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Views of Diagnostic Radiology Residency Program Directors Regarding Methods to Increase Female and Under-Represented in Medicine Residents: A Cross-sectional Study

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Original Investigation

Views of Diagnostic Radiology Residency Program Directors Regarding Methods to Increase Female and Under-Represented in Medicine Residents: A Cross-sectional Study

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Rationale and Objectives: Diagnostic radiology remains one of the least diverse medical specialties. Recent reports have found that the number of female and under-represented in medicine (URiM) residents have not increased despite efforts to increase representation over the last decade. Given the critical role of residency program directors in selecting diverse applicants, this study was performed to identify which strategies were most preferred to increase the number of female and/or URiM residents by directors of diagnostic radiology residency training programs.

Materials and Methods: This was an anonymous, cross-sectional study of diagnostic radiology residency program directors that included a survey about program characteristics, demographics, and strategies to increase the number of female and/or URiM residents.

Results: The questionnaire was submitted to 181 potential participants with a 19.9% response rate. The most preferred strategies to increase diversity involved directly recruiting medical students, promoting mentorship, increasing the number of diverse teaching faculty, and unconscious bias training. The least supported strategies included deemphasizing exam scores, accepting more international graduates, accepting a minimum number of female and/or URiM applicants, and de-identifying applications. Female and/or URiM program directors indicated a statistically significant preference for medical student recruitment and providing an opportunity to discuss workplace issues for female and/or URiM trainees ($p < 0.05$).

Conclusion: Diagnostic radiology residency program directors endorsed a wide variety of strategies to increase diversity. Recruitment of female and/or URiM medical students and promoting the number of diverse faculty members and mentorship of trainees by these faculty appear to be the most preferred strategies to increase female and/or URiM residents. Female and/or URiM program directors placed a greater importance on recruiting diverse applicants and supporting safe discussion of workplace issues faced by female and/or URiM radiology residents.

Key Words: Radiology; Female; Residency; Under-represented in medicine.

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INTRODUCTION

Female and under-represented in medicine (URiM) diagnostic radiologists constitute a fraction of the radiology workforce in the United States. Despite reaching gender parity in medical school applicants, women make up only 28% of residents, 28% of faculty, 26% of practicing physicians, 23% of residency directors, and only 9% of departmental chairs, leading to the so-called "leaky pipe" of women in radiology (1). A 2021 analysis of radiology residency demographics in the United States confirmed that over the last 12 years, with an average 26.7% female residents, there was a 0.0% per year increase in female radiology residents (2). Moreover, only 4.3% of radiologists were LatinX, 2.1% were Black, and 0.1% were American Indian, Native American, Native Hawaiian, or Pacific Islander (3). In addition, a recent analysis of Black, LatinX, American Indian, Alaskan Native, Native Hawaiian, and Pacific Islander similarly found no increase in the percentage of URiM radiology residents over the last 8 years (4).

Decades of stagnant diversification within the healthcare radiology workforce is now conflicting with an ever increasingly diverse patient population. As a result, leaders in the specialty have been called to action to respond to the needs of an increasingly diverse society (5). As recently as 2016, a survey of departmental chairs found that initiatives to increase diversity were not prioritized to fill residency positions through the National Residency Matching Program (NRMP) (6). A 2019 survey of the Association of Program Directors in Radiology similarly suggested that arguments to increase female and URiM representation in training programs have not successfully taken hold in radiology departments (7).

The residency program director has a direct and critical role in the selection of residents and therefore in the ranking of female and/or URiM applicants. Often, the residency program director, associate program director, and selection committee are the only ones with access and knowledge of the final rank list (8). As a result, this cross-sectional study of diagnostic radiology residency program directors was performed with the intention of identifying which strategies were most preferred to increase diversity of trainee radiologists.

MATERIALS AND METHODS

Study Design

This cross-sectional study was determined to be exempt by the Institutional Review Board (#HS-19-00580). To develop the questionnaire used in this study, an iterative process was used based on a continuing literature review of strategies to increase diversity in radiology residency programs. Survey items were modified from a previously published cross-sectional study of diversity in cardiology subspecialty training programs (9). Questions about program characteristics included items for region (Northwest, Southwest, Midwest, Southeast, or Northeast), category (community, university, or hybrid), location (rural, suburban, or urban), and type (diagnostic radiology). Questions about program demographics included items for number of residents, applicants, program director, associate program director(s), teaching faculty, teaching faculty in leadership positions, and departmental chairs.

Level of agreement or disagreement for each strategy to increase female or URiM representation was quantified using a Likert scale (1 = strongly disagree, 2 = somewhat disagree, 3 = neutral, 4 = somewhat agree, 5 = strongly agree). Strategies related to program structure included establishing office of diversity, establishing a mission statement to increase diversity, increasing funding for diversity initiatives, increasing female and/or URiM teaching faculty, promoting discussion about workplace issues faced by female and/or URiM residents, using metrics to quantify success of diversity initiatives, and conducting diversity research. Strategies associated with residency program events and training include holding diversity grand rounds, establishing "women in radiology" or similar informal groups, implementing cultural competence and unconscious bias training.

Methods to increase diversity related to applicant recruitment included directly recruiting female and/or URiM medical students, holding second-look days for female and/or URiM interviewees, advertising at schools with diverse student populations, promoting mentorship by female and/or URiM faculty, establishing pipeline programs for female and/or URM students, and building a webpage dedicated to diversity. Strategies related to applicant interviews included conducting holistic interviews, removing applicant photos, gender/sex, and ethnicities, establishing a dedicated subcommittee to increase diversity, increasing the number of female and/or URM interviewers, accepting a minimum number of female and/or URiM applicants, deemphasizing United States Medical Licensing Exam (USMLE) scores, and accepting more international medical graduates.

Data Collection and Analysis

An anonymous, electronic survey was sent to directors of diagnostic radiology residency training programs via SurveyMonkey (SurveyMonkey Inc., San Mateo, CA). A lottery was used to increase responses. Following the original email invitation, three reminder emails were sent to non-responders. Data were collected from January 2021 to May 2021. Descriptive statistics were applied to the dataset. A weighted average (WA) was calculated for each strategy to increase diversity. Responses were then dichotomized to compare the preferences of program directors who identified as female or URiM to the remaining respondents. The WA for each strategy was compared using *t*-tests, assuming unequal variances. p-values < 0.05 were considered statistically significant.

RESULTS

Demographics

A total of 36 residency program directors participated in the survey, constituting a 19.9% response rate. Programs from the West (n = 11, 30.6%), Midwest (n = 8, 22.2%), and East (n = 17, 47.2%) United States were represented. Directors from university (n = 23, 63.9%), hybrid (n = 7, 19.4%), and community programs (n = 6, 16.7%) participated in this study. Diagnostic radiology residency program characteristics are described in Table 1. Strategies to increase diversity ranked by WA are indicated in Figure 1. Additional summary tables can be found in the Supplementary Material.

TABLE 1. Diagnostic Radiology Program Characteristics

Category	*N (%)*	*Total Responses*
Region		36
Northwest	4 (11.1)	
Southwest	7 (19.4)	
Midwest	8 (22.2)	
Southeast	6 (16.7)	
Northeast	11 (30.6)	
Type		36
Community	6 (16.7)	
University	23 (63.9)	
Hybrid	7 (19.4)	
Setting		36
Rural	0 (0)	
Suburban	8 (22.2)	
Urban	28 (77.8)	

Diagnostic radiology residency training program characteristics as reported by program directors.

Applicant Recruitment

The most supported strategy to increase diversity in diagnostic radiology residency was recruiting female and/or URiM medical students (WA = 4.7). Program directors also endorsed promoting mentorship of applicants by female and/or URM faculty (WA = 4.6), establishing a program webpage dedicated to diversity (WA = 4.1), establishing pipeline programs for under-represented medical students (WA = 4.0), advertising at medical schools with diverse student populations (WA = 4.0), and second-look days for competitive female and/or URiM applicants (WA = 3.8).

Program Structure

Respondents expressed the most support for increasing female and/or URiM teaching faculty (WA = 4.6). Program directors also endorsed using metrics to identify which strategies were effective in increasing the number of female and/or URiM residents (WA = 4.3), establishing a program mission statement to increase diversity (WA = 4.3), increasing funding for diversity-related initiatives (WA = 4.2), and establishing opportunities for female and/or URiM residents to

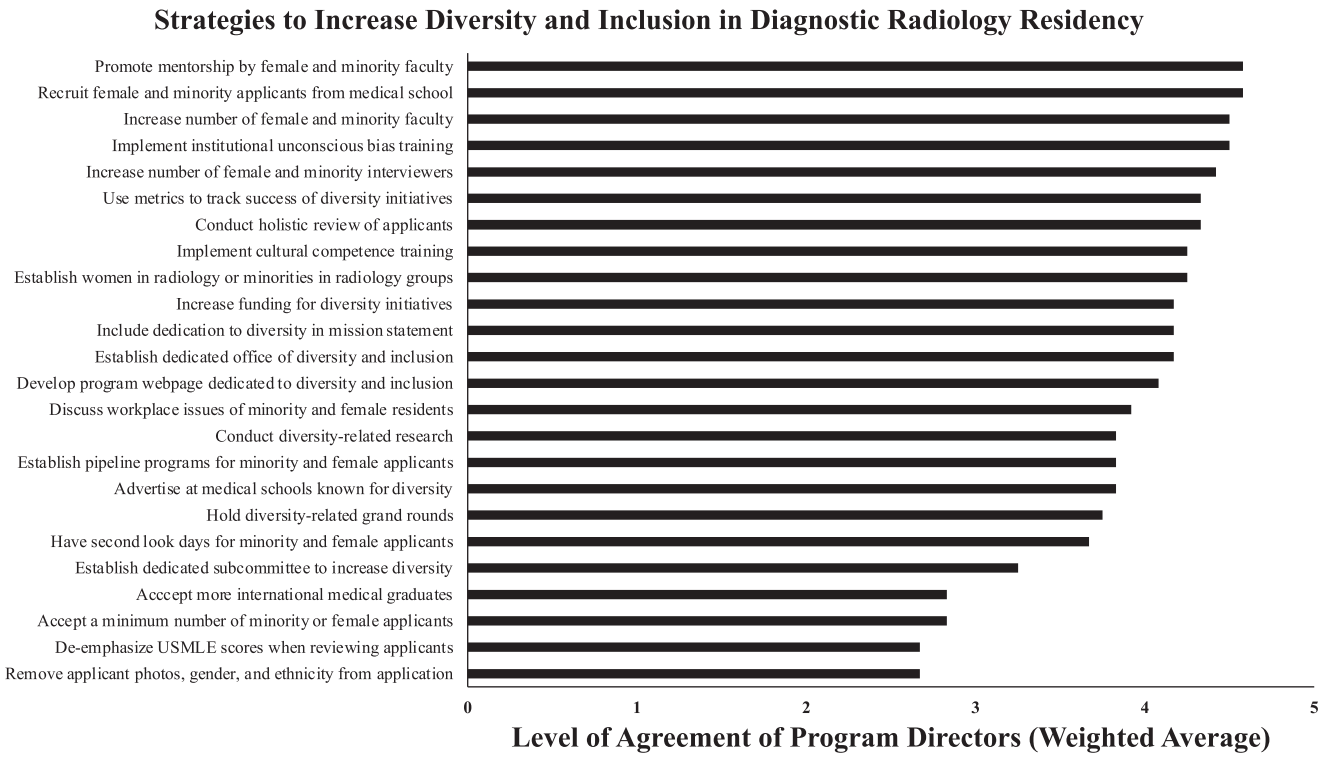

Figure 1. Contains a chart of strategies with the potential to increase diversity and inclusion in diagnostic radiology residency programs ranked based on the weighted average of the agreement allocated to each strategy by residency program directors.

discuss workplace issues (WA = 4.2). Establishing an office of diversity and inclusion (WA = 4.1) and conducting diversity-related research (WA = 4.0) were also strategies that respondents agreed would increase the number of female and URiM radiology residents.

Program Events and Training

Program directors expressed the most agreement for implementing unconscious bias training to increase diversity (WA = 4.5). Other supported strategies included establishing "women in radiology" or similar informal groups (WA = 4.4), implementing cultural competency training (WA = 4.4), and holding diversity grand rounds (WA = 4.1).

Applicant Interviews

The interview-related strategies most preferred by program directors to increase diversity included increasing the number of female and/or URiM teaching faculty conducting interviews (WA = 4.6) and conducting holistic application reviews (WA = 4.3). There was less agreement for establishing a subcommittee dedicated to review applications with the goal of increasing resident diversity (WA = 3.4). Respondents also expressed less agreement for deemphasizing USMLE scores (WA = 2.8), accepting more international medical graduates (WA = 2.8), accepting a minimum number of female and/or URiM applicants (WA = 2.7), and removing applicant photos, gender or sex, and ethnicities from applications (WA = 2.6).

Preferences of Female and/or URM program directors

Female and/or URiM residency program directors differed from their counterparts by indicating a stronger preference recruiting diverse applicants from medical schools (p = 0.0229) and providing an opportunity for female and/or URiM residents to discuss workplace issues (p = 0.0244). There were no other significant differences in the strategies preferred between groups ($p > 0.05$).

DISCUSSION

This cross-sectional study of diagnostic radiology residency program directors was performed with the aim of identifying which strategies were most preferred to increase the representation of female and/or URiM residents. Respondents constituted a subset of program directors from each geographic region of the United States. Both university-affiliated and non-academic programs were represented.

Diagnostic radiology residency program directors agreed that recruiting female and/or URiM medical students, promoting mentorship of female and/or URiM medical students by teaching faculty, and increasing the number of female and/or URiM teaching faculty were the most useful strategies to increase diversity in residency. These strategies are supported by a recent survey of 369 radiology residents that found that female residents placed a greater priority on program demographics, percentage of female faculty, the racial and ethnic diversity of faculty, and the racial and ethnic diversity of residents when selecting programs (10). In addition, a large, academic program reported a significant increase in URiM applicants and eventual residents using a comprehensive diversification strategy that involved advertising to medical students, early exposure initiatives for students, travel to conferences to recruit minority applicants, and mentoring URiM medical students (11). A study of female radiology program directors found that they believed mentorship to have played a greater role in advancing their careers compared to their male counterparts (12). One study found that female medical students have less preclinical exposure to radiology compared to males and may therefore benefit from active recruitment (13). Given that it has also been suggested that diverse applicants may view radiology as a hostile specialty, it remains critical to hire and retain visible female and/or URiM teaching faculty, particularly in positions of leadership (14). Moreover, the percentage of female residents has been reported to be greater in radiology residency programs with female program directors (15).

Program directors similarly expressed a great deal of agreement for incorporating unconscious bias training, cultural competency training, and establishing informal groups, such as "Women in Radiology" as a vehicle for increasing diversity. Experts have noted that counteracting unconscious bias may be one pathway to increasing the number of women and under-represented minorities (16). Moreover, race and ethnicity appear to significantly predict ratings of residency applicants scored by faculty radiologists (17). Therefore, employing implicit bias testing may be an effective means of increasing diversity during the applicant selection process (18). In fact, unconscious bias training has been adopted by approximately half of radiology residency training programs as of 2020 (7). With regards to cultural competence training, radiology residency programs can hope to not only better understand diverse applicants to their programs but also better serve patients from unique sociocultural backgrounds (1). Structured "Women in Radiology" groups have been reported to significantly increase workplace satisfaction and gender equity by supporting women's participation in research, education, and mentorship (19).

Program directors next expressed agreement for using metrics to quantify which efforts were successful to increase diversity, reviewing applications holistically, and establishing a program mission statement emphasizing diversity. A recent study by Spottswood et al. tracked change in percentage of URiM applicants and URiM residents to determine the success of their comprehensive strategy to increase residency diversity (11). The strategy included a holistic approach to application review as well as a mission statement dedicated to diversity, resulting in a statistically significant increase in the number of total URiM applications from 7.5% to 12.6% and an increase in URiM residents from 0% to 20% (11).

Respondents also agreed that increasing funding for diversity-related initiatives and providing a "safe space" for female and/or URiM residents to discuss workplaces issues were strategies to increase program diversity. Although there is little research showing how best to allocate funding to increase diversity in radiology residency programs, an analysis of radiology residencies associated with historically Black medical schools found that financial resource allocation and institutional policies that promote the success of these programs are likely necessary to increase representation of Black radiology residents (20). Notably, the importance of discussing workplace issues, such as micro-aggressions and biased behavior has been well-documented in radiology (1). Promoting dialogue for the unique issues faced by female and/or URiM residents may improve selection by female and/or URiM applicants, whom have been reported to value culture significantly when choosing a program (10-11).

On average, radiology program directors agreed that establishing an office of diversity, program webpage dedicated to diversity, and diversity-related grand rounds could be used to increase female and/or URiM representation. Many radiology departments have offices or committees devoted to diversity, equity, and inclusion, reflecting a commitment to these ideals. Dedicating a website to diversity in radiology residency programs has also been documented in the literature as part of a greater strategy (11). The practice of dedicating grand rounds to diversity by offering a platform for female and/or URiM to present their clinical achievements and research has also been described in the literature (21).

Program directors also expressed support for advertising at medical schools with diverse student populations, establishing pipeline programs, and conducting research related to diversity, equity, and inclusion. Traditionally, significantly fewer women have chosen to apply for a radiology residency position than men (22). Although over-represented minorities chose radiology more than all other races combined, the number of URiM applicants remained low. As a result, advertising to medical students and developing early exposure "pipelines" may be critical to increasing program diversity (11). In fact, the majority of radiology departments have revised their outreach to medical students by incorporating active learning opportunities into medical student clerkships and reframing radiology practice as clinical practice (6). Although the importance of diversity-related research as means of increasing female and/or URiM representation has not been studied in the literature, the use of metrics to track the success of diversity initiatives has been well documented (11).

According to this study, program directors were more neutral towards having second-look days for competitive female and/or URiM applicants and establishing a dedicated application review committee to increase resident diversity. However, both second look days and a more diverse application review committee were components of the comprehensive strategy published by Spottswood and colleagues (11).

Notably, diagnostic radiology program directors expressed less support for deemphasizing USMLE scores, accepting more international medical graduates, accepting a minimum number of female and/or URiM applicants, and removing applicant identifiers, such as photos, gender or sex, and ethnicities. Following the recent decision to change the USMLE Step 1 performance reporting from a 3-digit score to pass/fail, residency program directors believe that the change will make it more difficult to objectively compare applicants, but the potential effects on the evaluation of female and URiM applicants remain largely unknown (23). Available international medical graduates, which include a larger proportion of Hispanic and Asian applicants, constitute a viable option to enrich the diversity of residency programs (24). Despite minimal support for increasing the number of international medical graduates as radiology residents, a 15-year analysis of data from the NRMP found that the number of international medical graduates matching into diagnostic radiology residency training program doubled from 4.4% in 2006 to 9.4% in 2020 (25). The feasibility of interviewing or ranking a minimum number of female and/or URiM applicants, especially if identifiers are removed, is questionable given that the "leaky pipe" of female applicants and the low percentage of URiM medical students. In other words, efforts need to continue to improve diversity in undergraduate medical education according to program directors.

According to a review of the literature, a number of new developments have the potential to increase female and URiM representation in diagnostic radiology. Given that women make up approximately half of medical students, but a much smaller percentage of diagnostic radiology residents, efforts to recruit women to diagnostic radiology should be prioritized for medical students. These efforts may include clarifying opportunities for direct patient contact, the number one reason dissuading students from choosing radiology, and instituting more family-friendly policies (26-27). By comparison, the percentage of URiM medical students is low, suggesting that more concentrated efforts are needed both at the level of undergraduate medical education and further to students in college and high school for outreach, mentorship, and recruitment. The development of virtual medical student clerkships for URiM medical students has been reported to increase interest in pursuing a career in radiology (28). With regards to applicant selection, adopting a more structured interview may also reduce bias in the decision to rank qualified applicants (29). More recently, due to the COVID-19 pandemic, the use of virtual recruitment and virtual interviewing offers residency programs an opportunity to invite more geographically and culturally diverse candidates for interviews (30-31). Also, the growth of online communities, such as #MedTwitter, #RadTwitter, and #FutureRadRes in addition to Instagram, TikTok, and other social media applications offer the potential of networking and mentorship for under-represented applicants (31,32).

Although the goal of this study was to identify which strategies may increase the diversity of residents in residency

training programs in the United States, this study was not designed to differentiate between strategies to increase female representation and those that increase the number of URiM residents. Notably, there appears to be evidence that the barriers to increasing female and URiM representation, respectively, may differ. For example, the number of female applicants may be a limiting factor. However, according to a review of 4,117 applications to a university radiology residency training program, bias against female applicants was not a contributor (33). On the contrary, a study simulating the resident selection process found that ethnicity or race significantly predicted faculty reviewer rating of applications (17).

This study was not without limitations. The response rate from diagnostic radiology program directors in this study was 19.9%. However, we received participation from geographically diverse and non-university residency programs, suggesting that the likelihood of responder bias may be low. Nevertheless, responder bias favors responses from program directors that have a vested interest in increasing diversity in their radiology residency programs. It is also possible that potentially effective strategies were unintentionally omitted from the survey. One way we compensated for this possibility was to include an open text field in the survey for respondents to include additional strategies. Finally, although this cross-sectional study was performed with the goal of identifying the current preferences of program directors, this study was not designed to determine whether the aforementioned strategies were being implemented.

Importantly, program directors are subject to the outcome of the NRMP algorithm. Program directors that rank applicants from under-represented backgrounds highly also require applicants to rank the same programs highly. Should applicants not do this, the program will not match the applicants and may be viewed as not being inclusive even despite concerted efforts to match diverse candidates from under-represented backgrounds. Therefore, a number of future directions exist for further research. More is needed to be known about how program directors formulate their rank lists and how the diversity of applicants is factored into ranking qualified applicants. It may be also useful to ask matched applicants from under-represented backgrounds which program characteristics they most strongly considered when creating their rank lists and which strategies they would encourage program directors to implement to attract diverse candidates.

In summary, certain strategies appear to be strongly favored by diagnostic radiology residency program directors to increase diversity. These include direct recruiting of female and/or URiM medical students, promoting mentorship, and increasing the number of diverse teaching faculty. However, program directors were typically less supportive of deemphasizing USMLE scores, increasing the number of international graduates, establishing a quota system for diverse candidates, and de-identifying applications. Importantly, female and URiM program directors expressed more support than their peers in terms of recruiting diverse applicants from medical schools and creating "safe spaces" for female and/or URiM residents to discuss workplace issues. Despite strategies implemented by diagnostic radiology program directors to increase the diversity of residents, both parties are subject to the NRMP Match algorithm suggesting that the inclusivity of diagnostic radiology residencies should not solely be judged by the diversity of their resident workforces.

PREVIOUS PRESENTATION

(1) Radiological Society of North American 2021 Annual Meeting and (2) American Society of Head & Neck Radiology 2021 Annual Meeting.

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