A cross-sectional, national survey on current practices and patterns in telenephrology among nephrologists

Hari Shankar Meshram MD, Sanjeev Gulati MD, Sanshriti Chauhan MD, Saurabh Puri MD, Sourabh Sharma MD, Varun Kumar Bandi MD

ABSTRACT

Introduction: *Telenephrology is an emerging but underreported area of practice. This study evaluated nephrologists' confidence in diagnosing and managing a range of kidney conditions using telenephrology.*

Methods: *A cross-sectional online survey was conducted between September 2024 and January 2025 among practicing nephrologists in India. The questionnaire included 11 general and 110 condition-specific items. Respondents rated their confidence across clinical scenarios using a Likert scale. A response of moderate, high, or very high (≥60% confidence) was defined as "confident."*

Results: *A total of 136 nephrologists from India participated. Of these, 73 (53.7%) used synchronous methods, with half conducting video consultations. The most frequently cited limitations were incomplete clinical examination (115; 84.6%) and medico-legal risks (89; 65.4%). Overall, 11 (44%) of 25 kidney conditions in the naïve diagnostic setting surpassed the confidence threshold. In contrast, only 2 (8%) of 25 conditions in naïve management reached this benchmark, primarily urinary tract infections and early-stage CKD (≤G3a). In chronic dialysis care, confidence was higher for hemodialysis-related complications but notably lower for peritoneal dialysis issues. Follow-up care in general nephrology (97; 71.3%) and kidney transplant recipients (103; 75.7%) exceeded the threshold in several scenarios. Counseling-related tasks reflected the lowest confidence (43; 31.6%). Factors such as pediatric exposure, academic affiliation, years of experience, sector of work, and workload did not significantly affect confidence levels.*

Conclusion: *This India-focused survey highlights promising confidence in telenephrology for diagnosis and follow-up but underscores the need for targeted improvements in management and counselling applications.*

Keywords: Telenephrology, Nephrologists, Survey, Hemodialysis, telemedicine

INTRODUCTION

The World Health Organization defines telehealth as the delivery of health care services through information and communication technologies in which patients and providers are separated by distance, and which may be used for diagnosis, treatment, research, evaluation, and continuing education.[1] When applied to nephrology, telehealth is recognized as *telenephrology*. Over the past two decades, there has been a gradual transition from exclusively in-person visits to virtual care, a trend accelerated by the impact of the COVID-19 pandemic.

Despite this growth, there are few reports on telenephrology, particularly from the patient's perspective, and only limited large-scale studies have explored the complexities of its implementation.[2] The attitudes and practice patterns of nephrologists are also rarely reported, especially in emerging nations such

Corresponding author: **Sanjeev Gulati**
Contact Information: Sgulati2002@gmail.com
DOI: 10.12746/swjm.v14i59.1615

as India. This knowledge gap is further compounded by the variability in nephrology centers' policies and the acceptability of telenephrology.[3] Moreover, no prior study has evaluated nephrologists' confidence in using telenephrology for specific kidney conditions.

The objective of this study was to characterize current telenephrology practice patterns and confidence levels across a range of kidney conditions among nephrologists in India. Identifying areas of high and low confidence could inform improvements to the existing system and provide a basis for targeted interventions.

Materials and Methods

The survey was constructed by the investigators (HSM and SC). Ethical approval was obtained from the Institutional Ethics Committee (Approval No. EC/NEW/INST/2021/2140: F-442/25). A pilot version was circulated among 10 nephrologists for cross-validation. Based on their feedback, a few items requiring highly granular details of diagnosis and management were excluded to reduce fatigue and improve response rates.

The final survey was administered online using Google Forms and allowed only a single, non-editable response. It was fully anonymous, as no identifying information, such as email address, name, gender, or institution, was requested. The survey was distributed to nephrologists across India between September 2024 and January 2025 via email and phone calls, and responses were accepted until January 11, 2025.

The final questionnaire comprised 11 general questions and 110 condition-specific questions, all closed-ended. The complete list of items is provided in Supplementary Table 1. General questions included place of work, sector (public or private), pediatric exposure, years of experience, and the average number of new outpatient registrations per month (to estimate workload). Additional items assessed current practice patterns in telenephrology (not practicing, synchronous, asynchronous, remote monitoring, or mobile applications), the proportion of general and transplant patients managed using telenephrology, data storage practices, and the perceived role of telenephrology in clinical trials. The modality of practice (audio vs. video) and perceived limitations were also recorded.

Specific questions were organized into six domains: (1) naïve diagnosis, (2) naïve management, (3) counseling scenarios, (4) chronic dialysis complications, (5) follow-up of discharged general nephrology patients, and (6) follow-up of discharged kidney transplant recipients (KTRs). Confidence for each item was assessed using a 5-point Likert scale (very low, low, moderate, high, very high).

The naïve diagnosis domain (25 items) included acute kidney injury (AKI) and its common etiologies, AKI requiring dialysis, kidney biopsy, rapidly progressive glomerulonephritis, nephrotic and nephritic syndromes, autosomal dominant polycystic kidney disease (ADPKD), Alport syndrome, myeloma kidney, non-obstructive nephrolithiasis, various stages of chronic kidney disease (CKD), urinary tract infections, electrolyte disorders, and enuresis. The naïve management domain (25 items) addressed the management of these same conditions.

The counselling domain (13 items) included scenarios such as prognosis after AKI or CKD, initiation of dialysis, decisions regarding native or graft kidney biopsy, initiation of steroids or other immunosuppressive therapies (rituximab, cyclophosphamide), arteriovenous fistula creation, vaccination, reproductive counselling, and palliative care.

The chronic dialysis complications domain (18 items) included anemia, bone disease, vaccination, cardiovascular disease, pruritus, dialysis adequacy, diabetes, hypertension, volume overload, malnutrition, sexual and reproductive health, mental health issues, vascular access dysfunction, hepatitis B/C seropositivity, and HIV seropositivity. Peritoneal dialysis–specific complications (catheter dysfunction, CAPD infections, ultrafiltration failure) were also included.

The discharged-patient follow-up domain (17 items) included AKI (with or without dialysis), acute interstitial nephritis, lupus nephritis (induction/maintenance), membranous nephropathy (primary or secondary), nephrotic syndrome (conservative or immunosuppression), ANCA-associated vasculitis, and CKD with volume overload. It also covered CAPD-related

Table 1. Confidence Scale and Percentage Confidence of Various Naïve Diagnoses and the Management Related to Kidney Health

	Naïve Diagnosis									Naïve Management							
	Confidence Scale						% Confidence		p-value	Confidence Scale						Confidence		
Kidney Health Conditions	Very Low	Low	Moderate	High	Very High	p-value	No	Yes		Very Low	Low	Moderate	High	Very High	p-value	No	Yes	p-value
AKI KDIGO III, no KRT	22 (16.18)	40 (29.41)	28 (20.59)	34 (25)	12 (8.82)	0.0017	62 (45.59)	74 (54.41)	0.3035	32 (23.5)	43 (31.6)	29 (21.3)	28 (20.6)	4 (2.9)	<0.01	75 (55.1)	61 (44.9)	0.2299
AKI KRT	30 (22.06)	30 (22.06)	30 (22.06)	30 (22.06)	16 (11.76)	0.2174	60 (44.12)	76 (55.88)	0.1701	47 (34.6)	39 (28.7)	26 (19.1)	17 (12.5)	7 (5.1)	<0.01	86 (63.2)	50 (36.8)	0.0020
AKI (KDIGO I or II) Hypovolemia	34 (25)	42 (30.88)	29 (21.32)	20 (14.71)	11 (8.09)	0.0003	76 (55.88)	60 (44.12)	0.1701	32 (23.5)	48 (35.3)	29 (21.3)	22 (16.2)	5 (3.7)	0.0019	80 (58.8)	56 (41.2)	0.0396
AKI (KDIGO I or II) Drug induced	24 (17.65)	40 (29.41)	32 (23.53)	36 (26.47)	4 (2.94)	<0.01	64 (47.06)	72 (52.94)	0.4927	25 (18.4)	39 (28.7)	36 (26.5)	30 (22.1)	6 (4.4)	<0.01	64 (47.1)	72 (52.9)	0.4927
AKI (KDIGO I or II) Infection	21 (15.44)	43 (31.62)	43 (31.62)	26 (19.12)	3 (2.21)	<0.01	64 (47.06)	72 (52.94)	0.4927	27 (19.9)	43 (31.6)	36 (26.5)	24 (17.6)	6 (4.4)	<0.01	70 (51.5)	66 (48.5)	0.7316
AKI (KDIGO I or II) Cardio-renal	30 (22.06)	47 (34.56)	37 (27.21)	18 (13.24)	4 (2.94)	<0.01	77 (56.62)	59 (43.38)	0.1227	29 (21.3)	45 (33.1)	40 (29.4)	17 (12.5)	5 (3.7)	0.0132	74 (54.4)	62 (45.6)	0.3035
AKI (KDIGO I or II) Hepatorenal	34 (25)	47 (34.56)	39 (28.68)	13 (9.56)	3 (2.21)	<0.01	81 (59.56)	55 (40.44)	0.0258	33 (24.3)	45 (33.1)	40 (29.4)	12 (8.8)	6 (4.4)	0.1147	78 (57.4)	58 (42.6)	0.0863
AKI (KDIGO I or II) Contrast induced	18 (13.24)	34 (25)	38 (27.94)	42 (30.88)	4 (2.94)	<0.01	52 (38.24)	84 (61.76)	0.0061	28 (20.6)	38 (27.9)	36 (26.5)	28 (20.6)	6 (4.4)	<0.01	66 (48.5)	70 (51.5)	0.7316
AKI (KDIGO I or II) Obstruction	22 (16.18)	37 (27.21)	32 (23.53)	43 (31.62)	2 (1.47)	<0.01	59 (43.38)	77 (56.62)	0.1227	31 (22.8)	39 (28.7)	35 (25.7)	23 (16.9)	8 (5.9)	<0.01	70 (51.5)	66 (48.5)	0.7316
AKI requiring biopsy	34 (25)	41 (30.15)	33 (24.26)	26 (19.12)	2 (1.47)	<0.01	75 (55.15)	61 (44.85)	0.2299	50 (36.8)	41 (30.1)	27 (19.9)	13 (9.6)	5 (3.7)	0.0031	91 (66.9)	45 (33.1)	0.0001
RPGN	39 (28.68)	28 (20.59)	29 (21.32)	32 (23.53)	8 (5.88)	0.0006	67 (49.26)	69 (50.74)	0.8638	46 (33.8)	47 (34.6)	20 (14.7)	18 (13.2)	5 (3.7)	<0.01	93 (68.4)	43 (31.6)	<0.01
Nephrotic syndrome	15 (11.03)	32 (23.53)	29 (21.32)	44 (32.35)	16 (11.76)	0.0003	47 (34.56)	89 (65.44)	0.0003	30 (22.1)	41 (30.1)	24 (17.6)	32 (23.5)	9 (6.6)	<0.01	71 (52.2)	65 (47.8)	0.6069
Nephritic syndrome	24 (17.65)	37 (27.21)	31 (22.79)	35 (25.74)	9 (6.62)	0.0008	61 (44.85)	75 (55.15)	0.2299	31 (22.8)	49 (36.0)	25 (18.4)	24 (17.6)	7 (5.1)	<0.01	80 (58.8)	56 (41.2)	0.0396
ADPKD spectrum	14 (10.29)	22 (16.18)	35 (25.74)	58 (42.65)	7 (5.15)	<0.01	36 (26.47)	100 (73.53)	<0.01	18 (13.2)	38 (27.9)	29 (21.3)	39 (28.7)	12 (8.8)	<0.01	56 (41.2)	80 (58.8)	0.0396
Alport syndrome	28 (20.59)	30 (22.06)	40 (29.41)	33 (24.26)	5 (3.68)	<0.01	58 (42.65)	78 (57.35)	0.0863	25 (18.4)	44 (32.4)	37 (27.2)	23 (16.9)	7 (5.1)	<0.01	69 (50.7)	67 (49.3)	0.8638

(*continued*)

Table 1. Confidence Scale and Percentage Confidence of Various Naïve Diagnoses and the Management Related to Kidney Health (*Continued*)

	Naïve Diagnosis									Naïve Management								
	Confidence Scale						% Confidence		p-value	Confidence Scale						Confidence		
Kidney Health Conditions	Very Low	Low	Moderate	High	Very High	p-value	No	Yes		Very Low	Low	Moderate	High	Very High	p-value	No	Yes	p-value
Myeloma kidney	31 (22.79)	30 (22.06)	40 (29.41)	30 (22.06)	5 (3.68)	<0.01	61 (44.85)	75 (55.15)	0.2299	34 (25.0)	42 (30.9)	33 (24.3)	21 (15.4)	6 (4.4)	<0.01	76 (55.9)	60 (44.1)	0.1701
Nephrolithiasis (non-obstructive stones)	12 (8.82)	33 (24.26)	36 (26.47)	51 (37.5)	4 (2.94)	<0.01	45 (33.09)	91 (66.91)	0.0001	19 (14.0)	38 (27.9)	42 (30.9)	29 (21.3)	8 (5.9)	<0.01	57 (41.9)	79 (58.1)	0.0592
CKD KDIGO G1–G3a	17 (12.5)	26 (19.12)	30 (22.06)	53 (38.97)	10 (7.35)	<0.01	43 (31.62)	93 (68.38)	0.0000	17 (12.5)	32 (23.5)	35 (25.7)	40 (29.4)	12 (8.8)	<0.01	49 (36.0)	87 (64.0)	0.0011
CKD KDIGO G3b–G5ND	22 (16.18)	26 (19.12)	27 (19.85)	54 (39.71)	7 (5.15)	<0.01	48 (35.29)	88 (64.71)	0.0006	25 (18.4)	37 (27.2)	31 (22.8)	33 (24.3)	10 (7.4)	<0.01	62 (45.6)	74 (54.4)	0.3035
CKD dialysis initiation	36 (26.47)	25 (18.38)	37 (27.21)	34 (25)	4 (2.94)	<0.01	61 (44.85)	75 (55.15)	0.2299	37 (27.2)	37 (27.2)	30 (22.1)	25 (18.4)	7 (5.1)	<0.01	74 (54.4)	62 (45.6)	0.3035
Lower UTI	11 (8.09)	23 (16.91)	41 (30.15)	53 (38.97)	7 (5.15)	<0.01	34 (25)	102 (75)	<0.01	16 (11.8)	28 (20.6)	36 (26.5)	44 (32.4)	12 (8.8)	<0.01	44 (32.4)	92 (67.6)	0.0000
Pyelonephritis	26 (19.12)	30 (22.06)	36 (26.47)	33 (24.26)	11 (8.09)	0.0071	56 (41.18)	80 (58.82)	0.0396	29 (21.3)	37 (27.2)	34 (25.0)	31 (22.8)	5 (3.7)	<0.01	66 (48.5)	70 (51.5)	0.7316
Hyponatremia (mild/ moderate)	35 (25.74)	24 (17.65)	39 (28.68)	36 (26.47)	2 (1.47)	<0.01	59 (43.38)	77 (56.62)	0.1227	35 (25.7)	38 (27.9)	31 (22.8)	26 (19.1)	6 (4.4)	<0.01	73 (53.7)	63 (46.3)	0.3912
Hyperkalemia (mild/ moderate)	30 (22.06)	27 (19.85)	29 (21.32)	46 (33.82)	4 (2.94)	<0.01	57 (41.91)	79 (58.09)	0.0592	37 (27.2)	37 (27.2)	25 (18.4)	31 (22.8)	6 (4.4)	<0.01	74 (54.4)	62 (45.6)	0.3035
Enuresis	21 (15.44)	33 (24.26)	54 (39.71)	27 (19.85)	1 (0.74)	<0.01	54 (39.71)	82 (60.29)	0.0164	27 (19.9)	42 (30.9)	35 (25.7)	24 (17.6)	8 (5.9)	<0.01	69 (50.7)	67 (49.3)	0.8638

Abbreviations: AKI: acute kidney injury; KDIGO: kidney disease initiative and global outcome; RPGN: rapid progressive glomerulonephritis; CKD: chronic kidney disease; KRT: kidney replacement therapy; UTI: urinary tract infection; ADPKD: autosomal dominant polycystic kidney disease. Credit of questions: Meshram HS et al(Current author). The p-value for both likert scale of confidence and binary (yes/no) confidence threshold reaching cut-off 60% was calculated by chi square test.

complications and post-discharge follow-up of living kidney donors.

The kidney transplant follow-up domain (12 items) addressed immunosuppression tailoring (<1 year or >1 year post-transplant), augmentation of immunosuppression after infection, donor-specific antibody surveillance, BK virus monitoring, reproductive and sexual health, malignancy surveillance, cystitis/lower UTI, gastroenteritis, respiratory infections, post-transplant diabetes mellitus, and adherence to immunosuppressive drugs.

Data was reported as numbers and percentages for the Likert scale and confidence. Continuous data were reported as median (interquartile range). We did chi-square tests and logistic regression analysis. A p-value <0.05 was a measure of significance in this report. All statistical analysis was performed using SPSS version 16.

Results

A total of 136 nephrologists from India participated, representing 19 states. The largest groups were from Delhi (33 [24%]) and Gujarat (15 [11%]). Of the respondents, 10 (7%) practiced exclusive pediatric nephrology, while 67 (49%) managed both adult and pediatric patients. Most worked in the private sector (93 [68%]). Clinical experience exceeded 10 years in 95 (70%) respondents, 16 (12%) had 5–10 years, and 4 (3%) had less than one year.

Regarding practice patterns, 28 (21%) nephrologists reported never using telenephrology. The most common modality was synchronous communication (73 [54%]), followed by asynchronous (26 [19%]) and remote patient monitoring (10 [7%]). Mobile health applications were used by 37 (27%). For most nephrologists, only 0–10% of patients were enrolled in telenephrology programs. Kidney transplant recipients (KTRs) were significantly less likely to be enrolled in follow-up via telenephrology compared to general kidney patients (55 [40%] vs. 81 [60%]; $p < 0.001$).

On digital record-keeping, 68 (50%) respondents did not store any digital information, while approximately one-quarter stored data, with or without patient consent. A large majority, 112 (82%), agreed that telenephrology could improve enrollment and follow-up of patients in clinical trials.

Video consultation was the dominant mode (71 [52%]), followed by phone messages (53 [39%]) and audio-only consults (48 [35%]). A formal telehealth software platform was used by 23 (17%). Commonly cited limitations included inability to perform a complete clinical exam (115 [85%]), medico-legal risks (89 [65%]), misinterpretation of clinical signs (81 [60%]), reduced patient trust (67 [49%]), lack of standardized protocols (62 [46%]), and financial barriers (42 [31%]). Patients' lack of tech literacy was noted more frequently (36 [26%]) than physicians' (10 [7%]). See Figure 1.

Table 1 shows naïve diagnosis and management where confidence exceeded the 60% threshold in 11 (44%) of 25 diagnostic scenarios: lower UTI (102 [75%]), ADPKD (100 [74%]), nephrolithiasis (91 [67%]), CKD G1–G3a (93 [68%]), nephrotic syndrome (89 [65%]), CKD G3b–G5ND (88 [65%]), and enuresis (82 [60%]). Contrast-induced AKI and mild-to-moderate hyperkalemia did not meet the threshold. Only two management scenarios surpassed 60% confidence: lower UTI (92 [68%]) and CKD G1–G3a (87 [64%]). Confidence was lowest for RPGN, AKI requiring biopsy, and AKI requiring dialysis.

Figure 2 illustrates the confidence gap: mean diagnostic confidence exceeded management across all 26 scenarios (mean difference 0.18; 95% CI 0.12–0.24; $p < 0.001$). Notable gaps occurred in ADPKD ($\Delta 0.31$; 95% CI 0.22–0.40; $p < 0.001$) and lower UTI ($\Delta 0.25$; 95% CI 0.16–0.34; $p < 0.001$); smaller, non-significant gaps appeared for AKI requiring dialysis ($\Delta 0.02$; 95% CI −0.05–0.09; $p = 0.58$) and RPGN ($\Delta 0.03$; 95% CI −0.04–0.10; $p = 0.42$).

On Subgroup analysis (Supplementary Table 2), most diagnostic confidence levels were not associated with demographic or practice variables. Exceptions included lower confidence in diagnosing hypovolemic AKI among physicians with high outpatient volumes (aOR 0.44; 95% CI 0.21–0.94; $p = 0.035$) and in diagnosing lower UTIs among academic nephrologists (aOR 0.30; 95% CI 0.12–0.78; $p = 0.014$). In

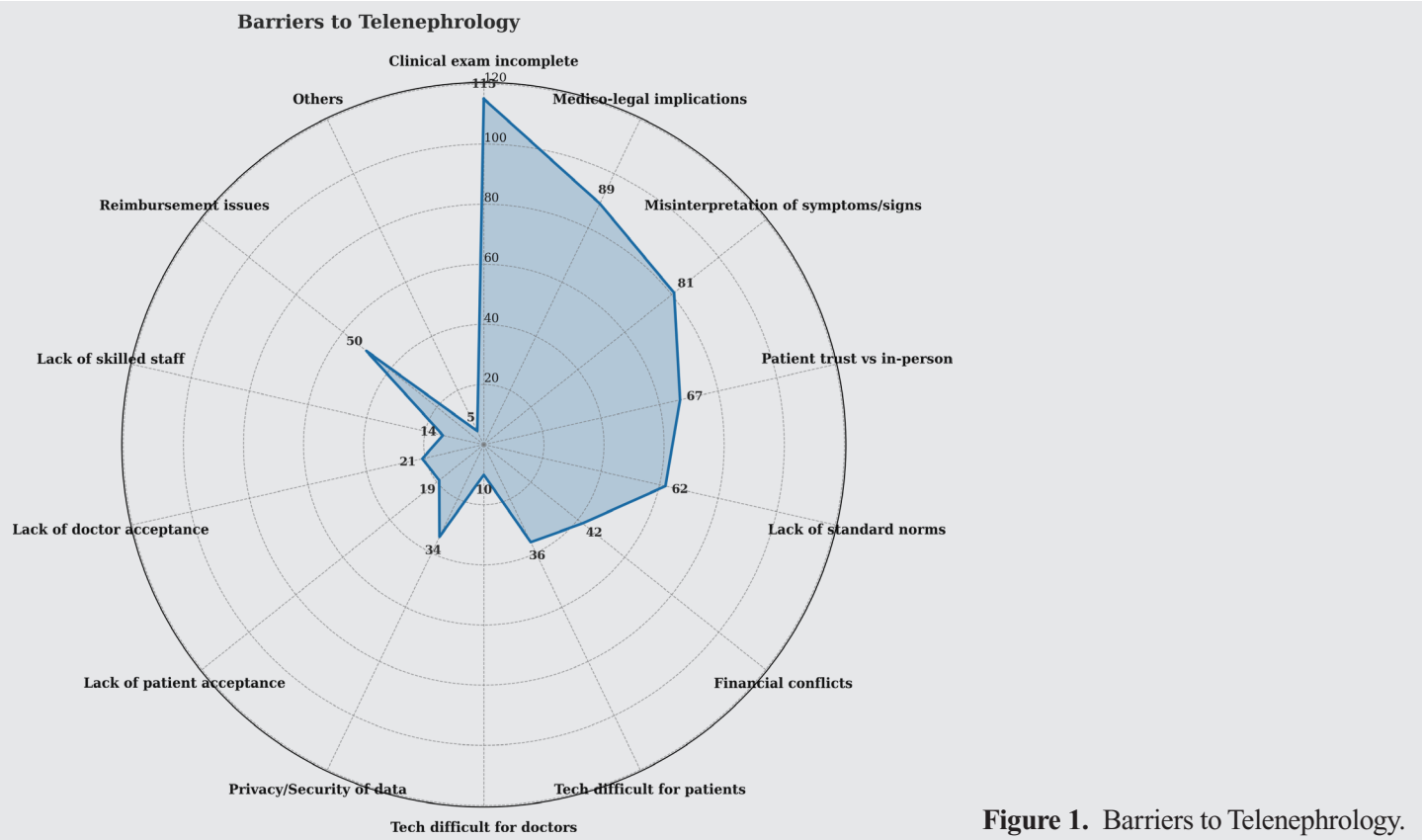

Figure 1. Barriers to Telenephrology.

management scenarios, pediatric-exposed nephrologists showed lower confidence in managing nephrotic (aOR 0.31; 95% CI 0.15–0.66; p = 0.002) and nephritic syndromes (aOR 0.34; 95% CI 0.16–0.72; p = 0.005).

Table 2 shows confidence in various kidney conditions. Confidence was above 60% for managing anemia (105 [77%]), bone disease (100 [74%]), vaccination (107 [79%]), cardiovascular disease (86 [63%]), pruritus (97 [71%]), diabetes (99 [73%]), hypertension (91 [67%]), and viral hepatitis (86 [63%]). It was below threshold for peritoneal dialysis catheter dysfunction (49 [36%]) and ultrafiltration failure (53 [39%]).

Confidence was high for immunosuppression management beyond one year (96 [71%]), but below threshold during the first year. Confidence in surveillance for BK virus (94 [69%]) and donor-specific antibodies (86 [63%]) was good; it was borderline for malignancy surveillance (79 [58%]). Confidence was high for managing post-transplant infections: UTI (90 [66%]), gastroenteritis (85 [63%]), and respiratory infections (94 [69%]), but lower for augmenting immunosuppression after infection (73 [54%]). Confidence for post-transplant diabetes and medication adherence was both 94 (69%).

Confidence was high for follow-up after AKI without dialysis (104 [77%]), AKI with dialysis (87 [64%]), acute interstitial nephritis (99 [73%]), and CKD with volume overload (72 [53%]). Glomerulonephritis follow-up was generally adequate, except for lupus nephritis and ANCA-associated vasculitis. Living donor follow-up was high (104 [77%]).

Confidence above threshold was seen in vaccination (99 [73%]), CKD prognostication (96 [71%]), reproductive counseling (97 [71%]), and palliative care (83 [61%]). Supplementary Table 3 shows that academic nephrologists had lower counseling confidence, significantly so for vaccination (aOR 0.34; 95% CI 0.14–0.87; p = 0.024) and post-discharge follow-up of nephrotic

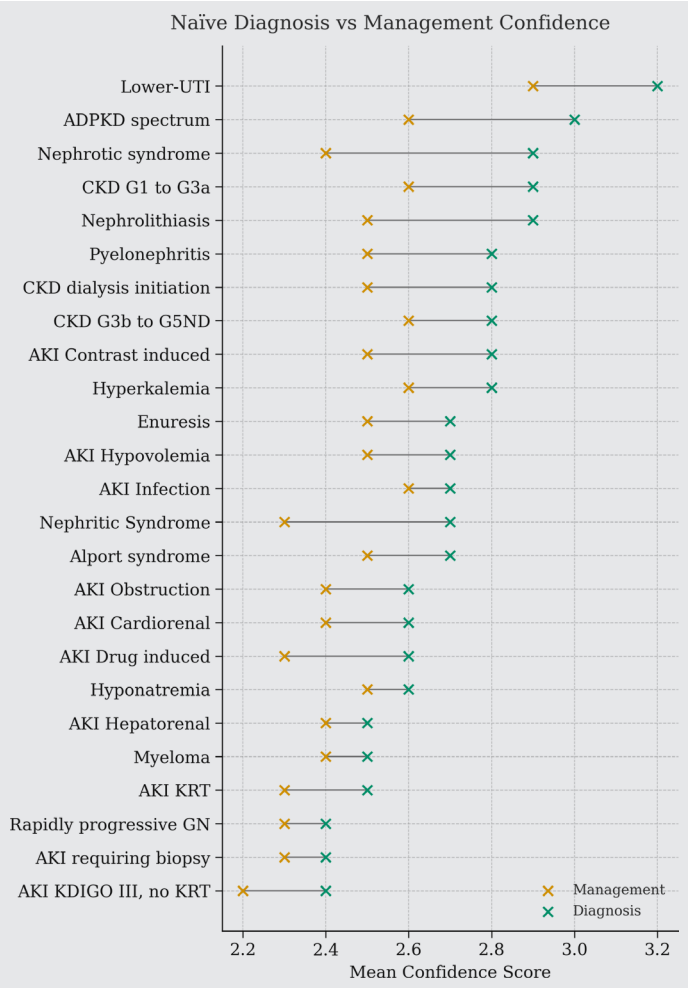

Figure 2. Naïve Diagnosis vs Management Confidence.

syndrome (aOR 0.36; 95% CI 0.14–0.97; p = 0.044). Private sector nephrologists were less confident than the public sector in augmenting immunosuppression post-infection (aOR 0.42; 95% CI 0.20–0.91; p = 0.027)

Discussion

To the best of our knowledge, this is the first study to provide a detailed survey of telenephrology practices among nephrologists in India. The major hurdles identified were the lack of physical examination, medico-legal concerns, and financial constraints. These findings highlight the need to restructure the existing framework to incorporate uniform rules and regulations addressing both legal and financial aspects.

Although most respondents had more than five years of clinical experience, confidence levels for many kidney conditions were only moderate. The fact that experienced specialists were willing to adapt and expressed confidence in several areas indicates that a strong framework for telenephrology can be developed. Respondents reported higher confidence in making naïve diagnoses compared to naïve management, where confidence lagged significantly. Strengthening and streamlining the link between nephrologists and primary care providers at the patient's end may help bridge this gap.

Evidence from developed countries has primarily focused on patient outcomes rather than nephrologist perspectives. A Veterans Affairs cohort study in the United States showed that patients with CKD managed through telenephrology had similar rates of CKD progression compared with those seen in person. Another U.S. study reported comparable outcomes and included nephrologist perspectives (n = 11).[10] That study found nephrologists favored video consultations and were comfortable with hybrid (combined in-person and telehealth) models—similar to the pattern observed in our study. However, their study did not assess nephrologists' confidence across individual kidney conditions. A smaller U.S. study demonstrated the successful application of telenephrology in rural and remote areas to reduce disparities in access to care.[11] Reports from low- and middle-income countries also suggest feasibility and patient acceptance of telenephrology.[12] Overall, recent evidence indicates that patient outcomes and acceptance are favorable; however, detailed protocols for implementing telenephrology remain lacking.

In our study, nephrologists were confident in managing common complications among chronic dialysis patients. In contrast, confidence in counseling scenarios was lower, likely because these interactions require trust-building and nuanced communication, which are more challenging through telehealth. Many diagnostic scenarios reached the 60% confidence threshold (e.g., urinary tract infection, ADPKD, nephrolithiasis), but management confidence lagged behind, with only UTIs and early CKD surpassing the threshold. The average diagnosis–management gap was significant. Confidence was also low for peritoneal dialysis

Table 2. Confidence Scale and Percentage Confidence of Various Kidney Health Conditions

Kidney Health Conditions	Confidence Scale					p-value	Confidence		p-value
	Very Low	Low	Moderate	High	Very High		No	Yes	
Counselling scenarios									
AKI recovery prognosis	17 (12.5)	38 (27.94)	33 (24.26)	38 (27.94)	10 (7.35)	0.0001	55 (40.44)	81 (59.56)	0.0258
CKD stage 1 to 5 non-dialysis prognosis	15 (11.03)	25 (18.38)	43 (31.62)	45 (33.09)	8 (5.88)	<0.001	40 (29.41)	96 (70.59)	<0.001
Dialysis initiation in CKD	26 (19.12)	29 (21.32)	26 (19.12)	37 (27.21)	9 (6.62)	0.0025	55 (40.44)	81 (59.56)	0.0258
Kidney biopsy (native)	29 (21.32)	35 (25.74)	29 (21.32)	37 (27.21)	6 (4.41)	0.0002	64 (47.06)	72 (52.94)	0.4927
Kidney biopsy (graft)	34 (25)	39 (28.68)	32 (23.53)	34 (25)	6 (4.41)	0.0001	73 (53.68)	63 (46.32)	0.3912
Starting of steroids	27 (19.85)	36 (26.47)	34 (25)	32 (23.53)	7 (5.15)	0.0004	63 (46.32)	73 (53.68)	0.3912
Starting rituximab	41 (30.15)	34 (25)	27 (19.85)	24 (17.65)	10 (7.35)	0.0005	75 (55.15)	61 (44.85)	0.2299
Starting cyclophosphamide	46 (33.82)	34 (25)	25 (18.38)	25 (18.38)	6 (4.41)	<0.001	80 (58.82)	56 (41.18)	0.0396
Starting other immunosuppression	46 (33.82)	33 (24.26)	29 (21.32)	27 (19.85)	9 (6.62)	0.0001	79 (58.09)	57 (41.91)	0.0592
AVF	24 (17.65)	39 (28.68)	35 (25.74)	36 (26.47)	2 (1.47)	<0.001	63 (46.32)	73 (53.68)	0.3912
Vaccination	16 (11.76)	21 (15.44)	41 (30.15)	51 (37.5)	7 (5.15)	<0.001	37 (27.21)	99 (72.79)	<0.001
Reproduction & contraception	16 (11.76)	23 (16.91)	44 (32.35)	34 (25)	19 (13.97)	0.0005	39 (28.68)	97 (71.32)	<0.001
Palliative care	23 (16.91)	30 (22.06)	38 (27.94)	37 (27.21)	8 (5.88)	0.0002	53 (38.97)	83 (61.03)	0.0101
Dialysis unit follow-up									
CKD – Anemia	12 (8.8)	19 (14.0)	31 (22.8)	57 (41.9)	17 (12.5)	<0.001	31 (22.8)	105 (77.2)	<0.001
CKD – MBD	11 (8.1)	25 (18.4)	29 (21.3)	54 (39.7)	17 (12.5)	<0.001	36 (26.5)	100 (73.5)	<0.001
CKD – Vaccination	8 (5.9)	21 (15.4)	20 (14.7)	66 (48.5)	21 (15.4)	<0.001	29 (21.3)	107 (78.7)	<0.001
CKD – Cardiovascular disease	18 (13.2)	32 (23.5)	37 (27.2)	40 (29.4)	9 (6.6)	<0.001	50 (36.8)	86 (63.2)	0.0020
CKD – Pruritus	10 (7.4)	29 (21.3)	30 (22.1)	51 (37.5)	16 (11.8)	<0.001	39 (28.7)	97 (71.3)	<0.001
CKD – Dialysis inadequacy	17 (12.5)	43 (31.6)	34 (25.0)	32 (23.5)	10 (7.4)	<0.001	60 (44.1)	76 (55.9)	0.1701
CKD – Diabetes	11 (8.1)	26 (19.1)	34 (25.0)	51 (37.5)	14 (10.3)	<0.001	37 (27.2)	99 (72.8)	<0.001
CKD – Hypertension	12 (8.8)	33 (24.3)	25 (18.4)	52 (38.2)	14 (10.3)	<0.001	45 (33.1)	91 (66.9)	0.0001
CKD – Volume overload	21 (15.4)	43 (31.6)	34 (25.0)	31 (22.8)	7 (5.1)	<0.001	64 (47.1)	72 (52.9)	0.4927
CKD – Malnutrition	14 (10.3)	47 (34.6)	32 (23.5)	32 (23.5)	11 (8.1)	<0.001	61 (44.9)	75 (55.1)	0.2299
CKD – Sexual & reproductive issues	16 (11.8)	41 (30.1)	37 (27.2)	30 (22.1)	12 (8.8)	0.0001	57 (41.9)	79 (58.1)	0.0592
CKD – Mental health issues	22 (16.2)	50 (36.8)	32 (23.5)	23 (16.9)	9 (6.6)	<0.001	72 (52.9)	64 (47.1)	0.4927
CKD – Vascular access dysfunction	24 (17.6)	43 (31.6)	34 (25.0)	28 (20.6)	7 (5.1)	<0.001	67 (49.3)	69 (50.7)	0.8638
CKD – Hepatitis B/C seropositivity	13 (9.6)	37 (27.2)	38 (27.9)	39 (28.7)	9 (6.6)	<0.001	50 (36.8)	86 (63.2)	0.0020
CKD – HIV seropositivity	15 (11.0)	47 (34.6)	37 (27.2)	31 (22.8)	6 (4.4)	<0.001	62 (45.6)	74 (54.4)	0.3035
PD – Catheter dysfunction	38 (27.9)	49 (36.0)	27 (19.9)	17 (12.5)	5 (3.7)	<0.001	87 (64.0)	49 (36.0)	0.0011
PD – Infection	32 (23.5)	44 (32.4)	28 (20.6)	24 (17.6)	8 (5.9)	<0.001	76 (55.9)	60 (44.1)	0.1701
PD – Ultrafiltration failure	34 (25.0)	49 (36.0)	27 (19.9)	20 (14.7)	6 (4.4)	<0.001	83 (61.0)	53 (39.0)	0.0101
General nephrology follow-up									
AKI no KRT	10 (7.4)	22 (16.2)	36 (26.5)	54 (39.7)	14 (10.3)	<0.001	32 (23.5)	104 (76.5)	<0.001
AKI KRT	18 (13.2)	31 (22.8)	45 (33.1)	32 (23.5)	10 (7.4)	<0.001	49 (36.0)	87 (64.0)	0.0011
AIN	10 (7.4)	27 (19.9)	43 (31.6)	44 (32.4)	12 (8.8)	<0.001	37 (27.2)	99 (72.8)	<0.001
Lupus nephritis – induction therapy	21 (15.4)	38 (27.9)	44 (32.4)	24 (17.6)	9 (6.6)	<0.001	59 (43.4)	77 (56.6)	0.1227
Lupus nephritis – maintenance therapy	13 (9.6)	30 (22.1)	35 (25.7)	46 (33.8)	12 (8.8)	<0.001	43 (31.6)	93 (68.4)	<0.001
IgA nephropathy – conservative therapy	6 (4.4)	27 (19.9)	43 (31.6)	47 (34.6)	13 (9.6)	<0.001	33 (24.3)	103 (75.7)	<0.001
IgA nephropathy – on immunosuppression	15 (11.0)	29 (21.3)	44 (32.4)	38 (27.9)	10 (7.4)	<0.001	44 (32.4)	92 (67.6)	<0.001
Membranous nephropathy – conservative	9 (6.6)	22 (16.2)	42 (30.9)	47 (34.6)	16 (11.8)	<0.001	31 (22.8)	105 (77.2)	<0.001

Table 2. Confidence Scale and Percentage Confidence of Various Kidney Health Conditions (*Continued*)

	Confidence Scale						Confidence		
Kidney Health Conditions	**Very Low**	**Low**	**Moderate**	**High**	**Very High**	**p-value**	**No**	**Yes**	**p-value**
Membranous nephropathy – immunosuppression	16 (11.8)	26 (19.1)	50 (36.8)	33 (24.3)	11 (8.1)	<0.001	42 (30.9)	94 (69.1)	<0.001
Nephrotic syndrome (follow-up)	13 (9.6)	24 (17.6)	41 (30.1)	43 (31.6)	15 (11.0)	<0.001	37 (27.2)	99 (72.8)	<0.001
AAV induction	27 (19.9)	34 (25.0)	44 (32.4)	23 (16.9)	8 (5.9)	<0.001	61 (44.9)	75 (55.1)	0.2299
AAV maintenance	15 (11.0)	31 (22.8)	47 (34.6)	34 (25.0)	9 (6.6)	<0.001	46 (33.8)	90 (66.2)	0.0002
CKD Volume overload	23 (16.9)	30 (22.1)	48 (35.3)	28 (20.6)	7 (5.1)	<0.001	53 (39.0)	83 (61.0)	0.0101
cPD catheter dysfunction	28 (20.6)	43 (31.6)	37 (27.2)	21 (15.4)	7 (5.1)	<0.001	71 (52.2)	65 (47.8)	0.6069
cPD Infection	26 (19.1)	43 (31.6)	32 (23.5)	25 (18.4)	10 (7.4)	0.0003	69 (50.7)	67 (49.3)	0.8638
cPD UF failure	31 (22.8)	42 (30.9)	39 (28.7)	18 (13.2)	6 (4.4)	<0.001	73 (53.7)	63 (46.3)	0.3912
Living donor nephrectomy routine follow-up	13 (9.6)	19 (14.0)	44 (32.4)	33 (24.3)	27 (19.9)	0.0003	32 (23.5)	104 (76.5)	<0.001
Kidney transplant unit follow-up									
Tailoring immunosuppression <1 year	27 (19.9)	40 (29.4)	40 (29.4)	21 (15.4)	8 (5.9)	<0.001	67 (49.3)	69 (50.7)	0.8638
Tailoring immunosuppression >1 year	11 (8.1)	29 (21.3)	39 (28.7)	47 (34.6)	10 (7.4)	<0.001	40 (29.4)	96 (70.6)	<0.001
Augmenting immunosuppression post-infection	25 (18.4)	38 (27.9)	38 (27.9)	26 (19.1)	9 (6.6)	0.0003	63 (46.3)	73 (53.7)	0.3912
DSA surveillance	19 (14.0)	31 (22.8)	45 (33.1)	31 (22.8)	10 (7.4)	<0.001	50 (36.8)	86 (63.2)	0.0020
BKV surveillance	15 (11.0)	27 (19.9)	50 (36.8)	36 (26.5)	8 (5.9)	<0.001	42 (30.9)	94 (69.1)	<0.001
Reproductive & sexual well-being	16 (11.8)	27 (19.9)	49 (36.0)	35 (25.7)	9 (6.6)	<0.001	43 (31.6)	93 (68.4)	<0.001
Malignancy surveillance	19 (14.0)	38 (27.9)	50 (36.8)	21 (15.4)	8 (5.9)	<0.001	57 (41.9)	79 (58.1)	0.0592
Managing cystitis /lower UTI	13 (9.6)	33 (24.3)	47 (34.6)	35 (25.7)	8 (5.9)	<0.001	46 (33.8)	90 (66.2)	0.0002
Managing gastroenteritis	19 (14.0)	32 (23.5)	45 (33.1)	34 (25.0)	6 (4.4)	<0.001	51 (37.5)	85 (62.5)	0.0036
Managing upper respiratory tract infections	18 (13.2)	24 (17.6)	44 (32.4)	43 (31.6)	7 (5.1)	<0.001	42 (30.9)	94 (69.1)	<0.001
Managing PTDM	14 (10.3)	28 (20.6)	45 (33.1)	41 (30.1)	8 (5.9)	<0.001	42 (30.9)	94 (69.1)	<0.001
Medicine adherence	17 (12.5)	25 (18.4)	50 (36.8)	35 (25.7)	9 (6.6)	<0.001	42 (30.9)	94 (69.1)	<0.001

The p-value for both likert scale of confidence and binary (yes/no) confidence threshold reaching cut-off 60% was calculated by chi square test.

complications, likely due to difficulties in remotely assessing catheter dysfunction and ultrafiltration failure. Follow-up after hospital discharge plays a crucial role in nephrology; however, in our study, only vaccination counseling exceeded the confidence threshold.

Our findings indicate that telenephrology may substitute for in-person visits in several common scenarios. Nephrologists reported high confidence in follow-up care for both general nephrology patients and kidney transplant recipients, particularly beyond the first-year post-transplant. However, personalized care remains essential. A recent mixed-methods study highlighted the importance of tailoring telemedicine to individual patient needs. [13] Taken together, our study provides a cross-sectional snapshot of telenephrology practice in India. Patterns are likely to evolve rapidly with the expansion of digital platforms and artificial intelligence.

This study has limitations. The sample size was modest, and findings may not be generalizable beyond India. Detailed data on specific therapies (e.g., types of immunosuppression, dialysis catheter type, and site) were not collected to avoid overburdening respondents. Rare conditions and management scenarios were excluded, as they were beyond the scope of the study. Cost-effectiveness of telenephrology was not assessed, as the primary objective was to evaluate practice patterns. Confidence was self-reported using a Likert scale, which reflects telemedicine competency but does not measure patient outcomes. Bias

inherent to online surveys and variability in individual responses cannot be ruled out. Although all questions were mandatory to ensure completeness, the scope of nephrology practice varies across respondents, which may have led to skewed results in some areas (e.g., peritoneal dialysis).

Conclusion

This study provides a national perspective on Indian nephrologists' confidence and readiness to manage a broad spectrum of kidney conditions through telemedicine. While confidence was high for standard diagnostic and follow-up scenarios such as AKI management and transplant surveillance, gaps remained in reproductive health, rare complications, and peritoneal dialysis–related infections. Years of clinical experience modestly influenced confidence, underscoring the need for structured, domain-specific telehealth training programs.

Our findings also highlight variability in confidence across domains, suggesting that a "one-size-fits-all" approach to telemedicine guidelines may be insufficient. Policymakers and professional societies must consider these realities while developing India-specific telemedicine frameworks for nephrology. A tailored, domain-sensitive, and experience-adapted strategy is needed to ensure equitable and effective digital nephrology services nationwide.

Article citation: Meshram HS, Gulati S, Chauhan S, Puri S, Sharma S, Bandi VK. A cross-sectional national survey on current practices and patterns in telenephrology among nephrologists. The Southwest Journal of Medicine. 2026;14(59):31–40
From: Department of Nephrology, ILBS, Vasant Kunj, New Delhi, India (HSM, SP) Department of Nephrology, Fortis Group, Delhi, India (SG, SC) Department of Nephrology, VMMC Safdarjung, New Delhi, India (SS) Department of Nephrology, Pinnamaneni Siddhartha Medical College, Andhra Pradesh, India (VKB)
Conflicts of interest: none

References

1. Telehealth: Analysis of third global survey on eHealth based on the reported data by countries. Geneva: World Health Organization. 2016.
2. Gordon EJ, Fink JC, Fischer MJ. Telenephrology: a novel approach to improve coordinated and collaborative care for chronic kidney disease. Nephrol Dial Transplant. 2013;28(4): 972–81. doi: 10.1093/ndt/gfs552
3. Sugawara Y, Hirakawa Y, Nangaku M. Telemedicine in nephrology: future perspective and solutions. Clin Kidney J. 2024;17(Suppl 2):1–8. Published 2024 November 22. doi: 10.1093/ckj/sfae267
4. KDIGO Acute kidney injury, guidelines: https://kdigo.org/wp-content/uploads/2016/10/KDIGO-AKI-AKD-Guideline_Scope-of-Work_2023_Final.pdf (last accessed on January 22 2025)
5. Levey AS, Eckardt KU, Tsukamoto Y, et al. Definition and classification of chronic kidney disease: a position statement from Kidney Disease: Improving Global Outcomes (KDIGO). Kidney Int. 2005;67(6):2089–100. doi: 10.1111/j.1523-1755.2005.00365.x
6. Al Lawati H, Blair BM, Larnard J. Urinary Tract Infections: Core Curriculum 2024. Am J Kidney Dis. 2024;83(1):90–100. doi: 10.1053/j.ajkd.2023.08.009
7. ISPD guidelines https://ispd.org/guidelines/ (last accessed on January 22, 2025)
8. Culmer N, Smith TB, Stager C, et al. Asynchronous Telemedicine: A Systematic Literature Review. Telemed Rep. 2023 December 21;4(1):366–86. doi: 10.1089/tmr.2023.0052. PMID: 38143795; PMCID: PMC10739789.
9. Scherzer ZA, Astor BC, Lesnik D, et al. CKD Management in the Age of Telenephrology: An Observational Analysis of a Hybrid Telenephrology System within a Veteran's Affairs Medical Center. Kidney360. Published online November 22, 2024. doi: 10.34067/KID.0000000641
10. Androga LA, Zoghby Z, Ramar P, et al. Provider Perspectives and Clinical Outcomes with Inpatient Telenephrology. Clin J Am Soc Nephrol. 2022;17(5):655–62. doi: 10.2215/CJN.13441021
11. Tan J, Mehrotra A, Nadkarni GN, et al. Telenephrology: Providing Healthcare to Remotely Located Patients with Chronic Kidney Disease. Am J Nephrol. 2018;47(3):200–7. doi: 10.1159/000488004
12. George K, Subbiah A, Yadav RK, et al. Utility and patient acceptance of telemedicine in nephrology. J Nephrol. 2022;35(9):2325–31. doi: 10.1007/s40620-022-01471-1
13. Ko D, Dierker J, Stouff R, et al. Telehealth Experience Among Liver and Kidney Transplant Recipients: A Mixed Methods Study. Transpl Int. 2023;36:11819. Published 2023 October 16. doi: 10.3389/ti.2023.11819