ORIGINAL ARTICLE

# Supporting Imagers' VOICE: A National Training Program in Comparative Effectiveness Research and Big Data Analytics

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## Abstract

Provided methodologic training, more imagers can contribute to the evidence basis on improved health outcomes and value in diagnostic imaging. The Value of Imaging Through Comparative Effectiveness Research Program was developed to provide hands-on, practical training in five core areas for comparative effectiveness and big biomedical data research: decision analysis, cost-effectiveness analysis, evidence synthesis, big data principles, and applications of big data analytics. The program's mixed format consists of web-based modules for asynchronous learning as well as in-person sessions for practical skills and group discussion. Seven diagnostic radiology subspecialties and cardiology are represented in the first group of program participants, showing the collective potential for greater depth of comparative effectiveness research in the imaging community.

**Key Words:** Comparative effectiveness research, big data, research methods, research training

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## THE RATIONALE FOR A NATIONAL PROGRAM IN COMPARATIVE EFFECTIVENESS AND BIG DATA RESEARCH

In recent decades, medicine has owed much of its progress to growth in the availability and options for diagnostic testing. However, consequences have included increasingly complex clinical decision making and rapid increases in costs, particularly those associated with use of medical imaging [1]. Health care policy has thus emphasized value, quality, and improved health outcomes through care, making it clear that these are critical areas of research [2]. Imagers can appraise the evidence basis accordingly, for example by examining the most effective technique for particular tests, comparing tests' performance, assessing the impact of tests on patient health outcomes, and quantifying the added value to patient care. And as more biomedical data are generated at the levels of both individuals and populations, investigators are looking to "big data" and applications of big data analytics for breakthroughs in precision medicine and deep learning [3,4].

Despite the radiology community's general interest in these important areas, specialized methodologic training in comparative effectiveness research (CER) and big data has not been readily available to imagers [5]. Introductory presentations on CER methods are available through the RSNA [6], and individual institutions' postgraduate training courses may include CER methods, though not necessarily specific to imaging or medicine. To address the need for a training program dedicated to imagers, our multidisciplinary, multi-institutional team of

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investigators and leaders in radiology, decision science, health economics, and bioinformatics developed a practical and widely accessible, yet rigorous, training program.

The Value of Imaging Through Comparative Effectiveness (VOICE) Research Program includes five core courses with lectures, hands-on exercises, and instructor-led group discussions through mixed web-based and in-person learning. In addition to fulfilling the immediate need for larger numbers of imagers understanding and performing CER and big data analytics, a long-term goal of developing the VOICE program was to better equip the radiology community to improve clinical practice guidelines and inform health policy decisions. We describe efforts to develop and implement this national program and summarize participant survey responses for the courses completed to date.

## COURSE DESIGN AND IMPLEMENTATION

Because the logistics of an in-person course for full-time radiology faculty members who have daytime as well as evening and weekend (call) time commitments would be nearly impossible, we explored a predominantly online or distance-learning approach. Over a 3-year period, more than 25 million people globally have enrolled in massive open online courses (MOOCs) [7]. MOOCs are offered by many organizations, such as Coursera (www.coursera.org), Khan Academy (www.khanacademy.org), and EdX (www.edx.org), on a variety of topics. MOOCs are taught almost exclusively online with variable interaction with faculty members using recorded lectures, online homework assignments, and electronic communications. Criticisms of MOOCs are the sometimes limited access to faculty members when learners have questions and limited interaction with other learners. One popular example is the National Health Service's virtual, global, open-access course on change management in health care (http://theedge.nhsiq.nhs.uk/school/). The program enrolls approximately 2,000 people annually. It creates a virtual classroom discussion through the use of social media and chats during the live webinars, and more recently, there have been small-group discussions after each webinar module. In radiology, the ACR has offered leadership training through the Radiology Leadership Institute (www.radiologyleaders.org) through a combination of online and in-person training.

The VOICE program consists of five courses spanning a total of 1 year, each involving approximately 10 weeks of web-based learning followed by a 2-day weekend session attended in person. Most in-person sessions are held at the NYU Medical Center, while one is scheduled to be held at the RSNA for the first year the program is held. Every course instructor is an experienced educator and principal investigator with research funding in the area he or she teaches, with backgrounds in decision analysis, cost-effectiveness, evidence synthesis, or biomedical informatics. The course tuition is $2,500 per participant. Upon completion of the yearlong program, an optional yearlong mentored research experience can be tailored to the participant's area of interest (at an additional cost of $5,000). Neither NYU Medical Center nor the individuals involved with the program have opportunity for financial gain from any aspect of the program.

The five VOICE courses include Decision Analysis, Cost Effectiveness Analysis, Evidence Synthesis and Systematic Review, Principles of Big Data Analytics, and Applications of Big Data Analytics. To date, the first two courses have been completed.

Courses were designed for an audience of clinical imagers, whose routine schedules leave limited time to join scheduled webinars or lectures. Asynchronous learning on Brightspace (D2L Corporation, Kitchener, Ontario, Canada), a learning management system software platform, provided the flexibility to view lectures and complete exercises at an individualized pace. Although a schedule was recommended for completion of each subsection and assignment, a timeline was not strictly enforced. Practical skills with software were emphasized at the outset. The web-based assignments for the first two courses, Decision Analysis and Cost Effectiveness Analysis, were performed using a widely used software program for decision-analytic modeling called TreeAge Pro (TreeAge Software, Williamstown, Massachusetts). Participants were encouraged to supplement learning by attending online "office hours," posting questions on the web forum, and contacting the teaching assistants or instructors directly with questions.

The in-person session provided a review of the major concepts covered by the online materials, intensive hands-on experience using the software program, and opportunity for group discussions critiquing major publications on the comparative effectiveness of imaging tests. In addition, participants were invited to submit their individual research questions related to the course methods for exploration during the 2-day session. Breakout sessions at each course enabled high-level, focused examination of such submitted topic in a small group setting with the course instructor.