RSNA 2009 Education Scholar Grant
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NOTE: Personal information for the applicant and other investigators has been removed from this sample application.

Title:
The Iinfluence of Evidence Based Teaching Methodology on Appropriate Imaging Utilization in a Large Academic Radiology Department

Abstract:
Diagnostic imaging has become widely available and plays an increasing role in clinical diagnosis and therapy. Inappropriate imaging utilization is also increasing at a high rate as referring clinicians are often unsure what test to order and when. Such use is costly and can delay diagnosis and therapy (thus decreasing patient throughput) and exposes patients to unnecessary ionizing radiation. Appropriateness criteria for imaging tests are available but are not widely known or easily applied. The long term objectives of this research (or work) are to increase appropriate utilization of cardiothoracic imaging studies in hospital settings. The short term objectives of the study described herein are to increase appropriate utilization of cardiothoracic imaging in our tertiary care academic center, by disseminating appropriateness information and imaging pathways, via formal and informal teaching. The first specific aim of this proposal will be to devise clinical imaging pathways for cardiothoracic imaging modalities, using evidence based guidelines. Dr Kelly would like to develop explicit guidelines (similar to the ones that exist for pulmonary embolism) for patient work-up for cardiothoracic diagnostic imaging in the clinical scenarios of cough, shortness of breath and chest pain (cardiac, atypical and non cardiac). The second specific aim is to educate clinical and radiology colleagues, using formal and informal teaching methods such as short didactic presentations, handouts on important points, the use of flow charts, and small group case based interactive sessions. The outcome measure is increased clinicians' and radiologists' use of appropriateness criteria for cardiothoracic imaging studies in their practice. This is expected to improve health care by improving diagnosis and therapy in patient care, increase reimbursements, decrease costs, increase efficiency in the imaging department, increase patient throughput in clinical departments and decrease radiation burden. The radiology and other clinical departments will benefit from improved teaching efforts.

Percent of Time Dedicated to this Project:
25%. One day a week for two semesters a year (10%) to attend the Masters Concentration in Medical and Professional education and three days a month (15%) to complete assignments, research the literature on appropriate imaging pathways and to prepare educational materials and handouts.

Priority Statement:
The Educational Scholar Grant will allow Dr Kelly to pursue her goal of bringing evidence-based imaging guidelines to radiology and other clinical specialties. Dr Kelly has vast experience as a pulmonology, cardiology, gerontology, endocrinology and rheumatology physician; and as a radiologist. As a physician (non-radiologist) in public health services abroad, Dr Kelly had to make many patient-related clinical decisions with limited resources. This taught Dr Kelly the necessity to find the best available evidence to justify treatment and diagnostic imaging decisions. As a radiologist in a public health service abroad, Dr Kelly saw another clinical care perspective, in deciding which imaging test to perform for whom and when, given limited resources.

There is insufficient evidence and guidelines in most areas of diagnostic imaging utilization. Currently there are publications which list the appropriateness of various tests for clinical scenarios (American College of Radiology Appropriateness Criteria and Royal College of Radiologists "Making the Best Use of Clinical Radiology Services") (1, 2). However, these documents are general and do not advise on the next best test, given a specific clinical scenario and initial test results. Explicit published guidelines for the work-up of suspected pulmonary embolism take into account patient variables, clinical signs and the results of initial testing (3-6). They also cover specific situations such as renal impairment, pregnancy and contrast material allergy (3, 4, 6). Dr Kelly plans to develop similar user-friendly guidelines for patient work-up for diagnostic imaging in the clinical scenarios of cough, shortness of breath and chest pain. Since her arrival at the University of Michigan, Dr Kelly has received annual teaching awards from the radiology residents. However, Dr Kelly has had no formal instruction in teaching methodology and wishes to improve that. Dr Kelly has demonstrated enthusiasm for evidence-based practice and teaching by attending the Oxford Centre of Evidence-Based Medicine course for teaching Evidence Based Medicine in 2007. There, Dr Kelly participated in different forms of small group teaching and would like to

build on that foundation. Dr Kelly co-chairs the Evidence Based Medicine Journal Club for radiology residents, using a mixture of didactic and interactive teaching techniques. In this endeavor, one faculty is a facilitator, and the other gives short formal talks and poses questions. However, Dr Kelly feels that the teaching approach would benefit from formal instruction in teaching professional and medical personnel. The Masters Concentration in Medical and Professional Education includes courses on teaching methodology and technology in teaching and can be taken in conjunction with a full-time occupation. This masters program will give Dr Kelly the strong foundation that she needs to bolster her teaching efforts.

The timetable for Dr Kelly's educational program and institution of searches for evidence based guidelines in the areas of chest pain; dyspnea and cough will first allow development of teaching materials based on pulmonary embolism work up guidelines. These will include PowerPoint presentations, handouts, flowcharts, summaries, reference lists, and lists of electronic resources. Dr Kelly wishes to disseminate the material to radiology and clinical colleagues via formal lectures and informal small group case based interactive teaching. Dr Kelly will start by disseminating the guidelines on pulmonary embolism work up with the emergency department, and has agreement from the emergency physicians to do so (Dr Desmond).

Next, Dr Kelly will consult the literature, searching for the best evidence on the imaging work up of chest pain, dyspnea, and cough. Dr Kelly is versed in searching the literature, having published meta analyses on contrast nephropathy, the solitary pulmonary nodule, and sentinel node mapping in mainstream medical and radiological journals (7-10). Dr Kelly is familiar with PubMed and Medline and will use these for the initial search. Dr Kelly will enlist the help of librarians at the Taubman Medical Library to ensure that information systems (synopses and syntheses) are efficiently and thoroughly searched. Dr Kelly has given lectures and workshops (11-19) and is also publishing papers on performing literature searches for evidence (20, 21). In searching for and developing guidelines, Dr Kelly will consult with colleagues in her department with an interest in evidence based imaging (Drs Carlos, Cronin, Dwamena and Kazerooni) and at other centers for Evidence Based Radiology within the US (Brigham and Women's Hospital, University of Iowa, University of Washington, Miami Children's Hospital, Indiana University) and abroad (McMaster University, Toronto General Hospital, St Vincent's University Hospital, Ireland and the Centre for Evidence Based Medicine, Oxford, England.). Where the evidence is lacking, Dr Kelly will seek a consensus agreement. Another reason to constantly consult with colleagues, particularly elsewhere, is to avoid duplication of evidence searches, pool the evidence obtained, have a single set of guidelines, and optimize use of human and other resources. The radiology and clinical departments will benefit from the guidelines that Dr Kelly will develop and her teaching abilities. In addition, clinical colleagues are seeking help at the point of test order entry in order to comply with insurance company requirements. Insurance companies now demand more explicit evidence to justify reimbursement for imaging. Dr Kelly also works on the Blue Cross Blue Shield of Michigan Physician Group Incentive Program (pay for performance) Radiology Program, which includes targeting the appropriate use of imaging modalities (including CT for Pulmonary Embolism) in the Emergency Department.

The guidelines will assist clinicians and radiologists in choosing the appropriate diagnostic imaging modalities for their acutely ill patients. This will enable faster imaging, improve clinical diagnosis, allow earlier institution of therapy, increase patient throughput, improve efficiency and increase reimbursements. Dr Kelly's formal training in teaching and education will improve dissemination and retention of the information to radiology and other clinical colleagues. The overall objective, to improve cardiothoracic health care will be realized once the guidelines are widely available, and are accepted in the radiology community in general. In the long term, Dr Kelly hopes to collaborate with faculty in other areas of radiology to develop similar evidence based guidelines and teaching materials.

Detailed Education Plan:

Dr Kelly's program for the Education Scholar Award will concentrate on three areas.

1. Improving the teaching skills of the recipient. Dr Kelly will pursue the Masters Concentration in Medical and professional Education at the School of Education, University of Michigan in order to improve her teaching skills.

2. Performing searches for the evidence to produce guidelines for the imaging work up of shortness of breath, cough and chest pain, and Developing Teaching Materials. As a student of the school of education, Dr Kelly will work to develop teaching materials based on the existing evidence based guidelines for pulmonary embolism, and the guidelines that she will produce (imaging work up for shortness of breath, chest pain, and cough) in collaboration with her colleagues at the University of Michigan and elsewhere.

3. Dissemination of evidence based imaging guidelines for imaging work up for shortness of breath, chest pain, and cough to radiology and other clinical colleagues. The evidence based guidelines will be disseminated to colleagues via a mixture of formal and informal teaching methods. Direct feedback will be obtained from the recipients/students using evaluation forms. In addition, utilization patterns (the percentage of appropriate

utilization for advanced diagnostic imaging, starting with pulmonary embolism rule-out CT) will be studied before and after the dissemination of the guidelines.

Improving the teaching skills of the recipient.
This will be enabled by registering for advanced training in education at the Masters Concentration in Medical and Professional Education at the University of Michigan (22). Many physician colleagues have attended this course which can be taken while working full time. This advanced training in education will provide a conceptual and scholarly foundation for Dr Kelly's educational responsibilities, and to enhance herleadership potential. Briefly the course components include:

Core curriculum
561. Introduction to Higher Education (3 credits)
Provides an overview of the postsecondary education system in the United States; examines the major features of this system and explores its effects; explores effects of various professional and disciplinary perspectives on the study of postsecondary education viewed as an interdisciplinary field.

662. Learning and Development in Higher Education (3 credits)
Examines patterns of intellectual, social and emotional development and change among older adolescents and adults; reviews and research on learning and development among college and university students.

One semester administrative practicum
777. Administrative Practicum in Higher and Continuing Education (3 to 6 credits).
ED 777 is a special seminar designed for master's students to reflect upon the connections between out-of-the-classroom practice and in-classroom learning. Emphasis will be placed on developing critical assessments of current literature, evaluation of practice performance, and the formulation of reflective modes of thought. Students must be placed in a supervised field setting. Throughout their programs of study, students are encouraged to be involved in career-related professional practice. ED 777 is a special seminar designed for master's students to reflect upon the connections between out-of-the-classroom practice and in-classroom learning. This forum allows students to reflect upon their professional experiences and consider the implications for their field of practice as well as their own professional development and careers.

Students typically begin internships in Fall and Winter semesters of their first year, ED 777 will meet periodically during the Fall and Winter Semesters of year 1, but students formally register for the class only in the Winter semester.
Concentration courses (12 credit hours)

882. Introduction to Medical and Professional Education (3 credits)
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Students in this course will explore professional education in the U.S., including medicine, dentistry, law, business, nursing and pharmacy. Topics to be covered include history (of professional education), curriculum, internship and practice, legal issues, accreditation and governance, and policy and funding. Students will participate in a constructivist approach to learning the material; i.e., the approaches will be active and will include peer sharing and teaching, and peer feedback. Underlying theories and practices related to education in specific disciplines will be presented by experts in each of the fields, and students will learn through interactive presentations accompanied by in-class activities and an out-of-class project chosen by each student. The goal of the course is to introduce students to the disciplines that comprise professional education, and to the educational methods and the current management, legal and policy issues within each of the disciplines.

883. Instructional Methods in Professional Postsecondary Education:Theory and Application (3 credits).
Professional education, with its focus on introducing students to simulated and authentic environments in which they will be practicing, has historically employed active, practice-based learning formats that include internships, clerkships, interactions with standardized patients/clients, computer- and mannequin based simulation, and case- or problem-based learning. The goal of this course is to introduce students to research and theory underlying these active, practice-based instructional methods, and to apply these methods across higher and professional education including medicine, dentistry, nursing, law and pharmacy. Along with this broad, multi-disciplinary approach to the course material, students will also study in depth a particular discipline and the common instructional methods within that discipline. Learning methods will be active and student-centered, and will include peer teaching, peer feedback and self-assessment.

And two of the following:
878. Professional Education in Colleges and Universities. (3 credits)
Analyzes education for the professions provided by colleges and universities, professional associations, and other private or governmental organizations. Includes such topics as roles of professions, professional socialization, external and

internal forces shaping education programs, needs of professional practitioners, methods of instructional delivery, and management of continuing professional education activities. Draws from current research and University resources to develop a profile of issues and trends across professional occupations.

860. Technology in Higher Education. (3 credits)
Explores the various uses of technology in higher education, with a focus on the use of technology in teaching, research, and administration. Analyzes how the use of technology affects faculty, students, and others in colleges and universities, with an examination of issues related to student outcomes, faculty incentives, virtual/distance education, equity, intellectual property public policy, and the management of technology. Students will have opportunities for hands-on use of technology.

861. Human Resource Development in Postsecondary Education. (3 credits)
Deals with the responsibility of administrators for faculty and non-faculty personnel matters in institutions with varying types of governance, ranging from collective bargaining to collegial decision-making. Discusses administrators' goals, strategies, and behavioral styles in providing leadership for personnel management. Also discusses administrative responsibility for emerging modes of administration and faculty development and evaluation.

868. Philosophy of Academic Leadership. (3 credits)
Furnishes the opportunity for each student to identify and defend a set of principles that will guide his or her action as an academic administrator on the fundamental issues of higher and continuing education. Analyzes classic philosophical works and applies them to such issues as right of access to postsecondary education, the nature of a liberal education, the participation of colleges and universities in social issues, and ethical obligations in research.

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Research Preparation Requirement
695. Research and Educational Practice. (0.5-3 credits)
Provides an overview of research methods used in educational inquiry. Enables students to review a variety of research studies done in education, to become familiar with techniques used in their conduct, and to acquire facility in interpreting them. CSHPE Master's students are expected to understand several approaches to research and their applications in higher education. The overall goal is to develop competencies in critically reviewing the professional literature and interpreting the results of inquiries that utilize a variety of research methods.

REFERENCES

1. American College of Radiology. ACR Appropriateness Criteria 2008 Version. Accessed on November 17, 2008. Accessed at: http://www.acr.org/SecondaryMainMenuCategories/quality_safety/app_criteria.aspx
2. Royal College of Radiologists. Publications and Guidance. “Making the best use of Clinical Radiology Services” Sixth edition, 2007, Accessed on November 17, 2008. Accessed at http://www.rcr.ac.uk/publications.aspx?PageID=310&PublicationID=261.

Budget:
The funds provided by the RSNA for this work will be used to pay for 25% salary support over the two year period, July 2009 to June 2011. Tuition for classes is calculated at $1241 per credit at the School of Education for the first credit and $887 for credits thereafter. The Masters Concentration in Medical and Professional Education is eight courses at three credits each, that is 24 credits in total. Dr Kelly will take two courses (for three credits each) per semester for four semesters in total (two semesters per year) at $24,220 (or $12,110 per annum). There are mandatory fees (registration, legal, student assembly and government) of $95 at the start of each semester. Inflation of an additional 5% per year has been added to these figures. Software and book purchases at an expected annual cost of $2000 will be purchased using Dr Kelly’s own Professional Development funds.

Total Budget = $75,000
Part time salary and fringe support = $ 62,890
Masters Concentration in Medical and Professional Education = $ 12,110

Other Sources of Support: Professional Development Funds. Dr Kelly will also apply for internal awards at the University Of Michigan Medical Center and the School of Education.