

The
Economist

INTELLIGENCE
UNIT

Telemedicine and diabetes care in Saudi Arabia and the United Arab Emirates

SPONSORED BY



Table of Contents

- 2** About this briefing paper
- 3** Executive summary
- 5** Chapter 1: Overview: Telemedicine and diabetes
- 12** Chapter 2: Rollout and outcome in care
- 23** Conclusion: The future of telemedicine and diabetes care in the Gulf

About this briefing paper

Telemedicine and diabetes care in Saudi Arabia and the United Arab Emirates is an Economist Intelligence Unit briefing paper, supported by Abbott, to explore how healthcare systems in these two countries have used telemedicine to remotely monitor people living with diabetes during the pandemic. The experience and lessons may serve as a helpful guide for other countries in the Gulf.

This briefing paper would not be possible without the expert insights of those on the front lines of diabetes and telemedicine care and research. Our thanks are due to the following for their time and insights (listed alphabetically):

- **Mohammed Al-Sofiani**, assistant professor of endocrinology, diabetes and metabolism, King Saud University, Saudi Arabia
- **Bassam Bin Abbas**, consultant to the endocrinology and diabetes department of paediatrics, King Faisal Specialist Hospital and Research Center, Saudi Arabia
- **Ahmed El-Laboudi**, consultant endocrinologist and diabetologist, Imperial College London Diabetes Centre (ICLDC), UAE
- **M Hamed Farooqi**, director and consultant, Dubai Diabetes Center for Dubai Health Authority, UAE
- **Basem Futa**, IDF Blue Circle Voices member and advocate, and senior dietary specialist, Johns Hopkins Aramco Healthcare (JHAH), Saudi Arabia

This briefing paper was led and edited by Elizabeth Sukkar of The Economist Intelligence Unit and written by Becca Lipman.

April 2021

Executive summary

Saudi Arabia and the United Arab Emirates (UAE) are two Gulf nations witnessing an explosive growth in the prevalence and incidence of diabetes, having some of the highest rates in the world. According to 2019 reports, prevalence is as high as nearly one in five adults (18.3%) in Saudi Arabia and about one in six adults (15.4%) in the UAE.¹ Telemedicine has been an important part of care in these countries' evolving healthcare services to keep affected patients healthy and costs down.

Treating and managing diabetes requires regularly collecting and monitoring patients' blood glucose data.² Patients with diabetes are used to self-monitoring blood glucose levels, with medical consultations relying more on the transfer and analyses of their self-collected data rather than the doctor's hands-on inspection. This makes telehealth a natural progression in the diabetes care pathway and it feasibly could play a bigger role compared with many other diseases.

Yet, as with most countries, the use of telemedicine in general, and for diabetes in particular, has been gradually growing but largely underutilised. That changed during 2020, when covid-19 lockdown restrictions limited in-person access to non-urgent clinical care, and with that telehealth for diabetes management increased dramatically. From this experience, these countries are learning many lessons that can help to shape future approaches to diabetes care.

As this briefing paper explores, there are several reasons why the rollout and adoption

of telehealth for diabetes in Saudi Arabia and the UAE have been particularly noteworthy, and why these successes are worth continued examination:

Diabetes care has been in dire need of enhancement: it is well known that Saudi Arabia and the UAE have a high prevalence and projected increase in diabetes among their populations. The resulting healthcare costs are significant. It has become imperative to national health, as well as healthcare budgets, that better, more innovative and sustainable management and prevention tools are explored to their fullest.

The legal framework is expanding possibilities: telemedicine has long been on the radar as a cost-effective option, but only recently—and just prior to the covid-19 pandemic—have regulation and legal frameworks allowed it to take shape. Leading up to the pandemic, adoption was already picking up.

Cost models are shifting: in many ways, telemedicine has reduced costs for patients and doctors and supported social distancing during covid-19. For patients, less travel to clinics has added convenience as well. Better adherence to health recommendations can also lead to fewer costly co-morbidities and complications like stroke and amputation. For doctors, the experience has also been positive. However, some concerns have been raised regarding the increased influx of data from these apps, which requires additional time and effort for analysis, followed by explanations and tailored recommendations

¹ "Worldwide toll of diabetes – 9th edition 2019". International Diabetes Federation. <https://www.diabetesatlas.org/en/sections/worldwide-toll-of-diabetes.html>

² J Lee, C Chan S Chua, et al. "Using telemedicine to support care for people with type 2 diabetes mellitus: a qualitative analysis of patients' perspectives". *BMJ Open*. 2019. <https://bmjopen.bmj.com/content/9/10/e026575>

to patients which is more intensive, and may require updates to how providers are compensated. Going forward, advances in predictive modelling may improve the efficiency and quality of care. Clinics will also have to determine the safest and most cost-effective hybrid model of in-person and virtual clinic interactions.

No going back: according to those interviewed and studies published, the rapid rollout and adoption of telemedicine for

diabetes have been largely welcomed and deemed successful by many patients, doctors and the wider health system. Emerging evidence suggests telehealth is helping this population to achieve better self-care. More long-term studies will be needed to judge its true safety and efficacy, as well as cost-effectiveness, but doctors and patient groups we spoke to are keen to progress this care pathway based on the experience during covid-19.

Chapter 1: Overview: Telemedicine and diabetes

Diabetes in Saudi Arabia and the UAE

Diabetes is a serious, complex condition that can affect many organs of the body. There is no cure, yet it requires daily care and, if poorly managed, complications can affect a person's quality of life and reduce life expectancy.

There are two main types of diabetes (see Box). And while diabetes prevalence is rising worldwide [see chart 1], its growth trajectory in Saudi Arabia and the UAE is highly concerning,³ driven by sedentary lifestyles and poor diets, high in sugar and fast food.⁴ Obesity is also rising. [see chart 2]

Diabetes prevalence among adults (aged 20–79 years) in the UAE is reported to be about one in six adults (or 15.4%) and in Saudi Arabia it reaches 18.3%, according to the 2019 IDF Diabetes Atlas. These stark figures contrast markedly with the global average of fewer than one in ten adults (9.3%)⁵—earning both nations top rankings as countries with the highest prevalence of the condition. [see chart 3] Furthermore, nearly 41% of adults with diabetes (aged 20–79 years) in the UAE and 39% of adults with diabetes in Saudi Arabia are unaware that they have the condition, leaving them at higher risk of complications without management.^{6,7}

What is diabetes?

Diabetes is a condition in which the body struggles to regulate blood glucose levels. If not effectively managed, it can cause damage to the heart, blood vessels, eyes, feet, kidneys and nerves, and increase the risk of stroke, amputation and dying prematurely.⁸

About 10% of people with diabetes have

type 1, an autoimmune condition in which the body does not produce insulin or insufficient amounts—this hormone regulates blood glucose. These patients require regular blood glucose testing and daily insulin to replace the insulin they cannot produce.⁹ It usually presents early in life and is believed to be caused by genes and environmental triggers by no fault of

³ A Al-Dawish, M Mujammami, MA Al Dawish. "Type 1 Diabetes Mellitus in Saudi Arabia: A Soaring Epidemic". *International Journal of Paediatrics*. 2018. <https://www.hindawi.com/journals/ijpedi/2018/9408370/>

⁴ Burki TK. Country in focus: Gulf region states face major health challenges from obesity and diabetes. *Lancet Diabetes Endocrinol*. 2016 Sep;4(9):737-738. [https://doi.org/10.1016/S2213-8587\(16\)30189-9](https://doi.org/10.1016/S2213-8587(16)30189-9)

⁵ "IDF Diabetes Atlas – Ninth edition 2019". International Diabetes Federation. 2019. https://www.diabetesatlas.org/upload/resources/material/20200302_133351_IDFATLAS9e-final-web.pdf

⁶ "Saudi Arabia – Diabetes report 2010-2045". International Diabetes Federation. 2019. <https://diabetesatlas.org/data/en/country/174/sa.html>

⁷ "United Arab Emirates – Diabetes report 2010-2045". International Diabetes Federation. 2019. <https://diabetesatlas.org/data/en/country/208/ae.html>

⁸ "IDF Diabetes Atlas – Ninth edition 2019". International Diabetes Federation. 2019. https://www.diabetesatlas.org/upload/resources/material/20200302_133351_IDFATLAS9e-final-web.pdf

⁹ "Insulin". Diabetes Australia. <https://www.diabetesaustralia.com.au/insulin>

the patient. Incidence is increasing by about 3% per year, with scientific debate as to why.^{10, 11}

The majority of people living with diabetes have type 2. This is characterised by the body either not producing enough insulin or the insulin is not working effectively, or both.¹² It is largely an acquired condition associated with poor diet, sedentary lifestyles and obesity—and can often be delayed or prevented altogether with a healthy diet and regular exercise. However, as excess body weight and physical inactivity are on the rise among both adults and children, cases of type 2 diabetes are rapidly growing around the world.¹³ These

patients may also require medicines and insulin to manage their blood glucose level, and it can be further managed by a mix of healthy eating and physical activity.

Another type, gestational diabetes, affects pregnant women. These patients are unable to produce sufficient insulin, which causes high blood sugar that can complicate the pregnancy and cause health problems for the woman and their unborn baby. The risks can usually be managed if detected early, and blood sugar usually returns to normal after birth, although these women retain a higher risk of getting type 2 diabetes later in life.¹⁴

Setting the scene: quick diabetes stats

- Diabetes has been labelled one of the fastest growing health challenges of the 21st century¹⁵
- The WHO estimates that diabetes was the ninth-leading cause of death in 2019¹⁶
- The life expectancy of people living with type 1 diabetes is approximately 12 years less on average than the general population¹⁷

¹⁰ A Al-Dawish, M Mujammami, MA Al Dawish. "Type 1 Diabetes Mellitus in Saudi Arabia: A Soaring Epidemic". *International Journal of Paediatrics*. 2018. <https://www.hindawi.com/journals/ijpedi/2018/9408370/>

¹¹ "Type 1 Diabetes". Diabetes UK. <https://www.diabetes.org.uk/type-1-diabetes>

¹² "IDF Diabetes Atlas – Ninth edition 2019". International Diabetes Federation. 2019.

https://www.diabetesatlas.org/upload/resources/material/20200302_133351_IDFATLAS9e-final-web.pdf

¹³ Ibid

¹⁴ "Gestational diabetes" NHS. <https://www.nhs.uk/conditions/gestational-diabetes/>

¹⁵ "IDF Diabetes Atlas – Ninth edition 2019". International Diabetes Federation. 2019.

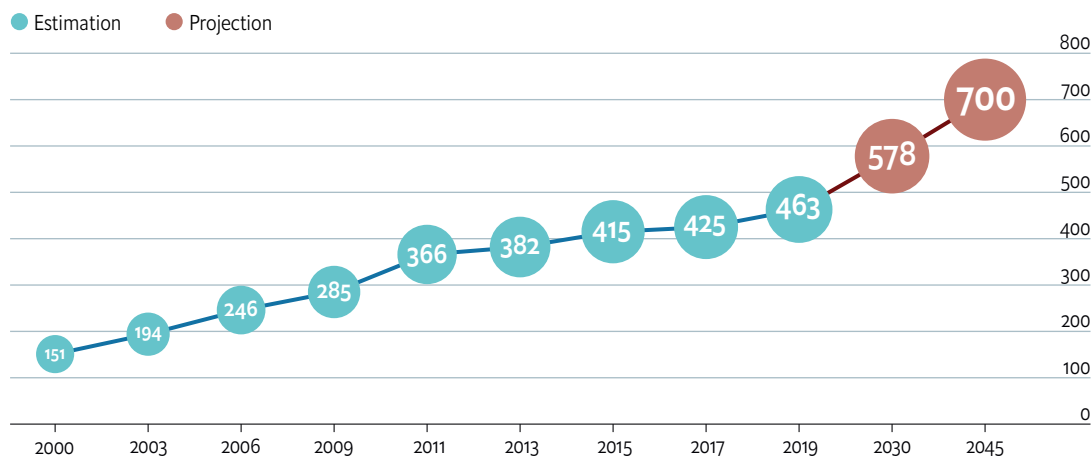
https://www.diabetesatlas.org/upload/resources/material/20200302_133351_IDFATLAS9e-final-web.pdf

¹⁶ "The top 10 causes of death", World Health Organization, 2020. <https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death>

¹⁷ L Huo, JL Harding, A Peeters, et al. "Life expectancy of type 1 diabetic patients during 1997–2010: a national Australian registry-based cohort study," *Diabetologia*, vol. 59, no. 6, pp. 1177–1185, 2016. <https://pubmed.ncbi.nlm.nih.gov/26796634/>

Chart 1: The IDF estimates that there will be 578m adults with diabetes globally by 2030 and 700m by 2045, up from 463m in 2019.¹⁸

(m)



Source: IDF Diabetes Atlas editions 1 to 9.

Chart 2: Obesity has risen dramatically in Saudi Arabia and in the UAE^{19, 20}

Future projections show increases among both genders, but especially in women, leading up to 2025.²¹

Obesity prevalence (%)

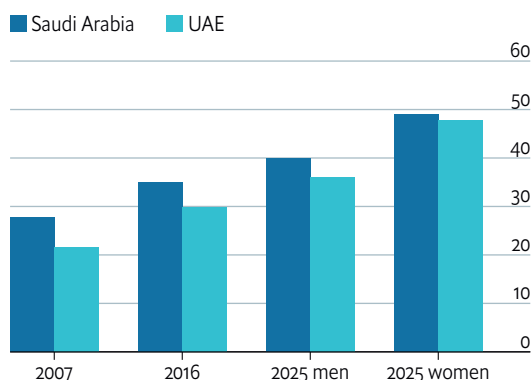
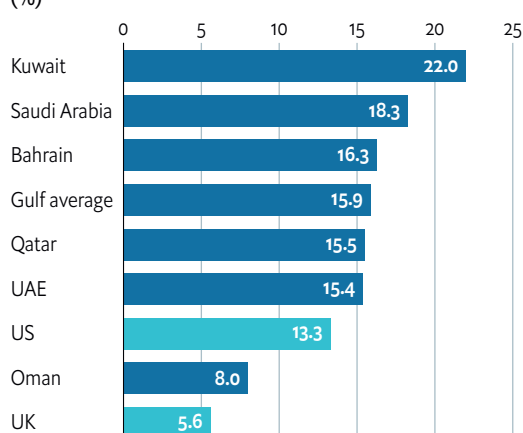


Chart 3: Diabetes national prevalence in selected countries in adults (20-79 years)

In Gulf countries (specifically, the countries listed in the Gulf Cooperation Council), the percentage of adults with diabetes is among the highest in Saudi Arabia and Kuwait.

US and UK included for comparison purposes.²²



¹⁸ "IDF Diabetes Atlas – Ninth edition 2019". International Diabetes Federation. 2019.

https://www.diabetesatlas.org/upload/resources/material/20200302_133351_IDFATLAS9e-final-web.pdf

¹⁹ "Prevalence of obesity among adult population in the UAE from 2007 to 2016". Statista. <https://www.statista.com/statistics/978079/uae-prevalence-rate-obesity-adult-population/>

²⁰ "Prevalence of obesity among adult population in Saudi Arabia from 2007 to 2016". Statista. <https://www.statista.com/statistics/1005251/saudi-arabia-prevalence-of-obesity-adult-population/>

²¹ F Azizi, F Hadaegh, F Hosseinpanah, et al. "Metabolic health in the Middle East and north Africa." *Lancet Diabetes Endocrinol.* 2019. [http://dx.doi.org/10.1016/S2213-8587\(19\)30179-2](http://dx.doi.org/10.1016/S2213-8587(19)30179-2)

²² "IDF Diabetes Atlas – Ninth edition 2019". International Diabetes Federation. 2019.

https://www.diabetesatlas.org/upload/resources/material/20200302_133351_IDFATLAS9e-final-web.pdf

Future projections are similarly worrisome. While individual country projections are largely dated and variable, the IDF estimates that the prevalence of diabetes in the Middle East and North Africa region will increase by 96% from 55m people in 2019 to 108m in 2045.²³

The human toll from diabetes in these countries is also significant: about 15,000 adults in Saudi Arabia and 2,100 in the UAE die from diabetes-related causes each year.²⁴

The economic costs of diabetes to health budgets is likewise considerable—and rising fast. Over two decades, Saudi Arabia saw expenses in healthcare and treatment of diabetes increase by more than 500%.²⁵

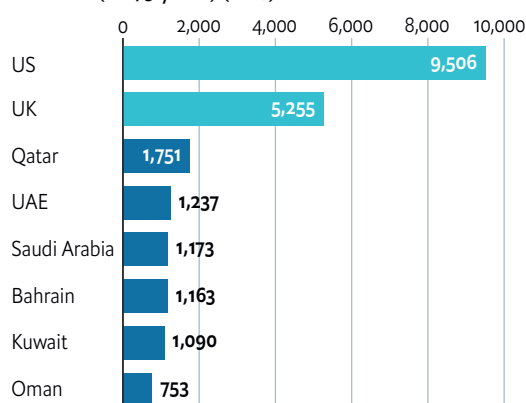
According to a 2013 report, the estimated economic burden of diabetes on Saudi Arabia would be around US\$2.4bn in 2015. That figure represented an increase of US\$1.5bn, “or nearly three times the level in 2010,” and is expected to rise by another US\$6.5bn in 2020.²⁶

The 2019 IDF Diabetes Atlas breaks health spending on a person basis and finds that the UAE spends around US\$1,237 per diabetic person per year, and Saudi Arabia US\$1,173. These are relatively average for the Gulf region [see chart 4], although, for comparative purposes, not as high as the US or UK.

Chart 4: Saudi Arabia and the UAE spend close to the Gulf average for diabetes-related health expenditure per person

However, this is not as much as other high-income countries in the Gulf. And, for comparison, the US and UK spend far more per person

Mean diabetes-related expenditure per person with diabetes (20-79 years) (US\$)



Source: IDF Diabetes Atlas, 2019.

Diabetes telemedicine growing

To curb rising healthcare costs and personal and social burdens from diabetes, there have been efforts from the health ministries in both countries to help better prevent and manage the condition.^{27, 28}

While regular clinic visits remain a staple of diabetes care, dating back to the 1990s it has been suggested that telehealth could act as a complementary tool to assist patients in managing diabetes.^{29, 30} This is because

²³ Ibid

²⁴ Ibid

²⁵ AA Robert, MA Al Dawish, R Braham, et al. “Type 2 Diabetes Mellitus in Saudi Arabia: Major Challenges and Possible Solutions.” *Curr Diabetes Rev.* 2017. <https://pubmed.ncbi.nlm.nih.gov/26813972/>

²⁶ Alhawaish AK. Economic costs of diabetes in Saudi Arabia. *J Family Community Med.* 2013. <https://dx.doi.org/10.4103%2F2230-8229.108174>

²⁷ “Press Report on the MOH’s Efforts Regarding Raising People’s Awareness of Diabetes”. Saudi Arabia Ministry of Health. 2013. <https://www.moh.gov.sa/en/Ministry/MediaCenter/Publications/Pages/Publications-2013-06-09-004.aspx>

²⁸ “MoHAP launches Drive in initiative and Diabetes Prevention program”. United Arab Emirates Ministry of Health and Prevention. 2020. <https://www.mohap.gov.ae/en/MediaCenter/News/Pages/2660.aspx>

²⁹ Klonoff DC. “Using telemedicine to improve outcomes in diabetes--an emerging technology.” *Journal of diabetes science and technology.* 2009. <https://doi.org/10.1177/193229680900300401>

³⁰ Institute of Medicine (US) Committee on Evaluating Clinical Applications of Telemedicine; Field MJ, editor. *Telemedicine: “A Guide to Assessing Telecommunications in Health Care.”* Washington (DC): National Academies Press (US); 1996. 7, Evaluating the Effects of Telemedicine on Quality, Access, and Cost. <https://www.ncbi.nlm.nih.gov/books/NBK45438/>

it can facilitate the timely collection and communication of accurate and reliable data between patient and healthcare provider for monitoring and analysis. The act of entering and reviewing data can also empower patients and has the potential to positively impact behaviour and attitude.³¹

According to the experts we interviewed, the exchange of glucose data and discussion of the results varies little between in-person and telehealth visits. “It is my belief that diabetes care is well suited to be conducted using telemedicine,” says Mohammed Al-Sofiani, assistant professor of endocrinology, diabetes and metabolism at King Saud University in Saudi Arabia. “And it’s simply because most of the data we ask for, as healthcare providers, when we manage people with diabetes in our clinics, can be obtained by the patients at home, and can always be remotely shared with us.”

Furthermore, beyond the pressure of providing remote care in light of the pandemic, telemedicine for diabetes has been shown to

be useful to improve the delivery of healthcare when traditional methods encounter difficulty, such as time, distance, cost and appointment availability.^{32, 33, 34}

Over the past decade telemedicine technology has advanced and patients, clinicians, insurers and regulators have put more effort into addressing the various legal and logistical challenges around its use. These difficulties have included data privacy and standardised data entry and cost. But even so, in most technically advanced nations only a minority of patients utilised these services until the covid-19 outbreak.^{35, 36, 37}

Saudi Arabia and the UAE start to uptake

Both countries have notably young populations (for example, in Saudi Arabia, nearly 70% are below the age of 35)³⁸ and are strong users of technology^{39, 40, 41} with increasing literacy and education rates.^{42, 43} And a 2017 study in Saudi Arabia showed that a majority of diabetic patients were happy,

³¹ McGloin H, O’Connell D, Glacken M, et al. “Patient Empowerment Using Electronic Telemonitoring With Telephone Support in the Transition to Insulin Therapy in Adults With Type 2 Diabetes: Observational, Pre-Post, Mixed Methods Study”. *Journal of Medical Internet Research*. 2020. <https://www.jmir.org/2020/5/e16161/>

³² McDonnell ME. “Telemedicine in Complex Diabetes Management”. *Current Diabetes Reports*. 2018. <https://link.springer.com/article/10.1007/s11892-018-1015-3>

³³ Lee JY, Chan CKY, Chua SS, et al. “Using telemedicine to support care for people with type 2 diabetes mellitus: a qualitative analysis of patients’ perspectives.” *BMJ Open*. 2019. <https://dx.doi.org/10.1136%2Fbmjopen-2018-026575>

³⁴ Ashrafzadeh S, Osama Hamdy O. “Patient-Driven Diabetes Care of the Future in the Technology Era”. *Cell Metabolism*. 2018. <https://doi.org/10.1016/j.cmet.2018.09.005>

³⁵ Webster P. “Virtual health care in the era of COVID-19”. *The Lancet*. 2020. [https://doi.org/10.1016/S0140-6736\(20\)30818-7](https://doi.org/10.1016/S0140-6736(20)30818-7)

³⁶ Koonin LM, Hoots B, Tsang CA, et al. “Trends in the Use of Telehealth During the Emergence of the COVID-19 Pandemic — United States, January–March 2020.” *Morbidity and Mortality Weekly Report (MMWR)*. 2020. <http://dx.doi.org/10.15585/mmwr.mm6943a3>

³⁷ “The boom of telehealth in UAE: Is it here to stay?”. Omnia Health by Informa Markets. 2020. <https://insights.omnia-health.com/technology/boom-telehealth-uae-it-here-stay>

³⁸ “Two-thirds of Saudi Arabia’s population is under the age of 35”. Gulf Business 2020. <https://gulfbusiness.com/two-thirds-of-saudi-arabias-population-is-under-the-age-of-35/>

³⁹ “Revealed: Biggest buyers of smartphones in Gulf region”. Zawya. https://www.zawya.com/mena/en/business/story/Revealed_Biggest_buyers_of_smartphones_in_Gulf_region-ZAWYA20200304133221/

⁴⁰ “Smartphone penetration rate as share of the population in Saudi Arabia from 2017 to 2025”. Statista. <https://www.statista.com/statistics/625436/smartphone-user-penetration-in-saudi-arabia/>

⁴¹ “UAE Internet Statistics 2020 (Infographics)”. Global Media Insight. <https://www.globalmediainsight.com/blog/uae-internet-and-social-media-usage-statistics/>

⁴² “Two-thirds of Saudi Arabia’s population is under the age of 35”. Gulf Business 2020. <https://gulfbusiness.com/two-thirds-of-saudi-arabias-population-is-under-the-age-of-35/>

⁴³ “Literacy rate, adult total (% of people ages 15 and above) - United Arab Emirates” The World Bank. <https://data.worldbank.org/indicator/SE.ADT.LITR.ZS?locations=AE>

even eager, to use mobile health tools to transfer blood glucose values from home to their doctor.⁴⁴

In Saudi Arabia, the health system was, until recently, dependent on individual efforts by healthcare providers and medical centres when it comes to implementing diabetes telemedicine services. “For the most part, these telemedicine clinics or services were limited in terms of function and only targeted certain subgroups of patients,” recalls Dr Al-Sofiani.

However, more recently, the Saudi Ministry of Health developed a digital health strategy as part of its Vision 2030, with a goal to expand on the functionality of digital health in general. This included support for the implementation of telemedicine for the national health system.^{45, 46}

In the UAE, federal legislation specifically addressing medical malpractice liability and remote telehealth services was introduced in July 2019.^{47, 48} It set out terms and conditions that all telehealth services must comply with, and shortly afterwards certain private healthcare operators across the country started offering telehealth services to

patients.⁴⁹ Prior to this, physicians were required to conduct in-person clinical examinations due to a medical liability law from 2008.⁵⁰

However, within the UAE the Dubai Health Authority passed its own legislation in 2017, and again in 2019, to regulate telehealth services in the Emirate of Dubai, leading to a growth in such services. One example is Doctor for Every Citizen, a 24/7 free voice and video call consultation service for most diseases, during which the physician can request tests and issue electronic prescriptions.⁵¹

These regulatory changes have corresponded with increases in telemedicine use.⁵² For instance, Dubai’s Doctor For Every Citizen telemedicine initiative addressed 88,000 calls from January 2020 to January 2021.⁵³

Covid-19 overload

Whatever the intended pace for rolling out telemedicine services, including specific services for diabetic populations—the choice largely left clinics’ and health ministers’ hands in the wake of the covid-19 pandemic.

⁴⁴ Alenazi H, Alghamdi M, Alradhi S, et al. “A Study on Saudi Diabetic Patients’ Readiness to Use Mobile Health.” *Studies in Health Technology and Informatics*. 2017. <https://pubmed.ncbi.nlm.nih.gov/29295297/>

⁴⁵ Alghamdi, Saeed M et al. “Current status of telehealth in Saudi Arabia during COVID-19.” *Journal of family & community medicine*. 2020. https://dx.doi.org/10.4103%2Fjfcmm.JFCM_295_20

⁴⁶ “Saudi Arabia: Digital Health Laws and Regulations 2020”. *ICLG*. 2020. <https://iclg.com/practice-areas/digital-health-laws-and-regulations/saudi-arabia>

⁴⁷ “Cabinet Resolution No. (40) of 2019.” *MOHAP*. 2019. <https://www.mohap.gov.ae/FlipBooks/PublicHealthPolicies/PHP-LAW-EN-79/mobile/index.html>

⁴⁸ “The UAE’s New Regulation on Medical Liability and Its Impact on the Health System”. *BSA*. <https://bsabh.com/the-uaes-new-regulation-on-medical-liability-and-its-impact-on-the-health-system/>

⁴⁹ “Who cares, wins. UAE healthcare perspective.” *KPMG*. 2020. <https://assets.kpmg/content/dam/kpmg/ae/pdf-2020/09/uae-healthcare-perspectives.pdf>

⁵⁰ “DHA Issues New Standard for Telehealth Services”. Al Tamimi & Co. 2019. <https://www.tamimi.com/law-update-articles/dha-issues-new-standard-for-telehealth-services/>

⁵¹ “Telemedicine — Virtual Doctor for Covid 19.” *UAE*. <https://u.ae/en/information-and-services/health-and-fitness/telemedicine>

⁵² “How technology can reduce healthcare costs for your UAE business”. *Gulf Business*. 2017. <https://gulfbusiness.com/technology-can-reduce-healthcare-costs-uae-business/>

⁵³ “DHA’s ‘Doctor for Every Citizen’ service benefits more than 88,000 customers in 2020”. *Emirates News Agency*. 2021.

The lockdown shut down great parts of patient trips to in-person appointments, while the virus diverted primary healthcare resources from clinics and hospitals towards services to address and mitigate the spread of covid-19, creating enormous challenges to traditional in-person diabetes care.^{54, 55, 56} To keep services afloat, telemedicine use went into overdrive in both countries.^{57, 58, 59}

“Before covid-19, perhaps 5% or 10% of our diabetes patients used telemedicine clinics,” recalls Bassam Bin Abbas, who is a consultant in the endocrinology and diabetes department of paediatrics at King Faisal Specialist Hospital and Research Center in Saudi Arabia. “But after covid it became like 80% or 90% being treated with telemedicine completely.”

⁵⁴ Algassi AA, Alharbi NK, Hassanain M, et al. “Preparedness and response to COVID-19 in Saudi Arabia: Building on MERS experience”. *Journal of Infection and Public Health*. 2020. <https://www.sciencedirect.com/science/article/pii/S1876034120304664>

⁵⁵ Al Falasi RJ, Khan MA. “The impact of COVID-19 on Abu Dhabi and its primary care response”. *Australian Journal of General Practice*. 2020. <https://doi.org/10.31128/ajgp-covid-35>

⁵⁶ Bawazeer M, Nouh T, Alburakan A, et al. “How the COVID-19 Pandemic Affected the Care of the Surgical Patients in the Intensive Care Unit”. *Saudi Critical Care Journal*. 2020. <https://www.sccj-sa.org/article.asp?issn=2543-1854;year=2020;volume=4;issue=5;spage=10;epage=13;aulast=Bawazeer>

⁵⁷ Al Falasi RJ, Khan MA. “The impact of COVID-19 on Abu Dhabi and its primary care response”. *Australian Journal of General Practice*. 2020. <https://doi.org/10.31128/ajgp-covid-35>

⁵⁸ Kaliyadan F A. Al Ameer M, et al. “Telemedicine Practice in Saudi Arabia During the COVID-19 Pandemic.” *Cureus*. 2020. <https://doi.org/10.7759/cureus.12004>

⁵⁹ “Digital innovation stories during COVID-19”. World Health Organization. <http://www.emro.who.int/noncommunicable-diseases/publications/success-stories.html?format=html>

Chapter 2: Rollout and outcome in care

It is difficult to view the growth and development of diabetes telehealth services in Saudi Arabia and the UAE without looking largely through the lens of the covid-19 pandemic.

While both nations had systems in place before the pandemic—and adoption was rising as the benefits and challenges were gradually being unpacked—the demands for virtual consultations during this period meant solutions were now fast tracked, enhanced beyond their original scope with emerging problems addressed in near real-time.

The impact for people living with diabetes and relevant health services has been simultaneously profound and rapid.

How telemedicine works

Before the covid-19 pandemic, Dr Bin Abbas describes the typical use case of telemedicine for his diabetic patients, which are predominantly children, as fairly straightforward. “The majority of my paediatric diabetic patients don’t have complications, so we don’t really need an in-person examination.” Still, before the pandemic regular physicals took place every three or four months with phone calls and sometimes virtual clinics between to provide results or give parents general instructions, such as advising on carbohydrate consumption or recommending routine workouts.

For adults, appointments were generally face-to-face and much the same. Doctors reviewed blood glucose data taken from patients who self-monitored as required. If readings were above or below ideal levels, doctors would spend more time reviewing diet and exercise and adjusting medication doses as needed.

Covid-19 did not necessarily impact the frequency of these consultations or significantly change the way they are run. However, it prompted doctors and patients to switch from in-person to virtual consultations whenever possible.

In one Saudi study, it was found that the majority of diabetic patients reported that telemedicine was essential for them to maintain good glucose control during the pandemic. Many patients also reported high satisfaction with the virtual sessions. Similarly, healthcare professionals thought the virtual sessions were simple and were satisfied with the model, adding that it allowed them to reduce the number of patients and staff physically present at their clinics.⁶⁰

Increasingly, telemedicine is capitalising on the increased complexity of self-monitoring. For example, data transmitted via telemedicine can be more robust thanks to more advanced continuous glucose monitoring and flash glucose monitoring technologies.⁶¹

These both further enhance the ability of patients to self-manage and helps doctors remotely prescribe more tailored treatments

⁶⁰ Al-Sofiani ME, Alyusuf EY, Alharthi S, et al. “Rapid Implementation of a Diabetes Telemedicine Clinic During the Coronavirus Disease 2019 Outbreak: Our Protocol, Experience, and Satisfaction Reports in Saudi Arabia.” *Journal of Diabetes Science and Technology*. 2020. <https://doi.org/10.1177/1932296820947094>

⁶¹ Gal R, Cohen NJ, Kruger D, et al. “Diabetes Telehealth Solutions: Improving Self-Management Through Remote Initiation of Continuous Glucose Monitoring.” *Journal of the Endocrine Society*. 2020. <https://doi.org/10.1210/jendso/bvaa076>

and make adjustments in a timely fashion.⁶² “These can provide patients with instant feedback on the impact of different lifestyle activities on glucose levels, which can generate important behavioural modifications in food, exercise and therapy—leading people living with diabetes to make better decisions,” says Ahmed El-Laboudi, consultant endocrinologist and diabetologist at the Imperial College London Diabetes Centre (ICLDC) in the UAE, and a PhD holder in the field of continuous glucose monitoring and diabetes technology.

According to some interviewees, continuous glucose monitoring is increasingly becoming the centre of remote diabetes health initiatives, especially with the demonstrated value during the covid-19-related lockdown. For example, the ICLDC in the UAE launched an initiative aimed at optimising the use of these technologies just prior to the pandemic. “We’re encouraging our patients to get connected to our virtual clinic, which allows for remote access to their glucose data,” explains Dr El-Laboudi. “This initiative prepared our virtual clinic patients for a safer stay-home time, as we were able to remotely provide them with tailored plans for their conditions.”

Similarly, in Saudi Arabia, Dr Al-Sofiani says his clinic depends heavily on continuous glucose monitoring devices. “Many of our patients use continuous glucose monitoring systems, and they are linked with us through the cloud so their glucose data would just be automatically transmitted to our clinic accounts.”

He adds that his diabetes clinic had this structure even before the covid-19

pandemic—although it was rarely utilised to its full capability—which made it easier for their patients and doctors to make the telemedicine transition relative to other clinics that have struggled with this.

A ready supply of actionable information to patients

In addition to consultations, the Saudi Ministry of Health made sure that approved telehealth services and apps could provide a wealth of self-care information for diabetic patients.

Basem Futa, a Saudi who lives with diabetes and is a diabetes advocate of the IDF Blue Circle Voices network, as well as senior dietary specialist at Johns Hopkins Aramco Healthcare, a hospital that counts several thousand diabetic patients, says government messages were about protecting patients, medical staff and society in general. Dr Futa explains: “When covid-19 started, the first message we all got from the Ministry of Health, which I received both as a person with diabetes as well as the healthcare provider, was to protect ourselves and to take care of our health, because people with diabetes are at higher risk [from] covid-19.”

He received a full spectrum of information from the Ministry of Health, including what kind of food to eat in isolation that supports immunity, reminders to get adequate sleep and hydration, and around hygiene practices such as washing hands, to social distance and to wear masks. There were also reminders to take medications and monitor blood sugar. In case blood sugar levels were elevated, further information was provided on whom to contact and how to obtain medication adjustments.

⁶² Ibid



Covid + diabetes: deadly combination?

There is evidence of increased severity of covid-19 in people living with diabetes.^{63,64} A study published in December 2020 in Saudi Arabia found that the prevalence of diabetes is high among hospitalised covid-19 patients. Furthermore, it found that diabetes patients had a significantly higher death rate (20.5% versus 12.3%) and lower survival time than those without diabetes.⁶⁵

However, it is worth noting that diabetes alone may not fully explain these figures or even be a significant risk factor by itself. Rather, diabetic patients often have worse health profiles overall, such as chronic diseases, obesity and cardiometabolic multi-morbidity, which can precipitate complications and be indicative of worse outcomes.⁶⁶

Inclusivity was also a consideration. "Information was given in both languages, in English and Arabic, because we have expatriates who don't speak Arabic in the country," adds Dr Futa.

Telemedicine cuts geographical barriers

There are socioeconomic inequalities associated with diabetes, with prevalence

⁶³ Singh AK, Gupta R, Ghosh A, et al. "Diabetes in COVID-19: Prevalence, pathophysiology, prognosis and practical considerations". *Diabetes and Metabolic Syndrome*. 2020 <https://doi.org/10.1016/j.dsx.2020.04.004>

⁶⁴ Hussain S, Baxi H, Jamali MC, et al. "Burden of diabetes mellitus and its impact on COVID-19 patients: A meta-analysis of real-world evidence". *Diabetes and Metabolic Syndrome*. <https://dx.doi.org/10.1016%2Fj.dsx.2020.08.014>

⁶⁵ Alguwaihes AM, Al-Sofiani ME, Megdad M, et al. "Diabetes and Covid-19 among hospitalized patients in Saudi Arabia: a single-centre retrospective study." *Cardiovasc Diabetol*. 2020. <https://doi.org/10.1186/s12933-020-01184-4>

⁶⁶ Ibid

concentrated among the poor and those with less education.⁶⁷ According to some interviewees, people living in rural or remote areas may not be able to easily access services in city centres that can sometimes be seen as higher quality. Therefore, socioeconomically disadvantaged diabetic patients and those who live in rural or remote areas, including in rural Saudi Arabia and UAE, could benefit most from telehealth services, as this is often a benefit cited for telemedicine.⁶⁸

Location is not the only traditional barrier to care: many patients struggle from disadvantages due to limited resources, low income or low socioeconomic status.^{69, 70} Dr Al-Sofiani reflects that in the early days of the lockdown he and fellow doctors “had to be a bit creative in handling some of the patients who belong in one of these subgroups,” but that issues have been largely resolved.

Another expected barrier to traditionally underserved patients is the ability to use technology effectively. However, in practice, digital literacy has not developed into much of a challenge in Saudi Arabia and the UAE, according to experts interviewed. Both nations have incredibly high technology

adoption rates and overwhelmingly young populations.

“There is a wide availability of smartphones and high use of messaging applications, such as WhatsApp, among Saudis,” Dr Al-Sofiani explains. “Many of these messaging applications do not require high service or internet speeds to function, and we used them as the main method of communication with our patients with limited resources.”⁷¹

Furthermore, many people live in intergenerational family groups, particularly in rural areas.^{72, 73} “If parents have a problem with technology, usually they will include their older son or daughter, and they can usually do the job pretty easily,” says Dr Bin Abbas.

“We know from experience and research evidence that it is inaccurate to assume that older populations struggle with technology or lack the skills to benefit from technological solutions,” adds Dr El-Laboudi. He cites studies that found the use of continuous glucose and flash glucose monitoring systems with participants with a mean age of 60 years old and above show that the outcomes of using these interventions are dependent on the

⁶⁷ Al-Hanawi MK, Chirwa GC, Pulok MH. “Socio economic inequalities in diabetes prevalence in the Kingdom of Saudi Arabia”. *Int J Health Plann Mgmt*. 2020. <https://doi.org/10.1002/hpm.2899>

⁶⁸ Wu C, Wu Z, Yang L, et al. “Evaluation of the clinical outcomes of telehealth for managing diabetes: A PRISMA-compliant meta-analysis.” *Medicine (Baltimore)*. 2018. <https://doi.org/10.1097/MD.00000000000012962>

⁶⁹ Lee JY, Chan CKY, Chua SS, et al. “Using telemedicine to support care for people with type 2 diabetes mellitus: a qualitative analysis of patients’ perspectives”. *BMJ Open*. 2019. <https://doi.org/10.1136/bmjopen-2018-026575>

⁷⁰ Jain SR, Sui Y, Ng CH, et al. “Patients’ and healthcare professionals’ perspectives towards technology-assisted diabetes self-management education. A qualitative systematic review”. 2020. <https://doi.org/10.1371/journal.pone.0237647>

⁷¹ World Bank. “Individuals using the Internet (% of population) - Saudi Arabia.” <https://data.worldbank.org/indicator/IT.NET.USER.ZS?locations=SA>

⁷² Al-Khrafif R, Salam AA, Rashid MFA. “Family Demographic Transition in Saudi Arabia: Emerging Issues and Concerns”. *SAGE Open*. 2020. <https://doi.org/10.1177%2F2158244020914556>

⁷³ “Saudi Arabian Culture”. Cultural Atlas. <https://culturalatlas.sbs.com.au/saudi-arabian-culture/saudi-arabian-culture-family>

consistent and proper use of the technology, irrespective of patients' age.^{74, 75, 76, 77, 78}

"We have young patients who are not that good with technology, and older patients who are excellent users. It is our job, as a healthcare system, to provide all patients with the skills they need, and to be more proactive in getting patients of all ages onboard with these technologies that enable them to have high quality of care and better quality of life."

Greater adherence to treatments and self-care

Evidence is emerging that patients report high levels of satisfaction with telehealth tools,^{79, 80, 81} and our interviewees anecdotally say that adherence is greater and emergency visits resulting from diabetic complications are declining.

Although published research does not yet overwhelmingly support these reflections—these are early days—there are hints of positive reports to come. For example, a study published in 2021 of type 1 diabetes patients who used telemedicine during Saudi Arabia's six-week lockdown in 2020 showed a

significant improvement in glycaemic metrics by the end of lockdown, while those who did not attend telemedicine visits showed no change in their glycaemic control.⁸²

Dr Al-Sofiani, the main author of the study, and other experts suggest the secret is the strength and frequency of the communication granted by telemedicine and diabetes technology in general. "We've increased empowerment," Dr Al-Sofiani says. "Behaviour plays a key role in the daily management of diabetes. We've had a huge opportunity to personalise the diabetes care we provide to patients and to support the behavioural changes that we typically recommend them to adopt."

Dr Bin Abbas echoes this: "The cornerstone of diabetes care is communication." In a paper he published in 2014, children with type 1 diabetes were provided through their parents daily and weekly messages, and messages on request, with information about procedures related to diabetes care. It resulted in improved knowledge about the condition among parents, and increased adherence to diabetes therapy and improved clinical outcomes.⁸³

⁷⁴ Beck RW, Riddlesworth TD, Ruedy K, et al. "Continuous Glucose Monitoring Versus Usual Care in Patients With Type 2 Diabetes Receiving Multiple Daily Insulin Injections: A Randomized Trial." *Ann Intern Med*. 2017. <https://doi.org/10.7326/M16-2855>

⁷⁵ Argento NB, Nakamura K. "Personal real-time continuous glucose monitoring in patients 65 years and older." *Endocr Pract*. 2014. <https://doi.org/10.4158/ep14017.or>

⁷⁶ Volčanšek Š, Lunder M, Janež A. "Acceptability of Continuous Glucose Monitoring in Elderly Diabetes Patients Using Multiple Daily Insulin Injections." *Diabetes Technol Ther*. 2019. <https://doi.org/10.1089/dia.2019.0131>

⁷⁷ Yaron M, Roitman E, Aharon-Hananel G, et al. "Effect of Flash Glucose Monitoring Technology on Glycemic Control and Treatment Satisfaction in Patients With Type 2 Diabetes." *Diabetes Care*. 2019. <https://doi.org/10.2337/dc18-0166>

⁷⁸ Pratley RE, Kanapka LG, Rickels MR, et al. "Wireless Innovation for Seniors With Diabetes Mellitus (WISDM) Study Group. Effect of Continuous Glucose Monitoring on Hypoglycemia in Older Adults With Type 1 Diabetes: A Randomized Clinical Trial." *JAMA*. 2020. <https://doi.org/10.1001/jama.2020.6928>

⁷⁹ Al-Sofiani ME, Alyusuf EY, Alharthi S, et al. "Rapid Implementation of a Diabetes Telemedicine Clinic During the Coronavirus Disease 2019 Outbreak: Our Protocol, Experience, and Satisfaction Reports in Saudi Arabia." *Journal of Diabetes Science and Technology*. 2020. <https://doi.org/10.1177/1932296820947094>

⁸⁰ Ruiz de Adana RM, Alhambra-Expósito MR, Muñoz-Garach A, et al. "Randomized Study to Evaluate the Impact of Telemedicine Care in Patients With Type 1 Diabetes With Multiple Doses of Insulin and Suboptimal HbA1c in Andalusia (Spain): PLATEDIAN Study." *Diabetes Care*. 2020. <https://doi.org/10.2337/dc19-0739>

⁸¹ Bashshur RL, Shannon GQ, Smith BR, et al. "The Empirical Evidence for the Telemedicine Intervention in Diabetes Management." *Telemedicine Journal and E-Health*. 2015. <https://dx.doi.org/10.1089%2Ftmj.2015.0029>

⁸² Alharthi SK, Alyusuf EY, Alguwaihes AM, et al. "The Impact of a Prolonged Lockdown and Use of Telemedicine on Glycemic Control in People with Type 1 Diabetes During the COVID-19 Outbreak in Saudi Arabia." *Diabetes Research and Clinical Practice*. 2021. <https://doi.org/10.1016/j.diabres.2021.108682>

⁸³ Bin-Abbas B, Jabbari M, Al-Fares A, et al. "Effect of mobile phone short text messages on glycaemic control in children with type 1 diabetes." *Journal of Telemedicine and Telecare*. 2014. <https://doi.org/10.1177/1357633X14529244>

Furthermore, later research found that tailored mobile text messaging interventions helped improve glycaemic control and stimulated positive behaviour change in adult type 2 diabetes patients.^{84, 85}

“Patients all fall off the wagon at some point,” agrees M Hamed Farooqi, director and consultant endocrinologist at Dubai Diabetes Center for Dubai Health Authority in the UAE. Asking a patient to change their lifestyle, regularly prick their fingers for blood tests, exercise and be mindful of high-caloric intake is exhausting. “But if doctors can keep patients connected to their providers, to continue supporting and encouraging them, they may stand a better chance of adhering over time.”

Emerging challenges

There were of course teething problems as diabetes telehealth services rocketed in popularity. Sometimes these were as basic as patients and doctors finding a regular, strong internet connection, particularly for those in remote areas.

Most people have smartphones—in fact, Saudi Arabia and the UAE have some of the greatest market penetration in the world, and the two highest in the Gulf^{87, 88, 89, 90}—so technology access hasn’t been a significant problem, but some patients and doctors were not familiar with the specific technology on their phones and had an initial learning curve.

Telemedicine supports psychological wellbeing throughout the pandemic

Telemedicine has been impactful in reducing depression and anxiety among patients with diabetes in Saudi Arabia during the covid-19 pandemic, according to a 2020 study on the issue.⁸⁶ Different groups of patients were asked about their depression. The study found that diabetic patients who had their clinic visits

cancelled during the outbreak without a method of telecommunication with their healthcare provider had significantly higher odds of depression and anxiety compared with those with diabetes that had telemedicine appointments and patients without diabetes after adjusting for all other potential factors.

⁸⁴ Sahin C, Courtney KL, Naylor PJ, et al. “Tailored mobile text messaging interventions targeting type 2 diabetes self-management: A systematic review and a meta-analysis.” *Digital health*. 2019. <https://doi.org/10.1177/2055207619845279>

⁸⁵ Haider R, Sudini L, Chow CK, et al. “Mobile phone text messaging in improving glycaemic control for patients with type 2 diabetes mellitus: A systematic review and meta-analysis”. *Diabetes Research and Clinical Practice*. 2019. <https://doi.org/10.1016/j.diabres.2019.02.022>

⁸⁶ Al-Sofiani ME, Albulnyan S, Alguwaihes AM, et al. “Determinants of mental health outcomes among people with and without diabetes during the COVID-19 outbreak in the Arab Gulf Region”. *Journal of Diabetes*. 2020. <https://doi.org/10.1111/1753-0407.13149>

⁸⁷ “Number of smartphone users in Saudi Arabia from 2017 to 2025 (in millions)”. Statista. <https://www.statista.com/statistics/494616/smartphone-users-in-saudi-arabia/>

⁸⁸ “GCC Mobile Market Buoyed by Strong Smartphone Shipments, but Uncertainty Looms Following Global COVID-19 Outbreak”. IDC. 2020. <https://www.idc.com/getdoc.jsp?containerId=prMETA46106520>

⁸⁹ “Saudi Arabia’s Q3 mobile phone sales hit by tripling of VAT”. *Arabian Business*. 2020. <https://www.arabianbusiness.com/retail/455362-saudi-arabias-q3-mobile-phone-sales-hit-by-tripling-of-vat>

⁹⁰ “Mobile consumption in a post-growth world Deloitte Global Mobile Consumer Survey, Middle East Edition 2019”. *Deloitte*. 2019. <https://www2.deloitte.com/content/dam/Deloitte/xs/Documents/technology-media-telecommunications/GMCS-whitepaper.pdf>

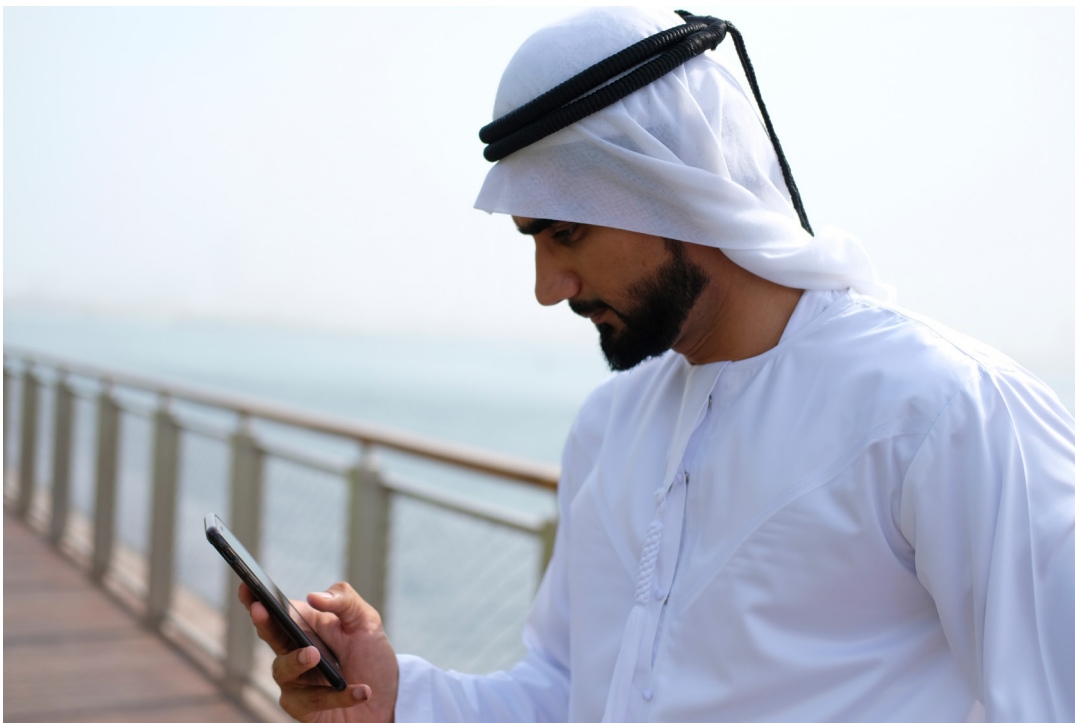
Other problems have been continuous, while some are just starting to emerge. Dr El-Laboudi says perhaps one of the important challenges facing telemedicine is having interoperability across different medical devices, electronic health records, mobile applications and cloud-based platforms. “These systems and platforms need to be fully integrated and seamlessly interoperating to unlock the potential of remote care,” says Dr El-Laboudi.

Additionally, professional competencies and skill sets need to better adapt to meet the virtual demands. Dr El-Laboudi says because uptake of virtual services has happened so quickly, well-structured research is needed to investigate their efficacy, safety, the patient’s experience and cost-effectiveness of remote care models. “Since the entire process is user-skill-oriented, it is essential to provide adequate training for both healthcare professionals and patients to adopt these new technologies,” he says.

“Whatever digital ecosystem that has been set up during the height of the pandemic needs further enhancements to cope with the rapid progress of its components for better patient outcomes,” adds Dr El-Laboudi. “This does not only apply to diabetes remote care systems initiated by healthcare providers but also to the wider healthcare system, including regulator and payer, to address the need to develop the proper regulatory frameworks that facilitate adoption and advancement of the remote care model.”

Averted healthcare costs

Experts interviewed say there is no doubt that remote diabetes care has added convenience and cost savings for patients. Many patients are used to travelling long distances from remote areas into town, which is often cited as a reason for missing in-person clinical appointments.⁹¹ Caretakers often accompany diabetic children and elderly diabetics on



⁹¹ Alsomali SI. “An Investigation of Self-Care Practice and Social Support of Patients with Type 2 Diabetes in Saudi Arabia”. University of Salford School of Health and Safety. 2018. https://usir.salford.ac.uk/id/eprint/49498/7/Sabah%20Ismile%20Alsomali%20Thesis%20_Redacted.pdf

trips, potentially reducing their own economic productivity.⁹²

In Saudi Arabia, where healthcare is free of charge in the public system⁹³, and according to interviewees, anyone coming from out of town—and their travel companions—would have their travel costs and accommodation provided for. Virtual clinic visits naturally remove or reduce this cost from the equation.

National and individual cost savings also come from averted complications that can be devastating when it comes to poorly managed diabetes such as stroke or amputation.^{94, 95, 96, 97, 98}

The quality of care that patients receive from virtual clinic appointments is comparable to in-person visits, says Dr Al-Sofiani. He adds that telehealth services can possibly provide better care than what patients in the most remote areas tend to receive—adding to potential health benefits and cost savings. “If digital health can help us to reach out to these people to improve their healthcare then I think at that point you’re going to reach the positive balance where this module of care becomes cost effective.”

Hidden costs of higher value health services

Despite the benefits to some patients, Dr Al-Sofiani cautions that cost models are shifting, and perhaps not yet given due attention. For example, calculations are still being reviewed

on the cost effectiveness of telehealth on the part of healthcare providers. “We still don’t have clear payment models to compensate for virtual diabetes visits,” he says.

Consider that for the full potential of telemedicine to be best utilised, a string of actions needs to be fulfilled. First, data have to be transmitted successfully from the patient to the clinic and then reviewed and analysed. After analysis, actionable insights are developed and recommended to patients.

As doctors and patients become more dependent on diabetes technology and as the telemedicine care model continues to grow, healthcare providers are likely to face an influx of digitally transmitted data for analysis, followed by more expectation of custom presentation and personalised recommendations for individual patients. These are higher value services that require time and resource capacity from healthcare staff.

“I can tell you from just the past six or seven months’ experience that this really requires a lot of effort and a significant amount of time that we as healthcare providers will need to be compensated for,” says Dr Al-Sofiani. “And unless this is incorporated in the healthcare models, healthcare providers are very likely to be less enthusiastic about implementing telemedicine in the future.”

Dr Futa, however, adds that telemedicine also creates opportunities to streamline appointments and focus doctors’ times on

⁹² Kanavos P, van den Aardweg S, Schurer W. “Diabetes expenditure, burden of disease and management in 5 EU countries”. LSE Health, London School of Economics. 2012. <https://www.lse.ac.uk/business-and-consultancy/consulting/assets/documents/diabetes-expenditure-burden-of-disease-and-management-in-5-eu-countries.pdf>

⁹³ Rahman R. “The Privatization of Health Care System in Saudi Arabia”. *Health Services Insights*. 2020. <https://doi.org/10.1177%2F1178632920934497>

⁹⁴ Karen R. Siegel, Mohammed K. Ali, Xilin Zhou, et al. “Cost-effectiveness of Interventions to Manage Diabetes: Has the Evidence Changed Since 2008?”. *Diabetes Care*. 2020. <https://doi.org/10.2337/dci20-0017>

⁹⁵ Brody JE. “The Costly, Life-Disrupting Consequences of Poor Diabetes Care”. *New York Times*. 2019. <https://www.nytimes.com/2019/11/25/well/live/the-costly-life-disrupting-consequences-of-poor-diabetes-care.html>

⁹⁶ “Economic costs of diabetes in Saudi Arabia”. *Journal of Family and Community Medicine*. 2013. <https://doi.org/10.4103/2230-8229.108174>

⁹⁷ Kanavos P, van den Aardweg S, Schurer W. “Diabetes expenditure, burden of disease and management in 5 EU countries”. LSE Health, London School of Economics. 2012. <https://www.lse.ac.uk/business-and-consultancy/consulting/assets/documents/diabetes-expenditure-burden-of-disease-and-management-in-5-eu-countries.pdf>

⁹⁸ Alzaid A, Ladrón de Guevara P, Beillat M, et al. “Burden of disease and costs associated with type 2 diabetes in emerging and established markets: systematic review analyses”. *Expert Review of Pharmacoeconomics & Outcomes Research*. 2020. <https://doi.org/10.1080/14737167.2020.1782748>

the highest value services. For example, Dr Futa says “when we use telehealth we made a record of patients’ questions and posted answers to the most anticipated ones on our website with images and illustrations and other resources for them to view and learn from.” As his healthcare institute has several thousands of patients with diabetes in the kingdom of Saudi Arabia, he says this simple act has streamlined care and saved immeasurable resources because patients don’t need to wait on their physician for answers or overutilise the physician’s time.

Integrating telemedicine for a post-covid world

Adoption of telemedicine was on the rise before covid-19, but during lockdown it became the go-to solution. It begs the question of what comes next following

widespread coronavirus vaccinations and easing restrictions.

Experts are unanimous that diabetes care will not return to “normal”. “Diabetes telemedicine is here to stay,” says Dr Al-Sofiani. Too much progress has been made on diabetes telemedicine technologies, their adoption and improvements in patient experiences.

“In a way, covid has made us stronger and more thoughtful and better planners about our health. I do not wish to see that undone,” adds Dr Futa. Much of the world seems to agree: in a global survey of type 1 diabetes patients from 89 countries, three-quarters of patients would consider continuing with online or telephone appointments with their doctors after the pandemic ends.⁹⁹

Dr Bin Abbas believes a hybrid mix of virtual clinics and in-person clinics will be



⁹⁹ “Global survey suggests patients most with type 1 diabetes that have adapted to remote medical appointments would continue this post COVID-19 pandemic.” *Diabetologia*. 2020.

the way forward. His hospital, like many other healthcare institutions in the Gulf, is already working to create a balance.¹⁰⁰ “Our administration considers virtual patients and virtual appointments to be as valuable as in-person patients and appointments. The hospital has therefore made it mandatory for each attending or consultant to hold at least two virtual clinics per week. It has become part of our practice, our service and our evaluations.”

As lockdown restrictions ease, Dr Al-Sofiani’s hospital is also looking to strike a balance by alternating patients between in-person and virtual appointments. “This minimises the number of trips these patients have to make to our clinic and will also keep us in close contact and monitoring. Through telemedicine, we can remotely reinforce behavioural changes recommended during the last in-person visit.”

Both Saudi doctors say that because patients and the hospital administration

are satisfied with the outcome and efficiency of telemedicine, they expect all stakeholders will want telemedicine trends to continue. However, cost will naturally be a big consideration for how a balance is ultimately struck. More research will have to be conducted around the real health impacts and cost savings from a mix of virtual and in-person appointments.

Future advances in diabetes telemedicine

Dr Farooqi is determined to use artificial intelligence (AI) to help further optimise diabetes telemedicine and make it more cost-effective for all stakeholders in the process.

In December 2020, at the Dubai Diabetes Centre, the largest public sector diabetes care facility in Dubai, he completed a clinical trial of around 40 patients over three months on a telemedicine programme that was spearheaded before the covid-19 pandemic.



¹⁰⁰ “Coronavirus: Remote healthcare here to stay in Middle East: experts”. Alarabiya News. 2020. <https://english.alarabiya.net/News/gulf/2020/12/20/Coronavirus-Remote-healthcare-here-to-stay-in-Middle-East-experts->

Each patient was provided with home-monitoring devices including a blood pressure monitor, a blood glucose monitor, heart rate monitor and pulse oximeter. They were also given a pill box that beeped every day at the time when their medicine needs to be taken. Data from the pill box and the monitoring devices is automatically sent to the centre, where AI is employed. If patient data show abnormal readings or a missed medication dose, they are immediately sent a customised alert with information to correct for it, such as to adjust their diet or seek exercise. If the data are highly abnormal, a phone consultation is arranged.

The goal, Dr Farooqi explains, is to use predictive modelling on the wealth of data being collected to understand how behaviours and readings can predict complications such as hypoglycaemia, and when to best intervene to improve a patient's quality of life and make healthcare system savings.

"If you look at diabetes as a chronic disease, what you do see is that the conventional

way of managing diabetes is to give patients staggered appointments every one to three months, and doctors basically look in retrospect at the data that is in front of them. So they are already behind the ball," explains Dr Farooqi. "The philosophy behind this study is how do we change the focus of diabetes management from being retroactive to being prospective, and if not prospective, at least along the same time as the disease is progressing."

While the results of the study have not yet been published, early data are promising. Those that underwent the trial showed an improvement in their overall blood glucose control, which could mean a significant decrease in diabetic complications, he says.

While further research will be needed on the likely benefits of predictive modelling, it speaks to the hopeful direction of diabetes care and telemedicine, which places more control and knowledge in the hands of patients and helps manage doctors' times for its highest value and impact.

Conclusion: The future of telemedicine and diabetes care in the Gulf

The covid-19 pandemic and its lockdowns have meant a sudden change in the delivery of healthcare, with telehealth and digital solutions becoming the go-to options. In Saudi Arabia and the UAE, the transition of care to telehealth and remote services for people living with diabetes has been supported by patients and doctors alike.

The experience has meant that patients are now more comfortable sitting in front of a screen and streaming data in real time to their doctors. In return, they have become familiar with continuous monitoring and virtually received advice on better self-care.

In Saudi Arabia and UAE, covid-19 established the use case for diabetes telemedicine in a shorter time frame than any practitioner or patient could have predicted, and studies demonstrating its efficacy and cost savings are starting to emerge. But this is still only a step on the journey towards better managing and reducing the burden from diabetes. Policymakers and healthcare professionals will want to ensure the best lessons are learnt and behaviours adopted during this period of intensive remote diabetes care are carried forward, and that they are improved upon wherever possible.

Outstanding operational and technical issues will need to be assessed and resolved. Access and equity must also remain at the forefront of consideration, as telemedicine has expanded

the potential to provide quality care to even the most remote diabetic patient. Doctors are learning the benefits of telehealth and must be supported on the effective ways to manage patients remotely. They are likely to benefit from formal guidance around remote care, incorporating lessons from existing centres of excellence.

Telemedicine must be examined in light of the tangible benefits it can provide diabetic patients (such as improved outcomes, reduced complications, convenience and safety) and to what extent it is cost-effective and sustainable. Current cost models will need to be re-evaluated to ensure health systems are using these tools effectively, and studies must be undertaken to ensure that no element of patient care is missed. Long-term studies must also be commissioned to better understand how any positive behavioural changes observed by patients using telemedicine can be sustained in the long run. Legal constraints must also be revisited, to ensure patients' data are secure and effectively managed.

Telehealth diabetes care has been given a boost by covid-19, and it is vital that Saudi Arabia and the UAE seize it to its fullest in order to mitigate the worrying trajectory of their national diabetes trends. But indications suggest that new hybrid models of care will emerge in future involving in-person care, remote care and predictive modelling supporting real-time care.

While every effort has been taken to verify the accuracy of this information, The Economist Intelligence Unit Ltd. cannot accept any responsibility or liability for reliance by any person on this report or any of the information, opinions or conclusions set out in this report. The findings and views expressed in the report do not necessarily reflect the views of the sponsor.

LONDON

20 Cabot Square
London, E14 4QW
United Kingdom
Tel: (44.20) 7576 8000
Fax: (44.20) 7576 8500
Email: london@eiu.com

GENEVA

Rue de l'Athénée 32
1206 Geneva
Switzerland
Tel: (41) 22 566 2470
Fax: (41) 22 346 93 47
Email: geneva@eiu.com

NEW YORK

750 Third Avenue
5th Floor
New York, NY 10017
United States
Tel: (1.212) 554 0600
Fax: (1.212) 586 1181/2
Email: americas@eiu.com

DUBAI

Office 1301a
Aurora Tower
Dubai Media City
Dubai
Tel: (971) 4 433 4202
Fax: (971) 4 438 0224
Email: dubai@eiu.com

HONG KONG

1301
12 Taikoo Wan Road
Taikoo Shing
Hong Kong
Tel: (852) 2585 3888
Fax: (852) 2802 7638
Email: asia@eiu.com

SINGAPORE

8 Cross Street
#23-01 Manulife Tower
Singapore
048424
Tel: (65) 6534 5177
Fax: (65) 6534 5077
Email: asia@eiu.com