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ORIGINAL RESEARCH

A Call to Action: A Specialty-Specific Course to Support the Next Generation of Clinician Scientists in Anesthesiology

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Clinical production pressure in anesthesiology is hardly a new concept.¹ In a 2001 survey assessing perceptions of the state of clinical research, 93% of academic chairs (including anesthesiology) and senior research administrators at 122 medical schools across the United States reported clinical production pressure as a moderate-to-large problem for faculty. Seventy-five percent indicated that there is an inadequate supply of clinical researchers to support research endeavors, and 72% lacked sufficient external research funding to support investigative work.² Further, department chairs and specialty leaders have long expressed concern for the challenge of balancing scientific investigation with the demands of clinical patient care.³⁻⁵

More recently, trends in funding and academic output have validated many of the concerns raised over the previous 2 decades.

THE CURRENT NATIONAL FUNDING LANDSCAPE

A 2022 study examining National Institutes of Health (NIH) grant recipients associated with anesthesiology departments across 10 years (2011–2020) outlines total awarded funds at \$1,676,482,440.⁶ A previous report documents the relative inequity of this funding, noting the majority of monies (55%) is awarded to only 10 departments.⁷ The total 1-year NIH funding in 2021 for academic internal medicine departments was 3 times higher than the 10-year funding of anesthesiology departments

at \$5,328,464,759.⁸ While anesthesiology has increased its funding since 2006, when only family medicine trailed behind anesthesiology in NIH awards, the gap in support remains.^{4,8}

Examining anesthesiology NIH-grant funding from 2011 to 2020⁶, 1250 grants were awarded to 532 researchers, representing 3844 cumulative years of support. Three quarters of the NIH funding was awarded as an R series grant, with PhDs receiving half of this funding. MD physicians command a lower number of investigative projects, R01 grants, and total R series grants, than PhDs or MD-PhDs. Of the 532 researchers receiving grants, only 198 were American Board of Anesthesiology (ABA) diplomats (37%), suggesting that a small percentage of practicing physicians obtain grant funding. At several institutions, >60% of NIH funding is held by a single investigator.⁷ Additional analysis of disparities reveals that while assistant and associate professors are receiving more K level awards, men continue to be awarded greater median R grants than women researchers.⁶ From 2006 to 2016, 33% of career development grants awarded to investigators in anesthesiology departments were women, roughly matching the proportion of women in academic departments; only 2 awards were provided to promote underrepresented minorities (URM) (2%).^{9,10} A synopsis of key facts regarding NIH-grant funding to Anesthesiology Departments in the United States is provided in Table 1.

RESEARCH PRODUCTIVITY ACROSS ANESTHESIOLOGY DEPARTMENTS

Academic anesthesiologists' median h-index (a quantitative measure that values publications and citations to determine the importance of a scientist's cumulative research contributions) across United States-based academic programs analyzed from 1996 to 2010 was 1, with 3 total publications.¹¹ For reference, a successful scientist should increase their h-index by 1 each year of their career. Departments with NIH funding house faculty with more publications than departments with limited government funding, and men have a higher median h-index and number of publications than women.¹¹ Between 2006 and 2008, 37% of faculty holding positions at 108 academic anesthesiology programs published at least 1 article. Notably, however, the overall median publication rate was 0, indicating that publications are generally produced by few faculty overall. The group with ≥ 1 publication were more likely of higher professorship rank, male sex, and more likely to hold a joint or courtesy appointment in the anesthesiology department. MDs were less likely to publish compared to MD/PhD faculty or PhD faculty.¹² More recent reports indicate that scholarship may be rising in new ABA diplomats; from 2006 to 2016, the number of mean publications in those obtaining their diplomat status in this same time increased from 0.31 to 0.79.¹³ These publications are wide in scope and

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impact, including case reports, reviews, and editorials. Overall, the number of publications per faculty anesthesiologist remains modest as does the impact of the scholarly work.

Improving environments in which academic anesthesiologists thrive may be paramount to successful academic productivity. A 2021 study examining an academic anesthesiology department demonstrated that, in addition to working assigned overnight call (7p-7a) and “late” shifts (a shift with expected work past 5 PM), anesthesiologists work later than 5 PM nearly 1 in every 5 evenings.¹⁴ Due to the structure of a teaching practice, academic departments often need to staff longer days than their community practice counterpart.¹⁵ Accordingly, those practicing in academic environments frequently lack sufficient protected time to participate in investigative endeavors.¹⁶ Adding to the lack of academic time is the limited bandwidth of senior academic physicians to mentor and support aspiring physician scientists.¹⁷

Anesthesiologists continue to assume a broader role in the perioperative care of patients,¹⁸ which threatens to exacerbate the concern for protected academic time if interpreted narrowly. Health care organizations increasingly seek anesthesiology expertise to improve care beyond the operating room, and the public rightfully demands that expert practices continue to evolve superior anesthetic delivery, improve safety margins, and enhance perioperative outcomes.¹⁹ Academic anesthesiologists themselves may be eager to deliver on clinical requests as a value-add in a competitive marketplace; however, we must likewise invest judiciously in the recruitment, development, and retention of a diverse group of outcome-oriented researchers, and clinically impactful discovery scientists as a strategic priority to preserve and enhance the relevance of anesthesiology in health care.

INVESTING IN THE FUTURE OF OUR SPECIALTY: CLINICAL RESEARCH AND NEXT- GENERATION INVESTIGATORS

This is not the first call to action for academic departments to provide a new generation of anesthesiologists with adequate mentorship and tools to actively participate in all aspects of the scientific process: from the production of meaningful research results through application of rigorous methods, to the ability to evaluate the quality of data submitted for publication and dissemination, and, ultimately, to correctly interpret published data. National collaboration efforts, those founded to promote specialty-specific research expertise, have proven to increase the physician scientist pipeline. An example of such collaboration is the Foundation for Anesthesia Education and Research (FAER), a charitable society dedicated to developing physician investigators. FAER has led anesthesiology research providing funding opportunities to junior investigators and consistently supporting groundbreaking basic science research proposals. Analyzing FAER grant awardees from 1987 to 2015, these individuals published 19,647 articles with >500,000 citations and went on to receive 391 NIH grants totaling \$448 million. FAER alumni demonstrate a consistent record of research productivity, academic scholarship, and subsequent grant funding.²⁰

Given then the challenges for individual departments and notable successes of specialty-specific collaborative efforts (eg FAER), additional pooled-resource approaches may be necessary to successfully pass along needed skills to pursue high-quality clinical research and to secure supporting funds. It is in this spirit that the leadership of Anesthesia and Analgesia and the Journal of Education in Perioperative Medicine, unified with the Association of University Anesthesiologists, aim to sponsor the Introduction to Clinical Research for Academic Anesthesiologists (ICRAA) Course. Directed toward early career academic anesthesiologists who wish to gain competency specifically in the fundamentals of clinical research and receive mentorship to develop an investigative project, the yearlong course

will provide participants with the skills necessary to design clinical research initiatives, ethically direct research teams, successfully communicate ideas with data analysts, and write and submit scientific manuscripts.

Additionally, the course, articulated in a series of interactive lectures, mentored activities and workshops, will teach participants to review articles submitted for publication to medical journals and to critically appraise evidence in published research (course objectives and planned sessions are illustrated in Table 2).

It is our hope that this initiative will be of interest to junior faculty of academic anesthesiology departments nationally and internationally. If successful, this initiative may serve as a model for other specialty-specific initiatives with the common aim to support scholarship, discovery and dissemination of worthwhile scientific results in anesthesia research.

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Abstract

Clinical production pressure is a significant problem for faculty of anesthesiology departments who seek to remain involved in research. Lack of protected time to dedicate to research and insufficient external funding add to this long-standing issue.

Recent trends in funding to the departments of anesthesiology and their academic output validate these concerns. A 2022 study examining National Institutes of Health (NIH) grant recipients associated with anesthesiology departments across 10 years (2011–2020) outlines total awarded funds at \$1,676,482,440, with most of the funds awarded to only 10 departments in the United States. Of note, the total 1-year NIH funding in 2021 for academic internal medicine departments was 3 times higher than the 10-year funding of anesthesiology departments. Additionally, American Board of Anesthesiology (ABA) diplomats represent a minority (37%) of the anesthesiology researchers obtaining grant funding, with a small number of faculty members receiving a prevalence of monies. Overall, the number of publications per academic anesthesiologist across the United States remains modest as does the impact of the scholarly work.

Improving environments in which academic anesthesiologists thrive may be paramount to successful academic productivity. In fact, adding to the lack of academic time is the limited bandwidth of senior academic physicians to mentor and support aspiring physician scientists.

Given then the challenges for individual departments and notable successes of specialty-specific collaborative efforts (eg Foundation for Anesthesia Education and Research [FAER]), additional pooled-resource approaches may be necessary to successfully support and develop clinician scientists. It is in this spirit that the leadership of *Anesthesia and Analgesia* and the *Journal of Education in Perioperative Medicine*, unified with the Association of University Anesthesiologists, aim to sponsor the Introduction to Clinical Research for Academic Anesthesiologists (ICRAA) Course.

Directed toward early career academic anesthesiologists who wish to gain competency specifically in the fundamentals of clinical research and receive mentorship to develop an investigative project, the yearlong course will provide participants with the skills necessary to design research initiatives, ethically direct research teams, successfully communicate ideas with data analysts, and write and submit scientific articles.

Additionally, the course, articulated in a series of interactive lectures, mentored activities, and workshops, will teach participants to review articles submitted for publication to medical journals and to critically appraise evidence in published research.

It is our hope that this initiative will be of interest to junior faculty of academic anesthesiology departments nationally and internationally.

GLOSSARY

ABA = American Board of Anesthesiology; **FAER** = Foundation for Anesthesia Education and Research; **ICRAA** = Introduction to Clinical Research for Academic Anesthesiologists; **NIH** = National Institutes of Health; **URM** = underrepresented minorities

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Tables

Table 1. Key Facts of the Current Research Funding to Anesthesiology Departments in the United States

• NIH awards to anesthesiology researchers from 2011 to 2020:
Total funding: \$1676,482,440 ⁶
1250 grants were awarded to 532 researchers, of the 532 researchers, 198 were ABA diplomats (= only 37% of funded researchers were practicing physicians) ⁶
• 55% of funding is awarded to 10 anesthesiology departments ⁷
• At several institutions, >60% of NIH funding is held by a single investigator ⁷
• 1-y NIH funding in 2021 for academic Internal Medicine departments was 3× higher than the 10-y funding of anesthesiology ^{6,8}

Abbreviations: ABA, American Board of Anesthesiology; NIH, National Institutes of Health.

Table 2. Introduction to Clinical Research for Academic Anesthesiologists Course

Objectives
Participants will
• Understand how to form a study question or hypothesis
• Learn how to design a study and practice writing a study protocol
• Identify the sections of a scientific proposal
• Practice how to write and organize the sections of a scientific manuscript
• Apply newly acquired knowledge to effectively review and evaluate scientific papers
Sessions
1. Deciding to participate in an academic career and in clinical research
2. Clinical outcomes research
3. Quality research
4. Data science research
5. Mixed methods research (Education Research)
6. Statistics
7. Evaluating a manuscript
8. Writing a starter grant