

Funding Research in Emergency Diagnostic Imaging: Summary of a Panel Discussion at the 2015 Academic Emergency Medicine Consensus Conference.

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Funding Research in Emergency Diagnostic Imaging: Summary of a Panel Discussion at the 2015 *Academic Emergency Medicine* Consensus Conference

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Abstract

As part of the 2015 *Academic Emergency Medicine* consensus conference “Diagnostic Imaging in the Emergency Department: A Research Agenda to Optimize Utilization,” a panel of representatives from the National Institute of Health’s Office of Emergency Care Research, the National Institute of Biomedical Imaging and Bioengineering, the Agency for Healthcare Research and Quality, and the Patient-Centered Outcomes Research Institute was assembled to discuss future opportunities for funding research in this particular area of interest. Representatives from these agencies and organizations discussed their missions, priorities, and how they distribute funding. They also addressed questions on mechanisms for new and established researchers to secure future funding.

Introduction

The 2015 *Academic Emergency Medicine (AEM)* consensus conference was focused on creating a future research agenda for diagnostic imaging in the emergency department (ED). As part of the conference, representatives of a diverse group of funding agencies were assembled to serve on a panel to discuss future funding opportunities in emergency

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This article reports on a panel discussion at the 2015 *Academic Emergency Medicine* consensus conference, “Diagnostic Imaging in the Emergency Department: A Research Agenda to Optimize Utilization” held on May 12, in San Diego, CA

diagnostic imaging. The goal of this panel discussion was to inform conference attendees of opportunities and strategies to secure future funding in this particular area of interest.

Participating Funding Organizations

Office of Emergency Care Research (OECR): Jeremy Brown, MD, Director

The OECR is part of the National Institutes of Health (NIH) and was established in 2012 to help coordinate and foster emergency care research across the many institutes of the NIH.¹ The OECR serves to catalyze and coordinate emergency care research and training across the NIH. One of its primary goals is to help find an appropriate funding partner for researchers in emergency care.² Dr. Brown and his office are excellent resources for those who do not have an established relationship with the NIH.

Comments and recommendations:

- There is no institute within the NIH dedicated specifically to emergency care research. This makes it difficult at times for emergency care researchers to align their projects with the goals of specific institutes, which are organ-, population-, or disease-specific. Because of this, it is best to think about a specific disease, organ, or population when applying for funding.
- One way to maximize interest in a grant proposal is to involve multiple principal investigators (PI), particularly if the study involves a single disease or organ (e.g. including a neurologist and/or neuroradiologist as co-PI on a study of acute stroke evaluation, or including a gastroenterologist and body radiologist as Co-PIs on a study evaluating imaging evaluation of patients with inflammatory bowel disease).
- The OECR can be particularly helpful for those researchers who do not have preexisting relationships and who may need assistance finding the best contacts within the NIH. The needs of a potential investigator will vary; some may have had no prior contact with NIH, and the OECR can help navigate between the various institutes, and to find a program officer with an appropriate background. Some projects may require a reviewer with a specific emergency care background, and the OECR can, in conjunction with the Center for Scientific Review, help insure that appropriate peer review occurs. In addition, because imaging studies are often disease-agnostic, the OECR can also help explain the scientific need to institutes that are disease- or organ-focused. For the researcher who has an established relationship with an institute within NIH, ideas for grant proposals should first be discussed with the appropriate program officer.
- Remember to request a reviewer with the necessary emergency medicine (EM) or radiology expertise. Although a specific reviewer cannot be requested by name, a submitter can request in the cover letter that the grant be reviewed by someone with content expertise in a particular area.
- Between 2011 and 2014, there were 113 new and 221 continuing emergency care research projects funded by the NIH that received \$100 million and \$163 million, respectively. The most common funding mechanism was an R01 grant. Of these

studies, 37% were from EM, with the remainder coming from other specialties but spanning EM topics. The funded studies evaluated the role of diagnostic imaging in the ED in two conditions: stroke and chest pain. Of the 113 new projects, three examined the role of computed tomography (CT) or magnetic resonance imaging (MRI) in stroke prediction. Of the 221 continuing projects, one studied the role of MRI in ED patients with elevated troponin, and a second examined the role of CT in the prediction of recanalization in acute ischemic stroke.

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National Institute of Biomedical Imaging and Bioengineering (NIBIB): Steven Krosnick, MD, Medical Officer and Program Director

The NIBIB is dedicated to improving health by leading the development and accelerating the application of biomedical technologies.³ This institute is committed to integrating the physical, engineering, and computer sciences with life sciences to advance research and medical care. The NIBIB is one of the newest institutes at the NIH and is unique in that it is the technology development institute.

Comments and recommendations:

- Imaging research focuses on technological development of innovative tools for medical and life science imaging. NIBIB has many funding opportunities in research, training, career development, and fellowships. One area of particular interest for EM researchers may be NIBIB's point-of-care technology development portfolio. This portfolio includes a Point-of-Care Technologies Research Network.
- Other areas of funding opportunities include low-cost medical devices, imaging of drug delivery, novel technologies for healthy independent living, and development and translation of medical technologies that reduce health disparities.
- NIBIB supports research and development of innovative biomedical imaging and bioengineering techniques; and devices to fundamentally improve the detection, treatment, and prevention of disease. Examples of NIBIB-supported research that may be of particular interest to the EM community include a comparison of MRI and CT for predicting stroke outcome and response to treatment, portable MRI technology, image-guided noninvasive ultrasound thrombolysis for DVTs, and handheld ultrasound guidance for neuroaxis anesthesia (see grant numbers in Funded Research below).
- Unlike many of the other NIH Institutes, NIBIB does not focus on a specific disease area or organ system.
- It is important to understand individual NIH institute priorities for funding. To this end, program directors at NIH serve as valuable resources to identify funding opportunities that align best with potential applicants' areas of interest.

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Patient-Centered Outcomes Research Institute (PCORI): Ayodola Anise, MHS, Program Officer for the Addressing Disparities Program

PCORI is an independent nonprofit research organization that was authorized by the 2010 Patient Protection and Affordable Care Act. The mission of PCORI is to help people make informed health care decisions and improve health care delivery and outcomes by producing and promoting high-integrity, evidenced-based information that comes from research guided by patients, caregivers, and the broader health care community.^{4,5}

Comments and recommendations:

- Funded research must compare two or more treatments, drugs, health systems, screening practices, or methods to deliver care. Efficacy studies, cost-effective analyses, and pilot projects are not funded by PCORI.
- Research must also be patient-centered and include patient and stakeholder engagement. Patient-centeredness ensures that the questions or outcomes being addressed matter to patients within the context of patient preferences, and should reflect what is important to patients and their caregivers. Patient and stakeholder engagement allows for meaningful integration of patients and other stakeholders (e.g., clinicians, payers, advocacy organizations) as key partners throughout all aspects of the research project from developing the study question to dissemination. It goes beyond the inclusion of patients as “research subjects,” but involves them as partners in research. The PCORI Engagement Rubric provides guidance to applicants and others about how patient and stakeholder partners can be engaged in the conduct of a study.⁶ This guidance and the examples provided are based on promising practices identified in projects funded by PCORI.
- PCORI has five national research priority areas that align with their funding programs: 1) assessment of prevention, diagnosis, and treatment options; 2) improving health care systems; 3) communication and dissemination research; 4) addressing disparities; and 5) accelerating patient-centered outcomes research and methodological research.⁷ As these priority areas do not define specific disease conditions, diagnostic imaging research applications could apply under all of these broad priority areas. For example, a PCORI-funded study evaluated a decision aid aimed to decrease unnecessary radiation exposure from head computed tomography (CT) in pediatric patients with minor head trauma.⁸
- Three general categories of PCORI funding opportunities exist:
 1. “Broad” PCORI funding announcements (PFA) are investigator-initiated projects and are available for each of PCORI’s five priority areas. These “broad” funding announcements range in total direct costs per project and should be completed within 3 to 5 years depending on the “Broad” PFA.

2. “Targeted” PCORI funding announcements aim to fund PCORI-initiated projects where PCORI details the comparative effectiveness research question of interest, patient population, outcomes, and study design. The “targeted” announcements range in total direct costs per project and should also be completed within 3 to 5 years depending on the “Targeted” PFA.
 3. “Pragmatic” clinical studies funding announcements address real-world and practical comparative effectiveness research questions. They assess whether two or more options differ in effectiveness when administered as they are in real life with research being conducted in a clinical setting that is as close as possible to a real-world setting. The methodological approach of “pragmatic” clinical studies (including study design, outcome measures, and follow-up) tends to be as simple as possible without sacrificing scientific rigor. These funding announcements are responsive to PCORI priority topics, AHRQ Future Research Needs Projects,⁹ and Institute of Medicine 100 priority topics for comparative effectiveness research (CER),¹⁰ as well as investigator-initiated topics. The “pragmatic” clinical studies announcements are up to \$10 million in total direct costs per project and projects should be completed within 5 years.
- Applicants are encouraged to carefully read through the PFAs before making decisions about which program and PFA to apply to. Program officers at PCORI are willing to speak to and address questions of potential applicants.
 - In addition to research awards, PCORI also has Eugene Washington PCORI Engagement Awards, and Pipeline to Proposal Awards. Launched in February 2014, the Engagement Awards provide support for projects that lead to better integration of patients and other stakeholders in the health care research process. They are awarded for knowledge building, training and development, and dissemination. The mission of the Pipeline to Proposal Award program is to build a national community of patients, researchers, and other stakeholders ready to participate in patient-centered CER, and encourages partnerships that lead to high-quality proposals. The three-tier program allows for building relationships, developing infrastructure, and creating channels for communication; maturing partnerships, developing research infrastructure, and defining research questions and priorities; and developing and submitting patient-centered research proposals with equal participation from patients, stakeholders, and researchers to PCORI or other funders of patient-centered outcomes research. Each of these non-research awards takes a unique approach to growing a national community of patients, clinicians, researchers, and other health care stakeholders who will advance patient-centered outcomes research. Researchers interested in building relationships and partnering with patients and stakeholders should consider these awards programs.

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Agency for Healthcare Research and Quality (AHRQ): Kerm Henriksen, PhD, Human Factors Advisor for Patient Safety, Center for Quality Improvement and Patient Safety

The mission of the AHRQ is to produce evidence to make health care safer; of higher quality; and more accessible, equitable, and affordable.^{11,12} AHRQ achieves this mission by working within the U.S. Department of Health and Human Services and with other partners to make sure high-quality, practice-ready evidence is understood and used. Within AHRQ, the Center for Quality Improvement and Patient Safety works on improving the quality and safety of our health care system through research and implementation of the evidence. It also is the center with a focused interest on diagnostic safety and its various manifestations of failure.

Comments and recommendations:

- Although AHRQ does not focus solely or specifically on emergency diagnostic imaging in any of its centers, it welcomes research applications from the EM diagnostic imaging community to achieve a well-balanced portfolio of patient safety grants of which diagnostic safety plays an emerging and active component.
- Two classes of grants exist for potential investigators: 1) Investigator-initiated grants (e.g., R03, R01, R18), and 2) funding opportunity announcements (FOA) that focus specifically on diagnostic safety (PA-15-179; PA-180). Each solicitation should be read carefully to see if it is compatible with the research interests of investigators. Applicants should strive to provide a close fit between their own interests, AHRQ's mission, and specific objectives of the announcement.
- The investigator-initiated R03 Small Research Grant Program supports small, self-contained projects limited in scope. Depending on research aims, the award budget is up to \$100,000 (total costs), and the project period of support can extend to two years. The R01 Health Services Research Projects support more comprehensive yet circumscribed studies. Contingent on research aims, the award budget is up to \$250,000 (total costs) annually and the period of support extends to five years. The R18 Health Services Research Demonstration and Dissemination Grants support the development, testing, evaluation, and dissemination of new approaches. The award budget is up to \$250,000 (total costs) annually and the period of support extends to five years, contingent on research aims.
- All AHRQ grants are very competitive. Many investigators who are new to the grant process start with the smaller R03 grants, and once they have established track records, they move on to the larger-scale R01s and R18s.
- As mentioned above, there are two FOAs that focus specifically on diagnostic safety: 1) Understanding and Improving Diagnostic Safety in Ambulatory Care: Incidence and Contributing Factors (R01; PA-15-180); and 2) Understanding and Improving Diagnostic Safety in Ambulatory Care: Strategies and Interventions

(R18; PA-15-179). The R01 FOA seeks to gain a better understanding of the complexity and incidence of diagnostic failures and its costs and harms, while the intent of the R18 FOA is to evaluate strategies and interventions for reducing diagnostic failures and patient harms, including approaches that enable departments, providers, and patients to better anticipate risk before failure and harm occurs. Depending on research aims, the award budget for each announcement is up to \$350,000 (total costs) annually, and the project period of support can extend to five years.

- For further details on any of the grant announcements, access AHRQ's website, www.ahrq.gov, under Funding and Grants/Funding Opportunity Announcements.

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Examples of Funded Research and Funding Announcements Related to Emergency Diagnostic Imaging

Below are some examples of research funded by various NIH agencies and others. All of these studies use diagnostic imaging in the emergency setting. Some of the studies have very direct means and purposes of looking at imaging, while others have found creative means to obtain funding from the various agencies as listed. These are listed as examples by which one may be able to obtain funding from the various agencies to perform imaging-related projects within certain subgroups or populations.

Funded Research

- Resource Over Utilization Due to Serious Alcohol Related Injuries (R01, Bahman Sayyar Roudsari, MD, MPH, PhD; now at the University of Washington. Funded by NIAAA: 1R01 AA017497-01A1). This study looked at resource utilization including x-ray of cervical spine, and CT scans of head, thorax, and abdomen.
- Coronary CT Angiography vs. Standard Evaluation in Acute Chest Pain (ROMICAT study). (U01, Udo Hoffmann, MD; Massachusetts General Hospital. Funded by NHLBI: U01 HL092040-01A1).
- Advanced MR and CT Imaging for Understanding Acute Stroke Evolution and Prediction (R01, Roland Bammer, PhD; Stanford. Funded by NIBIB: 5R01 EB002711-11).
- Technology for Portable MRI (R01, Lawrence Wald, PhD; Massachusetts General Hospital. Funded by NIBIB: 1R01 EB018976-01).
- Image-Guided Non-Invasive Ultrasonic Thrombolysis Using Histotripsy (R01, Zhen Xu, PhD; University of Michigan. Funded by NIBIB: 2R01 EB008998-06).
- Low-Cost Handheld Medical Device for Neuroaxial Anesthesia Guidance in the Obese (R44, Frank William Mauldin, Rivanna Medical. Funded by NIBIB: 2R44 EB015232-02).

- Emergency Diagnostic Imaging: A Research Agenda to Optimize Utilization (R13, Jennifer R. Marin, MD, MSc; University of Pittsburgh. Funded by AHRQ: 1R13 HS023498-01 and NIBIB: 1R13 EB019813-01).
- RCT of Ultrasound Versus CT for Patients in the ED with Suspected Renal Colic (Rebecca Smith-Bindman, MD; University of California San Francisco, Funded by AHRQ: 1R01 HS019312-01).
- Minimizing Unnecessary Irradiation From Renal Colic CT Scans in the United States (Christopher Moore, MD; Yale University. Funded by AHRQ: 1R18 HS023778-01).
- Shared Decision-Making in Parents of Children with Head Trauma: Head CT Choice (Erik Hess, MD, MS; Mayo Clinic. Funded by PCORI).
- UCSF CT Radiation Dose Registry to Ensure a Patient-Centered Approach for Imaging (Rebecca Smith-Bindman, MD; University of California San Francisco. Funded by PCORI).

Examples of Program Announcements and Funding Opportunities

NIBIB

- PAR-14-092: Bioengineering Research Partnerships (BRP [R01]).
- PAR-13-137: Bioengineering Research Grants (BRG [R01]).
- PA-12-284: Exploratory/Developmental (R21) Bioengineering Research Grants (EBRG).
- PAR-13-390: Indo-US Collaborative Program on Affordable Medical Devices (R03).
- PAR-14-118: Technologies for Healthy Independent Living (R01).
- PAR-14-119: Design and Development of Novel Technologies for Healthy Independent Living (R21).
- RFA-EB-15-001: Development and Translation of Medical Technologies that Reduce Health Disparities (SBIR [R43/R44]).
- PAR13-185: Imaging of Drug Delivery (R01).
- PAR-15-031: NIBIB Quantum Program: Technological Innovation to Solve a Major Medical or Public Health Challenge (U01).
- RFA-EB-15-003: Pediatric Research Using Integrated Sensor Monitoring Systems (PRISMS) Network (U54).

PCORI

- Large Pragmatic Studies to Evaluate Patient-Centered Outcomes
- Patient-Powered Research Networks (PPRN) Research Demonstration Projects
- Improving Methods for Conducting Patient-Centered Outcomes Research

- Improving Health Care Systems
- Communication and Dissemination Research
- Assessment of Prevention, Diagnosis, and Treatment Options
- Addressing Disparities
- Engagement Award: Knowledge, Training and Development, and Dissemination Awards
- Pipeline to Proposal Awards

AHRQ

- PA-15-180: Understanding and Improving Diagnostic Safety in Ambulatory Care: Incidence and Contributing Factors (R01)
- PA-15-179: Understanding and Improving Diagnostic Safety in Ambulatory Care: Strategies and Interventions (R18)
- R03 Small Research Grant Program
- R01 Health Services Research Projects
- R18 Health Services Research Demonstration and Dissemination Grants

Conclusions

There are several federal and non-federal opportunities for research funding in emergency diagnostic imaging. Partnering with individuals who complement a researcher's particular skill set can ensure the appropriate expertise and increase chances of funding success. Less experienced researchers without prior federal funding can apply for smaller grants to gain experience and build connections for larger, future grants. Project officers as well as the Office of Emergency Care Research can be assets to investigators by providing insight and advice prior to submitting grants. Ultimately, there are many opportunities to receive funding in diagnostic imaging, but researchers must be focused in their goals and consider multiple pathways to secure the funds they need.

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