Journal of Nephrology (2022) 35:2325–2331
https://doi.org/10.1007/s40620-022-01471-1

FROM DISTANT PLACES

Utility and patient acceptance of telemedicine in nephrology

Kristin George[1] · Arunkumar Subbiah[1] · Raj Kanwar Yadav[1] · Soumita Bagchi[1] · Sandeep Mahajan[1] · Dipankar Bhowmik[1] · Sanjay Kumar Agarwal[1]

Received: 24 May 2022 / Accepted: 23 September 2022 / Published online: 11 November 2022

Abstract

Purpose There is an increasing burden of kidney diseases worldwide and access to specialist care is limited. Telemedicine, has been relatively less used in developing countries like India. The current study aims to assess the feasibility and acceptance of telenephrology services at our institute, a public hospital.

Methods A total of 150 patients were selected by stratified random sampling from the list of attendees who had undergone both in-person outpatient consultation and telenephrology consultation. Patient's attitude towards, and knowledge and acceptance of telenephrology services were evaluated.

Results The average age of the study cohort was 42.52 ± 15.1 years. More than one-third (39.3%) of our patients belonged to the lower middle socioeconomic class. The median distance traveled to reach our outpatient clinic was 113.5 km (3–2249 km). Patients reported lost workdays in 54.7% cases. The majority (95%) of patients managed to consult through teleservices successfully. Ninety percent of the patients gave a satisfaction score of 4 (out of 5) or above for their teleconsultation experience. The most important perceived benefit of teleconsultation was the reduced risk of infection (40.6%) followed by economic benefits (32%). The major disadvantage (36%) was the absence of physical examination. A combination of physical and telenephrology services was the option preferred by 84% of the patients.

Conclusion In developing countries like India, with the majority of the population residing outside major cities and with limited medical access, telenephrology has a huge potential to provide quality nephrology care to the remotest parts of the country.

Keywords Telenephrology · Telemedicine · Patient satisfaction

Introduction

There is an increasing burden of kidney diseases in developing countries like India where access to specialist care is limited to a small proportion of the population. Telemedicine is the delivery of health-related services and information from a distant location by telecommunication technologies. In India, telemedicine is not commonly used, particularly in public sector hospitals. The use of telemedicine in nephrology is further limited, even on a global scale. Prior to COVID-19, telenephrology had shown promise in managing patients in a few developed countries like the United States, Canada and Australia [1]. It has also shown promise in managing kidney patients in rural and remote areas of Jordan [2]. Teleconsultation improved access to health care, helped in the diagnosis and improved the quality of life of these patients. The Indian experience in telenephrology is largely limited to peritoneal dialysis patients in whom it has been shown to improve 5-year survival outcomes, especially in the rural population [3].

The burden of kidney disease is high in India with approximately one in six adults suffering from CKD [4]. This is a tremendous burden for a country like India, where 65% of the total population resides in rural areas with poor accessibility to specialist nephrology care [5]. Further, there is a critical shortage of nephrologists in the country (less than 1 nephrologist per million population) [6]. Our hospital, situated in the nation's capital, provides specialist nephrology service to a large number of patients all over

Part of the data was presented as a poster in the 58th ERA-EDTA Congress 2021.

✉ Arunkumar Subbiah
gmedaks@gmail.com

[1] Department of Nephrology, All India Institute of Medical Sciences, New Delhi 110029, India

India, mostly from the northern and eastern parts of the country. Many patients travel more than 1000 km and stay for days near the hospital for each outpatient visit. Despite such hardships faced by patients, teleconsultation was not routinely implemented prior to the COVID pandemic in India. Healthcare disruption in the pandemic period was profound with curtailment of outpatient and inpatient services due to restrictions posed on travel, diversion of healthcare resources from specialist services towards COVID-infected patients and economic burden from disruption of work [7]. Teleconsultation services became a necessity and were started at our center in an attempt to provide medical care to our patients during these unprecedented times. In a recent systematic review on access to healthcare for patients with chronic kidney disease during the COVID-19 pandemic, the studies on telehealth were limited to American and European regions [7]. The feasibility of telenephrology in developing countries like India during the COVID pandemic has been reported [8]. However, data from public sector hospitals which cater to a significant proportion of the needy population is limited. Moreover, in addition to feasibility, patient as well as provider acceptance and satisfaction needs to be ensured for long-term viability [9]. We attempted to address these issues.

A large number of patients visit our nephrology outpatient department (OPD) from remote areas of the country. Most of these patients are accompanied by a family member or friend during their hospital visits and this often means staying away from home and work for 3–5 days for each outpatient visit. As a result, the patient bears the cost of travel and stay, in addition to loss of productivity due to missed work days. The current study was conceived to assess the patient's knowledge, attitude and acceptance of telenephrology services among kidney patients at a tertiary public care center in India. We expected that the data would not only help in modifying the services to make them more patient-friendly, but would also extend the scope of telenephrology beyond the pandemic period.

Materials and methods

This study was a cross-sectional survey carried out among patients who availed themselves of the Telenephrology services at our institute in New Delhi. The telenephrology service was started during the nationwide lockdown in March 2020 and has continued since then through the second and third COVID waves in 2021–2022. Patients could make an appointment for the teleconsultation by phone or via the institute's website (www.aiims.edu) or from the online registration system (https://ors.gov.in/orsportal/) initiated by the Ministry of Electronics & Information Technology, Government of India. After requesting an appointment, the patient receives a confirmation of their teleconsultation via short messaging service (SMS). On the day of the appointment, the nephrologist calls the patient on his/her registered contact number after retrieving his/her file from the outpatient medical records section. Patients share their health concerns and queries, which are duly recorded in the patient's medical file. During this call, patients are asked to share their latest laboratory investigations done locally, blood pressure (home/clinic) and blood sugar charts through WhatsApp® to the pre-specified contact number or e-mail as per his/her preference. The changes in treatment, including advice for future investigations and follow-up, are explained to the patient over the phone. The prescription is sent as an image through WhatsApp® or e-mail, and as a text message for those without internet access. Each treating nephrologist is given a separate login ID with password to access the teleconsultation appointment and send prescriptions as a text message. This allows the patient to obtain prescription drugs from the pharmacy or an online source without any hindrance. This was foreseen in the Telemedicine Practice Guidelines released by the Government of India in 2020 and helped patients get the medicines from the pharmacy of their choice [10]. All emails and messages are sent from dedicated computer systems and mobile devices provided to treating nephrologists to ensure safety of personal information.

After approval by the Institute's Ethics Committee, a questionnaire was designed to collect data on the socio-demographic characteristics, details about physical outpatient visits, knowledge of telenephrology service, patient's perception about the advantages and disadvantages of the use of telemedicine and the barriers faced by the patients (supplementary file 1). For the purpose of this survey, a total of 150 patients were randomly selected by the stratified sampling method from the list of patients who had availed themselves of both teleconsultation and physical consultation, to ensure adequate representation and to avoid selection bias. This study was conducted 6 months after the start of telenephrology services in our institute. Each patient was contacted over the phone and received an explanation regarding the purpose and methodology of the study, following which oral consent was obtained. Subsequently, the questionnaire was administered in the local language and the response was recorded. The patients were asked to rate their response to the questionnaire, on a five-point Likert scale. The patient's response to the questionnaire was kept confidential, coded, and remained with the principal investigator and was not available to the treating nephrologist. The patients were assured that their responses would not affect their future care. This study questionnaire has not been formally validated. The frequency distributions and average and median values for each of the questionnaire variables and descriptive analysis

Table 1 Baseline characteristics of the study population (total, $n = 150$)

Patient characteristics	*N* (%)
Age (years), mean ± SD [range]	42.52 ± 15.1 [17–83]
Male patients	102 (68)
Informant	
Self	84 (56)
Spouse	21 (14)
Parent	8 (5.3)
Son/daughter	31 (20.7)
Relative	6 (4)
Location of home	
Village	25 (16.7)
Town	82 (54.6)
City	43 (28.7)
Distance traveled for physical OPD (in kilometers), median [range]	113.5 [3–2249]
Living status	
With partner	2 (1.33)
With partner and children	131 (87.33)
Joint family	17 (11.33)
Education status of patient	
Illiterate	7 (4.67)
Schooling less than 8th standard	8 (5.33)
Primary education (8th std)	7 (4.67)
Secondary education (10th std)	23 (15.33)
Senior secondary education (12th std)	28 (18.67)
Graduate	50 (33.33)
Post-graduate/ professional	27 (18.0)
Occupation of patient	
Professional	16 (10.67)
Skilled worker	64 (42.67)
Unskilled laborer	3 (2.0)
Unemployed	69 (46)
Socioeconomic class [11]	
Lower	0 (0)
Upper lower	10 (6.67)
Lower middle	59 (39.33)
Upper middle	61 (40.67)
Upper	20 (13.33)
Knowledge about current medications	
Knows about medications and dosing	146 (97.33)
Needs help	4 (2.67)
Mode of travel to reach OPD	
Train	67 (44.67)
Bus	25 (16.67)
Taxi	14 (9.33)
Own vehicle	18 (12.0)
Flight	2 (1.33)
Metro rail	24 (16)
Duration away from home for one OPD consult	
None	78 (52)
1–3 days	22 (14.67)
4–6 days	20 (13.33)
7–10 days	19 (12.67)
> 10 days	11 (7.33)
Place of stay in Delhi	
No stay	78 (52)
Hotel/lodge/rental	27 (18)
Free stay/government sponsored	9 (6)
Relative's house	36 (24)
Patient accompanied by	
None	47 (31.33)
Spouse	39 (26)
Parent	17 (11.33)
Son/daughter	30 (20)
Relative	15 (10)
Friend	2 (1.33)
Employment status of accompanying person	82 (54.67)
Cost per visit (in INR), median [range]	1350 [40–35000]
Frequency of OPD visits per year, median [range]	5 [1–15]

OPD, Outpatient department

of the data was performed using IBM SPSS Statistics for Windows, version 23.0 (IBM Corp., Armonk, NY, USA).

Results

The mean age of our study cohort of 150 patients was 42.52 ± 15.1 (17–83) years, and 68% were males. The median number of teleconsultations per patient was 2.1 (1–10). The baseline demographic, socio-economic profile of our patients is given in Table 1. The patients interviewed were from the general nephrology clinic and included patients with chronic kidney disease, glomerular diseases and also patients on dialysis. Kidney transplant recipients were not included in this study. The questionnaire was answered by the patient himself/herself in 56% of cases, and by a family member or care-giver in the rest. Seventy-seven (51.3%) patients were graduates or post graduates. Almost 46% of the patients were unemployed and dependent on family members for financial assistance. Forty point seven percent of patients belonged to the upper middle and 39.3% belonged to the lower middle socioeconomic class, as per the modified Kuppuswamy classification [11].

One-half (54.6%) of the patients resided in towns while 16.7% were from villages. The median distance traveled to attend the physical OPD (one way) was 113.5 (3–2249) km and 77.3% were dependent on public transport for reaching the OPD. The median number of outpatient visits per patient per year was five (1–15). Nearly one-third (32.6%) of the patients stayed near the hospital premises for 4 or more days during each visit to get blood and imaging tests done and consult the nephrologist. Approximately two-thirds (68.7%) of patients were accompanied by someone

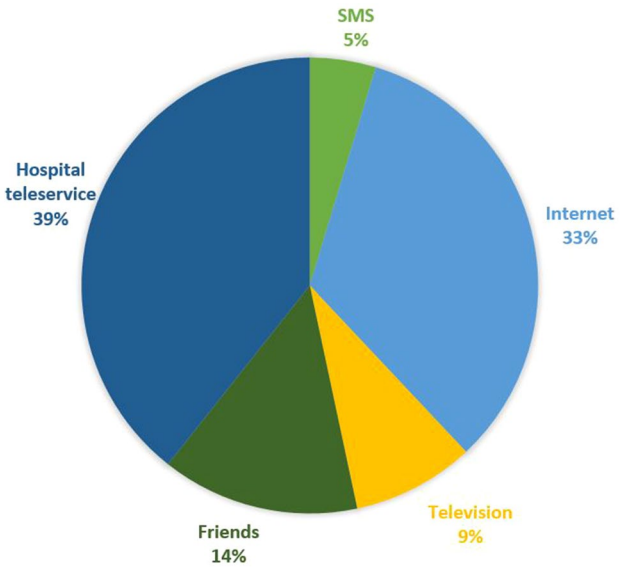

Fig. 1 Source of information regarding telenephrology service

during their hospital visits. Attendees incurred productivity loss due to missed work days in 54.7% of the cases. The median cost of each visit was 1350 INR.

The most common source of information regarding the telenephrology service was from our institute (39.3%) followed by internet services (33.3%). The various sources of information regarding our departmental telenephrology service are depicted in Fig. 1. Nearly all the patients (99.3%) felt that the telenephrology service was an acceptable approach during the COVID-19 pandemic. Over 90% of the patients managed to consult through teleservices successfully without any issues. When asked about the disadvantages of teleconsultation, 36% of patients felt that the lack of physical examination in a clinic could lead to misdiagnosis/incorrect management. The most important benefit of teleconsultation as per the respondents was reduced risk of potential infection (40.6%) followed by economic benefits (32%). After normalization of outpatient services, 84.0% of patients preferred a combination of physical and telenephrology services. Almost all the patients were satisfied with their experience with teleconsultation (Fig. 2).

Discussion

In this retrospective study, we found that telenephrology was a feasible and acceptable option that decreased healthcare costs and out-of-pocket expenditure for the patients and has promising scope for the future as well. Further, the issues faced by patients in terms of social support and physician availability can also be circumvented through telenephrology. Our findings are similar to those obtained in developed countries wherein teleconsultations reduced travel costs and carbon dioxide emissions related to travel, ensured medication adherence with fewer hospitalizations and is acceptable to the majority of patients [12, 13]. Telenephrology has shown to be useful in many observational studies especially in improving patient access to specialist care without compromising on clinical outcomes [14]. Long term sustainability over 2 years for managing patients with kidney disease has also been addressed in a recent case–control study [15]. Albeit small, a randomized controlled trial confirmed that telemedicine in addition to standard care reduced hospitalization and improved adherence to medications in renal transplant recipients [16]. Telenephrology has been successfully carried out for patients on peritoneal dialysis at the Mount Sinai hospital, New York and also in Columbia [17, 18]. Telehealth videoconferencing has been included in reimbursement claims in most developed countries thereby easing the economic burden of medical consults. Routine kidney care with video-based telemedicine is growing around the globe and has been accepted by patients across the entire spectrum of kidney disease [19].

Successful telenephrology services had already been provided in India for patients with kidney disease who were on peritoneal dialysis. Remote patient monitoring in patients on automated peritoneal dialysis (APD) significantly reduced hospitalization rates with better adherence, early detection of catheter dysfunction, reduction in the frequency of clinic visits, and enhanced communication between the patient and the clinical team [3]. Reports on the feasibility of telenephrology, including video consultations in a single center, though available have not been evaluated for patient satisfaction and acceptance [20].

Most of the patients in our study cohort were young or middle aged and belonged to the middle socioeconomic class; almost half were unemployed and dependent on family members for financial assistance. This reflects the category of patients visiting our hospital and likely in any other major public sector hospital in India and most other developing countries. Our patients were strongly supportive of the telenephrology service. Almost all the patients were confident reporting their complaints and comfortable sharing reports over the phone. It is also encouraging that there is widespread availability of telecommunication systems and internet service, even in remote areas, thus facilitating sharing of reports and getting appropriate medical consultation. We could not explore the problems faced by those patients who do not have access to smart devices. However, even in the absence of internet services, sharing of reports and prescriptions was feasible through SMS, following oral consultation (Table 2).

Ninety percent of patients gave a satisfaction score of 4 (out of 5) or above for their teleconsultation experience,

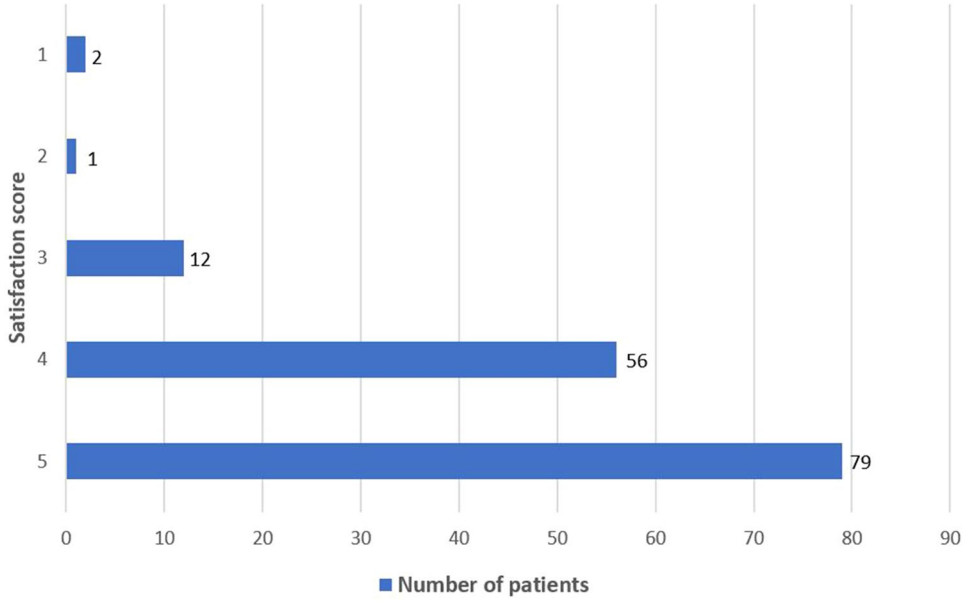

Fig. 2 Patient satisfaction scores for teleconsultation

Table 2 Patient's attitude and acceptance of telenephrology services

Acceptance of Telenephrology service	*N* (%)
Confident in expressing concerns	
Yes	145 (96.67)
No	5 (3.33)
Sharing test reports over phone	
Comfortable	139 (92.67)
Needed help	11 (7.33)
Teleconsultation vs physical consultation	
Teleconsultation better	17 (11.33)
Equally good	38 (25.33)
Acceptable in COVID	95 (63.33)
Problem faced during teleconsultation	
Drug dosing	5 (3.33)
Test reports not seen	3 (2.0)
Lack of physical examination	54 (36.0)
Difficulty in explaining symptomatology	3 (2.0)
Non-availability of investigations locally	5 (3.33)
Most important benefit of teleconsultation as perceived by patients	
Cost of travel/stay/work loss saved	48 (32)
Risk of potential infection reduced	61 (40.67)
Difficulty due to travel avoided	41 (27.33)
Preferred mode of OPD consults after COVID pandemic	
Teleconsultation	10 (6.67)
Physical consultation	14 (9.33)
Combination of both	126 (84.0)

thus suggesting adequate patient satisfaction. The majority of patients (86%) wanted telenephrology to continue beyond the COVID pandemic. This, apart from showing the acceptance of teleservices, indicates that patients may prefer it in certain selected situations. Among 14 patients who wanted only physical consultation, 13 (92.8%) were living in the same city, attending the OPD and returning home on the same day, prior to the COVID pandemic. The benefit of telenephrology was therefore most appreciated by those patients who were traveling longer distances for each visit. An approach involving regular telenephrology follow ups with need-based in-person consultations can significantly reduce the number of visits, cost of travel and stay, in addition to reducing the risk of infection.

One of the concerns of our patients during teleconsultation was the lack of physical connection during the clinic visits which had been the norm till the pandemic. Nearly one-third of the patients feared that lack of in-person clinic visits might compromise their health outcome. One way of overcoming this issue would be by using videoconferencing or video calls, where the patient can see the doctor face-to-face while explaining his/her problems and getting advice. This can also help the physician pick up certain non-verbal cues and address patient issues more effectively. The availability of suitable internet connectivity and smart devices is a prerequisite for this service.

One important observation in this study is that only 4.67% of patients were illiterate. About 85% of patients had studied till 10th grade or above. Also, the majority of patients belonged to the lower middle or upper middle socioeconomic class. This could indicate an underrepresentation of the very poor and illiterate patients who probably do not have access to the internet, mobile phone or are not aware of the telenephrology service. One approach to reach this subset of patients is by widespread dissemination of information regarding telemedicine, explaining how to make an appointment, and sharing investigations over the phone with the help of printed and digital mass media. Another solution could be to set up remote telemedicine clinics staffed with trained nurses or technicians where these patients can consult the nephrologist via telephone or videoconferencing.

The main strength of this study is that it is one of the first studies from India to assess the patient's attitude and acceptance of telenephrology service, especially at a large public sector hospital. This study was performed at a single center in North India which limits its generalizability to other areas of India. The impact of non-availability of smart phones/internet services could not be assessed. The applicability of results to patients with no support system and the socioeconomically disadvantaged is still unknown. We did not have video telenephrology services for new patients, so patients who had been previously registered and treated by our clinic were included in the study. These patients already had an available nephrology file which included basic patient history, prior clinical details and investigations thus making it convenient for the physicians to provide consults. Nevertheless, this study provides hope that a well-organized telehealth system would ensure continuous follow-up and proper management of patients with chronic diseases in developing countries like India without compromising on patient satisfaction and standard of medical care.

In conclusion, in a country like India made up largely of a rural patient population with limited accessibility to specialist care, telenephrology has a huge potential to provide quality healthcare in view of the reasonably well developed digital infrastructure. Therefore, the integration of telenephrology services to the existing healthcare system is the need of the hour to improve access to care and provide quality service to our patients without compromising outcomes.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s40620-022-01471-1.

Declarations

Author statement We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of us.

Funding sources None.

Conflict of interests None declared.

Ethical approval This study was approved by the institutional ethics committee and was performed according to the Declaration of Helsinki. Particiapnts were clearly explained about the questionnaire and study and only after their consent, they were included in the study.

References

1. Rohatgi R, Ross MJ, Majoni SW (2017) Telenephrology: current perspectives and future directions. Kidney Int 92(6):1328–1333. https://doi.org/10.1016/j.kint.2017.06.032
2. AlAzab R, Khader Y (2016) Telenephrology application in rural and remote areas of Jordan: benefits and impact on quality of life. Rural Remote Health 16(1):3646
3. Nayak KS, Ronco C, Karopadi AN, Rosner MH (2016) Telemedicine and remote monitoring: supporting the patient on peritoneal dialysis. Perit Dial Int 36(4):362–366. https://doi.org/10.3747/pdi.2015.00021
4. Singh AK et al (2013) Epidemiology and risk factors of chronic kidney disease in India—results from the SEEK (Screening and Early Evaluation of Kidney Disease) study. BMC Nephrol 14:114. https://doi.org/10.1186/1471-2369-14-114
5. Rural population (% of total population) | Data. https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS. Accessed 17 Apr 2022.
6. Jha V (2013) Current status of end-stage renal disease care in India and Pakistan. Kidney Int Suppl 3(2):157–160. https://doi.org/10.1038/kisup.2013.3
7. Deng D, Liang A, Chui JN, Wong G, Cooper TE (2022) The COVID-19 pandemic and access to health care in people with chronic kidney disease: a systematic review and meta-analysis. Nephrology 27(5):410–420. https://doi.org/10.1111/nep.14016
8. Gulati S, Sengar A (2021) Experience with telemedicine in paediatric nephrology during the COVID pandemic. Pediatr Nephrol 36(8):2499–2500. https://doi.org/10.1007/s00467-021-05085-w
9. Whitten P, Love B (2005) Patient and provider satisfaction with the use of telemedicine: overview and rationale for cautious enthusiasm. J Postgrad Med 51(4):294–300
10. "Telemedicine.pdf." [Online]. https://www.mohfw.gov.in/pdf/Telemedicine.pdf. Accessed 30 July 2022.
11. Wani RT (2019) Socioeconomic status scales-modified Kuppuswamy and Udai Pareekh's scale updated for 2019. J Fam Med

Prim Care 8(6):1846–1849. https://doi.org/10.4103/jfmpc.jfmpc_288_19
12. Andrew N et al (2020) Telehealth model of care for routine follow up of renal transplant recipients in a tertiary centre: a case study. J Telemed Telecare 26(4):232–238. https://doi.org/10.1177/1357633X18807834
13. Wang T-T et al (2016) Assessment of utilization and cost-effectiveness of telemedicine program in western regions of China: a 12-year study of 249 hospitals across 112 cities. Telemed J E-Health 22(11):909–920. https://doi.org/10.1089/tmj.2015.0213
14. Jain G, Ahmad M, Wallace EL (2020) Technology, telehealth, and nephrology: the time is now. Kidney360 1(8):834–836. https://doi.org/10.34067/KID.0002382020
15. Lambooy S, Krishnasamy R, Pollock A, Hilder G, Gray NA (2021) Telemedicine for outpatient care of kidney transplant and CKD patients. Kidney Int Rep 6(5):1265–1272. https://doi.org/10.1016/j.ekir.2021.02.016
16. Schmid A et al (2017) Telemedically supported case management of living-donor renal transplant recipients to optimize routine evidence-based aftercare: a single-center randomized controlled trial. Am J Transplant 17(6):1594–1605. https://doi.org/10.1111/ajt.14138
17. El Shamy O, Tran H, Sharma S, Ronco C, Narayanan M, Uribarri J (2020) Telenephrology with remote peritoneal dialysis monitoring during coronavirus disease 19. Am J Nephrol 51(6):480–482. https://doi.org/10.1159/000508023
18. Bunch A, Ardila F, Castaño R, Quiñonez S, Corzo L (2020) Through the storm: automated peritoneal dialysis with remote patient monitoring during COVID-19 pandemic. Blood Purif. https://doi.org/10.1159/000511407
19. Young A, Orchanian-Cheff A, Chan CT, Wald R, Ong SW (2021) Video-based telemedicine for kidney disease care: a scoping review. Clin J Am Soc Nephrol 16(12):1813–1823. https://doi.org/10.2215/CJN.06660521
20. Chandra A, Rao N, Srivastava D (2021) Initiating telenephrology in the coronavirus disease (COVID) era: a tertiary care experience in India. Kidney Res Clin Pract 40(1):175–176. https://doi.org/10.23876/j.krcp.20.123