

Design, Implementation, and Evaluation of a Diversity Program for Radiology

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Abstract

Rationale and Objectives: Diagnostic radiology training programs are less diverse than graduating US medical school classes and the patient populations they serve. Inclusion of physicians who are underrepresented minorities in medicine (URMM) can strengthen the profession and help to meet the needs of an increasingly diverse population. Our Department of Radiology developed and implemented a plan to increase the number of URMMs in our residency applicant pool and residency training program.

Materials and Methods: We designed a recruitment strategy to diversify the radiology residency applicant pool. This included website development, advertising, early exposure opportunities, travel to predominantly minority institutions and national meetings, and mentoring URMM medical students. We implemented parallel activities to increase the number of URMMs in our residency program. These included holistic screening tools for residency application review, a diverse residency recruitment committee, a welcome environment for visiting candidates, and “Second Look Weekend” visits for talented candidates. Primary outcomes measured include change in percentages of URMM applicants in our applicant pool and URMM residents in our residency program.

Results: The percentage of URMM radiology residency applicants increased from 7.5% (42 of 556) of the total applicant pool in the 2012 to 2013 recruitment year to 12.6% (98 of 777) in the 2017 to 2018 recruitment year ($P = .001$). URMM radiology residency representation increased from 0% (0 of 32) in the 2013 to 2014 academic year to 20% (6 of 30) in the 2018 to 2019 academic year ($P = .01$).

Conclusion: An intentional, strategic diversity program can diversify an institution’s residency applicant pool and increase representation of URMMs in a diagnostic radiology residency program.

Key Words: Diversity, radiology, residency, underrepresented minority

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INTRODUCTION

Background

In 1974, a consensus brief released by the Radiology Section of the National Medical Association documented “an insufficient supply of minority radiologists, both in training and in practice” [1]. More than 40 years later, African Americans, Hispanics, American Indians, Alaskan Natives, Native Hawaiians, and Pacific Islanders—groups deemed underrepresented minorities in medicine (URMM) relative to their numbers in the general population [2]—remain greatly underrepresented in the field of radiology.

According to 2010 US Census data, minority groups account for nearly 35% of the US population [3], yet only 6.5% of practicing radiologists are from minority groups [4].

Representation of URMM physicians in radiology is critical to meet the needs of today's diverse population. URMM physicians provide a disproportionate share of care to underserved populations (URMM physicians serve 54% of minority patients and 70% of non-English-speaking patients) [5]. Of concern, diagnostic radiology lags significantly behind other medical and surgical subspecialties with respect to training physicians from URMM backgrounds [6]. Although 13.9% of US medical school graduates are URMMs [7], these individuals comprise only 9.9% of diagnostic radiology residents [8].

The reasons for the persistent underrepresentation of minority groups in radiology are unclear, but likely multifactorial. The ACR Commission for Women and Diversity has identified the following potential deterrents and impediments to diversification in radiology and radiation oncology specialty training: (1) inadequate specialty exposure, (2) less interest in a specialty (inaccurately) perceived as having less patient contact or being of lesser direct service to the community, (3) a relative lack of URMM role models and mentors, and (4) bias, often unconscious or implicit [9].

The ACR Commission for Women and Diversity has formulated a strategic plan to increase diversity and inclusion in radiology and radiation oncology and has also delineated strategies to address impediments to diversifying radiology residency training programs, including: (1) provide early exposure programs for radiology and radiation oncology specialty training; (2) encourage URMM student application to summer fellowships; (3) create radiology and radiation oncology summer internship programs for first- and second-year medical students; (4) improve marketing and education about the radiological professions; (5) implement holistic selection criteria for residency training programs [10].

Our Institution's Response

In July 2013, none of our radiology department's 32 residents were from URMM groups, and no URMM residents were matched in the National Residency Matching Program (NRMP) to enroll in the subsequent 2 years. During the 2012 to 2013 residency recruitment season, only 7.5% (42 of 556) of our residency applicants self-identified on their Electronic Residency Application Service (ERAS) applications as URMMs. In the recorded history of our diagnostic radiology residency program

(1985 to 2018), only seven total URMMs were trained before 2013. The department committed to addressing this disparity among radiology trainees.

This article outlines our methods, short-term results (2013 to 2018), and future planned initiatives to increase the number of URMMs in our residency applicant pool and URMM representation in our residency training program. These efforts culminated in a comprehensive, multifaceted diversity program for the Department of Radiology.

METHODS

Developing a Radiology Graduate Medical Education Diversity Recruitment Plan

The Department of Radiology chair met with our institution's associate dean for diversity affairs to discuss medical center goals for diversifying the radiology resident applicant pool. The department chair then appointed an associate vice chair for diversity (AVCD), and they jointly wrote a Radiology Graduate Medical Education (GME) Diversity Recruitment Plan.

The primary objectives of the Diversity Recruitment Plan were to diversify the residency applicant pool and to diversify the residency training program. This document specified qualitative and quantitative goals, incorporated methods to overcome the barriers to diversification identified by the ACR Commission for Women and Diversity, and was evaluated and revised annually.

Diversifying the Applicant Pool

Incorporating methods outlined in the Diversity Recruitment Plan, the AVCD partnered with the radiology residency program director to develop activities to attract qualified URMM medical students to apply to our residency training program. A detailed list of these activities is outlined in [Table 1](#).

The AVCD and residency program director created a departmental diversity web page. Next, they revised the existing diagnostic radiology residency program website to attract talented applicants from both majority and minority groups.

The AVCD and residency program director developed opportunities for earlier exposure to radiology, including "shadowing" experiences with URMM faculty (participating students were required to undergo screening by our institution's "Observational Experience Department"). Concurrently, we initiated recruitment activities at predominantly URMM

Table 1. Activities designed to diversify the radiology residency applicant pool

Activity	Description of Activity
Create diversity website.	Created website to promulgate our mission, vision, objectives, and commitment to help eliminate health disparities and provide care for an increasingly heterogeneous population [website link to be provided when manuscript no longer anonymized]. https://www.vumc.org/radiology/diversity-equity-and-inclusion . Accessed January 10, 2019.
Revise existing diagnostic radiology residency program website.	Revised diagnostic radiology residency program website to include: <ul style="list-style-type: none"> ■ information about our commitment to diversity ■ video featuring the department chair, the AVCD, the residency program director, and a diverse group of faculty and trainees reflecting on their positive experiences within the department.
Develop opportunities for earlier exposure for radiology.	Developed 1- to 2-d “shadowing” experiences with URMM faculty for interested high school, undergraduate, graduate, and medical students. Local URMM students from our institution and from other local colleges and universities were informed of this opportunity, as well as URMM student members of the Student National Medical Association.
Engage in recruitment activities at URMM institutions and at national meetings.	Disseminated promotional materials at national radiology professional meetings and at URMM student medical society meetings. Provided lectures and educational seminars for students at historically black colleges and universities and for medical school radiology interest groups.
Provide mentoring opportunities for URMM students interested in radiology.	Developed 4-wk program partially funded by the School of Medicine designed to provide early exposure to radiology. Participated in ACR Nth Dimensions Summer Immersion Internship Program.

AVCD = associate vice chair for diversity; URMM = underrepresented minorities in medicine.

undergraduate and medical colleges, national meetings of the Student National Medical Association, and the Latino Medical Student Association Meeting. These recruitment activities were largely conducted by two URMM radiologists and the radiology residency program director.

Additionally, these two URMM faculty members developed mentoring opportunities for URMM students with a career interest in radiology, including a URMM summer internship program for URMM medical students. Finally, the Department of Radiology participated in the ACR’s Nth Dimensions summer immersion internship program [11]. During this 8-week summer internship, medical students work with experienced radiologists in academic or private practices, gaining a structured, firsthand clinical and research experience. In 2017 and 2018, two of our faculty members were selected by the ACR as preceptors for URMM medical

students competitively awarded an Nth Dimensions internship.

Diversifying the Residency Program

The AVCD partnered with the residency program director to develop activities to diversify the residency program by (1) revising our residency applicant screening process and (2) revising our interviewing and recruitment process. A detailed list of these activities is outlined in Table 2.

The AVCD and the residency program director developed holistic tools for screening talented URMM applicants. ERAS applications were initially reviewed while blinded with respect to racial or ethnic background and gender. All applicants were ranked on a scale of 1 to 4 based upon academic performance. Those who were considered unqualified were placed into group 4, and groups 1, 2, and 3 were considered

Table 2. Activities designed to diversify the radiology residency training program

Activity	Description of Activity
Develop holistic tools for screening of talented URMM applicants.	Develop tools to screen URMM applicants including blinding applications and holistic review to consider totality of application.
Diversify the Residency Recruitment Committee.	Include URMM faculty, women faculty, and URMM residents and fellows.
Develop relationship with institution's Office of Diversity.	Provide opportunity to meet with members of the School of Medicine's Office of Diversity, including the associate vice dean of diversity, URMM residents, and fellows and faculty from other clinical departments. Provide information on the medical center's URMM House-staff Association, resources and support for URMM applicants.
Create welcoming atmosphere for URMM interviewees.	Carefully review applications of highly talented URMM candidates with special note of hobbies, interests, and key life events, to facilitate a more relaxed, friendly interview. Pair URMM candidates with trainees and faculty within the department with similar backgrounds or interests during interview days.
Implement Second Look Weekend.	Provide opportunity for invited highly talented URMM candidates to return to our institution to participate in Second Look Weekend activities within the department, the university and the city at no cost. Involve department leadership, URMM radiology residents, and URMM residents from other specialties.
Rank talented URMM candidates intentionally.	Rank talented URMM candidates intentionally in NRMP rank list, paying attention to holistic review and candidate demographics.

URMM = underrepresented minorities in medicine.

“excellent,” “very good,” and “good,” respectively. After every applicant was scored, gender and racial or ethnic background were unblinded. Applicants in groups 1 to 3 were evaluated holistically, with care taken to consider the totality of the application. Our holistic review evaluated scholastic achievements, medical school attended, geographic location, gender, race or ethnicity, major influential life events, unique accomplishments or training or background—all factors that would contribute to the diversity of the incoming class, while maintaining excellence. Applicants were moved into a higher or lower group based on this holistic approach, with a goal to invite the best and brightest applicants from diverse backgrounds.

A key action employed to revise our interviewing and recruitment process was diversifying the Residency Recruitment Committee. This entailed inclusion, for the first time, of URMM faculty on the committee to interview and participate in the Residency Recruitment Committee's review of all applicants. URMM residents were later incorporated in the recruitment process during the interview season, attending lunch or dinner with the applicants, or providing departmental tours. In addition, an effort was made to include a strong representation of

women on the Residency Recruitment Committee, as there was a concurrent initiative to increase numbers of women trainees.

The Residency Recruitment Committee developed a relationship with the School of Medicine's Office of Diversity, which offered URMM radiology residency interviewees an on-site opportunity to meet with members of the School of Medicine's Office of Diversity, including the associate vice dean of diversity, URMM residents, and fellows and faculty from other clinical departments.

The Residency Recruitment Committee created a welcoming atmosphere for URMM candidates during interviews. Applications of highly talented URMM candidates were reviewed carefully, with special note of hobbies, interests, and key life events, to facilitate a more relaxed, friendly interview. During residency interviews, URMM candidates were paired with trainees and faculty within the department with similar backgrounds or interests.

The Department of Radiology implemented a “Second Look Weekend” for highly talented URMM candidates to return to our institution to participate in activities within the department, the university, and the city. The School of Medicine's Office of Diversity

sponsored this annual activity, covering all costs of travel for participants. The radiology department chair is actively involved, hosting both a lunch and a fun, social activity within the city for participants. The AVCD, the residency program director, and URMM radiology residents also participate in the Second Look Weekend activities. Additionally, URMM residents from other specialties share their experiences with the institution and the local community during an evening banquet panel.

Finally, the radiology residency program director and AVCD, with input from the Residency Recruitment Committee, ranked talented URMM candidates intentionally within the NRMP rank list.

Additional Departmental Diversity Activities

In year 3, the AVCD recognized the need for a more comprehensive approach to achieving diversity and inclusion within the department and established the Radiology Office of Diversity, Equity, and Inclusion. This office's efforts extended beyond implementation of the initially developed Diversity Recruitment Plan and incorporated additional faculty and resources to conduct educational sessions on diversity and inclusion. These efforts required developing a more comprehensive diversity program.

This diversity program implemented activities to improve the department's awareness of the importance of diversity and inclusion (Table 3). Unconscious bias education was offered to all radiology faculty and residents. A diversity lectureship series was established to provide recognition of research and clinical achievements of nationally renowned, URMM physicians within our specialty. This annual lectureship is in a grand rounds

format, and CME credit is provided to faculty. A Women in Radiology career development program, the Leadership Intervention to Further the Training of Female Faculty (LIFT-OFF), was created to identify and mitigate perceived barriers to career advancement of women faculty in our department [12,13].

Diversity Program Resources

Budget. Departmental financial support (approximately \$5,000 per year) was provided to defer costs for recruitment travel, brochures, student lunches, and other expenses. Honoraria, travel, and accommodations for visiting professors invited for the diversity lectureship were covered by the departmental grand rounds and visiting professor budget. Unconscious bias education was provided at no direct cost by trained medical center faculty members.

Graphics and Website Support. Departmental communications staff provided web, photography, and videography support, as well as design ideas for brochures and other marketing tools.

Time Commitment. The AVCD was provided 10% of full time equivalent (FTE) administrative time to oversee departmental diversity activities. Additional faculty members and URMM residents were provided protected time to perform recruitment activities, including residency interviews and local and out-of-town travel.

Department Chair Commitment. Our department chair demonstrated enthusiastic commitment to the mission to achieve diversity within our department. He offered insightful suggestions when consulted, spent

Table 3. Diversity program additional activities

Activity	Description of Activity
Establish Office for Diversity, Equity and Inclusion.	Staff office with appropriate personnel to accomplish diversity activities. Provide additional faculty and staff resources and conduct education and awareness initiatives on how to best realize the department's overall commitment to diversity, equity, and inclusion.
Provide unconscious bias training.	Offer training to all radiology faculty and residents to enhance recognition of our inherent biases when interviewing applicants, working with patients, and working with each other.
Establish diversity lectureship series.	Recognizes the research and clinical achievements of URMM physicians in our specialty. Invite renowned experts in diversity.
Implement a career development program for women faculty.	Develop program to mitigate perceived barriers to career advancement of women faculty in our department. Address underrepresentation of women in diagnostic radiology with intentional strategies to improve gender diversity in radiology by recruiting and retaining women in our residency program and faculty.

URMM = underrepresented minorities in medicine.

quality time with URMM candidates, and enthusiastically championed the work of the Office of Diversity, Equity, and Inclusion.

Outcome Measures

Primary outcomes measured were descriptive: the change in percentage of URMM applicants in our applicant pool and the change in percentage of URMM residents in our residency program. Secondary measures included evaluation of the additional diversity program activities.

Statistical Analysis

Data were entered into an Excel (Microsoft Corporation, Redmond, Washington) spreadsheet and analyzed using Stata (release 14, 2015) (StataCorp, College Station, Texas). Data were analyzed with descriptive statistics, using the χ^2 test to determine the likelihood that results were due to chance. The Fisher exact test was used when the expected cell frequency was less than or equal to 5. A *P* value of $<.05$ was considered significant.

RESULTS

Primary Outcomes

Diversifying the Residency Applicant Pool. In the 5 years since the initiation of our diversity improvement efforts, URMM applicants increased from 7.5% (42 of 556) of our institution's diagnostic radiology total applicant pool in the 2012 to 2013 recruitment year to 12.6% (98 of 777) in the 2017 to 2018 recruitment year ($P = .001$). This trend is compared with nationwide URMM diagnostic radiology program applicants in Figure 1.

Diversifying the Residency Program. During the same 5-year period, URMM radiology residency representation increased from 0% (0 of 32) in the 2013 to 2014 academic year to 20% (6 of 30) in the 2018 to 2019 academic year ($P = .01$). Our 2017 to 2018 NRMP match results reveal that in the 2019 to 2020 academic year, 25.9% (7 of 27) of our diagnostic radiology residents will be URMMs (Fig. 2).

Secondary Outcomes

Our department achieved 100% faculty and resident compliance with participation in unconscious bias educational sessions. The department has hosted three lectureships featuring nationally renowned physicians within our specialty. After implementation of the LIFT-OFF program, 62% (18 of 29) of women faculty

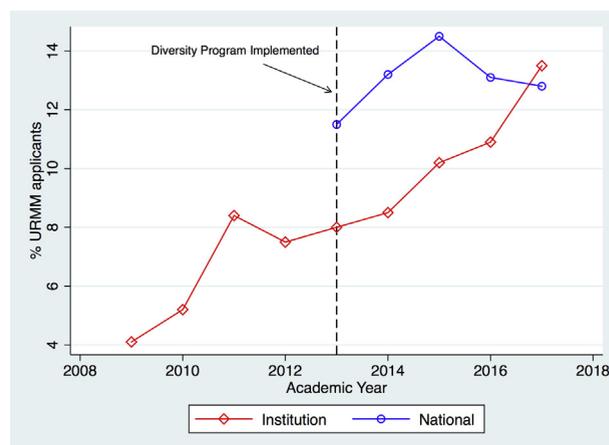


Fig 1. Percent underrepresented minorities in medicine (URMM) applicants to our diagnostic radiology residency program over time. Academic year is defined by the year of application submission (ie, data from applicants submitting in 2012 for the 2013 match are assigned to academic year 2012) to follow ERAS data presentation style. Before implementation of the diversity program in 2013, the number of URMM applicants was lower than the national average. After implementation of the diversity program, the number of applicants increased gradually and finally surpassed the national average. National data obtained from Association of American Medical Colleges [23]. (Note: National data from 2008 to 2013 are not available.)

indicated improved access to career advancement opportunities [11,12].

Diversity Program Growth

Personnel. Initially, the AVCD implemented the diversity improvement activities with assistance from the residency program director. Once the Department of Radiology Office of Diversity, Equity, and Inclusion was established, the AVCD recruited three faculty associate directors of diversity, equity, and inclusion, including two URMMs and one non-URMM woman. The division of labor is described in Table 4.

Resident Participation in Diversity Program. As URMM residents matriculated into our residency program, they have played key roles in recruitment efforts. In 2017, the office designated an official radiology resident liaison. This resident has taken responsibility for planning and coordinating the annual Second Look Weekend activities. He presented shared accomplishments in an annual medical center-wide strategic retreat, "Strategy Share" [<https://www.vumc.org/strategy/strategyshare>. Accessed January 10, 2019]. Inclusion of residents is a

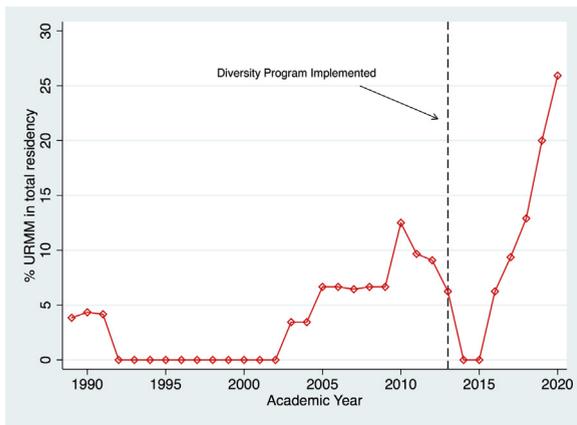


Fig 2. Underrepresented minorities in medicine (URMM) representation in our diagnostic radiology residency program over time. Academic year in Figure 2 is defined by the year of the graduating residency class (ie, data from academic year 2019 includes all current residents during the 2018 to 2019 academic year). The first documented URMM resident matriculated in 1987 and completed residency in 1991. Ten years passed before another URMM entered the program. A spike in URMMs occurred in 2009 to 2010 when a competitive URMM transferred from surgery to radiology, joining two URMMs who had already matched in the program. URMMs declined thereafter, until the impact of the diversity program in 2015. (Trainees who matched between 2013 and 2015 were selected before implementation of the diversity program.)

strategy for engaging and supporting URMM trainees, attracting new URMM trainees, and providing an opportunity to instill leadership skills while promoting diversity and inclusion.

We annually recruit a third-year radiology resident to assume this responsibility. This resident is groomed to become a leader in diversity and inclusion initiatives

during not only his or her time as a resident at this institution but throughout his or her future career. The selected resident serves for a term of 1 year and then during the fourth year of residency trains a third-year resident to take charge of the resident liaison’s duties.

DISCUSSION

In 2013, our Department of Radiology developed and launched a strategic Radiology GME Diversity Recruitment Plan to address the underrepresentation of URMMs in our diagnostic radiology residency applicant pool. Since implementation of this plan, we have seen a significant increase in our URMM representation. Our current resident URMM representation of 20% (6 of 30), for academic year 2018 to 2019, far exceeds the national average (9.9%) of URMMs in ACGME diagnostic radiology training programs. Furthermore, our 2017 to 2018 NRMP results reveal that 25.9% (7 of 27) of our diagnostic radiology residents will be URMMs in the 2019 to 2020 academic year.

Our departmental diversity efforts evolved into the development of a Department of Radiology Office of Diversity, Equity, and Inclusion that conducts diversity education and awareness initiatives through a comprehensive radiology diversity program. Careful search of the medical literature and conversations with colleagues revealed no similar radiology diversity programs in the United States.

The composition of the US population is rapidly changing. It is predicted that by the year 2050, the percentage of both Asians and Hispanics will triple and the African-American population will double [14]. With several studies reporting that minority patients tend to receive better interpersonal care from providers of

Table 4. Roles and responsibilities of Office of Diversity, Equity, and Inclusion personnel

Position	Roles and Responsibilities
Associate vice chair for diversity	Oversee all activities of Radiology Office for Diversity Equity and Inclusion. Maintain database. Maintain budget. Participate in and oversee resident recruitment activities. Assist the residency program director with developing a NRMP match list. Facilitate cultural proficiency and unconscious bias training. Organize the annual visiting diversity lectureship. Codirect the Women in Radiology career development program.
Associate director #1	Recruit and retain competitive URMM medical students. Codirect the Women in Radiology career development program.
Associate director #2 and Associate director #3	Recruit and retain competitive URMM medical students.
Resident liaison	Lead radiology Second Look Weekend activities.

NRMP = National Residency Matching Program; URMM = underrepresented minorities in medicine.

concordant race or ethnicity [15-17], radiology, as with other medical specialties, should be poised to serve this increasingly diverse population.

Furthermore, research shows that patient outcomes are improved when the workforce is more diverse and when the culture is welcoming to unrepresented minorities [18]. The Sullivan Commission on Diversity in the Healthcare Workforce (named for former US Secretary of Health and Human Services, Louis W. Sullivan, MD) issued a report, “Missing Persons: Minorities in the Health Professions,” which concluded that greater diversity in the health professions will likely lead to “improved public health (for the entire population as well as minorities) by increasing access, service quality, cultural competence, and responsiveness” [19]. Similarly, we know that a diverse student body creates a more robust learning environment for trainees [20], and diversity in medical education results in more thoughtful, open-minded, and humanistic physicians [20].

Immediate benefits of a diverse training program (and workforce) include enriched learning environment, improved problem-solving [21], enhanced innovation [21], and improved patient care. Anticipated long-term benefits include increased number of trained radiologists who can provide culturally proficient care to an increasingly diverse patient population and enhanced health care outcomes for the growing heterogeneous population that we serve.

One of the challenges of developing such a program is the time demand on participating faculty and trainees. Although the individuals in our department who were tasked with URMM recruitment were strongly invested in the mission and willing to contribute, to some extent, their contributions exacted a disproportionate burden of responsibility, or “minority tax” [22].

A successful diversity program of this kind requires vision, leadership, and a plan—with strategies to create and sustain positive change, financial resources, supporting infrastructure, and strategic partnerships. Our diversity program benefited from having a department chair who values and is committed to diversity and inclusion. The department chair concurrently co-developed the medical center’s “make diversity and inclusion intentional” strategic direction, one of four themes on the medical center’s directional compass. This alignment of strategic vision is useful for developing metrics for monitoring departmental and institutional progress on diversity and inclusion.

FUTURE EFFORTS

Future efforts will include strategically increasing the URMM applicant pool for the budding interventional radiology residency program and grooming URMM residents and fellows for future leadership and faculty positions. As US medical schools have begun to embrace a more inclusive definition of diversity, beyond race and gender, our institution has similarly expanded our definition of underrepresented minorities. Consistent with the mission of our institution, we will expand our definition of URMM to include other aspects of diversity, including: socioeconomic disadvantage, ability status, lesbian, gay, bisexual, transgender, and questioning individuals, and veterans of past military service.

CONCLUSION

An intentional, strategic diversity program can diversify an institution’s residency applicant pool and increase representation of URMMs in a diagnostic radiology residency program.

Our diversity program can serve as a helpful model for radiology departments without formal diversity programs. We encourage departments with existing diversity programs to join us in sharing diversity strategies and reporting outcomes.

TAKE-HOME POINTS

- A strategic diversity program can diversify the radiology residency applicant pool and radiology residency programs.
- Departmental leadership support is crucial for providing the required resources and infrastructure for a successful diversity program. Active engagement and participation of the department chair in recruitment activities sends a strong message of the department’s commitment to diversity.
- Care should be taken to avoid the burden of extra responsibilities placed on minority faculty during efforts to achieve diversity and inclusion.

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