



POLICY STATEMENT

Promoting Education, Mentorship, and Support for Pediatric Research

COMMITTEE ON PEDIATRIC RESEARCH

KEY WORDS

pediatric education, training, workforce, epidemiology, health services research, community-based participatory research, translational research, basic science research, postgraduate training

ABBREVIATIONS

NIH—National Institutes of Health

PBRN—practice-based research network

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abstract

FREE

Pediatricians play a key role in advancing child health research to best attain and improve the physical, mental, and social health and well-being of all infants, children, adolescents, and young adults. Child health presents unique issues that require investigators who specialize in pediatric research. In addition, the scope of the pediatric research enterprise is transdisciplinary and includes the full spectrum of basic science, translational, community-based, health services, and child health policy research. Although most pediatricians do not directly engage in research, knowledge of research methodologies and approaches promotes critical evaluation of scientific literature, the practice of evidence-based medicine, and advocacy for evidence-based child health policy. This statement includes specific recommendations to promote further research education and support at all levels of pediatric training, from premedical to continuing medical education, as well as recommendations to increase support and mentorship for research activities. Pediatric research is crucial to the American Academy of Pediatrics' goal of improving the health of all children. The American Academy of Pediatrics continues to promote and encourage efforts to facilitate the creation of new knowledge and ways to reduce barriers experienced by trainees, practitioners, and academic faculty pursuing research. *Pediatrics* 2014;133:943–949

INTRODUCTION

The goal of the American Academy of Pediatrics is the attainment of the optimal physical, mental, and social health and well-being of all infants, children, adolescents, and young adults. To achieve this vision, pediatrics, as a field, must continually add to the current knowledge about how to best care for children through pediatric research. Research is broadly defined as the “systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge.”¹ For the purposes of this statement, the term “child” health research refers to research focused on infants, children, adolescents, and young adults.

Child Health Research Is a Unique Field

Child health presents unique issues that require investigators who specialize in pediatric research. For example, childhood affects an

individual's long-term health trajectory and future adult outcomes, as many "adult" diseases have been shown to have their roots in childhood.²⁻⁴ The long-term effects of childhood interventions may be difficult to discern, and an intervention may take many years until any benefit is noted. Some cases, such as early child development interventions, can yield higher returns as a preventive measure compared with remedial services later in life⁵; however, it can be challenging to assess these potential long-term benefits with traditional approaches. Child health research also is characterized by the development and refinement of approaches to document long-term impact of early interventions.

The acceleration of racial and ethnic diversity in the United States is most pronounced in the pediatric population. Children now represent the most racially and ethnically diverse age group in the United States. As of 2011, most infants born in the United States had parents of ethnic minority groups.^{6,7} As a result, for those involved in child health care, it is crucial to develop and assess interventions to ensure they are culturally and linguistically, as well as developmentally, appropriate.^{8,9}

Compared with adults, children and adolescents have fewer common chronic conditions (eg, obesity, asthma, attention-deficit/hyperactivity disorder) but also have a wide plethora of rare diseases manifest in a very small percentage of children.^{10,11} It is challenging to develop research programs to study and create new treatments for rare and orphan disorders. This skewed epidemiology influences decisions regarding the allocation of resources of biomedical research.¹² For a variety of factors, medical advances are often developed for and tested initially in adults, frequently leaving pediatric

practitioners with little or no evidence-based guidance on appropriate use in children.¹³ The discovery, development, proper evidence-based evaluation, and translation of pediatric medical advances are vitally important to the health and well-being of the world's infants, children, adolescents, and young adults.

Finally, children are dependent on parents or adult guardians. This issue adds further ethical considerations in the conduct of pediatric research, such as the need to obtain parental consent and child or adolescent assent.^{14,15}

Child Health Research Is Broad in Scope

The scope of the pediatric research enterprise must also include the full spectrum of basic science, clinical, community-based, health policy, and health services research for appropriate translation into pediatric clinical practice. The Institute of Medicine¹² describes this translational research as the "transfer of new understandings of disease mechanisms gained in the laboratory into the development of new methods," as well as the "translation of the results of clinical studies into everyday clinical practice and health decision making." As a result, the research enterprise requires skills that include molecular and basic science laboratory skills; the conduct of randomized controlled trials and observational studies; and skills in designing, implementing, and evaluating interventions in everyday settings and/or analyzing the implications of health policies on child health outcomes.¹⁶ Furthermore, the movement of new knowledge is bidirectional, as insights gained in clinical settings inform inquiries in the basic sciences.

In the past, members of research teams focusing on pediatric issues had similar training; however, complex

clinical and societal issues require complementary sets of theoretical backgrounds and skills. Current issues in pediatric health are influenced by multiple factors (eg, genetic, environmental, political, social). Approaches to address these issues require medical research that involves a multitude of disciplines (eg, genetics, bioinformatics, epidemiology, sociology, health behavior and health education, health policy analysis, economics).¹⁷ In addition, research may need to acknowledge different theoretical models and incorporate diverse skills and methodologies used in other fields. Pediatric investigators may benefit from additional formal coursework, secondary degrees (eg, Master of Public Health, Doctor of Philosophy), research fellowships, and/or access to collaborators and faculty from other disciplines.

Working with families of patients in community settings through community-based participatory research adds a valuable dimension to health outside the treatment setting. Such research explores ways in which patient, family, and community priorities and settings may support or hinder complex disease management. Empowering the community as an equal partner in research offers promise for real change in the health of the population.¹⁸

The Importance of Pediatric Research Education for All Pediatricians

Although most pediatricians select careers primarily as practitioners, not research investigators,¹⁹ appropriate exposure to and an appreciation of research methodologies promotes skills and competencies for the critical evaluation of scientific literature and the practice of evidence-based medicine. These skills are closely interconnected to core competencies emphasized in pediatric education,

especially practice-based learning and improvement.²⁰ In addition, this training fosters a culture of deliberate and critical evaluation in pediatric clinical practice. It is not possible to practice evidence-based medicine without understanding the strengths and limitations of how the evidence was gathered and analyzed.²¹

In addition, a current gap is the paucity of child health research conducted in office-based settings, as opposed to highly specialized academic centers.²² Early exposure to research may increase the likelihood of practitioner involvement in practice-based research networks (PBRNs), which generate new knowledge that may be more generalizable to everyday practice.²³ Evidence-based practice is not possible without practice-based evidence. The increasing use of electronic health records in primary care settings and new maintenance-of-certification requirements create new opportunities and potential challenges for incorporating research in office settings. The generation of applicable, practice-based evidence is dependent on the active contributions of practicing pediatricians who understand and value pediatric research.

Current Threats to the Pediatric Research Enterprise

It is critical for pediatric research to continue to attract talented young trainees. Already, overall educational cost in comparison with potential future income is less favorable for physicians compared with many other professionals.²⁴ This situation is exacerbated for physician scientists, because they have more years of training, increased opportunity costs, and lower average salaries as academic pediatricians.²⁵ Over the past 3 decades, the amount of medical education debt has been increasing. In

2012, 86% of medical students obtained educational loans, with a resulting median individual medical student debt level of \$170 000.²⁶

The combination of increasing debt and lower expected earnings may discourage trainees from pursuing research careers.²⁷ In a survey of current pediatric subspecialist fellows, more than half indicated that, given the option, they would have chosen a shorter fellowship without a research requirement.²⁸ This sentiment was also noted by approximately 40% of junior faculty surveyed who had just completed fellowship training.²⁹ High levels of debt may contribute to a reluctance of young pediatricians to pursue a career in pediatric academic research and threaten the pipeline of future discoveries to benefit children.

In the past decade, extramural funding for research has become more competitive.³⁰ Pediatric funding from the National Institutes of Health (NIH) has mirrored the overall general NIH funding levels. As the budget for NIH has increased from fiscal year 1998 to fiscal year 2003 by 13.4%, pediatric funding increased by 11.5%; however, from fiscal year 2004 to fiscal year 2009, NIH appropriations increased by only 1.3%, with a corresponding change in pediatrics of only 0.3%. Accounting for inflation, the changes in the most recent period represent a negative change for pediatric research funding. Overall, for the individual pediatric investigator, this change represents few grants and fewer dollars per grant.³¹ There are fewer resources available to obtain a career development award and fewer resources for the transition to independent funding. In 2011, the average age of an investigator receiving an initial R01 (investigator-initiated grant) was 44 years for a Doctor of Medicine–Doctor of Philosophy

(MD-PhD) and 45 years for a Doctor of Medicine (MD).³² The decreased availability of research funding from NIH is a considerable barrier to young physician investigators.

Institutions may have a variety of expectations for faculty physician-researchers, such as teaching, clinical care, administration, and research.^{33,34} Given the increasingly competitive nature of securing extramural funding and requirements for clinical productivity, a career that attempts to balance research and clinical care is extremely challenging. Institutions need to invest significant resources (eg, senior faculty mentorship, space, technical support, supplies) as well as specified research time for junior faculty, which is often underestimated. This research time needs to be valued similarly to clinical, teaching, and administrative responsibilities.³⁵ In addition, it is important for clinical work to be synergistic with an investigator's research focus. Finally, extramural funding may not cover all project and infrastructure costs. As a result, institutional or medical center support may be necessary to support research faculty.

Diversity in the pediatric research workforce is increasingly important to help address the health care issues of a population that continues to grow more diverse.³⁶ Similar to the general pediatric workforce, there is a lack of diversity in academic pediatrics as well as among academic pediatric investigators.^{37–39} A lack of mentoring and support has been cited as one barrier to racial/ethnic minority application and competition for NIH research funding.⁴⁰ Examples of programs attempting to address this issue are the Academic Pediatric Association New Century Scholars Program and the Robert Wood Johnson

Foundation Harold Amos Medical Faculty Development Program.

RECOMMENDATIONS

The history of pediatric contributions to medical research is rich.⁴¹ These contributions are dependent on how pediatrics, as a field, promotes education, mentorship, and support for discovery and research throughout the career spectrum. As a result, education in research methodology should be provided, from medical school for pediatricians-in-training to continuing medical education for practicing pediatricians. The American Academy of Pediatrics continues to promote and encourage efforts to facilitate the creation of new knowledge and ways to reduce barriers experienced by trainees, practitioners, and academic faculty pursuing research.

Research Training Before Medical School

- Research training must begin early, ideally as a component of premedical course work.⁴²
- Early “pipeline” programs also may be helpful in attracting students of underrepresented minorities and lower socioeconomic status into the field of medicine and medical research. The pediatric research community should promote, encourage, and mentor high school and college students to develop career interests in medical research.

Research Training in Medical School

- Medical schools should provide a curriculum for health research.⁴³ This curriculum should encourage lifelong learning and develop trainee competencies in critically reviewing scientific literature. Fac-

ulty from pediatric departments should be encouraged to participate in the design and teaching of such curricula.

- Medical schools should consider recommending or requiring hypothesis-driven thesis projects for their students and should support dedicated time (for students and faculty), necessary resources, and faculty mentorship. Electives in research for credit (such as during the summer after the first and second years of medical school) or an additional year for fellowship for medical students to permit completion of a research project are additional options that can be established to support early development of the skills needed to conduct quality research.
- Medical student curriculum should include the issues of designing, conducting, and interpreting health research. The curriculum also should include the ethical dimensions of research, including informed consent, the role of institutional review boards, protection of research subjects, conflict of interest, and patient privacy, which are relevant to a research curriculum for physicians at any level of training or practice.

Research Training in Pediatric Residency Programs

- Consistent with the requirements of the Accreditation Council for Graduate Medical Education, an evidence-based medicine curriculum that can be integrated into a conference schedule should be developed for pediatric residents. The primary goal of this curriculum is to train pediatric resident competencies to evaluate and use medical literature as well as understand basic scientific methods, research design fundamentals, core

statistical principles, and the means to conduct critical literature reviews.

- Pediatric residency programs should promote research opportunities and encourage trainees to participate in a research project during their residency. Specified time, necessary resources, and faculty advisors are critical components in developing a research career or becoming involved in clinical research as a pediatric practitioner. These components should be readily available at all levels of pediatric training.

Research Training in Pediatric Fellowship Programs

- Fellowship programs should include advanced formal course work in research methodology that covers the widest possible spectrum of child health research. A research methodology curriculum for all fellowships in pediatrics should be developed that will outline the minimal core knowledge and skills expected of all child health researchers across subspecialties and general pediatrics. A core research methodology curriculum that is transdisciplinary and broad in scope can facilitate collaboration and potentially improve the quality and practical relevance of research conducted.
- The mentored-research experience is often cited as the key aspect of fellowship training.³⁵ Programs should assign all fellows to experienced faculty research preceptors with whom to work. To support mentorship, federal training grants should provide faculty mentor salary support in addition to trainee stipends. Institutions applying for fellowship training support should describe their plans for mentorship activities.

Research Training and Support for Junior Faculty

- Training and career development in a successful research career does not cease at the end of fellowship training. Junior faculty members require institutional support and mentoring to develop successful academic careers. Junior faculty members should develop individual career development plans and have such plans reviewed annually with their administrative and research mentors.
- Programs to identify, mentor, and link new investigators to a cohort of peers can help improve the likelihood of academic success.⁴⁴

Research Training Within Continuing Medical Education

- For continuing education of practitioners and academic faculty, educational institutions and professional organizations should establish programs in which intensive, brief training in research methodology or critical review of the scientific literature is provided.

Research and Pediatric Clinical Care

- Opportunities for pediatric practitioners to participate in research activities should be expanded through local and national PBRNs. Examples of national PBRNs include networks for outpatient settings (Pediatric Research in Office Settings), emergency department settings (the Pediatric Emergency Care Applied Research Network), and inpatient settings (Pediatric Research in Inpatient Settings), among others.
- PBRNs should be further promoted and expanded to reach practitioners previously underrepresented in these activities, especially those

who care for minority and underserved populations.⁴⁵

- To ensure that ongoing clinical experience can be harnessed to benefit future pediatric patients, incentives to support clinical research should be aligned with clinical care incentives.⁴⁶ Each clinical encounter represents a potential opportunity to contribute to primary data collection, quality improvement, or future secondary data analyses. An example of the successful integration of clinical care and clinical pediatric research is the Children's Oncology Group, which has improved the survival rate for childhood cancer through systematic, hypothesis-driven clinical research over the past 50 years.⁴⁷
- Programs that help educate patients and families about the role, importance, and proper conduct of pediatric research should be promoted to help support the pediatric research enterprise.⁴⁸

Loan Forgiveness and Research Support

- Programs that provide federal support for repayment of educational debt for physicians pursuing careers in child health research are important and should be continued to help encourage trainees to pursue careers in the field.⁴⁹
- Secure and sustained resources need to be identified to cover costs of research education at all levels, including subsidizing faculty time, space, supplies, and equipment.
- Professional organizations providing oversight for training of pediatricians and major federal funders of child health research (eg, NIH, Health Resources and Services Administration, and Agency for

Healthcare Research and Quality) should collect data to monitor the quality of pediatric research training, the number of pediatric researchers completing training and their productivity as researchers, and the level of support for child health research activities to ensure that there is ongoing progress in these areas.

- Junior faculty research success is dependent on outstanding mentorship from senior faculty. Academic institutions should support innovative programs to develop, cultivate, and recognize outstanding faculty research mentorship.⁵⁰

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