Radiologic Science & Education

Volume 25 Number 2 August 2020
Association of Educators in Imaging and Radiologic Sciences

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Editorial

A Lot Has Changed Since Last We Met 1
Laura Aaron, Ph.D., R.T.(R)(M)(QM), FASRT, FAEIRS

Guest Editorial

A Note From the New ERB Chair 3
Jeffrey S. Legg, Ph.D., R.T.(R)(CT)(QM)

Original Research

Best Clinical Education Practices Based on Perspectives of Medical Dosimetry Graduates 5
Mahsa Dehghanpour, Ed.D., C.M.D.
Jamie Baker, Ph.D., C.M.D.

Original Research

Program Directors' Perceptions of Student Membership in Professional Organizations 15
Kevin R. Clark, Ed.D., R.T.(R)(QM)
Beth L. Vealé, Ph.D., R.T.(R)(QM)

Departments

Guidelines for Authors 25

AEIRS Membership Application 29

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Mansucripts should be submitted to the Editorial Reveiw Board Chair for the exclusive use of *Radiologic Science and Education.* Guidelines for authors appear in this issue.

AEIRS encourages opinions from readers and other commentary via letters to the editor.

Books for review should be sent to the editor.

Managing Editor
Susan Carr
570 Leominster Road
Lunenburg MA 01462
978/501-0410
susan_carr@mac.com

Publisher
Association of Educators in Imaging and
Radiologic Sciences, Inc.
526 Kingwood Drive, #412
Kingwood, Texas 77339-4473
operations@aeirs.org

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A Lot Has Changed Since Last We Met

Laura Aaron, Ph.D., R.T.(R)(M)(QM), FASRT, FAEIRS

Since the last edition of *Radiologic Science & Education (RS&E),* there have been some dramatic changes in the world. It seems like we went to sleep one night and woke up in a crazy dream. The trouble is that it is not a dream—it's our new reality. The COVID-19 pandemic has had dramatic effects on many aspects of society. In higher education, we went from seeing our students face-to-face to seeing them online on computer screens. As radiologic sciences faculty, we have been forced to adapt and change our entire educational process. It is a good thing that, as a profession, we are familiar with change. Technology is evolving all the time, and we adjust and learn how to safely use the new equipment.

It seems like we went to sleep one night and woke up in a crazy dream.

The changes for radiologic sciences educators and students have been demanding and added pressure to an already difficult curriculum. Faculty have had to move all of their classes online, learn how to teach online, learn new technology, develop plans for lab and clinical experiences, and so much more. For students, the stress of the changes has been difficult as well. They have had to become online students and learn new technology as well. Students have had to have faith that their teachers would find a way to help them navigate their educational programs and still be able to graduate. To say that all of this has been a challenge would be an understatement.

Every day, every hour, and sometimes every minute we are presented with new challenges and changes. We develop plans A, B, C, D, and sometimes all the way to Z. But the truth is that we are doing the best we can to handle all that faces us. As radiologic sciences educators, we are in this together, but each of us has different circumstances. Sometimes we all need to reach out to one another for support, a new idea, or just to have someone listen who can understand. I hope that we all take time to help each other when we can and be a good support system for our colleagues. Together, we will find our path through this and adapt to this change just as successfully as we have to other challenges in the past.

New Leadership for Editorial Review Board

I would like to take this opportunity to thank Kathy Kienstra for serving as the chair of the Editorial Review Board (ERB) for *RS&E* over the past year. We are welcoming our new chair of the ERB, Dr. Jeff Legg. Many of you may know Jeff from his previous service with AEIRS, when he served as the Executive Editor for RS&E. We are glad to have the experience that he brings to the journal.

In this edition of *RS&E*, we have two peer-reviewed articles examining practices that many programs employ and that affect our students. The first peer-reviewed article by Drs. Mahsa Dehghanpour and Jamie Baker explores best practices for clinical education of medical dosimetry students. Their research evaluates the student's perspective of their clinical education experiences and provides suggestions for program improvement.

Drs. Kevin R. Clark and Beth L. Vealé present the results of a study that assessed the advantages and difficulties of student membership in professional organizations. Many programs either encourage or require their students to join professional organizations. The survey research in this study offers program director perspectives on the issues that students face as members of professional organizations. Recommendations for methods to increase student membership in these organizations are offered.

I hope you all enjoy this issue of RS&E and have a safe and happy summer. I look forward to your feedback and comments.

Take care!

Laura Aaron, Ph.D., R.T. (R)(M)(QM), FASRT, FAEIRS, is professor in the School of Allied Health at Northwestern State University in Shreveport, Louisiana. She may be contacted at carwilel@nsula.edu.

A Note From the New ERB Chair

Jeffrey S. Legg, PhD, RT(R)(CT)(QM)

When I stepped down as executive editor of *Radiologic Science & Education* after five years, I knew the journal was in the good hands of Dr. Laura Aaron. Now, I am pleased to return in the role of Editorial Review Board chair. I appreciate the faith the AERIS board places in me, and I vow to continue to promote a journal that reflects innovative and contemporary educational and professional research in our varied fields.

Joining me in this task is an editorial review board with radiologic sciences scholarship experience and a wide variety of professional knowledge and experiences:

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University of Hartford

This is the first term for Lisa, Kelli, Amy, and Kori. Laurie serves as the Vice Chair.

Also, a big thank you to two gentleman who leave the ERB as their terms expire: Drs. Kevin Clark (University of Texas MD Anderson Cancer Center) and Jeff Killion (Midwestern State University).

I encourage authors to consider a submission to *Radiologic Science & Education.* While the focus is primarily on education-related subjects, particularly research studies and systematic reviews, we also welcome broader profession-related topics that

impact students, faculty, or the profession as a whole. Should you have questions, never hesitate to contact me at jlegg@vcu.edu.

The ERB's goal is to provide timely reviews so to maintain the three per year publication schedule of RS&E. Authors should refer to the authors' guidelines to ensure the manuscript is styled and formatted appropriately. After receipt, I blind the paper and send to at least two ERB members who have interest and experience in the subject matter. We hope to provide feedback and recommendations to authors in 3 to 5 weeks.

Publishing peer reviewed manuscripts is not easy and the ERB recognizes the fact. We hope to provide feedback and editorial decisions that support our contributors, maintain scholarly standards, and promote Radiologic Science & Education as a clearinghouse for meaningful research.

Stay safe!

Jeffrey S Legg, Ph.D., R.T.(R)(CT)(QM), FASRT is an associate professor and chair of the Department of Radiation Sciences at Virginia Commonwealth University. He served as the first associate editor for the *Americas Radiography* (UK) and currently serves as an ERB member and assistant ERB chair for *Radiologic Technology*. He may be contacted at jlegg@vcu.edu.

Best Clinical Education Practices Based on Perspectives of Medical Dosimetry Graduates

Mahsa Dehghanpour, Ed.D., C.M.D.
Jamie Baker, Ph.D., C.M.D.

Abstract

To aid radiologic science faculty in establishing best practices for clinical education, researchers solicited the perceptions of medical dosimetry graduates of JRCERT-accredited medical dosimetry programs between 2013 and 2017 concerning their clinical education. Medical dosimetry graduates were asked about clinical learning opportunities, involvement in specific learning activities, interaction with clinical instructors, and positive/negative aspects of their clinical education. Results indicated that students were satisfied with the quality of their clinical education. However, four areas were identified that should be evaluated further and improved: quality of mentors, diversity in learning experience, interactions with different clinical staff, and required clinical time.

Medical dosimetrists are members of the radiation oncology team responsible for creating radiation treatment plans for the delivery of lethal doses of radiation to a patient's tumor while sparing the surrounding normal tissue. To become a certified medical dosimetrist, one must graduate from a Joint Review Committee on Education in Radiologic Technology (JRCERT)-accredited medical dosimetry program and successfully complete the Medical Dosimetry Certification Board (MDCB) examination. All accredited medical dosimetry educational programs should follow the educational curriculum guidelines established by the American Association of Medical Dosimetrists (AAMD), which outline clinical competencies and didactic content. A large portion of a medical dosimetry student's training occurs in the clinical environment where they interact with medical dosimetry mentors, preceptors, physicians, radiation therapists, and other clinical staff. The skills and aptitudes demonstrated by clinical instructors affect the efficacy of students' clinical education, and the variety of clinical education experiences impact the satisfaction of students during their clinical rotations.

The satisfactory attainment of student learning outcomes, graduation rates, and board certification pass rate can be used as measurements of the effectiveness of a medical dosimetry program, but the evaluation of clinical educational practices is more subtle. Educators in allied health education desire

Mahsa Dehghanpour, Ed.D., C.M.D., is the program director and associate professor for the Medical Dosimetry Program at the University of Texas M.D. Anderson Cancer Center, School of Health Professions. She may be reached at mdehghan@mdanderson.org.

Jamie Baker, Ph.D., C.M.D., is associate program director and assistant professor for the Medical Dosimetry Program at the University of Texas MD Anderson Cancer Center, School of Health Professions. She maybe reached at jabaker@mdanderson.org.

to improve their long-standing practices in clinical education and recognize current clinical instructors who are effective in teaching treatment planning techniques, critical thinking strategies, and the interpersonal interactions that are needed to be an effective practitioner in a diverse health care clinic. This study investigated the perceptions of medical dosimetry graduates concerning the quality of their clinical education. A survey was electronically distributed to the 2013 – 2017 graduates of JRCERT-accredited medical dosimetry educational programs in the United States with questions concerning: 1) clinical learning opportunities, 2) involvement in specific learning activities, 3) interaction with clinical instructors, and 4) aspects of their clinical education that had been particularly positive or negative.

Literature Review

Medical dosimetry is a specialized niche within the allied health professions. In 2018, there were only 19 JRCERT-accredited medical dosimetry educational programs in the United States. Because of the scarcity of published research concerning medical dosimetry educational practices, and to ensure a thorough literature review, the search criteria were widened to include allied health, radiologic sciences, and radiation therapy education.

An important component of the educational experience of medical dosimetry students occurs in the radiation oncology clinic as they interact and learn from clinical instructors. The teaching practices, experience level, demeanor, and style of the clinical instructors influence the effectiveness of the students' learning. For many medical dosimetry students, scheduled clinical rotations are the first time for participating in a professional clinical setting and interacting with patients and health care workers. The students' educational and professional backgrounds influence the level of clinical preparedness the students display in clinical rotations.

The success of a student's experience in his or her clinical education was found to be related to the understanding of a clinical instructor about these student-perceived domains.

Cohen et al. (2017) investigated the perceptions of radiography and radiation therapy students during their initial integration in clinic. The survey questions were categorized into three distinct components including social comfort, communication, and clinical confidence. The success of a student's experience in his or her clinical education was found to be related to the understanding of a clinical instructor about these student-perceived domains. Educators and clinical staff should acknowledge the student-perceived barriers as the students enter clinical education.

In addition to the techniques for plan construction, medical dosimetry students learn the cognitive processes for critical thinking, evaluation, problem solving, and deductive reasoning necessary for performing radiation oncology treatment planning. Cognitive apprenticeship is the process in which a clinical mentor demonstrates the mental skills needed to perform complex procedures in a clinical environment. Lasley (2016) outlined the cognitive apprenticeship strategies employed by radiation therapy clinical instructors. Radiation therapy mentors were encouraged to consider the interprofessional aspects of patient care; they challenged students to think more broadly, consider the input of multiple disciples, and their contributory role within the health care team.

Practical guidelines exist concerning best practices for clinical education in an allied health setting. Chapman and Oultram (2007) implemented a comprehensive program designed to support undergraduate radiation therapy students as well as clinical instructors when new students entered the clinical environment. The initiation of a three-hour orientation session was tailored to the needs of students and included a summary of student expectations, introductions to clinical preceptors and other key staff, a discussion of feedback mechanisms, and a tour of the department. Tutorials were created to offer step-by-step instructions regarding clinical techniques with a special focus on the rationale of these common practices. As part of their clinical rotations, radiation therapy students were encouraged to attend regularly scheduled professional development in-service sessions to learn new information and observe the multi-disciplinary approach to patient care that is so prevalent in modern medicine.

As a radiation therapist working with students in a clinical preceptor role, Stone (2002) addressed ways that staff therapists could serve as an effective clinical instructor. Many clinical mentors have not received formal training to be an educator, and their only experience in clinical education comes from memories of their own clinical rotations. The pace, intensity, and patient population of a radiation oncology clinic vary,

Each student brings different strengths and weaknesses to the clinic, and staff clinicians should be flexible and adapt their methods of teaching.

and the staff radiation therapist has a unique opportunity to make a long-lasting and positive impression on his or her students. Each student brings different strengths and weaknesses to the clinic, and staff clinicians should be flexible and adapt their methods of teaching. A goal of clinical education is to teach problem solving skills, and mentors can teach students to adapt to change, recognize when a clinical situation is not right, and choose the best possible course of action. A final point for developing excellence in clinical mentors involves the need to institute professional accountability concerning the performance of a clinical instructor as an effective teacher. The job description of a staff radiation therapist should include his or her responsibilities as a clinical mentor, and a discussion of the therapist's teaching abilities should be a part of one's annual job performance evaluation.

Methods

MedDos ClinEd IQ Survey

The survey used in this study to assess the perceptions of medical dosimetry graduates about the effectiveness of their clinical education was the Medical Dosimetry Clinical Education Instructional Quality Questionnaire (MedDos ClinEd IQ). This survey was developed from a modification of the Clinical Education Instructional Quality Questionnaire (ClinEd IQ). The ClinEd IQ was developed and validated by James and Osborne (1999) and investigated the perceptions of medical students about their clinical education. Permission was obtained from Dr. James to modify the survey to address the medical dosimetry student population. The final MedDos ClinEd IQ survey was used to assess medical dosimetry graduates' opinions concerning their clinical learning opportunities, involvement in specific learning activities, interaction with clinical instructors, and the positive and negative aspects of their clinical education.

The MedDos ClinEd IQ survey contained 47 questions and four subscales of inquiry. The first three subscales of multiple-choice questions probed student perceptions about their clinical learning opportunities, the degree of involvement in specific learning activities, and the amount and quality of interactions with clinical instructors. Items in the first subscale concerning clinical learning opportunities and the third subscale about interaction with clinical instructors were measured on a six-point Likert scale from "strongly disagree" (1) to "strongly agree" (6). The second survey subscale measured a medical dosimetry student's involvement in specific learning activities used the following six-point Likert scale: no exposure (1), involved hardly at all (2), involved to a small degree (3), involved to a moderate degree (4), involved to a considerable degree (5), and involved to a high degree (6). The last subscale contained two open-ended questions that allowed medical dosimetry graduates to list notable positive and negative aspects of their clinical education. The MedDos ClinEd IQ survey was formatted for an electronic distribution using Qualtrics. The research protocol was approved by the IRB of the parent institution in 2019.

Study Sample

A link to the Qualtrics survey was sent to the program directors of all JRCERT-accredited medical dosimetry programs. Program directors were requested to distribute the survey link to their students who graduated within the years of 2013 through 2017. All collected data was anonymous and confidential. The data was to be aggregated, and results would be reported in a manner that no medical dosimetry program could be tied to a specific result.

Results

Of the 19 JRCERT-accredited medical dosimetry education programs listed as active on the JRCERT website in early 2019, graduate responses were received from 15 programs. In total, the survey link was sent to 515 medical dosimetry graduates. Upon examination of the responses, 113 responses were determined to be valid which yielded a 22% response rate. A valid response was considered a survey response with at least one answer submitted for the questions.

Table 1 displays the distribution of responses from each medical dosimetry educational program. Medical dosimetry educational programs offer a variety of credentials, including certificates, Bachelor's degrees, and Master's degrees. Degree type and credentials were fairly equally distributed among respondents with 37% earning a Bachelor of Science or Bachelor of Arts, 35% completing a Master of

Table 1. Distribution of Responses from Participating Medical Dosimetry Educational Programs (*n* = 113)

School	Graduate Responses (*n*)
University of Wisconsin-LaCrosse	13
University of Texas Health Science Center at San Antonio	3
University of Oklahoma Health Science Center	3
University of North Carolina Hospitals	6
University of Maryland Medical Center	4
University of California, Irvine Medical Center	2
Thomas Jefferson University	2
The University of Texas MD Anderson Cancer Center	32
Suffolk University	11
Southern Illinois University Carbondale	17
SUNY at Stony Brook University	8
Radiological Technologies University VT	4
Pitt Community College	3
Grand Valley State University	4
Bellevue College	1

Table 2. Distribution of Degree Types/Credentials

Degrees	*n* (%)
Master's degree	39 (35)
Bachelor's degree	42 (37)
Certificate	32 (28)
Totals	113 (100)

Science, and 28% completing a certificate in medical dosimetry (see Table 2).

The first subscale in the MedDos ClinEd IQ survey involved medical dosimetry graduates' perceptions about the clinical learning opportunities offered during their clinical education. For the Clinical Learning Opportunities subscale, the participant responses were divided into "agree" and "disagree." The responses of mildly agree, agree, and strongly agree were coded as "agree," while the answer choices of mildly disagree, disagree, and strongly disagree were interpreted as "disagree." The percentages of graduates who agreed or disagreed with the first subscale in the MedDos ClinEd IQ survey are displayed in Table 3.

Graduates provided favorable ratings for 12 of the 15 survey items concerning clinical learning opportunities. The responses demonstrated less than 80% agreement for items 9, 12, and 14. Graduates did not highly agree that they had the opportunity to work in a variety of patient care settings (only 76% agreed with this statement). Twenty percent of survey respondents perceived that their time in the clinic was sometimes wasted with non-educational tasks, such as paperwork, excessive downtime, and waiting for faculty to check my work. Finally, 22% of the respondents agreed that they did not feel like a useful member of the health care team.

In the next subscale as detailed in Table 4, Involvement in Specific Learning Activities, the survey choices asked about the medical dosimetry student involvement in clinical activities ranked as no exposure, involved hardly at all, involved to a small degree, involved to a moderate degree, involved to a considerable degree, and involved to a high degree. These responses were separated into two broad categories of "low involvement" and "high involvement." "Low involvement" included the responses of no exposure, involved hardly at all and involved to a small degree; "high involvement" included the answer choices of involved to a moderate degree, involved to a considerable degree, and involved to a high degree.

The responses were less than 80% agreement for medical dosimetry student Involvement in Specific Learning Activities for the questions 20, 24, 25, 29, and 30. Question 20 asked medical dosimetry graduates about their involvement with learning and working with a variety of treatment planning software (e.g., Pinnacle, Eclipse, RayStation, Oncentra, Monaco), and only 55% of respondents felt that they had high involvement with diverse software. Seventy-nine percent of those surveyed responded that they had high involvement in making case presentations to physicians or instructors during their clinical instruction. Only 57% of the medical dosimetry graduates rated their participation in quality assurance checks (e.g., IMRT QA, patient chart QA) as high. When asked about their involvement in discussing patient information, treatment strategies, concerns, and expected outcomes with physicians and other members of the radiation oncology team, 75% of survey participants indicated they had high involvement. Lastly, only 44% of medical dosimetry graduates felt they had high involvement

Table 3. Percentage of Graduates who Agreed or Disagreed with the Clinical Learning Opportunities Subscale

Subscale Items: Clinical Learning Opportunities	Agree	Disagree
I have experienced a good mix of patients, problems, and clinical experiences.	95	5
The learning opportunities and mix of patient cases were too diverse, preventing me from developing proficiency.	7	93
My experiences were repetitive and offered few new learning experiences.	14	86
I increased my independence in developing treatment plans for patient cases.	89	11
I improved my communication skills.	96	4
I became more proficient in clinical skills because of opportunities to practice and receive feedback.	94	6
I have had the opportunity to work in a variety of patient care settings (e.g. schools lab, hospital clinics, community-based clinics, etc).	76	24
I have experienced a fair evaluation of my performance in clinic.	95	5
Things moved too fast for me to really learn anything (e.g. the clinic environment was hectic with too many distractions for efficient learning).	9	91
I felt like my time in the clinic was sometimes wasted with non-educational tasks, such as paperwork, excessive downtime, and waiting for faculty to check my work.	20	80
The clinic functioned smoothly so that I could efficiently construct treatment plans for patient cases.	93	7
I did not feel like a useful member of the health care team.	22	78
Support staff have been available and helpful (e.g. clinical coordinators, radiation therapists, medical physicists, assistants, nurses, etc.).	95	5
I had adequate resources available to me which facilitated my learning (e.g. equipment, supplies, assistance when needed, materials guidance from instructors, reference books).	96	4
For most of my clinical education I have been able to work consistently with the same instructors who know my abilities and learning needs, rather than having different instructors almost every day.	91	9

during their clinical education in assisting physicians, physicists, residents, or other team members with advanced procedures (e.g., research, stereotactic radiosurgery, QA, imaging, linac commissioning).

The third subscale in the MedDos ClinEd IQ instrument asked medical dosimetry graduates to indicate if they agreed or disagreed with statements concerning interaction with clinical instructors during their clinical education. As before, the responses of mildly agree, agree, and strongly agree were coded as "agree," while the answer choices of mildly disagree, disagree, and strongly disagree were interpreted as "disagree." The percentages of graduates who agreed or disagreed about the statements concerning Interaction with Clinical Instructors are outlined in Table 5. All subscale items surveying medical dosimetry graduates' Interactions with Clinical Instructors showed 88% or more favorable agreement.

Thematic Analysis of Students' Written Responses

The last two questions asked graduates of the medical dosimetry programs to describe the positive and negative aspects of their clinical education. Responses to these open-ended questions were submitted by 81 of 113 participants for the positive aspects and 75 of 113 participants for the negative aspects of their clinical education. The overview of the major positive and negative themes that emerged from the analysis of these responses are described in this section.

Major Qualitative Themes

The four main themes that emerged from the analysis of the responses in regards to the positive aspects of the medical dosimetry clinical education included: (1) effective and dedicated mentors, (2) diverse clinical experience and rotation sites, (3) independent learn-

Table 4. Percentage of Graduate Responses to the Specific Learning Activities Subscale

Subscale Items: Involvement in Specific Learning Activities	High Involvement	Low Involvement
Developing treatment plans for a variety of disease sites.	97	3
Developing treatment plans using a variety of techniques (2D, 3D, IMRT, VMAT, etc).	97	3
Learning and working with a variety of treatment planning softwares (Pinnacle, Eclipse, RayStation, Oncentra, Monaco, etc).	55	45
Performing verification calculations.	82	18
Developing a patient chart (paper or electronic chart).	82	18
Developing my own treatment plans (versus being told what to do by instructors).	95	5
Making case presentations to physicians or instructors.	79	21
Participation in quality assurance checks (IMRT QA, patient chart QA, etc).	57	43
Participation in all dosimetry-related activities for a well-rounded education such as image fusion, composite planning, etc.	92	8
Providing opportunities for my interaction with other radiation oncology team members.	84	16
Discussing research-based practice, protocols, and clinical knowledge with my clinical instructors.	81	19
Discussing patient information, treatment strategies, concerns, and expected outcomes with physicians and other members of the radiation oncology team.	75	25
Assisting physicians, physicists, residents, or other team members with advanced procedures (e.g. research, stereotactic radiosurgery, QA, imaging, linac commissioning, etc).	44	56

ing opportunity, and (4) interaction with different members of the radiation oncology team. The major concerns expressed by the majority of the respondents included (1) ineffective and uninterested mentors, (2) lack of diverse learning experience, (3) inadequate interaction with different members of the radiation oncology team, and (4) insufficient clinical time.

Illustrative Examples of Respondents' Comments

In this section, direct quotes concerning the positive and negative aspects of the medical dosimetry graduates' clinical education are provided to shed light on the strengths and weaknesses of the clinical education perceived by the respondents. The major positive experiences are described first followed by the major negative aspects of the clinical education.

Effective and Dedicated Mentors

There were a significant number of comments about the quality of mentors as the most positive aspect of clinical education.

"The best part was working with my clinical instructors and teachers. They were all incredibly knowledgeable and patient and I believe I am a good Dosimetrist because of everything I learned from them."

"I had very attentive clinical instructors and mentors who increased my treatment planning knowledge by giving me space to learn from my mistakes. Any problem or mistake I made while learning to plan was used as a teaching point. This helped my problem solving skills in dosimetry and increased my confidence."

Diverse Clinical Experience and Rotation Sites

There were numerous comments on the strengths of the clinical education due to the diversity of the clinical experience and opportunities to rotate to different clinical sites that allowed learning a variety of cases from a variety of mentors.

"One positive aspect of my clinical education was the diversity of instruction. This is evident through a diverse number of instructors as well as a diverse number of clinical treatment sites. This is a product of the size and scope of the institution itself."

"Almost like on the job training. I was in the clinic full time and got to see a wide variety of cases. I planned ac-

Table 5. Percentage of Graduates who Agreed or Disagreed with the Interaction with Clinical Instructors Subscale

Subscale Items: Interaction with Clinical Instructors	Agree	Disagree
Established an active role for me in developing treatment plans and gave me responsibility for managing all aspects of it that were appropriate for my level of training.	94	6
Failed to prepare me for my future career in medical dosimetry.	4	96
Gave me specific and practical information that helped me improve my skills.	98	2
Instructed me at my level of knowledge and expertise rather than at their level of knowledge.	91	9
Provided consistent instruction and feedback.	92	8
Brought to my attention techniques and strategies that I had previously not seen (e.g. willingly shared their clinical experience and expertise with me).	98	2
Made every clinical interaction a positive learning experience.	90	10
Created an environment in which I felt comfortable accepting challenges, even at the risk of making mistakes, and encouraged me to ask questions without fear of being put down.	88	12
Improved my understanding of clinical practice (such as decision making, learning new treatment planning methods, selecting treatment options, developing procedural skills, etc.).	94	6
Discouraged me from taking risks or trying new methods.	11	89
Did not check my work frequently and did not provide me with timely feedback when I needed it.	8	92
Demonstrated the value of respecting patient preferences through physician orders, even when they differed from their own preferences.	91	9
Encouraged me to become increasingly independent over time.	95	5
Criticized me without offering suggestions for improvement.	5	95
Responded promptly to requests for consultation, assistance, feedback, or evaluation day.	95	5

tual patients, then reviewed them with the physician and received feedback. I worked with a variety of dosimetrists who all did things differently which helped me see several different ways of doing the same thing and allowed me to develop my own preferences for planning."

Independent Learning Opportunity

Many of the respondents appreciated the opportunity to learn independently while in the clinic.

"Strongly encouraged independent work/planning and learning while supervising when needed. Stimulated our learning experience by asking thought provoking questions while under the pressure of a fast-paced clinical setting."

"I was given the opportunity to work independently and was therefore able to experiment with different techniques. This gave me the opportunity develop my abilities and learn how to best utilize workflow. Quality of output was always ultimately reviewed by dosimetry team and peer reviewed by physicians."

Interaction with Different Members of the Radiation Oncology Team

Another positive theme that emerged from the review of the comments was the opportunity to interact with different members of the radiation oncology team.

"Exposed to a variety of cases, able to work with the entire rad onc team, was able to grow independently under the care of my preceptors"

"Taught communication skills through daily interactions with Radiation Oncology staff which prepared us well for entering the workforce"

"Being able to present cases to doctors gave me confidence and helped me understand important details."

Ineffective and Uninterested Mentors

Mentors play an important role in the education of students. Having effective mentors was noted as one of the best aspects of the clinical experience and

having ineffective mentors was noted as one of the worst clinical experiences of the students.

"Some dosimetrists do not show enthusiasm to teach, I felt they were obligated to do it."

"Mentors sometimes assumed that I knew more than I did and did not explain a

procedure. They were busy and did not respond in [a] timely manner. One mentor in particular was disengaged and seemed irritated by my presence."

Lack of Diverse Learning Experience

While a diverse clinical experience was stated as a positive aspect of clinical education by many graduates, a lack of diversity was noted as a negative aspect by those who had a different experience.

"Too little emphasis on 3D plans and the speed at which they would be expected when working. Too much emphasis on IMRT and when I started work, they expected me to knock out 3D plans real quick. It was a wakeup call for me."

"Only learning 1 planning system or learning methods that clinical instructors use only knowing now that there are plenty of methods to approach a plan."

Inadequate Interaction With Different Members of the Radiation Oncology Team

Lack of adequate communication with the members of the radiation oncology team was noted as a negative aspect of clinical education by those who did not have this interaction opportunity.

"One part of my clinical experience that I wish we spent more time on was patient setups. Our exposure to the radiation therapy aspect would have helped improve my overall experience with the program."

"There are no significant negative aspects of the dosimetry program; however, I wish we would have had more time with Residents, Oncologists, of Physicists and see their work as well as converse with them about Rad Onc."

Insufficient Clinical Time

Another concern raised by several graduates was the lack of adequate time spent on clinical education. Many of the graduates wished they had spent more time in the clinic.

"Not enough time in a 12-month program"

"Early on in the program, we were pulled out of clinic too much while trying to apply techniques learned. Our Schedule called for half of a day in clinic and half in class. Would have been better to have whole days in clinic."

Discussion

The results of the thematic analysis were consistent with the quantitative data. The majority of respondents were satisfied with the clinical learning opportunities indicated by 80% or more favorable agreement. The areas of lesser satisfaction (less than 80% agreement) for this subscale included opportunities to work in a variety of patient care settings (Q9), wasted time in the clinic (Q12), and feeling like a useful member of the healthcare team (Q14).

For the involvement in specific learning activities subscale, the areas of less satisfaction included opportunities for learning and working with a variety of treatment planning software (e. g., Pinnacle, Eclipse, RayStation, Oncentra, Monaco) (Q 20); making case presentations to physicians or instructors (Q24); participation in quality assurance checks (e. g., IMRT QA, patient chart QA) (Q25); discussing patient information, treatment strategies, concerns, and expected outcomes with physicians and other members of the radiation oncology team (Q29); and assisting physicians, physicists, residents, or other team members with advanced procedures (e.g., research, stereotactic radiosurgery, QA, imaging, linac commissioning) (Q30).

All subscale items surveying medical dosimetry graduates' interactions with clinical instructors showed 88% or more favorable agreement.

The results of this study indicated that students appreciated opportunities to rotate to a variety of clinical settings and learn a variety of cases from different clinical instructors. Since there are different strategies to construct an optimal treatment plan, working with different clinical instructors who utilize different planning techniques provides a diverse learning experience for students. Rotating to different clinics provides opportunities to access and learn a variety of patient cases, treatment techniques, and technologies. Students value the role of their clinical instructors in their overall clinical learning.

The quality of clinical instructors and their passion in teaching students can make a clinical experience positive and nurturing while uninterested and uninformed clinical instructors can negatively affect the quality of students' clinical education. Program administrators should make efforts to provide adequate amounts of clinical time for students where

Students appreciate being treated as a team member and experience an atmosphere that simulates a real workplace environment.

they have opportunities to work on real patient cases as opposed to archival cases and interact with different members of the radiation oncology team. In the clinical setting, students benefit from an active learning environment where they receive direct instruction in addition to having autonomy in their own learning. Students appreciate being treated as a team member and experience an atmosphere that simulates a real workplace environment.

The results from this study can be used by program administrators to improve the quality of their students' clinical education and as a guide for clinical faculty development seminars and workshops. In addition, the insights from this study illuminate the importance of clinical rotation assignment of students that should provide a comprehensive and diverse clinical experience.

The limitation of this study is related to the sample size. Although the majority of medical dosimetry programs across the United States participated in this study (79%), the number of respondents from each program was limited. The response rate of 22% from participating programs' graduates suggest that our sample was not entirely representative, and our findings have limited generalizability.

Conclusion

Clinical education is an important part of medical dosimetry education. It is through the clinical education that students learn the application of theoretical knowledge into practice of medical dosimetry, gain experience on crafting individualized treatment plans for varied patients' situation, learn different kinds of technology to perform related duties, acquire the importance of and practice teamwork and communication, and demonstrate professionalism developed through role modeling.

This study suggested that generally students were satisfied with the quality of their clinical education. However, four important areas should be evaluated and improved to ensure a quality clinical education. These include: (1) quality of mentors, (2) diversity in learning experience, (3) interaction with different members of the radiation oncology team, and (4) required clinical time. Future faculty development opportunities and training workshops for both existing and future clinical faculty should focus on these areas and reiterate ways to improve them.

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Program Directors' Perceptions of Student Membership in Professional Organizations

Kevin R. Clark, Ed.D., R.T.(R)(QM)
Beth L. Vealé, Ph.D., R.T.(R)(QM)

Abstract

This descriptive survey research study identified medical imaging and radiation therapy program directors' perceptions of benefits and obstacles related to student membership in professional organizations as well as potential strategies that could attract more student members. The greatest perceived benefit of student membership in professional societies was access to educational resources, the greatest perceived obstacle was cost, and the most effective strategy to attract more student members was to lower costs. Future research should attempt to collect medical imaging and radiation therapy students' perceptions of professional organizations, including benefits, obstacles, motivators, and deterrents related to joining professional associations.

A professional organization provides several important services to its members, including continuing education and professional development opportunities (Farina et al., 2016). Other equally important services offered by a professional organization include networking opportunities, mentoring programs, and political advocacy efforts (Farina et al., 2016; Fusco et al., 2015; Petersen et al., 2017). Some professional organizations also set standards of practice and codes of ethics for their respective professions (Farina et al., 2016). Although many of these services are considered essential with regards to professionalism and career growth, there are concerns related to a decrease in membership in professional organizations, particularly among health care societies (Coerver & Byers, 2013; Farina et al., 2016). Furthermore, Michael et al. (2016) recognized that most students are not knowledgeable about professional organizations and encouraged educators to introduce their students to the many benefits of joining and being active members in professional societies.

To address these concerns in the medical imaging and radiation therapy profession, this research study was designed to identify program directors' perceptions of benefits and obstacles related to student membership in professional organizations and explore potential strategies that professional societies can implement to increase student membership. The findings of this study may potentially provide useful information to engage students in medical imaging and radiation therapy professional organizations during school and encourage continued membership after graduation.

Kevin R. Clark, Ed.D., R.T.(R)(QM), is an associate director and assistant professor with the School of Health Professions for The University of Texas MD Anderson Cancer Center in Houston, Texas. He may be contacted at KRClark@mdanderson.org.

Beth L. Vealé, Ph.D., R.T.(R)(QM) is Professor and Chair of the Shimadzu School of Radiologic Sciences with Midwestern State University's College of Health Sciences and Human Services. She may be contacted at beth.veale@msutexas.edu.

Literature Review

Although there are published research studies related to health care professionals and their membership (or lack thereof) in professional societies, literature is limited on the topic of student membership in professional organizations. A search of current literature using various electronic databases revealed two sources specific to professional association membership among radiography and sonography students, and two sources were related to pharmacy students.

Radiography and Sonography Students

Michael et al. (2017) collected data from program directors and found that 41% of radiography programs accredited by the Joint Review Committee on Education in Radiologic Technology (JRCERT) required students to join professional societies, mainly an affiliate society, and those radiography students were largely responsible for the cost of membership. Most of the program director participants supported or encouraged students to join professional organizations, but it was not mandatory. Notably, this study did not collect data specific to perceived motivators or deterrents of student membership in professional organizations.

Similar results were found in Michael et al.'s (2016) study where less than half of the surveyed program directors in sonography programs accredited by the Commission on the Accreditation of Allied Health Education Programs indicated that their students were required to join a professional society, mainly the Society of Diagnostic Medical Sonography. Only two sonography programs paid all or part of the student membership fee, leaving the student largely responsible for the cost. Program directors acknowledged that their sonography students often used professional societies' online resources, such as completion of electronic continuing education quizzes, and rarely engaged in activities sponsored by the organization that required travel or had additional costs, such as attending a conference or participating in student competitions or events. The researchers stressed the need for professional organizations to take an active approach to recruit students and encouraged educators to emphasize the value of membership to their students.

The researchers stressed the need for professional organizations to take an active approach to recruit students and encouraged educators to emphasize the value of membership to their students.

Pharmacy Students

Petersen et al. (2017) explored what motivated and deterred 856 pharmacy students' decision to join professional organizations. The researchers' goal was to create a list of meaningful factors that organizations could use for membership recruitment. As perceived by the pharmacy student participants, professional development and networking were the top two endorsed motivational factors, and time required for involvement and cost were the most commonly selected hindrances.

Fusco et al. (2015) also explored professional organization membership among pharmacy students and found area of interest, networking opportunities, student programs, and career development aids to be the most important factors to join an organization. In addition to cost, pharmacy students in this study indicated they discontinued their membership in professional societies because of a lack of perceived benefit, time, involvement, area of interest, and advanced opportunities for involvement. As suggested by Michael et al. (2016), educators can model appropriate behavior by being members of professional societies, and they can encourage their students to do so as well and explain the benefits of being involved in an organization.

Methodology

This study used a descriptive survey research approach to identify program directors' perceptions of benefits and obstacles specific to student membership in medical imaging and radiation therapy professional organizations. In addition, this study explored potential strategies to increase student membership in medical imaging and radiation therapy professional societies as perceived by program director participants. The guiding research questions for this study included:

- What are the benefits and obstacles related to student membership in professional organizations as perceived by program directors?
- What potential strategies can be used by professional organizations to increase student membership and encourage continued membership after graduation as perceived by program directors?

Ethics approval to conduct this study was granted through the institutional review board from Midwestern State University.

Sample Eligibility

The sample for this study included program directors of JRCERT-accredited radiography, radiation therapy, magnetic resonance, and medical dosimetry programs. Using a convenience sampling technique, personnel from the JRCERT provided a spreadsheet that contained program directors' email addresses. In an attempt to not skew data related to perceived benefits, obstacles, and potential strategies, duplicate email addresses from program directors who managed multiple accredited programs were removed. The final spreadsheet contained 712 email addresses, and all 712 program directors were invited to participate in this study.

The sample of program directors were informed that participation in this study was strictly voluntary, and they could elect to withdraw from the study or stop answering the survey items at any time without penalty. Program director participants were guaranteed that their identities and privacy would not be compromised, their responses would remain anonymous, and they were informed that no compensation would be awarded for participating in this study. Consent was implied when program director participants clicked on the link and began the survey.

Instrumentation and Pilot Study

The survey instrument was created by the researchers using Qualtrics and contained 14 items. Some of the survey items asked program director participants to:

- identify if students were required or encouraged to join professional organizations,
- report what professional organizations students were required to join,
- estimate what percentage of students required to join professional organizations continue their membership after graduation,
- identify benefits and obstacles of student membership in professional organizations,
- select the greatest benefit and obstacle related to student membership in professional organizations,
- identify potential strategies that professional organizations can implement to attract more student members,
- select the most effective strategy related to attracting more student members, and
- answer various demographic questions related to type of institution, type of program, and number of students.

Survey logic was integrated to minimize survey fatigue (depending on the responses, not all 14 items had to be answered). The survey was estimated to take no longer than 10 minutes to complete.

Upon receipt of ethics approval, and in an attempt to validate the instrument, the researchers piloted the survey to receive feedback regarding any problematic areas or suggestions for improvement. Pilot participants were acquired by sending an email to medical imaging and radiation therapy educators with more than 10 years' experience in the field. Pilot participants were instructed that their participation was voluntary and that the researchers wanted feedback on any potential problematic areas to improve the instrument and to ascertain the survey was aligned with the study's purpose. To promote anonymity, the pilot instrument contained an open-ended question at the end of the survey for participants to provide their feedback and suggestions. Fifteen pilot responses were received. Some of the feedback on the open-ended question suggested adding additional benefits, obstacles, and strategies to include on the survey. In addition, the researchers imported the pilot responses into IBM's SPSS to ensure that descriptive statistics could be calculated with ease. After revising the survey instrument based on the feedback, the pilot responses were deleted and not included in the data analyses for this study.

Procedures

Once changes were made to the survey instrument based on the pilot participants' feedback, the researchers obtained an email listing of program directors from the JRCERT. Incidentally, this spreadsheet that contained program directors' email addresses was deleted when the study ended. Program director participants received an email invitation to participate in this study, and the email included the purpose of the study, details about implied consent, and a link to the survey in Qualtrics. Participants initiated consent to participate in this study by clicking on the link to begin the survey. The survey link was active for three

weeks, and a reminder email was sent to all program directors two weeks after the initial distribution. The survey was closed after three weeks, and the results were exported from Qualtrics to IBM's SPSS to analyze the collected data.

The results were summarized using descriptive statistics. Mean and standard deviation were calculated for continuous survey items, and frequency and percentages were performed on those categorical survey items. Graphical presentations, created in IBM's SPSS, were used to display program director participants' perceived greatest benefit and obstacle regarding student membership in professional organizations and most effective strategy to attract more student members.

Results

After distributing an invitation to participate in this study to the 712 program directors identified on the JRCERT spreadsheet, 12 email addresses were returned undeliverable. Of the 700 invitations, 229 responses were received for a response rate of 32.7%. Incidentally, five of the recorded responses were incomplete and discarded to prevent extraneous errors in the data analyses. The margin of error for a sample size of 224 is ±6.5% at the 95% confidence level.

Demographics

Program director participants could select all that applied regarding the type of institution where they worked and the type of program they managed. There were 83 (37.4%) program director participants who worked at a community college, 82 (36.9%) who were employed at a college or university, 51 (23%) at a hospital, 9 (4.1%) at a technical college or institute, and 3 (1.4%) at a proprietary institution. There was a wide range of modalities represented in the programs that the directors managed. The type of programs in this study included radiography (185, 83.3%), radiation therapy (31, 14%), computed tomography (21, 9.5%), magnetic resonance (18, 8.1%), sonography (7, 3.2%), mammography (6, 2.7%), vascular interventional radiography (4, 1.8%), medical dosimetry (3, 1.4%), and cardiac interventional radiography (1, 0.5%). One participant selected other and identified the program type as "degree advancement." The mean number of students enrolled in the programs represented in this study was 35.7 *(SD* = 12.1), with a range of five to 125 enrolled students.

Results revealed that 89 (39.7%) program directors stated that students were required to join professional organizations while enrolled in school.

Results revealed that 89 (39.7%) program directors stated that students were required to join professional organizations while enrolled in school, 133 (59.4%) stated that enrollment in professional societies was not a requirement in their program, and two (0.9%) were unsure of this requirement status. Of those 135 program directors indicating that their students were not required to join professional organizations or were unsure, 133 (98.5%) encouraged their students to join a professional society, and two (1.5%) said that they did not encourage student membership. The survey ended for those two participants who did not promote student membership in

Table 1. Professional Organizations Students Were Required to Join[a] (*N* = 89)

Professional Organization	*n* (%)
American Association of Medical Dosimetrists	2 (2.2)
American Society of Radiologic Technologists (ASRT)	51 (57.3)
Association of Collegiate Educators in Radiologic Technology	3 (3.4)
Chicago Area Radiation Therapists	1 (1.1)
Society for MR Radiographers and Technologists	1 (1.1)
Affiliate society	60 (67.4)

[a] Participants selected all that applied.

Box 1. Affiliate Societies Students Were Required to Join

Connecticut
Georgia
Idaho
Indiana
Illinois
Minnesota
Missouri
Nebraska
New Hampshire
New Jersey
New York
North Carolina
North Dakota
Ohio
Oklahoma
Pennsylvania
South Carolina
South Dakota
Tennessee
Texas
Virginia

professional organizations. Table 1 displays the professional organizations that students were required to join during school as indicated by program director participants, and Box 1 lists the specific affiliate societies students were required to join as identified by program director participants.

Those 89 program directors who required enrollment in professional organizations estimated a mean of 46.5% (SD = 20.8) of students continue their membership in a professional society after graduation.

Table 2. Program Directors' Perceived Benefits of Student Membership in Professional Organizations[a] (*N* = 222)

Benefit	*n* (%)
Access to educational resources	183 (82.4)
Scholarship opportunities	174 (78.4)
Professional development	159 (71.6)
Networking	137 (61.7)
Career growth	122 (55.0)
Student competitions	121 (54.5)
Advocacy	113 (50.9)
Service to the profession	91 (41.0)
Mentorship	76 (34.2)

[a] Participants selected all that applied.

Benefits of Student Membership

Table 2 identifies the perceived benefits for students by joining professional societies according to program directors. When asked to select the greatest benefit that students receive from joining a professional organization (Figure 1), program directors indicated access to educational resources (95, 42.8%) as the greatest benefit, followed by professional development (51, 23%), networking (27, 12.2%), scholarship opportunities (13, 5.9%), advocacy (12, 5.4%), student competitions (10, 4.5%), career growth (6, 2.7%), service to the profession (6, 2.7%), and lastly mentorship (2, 0.9%).

Obstacles of Student Membership

Table 3 lists the perceived obstacles that may hinder students from joining professional societies. When asked to select the greatest obstacle hindering students from joining a professional organization (Figure 2), respondents indicated cost of membership (94, 42.3%) to be the greatest obstacle, followed by lack of interest in general (39, 17.6%), family, school, or work

Figure 1. Program Directors' Greatest Perceived Benefit

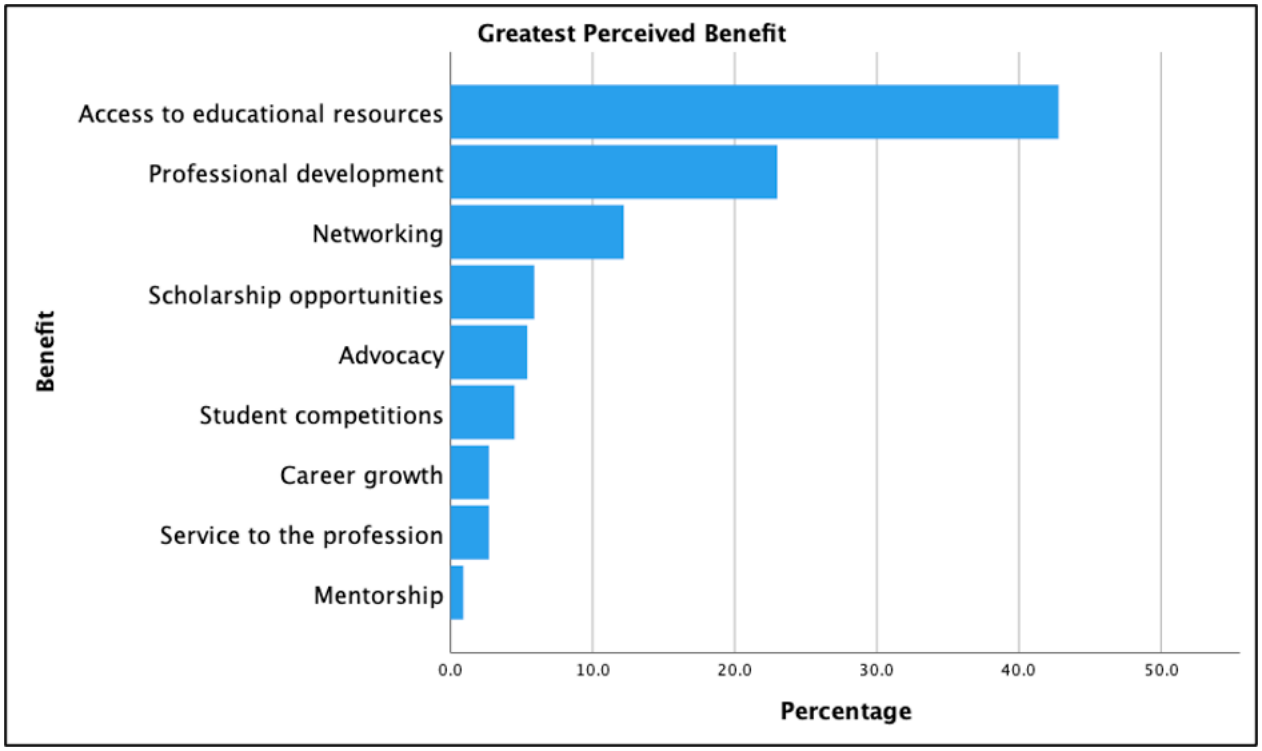


Table 3. Program Directors' Perceived Obstacles of Student Membership in Professional Organizations[a] *N* = 222

Obstacle	*n* (%)
Cost of membership	176 (79.3)
Lack of interest in general	98 (44.1)
Confusion about what the organization represents	81 (36.5)
Time constraints	76 (34.2)
Disinterest in governmental policies/advocacy efforts	71 (32.0)
Family, school, or work obligations	70 (31.5)
Lack of opportunities for involvement	33 (14.9)
Lack of continuing education credits	8 (3.6)
Lack of educational resources	8 (3.6)
None[b]	7 (3.2)

[a] Participants selected all that applied.
[b] Option was exclusive.

obligations (21, 9.5%), disinterest in governmental policies/advocacy efforts (18, 8.1%), time constraints (18, 8.1%), confusion about what the organization represents (17, 7.7%), and lastly lack of opportunities for involvement (15, 6.8%).

Strategies to Attract More Student Members

Table 4 indicates potential strategies that professional organizations can implement to attract more student members as perceived by program director participants. When asked to select the most effective strategy to reach more student members (Figure 3), program directors identified lowering costs (51, 23%) as the most effective approach, followed by offering free access to online resources (33, 14.9%), increasing social media presence (31, 14%), offering free or discounted educational materials (22, 9.9%), increasing marketing strategies to target students (18, 8.1%), offering student scholarships (15, 6.8%), providing free or discounted opportunities to travel to conferences

continued on page 22

Figure 2 . Program Directors' Greatest Perceived Obstacle

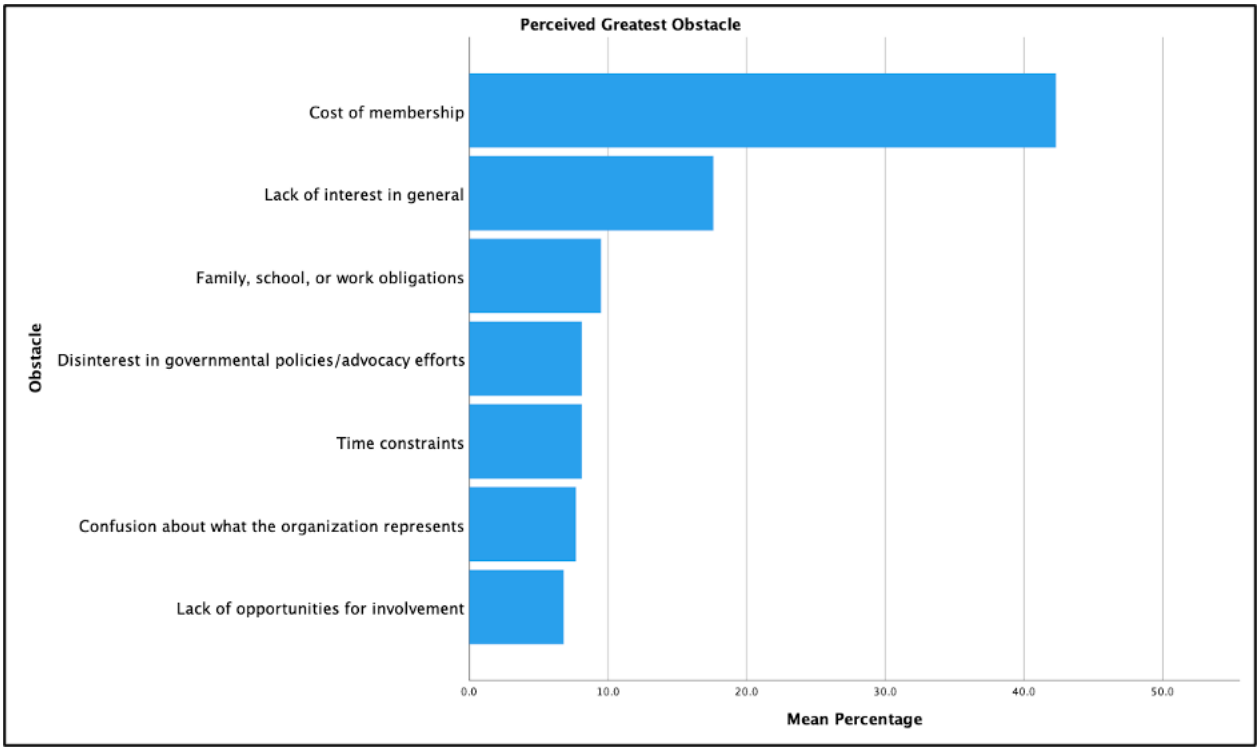
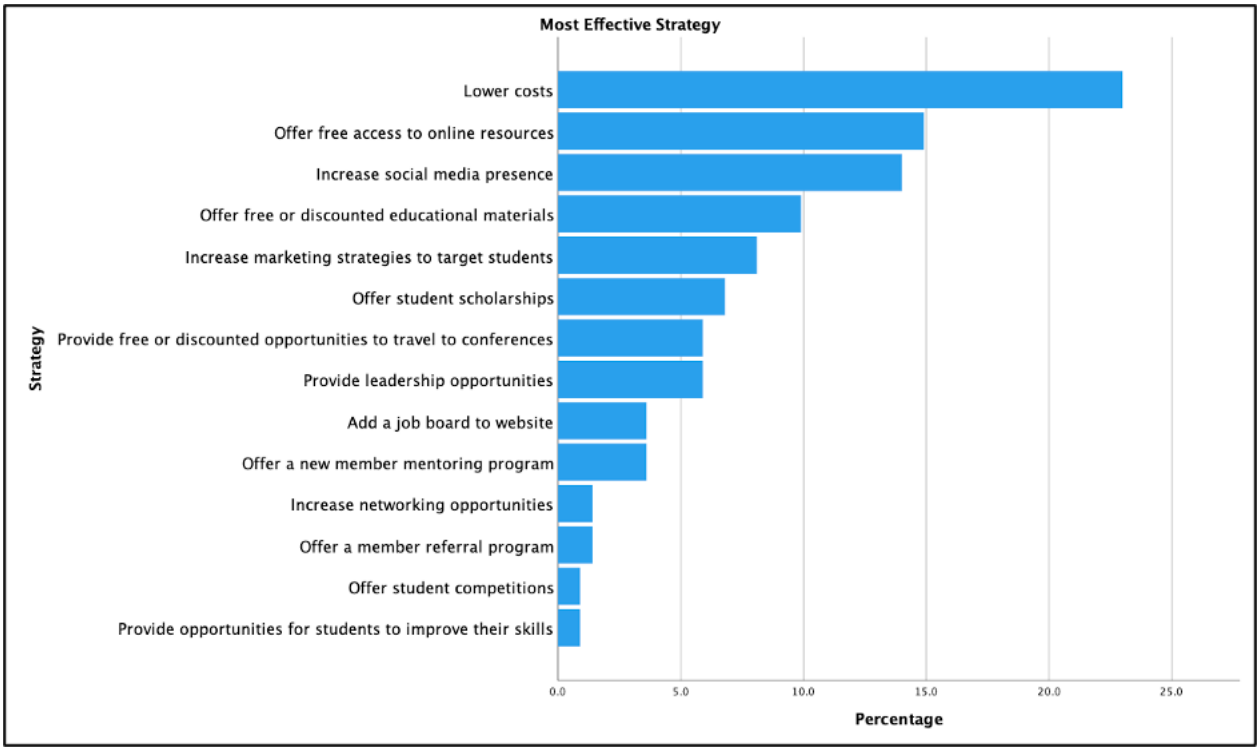


Table 4. Program Directors' Perceived Strategies to Attract More Student Members in Professional Organizations[a] *N* = 222

Strategy	n (%)
Lower costs	133 (59.9)
Offer free access to online resources	128 (57.7)
Offer free or discounted educational materials	122 (55.0)
Provide opportunities for students to improve their skills	103 (46.4)
Offer student scholarships	101 (45.5)
Provide free or discounted opportunities to travel to conferences	98 (44.1)
Increase social media presence	94 (42.3)
Provide leadership opportunities	94 (42.3)
Increase marketing strategies to target students	80 (36.0)
Add a job board to website	69 (31.1)
Increase networking opportunities	59 (26.6)
Offer a new member mentoring program	54 (24.3)
Offer student competitions	43 (19.4)
Offer a member referral program	33 (14.9)
Nothing[b]	4 (1.8)

[a] Participants selected all that applied.
[b] Option was exclusive.

Figure 3. Program Directors' Perceived Most Effective Strategy



(13, 5.9%), providing leadership opportunities (13, 5.9%), adding a job board to website (8, 3.6%), offering a new member mentoring program (8, 3.6%), increasing networking opportunities (3, 1.4%), offering a member referral program (3, 1.4%), and lastly offering student competitions (2, 0.9%) and providing opportunities for students to improve their skills (2, 0.9%).

Discussion

Less than half of program directors in this study indicated that their students were required to join professional societies while enrolled in school; however, more than half of the surveyed program directors encouraged their students to join professional organizations. This finding was aligned with the previous research related to sonography and radiography student membership in professional associations (Michael et al., 2016; Michael et al., 2017). Similar to Michael et al.'s (2017) study involving radiography programs, most students in the current study were required to join an affiliate society, followed by the ASRT. Furthermore, program directors in this study estimated that less than half of their students continue membership in professional organizations after graduation. To provide some perspective, the ASRT currently has 156,911 members with 8,577 of those being student members (M. Kudlas, personal communication, June 2, 2020). Although it appears most medical imaging and radiation therapy program directors encourage students to join professional societies, more work in this area is needed to increase the number of students who continue their membership after graduation.

The greatest benefit of student membership in professional associations, as perceived by program director participants was access to educational resources, such as journals, resume assistance, community discussion pages, registry review examinations, and training videos. This result was similar to Michael et al.'s (2016) study where sonography students often used professional societies' online resources and Fusco et al.'s (2015) study where pharmacy students found career development aids to be an important factor to join an organization. It may be viable for those professional organizations and affiliate societies that do not offer educational resources to consider investing in such media that benefit medical imaging and radiation therapy students.

In an open-ended survey item for additional benefits, one program director acknowledged that students can apply to the ASRT Student Leadership Development program and, if selected, can attend the annual governance and educational symposium for free. However, the director mentioned that only two students are chosen from each affiliate so it is not considered a benefit for all students. Another program director wrote, "To motivate students to join, I tell them it looks good on their resume." Several comments were made that students should join professional organizations to be aware of issues that affect their future profession.

The greatest obstacle related to student membership in professional organizations, as perceived by program director participants, was membership cost, a finding that was well documented in literature specific to pharmacy students (Fusco et al., 2015; Petersen et al., 2017). Although some professional organizations and many affiliate societies offer discounted membership rates for medical imaging and radiation therapy students, program directors in this study still considered cost to be a major hindrance. In fact, program director participants identified lowering costs to be the most effective strategy for professional organizations to implement to attract more student members. Other routes to lessen the cost burden should be explored, such as fundraising projects if permitted by the institution.

The participants also provided additional obstacles and potential strategies that were not listed on the survey. Several program directors stated that students may not consider joining a professional society to be a priority because technologists and therapists demonstrate poor role modeling during clinical education, and some faculty feel indifferent about professional associations. Students witness this apathy and then struggle seeing the benefit to joining a professional organization. One participant wrote, "I've heard stories of RTs being treated as nonessential personnel during the COVID-19 pandemic. I hope this is a wake up call for all professionals to join societies, and hopefully, students will see the urgency." Complacency was also listed by a program director as another obstacle. Regarding potential strategies, a program director stated, "If I think time is the issue, then none of the listed options will work." Several participants acknowledged the need for educators to promote professional behavior, including joining professional organizations, and suggested that associations provide more resources for educators to use to encourage student participation. As mentioned, Michael et al.

(2016) emphasized that educators are in a position to model appropriate professional behavior for students to observe and encourage joining and being an active member in a professional society.

Limitations

This research study was limited in several ways. Because of the sample size and sampling technique, caution should be made when generalizing the findings to all program directors. The small sample size is most likely a direct result of distributing the survey during the COVID-19 pandemic when many educators were working from home. In addition, the convenience of surveying program directors from JRCERT-accredited programs is limiting since not all programs seek programmatic accreditation through the JRCERT. The use of self-reported data also limits this study; however, the researchers assumed that program director participants would answer honestly regarding student membership in professional organizations in their respective programs. Finally, bias among program director participants should be mentioned as a limitation, considering some may be actively involved in a professional society and see the value of membership, and others may have negative impressions or experiences with an organization or their affiliate society.

Conclusion

The results of this study revealed that more than half of program director participants encouraged their students to join professional organizations, and less than half of the programs represented in this study required students to join a professional association, mainly an affiliate society. Incidentally, program directors in this study suggested that less than half of their students continue membership in professional societies after graduation. More work and additional encouragement in this area are needed to potentially increase the number of students who continue their membership after graduation.

Program directors perceived the greatest benefit of student membership in professional organizations to be access to educational resources, and the greatest obstacle was perceived to be membership cost. Program directors indicated the most effective strategy to attract more student members in professional organizations is lowering costs. It is suggested that those professional organizations and affiliate societies that do not offer educational resources consider providing such media that benefit medical imaging and radiation therapy students. Although some professional organizations and many affiliate societies offer discounted membership rates for medical imaging and radiation therapy students, other routes to reduce costs should be explored.

Future research should attempt to collect medical imaging and radiation therapy students' perceptions of benefits and obstacles related to membership in professional organizations. Furthermore, the research should address factors that motivated and/or deterred them from joining medical imaging and radiation therapy professional organizations. The future research project should also inquire what attracted medical imaging and radiation therapy students to join a particular professional organization.

This study was made possible by a research grant from the Association of Educators in Imaging and Radiologic Sciences.

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Radiologic Science & Education

The Journal of the Association of Educators in Imaging and Radiologic Sciences

Radiologic Science & Education (RS&E) is the journal of the Association of Educators in Imaging and Radiologic Sciences (AEIRS) and is refereed by an independent Editorial Review Board (ERB) of eminent scholars in radiologic sciences education. Articles are accepted across a wide range of scientific investigations, commentaries, and research in subjects pertaining to the purposes of the Association.

These purposes include advancing the knowledge base of imaging and radiologic sciences, establishing and maintaining high standards of education, exchanging educational concepts and methodologies at all levels in imaging and radiologic sciences, stimulating interest in academic advancement and teaching, advancing the profession of imaging and radiologic sciences and related areas through research, dissemination of works, and fostering mutual cooperation and understanding between imaging and radiologic sciences educators and other groups. Included among these purposes are investigations in the imaging and radiologic sciences, education, professionalism, international issues in the imaging and radiation sciences, and other items of potential interest to the membership of AEIRS.

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Manuscripts should be submitted to Jeffrey Legg, chair of the journal's Editorial Review Board (ERB), by email: jlegg@vcu.edu. The manuscript will be blinded and sent to the Editorial Review Board. The chair of the ERB will contact the corresponding author with reviews and recommendations approximately 8 to 12 weeks after manuscript submittal.

A signed, physical Copyright Stipulations statement (see below) will be requested by the ERB chair for all manuscripts accepted for publication. At that time, the Copyright Stipulation should be emailed to Jeffrey Legg, chair of the journal's Editorial Review Board (ERB), at: jlegg@vcu.edu.

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Manuscript Format

Manuscripts will be accepted for consideration as follows:

- Types of articles published in *RS&E:*
  - ***Research Report:*** A full-length report of original research that advances educational theory or demonstrates insights and/or relationships in educational practices in the imaging and radiologic sciences. A research report must contain a title page, introduction, review of the literature, hypothesis, methodology, findings, and discussion.
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  - ***Case Report:*** A detailed description of the management of a unique education-related problem. Case reports must include the following four sections: background, case description, outcomes, and discussion. The description of the case includes the relevant characteristics of the situation, examination/evaluation methods, a description of the interventions that were provided, and the outcomes.
  - ***Technical Note:*** A description of a new instrument, procedure, or technology relevant to the practice of imaging and radiologic science that is useful for educators in the field.
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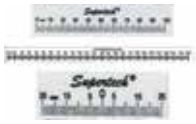

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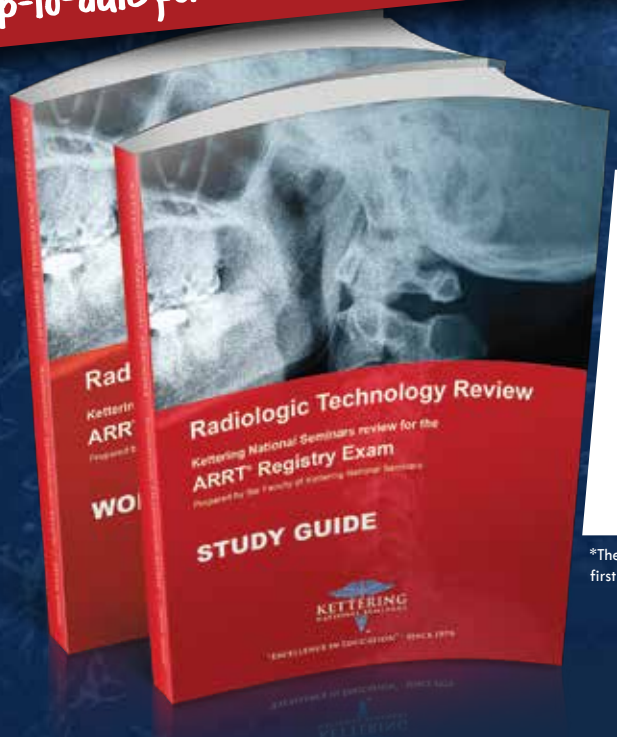

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