

A 2020 Update on Diabetes Technologies with Emphasis on Telemedicine during COVID-19

Jothydev Kesavadev

Chairman & Managing Director, Jothydev's Diabetes Research Center, Trivandrum, Attingal & Kochi, Kerala, India*

ABSTRACT

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Technological advancements have paved way to the development of an array of newer diabetes technologies making disease management much more effective and hassle-free. These include minimally invasive and user-friendly glucose monitoring systems with better accuracy, insulin pumps providing near physiological insulin delivery, point-of-care testing devices that provide immediate and actionable information, various artificial-intelligence enabled mobile apps for diabetes management, etc. where each one of them can empower the diabetes care providers as well as the patients or the care givers facilitating productive outcomes in diabetes management. In addition remote glucose monitoring systems and telemedicine are evolving as the standard of care during this COVID crisis. Some of such recently introduced diabetes technologies are being discussed here.

Keywords: Diabetes Technologies, Telemedicine, Technology and Diabetes, Covid-19

*See End Note for complete author details

INTRODUCTION

For a successful diabetes management, a systematic, patient-centered approach for diabetes care including a periodic review and a continually updated diabetes care plan provided by a multidisciplinary team has been highly advocated. Patient self-management also constitutes an important component in diabetes care for successfully preventing or delaying diabetes complications.¹ Numerous diabetes technologies that are currently available can empower diabetes care providers as well as the patients or the caregivers and thereby make disease management much more effective and hassle-free (**Figure 1**). Major examples include the minimally invasive and user-friendly glucose monitoring systems with better accuracy, insulin pumps providing near physiological insulin delivery, point-of-care testing devices that provide immediate and actionable information, and the various artificial-intelligence enabled mobile apps for diabetes management. This review throws light on some of the recently introduced technologies for diabetes care which are either available or to be launched soon in India.

Contour[®] Next One Blood Glucose Monitoring System

The CONTOUR[®]NEXT ONE smart meter and CONTOUR[®]DIABETES app seamlessly connect to capture the glucose readings via Bluetooth, which can be conveniently accessed on a smartphone, tablet or computer. The captured readings will be automatically

synced and logged, and over time, helps create meaningful insights regarding how one's lifestyle can affect the blood glucose levels. Salient features include the 1) smartLIGHT[®] feature (an instant indicator of the blood glucose levels i.e. green for within target, amber for above target and red for below target); 2) Second-Chance[®] sampling (same test strip can be reused if the first sample was insufficient); 3) options to add routine events like diet, activity etc.; 4) detects the patterns in glucose readings; 5) smart alerts, etc.²

In the Contour mobile app, patients can, at the click of a button create and send a digital diabetes diary to the doctor's office. Since this is colour coded, it is one of the easiest and fastest means of decision making for changes in therapies and behaviours.

Onetouch Verio Flex[™] Meter and the OneTouch Reveal[™] App

The OneTouch Verio Flex[®] meter connects wirelessly with the OneTouch Reveal[®] mobile app and syncs data to the patient's smartphone or tablet. The electronic visual logbook in the mobile app automatically logs and organizes blood glucose results and provides visual snapshots. ColorSure[™] technology highlights patterns and can motivate patients to perform structured SMBG. The app facilitates the entry of data on medications, carbs and physical activity and enhances the scope for setting and following customized targets. OneTouch

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Corresponding Author:

Dr. Jothydev Kesavadev MD, FRCP,FACE, Chairman & Managing Director, Jothydev's Diabetes Research Center, Trivandrum, Attingal & Kochi, Kerala, India. www.research.jothydev.com E-mail: jothydev@gmail.com

Reveal Web App facilitates the healthcare team to set individualized treatment goals, quick subgroup analysis of the patients, and generate ready to publish data.³ The real time availability of blood glucose data at the doctor's office along with visualisation of trends and patterns are provided totally free of cost in India.

iPro2 Continuous Glucose Monitoring System

The iPro² Professional Continuous Glucose Monitoring system procures interstitial fluid (ISF) glucose profile and consists of Enlite Sensor, iPro2 recorder and the Enliteserter. The iPro2 recorder collects (up to 7 days of data) and stores data from the glucose sensor and is intended for multiple patient use (can be used up to 60 times). CareLinkiPro[®] Therapy Management Software for Diabetes, helps generate reports and store the data, allowing the healthcare provider to take optimal treatment decisions.⁴

Freestyle Libre Pro Continuous Glucose Monitoring System

Abbott's FreeStyle Flash Glucose Monitoring system (FGM) is available in two versions FreeStyle Libre (real time) and FreeStyle Libre Pro (professional version). Only the FreeStyle Libre Pro model, is currently marketed in India. The sensor comes in a factory-calibrated mode thus eliminating the need for fingerstick calibrations. The recommended sensor wear-time is 14 days and the system captures as many as 1340 glucose values. The recorded glucose values can be procured by the health care provider's FreeStyle Libre Pro reader in as little as 5 seconds. A secure free cloud-based diabetes management system, Libre View or the Free Style Libre Pro reporting software designed for desktop provides easy-to-interpret reports. The comprehensive glucose report 'Ambulatory Glucose Profile (AGP)' generated provides a visual snapshot of glucose levels, trend sand patterns over time, allowing for better outcomes in diabetes management.⁵⁻⁷

Using a third party mobile app, millions of patients are using Libre Pro as a real time device and capable of communicating via telemedicine with healthcare providers during the pandemic.

Eversense[®] 90-Day Implantable Continuous Glucose Monitoring System

Eversense[®] CGM is the first and only CGMS to feature an implantable glucose sensor and procures data for up to 90 days. The system includes a pill-sized sensor implanted in the upper arm, an on-body transmitter, and a mobile app that displays glucose data and issues alerts. It eliminates the need for frequent sensor insertions and is also the first CGM to issue on-body vibration alerts and thus notifies the user in the event of highs and lows.⁸

Guardian[™] Connect Continuous Glucose Monitoring System

Guardian[™] Connect CGMS is intended for people using multiple daily insulin injections and aged 14 to 75 years. It works with 3 elements: a thin sensor, a small transmitter attached to the sensor and the Guardian Connect app on a compatible iOS device. It is thus the first smart standalone CGM system that does not require a receiver and directly sends continuous sensor glucose data from the sensor transmitter to a smartphone. The Sugar.IQ[™] smart diabetes assistant app analyzes how an individual's glucose levels respond to their food intake, insulin dosages, daily routines, and other factors. The system has customizable alerts that allow the users to get notified about future high and low glucose events up to 60 minutes in advance, and also allows the caregivers to track the user's glycaemic status remotely in real-time or via text alerts.⁹

Guardian sensor 3, the latest version, is available in India with superior accuracy. This sensor provide glucose values every 5 minutes. This has become a game changer during lockdown since the data can be shared via the web browser in real time and provides option for free sms alerts well ahead of a hypoglycemia or hyperglycemia.

Afinion 2 Analyzer

Afinion 2 Analyzer from Abbott is a Point-of-care HbA1c testing device, designed for use in a physician's office, a treatment room, or at a bedside. It uses a finger-prick capillary blood sample which when applied to a test cartridge, is analyzed within minutes. Potential advantages of the system over laboratory A1C testing include- Simple to perform, accurate and rapid test results expedites medical decision-making, more convenient for patients, and can improve health system efficiency.¹⁰

Minimed 640g Sensor-Augmented Insulin Pump

The MiniMed 640G Insulin Pump is a sensor-augmented pump (SAP) and has built-in intelligent features including the SmartGuard technology, active insulin tracking, bolus progress bar and predictive battery life. The SmartGuard technology predicts when a patient is approaching low glucose levels 30 minutes in advance and automatically stop insulin delivery. When the glucose levels recover, SmartGuard will automatically resume insulin delivery. Multiple low limits can be set throughout the day to give increased protection.¹¹

Minimed 670g Insulin Pump - The World's First Hybrid Closed Loop System

The Medtronic's MiniMed 670G hybrid closed-loop insulin pump system features an advanced algorithm, the SmartGuard HCL, which enables greater glucose control with reduced user input. The Suspend on low



Figure 1. Currently available diabetes technologies. (a) CONTOUR® NEXT ONE blood glucose monitoring system, (b) OneTouch Verio Flex™ meter and the OneTouch Reveal™ app, (c) iPro2 professional continuous glucose monitoring system, (d) FreeStyle Libre Pro continuous glucose monitoring system, (e) Eversense® 90-day implantable continuous glucose monitoring system, (f) Guardian™ Connect continuous glucose monitoring system, (g) Point-of-Care HbA1c testing device Alere Afinion™ HbA1c Dx, (h) MiniMed 640G insulin pump, (i) MiniMed 670G hybrid closed-loop insulin pump, (j) Life in Control Diabetes Coach, (k) Medios Technologies AI Assistant to detect diabetic retinopathy, and (l) mySugr app.

feature stops insulin delivery for up to two hours when the sensor reaches a preset low, and the Suspend before low option stops insulin delivery up to 30 minutes before reaching the preset low limits and automatically resumes when the glucose levels recover. When in Auto Mode, the system automatically adjusts the user's basal insulin every five minutes based on the CGM readings. 670G will thus reduce time at dangerous high and low blood sugar levels, improve time-in-range, reduce glucose variability, bring much greater nighttime safety and target morning blood sugars.¹²

Artificial Intelligence Enabled Platforms for Diabetes Management/ Detection of Diabetes Complications

Numerous disease management or disease detection platforms such as mobile apps are currently available and many of them are geared with the latest Artificial Intelligence (AI) technology. They have made the detection as well as management of the disease much simpler, accurate, affordable and accessible. The multi-model bot enabled diabetes care platform- Life in Control Diabetes Coach,^{13,14} Medios Technologies AI Assistant to Detect Diabetic Retinopathy and my Sugr diabetes management app are some of the disease management/detection platforms available for diabetes care. Medios Technologies AI Assistant helps doctors diagnose diabetic retinopathy (DR) during a typical diabetes check-up in a convenient and efficient way without a specialist.¹⁵

The mySugr app makes it quick and easy to collect relevant therapy data in one place. It integrates with a number of different diabetes and health-related partners via Bluetooth or direct connection and also supports a number of other cloud data sources as well as Apple Health[®], Google Fit, and web import for data from compatible programs. Important therapy data such as meals, medicines, blood sugars, can be captured quickly and easily. Other salient functions available include, 24-hour overview, estimated HbA1c, helpful feedback to encourage engagement, bolus calculator module etc.¹⁶

Smart Connected Insulin Pens

The conventional insulin pens are rapidly transforming into a connected ecosystem. Insulin pens with memory, which store the information on the size of the last delivered bolus; Bluetooth enabled pens which can connect to continuous glucose sensors and semi-automate insulin delivery based on algorithms in the mobile phone; pens which connects to mobile phone apps such as MySugr via near field communication(NFC) etc. are supposed to make diabetes care easier, error free and considerably improve outcomes.

Time in Range

Time in Range the new target for diabetes is endorsed by ADA 2020 guidelines, the assessment of which will require technological aid. A time in range between 70 and

180 mg/dL above 70% of time in 24 hrs should be the objective in general.¹⁷ Time below range or TBR describe the durations spent in hypoglycemia. The guidelines specify different ranges for different types of diabetes and for individuals with co-morbidities.^{17,18}

Telemedicine

Telemedicine has evolved as the standard of care during the Covid crisis. Use of electronic medical records and technologies in diabetes can make consultations highly fruitful and in diabetes this is likely to continue along with in person consultations even in the post Covid era.^{19,20}

CONCLUSION

Technological advancements have made a tremendous impact in diabetes care. They can empower healthcare providers, patients as well as their caregivers to become active players in improving diabetes care. The newer technologies while replacing the existing ones are simpler, user-friendly, cost-effective and ensure successful short term and long term outcomes in diabetes. All eligible and affordable candidates should, therefore, be invariably prescribed with the latest and the most recommended diabetes technologies to aid them successfully overcome the major barriers in treatment and help them retain the quality of life while surviving longer with the disease.

END NOTE

Author information

Jothydev Kesavadev, Chairman & Managing Director,
Jothydev's Diabetes Research Center, Trivandrum,
Attingal & Kochi, Kerala, India
www.research.jothydev.com
E-mail: jothydev@gmail.com

Disclaimer

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