

# Nephrologists' Attitudes Toward Native Kidney Biopsy: A Qualitative Study



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**Rationale & Objective:** Although kidney biopsy is a useful tool, nephrologists' approach toward biopsies is inconsistent for reasons incompletely understood, including lack of established clinical guidelines. We examined contemporary clinical decision-making patterns among nephrologists to perform native kidney biopsy.

**Study Design:** Qualitative study using semi-structured interviews.

**Setting & Participants:** Purposive sampling was used to select nephrologists from different regions in the United States. Semistructured interviews were continued until thematic saturation.

**Analytical Approach:** A modified grounded theory was used to identify dominant themes reflecting the nephrologists' decision-making styles about kidney biopsy.

**Results:** Twenty nephrologists were interviewed: 16 (80%) were from academic centers, 3 (15%) performed their own biopsies, and 7 (35%) had been in practice for less than 10 years. The median

time of practice was 14 years. We found substantial variability among the nephrologists in their attitude toward using kidney biopsy, which reflected individual differences in weighing the risks and benefits of the procedure for an individual patient. Five overarching themes were identified: operator comfort with biopsy and availability of interventional radiologist, exposure to biopsy during training and years of experience, concerns about the invasiveness of biopsy and inflicting harm, perception of evidence base and limited treatment options, and patient characteristics and preference.

**Limitations:** Generalizability was limited because the nephrologists sampled may not have been broadly representative.

**Conclusions:** Multiple factors influence nephrologists' decision to pursue kidney biopsy, with substantial variability among nephrologists that can have meaningful clinical implications. This suggests the need to establish consensus guidelines to make kidney practice more standardized.

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Acute and chronic kidney diseases are associated with significant morbidity and high health care utilization, costing >\$100 billion USD annually.<sup>1-3</sup> Timely diagnosis can slow disease progression and mitigate disease burden.<sup>3</sup> Kidney biopsy is the gold standard for diagnosing many kidney diseases and often guides further management.<sup>4</sup> Nevertheless, the use of biopsy is heterogeneous for reasons that are poorly understood, including lack of formal guidelines.

Kidney biopsy provides histopathologic information to guide diagnosis and treatment.<sup>5</sup> Studies have shown that between 30% and 40% of histopathologic analyses demonstrate a nonsuspected disease, indicating that biopsies are of major importance for the correct treatment of patients.<sup>4,6,7</sup> Bleeding is a major complication of kidney biopsies. Severe bleeding complications can lead to the need for blood transfusions, surgical or radiologic procedures to control bleeding, nephrectomy, or even death.<sup>8-11</sup> Advancements, such as automated needles and real-time ultrasound, to guide kidney biopsy have significantly decreased procedural risks while simultaneously improving tissue yield.<sup>12-14</sup>

Although there are no widely used formal guidelines for biopsy, most nephrologists would agree that kidney biopsy is indicated for unexplained nephrotic syndrome and rapidly progressive glomerulonephritis in adults.<sup>15,16</sup> Yet, there are instances in which the appropriateness of kidney biopsy remains unclear. For example, kidney biopsy

remains more controversial and nuanced for nephrotic syndrome in patients with type 2 diabetes and for acute kidney injury with suspected acute interstitial nephritis (AIN).<sup>17,18</sup> This variation can meaningfully affect patient outcomes. Hesitation to perform a kidney biopsy may lead to a delay in diagnosis and potentially result in worse disease outcomes.<sup>6</sup> Conversely, performing an "early" kidney biopsy that is not warranted may expose patients to avoidable risks such as bleeding. We conducted this study to examine factors that account for differences in decision making to perform a biopsy among nephrologists. Our results suggest the need to develop consensus guidelines to assist clinicians and standardize care for patients with kidney diseases.

## METHODS

### Design, Setting, and Participants

Drawing upon a literature review and clinical experience, the team identified factors associated with decision making about performing kidney biopsy, using a deliberative process, to develop an interview guide. Two nephrologists (SSW and AA) assembled a diverse list of nephrology practices, mostly in Massachusetts, and purposively sampled from the list to represent diversity in demography, years of experience, performance of one's own biopsies, and center type (academic vs nonacademic) to capture a wide range of perspectives.

Nephrologists were first emailed and then approached in person or via phone. Recruitment and analysis were concurrent and continued until thematic saturation and sufficient variation in sampling criteria were achieved and confirmed via deliberation.<sup>19</sup>

### Data Collection

The semistructured interview guide was developed by AA and SSW (nephrologists) and MW, TP, and KL (social scientists with expertise in qualitative methods).<sup>20,21</sup> The semistructured guide was informed by the authors' previous work,<sup>20</sup> clinical experience, and literature review. Using open-ended questions, nephrologists were asked to describe their approach to weighing clinical indications for kidney biopsy and reflect on how their clinical experiences with biopsy have influenced their practice patterns. We also explored nephrologists' opinions about patient engagement in the decision-making process. AA conducted all interviews with study participants. The interviews were conducted between September 2018 and October 2019 in person or via video or phone calls based on participant preference following verbal consent. The interviews were audiotaped and transcribed verbatim. The study was approved by the Brigham and Women's Hospital Institutional Review Board.

### Data Analysis

We used a thematic analysis for qualitative research. AA, IMS, and TP created a preliminary codebook based on the interview questions and structure. AA, IMS, and TP independently coded the first 3 transcripts using line-by-line coding.<sup>22</sup> The codebook was updated to reflect code refinement and emergent codes, and consensus was reached via deliberation. The 3 transcripts were then recoded using the revised codebook. AA and IMS then used the revised codebook to code another 5 transcripts independently before finalizing the codebook. In the second stage, using NVivo, version 12 (QSR International), we reviewed all codes to identify decision-making patterns and used axial coding to generate themes. AA, IMS, TP, and KL reassessed the themes and refined constituent codes through iterative discussions. The diverse backgrounds of the authors (nephrology, occupational therapy, community health, and bioethics) allowed data to be interpreted from multiple perspectives. We resolved disagreements via discussion until consensus was reached. We adhered to the consolidated criteria for reporting qualitative research.<sup>23</sup>

## RESULTS

In total, 31 nephrologists were approached, and 20 (65%) participated (Table 1). Of the 20 nephrologists, 16 (80%) practiced primarily in an academic center, 6 (30%) practiced in a combination of academic and nonacademic locations, and 4 (20%) practiced exclusively in nonacademic locations. Of the participants, 7 (35%) had been in practice

**Table 1.** Demography of Nephrologists (N = 20)

Characteristics	No. of Patients
Age, y	
Mean ± SD	49.1 ± 7.0
Median age (range), y	50 (37-65)
Sex, n (%)	
Women	7 (35)
Men	13 (65)
Race/ethnicity, n (%)	
White	14 (70)
Black	3 (15)
Other	3 (15)
Years in practice	
Median (range)	14 (4-23)
Mean ± SD	13.2 ± 5.7
Practice location (multiple affiliations possible), n (%)	
Academic-affiliated center	16 (80)
Veterans Affairs Medical Center	4 (20)
Nonacademic center, private practice	4 (20)
Geographic location, n (%)	
New England	14 (70)
Other Northeast	2 (10)
Southeast	1 (5)
Midwest	1 (5)
Northwest	2 (10)
Biopsy operator	
Biopsy done by IR or nephrology colleague	17 (85)
Performs own biopsies: yes, n (%)	3 (15)
Duration of interviews with participants, min	
Median (range)	34 (20-55)
Mean ± SD	34.6 ± 9.5

Abbreviations: IR, interventional radiology; SD, standard deviation.

for fewer than 10 years, and 3 (15%) performed the majority of their own biopsies. All the nephrologists who performed their own biopsies used real-time ultrasound guidance for the procedure.

Several nephrologists felt that biopsies were not performed frequently or early enough in the course of the disease. They explained that this was due to a combination of factors, including poor patient selection for biopsy and delays in the referral process. "Honestly, we probably don't biopsy enough as a specialty. At least in our group, I think we're very hesitant or very conservative in our biopsy rates" (nephrologist 14). "My experience has been that biopsies provide guidance for treatment, and we are not doing enough biopsies" (nephrologist 10).

We found substantial variability in the nephrologists' willingness to perform a biopsy, which was informed by 4 overarching themes: (i) comfort with biopsy and availability of interventional radiology for the procedure; (ii) experience with biopsy; (iii) concerns about biopsy risks, including patient characteristics and preference; and (iv) perception of an inadequate evidence base. These main themes are summarized in Box 1, and exemplar quotes are presented in Table 2.

**Box 1.** Summary of Main Themes From Interviews

- Operator comfort with biopsy and availability of an interventional radiologist
  - ◊ Nephrologists consider the operator's expertise and ease of scheduling biopsy. Nephrologists who perform their own biopsies believed they had a lower threshold for performing biopsies. Available IR services improved the likelihood of obtaining a biopsy.
- Exposure to biopsy during training and experience
  - ◊ Nephrologists who felt that they received adequate exposure to biopsy during education believed that they biopsied more. Prior experience with biopsy, both positive and negative, influenced the decision to obtain a future biopsy.
- Concerns about biopsy risks, including patient characteristics and preferences
  - ◊ Nephrologists expressed concerns about the invasiveness of biopsy and inflicting harm vs misdiagnosis and mistreatment that results from a delayed biopsy.
  - ◊ Patient characteristics and preferences were considered when making a decision on biopsy. Nephrologists' decision-making styles varied: informed, shared, and paternalistic decision-making styles.
- Perceived evidence base
  - ◊ Nephrologists had a wide range of opinions on the usefulness and timing of biopsy for both acute and chronic kidney diseases. For example, in acute interstitial nephritis and CKD in diabetic patients.
  - ◊ In patients with suspected acute interstitial nephritis, nephrologists were divided on their beliefs and comfort with biopsy. The decision on whether or not to biopsy was strongly influenced by anticipated treatment with steroids. Most nephrologists do not biopsy when they feel that acute tubular necrosis is the diagnosis.
  - ◊ Most nephrologists consider biopsy in diabetic patients with CKD mainly when some other nephropathies are suspected to be responsible for the progression of CKD.
  - ◊ Limited available treatment options hampered the willingness to obtain a biopsy.

Abbreviations: CKD, chronic kidney disease; IR, interventional radiology.

## Clinical Contexts

### Chronic Kidney Disease in Patients With Diabetes

Several nephrologists did not routinely perform kidney biopsy in patients with diabetes who presented with chronic kidney disease and nephrotic range proteinuria because they perceived that a kidney biopsy would rarely add new information that would alter management. Biopsy was considered in patients with diabetes when there was suspicion of nephropathies other than diabetes: "I biopsy when it does not follow the expected natural course of the disease...if someone has microalbuminuria, proteinuria, progressive proteinuria with a gradual decline in kidney function over years, I would not biopsy" (nephrologist 6) and "I will biopsy someone with diabetes if I thought they have a superimposed renal process which is hard to differentiate" (nephrologist 7). Conversely, some nephrologists maintained a low threshold of performing biopsies for patients with diabetes despite suspecting that the most likely diagnosis was diabetes: "I am willing to proceed in biopsy to confirm the diabetes...let's just make sure kind of thing" (nephrologist 19).

### AIN Versus Acute Tubular Nephritis

Opinions on the appropriateness of kidney biopsy in patients with AIN were split among the nephrologists in our study. One nephrologist stated, "when I suspect AIN, I will be more inclined to biopsy the patient...I want to have more certainty about the diagnosis" (nephrologist 12). However, another nephrologist had a different statement: "I rarely biopsy in AIN. Typically, I would manage

empirically, meaning, discontinue offending agent and then possibly try empiric steroids before considering doing a biopsy" (nephrologist 13). In contrast to the split opinion on kidney biopsy for patients with AIN, the nephrologists consistently stated that they seldom ordered a biopsy for acute kidney injury or acute kidney disease when acute tubular nephritis was the primary suspicion: "if the clinical scenario is very prototypical for ATN and the time course and rate of rise of creatinine and urine sediments, then I will not want a kidney biopsy" (nephrologist 3).

### Comfort With Biopsy and Availability of Interventional Radiology for the Procedure Expertise in Conducting Biopsy

Among nephrologists who did not perform their own biopsies, the proficiency and complication rate of their colleagues who performed biopsies influenced the decision to perform a biopsy. Nephrologists who were more confident in their colleagues' expertise were likely to order biopsies more frequently: "I used to be really restrictive with biopsies. But then when I joined the other hospital, Dr. X was doing all our biopsies and he had a very low complication rate...my threshold went dramatically down, and I started to biopsy a lot more. Then I realized that I was actually gaining a lot more insight from biopsy" (nephrologist 12). The nephrologists who performed their own biopsies believed that they had a lower threshold of performing kidney biopsies than those who referred patients for biopsies to colleagues: "I think that there will be a difference between nephrologists who perform their

**Table 2.** Selected Quotes Reflecting Physician's Training and Experience With Biopsy**Theme 1: Operator Comfort With Biopsy and Availability of an Interventional Radiologist**

"I do quite a lot of biopsies myself, and so, I don't feel nervous about ordering it or performing the biopsy myself. I mean some of my colleagues seem to feel that the biopsy seldom significantly changes management, but I don't think that's true. I think quite often we learn a lot about how we can treat people and about prognostic factors from the biopsy." (nephrologist 10)

"Honestly, it's much easier to have IR do it." (nephrologist 18)

"... we have our IR readily capable of doing the kidney biopsies and we're able to send it out locally to be read, and they're pretty good." (nephrologist 19)

"Half of that has to do with the time that it takes me or our staff here, that you know, our staff of nephrologists, to either leave clinic, stop rounds, go consent the patient, set up, get the patient down to radiology, and manage that is takes far more time than it takes Interventional Radiology to do it." (nephrologist 7)

"You can order the procedure to be done by IR if there is no nephrologist. Actually, it is easier to just get it done from IR. For a nephrologist to do it, it does require you to do it at a particular time slot...so if you're busy during that slot then it becomes more difficult and may make you reconsider." (nephrologist 6)

"We've been sending biopsies to interventional radiology with increasing frequency. Just because of faculty preference or faculty availability." (nephrologist 11)

"Logistics in the community tend to be a little bit easier. All of them are done by Radiology for us. So anywhere, there's Interventional Radiology or same-day procedure unit they're pretty good and they've gotten it down." (nephrologist 13)

**Subtheme 1A: Fewer Faculty Available to Perform and Supervise Biopsy and Consequently Fewer Opportunities for Fellows to Learn**

"There's logistics challenges to biopsy. We have fewer and fewer faculty members in our division who are doing kidney biopsies, now there are three or four faculty members in our division, it used to be everyone...it may be more difficult to find faculty who are available to supervise biopsies for fellows too." (nephrologist 11)

"We're losing them. I think that fewer and fewer nephrologists are doing biopsies, and so, skill level is down...I think that more of them are being referred out to interventional radiology or other interventional services." (nephrologist 9)

**Theme 2: Exposure to Biopsy During Training and Years of Experience****Subtheme 2A: Training Programs' Effect on Comfort and Competence With Biopsy**

"My teaching was actually very much pro biopsy...since then I've been doing a lot of biopsies myself, and I think I have pretty much the same approach to which was yes. Biopsy." (nephrologist 15)

"I've never had a fear of biopsy, I think people do, but I've been like that since my training. First of all, I want to know. I would much rather know the answer to the question than to guess." (nephrologist 16)

"The times when I have done a biopsy, it has been for good reason which makes me think I should probably do more. The way I was taught was if all your kidney biopsies are exciting then you're not doing enough biopsies." (nephrologist 19)

"Most of us practice in a highly individualized way probably based a lot on what we learned when we were training." (nephrologist 20)

"It depends on where you trained. At Hospital X there's a lot of biopsies that gets done there because of the pathologist and set up there, so you just want to know what it looks like." (nephrologist 13)

**Subtheme 2B: Effect of Experience With Biopsy**

"As a young nephrologist new in practice, I find that I leaned on my colleagues and I often discussed the case with other nephrology colleagues...those with more experience." (nephrologist 13)

"I think now compared to when I was just coming out of fellowship, I've come to appreciate more how often we're mistaken based on our clinical reasoning...the frequency with which the alternative diagnosis ends up being found on biopsy." (nephrologist 14)

"I feel more people need to get a biopsy; it is getting those people biopsies sooner so that we can actually make a difference in their care that's the challenge. My experience has been that we're seeing far too many people late in their disease process...if the person has been biopsied sooner, clearly we could have made some difference but that didn't happen because there is no access to care." (nephrologist 19)

**Theme 3: Concerns About Biopsy Risk, Including Patient Characteristics and Patient Preference**

"There are numbers quoted in the literature, but I think physicians are also affected by their patient experiences. I have been in practice for a long time, I have certainly seen patient have complications from renal biopsies, so I take the risk very seriously. I feel more cautious and frankly very protective of my patients." (nephrologist 3)

"I had a patient who got biopsied for hematuria, ended up with AV malformation and bleeding complications that resulted in a partial nephrectomy...so I think of it more thoroughly now." (nephrologist 2)

"For solitary kidney, to me the answer is almost a hundred percent. I would never biopsy somebody who has a single kidney, it's just too much of a risk in my opinion. I will empirically treat whatever the presumed diagnosis is in that setting." (nephrologist 16)

"When you see patients have major complications or potentially die from complications of biopsy, it changes your thinking about risk and benefits. I think that is probably a natural progression as you gain experience and maturity." (nephrologist 9)

"It's largely because there are other diagnostic tools now that kind of help us that I don't necessarily feel we need to biopsy." (nephrologist 18)

"I consider age, frailty, need for anticoagulation, body habitus...the frailer the patient is, the less likely I will be to recommend a biopsy. If the patient is very obese and I think that it'll be technically challenging to get the biopsy safely then I may be less likely to recommend one." (nephrologist 14)

"I have a low threshold to do biopsy in younger patients, I want to protect their kidneys for a longer time because their life expectancy is longer. I also have a higher tendency to biopsy African-Americans because of the underlying genetic makeup." (nephrologist 5)

(Continued)

**Table 2 (Cont'd).** Selected Quotes Reflecting Physician's Training and Experience With Biopsy

"I'm less inclined to biopsy people with very small echogenic kidneys...you get less valuable information on the risk is higher. I look at the age of the patient, I'm less inclined to biopsy in older age if I feel they cannot tolerate chemotherapy anyway." (nephrologist 4)

"Other factors that weigh into my decision; people who don't have good support at home. I usually think about it hard." (nephrologist 10)

"Patients are very different; some patients really want to know, so the threshold may be lower. Some patients really do not want a procedure and you really need to factor that in as well." (nephrologist 6)

"It would depend a bit on the person, there are those people who want to know, regardless of whether it's going to change management. So, I think that also has to play into it. So patient preference is a factor that will weigh into the decision."

"It is my view that it is our job as physicians to make a recommendation to the patient not to give them numbers and expect the patient to take the numbers and decide on what to do. So, I give the patient my best recommendation...I think you should a biopsy for the following reason." (nephrologist #9)

"Oh! Another factor is the referring doctor. That sometimes has an impact. So, a particular rheumatologist or oncologist may feel very strongly that biopsy is going to affect care, even if I don't 100% agree with that referring doctor, if the referring doctor feels very strongly then we might take that into account." (nephrologist 3)

#### Theme 4: Perceived Evidence Base

"We're an academic program and I think that the threshold for offering kidney biopsy differs enormously across providers, which is usually a sign that there's a problem...there is limited evidence to support practice, a lot of practice variation." (nephrologist 20)

"I think there's always a tension between doing a biopsy or conservative mgt...also I don't think there's really great data for treatment." (nephrologist 9)

#### Subtheme 4A: Diabetes and Kidney Disease

"I was more aggressive in the early days than I am now. You gain more clinical experience and comfort and form your judgments that differ from things you were taught...I used to biopsy patients with diabetes but no retinopathy, expecting to find something other than diabetes...every last one of them had diabetic nephropathy. So that you do it enough times and it changes your thinking and your practice patterns." (nephrologist 9)

"I probably biopsy fewer diabetics now. We used to think of nephrotics would probably be an aggressive form of diabetic kidney disease and we were biopsying right away. But now unless they're still in 10gram - 20 grams, we're not going to biopsy a diabetic." (nephrologist 18)

"I guess I rarely do it. I think the goal is to not, you know if you have 100 biopsies maybe just 5 should be diabetes you know. You have to take out a few normal appendixes." (nephrologist 7)

"I will want to biopsy, although this could be diabetes, but we know that in diabetic nephropathy, in significant number of cases, there can be concurrence of other etiology that may be treatable. So, if we blame all the disease on diabetes, we may never pick up other etiology." (nephrologist 1)

"Diabetes does not protect you against amyloid, minimal change disease, membranous glomerulonephritis, or lupus...just because someone has diabetes, I might biopsy them anyway." (nephrologist 4)

#### Subtheme 4B: AIN vs ATN

"If there's high clinical suspicion for AIN then I generally do not biopsy. I treat empirically."

"I biopsy maybe half of them if I feel the risk of the biopsy is relatively low and if I am really not sure there is a culprit drug or if I am really not sure it is AIN I will biopsy. I also use steroids empirically quite often." (nephrologist 7)

"I prefer to biopsy first, I don't like treating AIN with steroids without a biopsy." (nephrologist 12)

"I don't necessarily have to biopsy before I use steroids. I also typically don't use steroids because I feel like the risk of the complications of steroids outweighs the benefits because the data is so poor." (nephrologist 16)

"We're mistaken how common AIN probably is in the hospital. For instance, looking at somebody with AKI, I would wait less time before saying it's time to go for a biopsy." (nephrologist 14)

"I don't biopsy ATN. There's no information that I'm going to obtain on a biopsy of ATN that's going to change what I do for management." (nephrologist 11)

"You have to exclude ATN because I really try not to biopsy clear-cut ATN...if the history or the urinalysis suggests ATN, eg, if there was documented hypotension, documented sepsis and recent surgery and all the causes of ATN...I can be confident that it's ATN and I would not biopsy."

"A biopsy of ATN would be just out of curiosity. What could this be? But it doesn't offer any potential benefit to a patient. There's no benefit to a patient."

"I don't think they are very many specific therapies and so then, I think the risk of the biopsy which is higher in people with acute illness (ATN) is outweighed by the fact that I'm not going to change my treatment." (nephrologist 10)

Abbreviations: AIN, acute interstitial nephritis; AKI, acute kidney injury; ATN, acute tubular nephritis; AV, arteriovenous; IR, interventional radiology.

own biopsies versus those who refer the biopsy...nephrologist who perform their own biopsies are more likely to be have a lower threshold" (nephrologist 15) and "I do a lot of biopsies by myself, so I don't feel nervous about ordering or performing it. So, I think I biopsy more than other nephrologists" (nephrologist 10).

#### Ease of Scheduling a Biopsy

The nephrologists' decisions to biopsy were influenced by how easy or difficult it is to schedule. Many felt that logistical challenges with scheduling a biopsy and lack of time to perform a biopsy were 2 major barriers. The availability of interventional radiology for biopsies was a

factor that influenced the threshold of ordering a kidney biopsy: “how easy it is to do a procedure within a practice does shape practice a little bit” (nephrologist 20). Among the nephrologists who did not routinely perform their own biopsies, being able to delegate a biopsy was perceived to lower the threshold of ordering a kidney biopsy: “I think I biopsy more now... it could be that I’m not doing the biopsies myself, so I just delegate it (to the IR department). I think that makes it easier” (nephrologist 17).

## Exposure and Comfort With Biopsy During Training and Practice

### Training

Training programs’ practice patterns influenced the nephrologists’ approach toward the decision to biopsy: “my teaching was very much pro biopsy, so with that I’ve been doing a lot of biopsies myself in practice” (nephrologist 15). Conversely, some nephrologists acknowledged that they had a high threshold for ordering a biopsy as a result of limited exposure during training: “I wasn’t exposed to a lot of renal biopsies during training so my threshold for biopsy has always been pretty high” (nephrologist 20).

### Experience With Biopsy

Salient positive or negative clinical experiences played a key role when biopsy decisions were made. Positive experiences reinforced the likelihood of performing biopsies in similar scenarios, whereas prior negative experiences were likely to discourage the performance of a future biopsy. Some nephrologists believed that positive experiences, such as unexpected findings on histopathology that changed management and improved patient outcomes, increased their willingness to order future biopsies in similar cases. Nephrologists with such positive experiences suggested that a biopsy frequently uncovered an unexpected alternative diagnosis: “I biopsy more now. I’ve come to appreciate more how often we’re mistaken based on our clinical reasoning...the frequency with which the alternative diagnosis ends up being found on biopsy” (nephrologist 14).

Conversely, some nephrologists reported that their likelihood to pursue a biopsy decreased compared with that when they started practice because prior biopsy reports failed to add significantly new information to the prebiopsy suspicion. This perceived negative experience from previous biopsies discouraged them from ordering a future biopsy in similar cases: “I was more aggressive in the early days than I am now. The reason is you gain more clinical experience and form your judgments that differ from things that you were taught” (nephrologist 9).

## Concerns About Biopsy Risk, Including Patient Characteristics and Preference

### Biopsy Risks

Although biopsy was seen as a relatively safe procedure, the nephrologists expressed concerns about its invasiveness

and potential complications: “when you see patients have major complications or potentially die from complications of biopsy, it changes your thinking about risk and benefits...that’s a natural progression as you gain experience and maturity” (nephrologist 9). These concerns were heightened among patients who were perceived to be at higher risk, such as individuals with solitary kidneys, pregnant women, and elderly patients: “for solitary kidney, to me the answer is almost a hundred percent. I would never biopsy somebody who has a single kidney, it’s just too much of a risk in my opinion” (nephrologist 16). Some nephrologists described that the advent of noninvasive tests, such as serologic markers, have reduced reliance on biopsy: “there are ways to make a diagnosis without a kidney biopsy...eg, with PLA2R (phospholipase A2 receptor), I am now comfortable diagnosing primary membranous without a biopsy. Also, with ANCA (anti-neutrophil cytoplasmic antibody), I am comfortable in some cases not biopsying” (nephrologist 13).

### Patient Preferences and Characteristics

Patient characteristics and local practice patterns also strongly influenced the nephrologists’ decisions to order a biopsy. Most nephrologists stated that they were more likely to biopsy younger patients. They also considered frailty, coexisting comorbid conditions, and prognosis while determining when to biopsy: “in the elderly, it’s not their calendar age, but their physiological age, meaning how independent they are, that determines how aggressive I’m going to be” (nephrologist 12). Patients’ social support also affected the decision to biopsy: “we take care of underserved population so there is a lot of social factors that come into play, patient may live alone or may not have a family member who will monitor them post-biopsy to make sure they don’t have complications” (nephrologist 6). The nephrologists perceived that patients have different appetites for health information: “patients are very different; some really want to know so the threshold to biopsy may be lower, and some patients really do not want the procedure and you need to factor that in as well” (nephrologist 2). There was disagreement in how much involvement the nephrologists should have in guiding the patient to make decisions about kidney biopsy. Many nephrologists believed that they provided the patient with the necessary information and treatment options but usually left the biopsy decision to the patient: “I find myself a lot of the time framing it so that the decision is really up to the patient” (nephrologist 13). On the opposite extreme, some nephrologists described a more paternalistic approach. They explained that they just did not feel that the patient had enough knowledge to make such decisions and believed that it was their role to get more involved in the decision-making process: “I help them make a decision about biopsy. I have to make that decision and say this is what we need to do” (nephrologist 15).

Communication and decision making were not only restricted to the patient and their family but also extended to the interactions and wishes of the referring doctor. As a result, the nephrologists often had to balance their clinical judgment with patient preferences and the wishes of the referring doctor: “referring doctor has an impact. A referring specialist who feels very strongly that biopsy is going to affect care, even if I don’t 100% agree with that referring doctor, we might take that into account” (nephrologist 3).

### Perceived Evidence Base

Nephrologists who were less likely to order kidney biopsies referenced the limited evidence base and conflicting data on biopsy as a tool to manage many kidney diseases: “it’s a hard thing to study...we are in a data free zone when it comes to biopsy, most of us practice based on what we learn from our colleagues and from our own cumulative experience, but it’s definitely is a wild west out there” (nephrologist 20). The nephrologists also explained that treatment options are lacking or equivocal for many diseases. In such scenarios, the use of biopsy was called into question: “I biopsy less now...it’s an appreciation of risk and of limited benefits given that there’s fewer treatment options in nephrology. I mean if there were more treatment options, I would do more biopsies” (nephrologist 11). When asked about the use of steroids to treat suspected AIN, the nephrologists noted that the evidence was just not conclusive: “I typically don’t use it because I feel like the risk of the complications of steroids outweighs the benefits because the data is so poor” (nephrologist 16).

## DISCUSSION

We found substantial variability among the nephrologists in this qualitative study of making decisions about performing kidney biopsy in adults with suspected kidney diseases. The factors that influenced the approach to decision making on whether or not to pursue kidney biopsy included the nephrologists’ clinical experience or training, processes of care in their institutions, and clinical considerations of the use and safety of the procedure. Salient positive or negative experiences with biopsy, training, concerns for the risks of biopsy, and perceived available evidence all played critical roles and explained, to some degree, the differences in biopsy approaches. This study explored several considerations that nephrologists make in their decision to proceed with a kidney biopsy and highlighted the need for more guidelines to standardize decision making.

Kidney biopsy is considered the gold standard for the diagnosis of kidney disease. Biopsy is associated with less but significant harm to the patient. Guideline recommendations and advances in the biopsy technique have improved the procedure’s safety and efficacy.<sup>24,25</sup> However, bleeding still remains a common complication, and

the reported bleeding rates associated with biopsy vary considerably.<sup>8-10</sup> Bleeding complications and the risk of inflicting harm to the patient was a theme that was expressed by almost all the nephrologists while contemplating on the decision to perform biopsy. The nephrologists who performed their own biopsies believed that they performed more biopsies and felt less anxious about the procedure than their colleagues.

Although there seems to be consensus on certain clinical indications, such as unexplained nephrotic syndrome in adults or rapidly progressive glomerulonephritis without a serologic diagnosis, the decision to proceed with biopsy in most other kidney diseases is more nuanced. For instance, a nationwide survey among nephrologists in Japan reported significant variations in clinical practice patterns and indications for biopsy.<sup>26,27</sup> Our results are consistent with this finding. The guidelines that currently exist in nephrology regarding kidney biopsy are not specific to making decisions about when and in which patients to perform the procedure. Guidelines published by the Kidney Disease: Improving Global Outcomes on acute kidney injury<sup>28</sup> and glomerulonephritis<sup>29</sup> or by the Kidney Disease Outcomes Quality Initiative on diabetes and chronic kidney disease<sup>30</sup> do not discuss in detail the factors that should be taken into account while considering a kidney biopsy. Such guidelines do not provide specific information on the factors that should be considered while deciding whether to perform a kidney biopsy. For example, should patients with nephrotic syndrome in the setting of long-standing, poorly controlled diabetes mellitus undergo kidney biopsy to rule out diagnoses other than diabetic nephropathy? Should patients with acute kidney injury due to suspected AIN undergo kidney biopsy before being considered for corticosteroid therapy? In patients with rapidly progressive glomerulonephritis with positive serology results for antineutrophil cytoplasmic antibody, should kidney biopsy always be performed? The answers to these common clinical questions—or even a systematic approach to a risk-benefit decision—are not addressed in the current guidelines to the best of our knowledge. Recently, the Japanese Society of Nephrology published a report titled “Kidney Biopsy. Guidebook 2020 in Japan,” outlining general recommendations on the performance of kidney biopsies.<sup>31</sup> Recommendations on clinical indications for biopsy were broadly provided, but these did not describe clinical considerations in substantial detail.

Other kidney biopsy guidelines that do exist—for example, the Kidney Health Australia Caring for Australasians With Renal Impairment—focus more on procedural aspects, education for patients and caregivers, and safety considerations.<sup>32</sup> In pediatrics, the International Pediatric Nephrology Association and Kidney Disease: Improving Global Outcomes have published guidelines on the management of nephrotic syndrome in children, including considerations regarding the use of kidney biopsy.<sup>33,34</sup> No similar guidelines exist for adults with nephrotic syndrome

or for the management of acute kidney injury or acute kidney disease.

In other fields of medicine, making decisions about the choice to biopsy the liver, lung, endomyocardium, or peripheral nerves has received somewhat more attention, even outside of oncologic considerations.<sup>35-38</sup> For the diagnostic evaluation of cardiovascular disease, for example, the American Heart Association, American College of Cardiology, and the European Society of Cardiology published guidelines on the role of endomyocardial biopsy in the diagnosis and treatment of adult and pediatric cardiovascular diseases.<sup>36</sup> In their statement, the writing group identified 14 clinical scenarios in which the incremental diagnostic, prognostic, and therapeutic values of biopsy could be estimated and compared with its procedural risks. Similarly, the British Thoracic Society, Royal College of Radiologist, and Society of Cardiothoracic Surgeons of Great Britain and Ireland issued joint guidelines and recommendations for lung biopsy. The writing committee weighed the benefits and risks of biopsy in different clinical scenarios and graded the strength of their recommendation in the context of existing evidence.<sup>38</sup>

Acute and chronic kidney diseases include a number of distinct morphologic and clinical entities that differ with respect to prognosis and treatment. In recent years, across medical disciplines, there has been a heightened emphasis on precision medicine.<sup>39</sup> There are advocates for expanding the role of kidney biopsy in acute and chronic kidney diseases.<sup>40,41</sup> The National Institutes of Diabetes and Digestive and Kidney Disease launched the Kidney Precision Medicine Project, a project that includes research biopsies in patients with common forms of kidney disease. As our understanding of the pathogenesis of kidney disease deepens and technology advances, newer therapies and treatment options will likely emerge. This will make judgments on the risk-versus-benefit profile of biopsy more complex. The complex decision-making process that is often associated with a biopsy suggests the need for guidelines to standardize care. We acknowledge that such guidelines cannot capture all clinical scenarios and details and that decisions regarding biopsy will be on a case-by-case basis. However, it may be worthwhile for expert committees to provide general guidelines on decision making about common clinical scenarios faced by nephrologists. No guideline can supplant clinical decision making at the bedside, but general principles for the approach toward decision making may be helpful.

Our study highlighted some of the perspectives of nephrologists in their approach toward making decisions to perform a kidney biopsy. In this study, the nephrologists adopted various decision-making styles—informed, shared, and paternalistic—which reflect the complexities in balancing the risks and potential benefits of biopsies.

The strengths of our study include the use of open-ended questions and a qualitative analysis framework to identify overarching themes. The major limitations are the lack of generalizability. We sampled a relatively small

number of nephrologists, primarily in the Northeast United States and primarily from academic-affiliated practices. The considerations of nephrologists in other regions and private practices warrant further attention.

Clinical decision making for native biopsies in adults with kidney disease is complex. Our study demonstrated substantial variability among the physicians in their willingness to perform kidney biopsy and underscored the many factors that lead to this variability. As the scientific yield of kidney tissue and noninvasive tests improves with advances in technology, making decisions about performing kidney biopsy will become even more complex, and this highlights the need for guidelines to standardize biopsy practice.

## SUPPLEMENTARY MATERIAL

### Supplementary File (PDF)

**Item S1.** Survey study interview guide.

**Table S1.** Consolidated criteria for reporting qualitative research 32-item checklist.

**Table S2.** Description of study participants (n = 20).

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