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Brief Opinion

Variations in Resources Among Radiation Oncology Residency Programs in the United States

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Abstract

The purpose of this research was to assess the existing variations in the residency training resources among radiation oncology (RO) residency programs in the United States. We queried each residency program website and Fellowship Residency Electronic Interactive Data Access System website (www.freida.ama-assn.org) to obtain information on faculty and available treatment modalities. The data were continuously updated, most recently as of April 30, 2019. A total of 94 RO residency programs were identified during the academic year 2018-2019, and data were collected. The median number of attending physicians was 13 (range, 4 -71). The median number of physicists and biologists were 9 and 3, respectively. The conventional techniques, including 3 dimensional conformal radation therapy, intensity modulated radiation therapy, electron therapy, and stereotactic body radiation therap/stereotactic radiosurgery, were available in all residency programs. In terms of specialized external beam radiation therapy machines, gamma knife, CyberKnife, and magnetic resonance imaging (MRI) linear accelerator were available in 49 (52%), 21(22%), and 7 (8%) programs, respectively. Only 19 programs (20%) had in-house proton therapy availability; however, 37 programs (39%) offered proton therapy training via resident rotation at an affiliated institution. Prostate, gynecologic, and breast brachytherapy were available in 81 (86%), 82 (87%), and 58 (62%) programs, respectively. Eighty-one (86%) programs reported to have high dose rate, and only 20 (21%) programs had low dose rate brachytherapy. Our study found that marked variations exist among RO residency programs in the United States during academic year 2018-2019 and will serve as a baseline for future intervention.

Introduction

The Accreditation Council for Graduate Medical Education (ACGME) has designed the standards for residency programs across the country. Standardized basic training is tremendously significant to ensure a similar quality of resident education and patient care across the nation. Despite these efforts by ACGME, residency training is hugely heterogeneous among programs. From a technical standpoint, resident training varies based on faculty number, treatment modality, and brachytherapy training availability. At this time, no formal data exist on resource availability among programs. Therefore, we have quantified and assessed for variations the residency training resources for radiation oncology (RO) residents in the United States.

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Methods and Materials

A database of 2018 to 2019 accredited RO programs was created using publicly available information from the ACGME website (www.acgme.org) and Fellowship Residency Electronic Interactive Data Access System website (www.freida.ama-assn.org). We then queried each residency program website to obtain information on faculty (clinical, physics, radiation biology) and available treatment modalities. Specialized external beam radiation therapy (EBRT) modalities were additionally subcategorized (ie, proton therapy, magnetic resonance imaging linear accelerator. Brachytherapy availability was categorized by disease site and dose rate (high dose rates vs low dose rates). The data were continuously updated, most recently as of April 30, 2019.

Results

A total of 94 RO residency programs were identified during the academic year 2018 to 2019, and data were collected. The RO residency programs' resources were categorized into 2 groups: availability of faculty and treatment machines or modalities.

Faculty

The number of attending physicians was available in 92 (98%) programs. The median number of attending physicians was 13 (range: 4–71). Overall, the attending to resident ratio was 1.74:1 (ranging from 0.6:1-3.8:1; Fig 1). The number of physicists was accessible in 70 (74%) programs, and the median number of physicists was 9. Biologists' information was obtainable only in 66 (70%) programs, and the median number of biologists was 3.

Radiation therapy modalities

Conventional techniques, including 3 dimensional conformal radation therapy, intensity modulated radiation therapy, electron therapy, and stereotactic body radiation therapy, stereotactic radiosurgery, were available in all residency programs. In terms of specialized EBRT machines, gamma knife, CyberKnife, and magnetic resonance imaging linear accelerator were available in 49 (52%), 21(22%), and 7 (8%) programs, respectively. Only 19 programs (20%) had in-house proton therapy availability; however, 37 programs (39%) offered proton therapy training via resident rotation at an affiliated institution (Fig 2). Brachytherapy training availability varied across the institutions as well (Fig 3). Prostate brachytherapy was available in 81 (86%) programs. Gynecologic brachytherapy was available in 82 (87%) programs, and breast brachytherapy was available in 58 (62%) programs. Eighty-one (86%) programs reported to have high dose rates, and only 20 (21%) programs had low dose rate brachytherapy.

Discussion

Our research found variations among the RO residency programs regarding the number of faculty, treatment machines, and modalities. These variations might result in differences in resident education, training, and ultimately,

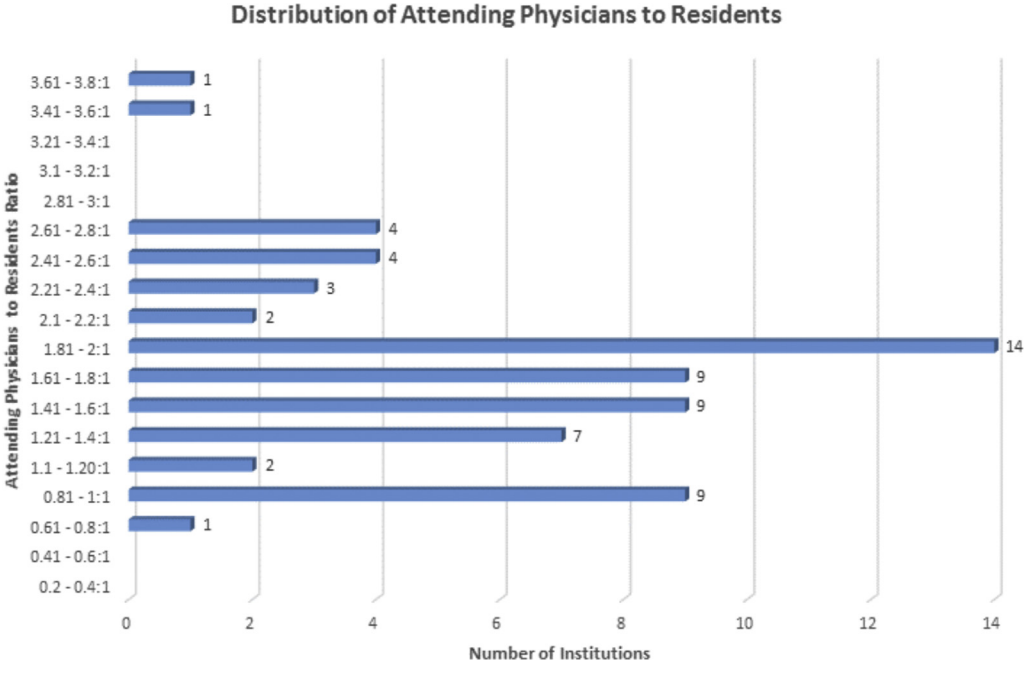

Figure 1 Distribution of attending-to-resident ratio across the programs.

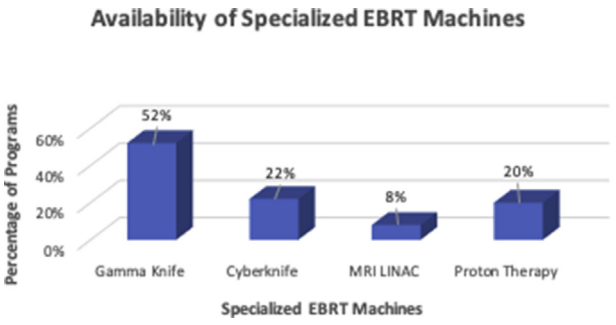

Figure 2 Availability of specialized external beam radiation therapy (EBRT) machines across radiation oncology (RO) residency programs.

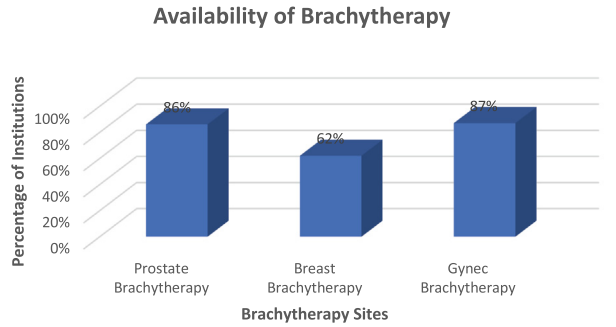

Figure 3 Availability of brachytherapy for different disease sites across residency programs.

patient care. Our research is the only one of its kind to evaluate the current status of variations among training programs.

ACGME has proposed to increase the number of available faculty from 4 to 6 in addition to the program director. It is important to note that 20 programs (21%) from our study do not meet this criterion during the academic year 2018 to 2019. ACGME also has proposed that all programs must have a radiobiologist for improving radiobiology education. Only 70% of programs reported having cancer biologists on the staff during the academic year 2018 to 2019.

There are significant differences in the availability of EBRT machines. Although only 20% of programs have proton therapy machines, interestingly, 39% of programs allow their residents to have access to proton therapy training through rotations outside the primary training institution. This is an excellent model to follow given the broader availability of proton therapy centers in the United States. Decreased use of brachytherapy in the United States in the last 2 decades has been discussed extensively in the literature, leading to worse patient outcomes.[1,2] A resident who has not had enough experience in brachytherapy might not be comfortable practicing it when they get into the practice; this can also contribute to a further decline in brachytherapy in the future.[3,4] Our study found that only 87%, 86%, and 62% of programs mentioned the availability of gynecologic, prostate, and breast brachytherapy, respectively. There is an opportunity for improvement by increasing the availability of brachytherapy training. Brachytherapy training at the primary residency program might offer sufficient exposure and training for residents, enabling them to practice brachytherapy independently.

We acknowledge that our study has several limitations. We collected the data primarily from the program websites. Program websites are limited as they are neither comprehensive nor up to date.[5,6] During our data collection, we also noticed occasional discrepancies within the websites between the departmental page and the residency page. The websites usually do not distinguish adjunct faculty and faculty at satellite centers from the primary faculty of the residency program at the primary site. The data collection becomes challenging when it comes to radiobiologists in the programs. Most programs list them in various designations, including biologists, basic scientists, or cancer researchers. Some discrepancies were noted between program websites and the Fellowship Residency Electronic Interactive Data Access System website as well, and we decided to use the data from the program website as our primary source.

Conclusions

Our study found that marked variations exist among RO residency programs in the United States with regard to the number of faculty and treatment machines or modalities. This study reports the status of these variations during the academic year 2018 to 2019 and will serve as a baseline for future intervention.

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