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# Sustainable diabetes care services during COVID-19 pandemic



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## ABSTRACT

**Introduction:** The COVID-19 pandemic creates a challenge in the provision of care for patients with diabetes. Furthermore, those with uncontrolled diabetes are at a higher risk for complications due to COVID-19. The purpose of this study is to find an innovative method to sustain effective diabetes care services amidst the COVID-19 pandemic.

**Methods:** Outpatient diabetes care was successfully transformed from traditional face-to-face encounters in the clinic to an online telemedicine service.

**Results:** 1,972 patients were encountered over a 4-week study period during which we had a low proportion of unreached patients (4%). Some patients were still seen in person because they came as walk-in visits or insisted to be seen in person.

**Conclusion:** Telemedicine has become an essential healthcare service and could be augmented by the use of technology like web-based applications and communication via transfer of data from patients' glucometer, insulin pumps, or sensors. Diabetes care can be transitioned to telemedicine effectively and would be successful in reaching more patients than by traditional face-to-face visits. This model of care is time consuming and unfortunately does not reduce the need for medical staff.

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## 1. Introduction

The need to have long-term sustainable healthcare services for patients with diabetes is essential to avoid poor glycemic control and subsequently diabetes-related complications. The contact precautions needed to halt the spread of the COVID-19 pandemic has impeded the provision of clinical care services and created a threat to the continuity of care for patients with diabetes. Telemedicine includes integrating communications technology to enhance healthcare services to individuals who find it challenging to see health care pro-

viders due to distance for example. Communication technology includes the use of telephone, e-mail, fax, in addition to smartphone applications, computer and network technologies [1]. The concept of telemedicine is not new, and while it has been more widely utilized in the last decade, its use has been hindered mainly due to lack of reimbursement. The COVID-19 pandemic has forced healthcare providers to find innovative ways to treat their patients. We describe here the steps taken by a tertiary hospital in the Kingdom of Bahrain to ensure that the healthcare of patients with diabetes remained uninterrupted.

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## 2. Methods

King Hamad University Hospital (KHUH) is a 314-bed public tertiary center. Patient information is managed through an electronic health record system that was developed in-house. Outpatient endocrinology clinic visits average 68 scheduled patients a day with additional walk-in patients. Additionally, approximately 14 patients a day would request for a medication refill after missing an appointment, resulting in around 90–100 daily encounters. The team comprises of one or two consultants, two registrars, and one or two senior house officers working in parallel with a diabetes nurse educator clinic for intensive insulin therapy.

The first case of COVID-19 in Bahrain was diagnosed on February 24, 2020. The endocrinology outpatient department at KHUH switched to telemedicine starting on March 16, 2020. The transition to telemedicine was to ensure continuity of care and to evaluate staffing needs to mobilize our workforce to inpatient COVID-19 patients if needed. We did allow patients who presented as walk-in visits or those who insisted to be seen. A telecommunication provider donated smartphones to be used in the clinic in adjunct to the established landlines. This helped with the exchange of messages and allowed for optional video calls with patients. Support staff called scheduled patients a day before their appointment and discussed with them the change in service. Patients who had their first visit at our clinic, were contacted by consultants. The health record software was updated with a window dedicated for remote consultations and medications entered through that window were tracked through a separate pathway by the outpatient pharmacy who then coordinated for the patients medication pick-up or delivery.

This was a cross-sectional prospective study of patients seen in the first four weeks of providing telemedicine service. All scheduled patients were included in the analysis; there was no exclusion criteria. Patients' were consented verbally at the beginning of the phone call to be managed by telemedicine. Data was collected daily from the physicians tracking all patients encounters as follows: reachable by phone, unreachable, seen in-person (because patient came as a walk-in or because they insisted to be seen in clinic in person), and refill prescriptions. Time per telephone encounter was estimated by the physicians and was not objectively or consistently tracked. The study was approved by the hospital administration.

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## 3. Results

Over the study duration of 4 weeks, 1,972 patient encounters took place with an average of 99 encounters per day (range 80–116 encounters). Telemedicine consultations accounted for 86.5% (1351), with 13.5% (268) cases seen in person because they either came as walk-in or preferred to be seen in person. (Table 1). The average daily number of unreached patients was 4 (4%) which is significantly less than the no-show rate of 20–30% in the past. The duration of a phone call varied between 7 and 35 min. This variability depended on the complexity of the patients' condition and the experience of the physician calling. There was a trend towards reduction

in the number of patients seen in-person towards the end of the fourth week (Fig. 1).

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## 4. Discussion

While the incidence and mortality of COVID-19 has been increasing, it remains much less than that of diabetes. The global prevalence of diabetes in 2019 was estimated at 463 million with 4.2 million expected deaths in 2019, contributing to 11.3% of global deaths [2]. Non-communicable chronic diseases are the lead cause of mortality in Bahrain with an estimation of 538 deaths being related to diabetes [3]. There is evidence that patients with diabetes experience increased incidence and severity of COVID-19, which may be related to the effect of hyperglycemia on the immune system and to the mechanism by which the virus enters the cells using ACE-2 as a receptor of entry [4,5]. Optimizing diabetes care during this time is a necessity and the association of diabetes with COVID-19 has several implications on public health globally [6,7].

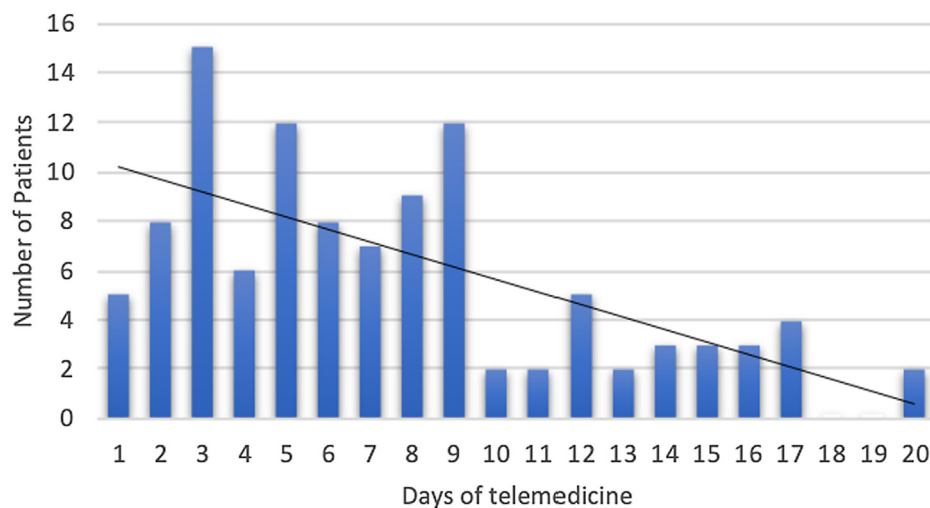
This study reflects the resilience of our healthcare system to cope with variable circumstances. Although telemedicine has been available for several years, its use has been limited for several reasons including reimbursement issues, concern for more liability on healthcare providers, and lack of comfort for patients and providers with the technology. The COVID-19 pandemic has forced healthcare providers and patients to adopt innovative approaches in order to receive their care. Telemedicine is well positioned in this environment, as we have demonstrated with our experience. Our study demonstrates that telemedicine will require similar staffing levels as face-to-face visits specially that we had less no-show rates (4%). Many of the counseling services provided currently by physicians in our practice can be replaced by trained diabetes nurse educators and this is something that we will explore further in order to allocate less physicians to outpatient clinics. Such model could help in sustaining healthcare delivery with less physicians and could be part of the care we provide even after the era of COVID-19.

As patients gained more trust with the new system, the demand to come for face-to-face visit decreased towards the fourth week.

In the post-COVID-19 era, telemedicine will likely become an integral part of healthcare delivery, especially for chronic illnesses like diabetes. In fact patients will demand this service as they become comfortable with the technology. Furthermore, e-consults and tele-consults between primary care physicians and specialists will also increase [8–11]. Similarly, the use of self-reflection, applications and tracking data from glucometers, insulin pumps or sensors can help to enhance the transmission of information between patients with diabetes and their healthcare providers [12–17]. There should be more emphasis on diabetes nurses providing care and education through telemedicine to help maintain supportive patient-nurse relationships [15]. Finally, programs for evaluation of retinopathy remotely and teleophthalmology have proven to be reliable and cost effective. Similarly, telemedicine for diabetic foot ulcers was shown to be noninferior to standard of care in achieving ulcer healing time

**Table 1 – Number and type of encounters over the first four weeks of telemedicine for patients under Diabetes Care Services.**

	Total No (%) Over 4 weeks	Daily Average (%)	Minimum	Maximum
Total Encounters	1972 (100%)	99 (100%)	80	116
Telemedicine	1363 (70%)	68 (69%)	51	88
Seen in person	256 (13%)	13 (13%)	4	22
Patients unreachable	88 (4%)	4 (4%)	0	9
Medication refill	265 (13%)	13 (13%)	4	17
Patients seen in person	256 (100%)	13 (100%)	0	9
Insisted to be seen in person	148 (58%)	7 (54%)	4	22
Walk-in visit	108 (42%)	6 (46%)	3	17
Walk-in visit	108 (42%)	6 (46%)	0	15

**Fig. 1 – Number of patients presenting as walk-in visits over the first 20 days (4 weeks) of telemedicine.**

with significantly lower rates of amputations without a significant differences in mortality [18,19].

Despite the successful implementation of a telemedicine program in endocrinology, there remains some obstacles. For example, some patients and caregivers with insulin pumps struggled with downloading and sharing the pump details with their providers and adjusting pump settings. An innovative approach we have piloted is to create a remote clinic using the hospital's home health care cars, where a physician and a diabetes nurse educator go to the patients' front doors to download the pump and adjust the settings. By doing this, they were able to provide care and still maintain social distancing. Even with these approaches, face-to-face visits will continue, as we saw in our patient cohort, especially with complex patients that need to be examined.

There are several limitations to our study as it represented a single center experience and it was feasible due to our robust IT support which might not be readily available in other centers. While it demonstrated how successful telemedicine can be adopted quickly without compromising the ability of the medical team to reach the patients it did not evaluate the success of this approach in achieving glycemic control, preventing complications or improving patients' satisfaction scores.

## 5. Conclusion

Our study reflects that diabetes care can be transitioned to telemedicine and would be successful in reaching more patients than by traditional face-to-face visits. It is time consuming to deliver the same care by phone and unfortunately does not reduce the need for medical staff. Further evaluation is needed to assess patient satisfaction and we intend to evaluate patients' satisfaction and the impact of telemedicine on patients' glycemic control.

## Author Contributions

- All authors have made substantial contributions to conception and design
- All authors have made substantial contributions to acquisition of data, or analysis and interpretation of data
- All authors involved in drafting the manuscript or revising it critically for important intellectual content
- All authors have given final approval of the manuscript version to be published.

- All authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.
- All authors do not have any conflict of interest to declare in relation to this project.

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