

CASE REPORT

Wanted: pediatric nephrologists! — why trainees are not choosing pediatric nephrologyMaria Ferris¹, Edward Iglesia², Zion Ko³, Ahinee Amamoo¹, John Mahan⁴, Tejas Desai³, Keisha Gibson¹, Kenar Jhaveri⁵, and William Primack¹¹The University of North Carolina Kidney Center, Chapel Hill, NC, USA, ²The Robert Wood Johnson School of Medicine, ³Brody School of Medicine, Eastern Carolina University, Greenville, SC, USA, ⁴Nationwide Children's Hospital, The Ohio State University College of Medicine, Columbus, OH, USA, and ⁵Department of Nephrology/Internal Medicine, Hofstra North Shore-LIJ School of Medicine, Great Neck, NY, USA**Abstract**

A workforce crisis for many pediatric specialties, particularly nephrology, is due to growing retirement rates, attrition during training, and retention difficulties. To obtain specific information regarding pediatric nephrology trainee shortages, we administered two cross-sectional surveys to non-renal pediatric subspecialty fellows and pediatric nephrology program directors. We characterized the fellows' experiences with nephrology and the program directors' experiences with their fellows as well as their outcomes in the last 10 years. We analyzed responses from 531 non-renal fellows (14.4% response rate). Overall, 317 (60%) fellows rated nephrology as difficult, particularly women (65.4% vs. 49.5%, $p < 0.001$), with American women medical graduates rating nephrology as more difficult compared to all others ($p = 0.001$). More men than women (24% vs. 8%, $p < 0.001$) considered the monetary benefit as not adequate. Program directors (25; 64% response rate) represented 57% of all USA fellows in training, and 15 (60%) found it difficult to recruit qualified applicants. Of the 183 graduates in the past 10 years, 35 (19%) were reported as not in the USA pediatric nephrology workforce. These findings support our belief that a strong effort needs to be made by the academic community to teach nephrology in more interesting and understandable formats. While these are national samples, we were unable to contact non-nephrology fellows directly and program directors from larger programs were underrepresented. Difficulties in attracting/retaining trainees (particularly women) to nephrology must be addressed systematically, identifying incentives to practice in this field. Bold concerted efforts are required and we propose seven steps to achieve this goal.

Keywords

Nephrology training, pediatric nephrology, specialty preference, trainee gender differences, work force

HistoryReceived 24 February 2014
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Published online 28 July 2014**Background**

The nephrology workforce in the United States may be insufficient to meet the needs of the growing number of patients with kidney disease.¹ This shortage is especially worrisome for pediatric nephrology due to inadequate recruitment of trainees and attrition due to retirement and dissatisfaction. American Board of Pediatrics (ABP) data show that in 2011, pediatric nephrologists had practitioners with the oldest mean age (57.4 years) of all 14 ABP subspecialties. In fact, of the 625 ABP certified pediatric nephrologists under the age of 65, nearly one-third (204) will turn 65 in the next 10 years.² It is not clear if the number and career decisions of trainees will create enough new pediatric nephrologists to maintain the current workforce or to meet future demands.

In the US, pediatric nephrology programs experience difficulty recruiting and retaining qualified applicants. For the 2012–2013 and the 2011–12 academic years, there were only 0.6 applicants for each of the 51 Accreditation Council of Graduate Medical Education (ACGME) accredited fellowship positions with 22 positions left vacant by the end of the National Resident Matching Program (NRMP) match for 2012 and 26 left vacant for 2013.³ In addition, these trainees have a high attrition rate, with 27% failing to complete the required 3 years of training.² When this is combined with the lowest pass rate of any pediatric subspecialty (75%) for first-time takers of the ABP nephrology board examinations in 2010 and 2012,⁴ the number of board certified pediatric nephrologists to replace those aging out may soon prove insufficient.

Weinstein in 2008 surveyed 103 pediatric nephrology fellows and received responses from 57 (55%).⁵ These fellows identified a lack of interest or exposure to pediatric nephrology and the perceived future workload as factors discouraging residents from entering pediatric nephrology training. Disturbingly, these fellows also identified perceived faculty dissatisfaction, faculty workload and financial disincentives

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as significant factors decreasing their interest in pediatric nephrology. They also noted a higher dissatisfaction rate from pediatric nephrology fellows in smaller programs.⁵

Concerns about the nephrology workforce are not limited to pediatrics^{1,6-9} nor solely to the United States.⁶⁻⁸ In the US, NRMP data shows that the number of applicants for internal medicine (IM) nephrology fellowship dropped by 33% between 2009 and 2012.³ In 2009, there were 1.6 IM nephrology applicants for each fellowship opening compared to only 1.1 in 2012. Similar concerns exist about nephrology workforce issues in Australia, Great Britain and Canada.⁷⁻⁹

In an effort to understand why nephrology may be less attractive than other fields to pediatricians seeking subspecialty training, we surveyed pediatric subspecialty fellows in fields other than nephrology about their experiences with nephrology during medical school and subsequently, and how these experiences influenced their specialty choice. We also surveyed pediatric nephrology program directors inquiring why they think pediatric residents choose nephrology, their experiences with fellow recruitment, and their estimation of the pediatric nephrology workforce. We believe this data provide important information about the present status of the pediatric nephrology workforce and allow us to suggest future steps to make nephrology a more attractive career choice.

Methods

Survey administration and instruments

Because trainees' direct contact information is not available to the public, we sent e-mails in May, 2011, to all program directors in pediatric specialties other than nephrology using the ACGME database,¹⁰ requesting that they forward a 19 item web-based survey to their fellows, with reminders sent in June and July. (www.unckidneycenter.org/about/Fellows_Survey.docx).¹¹ The pediatric non-nephrology fellows were asked their perceptions of pediatric nephrology as a career, their experience with clinical topics in nephrology, and the reasons why they chose their field of interest rather than nephrology. The survey branched so that those who had considered pediatric nephrology as a career were asked different questions from those who did not. Medical school and gender information were optional.¹¹

In addition, pediatric nephrology program directors identified from the ACGME database¹⁰ received an electronic email linked to a 12-question web-based survey in June of 2011 (www.unckidneycenter.org/about/Program_Directors_Survey.docx)¹¹ with two reminders. The survey asked about the number of fellows in their programs, funding sources, their opinions on why residents do or do not choose pediatric nephrology, possible reasons for fellow attrition, and enumerate any graduates in the past 10 years who are no longer practicing in pediatric nephrology.¹¹

Both surveys had structured items that included Likert-scale, single or multiple choices, slider scale questions and open-ended questions. The surveys were implemented using Qualtrics™ program software (Provo, UT).

The survey was IRB exempt since all data was de-identified.

Data analysis

For the non-nephrology fellows' survey, a 5-point Likert-scale asking fellows to rate the difficulty of nephrology was converted to a dichotomized variable (very easy, easy, and neutral were classified as easy; difficult and very difficult were classified as difficult). For the pediatric nephrology program directors survey, slider scale answers (from 0 to 100 using a sliding bar), were divided into quintiles. Each quintile was converted to a category on a 5-point scale from "weak disincentive" to "very strong disincentive". All survey items were analyzed using descriptive statistics for frequency distributions and Pearson's chi-square for categorical comparisons. We stratified the data by sex and medical school of origin – American medical graduates (AMG) or International medical graduates (IMG). All analyses were conducted in SPSS Version 19 (Chicago, IL). This investigation was exempt by the Institutional review board (IRB) of the University of North Carolina-Chapel Hill as no patient-specific information was requested.

Results

Pediatric non-nephrology fellows

We received complete responses from 531 non-nephrology fellows of a potential 3688 fellows in the ACGME database. The sample is geographically representative and representative of most pediatric subspecialties (Table 1). Overall, 317 (60%) rated nephrology as a difficult subject to learn (Table 2). Women found nephrology to be more difficult than men did (65.4% vs. 49.5%, $p < 0.001$) and female American medical graduates rated nephrology as more a difficult subject compared to all other responders ($p = 0.001$). As anticipated, those who had considered nephrology as a possible specialty choice found nephrology less difficult than those who chose another field (47% vs. 62%, $p = 0.006$).

Table 1. Non-nephrology pediatric fellows' characteristics ($n = 531$).

Characteristics	<i>n</i> (%)
Sex ($n = 523$)	
Male	188 (36)
Female	335 (64)
Location of medical training ($n = 528$)	
American Medical Graduates	410 (78)
International Medical Graduates	118 (22)
Fellowship Area ^a ($n = 531$)	
Critical Care Medicine	87 (16)
Hematology-Oncology	70 (13)
Emergency	69 (13)
Neonatology	57 (11)
Endocrinology	56 (10)
Pulmonology	37 (7)
Cardiology	33 (6)
Infectious Diseases	30 (6)
Gastroenterology	26 (5)
Rheumatology	25 (5)
Developmental-Behavioral	24 (5)
Adolescent Medicine	10 (2)
Other	16 (3)

Note: ^aNine fellows indicated that they specialized in more than one area.

Table 2. Non-nephrology pediatric fellows' perception of pediatric nephrology as a difficult field.

	Easy		Difficult		p Value
	N	(%)	n	(%)	
Overall	214	(40)	317	(60)	
Male ^a	95	(51)	93	(49)	<0.001
Female ^a	116	(35)	219	(65)	
American Medical Graduates ^a	157	(38)	253	(62)	0.051
IMG ^a	56	(47)	62	(53)	
Male American Medical Graduates	71	(50)	72	(50)	0.001
Female American Medical Graduates	84	(32)	180	(68)	
Male International Medical Graduates	23	(52)	21	(48)	
Female International Medical Graduates	32	(46)	38	(54)	
Considered nephrology as a specialty	48	(53)	42	(47)	0.006
Did not consider nephrology as a specialty	166	(38)	275	(62)	

Note: ^aGender and training location information was voluntary.

Table 3. Reasons for not considering pediatric nephrology as a career by non-renal pediatric fellows.

	Overall	Male	Female	p Value
	(n = 441)	(n = 149)	(n = 284)	
	%	%	%	
Too difficult of subject matter to grasp	22	16	26	0.023
Not taught well	18	18	18	0.894
No role model or mentor to guide me towards nephrology	25	29	30	0.876
Monetary benefit is not adequate	13	24	8	<0.001
Lifestyle is not appealing	18	21	16	0.233
Dialysis and transplant patients are too complicated to take care of	19	17	20	0.510
Not enough procedures	20	24	18	0.170
No interest	21	24	20	0.409
Liked my field better	17	18	17	0.750

Note: Respondents could choose more than one answer. Gender information was voluntary.

Table 3 depicts the non-nephrology fellows' perceptions of disincentives to pursue pediatric nephrology. For those who had not considered nephrology as a career, 24% identified "having no role models/mentors", 22% "too difficult of a subject matter to grasp, 21% "not interested" and 17% "liked my field better". More women than men found nephrology to be "too difficult of a subject," (64% vs. 34%, $p=0.023$). More men than women (24% vs. 8%, $p<0.001$) considered the monetary benefit as inadequate.

For the non-nephrology fellows who considered nephrology as a specialty choice, the answer "liked my field better" was understandably the most common reason for pursuing a field other than pediatric nephrology (85.6%), although 17% also listed quality of life issues such as work hours and monetary benefit.

Pediatric nephrology training program directors

We received complete responses from 25 of the 39 program directors (64% response rate). The funding sources for these fellowship positions were hospital (42%), federal (28%), pediatric department (13%), private foundation (12%), or state (2%).

Fifteen program directors (60%) found it either very difficult, difficult, or somewhat difficult to recruit qualified applicants. When asked an open-ended question to cite the reasons for unmatched positions, 24% believed it was due to lack of sufficient qualified applicants. Income and workload were rated as a strong or very strong disincentives

by 17 (68%) and 14 (56%) program directors, respectively. Weak and mild disincentives were "getting along with providers in nephrology" (92%), "ability to find research mentors" (84%), "nephrology patients and their families" (68%), and personal-family reasons (16%). In the past 10 years, 56% of the program directors reported at least one fellow who failed to complete fellowship training. The top 3 reasons cited for fellow attrition were deficient competency/skills, loss of interest, and burden of the research requirement.

Program directors reported the outcome of 183 graduates in the past 10 years with 35 (19%) as not in the US pediatric nephrology workforce. Eight had returned to their native country, 16 were practicing general pediatrics, 5 were in industry, 2 were in government-related agencies (FDA and NIH), 1 pursued another residency-training program, 2 were no longer practicing pediatric nephrology for family reasons, and 1 was no longer practicing for unknown reasons.

Discussion

Our contemporaneous surveys combined with the data from the ABP and the NRMP support the contention that the pediatric nephrology workforce in the U.S. may soon be insufficient to meet the demand for care of children with chronic conditions who survive kidney related complications.^{12,13}

Despite near doubling of pediatric nephrology trainees over the past decade, the fact that 54% of ABP certified pediatric nephrologists in the US were over the age of 55 at

the beginning of 2012 indicates that the number of soon-to-be vacant nephrology positions is worrisome. Furthermore, our data also indicate that a number of trained pediatric nephrologists are not practicing nephrology.

The perception of most program directors that “finding qualified applicants is difficult” is supported by NRMP data indicating an insufficient number of applicants for the number of available slots. Based on our data, possible explanations are lack of interest or fear of the difficulty in nephrology, lifestyle issues, and financial considerations. The relatively low ABP pediatric nephrology pass rate also suggests that some programs may be accepting less qualified applicants. The percentage of IMG’s in pediatric nephrology is also higher than in many other pediatric subspecialties,^{2,3} probably due to the difficulty in filling fellowship positions.

It is alarming that more than 40% of American and 48% of International medical graduates found that nephrology was not taught well or was too difficult of a subject to grasp. Also, women respondents (both AMG and IMG) considered nephrology to be a difficult area to understand (Table 3). Freed et al. surveyed trained pediatric subspecialists and found that the most important factor influencing their career choice was interest in a specific population or organ system, followed by interest in the research/academic environment and lifestyle issues.^{14,15} The perceived difficulty of nephrology as a subject clearly will limit interest in this field. A strong effort needs to be made by the academic community to teach nephrology in more interesting and understandable formats. Special emphasis should be placed on why women find learning nephrology especially difficult, particularly since women now make up a large majority of recent pediatric trainees and 71% of first year pediatric nephrology fellows.¹⁶ Greater exposure to nephrology outpatient clinics as opposed to inpatient settings might provide potential trainees a more accurate view of the clinical spectrum of pediatric nephrology. At least 25% of respondents felt that there was no role model or mentor to direct them towards nephrology is also a concern.

Our results are consistent with Weinstein’s 2008 survey of pediatric nephrology fellows.⁵ They identified a lack of interest or exposure to pediatric nephrology and the perceived future workload as factors discouraging residents from entering pediatric nephrology training. Disturbingly, these fellows also identified perceived faculty dissatisfaction, faculty workload and financial disincentives as significant factors decreasing their interest in pediatric nephrology.

Rochlin in 2011 reported that a pediatric nephrologist could expect more than a \$750,000 lifetime loss of income compared to that of a general pediatrician.¹⁷ The only pediatric subspecialties with lower earning potential than nephrology were endocrinology and infectious disease. Interestingly, only 14% of the non-nephrology fellows considered the earning potential as important although 68% of the pediatric nephrology program directors did.

Combined with the negative impressions of faculty workload and lifestyle, the perceived difficulty of the field, and geographic limitations in job opportunities mostly in academic settings; it is easy to see why only the most motivated trainees consider pediatric nephrology. Similarly, these issues probably account for a considerable portion of the dropout

rate during fellowship. As troubling, is the apparently high percentage of recent trainees who are not currently involved in clinical pediatric nephrology. A natural question is if the academic demands (for USA and international graduates) and career tracks are not conducive to keep young faculty practicing this field.

Nephrology workforce issues also affect internal medicine nephrology, with a 12% decrease in the number of applicants for fellowship in IM nephrology between 2009 and 2011, and only 24% of the positions filled by U.S. graduates.³ A survey among internal medicine non-nephrology fellows reported similar findings to our pediatric study.¹⁸ Findings show that minimal exposure to nephrology during clinical rotations, and the perception that nephrology is too complex, uninteresting, and with few opportunities are reasons for limited interest.

Federal funding has not increased for IM nephrology trainees, compromising the number of nephrologists needed.¹⁹ In a previous study, we determined individuals’ interest in nephrology training (“search term analysis technique”) based on Google™ searches.²⁰ We predicted that medical graduates will continue to pursue subspecialty training in fields other than nephrology until at least 2013, but we could not predict the pediatric nephrology interest because there were not enough search entries using this search term.

Limitations of this study include the inability to contact pediatric non-nephrology fellows directly (not public information). However, we have a large sample, broad subspecialty representation, and geographic distribution of the respondents. Program directors from larger programs were slightly underrepresented in our study so it is possible that larger programs are more desirable and find it easier to recruit fellows. However this hypothesis is refuted since current NRMP³ data indicates no difference in the ability of relatively large versus relatively small programs to fill their complement during the match.

Conclusions and recommendations

The pediatric nephrology workforce is aging and may not meet future demands. This workforce is highly bound for academia and greatly dependent on international medical graduates. Concerted efforts need to be implemented to ensure successful academic careers by these trainees. Some of the difficulties identified in these surveys in attracting and retaining more trainees to nephrology must be addressed systematically with efforts directed at medical students and residents, refinements in training experiences and incentives to complete pediatric nephrology training and enter the workforce. Bold concerted effort is required and we propose these steps:

- (1) Rigorous root cause analysis to understand the attrition of pediatric nephrology fellows should be pursued.
- (2) Re-evaluation of the mandatory US three-year pediatric nephrology fellowship training, as internal medicine trainees only do two years if training.
- (3) Nephrology, renal physiology and pediatric nephrology educators need to develop and teach innovative pediatric nephrology curriculums for trainees, using engaging educational platforms and evidence-based methods for

different learning styles and to attract young professionals from underserved populations. This should start during their early exposure to medical science courses.

- (4) Creative methods incentivizing fellows to complete pediatric nephrology training must be created. These include more loan re-payment plans, sponsorships by academic medical centers in need of pediatric nephrologists and creative schedules to balance fellowship training with personal interests.
- (5) Faculty development and mentoring must be modified emphasizing positive role models and customized for international medical graduates or those who seek part-time positions. Medical schools and professional societies should spearhead this effort evaluating better methods to attract trainees to pediatric nephrology.
- (6) All tracks in academic centers must be valued for career advancement (research clinical care, teaching, and administration).
- (7) Ensure that pediatric nephrology trainees attend therapeutic camps, allowing them to interact with patients away from more formal clinical settings and witness, first-hand, the complex lives our patients cope with and their resilience/joy of life they have.

Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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