Integrated Healthcare Journal

Integrated virtual medical consultations versus traditional clinic care in a public and a private outpatient service

Ivor Katz ,[1] Cathie Lane,[1] Saiyini Pirabhahar,[1] Paula Williamson,[1] John Kelly,[1] Rachel Preece,[2] Vishwas Raghunath,[3] Mark Brown[1]

To cite: Katz I, Lane C, Pirabhahar S, *et al*. Integrated virtual medical consultations versus traditional clinic care in a public and a private outpatient service. *Integrated Healthcare Journal* 2022;**4**:e000061. doi:10.1136/ihj-2020-000061

Received 12 October 2020
Accepted 29 August 2022

Check for updates

© Author(s) (or their employer(s)) 2022. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

[1]Renal Medicine, University of New South Wales Faculty of Medicine, Sydney, New South Wales, Australia
[2]Internal Medicine, Bathurst Base Hospital, Bathurst, New South Wales, Australia
[3]Medicine, Ipswich Hospital, Ipswich, Queensland, Australia

Correspondence to
Professor Ivor Katz;
Ivor.Katz@unsw.edu.au

ABSTRACT

Objectives The iConnect Care programme provided integrated 'virtual care' (VC) for patients with chronic kidney disease (CKD) in the South Eastern Sydney Local Health District. VC is an alternative to outpatient care which expedites time to specialists' opinions and is safe. Comparing different outpatient care models is important to understand the role of telehealth and integrated care, especially following the COVID-19 pandemic. This study aimed to compare a VC model with existing CKD outpatient care.

Design, participants and setting A multisite, comparative, retrospective cohort study with parallel groups. 374 patients with mild CKD were recruited (July 2013 and August 2015) from public and private outpatients and followed for 12 months (n=304) or via VC (n=70). Estimated glomerular filtration rate (eGFR) and urine albumin/creatinine ratio (ACR) were compared at baseline, 6 and 12 months.

Results At 12 months, no significant differences existed among groups in eGFR or ACR or haemoglobin, but serum creatinine was lower in the VC cohort. A significant difference existed in time to see a patient from time of referral; 7 days for VC clinic and 35–42 days for outpatient clinic. Patients interviewed felt VC was efficient and they were well managed.

Conclusion VC can be a faster mechanism to access a nephrologist and other specialists. It provided similar outcomes to outpatient care. VC represents an additional assessment and follow-up pathway supported in the community. Time to deliver is similar, but specific resources are needed. It has the potential to evolve into a standard component of chronic disease care.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ It is well known that we can carry out patient care with chronic diseases via virtual care. There are studies demonstrating their use in chronic kidney disease confirming that they are a safe way of providing care.

WHAT THIS STUDY ADDS

⇒ This study provides a direct comparison of virtual care with the 'standard' face-to-face outpatient consultation. This study has demonstrated that it can be quicker to provide virtual care compared with standard face-to-face outpatient care. It demonstrated similar outcomes over a short follow-up period of 1 year, providing reassurance for clinicians. It also demonstrated an asynchronous virtual care consultation method with multiple specialists, and it showed this is also a quicker method of seeing multiple specialists versus face-to-face consultations. It is the first study in Australia demonstrating virtual care in chronic kidney disease by specialists for the general practitioner in the community.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This study has become even more important following the necessity of providing care via a virtual care method during the recent COVID-19 pandemic. It lays down a strong argument that virtual care should also become a standard component of chronic disease care. It provides an opportunity to evaluate what the future supportive structures and protocols are to support virtual care. It lays down the opportunity of a randomised control study to compare these methods of providing care, which will further inform how it should be used in practice.

INTRODUCTION

An increasing prevalence of chronic conditions and an ageing population have highlighted the importance of developing innovative methods for patient care.[1] Chronic diseases provide a strong incentive for telehealth services,[2 3] which can facilitate access to specialists, and potentially provide convenience and cost saving for patients. These considerations are particularly relevant when patients' have impaired mobility, live in remote areas or are in a pandemic like COVID-19.[2 4 5] In these circumstances, technologies are being used to improve the communication between patients, general practitioners (GPs) and specialists. Virtual care (VC) is any interaction between a patient and clinician, occurring remotely with the use of information technology.[6] There are a few studies demonstrating benefits of VC in chronic kidney disease (CKD). 'iConnect'

Integ Health J: first published as 10.1136/ihj-2020-000061 on 17 November 2022. Downloaded from http://ihj.bmj.com/ on February 24, 2023 by guest. Protected by copyright.

Care, a VC care using e-consultations in South Africa, and later in Australia, successfully tracked patients with CKD[7 8] in the community. iConnect Care provided e-consultations with a nurse, nephrologist, endocrinologist, cardiologist and palliative care specialist. It did this safely and in a timely manner.[8 9] Consultations required initial face-to-face contact between patients and their GP. All subsequent specialist review occurred via on-line patient data in an asynchronous fashion. Only the relevant data were available to the specialist, allowing an e-consultation via the bespoke web-based e-consultation software.[7 8] Another randomised control trial, evaluating a tele-monitoring system vs standard care for patients with CKD, revealed no significant difference between groups with regards to death, hospitalisation, emergency department (ED) visits and nursing home admissions.[10] In a nurse-led programme for patients with advanced renal failure (CKD stages 4 and 5), the use of a clinical disease-based informatics system reduced hospitalisations and improved preparation for dialysis.[11] In another British study, GPs used e-consultations for referrals to nephrologists,[12] resulting in reduced paper referrals, provision of quick advice and a decreased need for a referral. ICTs also have social support and education benefits.[13] These include improved patient empowerment and health-related quality of life, possibly reducing hospitalisation and improving cost efficiency.

Barriers to care using VC include: complexities of communication between sites and between different segments of the healthcare system; the complexity of chronic diseases and their associated care plans; the provision of follow-up after initial assessment and the high investment of time and funding.[14 15] A systematic review of VC showed limited benefit in the detection and follow-up of cardiovascular diseases and in reducing mortality and health services utilisation.[16] There was also a need to need to better evaluate VC[17] in their different formats. Telephone or videoconference (e-consultation) technology, known as 'telemedicine,' is commonly used in Australia for more rural settings.[18] Here, one on one communication is still required. In contrast, VC like that used in the iConnect Care programme can allow asynchronous communication between patients and healthcare providers,[7 8] facilitating consultations at different times that are convenient for the patient and doctor. Despite the potential for VC to improve healthcare quality and reduce care costs, uptake has been limited. There have traditionally been no incentives, via financial reimbursement, to the doctor or practice.[19] The onset of the COVID-19 pandemic has forced the use of VC worldwide, including in Australia.[2 4] However, a more recent study demonstrated the significant challenges of integrating these into existing healthcare.[20] It was noted that three components were key to successful use of e-consultation systems. These included the incorporation of the patient into the process, the integration of technology into the organisational structure of daily care and the provision of human resources to support the technology.

Most patients with chronic illnesses like CKD are cared for by GPs.[1] Clinical outcomes of patients with chronic illness are better when there is an interactive communication between GPs and specialists.[2] Within CKD management, various models of GP-specialist collaboration have been proposed.[3 5] E-consultation is a promising pathway, complementing the traditional GP-specialist interface.[14 15 21 5]

There are still a few examples of information technology being used for chronic disease, and very few examples of its use in CKD.[22] In light of these factors, the aim of this study was to evaluate VC in CKD. We aimed to assess at least for non-inferiority, by comparing the programme against the current standard management of patients in both a public and a private nephrology outpatient setting. It assumed established treatments to reduce decline in renal function were standard, that is, blood pressure control, appropriate medications such as RAAS blockade and diabetes control.[23 24] The assessment was then undertaken by comparing proxy variables of care including estimated glomerular filtration rate (eGFR), urinary albumin to creatinine ratios (ACR) and haemoglobin. These proxy variables have clearly demonstrated that without treatment there would be ongoing decline.[23 24]

METHODS

A letter of invite was sent out to the GPs in South Eastern Sydney Local Health District (SESLHD) in which the tertiary St George Hospital is located. Twenty GP practices volunteered and were trained to use the software. Referral criteria were adapted from the Kidney Health Australia, Kidney Check Australia Taskforce GP guidelines.[25]

GPs were encouraged to enrol patients with the following issues—a declining kidney function which was a sustained decrease in eGFR of 25% or more or a sustained decrease in eGFR of 15 mL/min/1.73 m^2 within 12 months, persistent significant albuminuria or macroalbuminuria (urine ACR >30 mg/mmol), uncontrolled hypertension (consistently high blood pressures >130/85 mm Hg already on treatment), advanced CKD (low eGFR <30 mL/min/1.73 m^2) or with symptoms requiring advice and relevant to diseases conferring risk for CKD, for example, diabetes care.

GPs in the area collected patient data in various ways ranging from paper-based records to electronic medical record (EMR) systems. The latter being the predominant method. GPs were not obliged to use EMR. All GPs followed their patients face to face prior to using the VC programme. The standard method of referring to a specialist was by fax. The processes of the 'traditional' face-to-face (F2F) outpatient clinic and the Virtual Medicine Consultation Clinic are summarised in figure 1.

Usual care for ambulatory patients is funded by Medicare. Medicare, a government-funded programme, covers the cost of treatment in public hospitals and subsidises the cost of a wide range of health services and medications. Patients may choose only to have Medicare cover

Integ Health J: first published as 10.1136/ihj-2020-000061 on 17 November 2022. Downloaded from http://ihj.bmj.com/ on February 24, 2023 by guest. Protected by copyright.

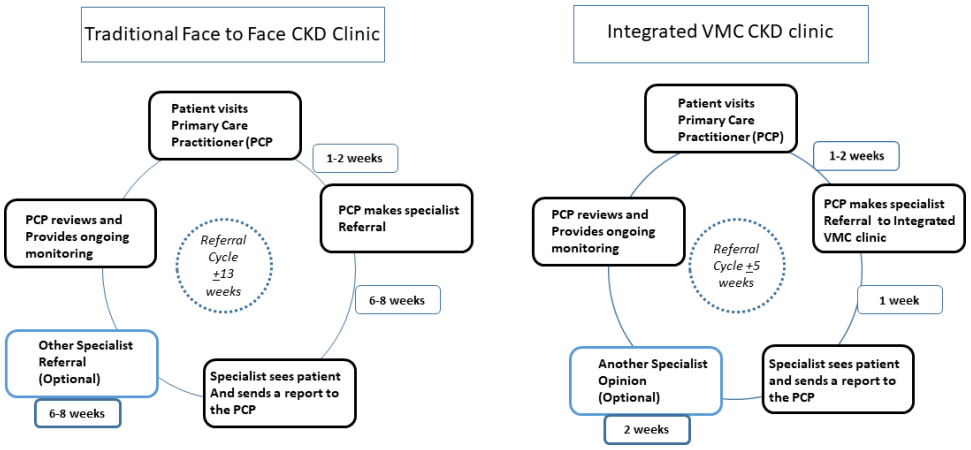

Figure 1 The processes of traditional face-to-face consultation versus virtual consultation. CKD, chronic kidney disease; VMC, virtual medical clinic.

or to also have private health insurance. Medicare allows a person to visit a 'bulk-billing' doctor and receive free medical treatment. Our GP practices were both bulk-billing and private.

For a GP or specialist to make a referral to the VC programme, data were either loaded directly into the web-based e-consultation software or by the CKD nurse on receiving a faxed referral. Thereafter follow-up was online. This initial consultation was face to face and funded by Medicare, the patient or both. All initial face-to-face consultations in the public hospital and by private nephrologist practices were funded by Medicare. In the private clinic a private supplement was usually paid by the patient.

Once enrolled these virtual consultations were not funded by Medicare. Specialists provided a voluntary service established for research purposes. GPs continued to be funded by Medicare for face-to-face consultations, but not for the extra time to use the VC software. The integrated VC group was tracked using the bespoke web-based software at the tertiary hospital.[7] These e-consultations involved the patient's clinical information and data, but no video interaction. Telephonic consultation was used to report a patient's results or progress to the GP when indicated. These tele-consultations were not funded by Medicare. The program software was developed by the first author with Medical Databanks through grant funding.[26]

The study design was a retrospective, multisite, comparative, cohort study using parallel groups. Patients were enrolled into the virtual medical clinic (VMC) during July 2013 to August 2015 as described previously.[8]

Records were collected prospectively from the renal outpatient clinic at St George Public Hospital and from a private nephrology practice. Data were then retrospectively reviewed. Only patients referred from GPs were included that is, no specialist to specialist referrals. Those attending follow-up after an earlier hospital admission were excluded, as they were felt to represent a different patient cohort. A summary of the components of the programme are outlined in table 1.

Demographic, laboratory (ie, haemoglobin, serum creatinine, eGFR CKD-EPI and urinary ACR), and medical information (including medications) were collected at baseline, 6 months and 12 months from all patients.

Time from referral to specialist assessment for both the VMC and face-to-face clinics was assessed.

Statistical analysis was conducted utilising the Kruskal-Wallis test and p values were set using the Mann-Whitney test when the data were non-parametric. The Friedman analysis of variance were used for repeated data, followed by the Wilcoxon signed ranks test for individual time points. If the data were parametric then we used analysis of variance followed by two sample t-tests on repeated data corrected using Hochberg's method for multiple comparisons. The software used was IBM-SPSS V.24.

RESULTS

The baseline demographic characteristics of the three groups are described in table 2. Two patients from the public group and three of the private group were excluded in analysis as there were no results. There were eight deaths; seven in the VMC group and one in the public group; causes of deaths were most commonly heart failure, followed by cancer. In the VMC group, none were related directly to CKD.

The average time from referral to specialist consultation for the VMC clinic was 7 days compared with 42 days for the public outpatient clinic and 35 days for the Private outpatient clinic. The VMC clinic patients had significantly lower serum creatinine compared with public and private outpatient groups at twelve months; p=0.008 (table 3).

Compared with the VMC group, the public group were slightly older but had similar comorbidities. The private group had slightly higher haemoglobin and less albuminuria at enrolment. No patients were receiving an erythropoietin analogue at enrolment but five were supplied

Integ Health J: first published as 10.1136/ihj-2020-000061 on 17 November 2022. Downloaded from http://ihj.bmj.com/ on February 24, 2023 by guest. Protected by copyright.

Table 1 Components making up the iConnect care Virtual Medical Consultation Programme

Programme personnel	Clinical nurse programme coordinator; panel of specialist (nephrologist, an endocrinologist, a cardiologist and a renal palliative care specialist).
E-consultations (VMC)	Involved reviewing a patient without the patient being present but having access to all the necessary clinical and laboratory information to create a report and provide decision support. There was no video or telephone link involved. A F2F consultation was the same as a traditional clinical consultation where the patient is present, and both the patient and laboratory results are examined together.
Data flow	Patients' demographic, medical, laboratory and medication data were collected and entered into the web-based system either by the GP; the GP practice nurse or by the case manager. Once the baseline information was completed, the online form progressed to the CNS to validate the information. The specialists were notified of awaiting reviews via email. The patients were virtually assessed within 7 days by the nephrologist. GPs were informed that the opinion was available online. The opinion form was then moved to the GPs inbox. If another opinion was required it moved to the specialist inbox. An opinion was required within 14 days. The GP was also reminded about this report by the CNS. In the public clinic data were captured from a CKD database. The private clinic data were captured from their own 'Medical Director' software database. All data captured was managed by the CNS.
Evaluation	Evaluation was conducted as an observational cohort comparison for variables evaluating CKD function and risk between the VMC group, public group and the private group of patients. These variables were tracked in the different databases. Patients and general practitioners participating in the VMC were interviewed by an independent evaluator.[19]

CKD, chronic kidney disease; CNS, clinical nurse specialist; F2F, face to face; GP, general practitioner; VMC, virtual medical consultation.

erythropoietin treatment for their renal anaemia in the VMC group. The retention rate at 12 months for VMC, public and privately managed patients was 92%, 62% and 52%, respectively. Reasons for exclusion or lost to follow-up are outlined in table 2. Explanations for discharge were that the issues at time of referral were

Table 2 Baseline demographics, enrolment and follow-up

Demographics of clinic cohorts	Virtual (VMC) n=70	Public n=137	Private n=167
Age (yrs)	78 (62, 83)	69 (52, 78)**	69 (59, 81)
Gender n (% male)	33 (47)	78 (57)	91 (55)
Creatinine (µmol/L)	119 (93, 167)	115 (79, 154)	110 (83, 150)
eGFR CKD-EPI (mL/min/1.73 m^2)	42 (32, 70)	50 (34, 83)	53 (35, 81)
Comorbid disease			
Diabetes	22%	25%	21%
Hypertension	76%	86%	72%
Heart disease†	40%	43%	36%
Hyperlipidaemia	38%	31%	32%
Urine albumin:creatine (mg/mmol)	7.1 (1.3, 30.0)	7.3 (0.9, 36.1)	2.7 (0.7, 8.7)*‡
Haemoglobin (g/L)	128±2	130±2	136±2**‡
Crossover with VMC	0	18	0
Reasons for exclusion from baseline to 12 months	137 167		
Discharged	0	36	43
Lost to follow-up	1	12	32
Insufficient laboratory results	1	3	2
Deaths	3	1	0
Continued follow-up with adequate pathology results (n)	65	85	87

Data expressed as mean±SEM or median (IQR).
*p<0.05, **p<0.01.
†Includes ischaemic heart disease, congestive cardiac failure and atrial fibrillation.
‡Public versus private.
CKD, chronic kidney disease; eGFR, estimated glomerular filtration rate; VMC, virtual medical consultation.

Integ Health J: first published as 10.1136/ihj-2020-000061 on 17 November 2022. Downloaded from http://ihj.bmj.com/ on February 24, 2023 by guest. Protected by copyright.

Table 3 Comparative analysis of tracked variables by group over time

Variables		Baseline	n	6 months	n	12 months	n
Creatinine (µmol/L)	Virtual	119 (96, 165)	65	120 (89, 145)	60	109 (80, 141)*	44
	Public	137 (110, 172)	85	135 (97, 160)	80	134 (110, 173)*	72
	Private	125 (90, 153)	87	119 (90, 150)	79	120 (100, 140)*	64
eGFR CKD-EPI (mL/min/1.73 m^2)	Virtual	42 (33, 68)	65	43 (34, 83)	60	54 (36, 81)	44
	Public	42 (31, 59)	85	43 (32, 60)	80	42 (30, 56)	72
	Private	42 (33, 70)	87	42 (33, 70)	79	46 (32, 60)	64
Haemoglobin (g/L)	Virtual	129±2	61	129±2	55	130±3	42
	Public	129±2	85	128±2	80	127±2	72
	Private	129±3	64	134±2** (0.002)	64	132±3	57
Urine albumin/creat (mg/mmol)	Virtual	8.7 (1.3, 30.0)	54	7.8 (0.8, 37.9)	36	6.6 (0.9, 36.5)	27
	Public	10.7 (1.1, 58.9)	61	8.3 (1.1, 34.4)** (0.008)	59	11.9 (1.0, 36.8)	52
	Private	5.0 (1.2, 10.6)	52	2.2 (0.8, 11.8)	44	4.5 (1.7, 16.6)	38

*p<0.01 comparing virtual group with public and private outpatients **p<0.01, baseline vs 6 months within the public patient cohort.
CKD, chronic kidney disease; eGFR, estimated glomerular filtration rate.

managed, for example, blood pressure controlled or CKD function was now stable or had improved. Specific reasons were not documented.

There was a slight reduction in albuminuria within the public group at 6 months, which was not sustained at 12 months. Otherwise, there was no difference in outcomes (serum creatinine, eGFR, haemoglobin and albuminuria) over the 12-month period within any of the three groups. The 6-month and 12-month progress are outlined in table 2.

All patients interviewed, (n=27), irrespective of their computer literacy or age, stated that VMC clinics should be available to their GPs (figure 2). Eighty-five per cent of the respondents felt that they were being well managed and followed up adequately. Eighty per cent also reported being very happy with being able to receive specialist virtual medical opinions. Two respondents said they would rather not receive consultations in a virtual manner. They were the youngest of the group interviewed. More than 50% of respondents aged over 70 years stated that they did not necessarily prefer to see a specialist face to face. This compared with less than 30% for people aged between 55 and 69 years.

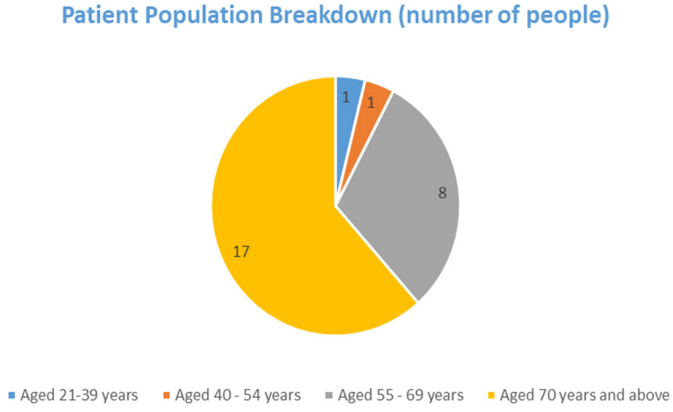

Figure 2 Virtual clinic patient participants interviewed by age.

In terms of timesaving, 30% of respondents did not mind waiting in a hospital outpatient department for a specialist consultation. The remaining 70% preferred the convenience of an online consultation. There were no discernable differences between the age groups. Twenty-five per cent of respondents similarly found the opinions to be quicker using the online system and preferred this to waiting to see a specialist in person. Again, the youngest respondents did not find the opinions to be advantageous online and preferred to see a specialist face to face.

DISCUSSION

In this study, VC integrated e-consultation for patients with mild CKD was associated with similar short-term stability of renal function compared with face-to-face consultation. The fact that e-consultation is equivalent mitigates concern other investigators have expressed about its limited utilisation,[10] at least in the short term. VC patients did in fact have better serum creatinine levels. In this programme, the fact that care could be integrated with multiple specialists is another advantage. These findings are reassuring as we see the multisystem complications of the current SARS-CoV-2 pandemic. In this pandemic, it has been demonstrated that there is a value to using virtual and telemedicine services,[2] particularly for people most at risk of acquiring infections in a hospital or clinic environment such as those with advanced age and with immunosuppression or chronic conditions.

A significant benefit in this study was the timing of review of the patients by the specialists. Healthcare referrals are susceptible to breakdowns, resulting in poor continuity of care, patient and provider dissatisfaction.[27] Across the

Integ Health J: first published as 10.1136/ihj-2020-000061 on 17 November 2022. Downloaded from http://ihj.bmj.com/ on February 24, 2023 by guest. Protected by copyright.

world, the median wait times for patient management in the specialist domain have gradually increased over the last decade. In Australia, the wait list for specialists is one of the longest in the developed world.[28] In the virtual integrated VMC group, the time to consultations was markedly reduced (figure 1) compared with traditional processes. Stoves e-consultation for patients with CKD in a British study also demonstrated improved speed of support and reduced need for referrals to specialists.[12] It also resulted in fewer paper-based referrals, quicker access by GPs to a specialist opinion and a reduction in outpatient referrals. Additionally, those patients referred outside of recommended guidelines for specialist review can be expeditiously returned to primary care,[9] saving time and money and inefficient resource utilisation. In our study, the VMC group was statistically older than the face-to-face cohorts, meaning that elderly patients unable to travel easily to a specialist would benefit from VC.[29] Another important and cost-effective component in this integrated VMC was the ability to receive multiple consultations from different specialists via a single referral. This is something the primary healthcare clinician found an advantage.[8]

We know from our previous study that younger people, despite being more familiar with technology, surprisingly did like to see a specialist. Interestingly, 60% of patients above 70 years were happy to be seen 'virtually'.[8] In our VC programme, 'younger' patients preferred a hybrid model of having face-to-face consulting, followed by VC. This is something important to consider for future e-consultation programmes. Patient involvement in the evaluation of the programme was also unique.

Retention rates were higher in the VMC group. VC programmes require existing organisational structure like those existing in the outpatient clinic. There is also not adequate support for the e-consultation technology in the existing health system.[20] We previously noted GPs found negotiating the software, particularly data entry, a challenge and time consuming.[30] Despite these limitations, all patients in the VMC group progressed safely through the study and could be tracked.

The fact that this programme and others could be run by a single nurse and nephrologist is encouraging.[7 8 11] Nurse-led programmes are cheaper to run. This study has also extended the finding that, at least in the short term, CKD progression is not adversely affected by e-consultations. To our knowledge, this is the first time such an analysis has been carried out in Australia.

The strength of this study was that it considered similar patient populations in one health district that have access to the same primary care providers. This facilitated minimising variables associated with healthcare systems and infrastructure, providing a relatively uniform comparative platform. The data were collected and analysed in a single centre.

The limitations included the limited number of clinical measures for analysis and the relatively small patient numbers. It was a retrospective analysis of a small patient population with a small number of participating specialist practitioners. It was also assumption driven with respect to treatment of progression factors related to CKD. While the major objective of this paper was to provide brief insights into these modalities of care, there remains scope for further detailed studies into virtual and telemedicine consultations.

CONCLUSIONS

VC such as those used in this integrated VMC programme has a distinct role to play in the future of chronic disease care and CKD management. Programmes using integrated e-consultations require more attention and funding and increased patient involvement in their design. Such systems should play a concurrent role in the care of patients with chronic medical conditions.

Acknowledgements I wish to acknowledge Mr. Peter Feldman from Medical Databanks company who developed the software working in excess of hours he was remuneratedl would also like to acknowledge Dr Gary Jacobson, from Zakumi Consulting, for his assistance with qualitative evaluation of the iConnect Care Virtual Medical Consultation programme.

Contributors In particular the following contributions occurred: Ivor Katz: The planning, conducting and reporting of the work. Cathie Lane was involved in the reporting of the work; Mark Brown was involved in the the planning and reporting; John Kelly was involved in the planning and reporting of the work; Saiyini Pirabhahar was involved in the the planning, conducting and reporting of the work; Rachel Preece was involved in the planning, conduction and reporting of the work; Vishwas Ragunath was involved in the planning, conduction and reporting of the work; Paula Williamson was involved in the conducting and reporting of the work; Peter Feldman was involved in developing and writing the software to run the programme under the direction of Ivor Katz. Ivor Katz takes full responsibility for the work and/or the conduct of the study, had access to the data, and controlled the decision to publish.

Funding This work was supported by internal funding from the Integrated Care Department in the South East Sydney Local Health District (SESLHD). There was no grant number attached to this funding, as it was not a grant.

Competing interests None declared.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and was approved by South Eastern Sydney Local Health District (SESLHD) ethics committee Study ethics no: HREC/11/STG/232. Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available on reasonable request. All data can be obtained from the lead author, Ivor Katz or from a coauthor Saiyini Pirabhahar, our research scientist and manager who works with the ethics committee of SESLHD. SP (South Eastern Sydney LHD) Saiyini.Pirabhahar@health.nsw.gov.au.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: http://creativecommons.org/licenses/by-nc/4.0/.

ORCID iD

Ivor Katz http://orcid.org/0000-0002-2716-9012

REFERENCES

1 Australian Institute of Health and Welfare A. *Ageing and the health system: challenges, opportunities and adaptations. Australia's health 2014; Australia's health series no. 14.(Cat. no. AUS 178)*, 2014.

Integ Health J: first published as 10.1136/ihj-2020-000061 on 17 November 2022. Downloaded from http://ihj.bmj.com/ on February 24, 2023 by guest. Protected by copyright.

2 Webster P. Virtual health care in the era of COVID-19. *Lancet* 2020;395:1180–1.
3 Jones ER, Hostetter TH. Integrated renal care: are nephrologists ready for change in renal care delivery models? *Clin J Am Soc Nephrol* 2015;10:335–9.
4 MBS SA. Mbs and telehealth website: MBS, 2020. Available: https://www.servicesaustralia.gov.au/organisations/health-professionals/services/medicare/mbs-and-telehealth [Accessed 26 May 2020].
5 Bello A, Zaidi D, Braam B, *et al*. Protocol: improving access to specialist nephrology care among Rural/Remote dwellers of Alberta: the role of electronic consultation in improving care for patients with chronic kidney disease. *Can J Kidney Health Dis* 2019;6:205435811987871.
6 NSW Ministry of Health. *Nsw health – virtual care strategy1 reserve road, St LEONARDS NSW 2065 Australia*. NSW Ministry of Health, 2022: 25.
7 Katz I, Schneider H, Shezi Z, *et al*. Managing type 2 diabetes in Soweto-The South African chronic disease outreach program experience. *Prim Care Diabetes* 2009;3:157–64.
8 Katz IJ, Pirabhahar S, Williamson P, *et al*. iConnect CKD - virtual medical consulting: A web-based chronic kidney disease, hypertension and diabetes integrated care program. *Nephrology* 2018;23:646–52.
9 Lane C, Pirabhahar S, Robins J. Improving nephrology service delivery - Accessing the specialist. *Aust Fam Physician* 2016;45:223–8.
10 Ishani A, Christopher J, Palmer D, *et al*. Telehealth by an Interprofessional Team in Patients With CKD: A Randomized Controlled Trial. *Am J Kidney Dis* 2016;68:41–9.
11 Fishbane S, Agoritsas S, Bellucci A, *et al*. Augmented Nurse Care Management in CKD Stages 4 to 5: A Randomized Trial. *Am J Kidney Dis* 2017;70:498–505.
12 Stoves J, Connolly J, Cheung CK, *et al*. Electronic consultation as an alternative to hospital referral for patients with chronic kidney disease: a novel application for networked electronic health records to improve the accessibility and efficiency of healthcare. *Qual Saf Health Care* 2010;19:e54.
13 Wildevuur SE, Simonse LWL. Information and communication technology-enabled person-centered care for the "big five" chronic conditions: scoping review. *J Med Internet Res* 2015;17:e77.
14 Harris MF, Zwar NA. Care of patients with chronic disease: the challenge for general practice. *Med J Aust* 2007;187:104–7.
15 Jerant AF, von Friederichs-Fitzwater MM, Moore M. Patients' perceived barriers to active self-management of chronic conditions. *Patient Educ Couns* 2005;57:300–7.
16 García-Lizana F, Sarría-Santamera A. New technologies for chronic disease management and control: a systematic review. *J Telemed Telecare* 2007;13:62–8.
17 Chouvarda IG, Goulis DG, Lambrinoudaki I, *et al*. Connected health and integrated care: toward new models for chronic disease management. *Maturitas* 2015;82:22–7.
18 Cherry JJ, Rich WC, McLennan PL. Telemedicine in remote Australia: the Royal Flying Doctor service (RFDS) medical chest program as a marker of remote health. *Rural Remote Health* 2018;18:4502.
19 Horner K, Wagner E, Tufano J. Electronic consultations between primary and specialty care clinicians: early insights. *Issue Brief* 2011;23:1–14.
20 Tossaint-Schoenmakers R, Versluis A, Chavannes N, *et al*. The challenge of integrating eHealth into health care: systematic literature review of the Donabedian model of structure, process, and outcome. *J Med Internet Res* 2021;23:e27180.
21 Arain M, Rostami M, Zaami M, *et al*. Specialist LINK and primary care network clinical pathways - a new approach to patient referral: a cross-sectional survey of awareness, utilization and usability among family physicians in Calgary. *BMC Fam Pract* 2020;21:86.
22 Diamantidis CJ, Becker S. Health information technology (it) to improve the care of patients with chronic kidney disease (CKD). *BMC Nephrol* 2014;15:7.
23 Remuzzi G, Benigni A, Remuzzi A. Mechanisms of progression and regression of renal lesions of chronic nephropathies and diabetes. *J Clin Invest* 2006;116:288–96.
24 Cortinovis M, Ruggenenti P, Remuzzi G. Progression, remission and regression of chronic renal diseases. *Nephron* 2016;134:20–4.
25 (KCAT) KCAT. Chronic Kidney Disease (CKD). Management in General Practice. In: *The Australian kidney Foundation*. 2nd ed. Melbourne: The Australian Kidney Foundation, 2012.
26 Feldman P, Ghabour I, Katz I. Medical databanks platforms, 2016. Available: http://www.medicaldatabanks.com/platforms [Accessed 26 May 2020].
27 Esquivel A. *Characterizing, assessing and improving healthcare Rederral communication*. Houston: University of Texas, 2008.
28 Siciliani L, Moran V, Borowitz M. Measuring and comparing health care waiting times in OECD countries. *Health Policy* 2014;118:292–303.
29 Wojciechowski P, Tangri N, Rigatto C, *et al*. Risk prediction in CKD: the rational alignment of health care resources in CKD 4/5 care. *Adv Chronic Kidney Dis* 2016;23:227–30.
30 Ivor_J_Katz. iConnect care virtual medical consulting, 2014. Available: http://www.iconnect-care.com.au/

Integ Health J: first published as 10.1136/ihj-2020-000061 on 17 November 2022. Downloaded from http://ihj.bmj.com/ on February 24, 2023 by guest. Protected by copyright.