% in 1991 to 32.6% in 2016. Lane-Fall et al (2) reported underrepresentation of women and American Indian or Alaska Native, Native Hawaiian or Pacific Islander but not of Black or Hispanic fellows in U.S. critical care fellowships from 2004 to 2014. More recently, Santhosh and Babik (3) found no improvement in the number of women fellows and a decline in the percentage of Black, Hispanic, American Indian or Alaska Native, Native

Stephen M. Pastores, MD
Natalie Kostecky, RN
Hao Zhang, MD

Copyright © 2023 The Authors. Published by Wolters Kluwer Health, Inc. on behalf of the Society of Critical Care Medicine. This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

DOI: 10.1097/CCE.0000000000000952



KEY POINTS

Question: We describe the trends of women and racial/ethnic minorities in U.S. critical care fellowship programs in recent years.

Findings: Data on gender, race, and ethnicity of critical care fellows in five Accreditation Council on Graduate Medical Education-accredited training programs from 2015 to 2016 to 2020–2021 were obtained from the joint reports of the American Medical Association and Association of American Medical Colleges. The percentage of women remained essentially unchanged at approximately 39%. The number of Black and Hispanic fellows has also not significantly changed. When compared with U.S. Census population estimates for 2021, the percentages of Black (4.4%) and Hispanic (7.5%) critical care fellows in 2021 were significantly lower than the proportion of the U.S. population identified as non-Hispanic Black (13.6%) and Hispanic (18.9%), respectively.

Meaning: Women, Black, and Hispanic fellows remain underrepresented in critical care training programs when compared with population estimates and more efforts are needed to enhance diversity.

Hawaiian or Pacific Islander in PCCM programs from 2009 to 2018. We sought to determine if these demographic trends in U.S. critical care fellowships have changed over the past 6 years (2016–2021).

METHODS

Data on gender, race, and ethnicity of critical care fellows for each of the five Accreditation Council on Graduate Medical Education (ACGME)-accredited training programs (internal medicine [IM], PCCM, anesthesiology, surgery, and pediatrics) from 2015 to 2016 to 2020–2021 were obtained from the joint reports of the American Medical Association (AMA) and Association of American Medical Colleges published annually in the *Journal of the AMA*. Hispanic ethnicity was analyzed separately from race.

For the purposes of this study, the five fellowship programs were analyzed together to illustrate the demographic diversity of all critical care fellows in any given year. Given the different trajectories of the increase in

critical care fellows, we separately analyzed the gender, race, and ethnicity trends annually across the specialties with different training pathways (**Supplemental File**, <http://links.lww.com/CCX/B226>). The racial and ethnic trends of all critical care fellows were then compared with U.S. population estimates of 2021 obtained from the U.S. Census Bureau (4).

We used descriptive statistics with Pearson's chi-square tests (SPSS Version 27; IBM Corp., Armonk, NY). Categorical data are reported as frequencies and percentages. *p* values of less than 0.05 were considered statistically significant. To determine whether there were significant differences across the multiple years for gender, race, and ethnicity in the five fellowship programs, we performed the *z* test with Bonferroni correction to obtain the adjusted *p* values. The Institutional Review Board (IRB) of Memorial Sloan Kettering Cancer Center determined that this study was not human participants research and therefore exempt from IRB review.

RESULTS

From 2016 to 2021, the number of U.S. critical care training programs and fellows increased annually, up 22.7% (413 in 2015–2016 to 507 in 2020–2021) and 23.8% (2,674 in 2015–2016 to 3,311 in 2020–2021), respectively, with the largest number of fellows in PCCM (60% in 2020–2021) (**Table 1**). Of the 3,311 fellows in 2021, two-thirds (65.8%) were U.S. allopathic medical school or Doctor of Osteopathy school graduates and a third (34.2%) were international medical school (including Canada) graduates.

From 2016 to 2021, the absolute number and percentage of female critical care fellows slightly increased from 38.7% ($n = 1,034$) to 39.4% ($n = 1,304$) ($p = 0.57$). Pediatric critical care programs had the highest number and percentage of female fellows every year (range, 59–65%) and IM critical care programs the least (26–33%) (Supplemental File, <http://links.lww.com/CCX/B226>).

From 2015–2016 to 2020–2021, the percentage of White fellows significantly decreased from 57.4% ($n = 1,536$) to 49.3% ($n = 1,633$) ($p = 0.0001$); similarly, Asian fellows significantly decreased from 30.8% ($n = 824$) to 27.5% ($n = 909$) ($p = 0.004$). The percentage of Black/African American fellows was not significantly different (4.9% vs 4.4%; $p = 0.44$). There was minimal increase in the combined percentage of Native

TABLE 1.**Demographics of Five Accreditation Council on Graduate Medical Education-Accredited Critical Care Fellowship Training Programs (Internal Medicine, Pulmonary Critical Care, Anesthesia Critical Care, Surgical Critical Care, and Pediatric Critical Care)^a**

Demographics	2015–2016	2016–2017	2017–2018	2018–2019	2019–2020	2020–2021
Total number of programs	413	419	434	476	496	507
Total number of fellows	2,674	2,743	2,895	3,011	3,143	3,311
Total number of fellows (%) by fellowship type						
Pulmonary critical care	1,583 (59)	1,621 (59)	1,726 (60)	1,835 (61)	1,931 (61)	1,991 (60)
Internal medicine critical care	193 (7)	208 (8)	228 (8)	226 (7.5)	250 (8)	260 (8)
Anesthesia critical care	179 (7)	168 (6)	177 (6)	184 (6)	169 (5)	204 (6)
Surgical critical care	230 (9)	253 (9)	258 (9)	262 (9)	258 (8)	296 (9)
Pediatric critical care	489 (18)	493 (18)	506 (17)	504 (17)	535 (17)	560 (17)
Medical school of graduation, <i>n</i> (%)						
U.S. Allopathic Medical School Graduates	1,491 (56)	1,535 (56)	1,623 (56)	1,627 (54)	1,706 (54)	1,759 (53.1)
International Medical Graduates	957 (36)	967 (35)	993 (34)	1,041 (35)	1,067 (34)	1,128 (34.0)
Doctor of Osteopathy	221 (8)	230 (8)	275 (9)	335 (11)	367 (12)	420 (12.7)
Canadian	5 (0.2)	11 (0.4)	4 (0.1)	8 (0.3)	3 (0.1)	4 (0.12)
Gender, <i>n</i> (%)						
Female	1,034 (38.7)	1,064 (38.8)	1,122 (38.7)	1,163 (38.6)	1,216 (38.7)	1,304 (39.4)
Race, <i>n</i> (%)						
American Indian/Alaska Native	0 (0)	2 (0.07)	3 (0.1)	3 (0.09)	1 (0.0003)	6 (0.18)
Asian	824 (30.8)	804 (29.3)	852 (29.4)	884 (29.3)	930 (29.6)	909 (27.5)
Black/African American	130 (4.9)	115 (4.2)	106 (3.7)	109 (3.6)	120 (3.8)	147 (4.4)
Native Hawaiian/Pacific Islander	4 (0.1)	7 (0.25)	1 (0.3)	7 (0.2)	5 (0.16)	5 (0.2)
White	1,536 (57.4)	1,567 (57.1)	1,673 (57.8)	1,724 (57.2)	1,753 (55.8)	1,633 (49.3)
Multiracial ^b	52 (1.9)	71 (2.6)	70 (2.4)	89 (2.9)	118 (3.7)	91 (2.7)
Other/unknown ^c	128 (4.8)	177 (6.4)	190 (6.6)	195 (6.5)	216 (6.9)	520 (15.7)
Ethnicity, <i>n</i> (%)						
Hispanic ethnicity ^d	179 (6.7)	177 (6.4)	196 (6.8)	211 (7.0)	235 (7.5)	248 (7.5)

^aCombined internal medicine/emergency medicine critical care training programs were excluded given their low numbers (< 20 fellows in each of the 5 yr examined), and fellows in neurocritical care fellowships due to lack of published data on their demographics.

^bMultiracial = fellows who have self-identified as more than one race.

^cUnknown = no answer given.

^dA person of Hispanic ethnicity may be of any race. Race and ethnicity Accreditation Council on Graduate Medical Education data are not captured separately.

Hawaiian/Pacific Islander and American Indian/Alaska native fellows (0.1–0.2%). The number of fellows who self-identified as multiracial significantly increased from 52 (1.9%) to 91 (2.7%) ($p = 0.043$). Similarly, the number of fellows listed as “Other/Unknown” racial category significantly increased from 4.8% ($n = 128$) to 15.7% ($n = 520$) ($p = 0.000$). The number and percentage of fellows who identified as Hispanic increased from 6.7% ($n = 179$) in 2015–2016 to 7.5% ($n = 248$) in 2020–2021 ($p = 0.23$). Pediatric critical care programs had the highest percentage of Hispanic fellows every year (range, 8–10%) and PCCM programs the least (6–7%) (Supplemental File, <http://links.lww.com/CCX/B226>).

When compared with U.S. Census population estimates for 2021, the percentages of Black (4.4%) and Hispanic (7.5%) critical care fellows in 2021 remain significantly lower than the proportion of the U.S. population identified as non-Hispanic Black (13.6%) and Hispanic (18.9%), respectively.

DISCUSSION

Our study shows that the number of U.S. critical care training programs and fellows has increased annually over the past 6 years. We believe that this increase was related to the creation of a single accreditation system for graduate medical education for both osteopathic (doctor of osteopathy) and allopathic (doctor of medicine) residencies and fellowships by the ACGME that culminated on June 30, 2020, after a 5-year transition.

Our study shows that the overall percentage of women in critical care fellowship programs over the past 6 years remained essentially unchanged at approximately 39%. Pediatric critical care programs had the highest percentage of female fellows every year (range, 59–65%). Several factors are associated with the decisions of women residents in IM, surgery, anesthesiology, and pediatric programs when choosing to go into a subspecialty fellowship such as critical care, including their educational experience, views of patient care, time with family, and lifestyle perceptions with lesser importance placed on financial considerations (5).

Our finding that racially and ethnically minoritized fellows (Black and Hispanic) in critical care training programs remain underrepresented mirror the results reported in IM and surgery residency and fellowship

programs and have been attributed to low faculty diversity, a lack of underrepresented minority students applying, and the inability to match these candidates due to the competition from other specialties (6–9). Furthermore, our findings confirm that racial and ethnic representation of Black and Hispanic critical care fellows in 2021 remain significantly lower than the proportion of the U.S. population identified as non-Hispanic Black and Hispanic, respectively. The same phenomenon is observed in the legal profession where nearly all people of color are underrepresented compared with their presence in the U.S. population (10). Undoubtedly, efforts to recruit and retain Black and Hispanic individuals in critical care fellowships is necessary to improve the diversity of the training programs, better reflect the diversity of the patient population, and provide culturally competent care.

Gonzaga et al (11) proposed a 5-point recruitment framework for diversifying individual graduate medical education training programs starting with strong institutional support by setting diversity as a priority, seeking out candidates, implementing inclusive recruitment practices, investing in trainee success, and building the pipeline. A nationally representative survey of IM program directors identified the use of websites demonstrating a commitment to diversity on interview day, underrepresented residents and faculty being present on interview day, matching underrepresented faculty to applicants and utilizing race/ethnicity data in the Electronic Residency Application Service as beneficial strategies (12). The most cited barriers were concerns about applicant interest in the geographic region of the residency program, and the diversity and qualifications of the applicant pool.

A recent scoping review of 27 articles (two reporting on fellowship programs) identified the combination of holistic review, decreased emphasis on U.S. Medical Licensing Examination Step 1 scores, and explicit institutional messaging regarding the importance of diversity as most likely to be associated with an increased number of underrepresented applicants, interviewees, and matriculants across various medical and surgical specialties (13). Women and racially and ethnically minoritized residents should get more exposure to the field of critical care through mentorship, clinical experiences, and didactic programs, and encouraged to apply to critical care programs and seek role models (3, 14).

Our study is limited with the use of publicly available data that is aggregated with no individual identifiers. Gender data was solely based on male/female and did not include gender identity and sexual orientation. We are unable to explain the significant increase of fellows listed under the “Other/Unknown” racial category in 2021 compared with 2016, which could have contributed to the decreasing trend of the other racial categories. Finally, we were unable to obtain complete demographic information on all the fellowship applicants to the five critical care training programs to relate the applicant pool diversity to the fellows accepted to those programs.

Additional research is needed to better understand the degree to which racial and ethnic underrepresentation in critical care fellowship programs is due to specialty choice versus ability to successfully match into critical care and to identify and overcome any barriers to representation (2, 3).

All authors: Critical Care Center, Department of Anesthesiology and Critical Care Medicine, Memorial Sloan Kettering Cancer Center, New York, NY.

Supplemental digital content is available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's website (<http://journals.lww.com/ccejournal>).

Supported, in part, by the Core Grant (P30 CA008748) and the Department of Anesthesiology and Critical Care Medicine, Memorial Sloan Kettering Cancer Center, New York, NY.

The authors have disclosed that they do not have any potential conflicts of interest.

For information regarding this article, E-mail: pastores@mskcc.org

REFERENCES

1. Stone AT, Carlson KM, Douglas PS, et al: Assessment of subspecialty choices of men and women in internal medicine from 1991 to 2016. *JAMA Intern Med* 2020; 180:140–141
2. Lane-Fall MB, Miano TA, Aysola J, et al: Diversity in the emerging critical care workforce: Analysis of demographic trends in critical care fellows from 2004 to 2014. *Crit Care Med* 2017; 45:822–827
3. Santhosh L, Babik JM: Diversity in the pulmonary and critical care medicine pipeline. *ATS Scholar* 2020; 1:152–160
4. US Census Bureau: Quick Facts. 2022. Available at: <https://www.census.gov/quickfacts/fact/table/US/PST045221>. Accessed March 7, 2023
5. West CP, Dupras DM: General medicine vs subspecialty career plans among internal medicine residents. *JAMA* 2012; 308:2241–2247
6. Jarman BT, Kallies KJ, Joshi ART, et al: Underrepresented minorities are underrepresented among general surgery applicants selected to interview. *J Surg Educ* 2019; 76:e15–e23
7. Poon SC, Nellans K, Gorroochurn P, et al: Race, but not gender, is associated with admissions into orthopaedic residency programs. *Clin Orthop Relat Res* 2022; 480:1441–1449
8. Geary A, Wang V, Cooper J, et al: Analysis of electronic residency application service (ERAS) data can improve house staff diversity. *J Surg Res* 2021; 257:246–251
9. Kalra A, Reed GW, Puri R, et al: Trend of demographics of cardiovascular disease fellows and association between fellows and program director race. *JACC* 2022; 1:100032
10. American Bar Association. 2020. Available at: <https://www.americanbar.org/content/dam/aba/administrative/news/2020/07/potlp2020.pdf>. Accessed May 17, 2023
11. Gonzaga AMR, Appiah-Pippim J, Onumah CM, et al: A framework for inclusive graduate medical education recruitment strategies: Meeting the ACGME standard for a diverse and inclusive workforce. *Acad Med* 2020; 95:710–716
12. Mendiola M, Modest AM, Kisielewski M, et al: Recruitment of underrepresented in medicine applicants to US internal medicine residencies: Results of a national survey. *Am J Med* 2022; 135:787–794
13. Mabeza RM, Christophers B, Ederaine SA, et al: Interventions associated with racial and ethnic diversity in US graduate medical education: A scoping review. *JAMA Network Open* 2023; 6:e2249335
14. Parsons Leigh J, de Grood C, Ahmed SB, et al: Toward gender equity in critical care medicine: A qualitative study of perceived drivers, implications, and strategies. *Crit Care Med* 2019; 47:e286–e291