# GCC HEALTH 2.0:

Tackling diabetes and obesity in an age of digital acceleration

# Contents

# About this report

*GCC Health 2.0: Tackling diabetes and obesity in an age of digital acceleration* is a report by The Economist Intelligence Unit (EIU), sponsored by EY. It explores the role of technology in preventing and managing diabetes and obesity in the Gulf Co-operation Council (GCC) countries, highlighting the potential impact on patients and the healthcare system.

*The report is based on desk research and interviews with medical experts and technology providers conducted by The EIU in November 2016. The insights from these interviews appear throughout the report. The EIU would like to thank the following individuals (listed alphabetically) for sharing their insight and experience:*

- **Dr Hawaa Al Mansouri**, deputy medical director, consultant endocrinologist and diabetologist, Imperial College London Diabetes Centre, UAE

- **Dr Bassam Bin Abbas**, head, endocrinology and diabetes department of paediatrics, King Faisal Specialist Hospital and Research Center, Saudi Arabia

- **Amer Haddadin**, regional director—Greece, Middle East, Africa, Turkey & Pakistan, Abbott Diabetes Care

- **Dr Sneh Khemka**, president, population health, Aetna International

- **Dr Mahiben Maruthappu**, co-founder, NHS Diabetes Prevention Programme, National Health Service, UK

- **Dr Arjen Radder**, chief executive officer Middle East & Turkey, Philips, UAE

- **Dr Alan Russell**, highmark distinguished professor and director, Disruptive Health Technology Institute, Carnegie Mellon University, US

The EIU bears sole responsibility for the content of this report. The findings and views expressed in the report do not necessarily reflect the views of the sponsor. Justinian Habner was the author of this report and Melanie Noronha was the editor.

# Executive summary

The countries of the Gulf Co-operation Council (GCC) are in the midst of a health crisis. Close to 20% of the region's population is suffering from diabetes, particularly type 2 diabetes. Rapidly rising incomes per head have led to an increasingly sedentary lifestyle and a shift to Western-style diets laden with sugar. Unchecked, this poses a substantial economic cost to the GCC, primarily in the form of increased healthcare expenditure to treat diabetes, which is forecast to rise from US$12.8bn in 2015 to US$21.8bn in 2040.

The sense of urgency is palpable: "There is no way [the healthcare system] can accommodate such a huge number of patients," said Bassam Bin Abbas, head of endocrinology and diabetes at the department of paediatrics, King Faisal Specialist Hospital and Research Center, Saudi Arabia. The tragedy lies in the fact that obesity and type 2 diabetes are largely preventable, mainly by raising awareness of the risk factors and maintaining a healthy lifestyle. Innovations in technology are creating new opportunities to facilitate both of these. This report identifies recent innovations and explores how these can be used to curb, and potentially even reverse, these dangerous health trends in the GCC.

**Key findings of the report**

**Technology is facilitating a shift in approach to tackling diabetes and obesity: from being reactive to proactive.** Apps, wearables and virtual health systems allow patients and medical professionals to proactively monitor key health metrics, from weight to glucose levels, to take the steps necessary to prevent symptoms from worsening. New technologies are making testing more convenient and less invasive, which will help people better understand and manage their condition.

**Apps and wearables on their own cannot solve health issues such as diabetes.** A common perception among patients is that the more apps they use, the more weight they will lose, but technology can only play a supporting role. The onus lies on the patient to use these technologies consistently and to modify their behaviour and dietary habits to deliver genuine results.

**The new wave of technological innovations provides an opportunity for health authorities in the region to transform their healthcare system.** Reducing the need for in-patient consultations through remote monitoring and self-management can alleviate existing pressures on healthcare capacity in the Gulf, particularly the shortage of physicians. Many apps and wearables that encourage healthier lifestyles can be effective in preventing diabetes and obesity, generating cost savings by avoiding the need for expensive medical procedures and treatment in the future.

**Insurance providers must be encouraged to cover new technologies.** Providing coverage of technologies that will prevent symptoms from worsening or, preferably, prevent the disease altogether, will reduce overall costs to insurers in the medium-to-long-term.

# Introduction

The Arabian Gulf countries have experienced a rapid rise in the prevalence of diabetes over the past decade.[1] It is estimated that, on average, close to 20% of the adult population in the GCC countries is living with diabetes, far higher than the global average of 8.5% and well above the prevalence in the US (11%), Germany (7.4%), France (5.3%) and the UK (4.7%).[2] The primary driver for this, specifically type 2 diabetes (see table 1 for definition), has been the rise in the prevalence of obesity[3] in the GCC, which was estimated to range between 27% in Oman to 41% in Qatar in 2014, compared with 23% in Germany, 26% in France, 30% in the UK and 35% in the US.[4] Shifts to more sedentary lifestyles and increased consumption of Western-style diets on the back of rising incomes per head have played a role in increasing the prevalence of these diseases.

## 20%
**of the adult population in the GCC countries is living with diabetes**

This health burden has not only been felt by patients and their families, but has placed pressures on health systems and economies in the region as well. Bassam Bin Abbas, head of endocrinology and diabetes at the department of paediatrics at King Faisal Specialist Hospital and Research Center in Saudi Arabia, attests to this: "One-quarter of our population has diabetes and another quarter is at risk of having diabetes. There is no way [the healthcare system] can accommodate such a huge number of patients." The International Diabetes Federation projects that between 2010 and 2030 healthcare expenditure for diabetes across the GCC countries is expected to more than double. At the high end of their estimates, this means that healthcare expenditure in the GCC for diabetes will increase from US$12.8bn in 2015 to US$21.8bn in 2040,[5] which some consider an underestimation[6].

As a result, governments in the region are starting to take a preventative approach to healthcare. So far they have been active in improving public health education around these diseases—promoting exercise, healthy diets and regular screenings. There have also been rapid increases in healthcare capacity to treat those already living with these diseases.

Advances in technology are facilitating efforts to manage and prevent diabetes and obesity. There are a host of new tools and techniques available for remote, self-management of these diseases, which will go a long way towards reducing the burden on existing healthcare capacity. Other technologies are facilitating governments' prevention strategies by supporting efforts to exercise, maintain a healthy diet and monitor key health indicators such as weight and glucose levels. Done right, this could not only provide long-term savings but also deliver better patient outcomes.

This report will explore some of the most innovative and effective technologies available to manage and prevent diabetes and obesity, highlighting their impact on the perceptions of living with the disease and the broader impact on healthcare in the GCC. In addition, the report explores factors that policymakers need to consider to create an environment conducive to greater adoption of these technologies in the region.



**Figure 1: Health expenditure due to diabetes, 20-79 years (US$m)**
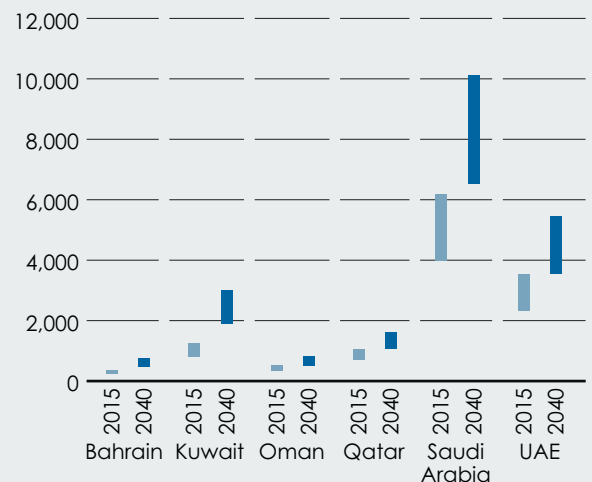
Note: 2015 estimate, 2040 forecast.
Source: International Diabetes Federation.

| Table 1: Defining diabetes | |
|---|---|
| Type 1 diabetes | Type 1 diabetes is characterised by deficient insulin production and requires daily administration of insulin. The cause of type 1 diabetes is not known and it is currently not preventable. |
| Type 2 diabetes | Type 2 diabetes results from the body's ineffective use of insulin. Type 2 diabetes comprises the majority of people with diabetes around the world, and is largely the result of excess body weight and physical inactivity. |

Source: World Health Organisation.[7]

# Chapter 1: Health technologies for diabetes and obesity

Innovation has been at the heart of advancements in healthcare. New technologies have helped improve diagnosis, advance treatments and support patients better to manage their own conditions. "We are no longer on the backfoot and can tackle conditions head on," says Mahiben Maruthappu, co-founder of the NHS Diabetes Prevention Programme. "Technology allows us to move from being reactive to proactive in tackling diabetes and obesity." His positive assessment of technology is supported by many clinicians, researchers, policymakers and patients.

Although we are still in the early stages of harnessing the power of new technologies to confront diabetes and obesity, there are exciting new opportunities. The Economist Intelligence Unit has categorised
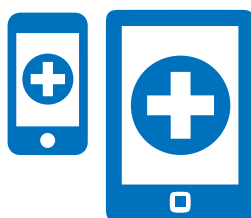
these technologies into four groups—stand-alone technology, social networking technology, patient-provider integration technology and health system technology. They facilitate education, behaviour modification, monitoring and treatment, and can thus play a strong supporting role in managing and preventing diabetes.

**Defining health technology**

Health technology is a broad term that covers a wide range of interventions. The World Health Organisation (WHO) defines the term as: "the application of organised knowledge and skills in the form of devices, medicines, vaccines, procedures and systems developed to solve a health problem and improve quality of life."

## Table 2: Key categories for health technology

| Use | Features | | Examples |
|---|---|---|---|
| Stand-alone technology | Single purpose, single user<br>Led by individuals | | • Smartphone apps promoting a healthy lifestyle<br>• Wearables providing data feedback to user on fitness levels |
| Social networking technology | Single purpose or multi-purpose, multiple users<br>Individuals using social networks for support, motivation, information sharing<br>Led by individuals | | • Internet-based patient peer support groups |
| Patient-provider integration technology | Multi-purpose, multiple users<br>Patients and providers engaging on a single system<br>Led by healthcare provider | | • Wearables feeding data directly to clinician<br>• Follow-up support provided via phone or internet |
| Health system technology | Involves multiple stakeholders including policymakers, health regulators, health providers and patients<br>Combines many technologies and data analytics<br>Designs and delivers comprehensive services<br>Led by healthcare provider or public-sector entities | | • Complete virtual or digital health service<br>• Database of approved apps |

Source: The Economist Intelligence Unit.

Our journey across health technology innovations begins with the administration of insulin, vital for those with type 1 diabetes. Carrying and taking insulin injections in a timely manner have been among the most inconvenient components of managing diabetes on a day-to-day basis. Insulin pump technologies, which deliver insulin to patients 24-hours a day through a catheter under the skin, are now available. These pumps remove the need for insulin injections and allow patients to adapt insulin delivery to their lifestyle, providing warnings when levels approach high and low thresholds. Data collected from these can be used for predictive analysis as well as broader research on treating diabetes.

Other technologies are being developed to make monitoring and managing diabetes less intrusive. Researchers have developed a patch that combines blood glucose monitoring and insulin delivery, addressing some key challenges in diabetes management such as the need for finger-prick blood glucose testing that patients often find uncomfortable.[9] Amer Haddadin, regional director, Greece, Middle East, Africa, Turkey & Pakistan at Abbott Diabetes Care points out that "[many] diabetics in the Gulf region do not regularly test their blood glucose levels. New technologies are making testing more convenient and less invasive, which will help people better understand and manage their condition."

Continuous glucose monitoring systems can also be synced to apps that create an automatic log, addressing another key issue among diabetic patients in the Gulf, according to Dr Abbas. In addition to this, one technology provider, Medtronic, has teamed up with Fitbit, the step-counting wristband, to capture activity levels and correlate this with changing glucose levels.[10]

Weight reduction is central to managing and preventing type 2 diabetes and obesity. Numerous smartphone apps are available that help individuals make healthy meal choices and develop exercise routines. Wearable technology, such as fitness trackers and smartwatches, utilise sensors to monitor physical activity through an individual's measurable attributes, such as their heart rate. These provide real-time data, which help individuals track progress towards weight-loss and exercise goals.

Some apps go the extra mile, taking a holistic approach to behaviour modification. The "nujjer" wristband not only tracks activity levels, but uses this data to generate motivational messages to encourage a healthy balance of exercise, sleep and diet.[11] Several trials are underway to test the product's efficacy, including one trial at the Dasman Diabetes Institute in Kuwait. JOOL Health, another app supporting behaviour modification, uses data and predictive modelling to develop personalised strategies for individuals to maintain healthier lives.[12] Some technology providers offer a suite of connected devices that feed into a personalised smartphone dashboard offering timely advice on sleep and nutrition. For Arjen Radder, chief executive officer, Middle East & Turkey, at Philips, "these programmes are important because they support action at all stages of the health continuum. Technology that measures, monitors and motivates people to stay healthy can help prevent diseases like diabetes and obesity."

In an era of online social networks and sharing, there are new opportunities for patient-centred peer support platforms online. One example is PatientsLikeMe (PLM), which provides opportunities for people living with disease to ask questions, share experiences and provide motivational support.[13] Worldwide, PLM has over 50,000 subscribers suffering from obesity and over 27,000 with diabetes (as of November 2016). While the quality and veracity of the information posted on such websites must be considered, there is evidence that peer-support models are a low-cost way to supplement formal health care, especially to reach specialists for complex conditions.[14]

To take this a step further, data collected through wearables and online social networking platforms can be integrated into an information system shared with healthcare providers. In this way, patients can be monitored remotely on a continuous basis, reducing the need for clinical appointments and generating cost savings to patients and the healthcare system. Hayati, an app launched by the Dubai Health Authority, the health regulator in Dubai, facilitates this.[15] In addition to providing tips on dietary habits and controlling blood sugar levels, the app allows data to be exported to the patient's file at a clinic, the first step to remote monitoring.

An extension of this is "vHealth", a virtual primary-care service recently launched by Aetna International, a health insurance company. Using a range of communication and data technologies, this programme facilitates virtual case management of patients. This will be especially beneficial in the GCC countries, which face a shortage of general practitioners and have a low number of primary care visits per head. "In this region we see our patients only every six to eight months," Dr Abbas explains. "Improving the frequency of conversations with patients will have a positive impact." In addition, over time, data collected through these systems will be a valuable source of information, facilitating research on the efficacy of various interventions.
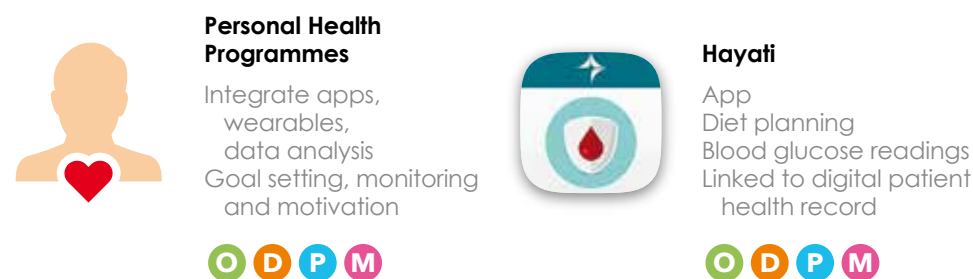
**Figure 2: Innovative health technologies for diabetes and obesity management and prevention**

### Standalone technology

**t:slim X2 pump**
Insulin pump
Bluetooth technology to
 connect to computers
Software updates
Modern design

**D** **M**

**Freestyle Libre**
Wearable patch
Measure blood
 glucose levels

8.3

**D** **M**

**MiniMed pump**
Insulin pump
Monitor glucose
 & predict levels
Automatically
 adjust insulin

**D** **M**

**Nujjer**
Wearable
Records activity
Motivation

**O** **D**
**P** **M**

**JOOL**
App
Motivation

**O** **D**
**P** **M**

### Patient-provider integration technology

**Personal Health Programmes**
Integrate apps,
 wearables,
 data analysis
Goal setting, monitoring
 and motivation

**O** **D** **P** **M**

**Hayati**
App
Diet planning
Blood glucose readings
Linked to digital patient
 health record

**O** **D** **P** **M**

### Social networking technology

**PatientsLikeMe**
Web-based
Peer-support group
Information sharing
Motivation

**O** **D** **P** **M**

### Health system technology

**vHealth**
Virtual primary care service
Supports patient case management

**O** **D** **M**

**NHS Diabetes Prevention Programme**
Digital support service for patients
Use phone to contact & manage patients

**D** **P**

**NHS Library**
Web-based electronic resource
NHS reviewed apps

**O** **D** **P** **M**

**O** Obesity  **D** Diabetes  **P** Prevention  **M** Management

# Chapter 2: The impact on patients and healthcare systems

New technology, by itself, cannot prevent and treat diabetes and obesity. As Alan Russell, highmark distinguished professor and director at Disruptive Health Technology Institute, Carnegie Mellon University, says, "diabetes and obesity are issues that cut across all of society. Medicine alone cannot solve the problem, nor can technology. Innovative technology needs to play a supporting role." For individuals, this means using technology to maintain healthy lifestyles. For health providers, technology can support designing and delivering more effective and efficient services.
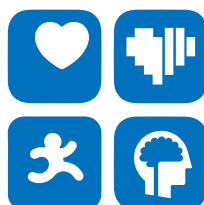
*Evolving perceptions of living with the disease*

The availability of new and engaging technologies has transformed perceptions of living with diabetes and obesity. Using a combination of apps, wearables and other technologies such as glucose patches can minimise the burdensome elements of managing the disease, improving patient attitudes and outlook. Some technologies can imbue an element of fun through gamification. Hawaa Al Mansouri, deputy medical director, consultant endocrinologist and diabetologist at Imperial College London Diabetes Centre, reiterates the importance of this, saying that "using entertaining apps to promote exercise, such as video and dance games, is a great way to encourage people to stay fit and healthy."

Using these technologies to manage and prevent diabetes and obesity can have a broader impact on worker productivity. For patients with type 1 diabetes in particular, patches and pumps that monitor and deliver insulin reduce the need for employees to schedule work-related tasks around insulin delivery schedules, providing more flexibility in managing their time. Remote monitoring of diabetic and obese patients reduces the need for in-person doctor visits, saving workers time spent in a hospital or clinic waiting rooms for check-ups and tests.

To be effective though, individuals must use these technologies consistently. Dr Russell asserts that patients must focus on developing the willpower to take charge of their health and that technology can only support these efforts. Furthermore, technology must be an enabler for behavioural change but should not mask the need for change. As Dr Al-Mansouri says, "too often patients think that the more apps they use, the more weight they will lose. We need to ensure that technology is not used as a crutch that prevents real lifestyle changes."

**Dr Al-Mansouri says, "too often patients think that the more apps they use, the more weight they will lose. We need to ensure that technology is not used as a crutch that prevents real lifestyle changes."**

Successful examples include South Africa's Discovery health programme, which at its core allowed citizens to earn points based on healthy activities—such as hours at the gym, step count from monitoring devices such as Fitbit, purchasing healthy products in supermarkets—which gave them discounts on health insurance premiums. In this way, the system was designed to provide incentives for healthy behaviour while harnessing the latest technologies.

*Delivering healthcare more efficiently*

New technology is shaping the delivery of health services. Consultations can be conducted over the telephone or the internet, medication can be prescribed online through "e-prescriptions" and treatment can be monitored remotely, reducing the need for in-person primary-care visits.

This can be extended to include individuals deemed to be at risk as well. Dr Maruthappu explains: "If we have people managing their own health and actively avoiding known risks associated with developing diabetes, this could

**90%** of the effort to improve outcomes sits with individuals themselves.

reduce significant pressures on the health system." In England, the NHS Diabetes Prevention Programme[16] provides digital support for at-risk individuals. This improves their knowledge of the disease and empowers them to better control their conditions, thus reducing the likelihood of developing type 2 diabetes.[17]

**"We need to spend now to save in the future. Knowing and responding early to [data trends] can prevent diseases from developing and reduce the need for expensive medical devices to treat ensuing conditions."**

Applying technology in this way could make the healthcare system in the Gulf more efficient, generating substantial cost savings to healthcare providers including governments—which have been largely responsible for healthcare provision in the GCC. Dr Radder makes the case: "We need to spend now to save in the future. Knowing and responding early to [data trends] can prevent diseases from developing and reduce the need for expensive medical devices to treat ensuing

conditions." Technologies that help keep people healthy reduce the need for more costly medical interventions in the future.

Those who pay for health services, such as insurers, agree. Dr Sneh Khemka, president of population health at Aetna International explains in the context of costly bariatric surgery undertaken by many obese patients in the Gulf: "Governments in the Middle East have responded to pressure to fund such surgery. Our health technology assessment unit has looked at the research and found that paying for this surgery is not the best way to get value for money. It is far better to focus on preventing obesity, so we need systems that provide incentives for this."

Overall, healthcare professionals who use apps are said to be more productive[18], and healthcare systems adopting fully integrated virtual systems can be more efficient through improved triaging of patients, reduced hospital admissions and lower labour costs.[19] A study in the US of a care co-ordination programme suggested that adopting phone-based patient monitoring for elderly diabetic veterans reduced the number of hospital admissions from 31 to 25, a 19% reduction.[20] In this way, technology can unlock savings across the healthcare system.

# Chapter 3: Facilitating greater adoption of these technologies

Technology can play a powerful supporting role in tackling diabetes and obesity. The efficacy of many emerging technologies is yet to be determined, but they are promising. With high internet and mobile-phone penetration rates in the GCC, these markets are ripe for adoption of these technologies. Greater adoption can be achieved by strengthening regulation and oversight, managing costs and insurance coverage, factoring in cultural considerations and enhancing systems integration.

The new wave of technological innovations provides an opportunity for health authorities in the region to transform their healthcare system, from one designed for infectious diseases to one better suited to tackle chronic, lifestyle diseases such as diabetes and obesity. Factoring in the role of technology in national healthcare plans will be crucial.

The plethora of technologies available creates multiple challenges that regulators need to oversee and address. Regulators need to play a role in ensuring that these are safe for patient use and must subject some of these to the same standards and registration process as other medical devices.

Given the data-heavy components of these technologies, there are two main areas of concern. The first is the veracity of the information provided by these apps. This requires a system to evaluate the various tools and technologies in the market. The NHS in England has created a library of NHS-reviewed apps to address this.[21] Building on this, the NHS is working to support clinicians to better understand apps and think about "prescribing" apps to patients. There are lessons here for health authorities and providers in the GCC. Governments in the region may be slow to move on this as "we do not know much about these yet," explains Dr Abbas. He highlighted the need for a deeper study of the various apps utilised in the Gulf to understand their successes and shortcomings and inform the policy framework. He led a study to test the effectiveness of sending

**70%**

of the Saudi population should have digital health records by 2020-National Transformation Plan

## Figure 3: Mobile and internet penetration in the GCC, 2015



- ■ Mobile penetratation per 100 inhabitants
- ■ Percentage of individuals using the internet
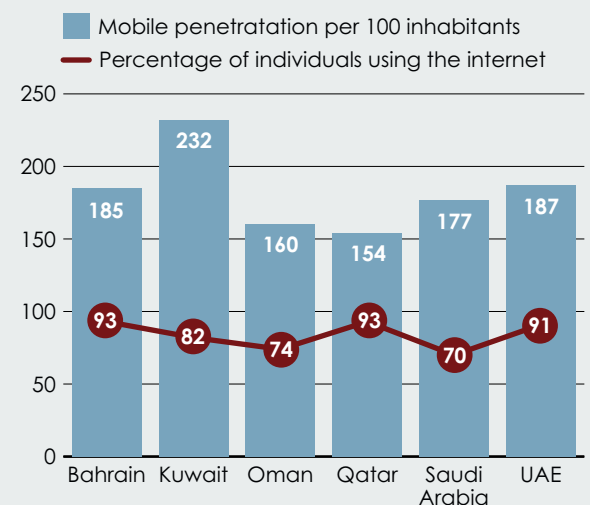
Source: International Telecommunication Union.

educational text messages to the mobile phones of a group of diabetic children as reminders to maintain healthy habits. Results showed a marked improvement across parameters such as glucose levels, frequency of attacks per week, frequency of hospital admissions and frequency of monitoring.[22] Further studies with more recent technologies will help to close this knowledge gap.

The second concern is data privacy. Data shared and stored on digital systems should be protected and treated with the same level of doctor-patient confidentiality as information shared during in-patient consultations. The health data protection regulation for Dubai Healthcare City, a healthcare free economic zone, is the most advanced in the Gulf region, but more needs to be done across the region to emulate the regulatory framework for e-health and telehealth set up in the US and the EU. Addressing these two elements will go a long way towards encouraging greater adoption of these technologies.

There may be a role for insurers too. Mr Haddadin

says that "we need to see medical devices, such as blood glucose monitoring equipment, covered by the payment system." While some technologies and medical devices are covered by insurers in more developed markets such as the US, this is largely absent in the GCC countries. Insurance companies need to be convinced about the medium-to-long-term financial benefits of insuring these preventative technologies. Dr Abbas makes the case: "We should encourage insurance companies to cover these new technologies. They should know in general that covering these devices will help them, not harm them [financially], as [greater use of these technologies] will decrease the number of complications and admissions to hospitals and emergency rooms. They are looking at short-term metrics. In the long-term complications will reduce, generating savings." If insurers are reluctant to provide coverage, the onus will remain on technology providers to develop less expensive technologies affordable to a larger segment of the population.

Beyond affordability, technology providers must also pay close attention to cultural considerations when developing new products and services. For the GCC, this refers to Arabic language requirements and regional dietary habits. Nurturing local developers is essential to achieving this. Future technical advancements should be informed by patients living with diabetes and obesity as well as experts across disciplines. Developing networks to foster such collaboration will be required.

Finally, it is essential that the diverse set of technical solutions is integrated into a cohesive health system. While individual technologies may be relatively inexpensive, simply investing in these without a broader picture of how they integrate into a healthcare system will be wasteful. For instance, encouraging the use of apps to identify early warning signs of diabetes must be met with systems to communicate with professionals in an effective manner as well as the necessary capacity to treat these patients.[23] Moreover, policymakers and providers must ensure that different solutions do
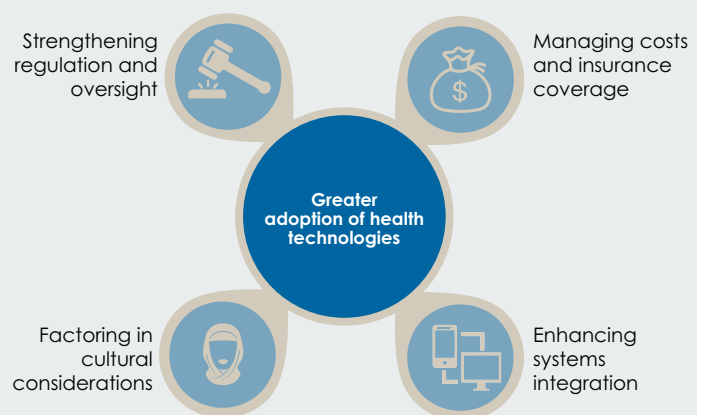
not undermine each other. Making management technologies available must be balanced with encouraging a preventative approach to diabetes and

> **Beyond affordability, technology providers must also pay close attention to cultural considerations when developing new products and services. For the GCC, this refers to Arabic language requirements and regional dietary habits.**

obesity. Combined, a holistic and integrated healthcare system will lead to better patient outcomes. If patients and providers can map the impact of technology to tangible results, this will encourage increased use of these technologies, creating a system that will that will deliver benefits to patients, healthcare providers and governments in the Gulf region.



**Figure 4: Action points to facilitate greater adoption of health technologies**

Strengthening regulation and oversight

Managing costs and insurance coverage

Greater adoption of health technologies

Factoring in cultural considerations

Enhancing systems integration

Source: The Economist Intelligence Unit.

# Notes

[1] Boutayeb, A, et al, *The rise of diabetes prevalence in the Arab region*. 2012.

[2] http://data.worldbank.org/indicator/SH.STA.DIAB.ZS?end=2015&start=2015&view=chart

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