Remote monitoring in renal medicine: experience from a 6-month pilot during the COVID-19 pandemic

■ virtual care ■ patient satisfaction ■ COVID-19 ■ NHS Long Term Plan

Many patients with a kidney transplant or with stable chronic kidney disease (CKD) enjoy a full social and family life and can work full-time. It is important that medical oversight of these patients is delivered in a way that is safe, yet makes the slightest possible intrusion into their ability to conduct their lives as normal. Key elements of the oversight required by kidney patients are management of cardiovascular risk, blood pressure control and renal function monitoring. It is traditional for these routine reviews to be undertaken at a hospital at scheduled clinic visits spaced several months apart. The interval between appointments is somewhat arbitrary, but is timed to reassure the nephrologist that nothing of importance—of which the patient may be unaware—goes unnoticed for too long. Blood tests form the basis of this assessment. Reviewing our hospital's 2018–2019 outpatient attendance data, we estimate that more than 80% of patients were attending clinics for such routine reviews. For this population, it is believed that there are better ways of delivering the necessary surveillance that are less intrusive into patients' lives and more financially efficient for health services.

Nicholas C Sangala
Wessex Kidney Centre, Portsmouth Hospital University NHS Trust
Email: nicholas.sangala@porthosp.nhs.uk

Robert J Lewis
Wessex Kidney Centre, Portsmouth Hospital University NHS Trust

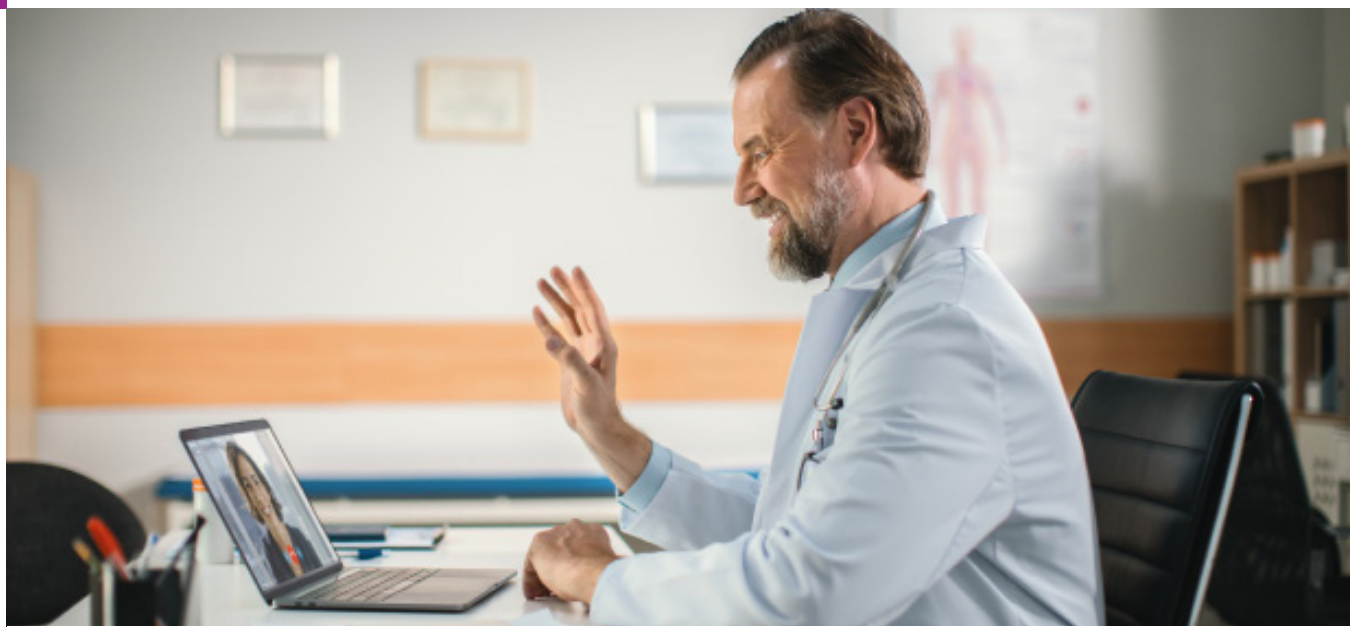
Jonathan Gamble
Specialist Registrar, Wessex Kidney Centre, Portsmouth Hospital University NHS Trust

Internet access

The internet is now widely used by the UK public for everyday needs, some of which involve the transfer of highly confidential information. Nearly all UK residents have access to the internet, and its usage is growing every year. UK Government data shows that 91% of UK adults are internet users (Office for National Statistics (ONS), 2019). In 2019, only 7.5% of adults stated that they have never used the internet, but this is down from 8.4% in 2018 (ONS, 2019), which indicates that non-users are becoming increasingly rare. Furthermore, in 2018, 78% of all UK adults used a smartphone to access the internet, and therefore have mobile internet access (ONS, 2018). The NHS Long Term Plan encourages the introduction of digitally based alternatives to hospital attendance (NHS England and NHS Improvement, 2019). Such systems are more financially efficient and enable patients to engage in their own health, which has been shown to improve outcomes in patients with some long-term conditions. Despite these well-recognised benefits, the introduction of digital options to the routine management of renal patients has been slow in the UK. The authors' experience is that many clinicians trained in the UK tradition consider a 'proper' assessment of a patient to involve face-to-face contact. There is also a persisting belief that patients value the personal attention of a clinician.

Changes to clinical practice

The advent of the COVID-19 pandemic in early spring 2020 meant that many renal patients, particularly those receiving immunosuppression, could no longer safely attend their routine reviews. With little notice, clinical teams had to devise new ways of ensuring oversight. In most renal units, non-urgent visits were supplanted by scheduled telephone calls, with the intention of returning to



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The COVID-19 pandemic has prompted a re-evaluation of traditional clinic-based care

routine clinic visits as soon as it was safe to do so. With this enforced change in clinical practice came the realisation that many patients preferred remote monitoring to the, at times, inconvenience of a hospital visit. This has prompted a re-evaluation of the traditional clinic-based care, which has, until now, been the norm.

A virtual consultation platform

In 2019, the Wessex Kidney Centre piloted a remote monitoring system (MyRenalCare) with a small group of individuals with CKD. The platform is a web-based application that has been specifically designed to promote remote monitoring and communication between the specialist centre and the patient, with a view to reducing face-to-face consultations. It builds a health record that is readily accessible by the patient, engages them in their own care and introduces a degree of self-management (self-monitoring and recording of blood pressure, weight and symptom-reporting). The application was designed to enable consultations to be delivered over the platform without the requirement for any other contact—a 100% digital virtual consultation. When a virtual consultation is due, the application delivers a reminder to the patient by email, prompting the patient to arrange a blood test at a time and site convenient for them. Using the application, the patient notifies the clinician when the blood test has been performed. The clinician reviews all the results, including patient-entered blood pressure, weight and the symptom report, and uses these to make a clinical judgement remotely. The clinician then enters a clinical note onto the system, which is fed back to the patient. If an issue requiring face-to-face contact is identified, a clinic review can be arranged with the patient.

Each virtual consultation takes the clinician less than 5 minutes and can be performed at any time, without the necessity of a scheduled time or date. It should be emphasised that this arrangement for virtual consultations is for routine surveillance when patients feel well. When clinical circumstances suggest the need for regular telephone or face-to-face contact, the fact that the patient is using the platform does not prevent this. The data entered onto the platform can be used to inform any non-virtual contact that may be required. Furthermore, the platform has been designed with the facility for patients to request face-to-face or phone consultations directly with their clinician when they feel this is necessary, thus empowering them to take an active role in their care.

Despite the success of this small pilot, the authors were mindful that this digital approach was a relatively new experience for patients who had previously become accustomed to attending the hospital on a regular basis. It could not be assumed that it was an acceptable alternative to traditional care. Therefore, undertaking a larger study to explore the opinions and experiences of users was considered to be important. The aims were to ascertain if this way of working with patients was considered by them to be a favourable alternative to clinic visits and to take account of any benefits and drawbacks that they reported.

Methods

Between 19 March 2020 and 10 September 2020, individuals with CKD were invited to use the remote monitoring platform by their consultant. The criteria for offering a renal patient the opportunity to use this method of monitoring were few: patients were required to have access to the internet, to possess an internet-enabled device and to be willing to try the technology. If, after learning more about the application, the patient wished to try it, they were given login details to the platform, along with an instruction booklet detailing how to use it. From the clinician's knowledge of the patients' needs, a decision was made about the frequency of reviews. The patients were notified of the date of their review to enable them to upload observations and obtain a local blood test shortly beforehand.

An online questionnaire of four questions designed by the investigating team was offered to all patients who expressed an interest in using the platform. This questionnaire explored the patients' pre-existing opinions of routine monitoring and how they felt about the concept of virtual consultations before they entered the pilot. At the end of September 2020, a second questionnaire was offered to all patients who were participating in the pilot. This questionnaire consisted of 16 multiple choice questions designed to explore the patients' opinions of clinic visits and their perceptions of the benefits and drawbacks of the new way of delivering care. Patients were asked about the ease with which the platform could be used, their level of confidence in the care they were receiving, if they felt neglected or isolated and how they used the platform in conjunction with the existing nationwide renal patient information website (PatientView), which is already accessible by all renal patients in England. No deadline for completion of the questionnaire was set.

No attempt was made to formally validate the questionnaires, as there are no existing comparators. As the questions were specifically designed to seek opinions regarding the experience of using the application, all responders were required to be users. Accordingly, no direct comparisons could be made with a control population of subjects receiving traditional clinic-based monitoring. Respondents drew comparisons based on their own experience of the care that they had received in the past.

Results

Some 108 patients were invited to use the platform, of which, 103 completed questionnaire 1 (95%). Responses showed that most patients (55%) felt that routine face-to-face appointments were not a good use of their time or that of the clinical team.

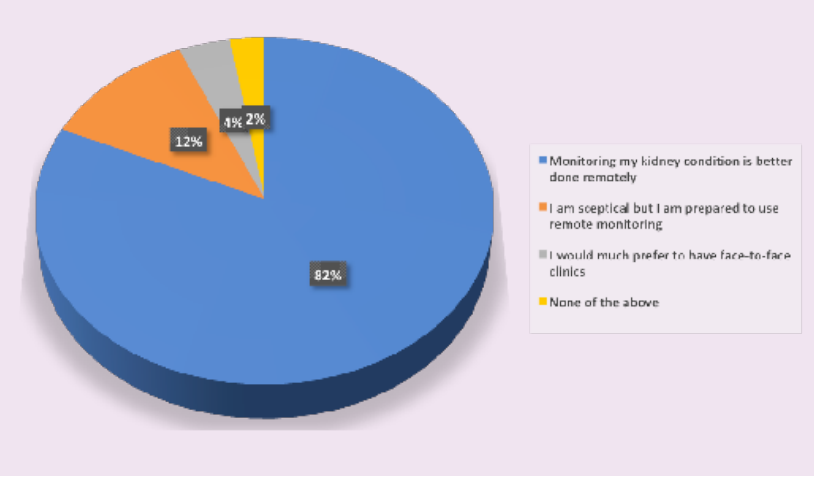

Figure 1. Which of these statements best describes your opinion of using computer or smartphone-based monitoring with fewer routine face-to-face appointments per year?

Some 75% thought such appointments would be better delivered using a computer or smartphone-based application.

Some 100 (62 male and 58 female) patients agreed to take part in the pilot. The youngest patient was 26 years of age and the oldest was 82 years of age, with a mean age of 55 years. Some 17 patients were over the age of 70, and 53 were transplant recipients, all at least 6 months post-transplant. Some 38 were general nephrology patients, and 7 were patients with advanced CKD.

Questionnaire 2 received 87 responses, of which, eight were partially filled and excluded from the analysis. Some 18% of responders had been using the platform for more than 6 months, 53% for 3–6 months, 22% for 1–3 months and 6% less than 1 month.

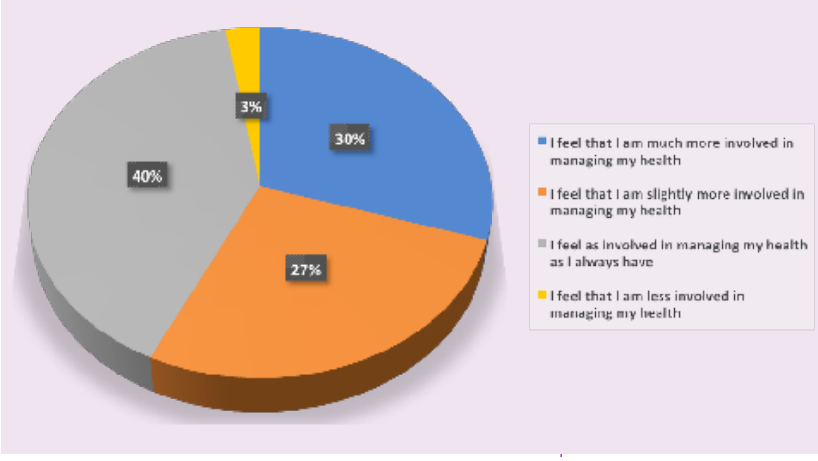

Figure 2. Has this new computer or smartphone-based approach to your care changed how involved you feel with managing your renal health?

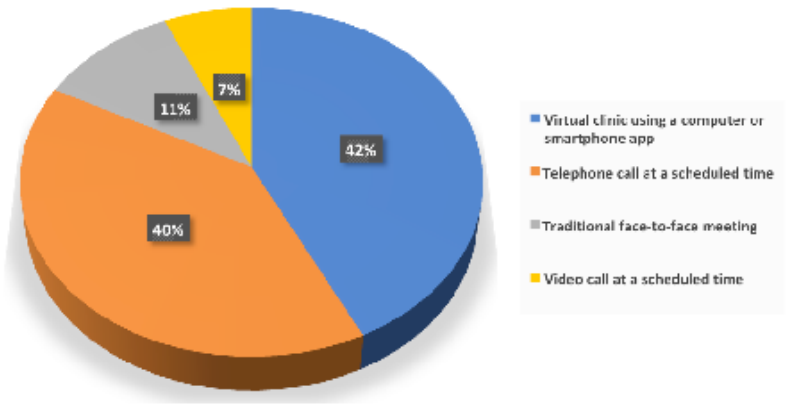

Figure 3. Having used the platform for a while, which of these options is your preferred way to be reviewed by your renal consultant when you are well?

Some 93% found the platform easy to use, and 82% felt that, when well, monitoring of their kidney condition was better done using a digital health platform with fewer face-to-face appointments (*Figure 1*). When asked about their level of confidence in their renal care when using the platform, 74% felt just as confident as when attending face-to-face appointments, and 16% reported feeling more confident. Some 8% reported feeling neglected when using the app-based system, while 57% reported feeling more involved in their management (*Figure 2*) and 29% reported better understanding their management using the platform. Of the 39 patients who used PatientView in addition to the platform, the majority (67%) felt that the two systems were complimentary. Some 30% found the platform more useful than PatientView, and 3% the reverse. Patients were asked to estimate how much time they saved undertaking a virtual consultation compared with a traditional clinic attendance. Some 33% of respondents saved 30–60 minutes, 43% saved 60–120 minutes and 16% saved more than 120 minutes. When asked to select their preferred modality for a routine outpatient review when they were well, 11% chose a traditional face-to-face appointment, 7% a video call, 40% a scheduled telephone call and 43% a virtual consultation using the remote monitoring platform (*Figure 3*). Some 97% of respondents stated that they would recommend using the platform to other renal patients.

Discussion

The survey has shown that most patients in the pilot did not regard routine on-site clinic visits to be a good use of their time and agreed that alternatives should be investigated. The majority felt that a virtual consultation using a digital health platform would provide a better way of delivering routine renal reviews than clinic attendance. Initially, it was a concern that patients would feel cut-off or neglected by their specialist team when being managed remotely, but the results showed that only a small minority felt this. These responses show that most patients favour this means of monitoring over routine clinic visits when they are well.

This new way of working may benefit the NHS by improving the efficiency with which care can be delivered, but the survey shows that it also has the potential to improve patients' experience by reducing inconvenience and enhancing their role in their own care.

Flexibility in delivering care

A key benefit of the platform is the convenience and efficiency of a virtual consultation for both patients and clinicians. Results showed that virtual consultations saved the patients' appreciable time. Clinical observations and symptom reports are uploaded at any time by the patient with minimal disruption to their daily activities. Blood tests are arranged by patients at a time and site of their convenience, and the platform allows patients to notify their clinical team once the blood test has been performed, thereby preventing any delay in reviewing the results. For the patient, this is all that is required for a virtual review. Importantly, removing the need for a scheduled interaction (either face-to-face, by phone or via video link) at a particular time on a particular day introduces flexibility into patient care. The result is that virtual consultations are less disruptive to patients' daily lives.

The digital consultations are also more efficient for the clinician. Like patients, they are not restricted to a scheduled interaction at a given time on a given day. Once alerted that the necessary blood test has been completed, they can review the online record submitted by the patient, review the laboratory results and provide feedback directly to the patient through the platform. In the authors' experience, these virtual consultations typically take no more than 5 minutes. As monitoring can take place with far less disruption than traditional face-to-face appointments, such consultations lend themselves to individuals in need of frequent monitoring. This pattern of frequent, flexible 'micro-consultations' allows close surveillance to be delivered more efficiently than with traditional inflexible hospital visits.

The benefit of this approach may be particularly relevant to recent transplant recipients who require close oversight of their transplant function

and frequent titration of their medication. Such patients are currently required to attend more than 30 outpatient appointments in the first year post-transplantation (The Renal Association, 2017). As there is often a long commute between patients' homes and the transplant centre, benefits can be gained from remote monitoring of their transplant with prompt attendance only when problems are identified. The pilot study did not include such patients, and this is an area requiring further study.

Patient-led care

Traditional routine clinic reviews are scheduled months apart, leaving long periods during which important changes in the patient's condition can occur. With the traditional clinic-based system, patients noticing a change in their condition between scheduled visits are required to phone a secretary to ask for an expedited appointment, seek advice from their GP, ring the on-call renal team or even access emergency services. This can introduce delays and the involvement of clinicians who may not fully understand the patient's condition or treatment plan. In contrast, a digital health platform allows patients to initiate an interaction with their specialist directly, thus streamlining timely access to the most appropriate source of advice. This meets a key requirement of clinical services: to deliver the right care for the right patient at the right time. During the 6-month study, a total of 33 patient-initiated contacts were made, with an average response time of 25.4 hours. The majority of these were important, yet easily resolvable, and prompt resolution improved patient care (e.g. intolerance of a new medication prompting a change to an alternative). However, three of the 33 contacts revealed a significant deterioration in the patients' renal condition, which, if the clinician had not been alerted by the patient, could have resulted in further deterioration and an avoidable admission to hospital.

There is also a growing body of evidence that emphasises the importance of effective self-management of long-term conditions (Hibbard and Gilburt, 2014). Patients who recognise that they have a key role in managing their condition, and have the skills and confidence to do so, tend to experience better health, have better health outcomes and engage in healthier behaviours. Working with this platform in the manner described promotes supported self-management. The patient is required to engage in their healthcare by being entrusted to perform their own clinical observations and symptom reports. Over the 6-month study period, a total of 1138 clinical observations were uploaded by 91 of the 100 patients, with an average of 13 records per patient (range one to 93 records per patient). A significant majority of the cohort reported feeling more engaged in their care while using the platform than before (*Figure 2*), and many reported a better understanding of their management.

Key points

- A significant proportion of renal out-patient appointments are for routine monitoring when patients are well
- Individuals with chronic kidney disease are open to using remote monitoring as a replacement for routine clinic appointments when they are well
- Patient-initiated follow-up enables individuals to access to the right care at the right time
- Cloud-based technology can be used securely for remote monitoring

Reducing face-to-face appointments

The NHS Long Term Plan aims for a 33% reduction in face-to-face outpatient clinics within 5 years (NHS England and NHS Improvement, 2019). In the study, 94 of the 100 patients had a total of 263 consultations between them (one to 14 per patient) during the 6-month pilot. Some 175 (66.5%) of these consultations were virtual. The study was not extended to all suitable patients attending clinics in the authors' department. Furthermore, it was undertaken during the disruption to normal outpatient processes as a result of the COVID-19 pandemic. Despite this, it indicates that, in a selected cohort of patients, the use of virtual consultations reduces outpatient attendance. Clinic capacity is reduced, and consequently available for patients who may not be suitable for virtual monitoring and those who have particular clinical need for on-site assessments. Thus, it may play a role in providing a safe means of attaining the aspirations of the NHS Long Term Plan.

Patient safety

The platform used in this pilot was specifically designed to support remote monitoring of renal patients in a way that reduced the need for face-to-face consultations in patients who are well. This concept predated the COVID-19 pandemic. During the height of the COVID-19 pandemic, patients with CKD, notably transplant recipients and those receiving immunosuppressive treatments, were classified as clinically vulnerable or extremely vulnerable. Patients in these categories were particularly discouraged from attending hospital for routine visits. This study took place during the pandemic and showed that a cohort of such patients could avoid hospital attendance while

CPD reflective questions

- What are the aims of the NHS Long Term Plan regarding hospital outpatient attendance?
- What percentage of the UK population use the internet?
- What is patient activation and what are its benefits?

receiving supervision of their care. No one in the group developed a COVID-19 infection, and there were no instances where patients came to harm from inadequate oversight. Some 90% reported feeling at least as confident in their management as they did when attending clinics. The pilot study suggests that use of the platform provides a means of reducing exposure of renal patients to COVID-19 by avoiding hospital appointments while ensuring that their renal health is maintained.

With the advent of a second wave COVID-19 infections, a patient-responsive system of remote monitoring is urgently required for highly vulnerable people with long-term renal conditions. Prolongation of the COVID-19 pandemic, or even the emergence of future pandemics, will further intensify the need for such innovations in future.

Limitations of the study

This is not a controlled study to compare monitoring using the digital platform with standard care (routine clinic attendance). The authors believe that such a study is necessary, particularly looking at the effect of remote monitoring on patient activation and patient-reported outcomes. The report describes a 6-month pilot, but, clearly, a longer period of use is desirable to establish clinical utility.

The patients chosen for this pilot represent a selected cohort. The clinicians tended to offer use of the application to patients who they thought would benefit. There were no firm criteria for this assessment, merely a subjective sense that they were suitable. Therefore, it cannot be concluded from this pilot that the use of virtual consultations can replace clinic visits for all patients. However, there is a population of kidney patients who appear to benefit from its use, and the authors believe that a willingness to try it identifies those patients most likely to benefit. Notwithstanding this, clinical judgement still needs to be applied before offering a patient the option of remote monitoring instead of clinic attendance.

While accepting these limitations, experience shows that remote monitoring using a digital health platform is an acceptable alternative to clinic attendance for patients who choose to use it. Additionally, the potential benefit of the platform is not limited to delivering virtual consultations; it aims to encourage patient engagement in their care, improve communication of management plans and provide regular and longitudinal patient reporting of clinical observations and symptoms that can better guide decision-making, even during face-to-face appointments. Further study is required to identify the extent to which it can replace traditional clinic attendance and how it influences outcomes in the long term.

Conclusion

Remote monitoring has the potential to reduce demand on clinics, thereby releasing capacity for patients who would benefit from on-site hospital evaluation. Its value extends beyond the requirement of the COVID-19 pandemic, and renal units should not default to clinic-based monitoring when the pandemic passes. The authors believe that the future of chronic disease management lies in patient involvement. Supported self-management using an online web application is a good way to deliver this in a digital age. This new way of working may help in achieving the NHS Long Term Plan goal of reducing face-to-face outpatient appointments by a third while increasing patient involvement in their management. Further evaluation with a larger cohort of patients over a longer time period is necessary. This should be the subject of a controlled trial. JKC

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