

Does the Kidney Biopsy Portend the Future of Nephrology?

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The histology of the kidney provides valuable information regarding pathologic processes, the chronicity and reversibility of damage, and the opportunity for therapeutic intervention. The kidney biopsy has been an important tool in nephrology practice for more than 50 years. Danish physicians Iversen and Brun (1) described an early technique in 1951, and Kark and Muehrcke (2) introduced the Franklin modification of the Vim–Silverman needle in 1954. In 1958, Brun and Raaschou published their experience with 500 percutaneous kidney biopsies in presentations of GN (3). By the 1970s, histology was recognized as an important determinant of prognosis and treatment (4). The role of histology in securing a diagnosis, assessing prognosis, and guiding management has continued to grow as novel markers of pathogenesis are identified and new techniques are developed to examine tissue. In fact, the Kidney Precision Medicine Project, launched by the National Institutes of Health in 2016, aims to develop a bank of kidney tissue in AKI and CKD, with a goal of defining disease subgroups and identifying cells and pathways for targeted therapies (5).

Although initially performed as an open procedure by surgeons, the percutaneous approach moved the procedure into the hands of general nephrologists. However, the addition of real-time imaging with ultrasound or computed tomography in the 1990s, in an effort to improve safety and the quality of tissue sampled, required specialized equipment and procedural suites. More recently, the performance of the kidney biopsy has been consolidated in the hands of fewer nephrologists, interventional radiologists, and other procedural specialists. The number of nephrologists in practice who continue to perform kidney biopsies has been declining (6), and new challenges exist for training nephrology fellows to safely perform the procedure.

In this edition of the *Clinical Journal of the American Society of Nephrology*, Yuan *et al.* (7) report the results of two surveys: one of graduates of the Walter Reed National Military Medical Center Nephrology Fellowship Program, and the other of training program directors (TPD) of nephrology fellowships in the United States. The Walter Reed survey describes the procedural activity of graduates of a military nephrology fellowship program and the challenges to maintaining this procedure in general nephrology practice. Thirty-five

percent of the 58 respondents continue to perform kidney biopsies, although only 16% do at least ten per year. This paucity is despite the vast majority (83%) feeling well trained and prepared during fellowship for the procedure. The barriers to performing biopsies in clinical practice, including logistics, time, and erosion of skills, are similar to those reported in other surveys of biopsy practice (8).

The importance of the kidney biopsy is evident as TPDs strongly value a comprehensive understanding of the indications, contraindications, and complications of the procedure, as well as kidney histology and pathology. Nevertheless, 51% reported that procedural competence should not be a requirement of fellowship training. Despite an adequate number of biopsy opportunities at nearly every program, logistics, time, fellow disinterest, and untrained nephrology faculty were cited as barriers to fellows performing enough procedures to develop competency at many programs.

Yuan *et al.*'s (7) results highlight the crossroads for kidney biopsy procedures today. Fewer nephrologists are performing kidney biopsies despite the fact that biopsies provide valuable clinical information and yield promise in advancing our understanding of the cellular and molecular determinants of disease, and will likely point us toward novel targeted therapies. The logistic burden of accessing a procedural suite and the time challenge of performing the procedure have resulted in kidney biopsies being referred to specialists both inside and outside of nephrology. These referrals beget an erosion of volume and a decline in procedural skills, propagating the cycle.

Interestingly, at the Walter Reed Center, as well as at other institutions (9), the number of ordered kidney biopsies increased after the procedure was transitioned from nephrology to interventional radiology in 2012, removing the logistic hurdles but maintaining tissue adequacy and patient safety. This suggests the barriers to performing the biopsy are dissuading nephrologists from pursuing histologic data that they would otherwise use should these barriers be eliminated.

At the same time, many nephrology fellowship programs struggle to bring all their trainees to procedural competence in kidney biopsies despite this being an American Board of Internal Medicine requirement to qualify for the initial board certifying examination. This challenge has resulted in the uncomfortable dilemma

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where TPDs have vouched for competence in graduating trainees performing kidney biopsies without confidence in this ability (10).

Addressing this situation requires a careful rethinking of what a nephrologist is, and what requisite skills are expected of nephrologists. As the kidney biopsy is a tool for the evaluation of kidney disease, biopsies should be considered and ordered by nephrologists who are able to assess individualized patients' risks and benefits, counsel patients on the procedure, advise on alternative diagnostic approaches, and recognize complications. That belief is core to nephrology. However, there is disagreement on whether all nephrologists should be expected to have the skills necessary to safely perform the biopsy, most recently revealed by Yuan *et al.* (7).

Several visions of nephrology exist, each with implications on the fellowship training experience. First, the general nephrologist will have the skills to perform biopsies, and the current standard will be maintained that all nephrology fellows are trained to the point of competency. The inability of many programs to fulfill this requirement likely will cull programs in a period of excess supply. In addition, objective measures of fellow competence, such as procedural logs or centralized credentialing, will be needed to enhance the system for verification. This approach will ensure that current graduates and initial American Board of Internal Medicine nephrology diplomates have the skills to safely perform the procedure. Given the reality that a small subset of practicing nephrologists will continue to perform biopsies in practice, this will not presume that all nephrologists can safely perform biopsies as time passes and skills deteriorate.

Second, general nephrologists will facilitate and lead the biopsy by assessing, counseling, and referring patients. However, the procedure will be performed by specialists who maintain equipment, procedural suites, and volume to preserve skills. All nephrology fellows will be trained in the indications, risk and benefits, and complications, but additional training in the form of an interventional nephrology fellowship or focused experience will be required to perform the biopsy. Nephrologists are dependent upon several procedures, including hemodialysis catheter placement, arteriovenous fistula creation and maintenance, and peritoneal dialysis catheter insertion. Kidney biopsies could be added to this list, and promoting interventional nephrology could create a cohort of nephrologists with this as an interest and skillset that can bolster and grow the field. This model is adopted by cardiologists where competency to perform angioplasties is reserved for those completing interventional cardiology training, and competency to ablate arrhythmias is limited to subspecialty-trained electrophysiologists.

Third, general nephrology can be redeveloped to include exposure to all procedures, with additional training in transplantation and critical care nephrology, and nephrology care in current and future models. This option would most certainly evolve nephrology training into a 3-year fellowship, limiting programs that are unable to provide this comprehensive training, and likely affecting the pipeline of applicants deterred by extended training.

Nephrology, too, is at a crossroads. Declining interest among medical students and internal medicine residents has reached a critical point where training programs are unable to fill their complement of positions. Other fields are making

aggressive inroads on traditional nephrology procedures, critical care medicine, and hypertension and CKD management. Instead of allowing this erosion, nephrology must stand firm and declare its value. The subspecialization of nephrology would allow a structured and thoughtful approach to focused domains. An interventional nephrology fellowship would create a select group of motivated and skilled nephrologists able to obtain the equipment, develop the workflow, and maintain the volume to safely perform the kidney biopsy, pulling this and other procedures back into the hands of nephrologists. A similar model exists for transplantation, and can be applied to critical care nephrology, dialysis care, palliative care, glomerular diseases, onconeurology, and other areas of nephrology. The diversification of nephrology could broaden the appeal of the field to students and residents drawn to particular aspects of the field. The kidney biopsy need not fall out of the hands of nephrologists, nor the field of nephrology fall out of favor of students and trainees. New models of practice can address these challenges.

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Disclosures

None.

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See related article, "Survey of Kidney Biopsy Clinical Practice and Training in the United States," on pages 718–725.