

Henry Ford Health System

Henry Ford Health System Scholarly Commons

Diagnostic Radiology Articles

Diagnostic Radiology

8-7-2020

"What Program Directors Think" V: Results of the 2019 Spring Survey of the Association of Program Directors in Radiology (APDR)

Anna Rozenshtein

Brent D. Griffith

Priscilla J. Slanetz

Carolynn M. DeBenedectis

Jennifer E. Gould

See next page for additional authors

Follow this and additional works at: https://scholarlycommons.henryford.com/radiology_articles

Authors

Anna Rozenshtein, Brent D. Griffith, Priscilla J. Slanetz, Carolynn M. DeBenedectis, Jennifer E. Gould, Jennifer R. Kohr, Tan-Lucien Mohammed, Angelisa M. Paladin, Paul J. Rochon, Monica Sheth, Ernest F. Wiggins III, and Jonathan O. Swanson

“What Program Directors Think” V: Results of the 2019 Spring Survey of the Association of Program Directors in Radiology (APDR)

Anna Rozenshtein, MD, MPH, Brent D. Griffith, MD, Priscilla J. Slanetz, MD, MPH,
Carolynn M. DeBenedictis, MD, Jennifer E. Gould, MD, Jennifer R. Kohr, MD,
Tan-Lucien Mohammed, MD, MS, Angelisa M. Paladin, MD, Paul J. Rochon, MD, Monica Sheth, MD,
Ernest F. Wiggins III, MD, Jonathan O. Swanson, MD

Rationale and Objectives: The Association of Program Directors in Radiology (APDR) surveys its membership annually on hot topics and new developments in radiology residency training. Here we report the results of that annual survey.

Materials and Methods: A web-based survey was posed to the APDR membership in the Fall of 2018. Members were asked 43 questions on program staffing, resident education resources/funding, impact of the integrated-Interventional Radiology residency program on Diagnostic Radiology program resources, resident interest in imaging informatics, Accreditation Council for Graduate Medical Education requirements on resident practice habits data reporting, institutional reliance on residents for clinical coverage, teaching format in the post-oral board era, resident conference attendance, confidentiality of the Match rank list, Early Specialization in Interventional Radiology pathway recruitment and selection, Diagnostic Radiology and Interventional Radiology program relationships, independent resident call, pediatric radiology training, diversity and unconscious bias training, and social media in radiology education.

Results: Responses were collected electronically, results were tallied using *Qualtrics* software, and qualitative responses were tabulated or summarized as comments. There were 86 respondents with a response rate of 31.3%.

Conclusion: Survey result highlights include perceived resident interest in imaging informatics with the vast majority of residency programs offering an informatics curriculum; the provision of resident practice habits data by nearly all residency programs despite lack of clarity surrounding this Accreditation Council for Graduate Medical Education requirement; continued use of case-taking in the post-oral boards era; frequent disclosure of the Match rank list to departmental and hospital administration; low penetration of unconscious bias training in academic radiology; and finally, the successful integration of interventional and diagnostic radiology training programs.

Key Words: Resident education; Program Director; Residency; APDR; Survey.

© 2020 Published by Elsevier Inc. on behalf of The Association of University Radiologists.

Abbreviations: **ABR** American Board of Radiology, **ACGME** Accreditation Council for Graduate Medical Education, **ACR** American College of Radiology, **APD** Associate Program Director, **APDR** Association of Program Directors in Radiology, **DR** Diagnostic Radiology, **ERAS** Electronic Residency Application Service, **ESIR** Early Specialization in Interventional Radiology, **IR** Interventional Radiology, **NIIC** National Imaging Informatics Curriculum, **NRMP** National Resident Matching Program, **PC** Program Coordinator, **PD** Program Director, **RVU** Relative Value Units

Acad Radiol 2020; ■:1–8

From the Westchester Medical Center, 100 Woods Road, Valhalla, NY 10595 (A.R.); Henry Ford Hospital, Detroit, MI (B.D.G.); Boston University Medical Center, Boston, MA (P.J.S.); University of Massachusetts – UMass Memorial Health Care, Worcester, MA (C.M.D.); Washington University in St. Louis School of Medicine, St. Louis, MO (J.E.G.); Virginia Mason Medical Center, Seattle, WA (J.R.K.); University of Florida College of Medicine, Gainesville, FL (T.-L.M.); University of Washington Medical Center, Seattle, WA (A.M.P.); University of Colorado School of Medicine, Aurora, CO (P.J.R.); NYU Grossman School of Medicine – Langone Medical Center, New York, NY (M.S.); Robert Wood Johnson/Barnabas Health System, West Orange, NJ (E.F.W.); University of Wisconsin School of Medicine and Public Health, Madison, WI. Received May 22, 2020; revised June 30, 2020; accepted June 30, 2020. **Address correspondence to:** A.R. e-mail: anna.rozenshtein@wmchealth.org

© 2020 Published by Elsevier Inc. on behalf of The Association of University Radiologists.
<https://doi.org/10.1016/j.acra.2020.06.035>

INTRODUCTION

Since 2000, the APDR has conducted an annual survey of its membership on a broad range of topics related to radiology residency. The primary goal of this survey is to provide reliable, current data that can be used by program directors (PD) and other stakeholders to benchmark themselves and their programs against national averages, recognize evolving trends in radiology residency education, exchange ideas and practices with other training institutions and provide feedback to the American Board of Radiology (ABR) and the ACGME. As PDs and associate PDs (APD) constitute the majority of the APDR, the survey provides first-hand insight into the opinions of residency program leadership across the country.

In addition to continuing to track administrative issues such as program director support and resident call responsibilities, this year's survey centered on four additional areas of interest to APDR members (1) Educational curriculum, particularly the balance of service and education and the growing field of imaging informatics/artificial intelligence; (2) Teaching methods, particularly the changes in training after the end of the oral board examination and the use of social media; (3) Recruitment, especially the confidentiality of the Match Rank list and conscious bias training; and finally, (4) ACGME requirements, namely the new mandate to provide "practice habits data" to residents. In addition, with the Interventional Radiology residency still in the early stages, the survey also included questions regarding its potential impact on DR programs, including issues related to the ESIR pathway.

MATERIALS AND METHODS

This is an observational cross-sectional study using a web-based survey conducted in the winter of 2019 (January 3–February 7, 2019). Survey questions were created and

edited by members of the 2018–2019 APDR Annual Survey Committee and APDR leadership. The final survey was comprised of 43 questions determined by the Committee members and chair and approved by the then current APDR president.

Survey methodology was described in detail previously (1). Briefly, all active members of the APDR were invited to participate. Participants were allowed to skip questions at will. Deidentified responses were collected electronically, tallied utilizing *Qualtrics* software, and aggregated for the purposes of analysis and reporting at the 67th annual meeting of the Association of University Radiologists (April 9–12, 2019, Baltimore, MD). The report was archived on the "members only" portion of the APDR Website.

Demographic data of the respondents' program size, location and university affiliation in 2017 and 2019 were compared to the United States data. To do so, we recorded size, location, and university affiliation for all US radiology programs on the Electronic Residency Application Service (ERAS) active list who had at least one resident in 2018 was recorded. Location by state was present on the ERAS list, while size and university affiliation was taken from the individual residency websites. Chi-Square test was used to compare the 2019 and 2017 samples to the national averages.

All survey questions are reported in this manuscript with the exception of free text response questions (Q38, 43), which were shared at the national meeting.

RESULTS

Demographics (Q1-3; 40-42)

The response rate was 31.3%. The demographic data pertaining to the survey respondents are summarized in [Table 1](#). The mean and median program sizes in the United States are summarized in [Table 2](#). There was significant difference

TABLE 1. Demographic Data (Q1, 40, 41). The Distribution of Respondents to the 2019 APDR Survey by Program Size, Location and University Affiliation Compared to Respondents to the 2017 APDR Survey and to the Distribution of Programs in the United States.

Total Respondents	% Respondents 2017	% Respondents 2019	% Total US
Type of program			
University	65%	61%	65%
University affiliated	21%	29%	25%
Community	13%	10%	9%
Military	1%	0%	1%
Program size (Figure 1)			
12 or fewer residents	11%	5%	15%
13-28 residents	39%	46%	53%
29-40 residents	32%	33%	22%
>40 residents	18%	16%	10%
Program location			
Northeast	32%	39%	32%
Southeast	23%	17%	26%
Central/Midwest	29%	29%	30%
Western	16%	15%	11%

TABLE 2. Mean and Median Number of Residents in United States Radiology Programs by Geographic Location

	Mean Number of Residents	Median Number of Residents
North East (N = 61)	23	20
Central/Midwest (N = 52)	25	22
South East (N = 50)	26	24
West (N = 53)	26	24

between the predicted and actual response rates for the small/medium size programs and large/very large programs ($p = 0.00000011$), with the larger programs being more frequently represented than the smaller programs. There was no difference between the predicted and actual response rates for Northeast and Central/Midwest programs ($p = 0.21$). However, there was significant difference between the predicted and actual response rates for South East and West programs ($p = 0.007$), with programs located in the West being more frequently represented than the national average, and programs located in the Southeast less frequently represented. There was no significant difference between the predicted and actual response rates for the University versus non-university programs, university versus affiliated programs, university vs community/military programs and affiliated vs. community/military programs (p -values ranging from 0.2 to 0.4)

Program Resources and Departmental Support of Resident Education (Q4-6; 20-21)

The majority of respondents (56%) reported the allocation of protected time to faculty other than the PD and APD. Nearly half (49%) of respondents have a vice-chair for education in their department, while the remainder (51%) do not.

Responsibility for institutional faculty development was equally divided between the Department Chair (21%), Residency PD or APD (24%), and the training institution (21%). The vice-chair for education was identified as being responsible for faculty development by only 13%, although only half of the respondents had such a position in their department. Only 3% of respondents reported either no responsible individual or no resources for faculty development.

A minority of respondents (8% and 12%) reported that departmental support for faculty teaching effort came in the form of a financial bonus or protected time, respectively. An additional 7% reported an educational Relative Value Units or other tracking system for contributions. Thirty-seven percent reported a system of teaching awards, 18% received moral support only, and 6% reported no formal support or encouragement whatsoever. The most common barriers to faculty teaching cited by respondents (allowed to select all that applied) were an increase in clinical volumes (33%), Relative Value Units-based compensation plan (14%), lack of faculty development (14%), no impact of teaching effort on faculty promotion (14%), and absence of recognition (12%).

Interventional Radiology (Q7; 24-26)

Impact on Current DR PDs and Programs

Fifty-four percent of respondents reported that the creation of an integrated IR residency at their institution resulted in a decreased complement of DR residency positions and/or moved them into a lower ACGME category of protected administrative time for PD and program coordinator (PC). At the same time, 87% of respondents reported that despite the decreased resident complement, their institution continued to support the existing higher FTE level for the PD and PC. A small minority (5%) of respondents reported asking for a resident complement increase in order to support existing full-time equivalent (FTE). Additionally, 7% actually reported asking for a complement decrease.

Eighty-seven percent of respondents reported that the interplay between the IR and DR residencies turned out as expected or better, while 13% felt it was worse than expected. Fifty-nine percent of respondents described their relationship with the IR PD in their department as excellent, 12% as workable, and 5% as strained. Twenty-four percent of respondents did not have an integrated or independent IR residency program in their departments.

Respondents who had an IR resident(s) in their R4 class or would have such residents next year planned to have them take the same amount of DR call as DR residents (33%), some DR call but less than DR residents (32%), and no DR call (15%).

Of the 80% of respondents with knowledge of medical student interest group status at their programs, the majority (52%) had both, but separate, DR and IR interest groups that shared either some or all of the same meetings and activities with only a small percentage (9%) reporting entirely separate interest groups. A minority of those respondents (39%) had only one interest group at their institution, and in those cases, the vast majority (88%) were DR interest groups.

ESIR

Eighty-eight percent of respondents reported having at least one ESIR position approved – 29% for one position, 48% for two positions, and 11% for 3 or 4 positions. Thirty-two percent of respondents reported that the DR PD chaired the ESIR selection committee, while 49% reported that this function fell to the IR PD. The most common participants on the ESIR selection committee included the DR PD (27%), IR PD (20%), DR APD (20%), and IR APD (16%). The most common criteria used to select the ESIR candidates were USMLE scores (19%), letters of recommendation (19%), performance during the interview (18%), and performance on visiting rotation (14%).

For the year 2019–2020, 21% of respondents reported one and 25% two of their fourth year residents accepted to do the ESIR pathway at their institution. Fifty-four percent reported having adequate positions to accept all residents who applied to do the ESIR pathway, 14% turned away one of their residents due to inadequate positions, and 30% did not have any

of their residents applying to the ESIR pathway. Only 11% of respondents reported turning away residents from the ESIR pathway for reasons other than lack of adequate positions with reasons including performance issues (3%), poor fit for IR (1%), need for staffing of DR rotations (1%), and other (6%).

The most common advice given to residents who planned to do ESIR but failed to match into an independent IR residency was a recommendation to complete the ESIR year because (1) they would be well prepared to do procedures in clinical practice even without having completed an independent IR residency (28%) and (2) because if they really wanted to practice IR, they should try to match again next year (20%). Twenty-three percent did not give advice, 8% recommended that the resident bow out of ESIR because their fourth year would be best spent acquiring other skills, and 3% required that the resident complete the ESIR pathway even if they did not wish to do so because they committed to it and next year's schedule had already been set.

Resident Recruitment (Q23c,d; 36-37)

Radiology Residency Match

Forty-nine percent of respondents reported that the final rank list is known only to the program administration (PD/APD) and the selection committee, while 27% disclosed the rank list to the department administration and 24% to the institution. Thirty-seven percent felt pressure to match applicants from the top of the rank list in order to improve the perceived "success" in the match.

Unconscious Bias Training

Twenty-three percent of respondents had all faculty in their department receiving unconscious bias training, 21% reported such training reserved for faculty participating in resident recruitment, and 44% reported no training whatsoever. As to the residents, 32% of respondents reported all residents and 11% chief residents only receive unconscious bias training, while 6% reported training only residents participating in resident recruitment. Forty-nine percent reported no resident training in unconscious bias.

Resident Education (Q8-12; 13-19; 22; 23a,b; 27-28; 29-30; 31-35; 39)

Clinical Demands and Call Responsibilities

Twenty-six percent of respondents reported that residents are not essential on most clinical rotations because the faculty could manage most or all clinical demands. Thirty-nine percent reported that residents were needed in some rotations, and 35% felt that residents were needed on all or most rotations.

Sixty-four percent of respondents reported that residents took independent call at their institutions, although 89% felt that residents benefitted from independent call.

Pediatric Imaging Education

As to pediatric radiology training, 57% reported having a free-standing children's hospital and 20% reported sending their residents to an away rotation at a free-standing children's hospital. In terms of length of pediatric radiology training, 82% of respondents offered 3–4 months during residency, 10% offered 2 months, and 4% each offered either 1 month or >4 months of pediatric radiology training. Twenty-two percent reported their residents taking dedicated pediatric radiology call, 21% on an away rotation only, and the remaining 57% did not report dedicated pediatric radiology call assignments. Thirty-one percent of respondents reported that residents took more than 4 weeks of pediatric radiology call during their 4 years of residency. Of the remainder, 11% reported 4 weeks of call, 26% 3 weeks, 23% 2 weeks, and 9% 1 week.

Imaging Informatics and Artificial Intelligence

Seventy-two percent of respondents reported that their residents are either very interested or somewhat interested in the imaging informatics curriculum, and 54% reported that this interest increased compared to the prior years, while 42% found no change. At the same time, 31% reported that the national conversation on Artificial Intelligence/Machine Learning had a positive impact on trainees, generating excitement at the promise of new opportunities, 42% saw no effect, and 27% felt that the trainees were impacted negatively. Regarding the delivery of the informatics curriculum in residency training, 34% reported using the National Imaging Informatics Curriculum and Course sponsored by the Radiological Society of North America (RSNA) and the Society for Imaging Informatics in Medicine, 23% offered on-site didactic lectures, 11% offered resident electives, and 21% offered no curriculum whatsoever. The responsibility for oversight of the imaging informatics curriculum was most commonly with the PD (29%) followed by the director of imaging informatics (15%) or another faculty member (12%). Eight percent responded that while the program does have a departmental curriculum or elective, there was no specific individual overseeing the curriculum. Finally, 33% of respondents reported that there is no departmental imaging informatics curriculum.

ACGME Requirements

Seventy-three of respondents felt that the requirement of providing practice habits data to residents was either somewhat unclear or not at all clear. Likewise, 80% thought that their residents found it either somewhat unclear or not at all clear. Ninety-eight percent of respondents provided some practice habits data to their residents, including report quality (eg, missed ER cases) in 27%, volume of studies read by them in 38%, and the volume of studies read by their peers in 22%. A small minority (6% and 4%) provided turnaround time for the residents and their peer average turnaround times, respectively. Forty-seven percent of respondents reported providing

practice habits data semiannually, the rest once or several times per year. The responsibility of delivering this practice habits data most frequently (59%) fell to the PD. Nineteen percent of respondents reported having online/electronic reports available for practice habits data either continuously or by request. Seventy-seven percent of respondents were definitely and 18% potentially interested in a session or report on the subject of practice habits data provision.

In terms of primary responsibility for meeting the recent ACGME requirements for new curriculum/programming (eg, patient-centered care, well-being, quality improvement/safety, etc.), the PD/APD were overwhelmingly responsible (76%).

Teaching Format in the Post-Oral Board Examination Era

Eighty-eight percent of respondents reported using the "hot seat" format (case taking) in conferences, although 73% felt that it happened less frequently than during the oral board examination era, and 12% reported not using this format at all. The two most common educational formats reported by APDR members were in-house lectures (46%) and "hot seat" case conferences (23%).

Thirty-nine percent of respondents targeted specific learners in their didactic curriculum, while 61% did not. Of the respondents who reported having such curriculum, 50% targeted first year residents vs advanced residents, 38% separated their learners into junior (1st and 2nd year) vs senior (3rd and 4th year) residents, and 6% focused separately on residents preparing for the ABR core versus certifying examination.

Conference Attendance

Regarding conference attendance, 66% of respondents estimated conference attendance between 80% and 100%, while 34% estimated attendance between 50% and 80%. All respondents tracked conference attendance. The two most frequently cited reasons for missing conference were clinical responsibilities (34%) and seeking self-directed learning (21%). The two most frequently cited consequences for missing conference were Focus of Concern for unprofessional behavior (45%) and loss of moonlighting privileges (23%). The large majority (85%) of respondents required their fourth year residents to attend conferences. As to alternative educational opportunities on site for fourth year residents, 28% of respondents cited multidisciplinary conferences (eg, tumor boards), 25% reported self-directed learning, 22% reported fellow level conferences, and 22% allowed them to attend any conference they found helpful.

Social Media in Radiology Education

Twenty percent of respondents incorporated social media into resident education, most commonly using Twitter (40%), Facebook (30%), and Instagram (17%). Of the 17 (20%) social media users, 6 incorporated it into a "flipped classroom," 9 used it for case review or discussion, 1 for consultation on difficult cases, and 1 for quality assurance (missed cases).

DISCUSSION

Educational Curriculum

Service Versus Education

Our study suggests that the majority of training institutions rely on radiology trainees for clinical services only partially or not at all. This suggests that the ACGME Program Director Guide to the Common Program Requirements (2) statement that "The learning objectives of the program must not be compromised by excessive reliance on residents to fulfill service obligations" is being heeded in the majority of radiology programs. As the clinical workloads increase, the burden is increasingly shouldered by attending radiologists rather than trainees. While this reduces trainee stress and improves continuity of educational experiences to the extent that it decreases "pulling" residents from teaching rotations in order to fill service gaps, it is uncertain how the decreased reliance affects the educational objectives.

Resident obligations to the institution, senior physicians, and patients have been studied extensively in the surgical literature (3–7). In their 2009 work on balancing service and education in radiology residency Huang et al. (8) note that "Although a heavy burden of service may compromise education, a certain element of service may be beneficial, and emphasis should be placed on finding an appropriate balance of the two. . . Education and service are intimately intertwined, and measures must be taken to ensure that a proper balance is maintained."

The wide range of service obligations reported in our survey, with only one-third of respondents needing residents on all clinical rotations, attests to the nonuniformity of training settings in radiology residency programs across the United States. More research is needed to determine the desired balance of service responsibilities and education in radiology.

Pediatric Radiology Training

Our survey suggests that the vast majority of residents spend 3–4 months on pediatric radiology rotations at free-standing children hospitals, either on site or during an away rotation.

Social Media, Imaging Informatics and Artificial Intelligence

The vast majority of respondents did not use social media in their residents' education. One-third of respondents reported that the national conversation on Artificial Intelligence/Machine Learning had a positive impact on trainees, generating excitement and promise of new opportunities, and that three-quarters of trainees were interested in the imaging informatics curriculum. In addition, over half reported an increase in such interest compared to prior years. This is good news for radiology, particularly from the recruitment standpoint, suggesting that despite the projections by some that advances in artificial intelligence will lead to significant disruptions in the radiology workforce (9), the majority of radiology trainees remain confident and excited about the future of their chosen profession. As to the resident training in imaging informatics, the majority (79%) of respondents offered

such a curriculum, either using the National Imaging Informatics Curriculum and Course course, on-site didactic lectures, or in the form of away electives.

ACGME Requirements

Our survey demonstrates substantial responder compliance with the requirement to provide practice habits data to their trainees, with nearly all (98%) PDs providing some data, compared to 70% in the 2016–17 ACGME resident survey (10). While comparison with the latter is complicated by the different target groups (program directors in our case as opposed to trainees in the ACGME survey), our results suggest overwhelming compliance with this ACGME requirement. At the same time, three-quarters of survey respondents felt that the ACGME requirement of providing data on practice habits to residents was unclear, and four-fifths believed their residents were similarly in the dark. It is, therefore, not surprising that no single practice habits data emerged as the dominant or “go-to” metric. The data most commonly provided to residents were the study volumes (38% sharing personal and 22% peer study volumes) and report quality (27% shared missed ED cases). We speculate that in the absence of clear ACGME guidelines, radiology PDs most commonly choose to share the most accessible data informing residents’ performance, such as their clinical productivity either with or without comparison to the class mean, as well as the quality of their interpretations. Predictably, three-quarters of respondents expressed interest in a “best practices” session on the subject.

As to the new curricular programming required by the ACGME, such as patient-centered care, well-being, quality improvement and patient safety, three quarters of our respondents reported that this task fell to them as program directors. It is unclear whether radiology PDs by and large have the necessary skills to provide effective education on these important topics or whether departments and institutions are better equipped to take the lead.

Teaching Format and Conference Attendance in the Postoral Board Examination Era

The two most common teaching formats in the post-oral board examination era reported by program directors remain in-house didactic lectures and case conferences. However, while the large majority (88%) of respondents reported using the case-taking format in conferences, three-quarters felt that it was happening less frequently. A large minority (39%) of respondents delivered targeted curricula, half separating their first-year residents from advanced residents, and two-fifths providing separate curricula to junior (PGY II and III) and senior (PGY IV and V) residents. A small minority (6%) focused on residents preparing for their ABR core versus certifying examinations.

All respondents tracked conference attendance, attesting to widespread compliance with this program requirement. This may explain the high ($\geq 80\%$) attendance in 66% and moderate ($\geq 50\%$) in 34% of responding programs. The most common

cause of missed conference was clinical responsibilities, but one-fifth of respondents pointed to self-directed learning.

While formal lectures are the mainstay of traditional medical school and postgraduate medical education, there is a debate as to the advisability of compulsory classroom attendance in medical school (11–13). Research shows that in addition to availability of pre-recorded lectures, experience with the lecturer, lecture quality, lecturer’s effectiveness (delivery, preparedness, organization, and knowledge), pacing, and control over time are important factors influencing conference attendance (14–16). It is not surprising that some learners carry the preference for self-directed learning into residency training, and there is no evidence that it is harmful to their education. Mandatory conference attendance can be precisely measured and accurately reported while ensuring protected time away from clinical activities. However, since it may not be equally useful to all learners, protected time for self-directed learning with quizzes demonstrating knowledge acquisition may be a viable alternative in the age of informatics and online learning tools. Insofar as self-directed learning is recognized by all specialty boards (including the ABR), the ACGME, and numerous other national medical organizations as part of the life-long learning process, it may be necessary to rethink the rigid requirement of conference attendance.

Recruitment

Residency Match Rank List Confidentiality

Our survey shows that at least half of respondents disclose their rank lists to the department, hospital administration, or both, and one-third feel pressure to match applicants from the top of their rank list in order to appear successful in the match. Our findings explain why training programs frequently request specific commitment and applicants tend to overstate their interest in programs in direct contravention of the National Resident Matching Program policies (17,18). As Anderson et al. concluded in their 2000 paper on general surgery PDs’ perceptions of the match, “As long as the stakes are high and there are no repercussions for unethical behaviors and practices during residency recruitment, gamesmanship will continue to be the accepted culture” (18). Since the match is designed to be a no-strategy environment where every stakeholder would get the best outcome if they ranked their preferences honestly (19), these violations of National Resident Matching Program rules can only be explained by external factors not previously acknowledged. Our survey suggests that the lack of confidentiality of the rank list may be one of them. Given the proposals to ban or at least regulate all post-interview communications between all stakeholders (20, 21), it is attractive to imagine a world where the program director is shielded from rank list manipulation by the sacred confidentiality of the list.

Unconscious Bias Training

Despite a large body of evidence showing that unconscious bias affects all aspects of medical practice and training (22),

our survey shows relatively low penetration of unconscious bias training. Specifically, while a minority of respondents reported providing such training for all faculty (23%), all residents (32%), and faculty members participating in resident recruitment (21%), half reported providing no unconscious bias training at all. Insofar as unconscious bias is a barrier to diversity, our results show that recent discourse in the radiology literature (23–25) on issues of under-representation, creation of the American College of Radiology (ACR) Office of Diversity, Equity and Inclusion at the national level (26) and a legion of suggestions on how to increase representation of women and minorities (27, 28) are reaching a minority of radiology departments.

A recent survey of department chairs by Francavilla et al. (29) showed that having a diversity program was not seen as being useful in filling positions in the match. Indeed, because pipelines and recruitment of women and minorities are set at the medical school level, many radiology residency programs may not be willing to invest already limited resources into such activities. However, this viewpoint is shortsighted, because recruitment is not the only goal in combatting unconscious bias. As Dyrbe et al. demonstrated, perceived discrimination leads to burnout and poor performance during training [30]. Nevertheless, our findings suggest that despite the robustness of ongoing debates in academic radiology circles regarding diversity and inclusion, the impact remains negligible in the absence of concrete actions at the departmental level to combat unconscious bias. It is unlikely that this state of affairs is unique to radiology. The recent decision by the ACGME to add three Common Program Requirements directly impacting diversity and inclusion [31] may be the push needed for unconscious bias training to become widespread in the graduate medical education community.

IR

Potential Impact of the Integrated IR Residency on Diagnostic Radiology Programs

Despite the multitude of concerns with the jurisdictional and programmatic changes stemming from the implementation of a new IR residency (32) our survey shows that the relationship between the IR and DR PDs was excellent or workable and that the interplay between the two residencies worked out as or better than expected. While half of DR PDs reported that creation of an integrated IR residency at their institution decreased the number of DR training positions, in the vast majority of cases this did not affect institutional support for DR programs. This suggests that departments have been successful in achieving integration of DR and IR programs in most radiology departments which decided to offer IR residency.

ESIR

The vast majority of respondents had at least one ESIR position in their department. Eighty-five percent of programs

either had enough ESIR positions to accept all residents who applied to the pathway (54%) or had no residents apply to the pathway (30%) with only 14% having to turn away one resident due to inadequate positions. This suggests that programs have an adequate number of ESIR positions and should assuage any concern DR residents might have regarding the opportunity to pursue this pathway followed by a 1-year independent IR position. As to the situation where an ESIR-bound resident does not match to an independent IR residency, the majority of PDs encourage them to still pursue their primary career interest—continue with the ESIR training and either reapply in the match the following year or gain the additional skills to be used in clinical practice.

This study has several limitations. While the response rate of 31% is within range for mail surveys (33), we are seeing over-representation of large and very large programs as well as programs located in the West, with underrepresentation of small and very medium-size programs and programs located in the South East. Because many associate/assistant PDs are APDR members, over-representation of the larger programs may be due to double-counting of responses from the same. Since the size of the program determines the number of administration officers, it stands to reason that larger programs would have more associate/assistant PDs than smaller programs and that the program may be able to allocate resources for the APDR membership. At the same time, we do not have a plausible explanation for geographic difference in response rate. There is no difference in the mean and mean program sizes between West and South East regions (Table 2). Therefore, the geographic differences are unlikely to be due to double-counting. Going forward, more granular survey data is needed to understand the response rate by geographic location and program size.

CONCLUSION

1. Majority of teaching radiology departments rely on radiology trainees partially or not at all. While this may improve resident well-being and continuity of educational experiences, it is unclear how the decreased reliance on residents impacts the educational objectives.
2. The vast majority of radiology residents learn pediatric radiology in free-standing pediatric hospitals either on site or on away rotations.
3. The vast majority of radiology programs offer an imaging informatics curriculum to residents, many of whom demonstrated more interest in it compared to the prior years.
4. The vast majority of radiology training programs provide practice habits data to their residents, largely on productivity and interpretation quality.
5. Case-taking is still widely practiced in the post-oral boards era, but is used less frequently. A large minority of PDs offer targeted educational curricula aimed at different levels of training.
6. While the most common cause of missing a didactic conference is still clinical duties, self-directed learning is

gaining ground. Since it is an integral part of the life-long learning process, it may be necessary to rethink the rigid requirement of conference attendance in some cases.

7. Disclosure of the Match rank list to departmental and hospital administration as pressure to “match from the top” is widespread in radiology residencies. The lack of confidentiality of the rank list may be one of the factors leading to gamesmanship in the Match.
8. Despite the robust debate on diversity and inclusion, there is low penetration of unconscious bias training in academic radiology.
9. New IR programs are being successfully integrated with the existing DR programs. There are plentiful ESIR positions to accommodate most interested trainees.

ACKNOWLEDGMENTS

The APDR Annual Survey Committee would like to thank Stephanie Taylor, Account Executive, and Amanda Decker, Deputy Account Executive of the APDR for their invaluable help and support in the distribution of the survey and data collection for preparation of this manuscript.

REFERENCES

1. Deloney LA, Rozenshtein A, Deitte LA, et al. What program directors think: results of the 2011 annual survey of the Association of Program Directors in Radiology. *Acad Radiol* 2012; 19:1583–1888.
2. Accreditation Council for Graduate Medical Education program director guide to the common program requirements. Available at: <https://www.acgme.org/Portals/0/PFAssets/ProgramResources/PDGuideResidency.pdf> Last accessed May 12, 2020
3. Reines HD, Robinson L, Nitzchke S, et al. Defining service and education: the first step to developing the correct balance. *Surgery* 2007; 142:303–310.
4. Wood VC, Markert RJ, McGlynn TJ. Internal medicine residents' perceptions of the balance between service and education in their night-call activities. *Acad Med* 1993; 68:640–642.
5. Boex JR, Leahy PJ. Understanding residents' work moving beyond counting hours to assessing educational value. *Acad Med* 2003; 78:939–944.
6. Podnos YD, Williams RA, Jimenez JC, et al. Reducing the non-educational and nonclinical workload of the surgical resident: defining the role of the health technician. *CurrSurg* 2003; 60:529–532.
7. Brasel KJ, Pierre AL, Weigelt JA. Resident work hours: what they are really doing. *Arch Surg* 2004; 139:490–494.
8. Huang BK, Lubner M, Resnik CS. Balancing clinical service and education in the radiology residency. *AcadRadiol* 2009; 16:1161–1165.
9. Mazurowski MA. Artificial intelligence may cause a significant disruption to the radiology workforce. *JACR* 2019; 16(8):1077–1082.
10. Powers EM, Kashyap N, Weiss P. Data-driven practice habits for pediatric trainees: getting a return on our data entry investment. *Acad Pediatr* 2018; 18(5):e18–e19.
11. Collins J. Education techniques for lifelong learning. *lifelong learning in the 21st century and beyond*. *RadioGraphics* 2009; 29:613–622.
12. Cantillon P. Teaching large groups. *Br Med J* 2003; 326:437.
13. Kulkarni R, Ashwini CA, Reddy B. Student perception on lectures in medical education. *Anat Karnataka*. 2011; 5:1–9.
14. Zazulia AR, Goldhoff P. Faculty and medical student attitudes about pre-clinical classroom attendance. *Teach Learn Med* 2014; 26:327–334.
15. Billings-Gagliardi S, Mazor KM. Student decisions about lecture attendance: do electronic course materials matter? *Acad Med* 2007; 82:S73–S76.
16. Gupta A, Saks NS. Exploring medical student decisions regarding attending live lectures and using recorded lectures. *Med Teach* 2013; 35:767–771.
17. Carek PJ, Anderson KD, Blue AV, Mavis BE. Recruitment behavior and program directors: how ethical are their perspectives about the Match process? *Fam Med* 2000; 32:258–260.
18. Anderson KD, Jacobs DM. General surgery program directors' perceptions of the match. *Curr Surg* 2000; 57:460–465.
19. Roth AE. The origins, history, and design of the resident match. *JAMA* 2003; 289:909–912.
20. Grimm LJ, Avery CS, Maxfield CM. Residency postinterview communications: more harm than good? *JGME* 2016; 8:7–9.
21. Berriochoa C, Reddy CA, Dorsey S, et al. the residency match: interview experiences, postinterview communication, and associated distress. *JGME* 2018; 10:403–408.
22. Marcelin JR, Siraj DS, Victor R, et al. The impact of unconscious bias in healthcare: how to recognize and mitigate it. *J Infect Dis* 2019; 220:S62–S73.
23. Spalluto LB, Arleo EK, Lewis MC, et al. Addressing needs of women radiologists: opportunities for practice leaders to facilitate change. *RadioGraphics* 2018; 38:1626–1637.
24. Higgins MC, Hwang WT, Richard C, et al. Underrepresentation of women and minorities in the United States IR academic physician workforce. *J VascIntervRadiol* 2016; 27:1837–1844.
25. Lightfoote JB, Fielding JR, Deville C, et al. Improving diversity, inclusion, and representation in radiology and radiation oncology part 1: why these matter. *J Am CollRadiol* 2014; 11:673–680.
26. In: Diversity Matters: Radiology leaders in Nashville bring diversity and inclusion to the forefront with initiatives to recruit, retain and advance top talent; 2020. https://www.acr.org/-/media/ACR/Files/Case-Studies/Strategic-Planning/Imaging3_Diversity_Matters_August2018_update.pdf Last accessed May 12.
27. Campbell JC, Yoon SC, Cater SW, et al. Factors influencing the gender breakdown of academic radiology residency programs. *J Am CollRadiol* 2017; 14:958–962.
28. Retrouvey M, Keefe B, Kotsenas A, et al. Women in radiology: creating a global mentorship network through social media. *JACR* 2018; 15:229–232.
29. Francavilla ML, Arleo EK, Bluth EI, et al. Surveying Academic Radiology Department Chairs regarding new and effective strategies for medical student education. *AJR* 2016; 207:1171–1175.
30. Dyrbe LN, Thomas MR, Eacker A, Harper W, et al. Race, ethnicity, and medical student well-being in the United States. *Arch Intern Med* 2007; 167:2103–2109.
31. Accreditation Council for Graduate Medical Education. Summary of Changes to ACGME Common Program Requirements Section VI. <https://www.acgme.org/What-We-Do/Accreditation/Common-Program-Requirements/Summary-of-Proposed-Changes-to-ACGME-Common-Program-Requirements-Section-VI>. Last accessed May 12, 2020
32. Heitkamp DE, Gunderman RB. The interventional radiology/diagnostic radiology certificate: asking the hard questions. *Radiology* 2014; 27:322–325.
33. Baruch Y, Brooks H. Survey response rate levels and trends in organizational research. *Hum Relat* 2008; 61:1139–1160.

SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.acra.2020.06.035.