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Challenges for Today's Pediatric Physician-Scientists

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This issue of *JAMA Pediatrics* features two articles^{1,2} addressing the diminishing workforce of pediatric physician-scientists and the worrisome state of the federally funded pediatric research portfolio in the United States, challenging fewer pediatric researchers to do more with less. The article by Good et al¹ suggests that the pool of qualified physician-scientists in pediatrics is decreasing. They raise concerns that a small group of research-intensive universities are home to the vast majority of National Institutes of Health (NIH) –funded pediatric scientists (15 institutions supported 63% of R01-equivalent grants) and that most funded investigators are full professors (or hold other senior leadership roles), suggesting that pediatric physician-scientists reflect an aging workforce.

The article by Gitterman et al² is the third in a series of articles by this group on NIH funding for pediatric research.^{3,4} This article presents NIH data from 1992 to 2015 but focuses on funding in the most recent era, fiscal years 2010 to 2015, comparing the NIH pediatric research portfolio (both clinical and basic research) with the overall NIH budget. Gitterman et al² lament the challenging nature of the NIH pediatric research portfolio. Although total funding for pediatric research has increased since 1992, funding has been relatively flat since 2003 (range, 9.4% to 12.0%), as has the percentage of the NIH budget supporting pediatric research. The authors note that pediatric research is funded by all 25 NIH institutes and centers, with the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) supporting the largest proportion of the pediatric portfolio (18.5%). Within NICHD, the success rate for several award types (ie, K08, K23, R01, P01, T32, and F32) has declined since 2010, reflecting the increased difficulty of obtaining research funding for career development as well as for independent researchers in pediatrics. Gitterman et al² present a plan of action to prioritize increasing investments in both basic and clinical pediatric research to promote improved health of children, with the potential to reduce lifelong disease burden.

These articles provide a compelling argument for an increase in funding for pediatric research. The return on investment for pediatric research goes far beyond improvements in child health. It is now recognized that adult health risks and adult long-term diseases have

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their antecedents early in life (even before birth) and that pediatric research is really lifespan research, with effects on the health of adults as well as children and families.⁵⁻⁷ On the 50th anniversary of the establishment of NICHD, former Director Duane Alexander, MD, wrote a brief history of NICHD, summarizing major advances in child health that were direct results of NIH-funded research. He concluded, “From this record of accomplishment it would be easy to conclude that there is not another institute at the NIH whose research has had such a widespread and beneficial impact on people’s lives as that from the NICHD.”⁸ In two recent articles, Cheng and colleagues⁹ highlighted seven great achievements in pediatric research and predicted the next seven achievements,¹⁰ demonstrating the remarkable return on an investment in pediatric research.

The future of pediatric medicine depends on a continuous pipeline of young scientists interested in pediatrics and child health. Long-term, sustainable funding for pediatric research training must be a priority. The NIH-sponsored Pediatric Scientist Development Program and the NICHD Child Health Research Centers are fitting examples of programs that provide rigorous high-quality research training and start trainees off on a strong footing in a very competitive scientific world.

A fragile portfolio of career development opportunities has clear implications for the future of physician-scientists in pediatrics and perhaps more profound implications for the profession of pediatrics. Will a shrinking cadre of physician-scientists make this a less rigorous, less evidence-based profession? The great pediatric physician-scientists of the past (eg, Helen Taussig, MD; William Silverman, MD; and Jack Sinclair, MD) were also great teachers who taught us that a love of science and a commitment to rigorous research support a love of patients.

Although concerns that the clinical investigator is an “endangered species” are not new,¹¹ recent reports have highlighted increasing shortages of physician-scientists in multiple disciplines.^{12,13} The challenges for today’s physician-scientist are multifactorial. More limited career development opportunities and difficulty in obtaining extramural research funding are clear deterrents to a successful research-intensive career. Moreover, the dilemma of the physician-scientist is in part the result of competing demands and diverging career paths. At many academic centers, today’s aspiring physician-scientist is not given sufficient research time and is expected to practice and teach medicine at the same level of efficiency and fiscal responsibility as full-time practitioners of the specialty. This is measured not simply by quality of care and acknowledged prowess as a teacher but also by financial metrics, including numbers of patients seen, procedures performed, and relative value units earned. At the same time, the physician-scientist is expected to lead an independent research program, usually laboratory based, teach postdoctoral fellows and students, and support the enterprise through competitively reviewed extramural research grants. In short, many academic institutions expect the physician-scientist to be both a competent, fiscally responsible physician and a superior scientist, all in one. This may explain in part why funding for pediatric research is concentrated in only a few research-intensive universities—universities that have the endowed funding base and long history of support for research to provide protected research time and the critical mass of scientists needed to mentor young physicians as well as to support the careers of established investigators. However, excellent

minds are not confined to only a few elite institutions. We consider physician-scientists as irreplaceable and call for improved pathways to attract, nurture, and support them at a broad array of institutions.

This Editorial is written from the perspective of a pediatrician clinician-scientist, who now serves a diverse constituency as a medical school dean, and a practicing cardiologist, whose laboratory research has been continuously supported by the NIH since 1976. Both of us grew up at a time when academic physicians were considered the elite of medicine,¹⁴ and we were given opportunities and time to refine our research skills and to build both a clinical and a research career. We suggest that the model physician-scientist is the physician whose clinical skills are honed by the rigors of scientific reasoning and by ethically considered, carefully designed and conducted research. The goal of biomedical science is to ask important questions, use the best available tools to answer those questions, and carefully interpret findings to come to valid and reproducible conclusions. At its best, medicine is a patchwork of talent and interconnection between outstanding clinicians with a depth of clinical knowledge and experience and researchers prepared to address the right questions. Building bridges between fundamental research and clinical research has produced the most fantastic advances in the diagnosis and treatment of diseases. Throughout the history of pediatrics, from the cowpox vaccine discovered by Edward Jenner, MD, to the vaccination against infectious diseases, from the magic bullet concept developed by Paul Ehrlich, MD, to the discovery of antibiotics, from the unraveling of the immune system by Sir Peter Medawar, DPhil, to the transplant of whole organs, the love for patients has always included the love for science.

Despite the current funding climate and the many challenges to the physician-scientist, there are reasons for optimism. Exciting advances in science and technology can dramatically change child health and the antecedents and trajectory of adult disease. The crosstalk between research and clinical medicine needs physician-scientists to take best advantage of these advances to translate new discoveries into better health. We have an obligation to use our collective influence to expand efforts to advocate on behalf of enhanced funding for child health research and for pediatric research training. Likewise, we have an obligation to train more (and more effective) communicators for the cause of translational research because pediatric research matters and makes a difference throughout the life course.

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