Editorial

Digital Diabetology in Daily Practice

Healthcare Technology Comes Calling

With the easy availability of access to internet, especially on mobile devices, the last decade has seen rapid progress in digital health care. Diabetes care has been keeping pace with this march of technology[1]. Today, as technology empowers patients and healthcare professionals like never before, we focus on the clinical aspects of technology in diabetes, or "digital diabetology", as the title of this article says. Broadly, there are five aspects of digital health whereclinicians can help their patients.

Of Lifestyle Disease and "An App for That"

The increasing occurrence of type 2 diabetes in our midst has overwhelmed healthcare practitioners. This has been accompanied by digital tools which can assist the person with diabetes to follow dietary advice, be physically active and reduce stress. These tools have been shown to meaningfully improve glycemic markers such as HbA1c. Importantly, many of these tools are free, and can be accessible to all. Listing these apps is beyond the scope of this article. Doctors and caregivers must themselves study the application and its usefulness before advising digital tools that promise to change lifestyle. While we know of the well-known promise of technology to solve the world's problems (remember the adage "there's an app for that"), there are many concerns with these digital lifestyle apps.[2] For instance, while some tools write about the remission of type 2 diabetes, the sustainability (or, more importantly, the lack of it) of remission beyond the short term needs to be discussed with our patients. Security concerns also exist – and any digital tool must clearly spell out how the data is used. Third, reputability of the service provider, based on high quality research publications and endorsement by government regulatory bodies are important to consider. Taken together, a personalized and ongoing consultation, or for that matter teleconsultation with doctors, nutritionists, behaviour therapists and exercise experts is still the best choice when it comes to motivating and lifestyle change for health improvement. Admittedly, this is not easy to implement in a country like India, given its more than 76 million people with diabetes. Given this reality, we as healthcare practitioners could be cautiously optimistic of health care tools that promise to improve adherence to lifestyle change.

The "Class" Monitor

The sheer class of technology in empowering diabetes care is best brought out in the monitoring of glycemia. This is where digital diabetes care is literally blooming

in the management of hyperglycaemia. From the days of urine glucose testing and the years of the archaic and unreliable glucose meters, we have now entered the era of smart monitoring. Today, connected glucometers that sync data from the glucose meter to the mobile phone are a reality and several glucose meters offer this advantage. These glucose meters are often appreciated by patients too[3]. Such connected glucose meters facilitate remote monitoring and tele-diabetology practice[4]. For instance a health care provider sitting in the clinic can access blood glucose data of the patient, offering health care advice remotely.

Even more exciting is the Continuous Glucose Monitoring (CGM) system. While the glucose meters mentioned above can detect blood glucose levels at a point in time, CGM device scan sense glucose continuously by simple subcutaneous devices and transmit it to a screen. Data can be downloaded and analysed by doctors; the use of CGM has been supported by guidelines[5]. More importantly, this data can be directly seen by patients helping them make lifestyle changes in accordance with their blood glucose patterns, making this CGM into a "moving selfie" of blood glucose levels. Not surprisingly, companies are connecting such CGMs with lifestyle modifying apps and promising a remission of type 2 diabetes. But more excitingly both industries and individuals have been connecting the CGM devices to insulin treatment algorithms in type 1 diabetes. This is because people with type 1 diabetes require insulin injections long term, and the pain of testing and injection can, to some extent be attenuated by these Do-It-Yourself (DIY) devices which connect CGMs to insulin delivery systems[6]. The use of this DIY device does raise some ethical dilemmas though as these connected systems require more research[7]. While these CGM systems do reduce glycemic variability, the targets to be achieved for CGM parameters of variability with a view to preventing diabetic complications remains to be established[8]. Nevertheless it is true that these CGM devices do reduce variability and prevent hypoglycaemic episodes, facilitating overall better glycemic patterns.

A Tech Treat

One of the biggest advantages of technology in diabetes is it's potential to impact therapeutics. The promise of technology in lifestyle interventions has been mentioned above. Also well-known are the simple alarm-based pill reminders, which could potentially improve adherence[9]. While the potential of mobile text messaging for preventing the progression of prediabetes to diabetes is well known[10], more studies are needed.

However, it is known that technology can help adjust medications, for example, insulin doses. A recent study showed that people with type 2 diabetes who were started on basal insulin could be assisted by an app which helps implement a basal insulin-titration schedule to reach appropriate glycaemic targets[11].

However, the most classical implementation of technology is continuous subcutaneous insulin therapy also referred to as CSII or insulin pump treatment. Newer versions of this technology promise to transform type 1 diabetes care[12]. This treatment, in which a battery powered chip pushes a syringe pump's insulin through a tubing directly into the subcutaneous space is an accepted therapy of type 1 diabetes; recent versions of this machine can adjust insulin dosing according to the ambient glucose levels: this works in ways similar to, though nowhere close to a true artificial pancreas. This system is also referred to as a closed loop system, because it closes the loop between glucose sensing and insulin delivery. Such closed loop systems are shown to give a more precise insulin delivery, reducing or even stopping insulin from entering the body when correctly predicting hypoglycaemia. On the otherhand the close loop system can increase the insulin dose during hyperglycaemia. A variant of this closed loop system is the bionic pancreas – which, in addition to insulin dosing, also avoids hypoglycaemia by timely infusion of a blood glucose raising hormone, i.e. in this case, glucagon[13].

It is Complicated

Complications due to diabetes can be diagnosed early via technology. A classic example is the increasing use of artificial intelligence in ophthalmic hand-held fundus cameras, which could identify both early and advanced diabetes related retinopathy[14]; it is important to note that these tools have limitations. Similarly, early detection of neuropathy and postural instability via fall and gait detection have been studied[15]. An early sign of diabetic kidney disease is hypertension and this can be diagnosed early by wearables. Detection of hypertension, heart failure and arrhythmias using technology is being increasingly discussed, though there are challenges with analysis and smart handling more than data acquisition[16]. In future, it might be possible to predict and diagnose diabetes-related complications via point of care, and multi-analyte detecting sensors. It is hoped that the appropriate use of technology could help diagnose and treat diabetes related complications early.

The Idea is HIS

With the increasing availability of Electronic Medical Records (EMR) and Hospital Information Systems (HIS), telemedicine for diabetes care is becoming a reality. It is important, firstly, to decide whether the person with diabetes can be managed over telemedicine, or whether the disease, its complications and comorbidities require a hospital visit[17]. A first time telemedicine consultation can be challenging, while follow up consultations are possibly simpler. Tele-diabetology for podiatry care, also referred to as tele-podiatry, has been described, and a recent article suggests that tele-podiatry could serve as a triage for bringing the sicker diabetic foot patients to hospital; at the same time, ideally all diabetic foot patients should visit a hospital for their care[18]. It is possible, however, to have a diabetes related consultation to be delivered via telemedicine in certain scenarios, and there have been guidelines for this. While choosing an appropriate EMR, doctors should choose a product that is secure and ensures privacy; after all, the entire data of the patient belongs to the patient and the doctor/ hospital/ platform/ provider has merely been entrusted with looking after it.

Thoughts for Today and the Future

Technology is enabling research like never before-indeed CGM-based outcomes can be included in research studies of anti-diabetes medications, as was elucidated by a recent study from India[19]. Another, unrelated point is that with the advent of social media, the spectrum of digital diabetology has become a tool for information, as well as misinformation. As doctors, we have a responsibility to educate and make people aware of the right approaches to diabetes management. Given this, it is important that we prevent misinformation by proactively conducting awareness sessions for both people with diabetes as well as the larger general population. Misinformation can harm – an example is the case of statin discontinuation in people with baseline diabetes and cardiovascular disease in Denmark[20]. In this Danish study, it was shown that negative news stories about statins lead to statin discontinuation in people who have diabetes and cardiovascular disease. The study also concluded that such early stoppage of statins increases the risk of cardiovascular events such as myocardial infarction and cardiovascular death[20]. Given the all-pervasive nature of digital media today, we health care professionals should fight misinformation by conducting educational programs that help convey the correct information.

While the revolution of artificial intelligence and digital health sweeps over the healthcare domain, we as doctors could welcome it as another tool in our armoury. Embellishing clinical art and intuition with the science of data may indeed help patients. In future, artificial intelligence may build in the “art of medicine” and even artificial empathy and compassion. But for the moment, a good history taking, clinical examination, interpreting laboratory tests/ imaging and discussing treatment decisions are the best tools that we have. And if we indeed already have these skills, refining them further with technology-enabled data and tools can only help healthcare progress further as we help our patients to heal.

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