Propagating the Nephrology Research Workforce: A Kidney Research National Dialogue Training
Commentary

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Abstract
The National Institute of Diabetes and Digestive and Kidney Diseases conducted the Kidney Research National Dialogue as an interactive means to formulate and prioritize research goals necessary to address the needs of patients with renal disease. This commentary summarizes the discussion and priorities arising from the training domain of the dialogue and posits three overall strategies to broaden the nephrology research workforce pipeline. The community needs to recruit and provide support for mentors in nephrology, target medical and graduate students earlier in their education for exposure to renal research, and expand the research workforce to include basic scientists from many disciplines as well as under-represented minorities.


Introduction
The contraction of the clinical nephrology workforce is well documented and was recently examined by Parker et al. (1). This contraction extends to the nephrology research workforce, which is critical to the development of novel therapies and interventions. This workforce includes not only those who are clinically trained in nephrology and are motivated to conduct basic or clinical research, but also basic scientists performing fundamental studies in renal physiology and pathophysiology (Figure 1). Cultivating a robust research workforce requires supportive individual mentors, institutions, and professional societies willing to utilize novel approaches to training and willing to support research experiences for a diverse pool of trainees.

The National Institutes of Health (NIH) National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) asked the community to identify research objectives that would lead to improved understanding of basic kidney function and aid in the prevention, treatment, and reversal of kidney disease. The Kidney Research National Dialogue (KRND) welcomed all interested parties to submit, discuss, and prioritize ideas via an interactive website (2). The training topic area transcended all others and is integral to the success of any disease-based initiatives arising from the dialogue. The posts in this area engendered the most discussion in the dialogue and the key themes identified therein are summarized here. Extending the dialogue, we include recommendations for training that have emerged from our discussions and from parallel efforts of invested stakeholders.

The over-riding theme of the training commentary in the KRND was the need for more efforts to recruit individuals earlier in their medical training into nephrology. Additional elements of a productive training pipeline include influential mentors or role models, the expansion of scientific expertise by recruiting well trained basic scientists from other fields, and the enrichment of nephrology by recruiting individuals from diverse racial and ethnic backgrounds.

Adequately addressing these issues requires resources from all stakeholders who support nephrology—from the local institution to the Federal government. We outline below several new programs developed in response to input from the KRND and the nephrology community and identify remaining priorities that need to be addressed.

Research Objectives
1. Train and Support Successful Mentors, Particularly the Physician Scientist Engaged in Bench or Clinical Research
Influential mentors or role models are integral to steering interest into nephrology research. Of particular need for nephrology are more mentors that engage in both clinical care and research—an increasingly rare individual who can provide unique perspectives into disease and speak to MDs and PhDs. The Clinical and Translational Science Awards contain some resources for research mentoring (http://accelerate.ucsf.edu/training/mdp-materials); however, they have not been utilized broadly for nephrology mentors. The Diversity Workforce Committee of the Advisory Committee of the Director (ACD) has implemented a program designed to provide mentoring support for under-represented minorities in science (National Research Mentoring Network), but

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this network of institutions has just started their efforts and it will be some time before this program can be evaluated for effectiveness, particularly with respect to supporting physician scientists. The NIDDK is developing a mentoring support mechanism modeled after the K24 Mentor Award (Table 1) that targets physician scientists who mentor under-represented minorities engaged in basic or clinical research. The NIDDK could also provide additional resources to the most successful T32 programs (Table 1) and sponsor workshop-based programs to educate and foster junior mentors, particularly those from under-represented minorities.

2. Capture Students and Residents Early—During Graduate and Medical Training

Undergraduate, medical, and graduate students represent a wide pool of talent from which to recruit individuals into renal research. To address this priority, the American Society of Nephrology (ASN) and the NIDDK have developed several new programs. The ASN initiatives include an expansion of the popular nephrology fellows' course on the “Origins of Renal Physiology” at Mount Desert Island Biologic Laboratory (MDIBL) to include medical students and residents, a structured experience for medical school students and residents at the ASN annual meeting, and student scholar grants for medical students to promote training experiences in scientific investigation (1). The NIDDK supports several “early capture” activities through its R13 meeting grant mechanism (Table 1) and has recently leveraged a long-standing R25 education grant program (Table 1) as a vehicle to support a variety of educational activities that advantage nephrology. The R25 portfolio currently supports the MDIBL fellows course, a summer nephrology research program at Vanderbilt University that targets diversity undergraduates, a novel undergraduate curriculum development program at the University of Georgia, and a medical student summer research experience at the University of Wisconsin. The NIDDK has been providing supplemental support for several years to the O’Brien Centers for summer undergraduates and has recently solicited additional R25 grants to broaden this program for undergraduate students. In addition to these new programs, the NIDDK continues to support the National Research Service Award T35 program for medical student summer training (Table 1) and the Medical Student Research Training program for eligible medical students to engage in a “sabbatical” research year early in their medical school experience (http://go.usa.gov/ZeJJ).

As these programs mature, it will be critical to track participants and their subsequent career decisions in order to assess program success. Even well established programs...
designed to engage medical or undergraduate students in research careers by incorporating intense research experiences into their education are challenged to evaluate the overall achievement of their goals (3,4). NIH-sponsored trainees supported through the National Research Service Awards remain difficult to track (5) and reinforce the recent recommendation of the Biomedical Workforce Working Group (BMW) of the ACD (http://acd.od.nih.gov/bwf.htm) to assign Commons IDs to every “trainee” supported by NIH funds, whether supported by targeted training grants or via a mentor’s R01 grants (Table 1). In addition, it will be important to capture information on how influential a single research experience is in influencing a student’s decision to pursue renal research—perhaps multiple “person contacts” over the course of an educational career are necessary to maintain long-term interest in nephrology. Of course, some undergraduate students exposed early to renal research might “drift” into other disciplines; however, this would still be an overall gain to the scientific enterprise.

Although these programs have made a good start, we must continue efforts to capture young students early in the pipeline. Future programmatic efforts might:

- Leverage existing large center programs as catalysts for recruitment of undergraduates and medical students through supplemental support of summer research experiences;
- Coordinate the current and future R25 programs to provide a focus for broad-based experiences in bench and clinical research and promote a national, diverse recruitment; and
- Continue expanding opportunities for short, intensive, research experiences focused on nephrology for medical students and residents. Not only would these experiences promote the value of research to understanding renal physiology and disease, but they would also serve to expose medical students and residents to modern scientific approaches and techniques utilized at the laboratory bench and in clinical research.

### 3. Expand the Nephrology Scientific Workforce

Although nephrology is primarily a clinical discipline, a wide spectrum of talent from various disciplines of basic and clinical research is needed to enrich our understanding of renal physiology and pathophysiology and to develop therapies targeted to the clinical needs of renal patients. The workforce must also include more under-represented minorities to better reflect the renal patient population and to ensure that the community utilizes all of the scientific talent available. ASN has hosted recent summits to address issues surrounding recruitment of PhD scientists into nephrology as well as recruitment of under-represented minorities into both clinical care and research. Existing NIDDK programs (http://go.usa.gov/Zeffj) are complemented by efforts of the BMW and the Diversity Working Group of the ACD (http://acd.od.nih.gov). Many of the recommendations from those committees have been or will be implemented in the coming year (http://acd.od.nih.gov/meetings.htm#september2013) (6). The BMW has recommended that the predoctoral F31 fellowship program (Table 1) expand to all NIH institutes and centers and has commissioned a new workgroup focused on the physician scientist. It will be important to monitor the progress of the new diversity consortia and look for opportunities to leverage those programs for recruitment of investigators into renal research.

In addition, we recommend the following:

- Providing support for PhD faculty appointed within clinical departments and integrating them more fully into medical school clinical activities;
- Incorporating disease-based training into graduate school curricula in order to break down artificial barriers between graduate and medical schools and provide more disease context to fundamental research endeavors;
- Expanding eligibility of the Loan Repayment Program to clinicians engaged in basic research projects,

### Table 1. Summary of NIH funding mechanisms mentioned in this commentary

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<th>Funding Mechanism</th>
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<tr>
<td>F31—Individual Predoctoral NRSA</td>
<td>Provides predoctoral individuals with supervised research training in specified health and health-related areas leading to the research degree (e.g., PhD)</td>
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<td>K24—Midcareer Investigator Award in Patient-Oriented Research</td>
<td>Provides support for clinicians to allow them protected time to devote to patient-oriented research and to act as mentors for beginning clinical investigators</td>
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<td>R01—Research Project grant</td>
<td>Supports a discrete, specified, circumscribed project to be performed by the named investigator(s) in an area representing his or her specific interest and competencies</td>
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<tr>
<td>R13—Conference grant</td>
<td>Supports scientific meetings, conferences, and workshops</td>
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<td>R25—Education Projects grants</td>
<td>Supports the development and/or implementation of a program in one or more of the areas of education, information, training, technical assistance, coordination, or evaluation</td>
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<tr>
<td>T32—Institutional NRSA</td>
<td>Enables institutions to make NRSA to individuals selected by them for predoctoral and postdoctoral research training in specified shortage areas</td>
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<tr>
<td>T35—Short-Term NRSA Research Training</td>
<td>Provides individuals with research training during off-quarters or summer periods to encourage research careers and/or research in areas of national need</td>
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NIH, National Institutes of Health; NRSA, National Research Service Award.
• Expanding eligibility of NIH training programs to non-United States medical graduates with a required commitment to conduct United States-based research, and
• Promoting and rewarding engagement in team science at the institutional level.

Institutions, professional societies, and the NIH have addressed the easily achievable solutions to this problem. Clearly, what we outline here requires additional resources and effort. We should strive to accomplish these goals—even if initial efforts are only partial. NIH and other stakeholders need to remain committed to addressing these goals through constructive and cooperative strategies. As Theodore Roosevelt so succinctly stated, “Do what you can, with what you have, where you are.”

Acknowledgments

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Disclosures

M.G.P. is the chair of the ASN Workforce Committee.

References


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