

# Remote monitoring of chronic kidney disease

**Dr. Robert Lewis**, a consultant nephrologist, from Wessex Kidney Centre Portsmouth, argues that patients are keen to embrace web-based remote monitoring, to support self-management of chronic kidney disease. Despite the benefits, some clinicians have been hesitant to adopt the technology. He calls for a change in attitude and shares his insights into the implementation of virtual consultations.

In 2019, the NHS plan set the ambition for greater adoption of remote monitoring and virtual consultations in order to achieve a 33% reduction in outpatient attendance over five years.<sup>1</sup> The authors of the NHS plan could not have foreseen the COVID-19 pandemic, which prompted an abrupt, unplanned reduction in clinic attendance driven by the need to reduce the risk to patients of COVID-19 exposure. Routine face-to-face consultations were largely replaced by telephone or video consultations scheduled at a given date and time using traditional clinic templates. This approach caused minimal disruption to existing administrative processes or staff working practices and thus provided a tolerable quick-fix to meet the needs of an emergency.

Prior to the pandemic, there had been growing interest in the application of digital technologies to the management of chronic kidney disease (CKD). These systems have

been shown to be useful for the remote transfer of data from patient to clinician<sup>2,3</sup> or as a means of providing patient education.<sup>4</sup> Computer-based software designed for remote management of CKD has been described,<sup>5</sup> but its value in clinical practice remains unclear. The adoption of such technology into routine clinical practice has therefore been slow.

The changes in practice forced upon us by the pandemic have shown us that traditional clinics are not the only (or even the best) way to monitor patients with chronic disease. We now have an opportunity to establish the optimal relationship between healthcare users and providers in the digital age. We need to ask if digital technologies can be used to enhance patient involvement and if clinicians need to overhaul their traditional working practices to incorporate these technologies in order to reduce the burden of disease on patients and improve the efficiency of healthcare.

This article describes our experience with

a novel web-based application designed to monitor people with CKD remotely while introducing a degree of self-management. It was developed by Ardia Health Care in collaboration with the Wessex Kidney Centre, which provides specialist nephrology, dialysis and renal transplant services to a catchment population of about two million in the central south coast region of England. Although this account relates solely to renal disease, the principles underlying the technology and the way it has been applied in practice could readily be adapted to the management of a wide range of chronic conditions.

## Why consider remote monitoring?

Many people with a kidney transplant or with stable CKD enjoy a full social and family life and can work full-time. Medical oversight should therefore be delivered in a way that is safe and yet makes the slightest possible intrusion into the ability of these ►



people to conduct their lives as normal. Notwithstanding this, it has been standard practice to schedule regular on-site hospital reviews in the absence of any apparent problem. Although the main purpose of these visits is to monitor renal function (i.e. view the latest blood tests result and check the blood pressure), it has been assumed that it serves other useful purposes; patients value the reassurance they gain from physically seeing their doctor and clinicians need their patients' presence in order to identify problems which are not otherwise apparent. But is this really the case?

In 2019, such routine monitoring visits (four or fewer visits per year) accounted for about 85% of clinic attendances in our department. Because they were scheduled months in advance, they were unlikely to be responsive to the needs of the patients – there was little chance of an appointment coinciding with the onset of a new problem. If an issue requiring specialist input arose between visits, the patient needed an additional unscheduled appointment, for which there was seldom capacity. Clinics became overbooked with the result that many people attending routinely, with no apparent problem, went to considerable inconvenience (missing work, travelling, parking etc.) to attend hospital appointments, only to wait an unconscionable length of time for a brief review of blood pressure and pathology results along with an exchange of best wishes.

Before the COVID-19 pandemic, we surveyed patients attending these routine clinics. New transplant recipients told us that they spent an average of five hours (door to door) attending a clinic visit, only 15 minutes of which was face to face with a clinician. Most CKD patients (55%) expressed the view that, when they were well, routine face-to-face appointments were not a good use of their time or that of the clinical team. Presented with various

options for monitoring their kidney function (including clinic attendance) 75% of the surveyed patients expressed the view that oversight could be better delivered remotely using their home computer.

**MyRenalCare: what it is and what it does.**

MyRenalCare is a web-based application which has been designed to promote remote monitoring and communication between the specialist centre and the patient in order to reduce face-to-face consultations. It builds a health record, stored in the cloud, which is readily accessible by the patient via the internet and engages them in their own care (self-monitoring and recording of blood pressure, weight and symptom reporting). The application was designed to enable consultations to be delivered via a computer or smartphone without requirement for any other contact: a 'virtual consultation'.

When the review is due, the application delivers a reminder to the patient by e-mail, prompting him or her to arrange a blood test at a time and site convenient for them (usually the GP or local hospital). Using the application, the patient notifies the clinician when the blood test has been performed. The clinician reviews all the results, including patient-entered BP, weight and 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 or telephone contact is identified, the clinician can arrange this. If all is well, the clinician simply enters a suggested date of the next blood test or routine review by entering this into the patient's on-line diary.

Each routine virtual consultation can be performed without the clinician or patient needing to be available to interact at a scheduled time or date. If a direct interaction

is required by the patient, the platform has been designed with the facility for patients to request a face-to-face or phone consultations, thus empowering them to take an active role in their care.

The criteria for offering a patient the opportunity to use web-based remote 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 consented and given login details to MyRenalCare, along with instructions detailing how to use the application.

**The patients' experience**

The system allowed clinical observations and symptom reports to be uploaded quickly and easily by the patient at any time with little intrusion into their daily activities. Patients were notified of test results and the clinical decisions made by their specialist within a day or two. 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 introduced a new flexibility into their care, thus reducing the burden of routine monitoring. Furthermore, they had the reassurance of knowing that clinical oversight was being delivered by their own specialist, who was named on their record at each interaction.

One hundred and eight patients (mean age 55 years, range 26-82 years) used our web-based platform for routine monitoring. We undertook a survey of their experiences over a six-month period. Ninety-three percent found the platform was easy to use and 82% felt that, when well, monitoring of their kidney condition was better done using our digital health platform with fewer face to face clinics. Patients were asked to estimate how much time they saved undertaking a virtual consultation compared with a traditional clinic attendance. 33% of respondents saved 30-60 minutes, 43% saved 60-120 minutes and 16% saved more than 120 minutes. 97% of respondents stated that they would recommend web-based remote monitoring to other renal patients.

During the six months of observation, no face-to-face clinics were required. A follow-up telephone call was made (either at the request of the patient or as a clinical decision) after 35% of the reviews, but the remaining 65% were undertaken solely via the application.

**The clinician's experience**

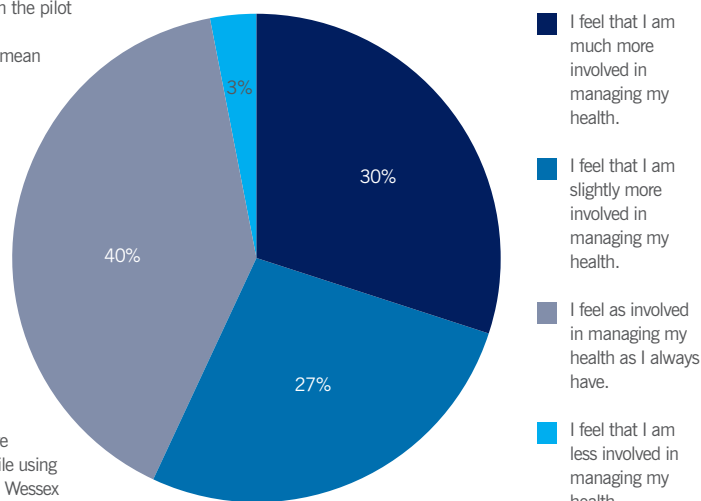
Virtual consultations were more time-efficient for the clinician. Like the patients, clinicians were not restricted to a scheduled interaction at a given time or place. The process of reviewing the information on a patient's record and entering a clinical note typically

100 patients took part in the pilot

● 26 years to 82 years mean age of 55 years

● 53% transplant  
38% nephrology  
7% advanced kidney disease

57% reported being more involved in their care while using remote monitoring at the Wessex Kidney Centre



**Figure 1** How has your involvement in managing your renal health changed since using the app?

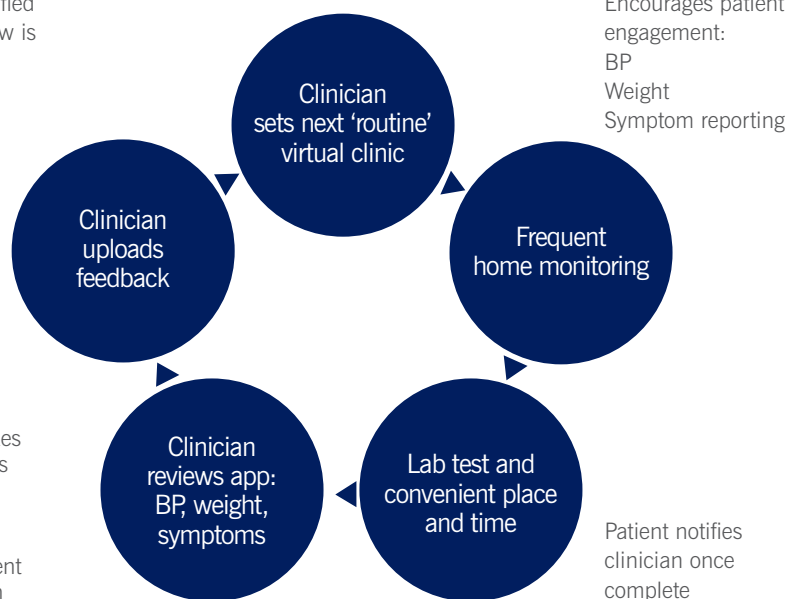
took no more than five minutes.

Because monitoring could take place more quickly and efficiently than traditional face-to-face appointments, the system was particularly valuable where frequent monitoring was required. Flexible “micro-consultations” which focus on the key issues (e.g. monitoring the response to new antihypertensive medication or checking decline in proteinuria after initiation of treatment for a relapse in nephrotic syndrome) saved repeated clinic attendances while keeping patients up-to-date with any medication changes on their clinical record. If problems were identified (either by the clinician or the patient), prompt action was initiated over the platform. An attempt to provide such a degree of oversight using traditional clinics would have been highly intrusive into a patient’s life and would burden clinic administration and capacity.

The work-pattern which emerged from our experience was of timely *ad hoc* reviews determined by clinical need rather than our timetable of available clinics. If this way of working became widely adopted in future, the notion of allotting Programmed Activities in consultant job plans according to the number of clinics undertaken no longer seems appropriate. Organisations may need to consider how to address this issue during the reconfiguration of commissioning

Patient notified when review is complete

Process takes five minutes  
Little delay for patients  
More efficient for clinician



Encourages patient engagement:  
BP  
Weight  
Symptom reporting

Patient notifies clinician once complete

Figure 2 A new way to deliver routine care – the web-app clinic

planned for the NHS in England (Integrating Care, 2020),<sup>6</sup> one aim of which is to bring digitally-based care into routine practice.

**Are patients ready for remote monitoring?**

Remote monitoring reduces the need for hospital clinics and thus save time and

money. But in addition to the potential economic benefits of remote monitoring, there is a growing body of evidence that emphasises the importance of facilitating effective self-management of long-term conditions.<sup>7</sup> People who recognise that they have a key role in managing their condition and have the skills and confidence to do so, ▶



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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. A majority of our cohort reported feeling more engaged in their care while using the platform than prior and many reported a better understanding of their management.

A concern is that web-based monitoring via a smartphone or computer may introduce health inequalities – not everyone is so enabled. However, this possibility needs to be considered in context. The internet is now widely used by the UK public for everyday needs, some of which involve the transfer of highly confidential information (e.g. online banking and shopping). UK Government data show that 96% of UK adults are internet users (80% in people over 65 years).<sup>8</sup> In 2019, 87% of adults aged 25-64 used a smartphone to access the internet.<sup>9</sup>

The great majority of patients could therefore access healthcare via digital means and this number is certain to grow in future. A few individuals may not be able to use these technologies, but it is likely that they too will derive benefit from greater access to the clinic capacity which remote monitoring creates. It is therefore possible that adoption of remote monitoring, where it is appropriate, may help reduce health inequalities across the service as a whole.

### Are healthcare professionals ready for remote monitoring?

We offered the option of remote monitoring to a selected cohort who, in our opinion, stood to benefit from it. We regarded remote monitoring as an adjunct to, rather than a wholesale replacement for, clinic-based care. Importantly, clinicians and patients retained the freedom to decide what kind of review was most appropriate for a given clinical circumstance. Failure to appreciate this hybrid model causes problems for some clinicians, who fear a wholesale takeover of traditional care by impersonal technology.

We noted some resistance from clinicians to the introduction of this system to our unit. Some were of the opinion that "proper" medicine cannot be delivered remotely. They felt that physical contact with patients is the essence of the care a doctor should provide and that patients value this contact. Others were sceptical that patients could be trusted to take responsibility for their care without face-to-face professional oversight. Our evidence, derived from the patients themselves, does not support these views. We have shown that those who opted to use remote monitoring found it convenient and reassuring; they told us that they did

not miss routine face-to-face consultations. We did not identify a single instance when a using remote monitoring led to outcomes which were inferior to those attained with clinic attendance.

Remote monitoring is not for everyone, but it is wrong for clinicians to assume that it is only suitable for computer-savvy youngsters. For internet-based monitoring to be used appropriately in clinical practice, professionals need to learn to identify those patients who are likely to benefit. This requires unprejudiced judgement of a patient's physical attributes (eyesight, manual dexterity) cognitive function, psychological health and clinical suitability (the expected natural history of their disease). Clinicians must also learn to identify users of remote monitoring who are no longer benefiting and require a change to face-to-face surveillance. These skills are not yet fully developed in the clinical workforce but are important if the ambitions of the Topol review, which aims to prepare the workforce for the digital age, are to be realised.<sup>10</sup>

### Conclusions

We have shown that a selected cohort of patients with CKD prefer remote, web-based, shared management to traditional clinic-based care for routine surveillance when they felt well. When used for such routine monitoring, it enabled an interaction with clinicians which met the needs of patients. The resulting reduction in demand for clinic space improved access for patients who needed a face-to-face interaction. From our experience, the major barrier to realising the benefits of guided self-management using this technology is not the preference or capability of patients, but rather the willingness of clinicians to embrace its introduction and of organisations to create conditions which enable its use. Widespread acceptance of these systems by healthcare providers will depend on the provision of a body of peer-reviewed evidence which confirms the benefits we have seen during our experience. There is therefore a need for large clinical trials examining the role of new technologies in modern healthcare delivery. Now is the time. **CSJ**

### References

1. NHS Long Term Plan 2020. available at <https://www.longtermplan.nhs.uk> (accessed November 2020)
2. Rosner MH, Lew SQ, Conway P, Ehrlich J, Jarrin R, Patel UD, Rheuban K, Robey RB, Sikka N, Wallace E, Brophy P, Sloan J. Perspectives from the Kidney Health Initiative on Advancing Technologies to Facilitate Remote Monitoring of Patient Self-Care in RRT. *Clin J Am Soc Nephrol.* 2017 12(11):1900-1909.
3. Logan AG, McIsaac WJ, Tisler A, Irvine MJ, Saunders A, Dunai A, Rizo CA, Feig DS, Hamill M, Trudel M, Cafazzo JA. Mobile phone-based remote patient monitoring system for management of

hypertension in diabetic patients. *Am J Hypertens.* 2007, 20:942-948.

4. Tuot DS and Boulware LE, "Telehealth Applications to Enhance CKD Knowledge and Awareness Among Patients and Providers," *Adv Chronic Kidney Dis,* 2017, 24 (1) 39-45
5. Ong SW, Jassal SV, Miller JA, Porter EC, Cafazzo JA, Seto E, Thorpe KE, Logan AG.: Integrating a smartphone-based self-management system into usual care of advanced CKD. *Clin J Am Soc Nephrol* 2016, 11: 1054-1062
6. Integrating Care. NHS England 2020. available at <https://www.england.nhs.uk/wp-content/uploads/2020/11/261120-item-5-integrating-care-next-steps-for-integrated-care-systems.pdf> (accessed November 2020)
7. Hibbard J and Gilbert H. Supporting People to Manage their Health, Kings Fund 2014. ISBN978 1 909029 30 9
8. Office of National Statistics 2020. Available at <https://www.ons.gov.uk/peoplepopulationandcommunity/householdcharacteristics/homeinternetandsocialmediausage/bulletins/internetaccesshouseholdsandindividuals/2020> (Accessed November 2020)
9. Statista: Share of individuals who accessed the internet via a mobile phone in Great Britain in 2019, by age and gender, available at: <https://www.statista.com/statistics/275985/mobile-internet-penetration-in-great-britain-by-age-and-gender/> (Accessed November 2020)
10. NHS. The Topol Review. Preparing the healthcare workforce to deliver the digital future. NHS 2019 <https://topol.hee.nhs.uk/wp-content/uploads/HEE-Topol-Review-2019-printable.pdf> (accessed November 2020)



## About the Author

Dr. Robert Lewis MD FRCP was appointed as a consultant nephrologist at the Wessex Kidney Centre in 1997 after completing his renal training and MD thesis at Guy's Hospital London. He has previously been head of department and is now head of research and innovation. He is an honorary senior lecturer at the University of Portsmouth and renal specialty lead for the Wessex Clinical Research Network.