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Nephropathology Education During Nephrology Fellowship Training in the United States

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The goals of nephrology fellowship programs are to develop the skills and knowledge of the fellows in order to be competent in the subspecialty and act as independent consultants. Nephrology fellowship training program directors are required to maintain an environment conducive to educating the fellows in each of the Accreditation Council for Graduate Medical Education (ACGME) competency areas.[1] Education in nephropathology is an important ACGME competency that needs to be achieved during fellowship training.[1] In 2009, Berns conducted a survey of practicing nephrologists to assess the adequacy of their fellowship training.[2] The majority (57.1%) of respondents in this survey felt competent and well trained in interpreting kidney biopsy pathology. The other respondents reported either having no or little training in interpreting kidney biopsy pathology during their fellowship and, in any case, not enough to feel competent.[2]

Given the intimate relationship between structure and function of the kidney and the corresponding disease entities, it is understandable how valuable access to kidney biopsies is to nephropathology education. Kidney biopsy is an important diagnostic tool, making it integral to nephrology fellow education. The nephrology fellow not only has to master the biopsy technique but also to incorporate pathology information from light microscopy (LM), immunofluorescence (IF), and electron microscopy (EM) with clinical details to diagnose the kidney disease. Moreover, the emergence of various kidney disease–specific classification and reporting systems emphasize the need for continued update of knowledge in these areas.[3–6] This is further enhanced by the formulation of an etiopathogenetic basis of reporting glomerular diseases, aiding in a more personalized management of patients.[5] A recent refinement in kidney biopsy reporting includes scoring of chronic kidney parenchymal parameters for prognostication,[6] emphasizing the need for familiarity and awareness of kidney pathology terminology by the clinical nephrology community.

The interdisciplinary cooperation of nephrologists and nephropathologists is essential not only to obtain immediate kidney biopsy information, but also to accurately develop clinico-pathological correlations, both in native and transplant kidney diseases. The diagnosis of most renal parenchymal diseases includes criteria such as morphology, immunopathology, and clinical features, but lacks an etiologic basis.[7] To deliver accurate targeted therapy, there need to be continued advances in elucidation of pathogenesis of such glomerular diseases. Historically, fellows learned nephropathology through case discussions, kidney biopsy conferences, and close interactions with the nephropathologist.[8] However, in the recent years, increasing numbers of kidney biopsy samples in the United States have been outsourced to commercial nephropathology groups for analysis. This may hinder or diminish some of the educational components of nephrology fellowship training.

Nephropathology education during nephrology fellowship training may vary across institutions in the United States. The factors for successful nephropathology education have not been well studied. To gain greater insight into fellows' experience regarding nephropathology education, we

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surveyed nephrology fellowship training program directors (N-TPD) in the United States.

METHODS

The study was declared exempt by the institutional review board at Northwell Health. The survey was newly created with no prior known validation. Faculty input and validation were provided internally within the department at our institution. In May 2014, this online survey was distributed via e-mail to all US adult nephrology fellowship training program directors. Each survey was identified by a unique respondent identification number generated by the survey creation software. This ensured the anonymity of all respondents. Follow-up reminders were sent via e-mail in June and July 2014.

Survey domains included characteristics of the programs such as location, size, number of fellows, and number of kidney biopsies evaluated each year (Table 1). Specific questions regarding nephropathology were addressed, including the presence of a division of nephropathology and whether a nephropathologist was present at their institution. Characteristics of nephropathology education at the institution were also obtained to determine how involved the nephropathologist was with teaching, how often nephropathology conferences were offered, and what educational tools were used to teach kidney pathology, such as lectures or videoconferencing. N-TPDs were also asked about other opportunities to enhance the nephropathology education of fellows. The survey included open-ended questions to provide feedback on what a graduating nephrology fellow was expected to know regarding nephropathology. N-TPDs were also asked to rate their satisfaction with nephropathology education at their institution. Survey responses were tabulated as frequencies and percentages. To analyze the independent association of each variable in the survey with satisfaction, we used a generalized logit model. Satisfaction was analyzed as a binary variable by having "Yes" as 1 category and collapsing "No" and "Yes, but we can do better" together (reference category). A χ^2 test of independence was performed to examine the relationship between each survey question and the overall level of satisfaction. A Cramer V test was used to measure the strength of association between variables. A P value less than 0.05 was considered statistically significant.

All analyses assumed a 2-sided significance level of 0.05. Analysis was performed with R statistical software, version R 3.3.1 (R Foundation for Statistical Computing).

Table 1. Baseline questions and results of all components of the survey

Variable	Geographic category	n (%)
Location of institution	Northeast	29 (48%)
	Central	8 (13%)
	Southern	16 (26%)
	Western	8 (13%)
Size of institution	Community hospital with no medical school	2 (3%)
	Community hospital with an affiliate medical school	6 (10%)
	Small-to-medium hospital system w/medical school	9 (15%)
	Large hospital health system w/medical school	44 (72%)
Number of fellows	<2	2 (3%)
	3	2 (3%)
	4	14 (23%)
	5–8	30 (49%)
	>8	13 (21%)
Number of kidney biopsies performed	<50/yr	14 (23%)
	51–100/yr	18 (30%)
	101–150/yr	13 (21%)
	>151/yr	16 (26%)
Division of nephropathology	No	24 (39%)
	Yes	61 (61%)
Nephropathologist at institution	No	11 (18%)
	Yes	50 (82%)
How involved is nephropathologist with teaching	Infrequently involved	1 (2%)
	Sometimes involved	3 (5%)
	Frequently involved	13 (21%)
	Very involved	44 (72%)
Frequency of nephropathology conferences	Biweekly	6 (13%)
	Weekly	2 (4%)
	Monthly	36 (75%)
	Every 3 mo	4 (8%)
Introductory nephropathology lectures	No	5 (8%)
	Yes	56 (92%)
Use of videoconferencing in reviewing nephropathology cases	No	54 (89%)
	Yes	7 (11%)
Satisfaction with nephropathology education	No	2 (3%)
	Yes but we can do better	22 (36%)
	Yes	37 (61%)

RESULTS

A total of 63 U.S. N-TPDs responded (response rate 43%). Table 1 provides the characteristics of the programs (such as location, size,

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