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Residents' Introduction to Comparative Effectiveness Research and Big Data Analytics

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THE RATIONALE FOR AN AMERICAN INSTITUTE FOR RADIOLOGIC PATHOLOGY MINI-COURSE IN COMPARATIVE EFFECTIVENESS RESEARCH

As US health care policy continues its push toward value- and quality-based care, the need is greater than ever for health outcomes research and evidence-based standards for imaging utilization [1,2]. Defining the performance of diagnostic imaging in disease detection and characterization continues to be fundamental, but the current scientific and economic climate demands comparative assessments of impact on health outcomes and added value to patient care. The answers regarding the best uses of imaging are woven from the context of the available evidence, and “big data” is fast becoming a driving force for the questions of high clinical relevance today, as well as for precision medicine and deep learning applications tomorrow [3,4]. Comparative effectiveness research (CER) methods have been underemphasized in radiology, however, and require specialized training that has not been broadly accessible to the imaging community.

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To help close this gap, the Value of Imaging Through Comparative Effectiveness (VOICE) Research Program was developed to provide imagers in training with exposure to CER and big data analytics research. This educational program brings together experts from multiple institutions in radiology, bioinformatics, decision science, and health economics to teach a yearlong set of courses for imagers in a mixed online and in-person format. In addition, one of the major aims of this National Institutes of Health (NIH)–funded program is to introduce these areas of research to diagnostic radiology residents. We therefore designed a 2-day mini-course at the American Institute for Radiologic Pathology (AIRP) during each 4-week radiology-pathology correlation course, beginning in August 2016. This course, attended by approximately 95% of all North American radiology residents, as well as residents and fellows from Canada and other parts of the world, provides a unique venue to introduce key CER concepts in person to the target audience [5].

There are many important reasons to extend these educational efforts to trainees on a national level. Among these, the rationale for training radiology residents in CER and big data analytics might be captured in three major themes: (1) the need for more imaging researchers in this critical field, (2) the need for more and earlier exposure to research methods used in CER, and (3) the opportunity for the next generations of radiologists to anticipate challenges and drive health policy research and decisions.

A mini-course cannot comprehensively address these thematic interests, and instead, our focus is on resident engagement in pathways to CER. In this article, we describe our work to organize and present the mini-course to residents at the AIRP and summarize survey responses gathered to date from the participants about their experiences in the course.

COURSE ORGANIZATION AND PRESENTATION

The AIRP mini-course is called Introduction to Comparative Effectiveness Research and Big Data Analytics for Radiology and was designed to provide introductory lectures on CER and big data research, to provide vignettes about recent research experiences and reception to novel findings, and to describe our career paths in CER. Each mini-course is offered on the first Tuesday and Wednesday of each 4-week long AIRP resident course, immediately after the usual daytime sessions. Registrants for the AIRP course receive an e-mail invitation 1 month before their start date to sign up for the course. Dinner is provided for the attendees on both evenings. In addition, attendees who complete both days of the mini-course are recognized with a certificate and an e-mail to their program directors regarding their participation.

One of the challenges of including more educational lectures at the AIRP is the already demanding daily schedule. Because this mini-course is meant to introduce residents to core principles and topics in CER and encourage engagement at the end of lengthy didactic days, the mini-course takes the format of high-yield learning points, including real-life case examples and timely policy topics. The brief lectures were presented in a TED Talk–like format, stressing attention and engagement over formal structure. VOICE program faculty members focused on their own recent efforts, reflecting on how their work has influenced

policy-level decisions and current practice. Given the brevity of the mini-course, there is no formal evaluation of residents' comprehension of lecture content.

The most recent series of lectures have included the following topics:

- current machine learning initiatives and their likely impact on the radiologist's role [6],
- breast density legislation and the cost-effectiveness of supplemental screening technologies [7],
- the impact of CER on the future of radiology [8,9],
- measuring the value of advanced imaging on costs and outcomes [10,11],
- basic concepts in decision science and medical decision making [10], and
- exploring patient-centered care in radiology [12].

Each 2-day session concludes with a career panel over coffee and dessert to answer any questions posed by the participants about pathways to performing CER or pursuing a research career. Examples of resident-driven conversations in the sessions so far include whether there is need for an advanced degree to perform CER, how to develop a research career as a junior faculty member, and how to find research opportunities in outcomes research.

SURVEY FOR COURSE PARTICIPANTS

A survey was designed to capture residents' opinions after their mini-course, covering five major areas of interest: (1) how helpful the mini-course was as an introduction to CER and big data research (on a 5-point scale, with 5 indicating very helpful), (2) whether the residents would likely pursue further educational or research opportunities in CER, (3) whether residents had prior educational or research exposure to CER, (4) whether a mentor was available for CER at their home institutions, and (5) the importance of CER and big data research to the field of radiology (on a 5-point scale, with 5 indicating very important). Additional questions included resident characteristics, including gender and year in training, and whether the participants' residency programs were at large academic or community hospitals.

Survey responses have been collected from the two mini-course sessions that have been completed to date, completed by 49 of 118 attendees (42%). Seventy-six percent of respondents (37 of 49) were men, 24% were women, and 92% of trainees (45 of 49) were in their third year of residency. Eighty percent of residents (39 of 49) indicated that their training programs were at large academic medical centers. Fifty-nine percent of the residents (29 of 49) had prior CER or health services research exposure. Thirty-seven percent of residents (18 of 49) reported prior educational exposure to CER, mostly in the form of lectures at their home institutions. Ninety percent of residents (44 of 49) reported that the course was helpful or very helpful, and 94% of participants (46 of 49) felt that the lectures were of high or very high quality. Eighty-two percent (40 of 49) reported that they planned to pursue additional educational or research training in CER or big data analytics after the

course, but only 65% of all participants (32 of 49) knew of radiologists at their institutions who could serve as mentors. Finally, 98% of respondents (48 of 49) felt that health services and big data research are important or very important for the future of radiology.

FURTHER RESOURCES FOR RESIDENTS

In panel discussions, we draw attention to further educational resources available for training in CER: the 1-year VOICE research training program and the RSNA's educational modules. As the sessions continue to be offered, we will update recommendations with new resources that may become available. In terms of research experience, residents are encouraged to proactively seek CER projects in areas that naturally interest them and to seek faculty mentors at their own or other institutions. The 1-year VOICE research program also has a 1-year mentoring program available for participants to pursue specific research projects with experts matched to their interest.

FUTURE RESIDENT FOLLOWUP AND INVOLVEMENT

Even though this mini-course is meant as an initial exposure to CER and big data analytics among radiology residents, its impact remains unknown. We plan on following up with participants through an e-mail survey to determine how many residents go on to pursue CER research during residency and in their future faculty appointments, apply to the 1-year VOICE research program or a similar program as a result of this initial exposure, or succeed in publishing CER research.

The VOICE program, including the AIRP course, is supported by a NIH grant, financial and in-kind support from the ACR and RSNA, as well as philanthropy from several industrial partners. Although our NIH funding is limited to 3 years, we hope that the other funding will continue, allowing this program to endure. With continued positive feedback and active engagement on the part of radiology residents, this novel introduction to CER can continue to serve an unmet need in radiology education.

Implementing this course has impressed upon us the residents' outlook on innovation, adaptability, and their self-initiated interests in academic radiology—in need of more widely available mentoring and educational exposure to CER. These exposures will be of vital importance to align radiology trainees' abilities with the changing demands of the health care system, advance the evidence basis for imaging-based outcomes, and to prepare future radiologists as leaders in health policy decision making, particularly as it relates to imaging utilization.

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References

1. Institute of Medicine. Crossing the quality chasm: a new health system for the 21st century. Washington, District of Columbia: National Academies Press; 2001.
2. Selby JV, Beal AC, Frank L. The Patient-Centered Outcomes Research Institute (PCORI) national priorities for research and initial research agenda. *JAMA*. 2012; 307:1583–4. [PubMed: 22511682]
3. National Research Council, Committee on a Framework for Developing a New Taxonomy of Disease. Toward precision medicine: building a knowledge network for biomedical research and a new taxonomy of disease. Washington, District of Columbia: National Academies Press; 2011.
4. Alyass A, Turcotte M, Meyre D. From big data analysis to personalized medicine for all: challenges and opportunities. *BMC Med Genom*. 2015; 8:33.
5. American Institute for Radiologic Pathology. Four week radiologic pathology correlation course. Available at: <http://www.airp.org/resident-courses/four-week-course>. Accessed October 14, 2016
6. Chockley K, Emanuel E. The end of radiology? Three threats to the future practice of radiology. *J Am Coll Radiol*.
7. Lee CI, Cevik M, Alagoz O, et al. Comparative effectiveness of combined digital mammography and tomosynthesis screening for women with dense breasts. *Radiology*. 2015; 274:772–80. [PubMed: 25350548]
8. Hirsch JA, Schaefer PW, Romero JM, Rabinov JD, Sanelli PC, Manchikanti L. Comparative effectiveness research. *AJNR Am J Neuroradiol*. 2014; 35:1677–80. [PubMed: 24874531]
9. Pandharipande PV, Gazelle GS. Comparative effectiveness research: what it means for radiology. *Radiology*. 2009; 253:600–5. [PubMed: 19952024]
10. Kang SK, Mushlin AI. Designing radiology outcomes studies—essential principles. *Acad Radiol*. 2016; 23:898–904. [PubMed: 27066756]
11. Fryback DG, Thornbury JR. The efficacy of diagnostic imaging. *Med Decis Making*. 1991; 11:88–94. [PubMed: 1907710]
12. Kang SK, Fagerlin A, Braithwaite RS. A roadmap for personalized care in radiology. *Radiology*. 2015; 277:638–43. [PubMed: 26599924]