



Implementation of Diabetes Technologies in Primary Care: Challenges and Rewards

Eric L. Johnson¹ and David M. Kayne²

This article focuses on the challenges to and rewards of using technology in diabetes care. The authors provide everyday, practical information regarding the integration of technology, including insulin pumps, continuous glucose monitoring devices, and other diabetes consumer technologies, into busy primary care practices. Cases are presented to highlight these tips.

This special-topic issue of *Clinical Diabetes* focusing on diabetes technology includes comprehensive overviews of available technologies and their translation into primary care practices throughout. These technologies include optimized blood glucose monitoring (BGM) with smart meters and continuous glucose monitoring (CGM) systems, as well as practical applications of the data collected through such monitoring in the clinical decision-making process. The articles in this issue also review guidance from the American Diabetes Association and the European Association for the Study of Diabetes regarding the plethora of digital solutions (i.e., consumer applications [apps] and wearable devices) and their potential for assisting in diabetes management via features such as meal tracking, exercise monitoring, and even cardiac monitoring. The importance of having frequent discussions with patients about the potential benefits of using technology for help with daily diabetes management tasks such as insulin dosing is underscored. Concepts are introduced such as interpreting CGM data in terms of time spent in the target glycemic range and improving insulin delivery via smart insulin pens and pen caps or advanced insulin pumps to avoid extreme low or high blood glucose levels. Ultimately, the goals of all of these technologies are to improve the diabetes experience for patients and to reduce their self-care burden. Patients in primary care

practices often express interest in how they might incorporate technology solutions—especially CGM systems, smart meters, and smart insulin pen devices—into their own diabetes regimen. This article examines some of the challenges and rewards of implementing diabetes technologies in the primary care setting.

Challenges to the Use of Technology in Primary Care

The coronavirus disease 2019 (COVID-19) pandemic has catapulted primary care into the virtual care arena, and telemedicine is now accepted as the necessary new normal for primary care practices to survive. The future will see fewer in-person visits and more telemedicine, with a heavy emphasis on video and telephone visits. This evolution will be a big transition for many patients and providers. Developing a skill set to improve the quality of remote visits may help ease the transition.

Successful virtual visits are more than just video calls, yet they are not replications of in-person clinic visits; they are an experience unto themselves. In some ways, they are like old-fashioned house calls, allowing providers to see patients in their own environment, which may or may not be comfortable for patients. Providers need some skills to really connect with their patients during virtual visits. These include looking into the camera to simulate eye contact, speaking up to be easily heard through a microphone, providing a private environment on the provider side that is free of distractions, and maintaining professionalism. Resources for achieving successful telemedicine visits are available from the American Medical Association (1), the American Academy of Family

¹Department of Family and Community Medicine, University of North Dakota School of Medicine and Health Sciences, Grand Forks, ND; ²Cedars Sinai Medical Group and Providence Cedars Sinai Hospital, Encino, CA

Corresponding author: Eric L. Johnson, eric.l.johnson@med.und.edu

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Physicians (2), and the American Association of Medical Colleges (3).

Electronic health record (EHR) systems have become the hubs that connect most primary care activities such as visit documentation, review of laboratory results, prescription management, and communication with patients. Adding new systems and data streams from smart devices that may not integrate into the EHR can complicate providers' workflow. Furthermore, mastering the new skill set needed to meaningfully and appropriately use blood glucose and other remotely collected data can also be a challenge. However, the ability to bill payers for many of these services can make such changes worthwhile even in busy primary care practices.

Other barriers to technology use in primary care practices include difficulties with time management, limited access to resources, fear of encroachment of ever-increasing technology options, and lack of understanding of billing and coding procedures.

Rewards From the Use of Technology in Primary Care

Data provided by smart glucose meters, including blood glucose values and records of activity, meals, and sick days, are collected into a meaningful, cohesive dataset. Patients may find that they should be testing at different times, or perhaps even testing less frequently, depending on their data and medications. Problem areas may be uncovered that can be specifically addressed.

With the use of CGM in particular, 24-hour patterns can reveal glycemic control during previously unevaluated times such as overnight, during exercise, after meals, or during travel. CGM enables the capturing of hyperglycemia and hypoglycemia around the clock, which is not feasible with traditional fingerstick blood glucose testing, which provides data only at discrete time points. CGM vastly reduce patients' need for fingerstick BGM testing, which may in turn improve their quality of life. Acting on continuously collected glycemic data, patients may decrease the time they spend in both hypoglycemia and hyperglycemia.

Smart pens or pen caps provide their own proprietary datasets or can be incorporated into CGM data, allowing patients and providers to evaluate insulin dosing, dose timing, and therapy compliance in addition to glucose values before and after doses. When properly uploaded into a cloud-based environment, these datasets can be reviewed with patients either during an in-person visit or remotely during a telehealth visit.

Tips for Incorporating Technology Into Primary Care

Defining a Division of Labor

Diabetes is a well-accepted interprofessional team management condition. Data may originate from a variety of different devices used by patients in a typical primary care clinic. A good way to start using various devices and technologies is to review who your diabetes care team members are and the roles they can play in this effort. An ideal practice providing diabetes care would include a primary care provider, nurse, certified diabetes care and education specialist (CDCES), nutritionist, advanced practice nurse and/or physician assistant, and other professionals such as a social worker and behavioral health professional. The initial step in integrating diabetes technology into practice is to become familiar and comfortable with the most common devices that may be used. In a primary care practice with many patients with diabetes, developing a clear division of labor can optimize the management and interpretation of digital data from smart meters, CGM systems, smart pens, wearable devices, and health apps.

Uploading or Downloading Data

CGM systems and smart meters often offer downloadable or uploadable datasets. The responsibility for obtaining and compiling the data for the clinic could be assigned to a CDCES, but more likely in many primary care practices without such a professional in hand, a nurse or medical assistant will need to be trained to manage this task. Cross-training of at least two staff members is advised. Once staff are adequately trained, data downloading or uploading can be carried out fairly quickly, making data available in a timely manner for patient visits.

A large majority of device manufacturers offer software that can be installed on an in-clinic computer. Subsequently, devices can be downloaded to paper or an electronic file (i.e., a PDF report), uploaded into an EHR, or uploaded to a commercial data management site. For CGM data, such software can be specific to the device (e.g., Dexcom Clarity software for Dexcom CGM systems, Medtronic CareLink for Medtronic devices, or LibreView for the FreeStyle Libre CGM) or a third-party app such as Glooko or Tidepool, which offer uniform data views and are compatible with many different devices. Industry representatives can often provide help by phone or online in installing apps on a dedicated clinic computer. In some cases, assistance may be needed from a clinic's information technology specialist.

For professional CGM systems (i.e., those owned by clinics for use by patients intermittently over time to guide therapy), a CDCES or other trained team member often takes care of device starts, setting up the system to collect 1–2 weeks of data for retrospective review by the provider and patient. For personal CGM systems (i.e., those owned by patients for intermittent or continuous use based on individualized needs and preferences) and other digital devices, clinic personnel can download or upload data, or, alternatively, patients can do so at home before scheduled visits to save precious time.

For virtual visits, the ability of patients to download to a paper (i.e., PDF) report or upload to the appropriate software or website is a necessity, and many of the device companies are facilitating this process. Patients might also choose to e-mail their data (ideally through a secure connection) to the clinic.

A CDCES, nurse, or medical assistant can manage these datasets for clinic visits to improve efficiency. Uploading websites for specific CGM systems are set up to operate the same or nearly the same as in-clinic data apps, so data can be viewed easily either way before or during the clinic visit. Having data available can improve the efficiency of tightly scheduled clinic visits and promote meaningful interactions with patients or their caregivers regarding blood glucose management. These discussions, in turn, can assist providers and patients in making appropriate changes to medications or lifestyle behaviors in response to specific needs. Helping patients get comfortable with these processes can reduce the possibility of device and data overload on the part of patients.

With respect to wearable devices, useful data can include physical activity and food logs (i.e., calories and carbohydrates consumed) and are reviewed easily with patients at the time of the visit. Future linkage between these devices and EHRs will enhance their use.

Scenario 1: Dr. Jones' Clinic

Getting Started

Dr. Jones is an internist in a busy urban primary care practice with seven other physicians, two advanced practice nurses, 10 nurses, and several front office staff members. There is not a CDCES or a dietitian in the practice, but these professionals are available in the community. About 60% of the patients in this practice have type 2 diabetes. These patients generate many phone calls for the nursing staff, and one nurse has been designated as the “phone nurse.” The clinic is affiliated with a larger health care system that provides its EHR platform.

Increasingly, patients in the clinic have been inquiring about CGM, and particularly the FreeStyle Libre CGM system. Dr. Jones has read some materials, visited some websites, and watched some videos about the more common CGM systems. She decides to place this issue on the agenda of the next clinic staff meeting.

At the meeting, the clinical team decides to start using the flash CGM system and its online platform and prescribe it to a few patients “to see how it goes.” The phone nurse volunteers to also serve as “device manager,” and getting the data app set up on a dedicated computer is achieved in a couple of hours with the help of a device company representative, the company’s data management website, and the clinic’s information technology manager.

Most patients prescribed the CGM system download their data to paper (i.e., a PDF report) or upload data to the device site when they arrive at the clinic for an in-person visit. However, the providers find it frustrating to wait for data to start their appointments and often fall behind with stacks of unread CGM data waiting on their desks.

Improving Clinic Workflow

Typical workflow steps for CGM use in a primary care practice are as follows:

1. Patients check in at reception or online before their appointment.
2. Patients may upload their data to the device website (a password-protected process) in advance of their appointment.
3. Patients having in-person appointments who have not uploaded data at home in advance may give their devices to the designated staff “device manager” when they check in.
4. Health care providers see patients for their usual clinic encounters, saving some time for discussion of blood glucose values and the treatment plan at the end of the visit after the dataset has been generated or accessed.

After some thought and discussion with staff, Dr. Jones decides to do most of each clinic encounter with patients first and review CGM data at the end of the appointment rather than waiting for the data to be obtained before starting. She also decides to look at some of the uploaded reports online rather than reviewing a printed paper copy of the downloaded data. This proves to be a smoother process, and she notices some patients are more invested in their own diabetes care. She also sends some patients to the CDCES to be started on short-term professional CGM because they are struggling to

manage their blood glucose but are not sure if they want to get and use a personal CGM system.

After Dr. Jones has worked with a few patients using CGM, she builds more confidence, and the process becomes even smoother. The practice is now doing video visits for many of its patients. Having patients upload their data to the device website in advance of these encounters is ideal, allowing Dr. Jones and her patients to view the data together during the video visit.

Coding and Billing for CGM

CGM data interpretation is billable in many circumstances, and third-party payers may cover such services in addition to an office visit or even a video visit. At present, relaxation of certain third-party payer rules, including those of the Centers for Medicare & Medicaid Services, may apply (4). Current Procedural Terminology (CPT) code 95251 is the billing code used for analysis, interpretation, and reporting of CGM data for a minimum of 72 hours of data regardless of whether they come from a patient's personal CGM device or a professional CGM system owned by the clinic. An appropriate CGM analysis, interpretation, and report should also include the following elements:

- For professional CGM, the addition of CPT code 95250 for placement of the sensor (not on the same day as the interpretation code 95251)

- Patient's name
- Patient's date of birth
- Patient's medical record number
- Indication for the device placement
- Name and type of device placed
- Sensor placement and removal dates (for professional CGM)
- Start and end dates of data recording (for personal CGM)
- Date of printout of data (which would be the date of service for 95250/95249 is reported)
- Analysis of data
- Interpretation of data
- Documentation of the ambulatory glucose profile (AGP; the standardized data summary report provided by CGM systems) (Figure 1). Times spent in, below, and above target glycemic ranges, as well as percent coefficient of variation (glycemic variability), all shown on the AGP report, are important concepts for interpreting data and taking actions to improve glycemic management.

The report should be signed by the physician (or non-physician health care professional working within his or her scope of practice) who is interpreting the report. All electronic signature rules apply.

Other documentation needed to justify CGM use may include:

- The patient is considering purchasing a personal CGM device to help with glucose management.

Ambulatory Glucose Profile
Dates of data review: June 23-July 3, 2020
Average glucose: 175 mg/dL
Glycemic variability (percent coefficient of variation; goal <36%): 49%
Time wearing CGM: 90%
Percentage of Time in Ranges
Very low: <54 mg/dL (goal: <1%): 4%
Low: <70 mg/dL (goal: <4%): 6%
Target range: 70–180 mg/dL (goal: >70%): 47%
High: >180 mg/dL (goal: <25%): 23%
Very high: >250 mg/dL (goal: <5%): 20%
Glucose management indicator: 7.6%
Interpretation: Excessive hypoglycemia both <70 and <54 mg/dL. Notable hyperglycemia >250 mg/dL. Less-than-ideal glycemic variability. Glucose management indication (estimated A1C) above 7% target. Adequate sensor wear time.

FIGURE 1 Documentation of information from the standardized CGM AGP data summary report.

- The patient has shown interest in CGM to achieve optimal blood glucose control. Other considerations in making this decision were:
 - Patient is currently taking insulin four times per day (or other medications)
 - Patient is currently performing BGM five times per day.
 - Patient can adjust mealtime insulin dose according to current glucose level and/or carbohydrate amount or meal size (if using mealtime insulin)

Smart insulin delivery pens have their own CPT codes: 99453 for initial setup and patient training on the use of equipment; 99454 for wireless data transmission/data collection/alerts and messaging; and 99457 and 99458 for remote patient monitoring treatment management services (the former for the first 20 minutes per month and the latter for an extra 20 minutes).

Scenario 2: Dr. Jones' Patient, Mr. J.

Mr. J. is a 60-year-old man with a 15-year history of type 2 diabetes. He also has hypertension, dyslipidemia, mild nonproliferative retinopathy, stage 3 chronic kidney disease (estimated glomerular filtration rate 52 mL/min/1.73 m² with albuminuria), and no history of cardiovascular disease. His medications include:

- Metformin 1,000 mg twice daily
- Lispro insulin 4–10 units before meals
- Extended-release glucagon-like peptide 1 receptor agonist maximum dose once weekly
- Basal insulin 34 units daily
- Lisinopril 20 mg daily
- Hydrochlorothiazide 25 mg daily
- Atorvastatin 40 mg daily
- Aspirin 81 mg daily

Mr. J. only occasionally carries out BGM via fingerstick testing and that is usually in the morning. He reports values generally in the mid-100 mg/dL range. His A1C is 8.2% with an individualized target of <7%. He notes late in the afternoon that he gets shaky and sweaty, especially if he has engaged in moderate activity such as walking or gardening. He has seen a CGM system advertised on television and would like to lower his A1C and not have to do fingerstick BGM. He relates this to Dr. Jones, his primary care physician.

Given his symptoms, Dr. Jones suspects afternoon hypoglycemia, but she also wonders whether there is undetected hypoglycemia or hyperglycemia at other times of the day as well. She orders a professional CGM study for 2 weeks.

Mr. J.'s 14 days of CGM reveal a pattern of late-afternoon hypoglycemia. As noted on his AGP data summary report, he had 6% of all CGM glucose readings in hypoglycemia (<70 mg/dL) and 35% >180 mg/dL. His glucose is in the recommended range (70–180 mg/dL) 59% of time, which is less than the recommended >70%. His glucose management indicator (estimated A1C predicted from his CGM data) is 8.1%.

Dr. Jones recommends adjusting his mealtime insulin dose downward at lunchtime and performing BGM before all meals and at bedtime. Mr. J. might also consider a different time of day to be physically active, if possible.

Together, Mr. J. and Dr. Jones decide that purchasing a personal CGM device may be a good choice for more consistent monitoring of glucose levels, as well as better understanding the effects of physical activity, food choices, and meal sizes on his blood glucose. Dr. Jones also recommended a smart insulin delivery pen so she can see that Mr. J. is following his regimen and monitor his insulin dosing and timing from the data it collects. Mr. J. can purchase both devices at his local pharmacy with proper documentation from Dr. Jones. He must also provide some additional BGM fingerstick test results demonstrating hypoglycemia and hyperglycemia so his insurance plan will cover a personal CGM. Once he is trained on both his CGM device and his smart pen by the CDCES, he can follow up remotely with cloud-based uploads and video visits on a monthly basis until he obtains optimal glycemic management.

Within a few weeks, Mr. J. likes having his blood glucose data instantly available without fingersticks but finds the CGM device's frequent low- and high-glucose alarms to be distracting. In addition, he had one instance of a sensor not inserted correctly, which resulted in inaccurate data. Review of his medications, food, and activity levels helped him reduce his glycemic variability and resulted in fewer alarms. A follow-up session with the CDCES helped him become more consistent with his sensor insertion technique.

After a few months, Mr. J. is feeling well with blood glucose levels more consistently in the target range, and he enjoys not having to perform fingerstick BGM.

Conclusion

Until recently, the rapidly advancing field of diabetes technology was apparent mostly in diabetes-oriented specialty clinics. Now that virtual medicine is at the forefront of primary care, it is clear that primary care providers who have patients with diabetes must also

embrace these advances. Increasing quality, improved ease of use, and better remuneration will lead to more use of various diabetes technologies in primary care practices. There will also be increased patient demand for certain devices, particularly smart meters, CGM systems, and smart pens. Some practices may also see an increase in the use of insulin pumps.

The articles in this special-topic issue of *Clinical Diabetes* approach the topic of diabetes technology from a variety of angles. The goal of this article was to review both the challenges and rewards of diabetes technologies and to provide tips for more easily implementing some of the more common ones in the primary care setting. Doing so, especially in this age of expanded telemedicine, will benefit both providers and patients in a team-oriented approach to improve diabetes management.

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DUALITY OF INTEREST

E.L.J. has served on speakers' bureaus for Medtronic and Novo Nordisk and advisory panels for Medtronic, Novo Nordisk, and Sanofi. D.M.K. has been a consultant and/or speaker for Eli Lilly,

MannKind, Novo Nordisk, and Sanofi. No other potential conflicts of interest relevant to this article were reported.

AUTHOR CONTRIBUTIONS

E.L.J. wrote the manuscript and researched data regarding blood glucose data and billing. D.M.K. reviewed and edited the manuscript and added information about various technologies. E.L.J. is the guarantor of this work and, as such, had full access to all the materials used and takes responsibility for the integrity of the data and the accuracy of the data and information included.

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