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Utilisation of telehealth for outpatient diabetes management during COVID-19 pandemic: how did the patients fare?

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Abstract

Background: During the Coronavirus disease 2019 (COVID-19) pandemic, many outpatient services at public hospitals, including diabetes services, had adopted telehealth appointments for their clinic patients. There was concern that patients' glycaemic control may worsen during the pandemic.
Aim: To assess glycaemic control of patients with diabetes attending telehealth consultations in 2020, compared to face-to-face reviews prior to pandemic.
Methods: We conducted a retrospective review of patients with diabetes managed by telehealth consultations over 5 months at two metropolitan hospitals in Sydney. Their attendance rate, glycaemic control and unplanned admissions to hospital were assessed, and these were compared with the same period 12 months prior when patients were reviewed via face-to-face appointments.
Results: Between April and September 2020, the attendance rate for telehealth consultation at the diabetes services at the two hospitals was 88.9% (884 out of 994), which was higher than in 2019 (85.2%; 818 out of 959; $P = 0.016$) when patients attended via face-to-face appointments. Of the 629 patients reviewed via telehealth in 2020 and who had been with our service for over 12 months, glycaemic control was better in 2020 (HbA1c 7.8 ± 1.4% (62 ± 15 mmol/mol)) compared with 12 months earlier (8.2 ± 1.7% (66 ± 19 mmol/mol); $P < 0.001$). There was no difference in the number of unplanned admissions for this cohort in 2020 ($n = 58$; 9.2%) compared with 2019 ($n = 75$; 11.9%; $P = 0.100$).
Conclusions: The present study showed that for patients with diabetes who received care via telehealth consultations during the COVID-19 lockdown, their glycaemic control was slightly better, and unplanned admission rates were not higher compared with those in the pre-COVID-19 period. Telehealth consultation offers an important care delivery option in the management of patients with diabetes under these circumstances.

Introduction

The Coronavirus disease 2019 (COVID-19) pandemic has posed major challenges to the delivery of healthcare worldwide, not just in the treatment of coronavirus-related illnesses but also in the management of other medical conditions. Studies have shown that people with diabetes suffered greater severity of the respiratory syndrome associated with COVID-19 and had higher mortality.[1–3] As health resources were directed towards the containment of the COVID-19 pandemic, other medical conditions were often given lower priority in 2020, and this may have an adverse health impact on the population.[4–6] At the height of the pandemic in Australia, many patients with diabetes were also anxious about attending face-to-face consultations at hospital clinics. In order to minimise personal contact and to maintain appropriate social distancing, there was a sharp increase in the use of telehealth for medical consultations in Australia.[7] Indeed, diabetes centres across Australia have adopted phone consultation or videoconferencing to

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review their patients during the COVID-19 pandemic.[7] However, many aspects of this model of care are not optimal: physical examinations cannot be conducted and establishing a good rapport with the patient over the telephone or through videoconferencing can be difficult. Furthermore, in servicing a population that comes from diverse ethnic backgrounds, it is particularly challenging to provide a clinical review via telehealth to those who are not proficient in English.

Due to the abovementioned reasons, there was concern that glycaemic control among patients with diabetes would deteriorate during the COVID-19 pandemic. The aim of the present study is to assess the changes in the glycaemic control of patients attending diabetes clinics during the COVID-19 pandemic at two metropolitan hospitals in Sydney, Australia, when patients were reviewed via telehealth consultations.

Methods

Liverpool Hospital is a tertiary referral institution, while Fairfield Hospital is a district hospital. Both hospitals have outpatient diabetes clinics and are under the governance of South Western Sydney Local Health District (SWSLHD). Patients are reviewed at intervals ranging from 4 weeks to 6 months, depending on clinical needs. From 1 April 2020, diabetes outpatient appointments with endocrinologists at Liverpool and Fairfield Hospitals were changed to telehealth consultations (phone or videoconferencing) under the directives of hospital executives. Telephone interpreters were available to assist patients from non-English-speaking backgrounds, but these telehealth consultations were conducted via three-way conference calls. Dietitians and diabetes educators also reviewed patients using telehealth consultations, and face-to-face consultations were limited to patients starting on subcutaneous insulin therapy or other injectable devices. We still offered small group face-to-face education sessions for pregnant women with diabetes under the strict observation of social distancing.

In the present study, we performed a retrospective audit of patients who were reviewed by telehealth consultations (telephone consultation or videoconferencing) between 1 April 2020 and 1 September 2020 by endocrinologists at the Diabetes Services of Liverpool and Fairfield Hospitals. We excluded pregnant women with pre-existing diabetes, as well as women with gestational diabetes, as these women continued to be reviewed by the diabetes team in conjunction with the obstetrics unit via face-to-face appointments at the multidisciplinary high-risk antenatal clinic.

In the first instance, we looked at the total number of appointments booked at the diabetes outpatient clinics during those 5 months in 2020. We assessed the proportion of patients who attended the clinic and compared this with the proportion of patients who attended face-to-face consultations during the same 5 months in 2019.

Next, we assessed the electronic medical records (eMR) of patients with Type 1 or Type 2 diabetes who had attended diabetes clinics between April and September 2020, and who had been attending the clinics at these two hospitals for at least 12 months prior to the pandemic. For patients who had multiple reviews between April and September 2020, data from their most recent encounter were extracted.

Demographic characteristics of the patients, including age, ethnic background, type of diabetes, other cardiovascular comorbidities and any changes to diabetes therapy, were collected from the eMR. Patients' glycated haemoglobin (HbA1c) between April and September 2020 (Visit A), at the last review before the pandemic (Visit B) and 12 months prior (Visit C) were also documented. We also recorded any unplanned admissions to hospital throughout this local health district within this cohort during the period between April and September 2020, comparing that with the same period in 2019.

The study was approved by the South Western Sydney Local Health District Human Research Ethics Committee.

Statistics

Paired *t*-tests were used to compare continuous variables (e.g. HbA1c) of the patients during the most recent review and prior to the pandemic. Chi-squared tests were used to evaluate the differences in categorical variables of the subjects. The *t*-test and Chi-squared tests were also used to assess patients' characteristics between those whose glycaemic control had improved (from Visit B to Visit A) and those who had not. The analyses were performed in STATA 7.0 (College Station, TX, USA). A *P*-value of <0.05 was considered statistically significant.

Results

Between 1 April and 1 September 2020, 994 patients were booked to see an endocrinologist for diabetes consultation at these two institutions, compared with 959 patients booked in the same period in 2019 when all patients were reviewed via face-to-face consultations. The attendance rate for telehealth consultation was 88.9% (884 out of 994) in 2020, which was higher than that in 2019 (85.2%; 818 out of 959; $P = 0.016$).

Among those who attended telehealth appointments between April and September 2020, there were

629 patients who had been with the service for at least 12 months. Almost all were reviewed via phone consultations, with only 31 attending consultations via videoconferencing. Most patients had Type 2 diabetes, and three-quarters were on insulin therapy (Table 1). Only half were from Anglo-European backgrounds and one-quarter required phone interpreters to assist with the consultations (Table 1). This cohort of patients had significant comorbidities: one-third had established cardiovascular diseases (ischaemic heart disease, previous stroke or peripheral vascular disease) and one-third suffered from chronic kidney disease (estimated glomerular filtration rate below 60). Only one patient in the cohort contracted COVID-19 and required respiratory support in an intensive care unit, but the patient recovered fully.

Table 1 Characteristics of the patients reviewed via telehealth between April and September 2020

Characteristic	
Number of patients, *n*	629
Liverpool Hospital, *n*	448
Fairfield Hospital. *n*	181
Type 1 diabetes, *n* (%)	129 (20.5)
Age (±SD) (years)	58.1 ± 16.9
Ethnicity, *n* (%)	
Anglo-European	309 (49.4)
East/South East Asians	84 (13.4)
South Asians	71 (11.4)
Middle Eastern	79 (12.6)
Others	85 (13.3)
Required interpreters, *n* (%)	158 (25.2)
Complications of diabetes, *n* (%)	
Ischaemic heart disease/stroke	182 (29.0)
Peripheral vascular disease	61 (9.7)
Diabetic retinopathy	181 (28.8)
Chronic kidney disease (eGFR < 60)	198 (31.5)
Required insulin therapy, number (%)	487 (77.6)

eGFR, estimated glomerular filtration rate.

In evaluating patients' glucose profile during the COVID-19 pandemic, clinicians were able to access the glucose monitoring records (from insulin pump or metre downloads, glucose records via email or fax) of only 139 (22.1%) patients. For the remainder of the cohort, patients reported their glucose profile from their blood glucose metre or glucose diary over the phone. Clinicians made adjustments to diabetes therapy in 55.6% of the telehealth consultations, which was significantly less than that during the previous face-to-face consultations (71.5%; $P < 0.001$).

In assessing glycaemic control during the pandemic (Visit A), prior to the pandemic (Visit B) and that 12 months earlier (Visit C), only 523 (83%) patients had a HbA1c available at the time of clinic review at Visit A, significantly fewer than those at Visit B ($n = 603$; 95.8%; $P < 0.001$) and Visit C ($n = 604$; 96%; $P < 0.001$) respectively. Patients who did not have a HbA1c performed at Visit A were younger (52.6 ± 20.4 vs 59.4 ± 16.0 years; $P < 0.001$) and were more likely to have Type 1 diabetes (33.3% vs 20.5%; $P = 0.001$) when compared with those who had HbA1c available across the three visits. However, the last HbA1c (at Visit B) of these patients was not significantly higher than that of the rest of the cohort (8.3 ± 1.6% (67 ± 17 mmol/mol) vs 8.1 ± 1.4% (65 ± 15 mmol/mol); $P = 0.069$).

If we assessed patients with an HbA1c available at all three visits ($n = 504$), their glycaemic control was better at Visit A compared with those at Visits B and C, $P < 0.001$) (Table 2). For patients with Type 1 diabetes, their glycaemic control was not different across the three

Table 2 Comparison of HbA1c at Visit A (telehealth consultation during pandemic), Visit B (last face-to-face review prior to pandemic) and Visit C (face-to-face consultation 12 months earlier)

	HbA1c at Visit A, % (mmol/mol) (±SD)	HbA1c at Visit B, % (mmol/mol) (±SD)	HbA1c at Visit C, % (mmol/mol) (±SD)
All patients ($n = 504$)	7.8 ± 1.6 (62 ± 17)	8.1 ± 1.4 (65 ± 15)**	8.2 ± 1.7 (66 ± 19)**
Type 1 diabetes ($n = 92$)	8.3 ± 1.4 (67 ± 15)	8.4 ± 1.7 (68 ± 19)	8.4 ± 1.8 (68 ± 20)
Type 2 diabetes ($n = 412$)	7.8 ± 1.4 (62 ± 15)	8.0 ± 1.6 (64 ± 17)*	8.2 ± 1.7 (66 ± 19)**
Liverpool Hospital ($n = 359$)	7.9 ± 1.5 (63 ± 16)	8.1 ± 1.6 (65 ± 17)	8.2 ± 1.7 (66 ± 19)*
Fairfield Hospital ($n = 145$)	7.7 ± 1.2 (61 ± 13)	8.0 ± 1.5 (64 ± 16)*	8.2 ± 1.6 (66 ± 17)**
Anglo-European ($n = 259$)	7.9 ± 1.3 (63 ± 14)	8.0 ± 1.4 (64 ± 15)	8.2 ± 1.6 (66 ± 17)*
Non-Anglo-European ($n = 245$)	7.7 ± 1.4 (61 ± 15)	8.0 ± 1.8 (64 ± 20)	8.1 ± 1.8 (65 ± 20)*
Need interpreters ($n = 128$)	7.8 ± 1.3 (62 ± 14)	8.0 ± 1.7 (64 ± 19)	8.2 ± 1.7 (66 ± 19)
No interpreters ($n = 376$)	7.9 ± 1.4 (63 ± 15)	8.1 ± 1.6 (65 ± 17)	8.2 ± 1.7 (66 ± 19)
No. patients with improved HbA1c			
Visit A versus Visit B, *n* (%)		269 (53.4); $P = 0.284$	
Visit A versus Visit C, *n* (%)		276 (54.8); $P = 0.130$	

*$P < 0.05$ when compared with Visit A.

**$P < 0.001$ when compared with Visit A.

Table 3 Comparison of patients who had improvement of their HbA1c between Visit A and Visit B

	Improvement in HbA1c ($n = 269$)	No improvement in HbA1c ($n = 235$)	*P*-value
Age ± SD (years)	58.9 ± 15.7	60.1 ± 16.6	0.423
Type 2 diabetes, *n* (%)	220 (81.8)	192 (81.7)	0.981
Requirement of insulin therapy, *n* (%)	210 (78.4)	174 (74.0)	0.257
Known cardiovascular disease, *n* (%)	80 (29.9)	84 (35.7)	0.160
Need for interpreters, *n* (%)	64 (23.8)	63 (26.8)	0.436
Anglo-European background, *n* (%)	133 (49.4)	126 (53.6)	0.351
BGL records available to clinicians, *n* (%)	75 (27.9)	42 (17.9)	0.008

BGL, blood glucose level.

visits, but patients with Type 2 diabetes had a lower HbA1c at Visit A when compared with those at Visits B and C. There was no difference in HbA1c between patients proficient in English and those who required interpreters. There was also no significant difference in the HbA1c between patients from Liverpool (HbA1c 7.9 ± 1.5% (63 ± 16 mmol/mol)) and those from Fairfield Hospitals (HbA1c 7.7 ± 1.2% (61 ± 14 mmol/mol); $P = 0.078$), but for patients at Fairfield Hospital, the glycaemic control was better at Visit A compared with that at Visits B and C (Table 2).

There was no difference between patients who had improvement in their HbA1c (from Visit B to Visit A) and those who showed no improvement, in terms of their age, type of diabetes, requirement of insulin therapy or need for interpreters (Table 3). However, those with improvement in glycaemic control were more likely to provide clinicians with their glucose records (through email, fax or downloads).

There was no difference in unplanned admissions to hospital among our cohort between April and September 2020 ($n = 58$; 9.2%) compared with those in the same period in 2019 ($n = 75$; 11.9%; $P = 0.100$).

Discussion

Overall, we found that glycaemic control was marginally better during the COVID-19 pandemic when patients were reviewed via telehealth consultations. The attendance rate was better than face-to-face consultations 12 months earlier, but it was more difficult to access patients' glucose profiles during telehealth consultations and fewer patients had pathology tests performed prior to their appointments. Unplanned admission to emergency departments among this cohort was no different compared with 12 months earlier.

The use of videoconferencing or phone consultation is not novel, and telehealth has been used to manage patients from remote and rural areas, or where face-to-face consultations are not feasible.[8,9] There is evidence that telehealth is effective in managing patients with diabetes, and studies have demonstrated that telehealth can cause behavioural changes with improvement in glycaemic control.[10–13] Prior to the COVID-19 pandemic, telehealth consultations were not widely utilised in metropolitan diabetes services in Australia, which could be related to the lack of Medicare funding for telehealth services. Since April 2020, although we offered videoconferencing as well as telephone consultation to all our patients, the great majority of patients selected telephone consultations. Patients who were older or from non-English-speaking backgrounds might have difficulties with the technological aspects of logging on to videoconferencing, and taking a telephone call was much simpler. As the decision to stop face-to-face consultation was made rather swiftly in April 2020, there was insufficient time to establish clear administrative protocols to help patients navigate through the process of accessing videoconferencing.

At the start of the lockdown in April 2020, there was concern that patients' glycaemic control might deteriorate with cessation of face-to-face consultations at diabetes clinics. The psychological stress associated with the COVID-19 pandemic could affect adherence to therapy and influence diabetes management.[14–16] With telehealth consultation, assessment of patients' glycaemic profile was challenging. Without reliable access to patients' glucose monitoring records (on blood glucose metre or glucose diary), it was more difficult to adjust their diabetes therapy. In our cohort, clinicians made changes to diabetes therapy in just over 50% of the telehealth consultations, which were significantly fewer than when patients were reviewed at face-to-face appointments. The availability of blood glucose metres that allow data to be uploaded by patients and accessed remotely by clinicians may overcome this hurdle, but to date, most of our patients have not embraced these technological innovations. The present study showed that patients who were able to provide clinicians with copies of their glucose records electronically or through fax were more likely to improve their glycaemic control. Over one-sixth of our cohort did not have pathology tests (including HbA1c) performed prior to their telehealth appointments. One of the reasons could be that patients had reservations about visiting pathology laboratories at the height of the

COVID-19 pandemic. These patients were younger and were more likely to have Type 1 diabetes, and there was a trend that they had higher HbA1c prior to the COVID-19 pandemic. Unfortunately, for those without a recent HbA1c, and if clinicians cannot reliably access their glucose profile, it is not possible to properly assess their glycaemic control. This subgroup of patients with diabetes is therefore less suitable for telehealth consultations. For face-to-face consultations, point-of-care HbA1c can be performed at the time of the patients' clinic attendance if they have not had blood tests prior to their appointment. This explains why HbA1c was available for almost all patients at clinic visits prior to the pandemic.

Patients who attended diabetes clinics at the two hospitals were from diverse ethnic groups, and this could present extra barriers for telehealth consultation. The process of accessing the patients via phone interpreters was time consuming and maintaining a three-way conversation between the patient, the clinician and the telephone interpreter could be quite difficult. Establishing rapport with the patient through an interpreter in the absence of non-verbal cues was also challenging.

Despite the interplay of the above mentioned factors, many of these concerns did not culminate in the worsening of the glycaemic control for the present cohort. In particular, there was no deterioration in the HbA1c among patients from non-English-speaking backgrounds during the COVID-19 pandemic and also no increase in unplanned admissions to hospital. There are possible explanations for these findings. Because this cohort consisted of patients who had been attending our service for at least 12 months, they already had a management plan in place and had commenced the appropriate therapy prior to the pandemic. As the patients' glycaemic control improved from Visit C to Visit B, the ongoing reduction in their HbA1c at Visit A may merely reflect a continued trend. For the majority of patients, providing support over the telephone was sufficient to manage most of their diabetes-related issues. Unless a new medical issue had arisen, telehealth consultation seemed to be adequate to address the needs of the patients. We observed a greater improvement in the glycaemic control among patients from Fairfield Hospital, but less so at Liverpool Hospital. This could be related to the complexity of patients at Liverpool Hospital, which is a tertiary referral centre. Therefore, managing complex patients with multiple issues via telehealth consultation is more difficult.

In terms of lifestyle changes, due to the imposed restrictions, the amount of work-related or social activities was dramatically reduced. Patients were forced to eat at home, resulting in more regular eating habits and a greater stability in their diets. Furthermore, as more patients worked from home, they could make use of the time saved from travelling to do exercise. In fact, one study in India demonstrated that physical activities had indeed increased among patients with Type 2 diabetes during the lockdown period.[17] The improvement in eating habits and the increase in physical exercise enabled patients to improve their lifestyle, which in turn brought about a positive effect on their glycaemic control.

To date, a number of studies have examined changes in glycaemic control during the COVID-19 pandemic.[17–25] Some studies had shown that patients with diabetes had gained weight or their glycaemic control had worsened during the COVID-19 pandemic.[18–21] However, patients in these studies were not reviewed regularly by their clinicians over that period and telehealth consultations were not offered. In contrast, there were studies that showed improvement in glycaemic control among patients who received regular telehealth support.[22–25] This further confirms the value of telehealth consultations during the pandemic.

There is speculation that telehealth consultation may become part of routine care for patients with diabetes in the post-COVID-19 era, and this model of care may not be confined to patients residing in remote areas. However, telehealth reviews cannot completely replace face-to-face consultations in the long term. It is conceivable that a combination of both types of consultations can be offered to patients for the management of diabetes in the future.

There are several limitations in the present study. Patients attending our diabetes service had significant comorbidities and the majority were on insulin therapy; hence, findings from the present study may not be extrapolated to other centres or to primary care settings. Information, such as changes to patients' lifestyle factors and weight, was not available and patients' mental well-being was not recorded. We did not conduct any patient survey in relation to telehealth consultation, which would have provided some insight into patients' satisfaction with this model of care. As videoconferencing was taken up by only a small number of patients, we were also unable to assess the differences between videoconferencing and telephone consultations. In the comparison of glycaemic control across the three visits, the fact that we had excluded patients whose HbA1c was not available at Visit A could introduce a selection bias. Finally, a longer period of follow up of patients utilising telehealth consultation may be required to properly ascertain the effectiveness of this model in delivering optimal diabetes care to patients.

Conclusion

We demonstrated that among patients with diabetes who undertook telehealth consultations in South Western Sydney, their glycaemic control was marginally better during

the COVID-19 pandemic than that prior to the pandemic. We believe that this could partly be due to factors such as a greater stability in patient's diet and more time available for exercise, but more studies might be needed to examine the changes in lifestyle factors during the COVID-19 pandemic. Telehealth is an important care delivery option in the management of patients with diabetes during the pandemic and the future role of telehealth consultation as part of routine care for patients with diabetes in the outpatient setting remains to be defined.

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