FEATURE ARTICLE

Remote Patient Monitoring in Diabetes: How to Acquire, Manage, and Use All of the Data

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The ability of patients and health care providers to use various forms of technology for general health has significantly increased in the past several years with the expansion of telehealth, digital applications, personal digital devices, smartphones, and other internet-connected platforms and devices. For individuals with diabetes, this also includes connected blood glucose meters, continuous glucose monitoring devices, and insulin delivery systems. In this article, the authors outline several steps to facilitate the acquisition, management, and meaningful use of digital diabetes data that can enable successful implementation of both diabetes technology and telehealth services in primary care clinics.

The role of technology in health care delivery has been steadily increasing over the past decade (1,2) and noticeably escalated during the coronavirus disease 2019 (COVID-19) pandemic (2–4). Many medical practices and patients have adapted to a new reality of care delivery via electronic means (5,6). Although terms such as "connected care," "telehealth," and "telemedicine" are often used interchangeably, here we will use "telehealth," which generally describes a broad collection of electronic and telecommunications technologies and services that can support at-a-distance health and medical care delivery. These tools can include video and audio platforms, health applications (apps), and data management technologies, all of which enable virtual medical visits, real-time or asynchronous communication, and the electronic transfer of data between health care providers (HCPs) and patients (6–8).

In recent years, telehealth has expanded to encompass both acute and chronic care, as well as hospital and emergency services (6,9–13). Experience is also building specifically for the use of telehealth in diabetes care (14,15), aided by expanded use of diabetes technology devices such as internet-connected blood glucose meters, continuous glucose monitoring (CGM) systems, and insulin delivery devices. Evidence is also accumulating in support of telehealth as a means of reducing some health care disparities, such as those facing people who live in rural areas, lack adequate transportation, or otherwise face limited access to medical care; however, disparities remain for individuals who lack access to the internet or to potentially beneficial technology devices (14–19).

Still, telehealth services are being used increasingly to acquire and remotely monitor patient health data from a variety of sources. Remote patient monitoring (RPM) is one important facet of telehealth that specifically refers to the process of using digital technology to obtain medical and health data from patients in one location and electronically transmit it securely to HCPs in a different location to be reviewed, interpreted, and used to inform clinical decision-making.

Common Devices Enabling RPM in Diabetes Care

CGM Systems

At the time of writing, commonly used personal external CGM systems in the United States included the Medtronic Guardian 3, Dexcom 6, and Freestyle Libre and Libre 2 14-day systems. These devices have two components: a sensor, which is a filament inserted below the skin into subcutaneous tissue, and a transmitter attached to or embedded within the sensor. The transmitter sends glucose data wirelessly to a reader or smartphone app. With some systems, transmitters can also send data to a sensor-augmented insulin pump (SAP) to enable automatic suspension of basal insulin delivery to prevent hypoglycemia or to an automated insulin delivery (AID) system to enable automatic adjustment of basal insulin in response to both hypo- and hyperglycemia.

CGM systems each have a proprietary, password-protected, free online platform where data can be uploaded and then

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downloaded in printable reports (i.e., the Clarity platform for Dexcom [20], the CareLink platform for Medtronic [21], the Libreview for Freestyle [22]). Patients can review the data with their HCPs in person or remotely to make treatment changes in response to their glucose patterns. HCPs may also review the data asynchronously (i.e., separately and at a different time from an in-person or virtual patient encounter).

Often, patterns emerge in CGM data that are not easily captured by fingerstick blood glucose monitoring (BGM), as CGM provides glucose data continuously rather than only at specific times of day when fingerstick BGM may be performed. For example, perhaps a significant and consistent pattern of glucose elevation is noted to begin after evening meals and extend partially overnight. Changing the medication regimen and/or instituting lifestyle modification could target and eliminate this pattern. Additionally, some systems offer alarms to signal impending high and low glucose levels so action can be taken to keep glucose within a person's target range. All of these devices also have smartphone apps, so users can access data easily at any time. Additionally, some CGM systems can be used with third-party data management sites such as Glooko (23) and Tidepool (24), which can also incorporate data from insulin pumps and other devices, although a subscription fee may be required in some cases.

As CGM becomes more popular and more widely used, primary care practices should be prepared to respond to increasing patient interest (25–27). As previously noted, CGM is already integrating with insulin pump technology in SAP and AID systems. Additionally, Tidepool has applied for U.S. Food and Drug Administration (FDA) approval of an algorithm that would enable users to connect various insulin pumps and CGM systems for fully closed-loop (i.e., artificial pancreas) insulin delivery (28). Additionally, other open-source algorithms for do-it-yourself (DIY) closed-loop systems already exist. Beyond Type 1 and other organizations provide up-to-date summaries of these looping systems (29–31). It is important to note that these systems are not approved by the FDA, however. In fact, in May 2019, the FDA issued a formal warning about DIY closed-loop systems, stating that "when patients combine devices that are not intended for use with other devices, or when patients use any unauthorized devices, new risks are introduced that the FDA has not evaluated for safety or effectiveness" (32).

This is a rapidly evolving field. Primary care practices will typically encounter or prescribe FDA-approved CGM systems for individuals with diabetes managed in a variety of ways, including those who may or may not be on insulin therapy and who may or may not use an insulin pump.

Connected Glucose Meters

Many common brands of meters used for fingerstick BGM (e.g., Accu-Chek, OneTouch, and Contour) now offer Internet connectivity and memory features to caption and integrate data such as BGM results, sick days, medications, and other physical activity. Some connected meters (e.g., Dario and Livongo) offer diabetes coaching and education for a fee, and some health insurance plans and employers cover these fees. Data management platforms such as Glooko (23) and Tidepool (24) can also access data from some connected meters (33).

Insulin Pumps

Insulin pumps are a high-tech means of delivering insulin for people who require it for diabetes management. These devices deliver rapid-acting insulin at programmed infusion rates for basal coverage, as well as calculate and deliver bolus doses for mealtimes and hyperglycemia correction based on insulin-to-carbohydrate ratios and insulin correct factors that are customizable to each user. Traditional insulin pumps are worn on the body and deliver insulin subcutaneously via a small catheter. Wear times vary, and infusion sites generally need to be changed every 2–3 days depending on the individual. Patch pumps are another available option for delivery of basal and/or bolus doses.

As previously mentioned, when integrated with a CGM system, SAPs will suspend delivery of basal insulin in response to impending hypoglycemia, and AID systems will automatically adjust insulin delivery based on CGM data to prevent both hypo- and hyperglycemia and increase glycemic time in range. All insulin pump devices, their settings, and any paired CGM data can be uploaded using software provided from the manufacturer or third-party platforms (23,24,33).

Smart Insulin Pens and Pen Caps

Smart insulin pens record and transmit insulin dosing data and provide bolus dose calculators that take into account a person's programmed insulin-to-carbohydrate ratios and correction factor, as well as current insulin on board (remaining active insulin from a previous dose). Smart pen caps can be used with standard pen devices for similar data management functionality. Both types of device offer reminders to help prevent missed doses. These options may be ideal for individuals who want to be more engaged in insulin dosing and decision-making without the use of an insulin pump. Furthermore, if used with CGM, smart pen/cap datasets can be reviewed remotely to evaluate insulin

dosing, therapy adherence, and dose timing, similar to insulin pump data. Smart pen data can also be uploaded to multidevice platforms such as Glooko and Tidepool (23,24,33).

Health Apps and Personal Digital Devices

The use of smartphone health apps has increased significantly in the past decade, as has the use of other consumer electronic devices. Billions of people globally use smartphones (34), with a significant proportion also using some kind of health app, often for lifestyle tracking and management. Tens of thousands of health apps are available on the Apple Store and Google Play websites (35,36), and sophisticated apps exist specifically for chronic disease management (37,38). From 2020 to 2021, during the COVID-19 pandemic, some of the most popular health apps were for fitness (39). Other popular apps are used for wellness tracking, food management, and even electrocardiogram tracking, and some can be used on smartwatches as well as smartphones. Free-standing personal digital devices such as Fitbit also offer many options and include smartphone apps and/or online platforms. Some apps and devices offer some features for free, with additional features available for a fee. A note of caution, however: not all apps are reviewed and approved by the FDA. At present, only high-risk apps such as those that calculate insulin dosing are regulated by the FDA, whereas lower-risk apps that offer only tracking or lifestyle support are not regulated. Digital therapeutics, which are clinically validated health technologies designed to treat a medical or psychological condition, are a separate category that must undergo an FDA review and approval process similar to that of prescription drugs (40).

The American Diabetes Association (ADA) and the European Association for the Study of Diabetes offer guidance for use of digital devices (41). In addition, the ADA offers a comprehensive consumer guide to devices and medications that is updated annually (42). These are excellent, comprehensive resources to guide the selection of diabetes devices and apps. A number of these products are described in detail in Table 1 (33).

Other diabetes education resources offer quality comprehensive information on devices and apps (43), as well as coaching apps (44). Common apps reviewed include Calorie King, MyFitnessPal, and mySugr, along with the various connected devices.

Successful Implementation of Technology and RPM

How can busy primary care offices implement diabetes technology devices and apps and best access, use, and manage the data they provide? The key to effective integration of technology is to set aside a time to fully explore the technology landscape, learn and gain comfort using the systems you will most likely manage in your practice, and understand the process needed for prescribing, initiating, managing, and trouble-shooting these systems, as well as billing for these services. Preparing for technology integration and organizing your clinic to efficiently acquire and manage data are key to successfully implementing RPM. Below, we offer tips gleaned from our own clinical experience.

Survey the Landscape

HCPs who prescribe diabetes technology can potentially recommend any device, but extensive familiarity with the technology that is being initiated at the clinic level or patient utilization level will lead to more successful outcomes for patients and the practice. Note the more common devices used in your practice area, particularly with respect to blood glucose meters. Typically, insurance plans cover particular brands, and some employers may actually provide meters to their employees. Become aware of these arrangements, as there may be certain devices that are more likely to be used in your area.

Take the time to learn about the data available from each device and how they are downloaded and reported. Many glucose meters have software or plug-ins that can be installed on an in-clinic computer, whereas some have Bluetooth connectivity to an app. These are generally easy to manage after your practice has developed some comfort with them. Most data logs can be downloaded as .pdf files and scanned into an electronic health record (EHR) system or uploaded to password-protected commercial sites for review. In addition, clinics can purchase accounts to access data from third-party platforms such as Glooko and Tidepool (23,24).

Becoming familiar with the reports provided by devices in your clinic will enhance your ability to quickly and efficiently review data to inform care changes. Starting with a few devices will allow you to build your knowledge of each system, gain comfort in using it, and avoid information overload.

It is also important to learn about any other advanced features of the devices your patients may use. For example, some smart meters offer functionality including electronic communication with a certified diabetes care and education specialist (CDCES) or pattern-tracking capabilities.

TABLE 1 Summary of Diabetes Apps

App	Platform*	Type	Cost	Patient Benefits	HCP Benefits
ADA SOC	Apple/Android	Medical care recommendations	Free	—	• Full access to ADA Standards of Care • Online Web app available • Interactive tools for evidence-based decisions • Quick access to the summary of new revisions to the Standards of Care • Classifications for diabetes type and special populations
OneTouch Reveal	Apple/Android	Glucose tracking	Free	• Wireless data pairing • Glucose alerts • Food, medication, and activity tracking	• Data sharing • HCP reports
mySugr	Apple/Android	Glucose tracking	Basic: free; premium: mySugr Pro $27.99/year subscription; coaching plans: $19.99–$399.99	• Wireless data pairing • Medication and carbohydrate tracking	• HCP reports • A1C prediction
iHealth Gluco-Smart	Apple/Android	Glucose tracking	Free; requires iHealth Gluco-Monitoring System	• Wireless data pairing • Diet and activity tracking	• Data sharing • Secure Cloud data storage
One Drop	Apple/Android	Glucose tracking	Basic: free; premium: $17.99/month digital-only membership; $30.99–$89.99 membership with digital plus glucose meter and strips	• Wireless data pairing • Diet, medication, and activity tracking • Real-time decision support via personalized coach	• HCP reports
Health2Sync	Apple	Glucose tracking	Basic: free; advanced: $2.99/month subscription	• Manual glucose tracking/download with smart cable • Biometric tracking • Food, medication, and activity tracking	• HCP reports
BeatO Smart/BeatO Curv	Apple/Android	Glucose tracking	Free	• Glucose meter connection via 3.5-mm audio jack/charging port for data pairing • Option to connect with diabetes specialists • Activity tracker • Link to diabetes-friendly foods and products	• HCP reports • Glucose trend analysis
Dario Health Diabetes Management	Apple/Android	Glucose tracking	$25–$70/month subscription; covered by insurance for some	• Glucose meter connection via 3.5-mm audio jack/charging port for data pairing • Tracks carbohydrates, insulin, and activity • Database of 500,000 food items	• HCP reports

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TABLE 1 Summary of Diabetes Apps (Continued)

App	Platform*	Type	Cost	Patient Benefits	HCP Benefits
				• Emergency GPS location services • Proven glycemic improvement for hyperglycemia and normal glucose (80–120 mg/dL) for patients with type 2 diabetes	
Glooko	Apple/Android	Data management and monitoring	Free to individuals; custom pricing for clinicians	• Multidevice compatibility and integration (>100 devices) • Database of 500,000 food items • Diet and activity logging	• Remote patient monitoring • HCP reports • Insulin pump, insulin pen, CGM, glucose meter, and smart app integration
Dexcom G5/G6 CGM	Apple/Android	CGM	Free	• Real-time alerts • Severe hypoglycemia prediction alert (G6 only) • Rate-of-change alerts • Data sharing	—
Dexcom Follow	Apple/Android	CGM	Free	• Real-time alerts for high, low, and urgent low (<54 mg/dL) glucose	—
Dexcom Clarity	Apple/Android	CGM	Free	• Time-in-range glucometric data • Comprehensive reports with retrospective glucose patterns and trends • Data sharing with clinic • Daily or weekly notifications via e-mail • Connects with HCPs and caregivers to seamlessly share glucose information • Food, insulin, and activity logging	• Remote patient monitoring • HCP reports • CPT code 95251 for reimbursement
FreeStyle LibreLink/ Freestyle Libre 2 LibreLink	Apple/Android	CGM	Free	• Real-time glucose values updated every minute • Painless, 1-second scan to see glucose value and trends • In-app reports with retrospective glucose trends and patterns, including Time in Target and Daily Patterns (AGP) • Connects with HCPs and caregivers to seamlessly share glucose information • Food, insulin, and activity logging	• Remote patient monitoring via LibreView • Standardized AGP report with CGM metrics included in HCP reports • CPT code 95251 for reimbursement

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TABLE 1 Summary of Diabetes Apps (Continued)

App	Platform*	Type	Cost	Patient Benefits	HCP Benefits
LibreLinkUp	Apple/Android	CGM	Free	• Shareable with up to 20 followers • Notifications include current glucose and trend arrow • Logbook of previous glucose values	—
Medtronic Guardian Connect	Apple/Android	CGM	Free; Guardian CGM prescription required for use	• Real-time glucose data and alerts • Predictive alerts (60 minutes) • Data auto-uploaded to Medtronic CareLink	• Data shared to HCP clinic
SugarIQ	Apple	CGM	Free; Guardian CGM prescription required for use	• IBM Watson analytics for pattern detection • Personal insights based on retrospective data provided via text messages	—
Eversense	Apple/Android	CGM	Free	• Real-time glucose data and alerts • Predictive alerts • Temporary glucose profiles and do-not-disturb mode • Sharable with up to five followers via Eversense Now app	—
CGM in the Cloud/ Nightscout	Apple/Android	CGM	Free	• Real-time access to various CGM device data via personal website, smart watch, or app for CGM users and their followers • All CGMs are compatible with Nightscout	• Remote patient monitoring • HCP reports • CPT code 95251 for reimbursement
Tidepool Mobile	Apple/Android	CGM/multidevice data management	Free	• Compatible with pumps, CGM systems, glucose meters • Insulin, CGM, carbohydrate data tracking with notes	• HCP reports • Secure and anonymous data donation for future research
Livongo	Apple/Android	Lifestyle support	$73–$99/month subscription; typically provided by insurance plan	• Real-time support from diabetes response specialists • Health nudges: recipes, tips, and articles • Unlimited test strip and lancet ordering via app	• HCP reports
Apple Health	Apple	Lifestyle support	Free	• Glucose and medication/insulin tracking	• Streamlined health data sharing

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TABLE 1 Summary of Diabetes Apps (Continued)

App	Platform*	Type	Cost	Patient Benefits	HCP Benefits
				• Laboratory value storage • Apple HealthKit-linked CGM and glucose meter data • Personal health data storage	• Patient portal linking with affiliated health care organizations
MyFitnessPal	Apple/Android	Lifestyle support	Free	• Database of 11 million food items • Barcode scanner for packaged foods • Custom goals for weight loss and exercise, with community support	–
Calorie King	Apple	Lifestyle support	Free	• Database of 100,000 food items from 260 restaurants and fast-food chains	–
Figwee	Apple	Lifestyle support	Basic: free; advanced: $7.99/month	• 8,000-item visual food diary • Portion adjusting tool for carbohydrates	–
Glucose Buddy	Apple	Lifestyle support	Basic: free; advanced: $59.99	• A1C and blood glucose tracking • Medication, weight, blood pressure, and dietary tracking	–
MealIQ	Android	Lifestyle support	Basic: free; premium: subscription TBA†	• Customized meal planning based on diet, cost, ingredients, and macronutrients • Linked to online grocery stores	–
Diabetes Connect	Apple/Android	Lifestyle support	Basic: free; premium: $1.99/month; lifetime: $26.99	• Synchronized data from multiple glucose meters • Insulin, exercise, vital sign, and mood tracking	–
Diabetes M	Apple/Android	Lifestyle support	Basic: free; premium: $4.99	• Bolus and basal insulin calculators • Glucose and food tracking	• HCP reports
Beat Diabetes	Apple/Android	Lifestyle support	Free	• Basic education for users new to diabetes • Information about complications and treatments • Modern medicine and Ayurvedic practices	–

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TABLE 1 Summary of Diabetes Apps (Continued)

App	Platform*	Type	Cost	Patient Benefits	HCP Benefits
Sugar Sense	Apple	Lifestyle support	Free	• Glucose, insulin, carbohydrate, weight, and exercise tracker • Step counter • Estimated A1C	–
BlueStar Diabetes	Apple/Android	Combination blood glucose data management and lifestyle support	Free; requires access code from employer or health plan	• Artificial intelligence–derived feedback • Custom reports and education • Wireless data pairing • Medication, food, sleep, exercise, and blood pressure tracking	• Connected to HCP team • Access to diabetes care and education specialists • Electronic medical record integration
GoodRx	Apple/Android	Prescription cost-saving	Free	• Comparison of drug prices • Coupons for print or in-app use • Price tracking and alerts for drugs and medical supplies	–
RxSaver	Apple/Android	Prescription cost-saving	Free	• Comparison of drug prices • Coupons for print or in-app use • "My Meds" list for coupons and personal prescription list	–

*For specific compatibility details, check listing on app websites such as the App Store or Google Play. †Subscription plan still under development. Adapted from ref. 33. This is a rapidly changing field; be aware of possible changes or updates for individual apps or technology.

Gain Knowledge and Confidence

Many practices are adding CGM their diabetes management plans, as patient interest grows. Some patients may simply want to avoid the fingersticks needed for BGM; others may desire additional data to enable better glycemic management, particularly when CGM can be paired with a smart pen, advanced insulin pump, or app. Even the many patients who are still using traditional insulin injections or other diabetes medications may benefit from the insights afforded by CGM, and initiating this technology may be a logical next step for those who have become familiar with the data sets provided by connected glucose meters.

Because there are only a few FDA-approved CGM systems currently on the market, HCPs can learn about these devices with little difficulty. Importantly, it is essential not only to learn how the systems work and how to obtain data, but also how to make diabetes management decisions based on CGM-based glycemic metrics, which are more comprehensive and more rapidly available than A1C values and can therefore help to avoid therapeutic inertia by facilitating timely therapeutic adjustments based on shared decision-making with patients (45).

HCPs who prescribe a CGM system should be comfortable initiating, managing, and troubleshooting its use. This knowledge can be obtained through several different avenues such as device manufacturer training programs, online public information, or continuing education programs. The time investment needed for an HCP to gain the requisite knowledge is approximately 1–2 hours—roughly the same amount of time it takes to train a patient on this technology. Sitting in with an experienced CGM trainer, often a CDCES, may also be an option for some clinicians or clinic staff.

As familiarity with the technology grows within the clinic, we have found that designating a technology champion on staff who can receive additional training can improve efficiency. This champion can be responsible for keeping staff and patients up-to-date on new devices and features, overseeing data management, and maintaining a downloading station with a dedicated computer for this purpose in a

convenient location within the clinic. The clinic will likely need various software programs loaded on the dedicated computer for downloading data from various devices and platforms. The technology champion can also be responsible for maintaining the software and obtaining any necessary periodic updates.

Assign Responsibilities and Develop Workflows

Diabetes is best managed by interprofessional care teams. These teams may include physicians, pharmacists, physician assistants, advanced practice nurses, registered nurses, CDCESs, dietitians, and other professionals such as social workers, behavioral health professionals, medical assistants, and community health workers. Know which professionals are available to serve on your team, either within your clinic or on a consultative basis. CDCESs with expertise in technology can be especially helpful in teaching patients about their CGM system and how it interacts with their daily diabetes care.

Assigning specific duties related to data management can help to optimize your RPM efforts. Toward that end, developing staff workflows is an essential step. Taking the time to establish efficient workflows before implementing diabetes technology and RPM will save countless hours later and immediately maximize HCP-patient interactions.

In addition to the clinic technology champion, other staff members also play important roles. We have found that it helps to start the process at the time an appointment is made. Schedulers or clinic receptionists should ask whether patients are using any diabetes technology devices and remind them to bring all of the necessary components (i.e., devices and cords needed to connect and download data) with them to the appointment. Alternatively, a designated clinical team member could call patients in advance of their appointments to carry out remote data acquisition or uploading ahead of the encounter. Gathering data and information in advance will make the subsequent patient encounter more efficient and productive, whether it takes place in person or as a virtual visit.

In clinical practice, designating at least one team member to be responsible for obtaining patient data before, during, or after encounters is key. This could be a CDCES, nurse, or medical assistant; having more than one team member familiar with and able to carry out these processes is ideal. Patients or their caregivers can also play a role in data-sharing if they can upload data to a platform that the clinic can access in advance or download and e-mail data reports to the clinic ahead of their visits.

Obtaining data ahead of encounters will enhance the efficiency of the visit, allowing for meaningful discussion of blood glucose and lifestyle patterns right from the start. If data are not available at the start of a visit, however, the clinician can complete other elements of the visit first while the designated staff member obtains the needed data. The clinician can then review and discuss the data with the patient at the end of the visit.

Laying the groundwork for implementing technology can be time-consuming, but establishing consistent procedures, developing efficient workflows, and clearly defining roles and responsibilities is well worth the effort. This solid foundation, customized to the clinic, HCPs, and staff will be invaluable to ensure the smooth integration of technology in day-to-day clinical practice.

Engage With Patients

Assess patients' interest in adding CGM or other devices to their diabetes management regimen. Ask what health-related apps or wearable personal digital devices they may be using and what goals they may have set. Commonly, patients may be tracking food and/or fitness measures through apps or wearable devices. Because the number of available apps is large, validity may be a concern (46), so be prepared to recommend high-quality apps for patients to consider (Table 1).

Conducting virtual visits via internet-connected telehealth platforms is another aspect of RPM. The ability to meet with patients virtually has been crucial to maintaining continuity of care since the start of the COVID-19 pandemic and is also helpful in overcoming barriers to care such as distance, transportation, and mobility issues. Virtual visits can take the place of in-person visits or can augment in-person encounters for brief check-ins after changes are made to treatment regimens. HCPs can even educate patients about using diabetes devices during virtual visits. A few examples from our own practices include:

- How to administer glucagon-like peptide 1 receptor agonist doses with a pen device
- How to administer insulin using a vial and syringe or with an insulin pen
- How to use a smart insulin pen or pen cap
- How to carry out BGM with a glucose meter
- How to apply a CGM sensor and operate a CGM system
- How to review the standardized ambulatory glucose profile (AGP) report provided by all CGM systems
- What to do in response to data collected via BGM or CGM
- How to manage device or health-monitoring apps

For patients initiating use of an insulin pump, device manufacturers usually will provide a certified trainer to meet with the patient either in person or virtually, if none are available in your area.

Overall, the use of any diabetes technology, including devices, virtual visits, and other telehealth services, should be individualized and customized for each patient as part of the shared decision-making process recommended for the provision of diabetes care (47).

Understand Interoperability Limitations

The lack of universal interoperability of diabetes technology systems remains a formidable barrier to making the most efficient use of data originating from many sources. At present, certain insulin pumps interact only with specific CGM systems, and some glucose meters communicate glucose data only with certain insulin pumps. Additionally, some CGM systems require calibration with fingerstick BGM from an integrated meter, whereas others are factory-calibrated and require no fingersticks. Furthermore, compatibility among devices may change with software updates. Although such problems can be vexing, HCPs and clinic technology champions can stay on top of such issues by visiting manufacturer's websites or meeting with their representatives. Often device companies also have official channels on platforms such as YouTube, offering how-to videos and product updates.

Billing and Reimbursement for Technology Management and RPM

Securing Reimbursement for Professional Services

Obtaining reimbursement for implementing diabetes technology and downloading and interpreting data are relatively straightforward processes. In general, time documentation can always be noted in the time portion of the Current Procedural Terminology (CPT) evaluation and management (E/M) billing codes. Currently, there are no unique CPT additional modifiers for interpretation of data from insulin pumps or smart insulin pens. However, CGM has its own unique codes that are billable in all instances: as a stand-alone CGM or when paired with an insulin delivery device (Table 2). Physicians, nurse practitioners, and physician assistants are the prescribers who are allowed to bill for these services, although clinicians should check their individual state and payer requirements. Which CPT code and how to use it depends on who owns the equipment and what the service is; there are separate codes for initiating personal (patient-owned) and professional (clinic-owned) CGM systems, although a single code is used to bill for interpreting data from either type of system.

The following rules apply to billable interpretation of CGM data.

- Data must be derived from a minimum of 72 hours of CGM wear time.
- A face-to-face patient encounter is not required.
- Data can be obtained from the CGM receiver via downloading in the clinic, electronic transfer, or accessing and printing data from a Cloud-based platform.
- Data interpretation services can be billed on the day of the download or at any time analysis is performed before or after a virtual or in-person patient encounter.

Facilitating Coverage for Patients

Identifying a patient's technology needs, effectively matching the patient to the most appropriate device, and appropriately documenting these decisions in the medical record are the three essential steps to obtaining insurance coverage for diabetes-related technologies for patients. The following guidelines apply to CGM approval for Medicare and Medicaid recipients only; approval pathways and documentation requirements vary among private insurance plans but tend to be less restrictive.

TABLE 2 CPT Codes for CGM Services

Code	Description and Notes
95249	Personal CGM startup. This service involves ambulatory CGM of interstitial tissue fluid via a subcutaneous sensor for a minimum of 72 hours using patient-provided equipment and includes sensor placement and removal, device initiation/system start-up and calibration, patient training, and recording printout. Cannot be billed for a given patient more than once per month.
95250	Professional CGM startup. This service involves ambulatory CGM of interstitial tissue fluid via a subcutaneous sensor for a minimum of 72 hours using clinic-provided equipment and includes sensor placement and removal, device start-up and calibration, patient training, and recording printout. Cannot be billed for a given patient more than once per month.
95251	CGM data interpretation. This service involves analysis, interpretation, and reporting of data from ambulatory CGM of interstitial tissue fluid via a subcutaneous sensor for a minimum of 72 hours using patient- or clinic-provided equipment. Cannot be billed for a given patient more than once per month.
E/M codes	For an appointment in an office setting, appropriate code to be determine by the office at the time of service.

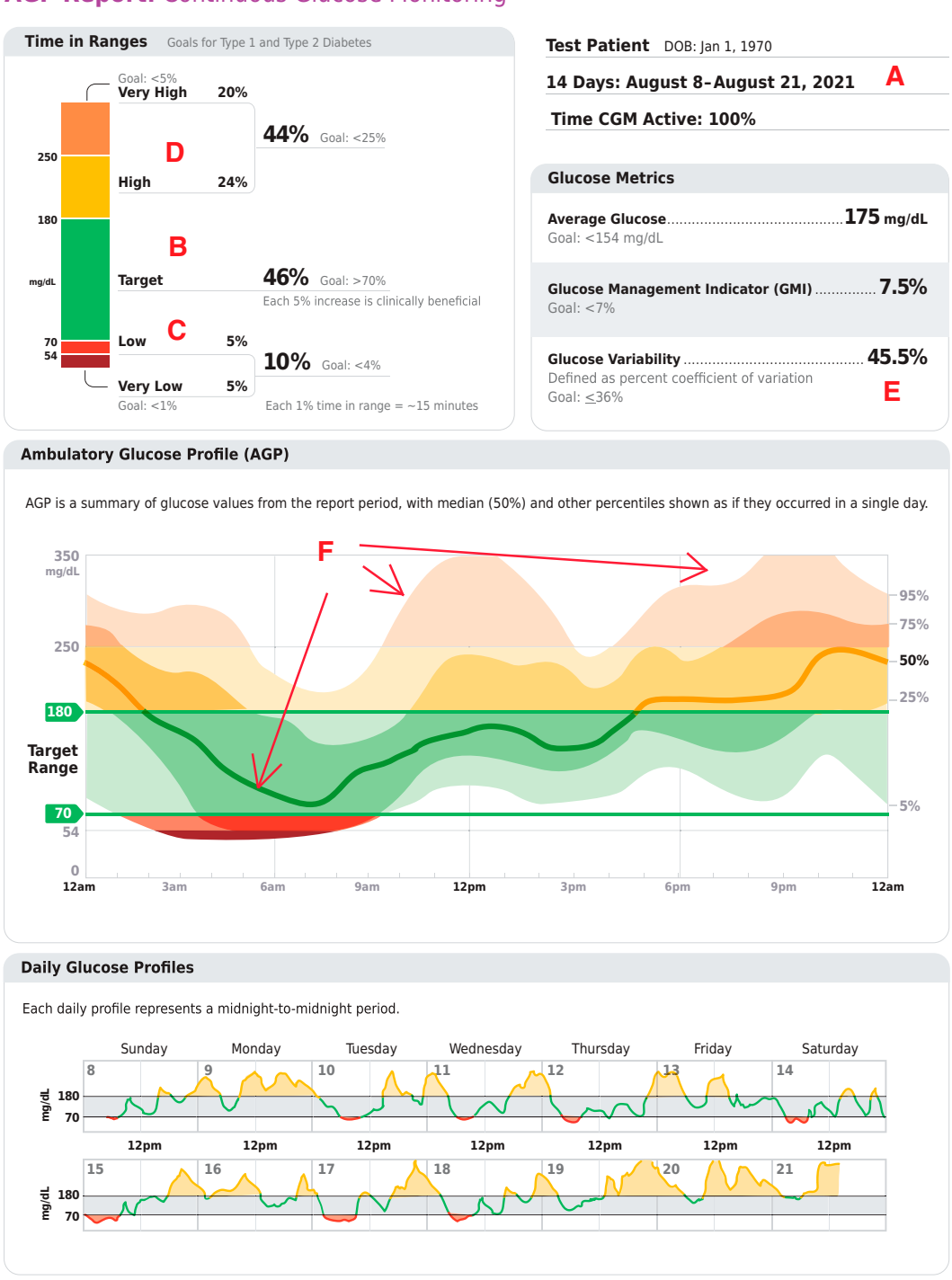

FIGURE 1 Recommended steps for reviewing a CGM AGP report. Begin by downloading, printing, and/or archiving the report in the EHR. Check to ensure that the report reflects adequate data for meaningful interpretation (*A*). The ADA recommends a 14-day data report with the CGM active for at least 70% of that time period. Ask the patient what he or she notices on the AGP. Review the amount of time spent in the glycemic target range (time in range [TIR]; 70–180 mg/dL) (*B*). For most people with diabetes, the ADA recommends TIR >70%, although targets should be individualized based on patient characteristics. Review the amount of time spent in hypoglycemia (time below range [TBR]; <70 mg/dL) (*C*) and the time spent in hyperglycemia (time above range [TAR]; >180 mg/dL) (*D*). For most people, the ADA recommends targets of TBR <4% and TAR <25%. Review glucose variability (recommended ≤36%) (*E*) and identify wide events or patterns (*F*). Discuss interventional opportunities, and, through shared decision-making, develop an action plan based on the data to avoid therapeutic inertia and improve glycemic control. Document the AGP review in the EHR and provide a link to the report or a marked-up copy for the patient to keep. Adapted from ref. 48.

TABLE 3 Additional Tips for Successful Implementation of Diabetes Technology and RPM

- Diabetes technology is a rapidly changing field, with new products constantly in the pipeline. To stay abreast of the ever-changing technology landscape:
  - o Be prepared to update all of the clinic's technology-related software and apps at least quarterly.
  - o Be on the lookout for information about new technology in the development pipeline, as well as new products receiving FDA clearance, and become familiar with these in a timely manner.
- In addition to reviewing patients' diabetes data during in-person or virtual visits, HCPs can manage data asynchronously and communicate findings and recommendations via different telehealth options such as patient message portals. Identify the processes that will work best for your clinic.
- For HCPs just beginning to incorporate technology, start with one device or connected tool and one motivated patient and add to your technology program one step at a time.
- Be sure that all recommendations regarding technology use are individualized based on patient characteristics and customized to meet their specific needs and preferences.
- Prepare your clinics and patients for a not-too-distant future in which it may become common for many tests formerly performed in clinics, as well as vital statistics and other health monitoring, to occur from patients' homes and transmitted or communicated to HCPs remotely.
- Be sure to refer patients to online informational resources such as:
  - o American Diabetes Association website: www.diabetes.org
  - o Instructional videos offered on device manufacturers' websites or YouTube channels

- The HCP must provide supporting clinical indications, such as history of hypoglycemia unawareness, severe glycemic excursions, and patient's demonstrated performance of BGM.
  - o Although patients were once required to perform fingerstick BGM at least four times per day, this is no longer a requirement for CGM approval.
- The request for approval must include a copy of the patient's BGM log for the past 30 days.
- The patient must be treated with at least one insulin injection, inhaled insulin, or insulin pump therapy.
- The HCP confirms that the patient's insulin treatment regimen requires frequent adjustments that necessitate CGM data.
- Within 6 months before ordering CGM, the patient was seen in the clinic to evaluate glycemic control and determine whether eligibility criteria are being met.
- CGM devices for Medicare and Medicaid recipients must be ordered through a durable medical equipment supplier or a pharmacy that processes Medicare Part B orders. Failing to order from these sources is a common error that can jeopardize coverage. It is also important to identify and use the appropriate acquisition pathway required by different private insurance payers.
- Every 6 months after the initial prescription of CGM, the patient must have an in-person visit with a physician, physician assistant, or nurse practitioner to assess adherence to the CGM regimen and diabetes treatment plan.

Policies and requirements regarding CGM coverage are rapidly changing, so staying current with the latest guidance helps to streamline the approval process. This may be another responsibility suitable for your clinic's designated diabetes technology champion. In addition, it may help to have one team member who is responsible for coding and collecting the necessary documentation to ensure effective reimbursement.

Using Diabetes Data Effectively

With a technology program in place and payer reimbursement procedures for device management and RPM services understood, the final and most important piece of the puzzle is to take the steps needed to ensure meaningful use of technology-derived diabetes data to improve your patients' diabetes management and outcomes. Optimal use of diabetes technology requires both active patient engagement and consistent HCP involvement in acquiring, reviewing, interpreting, and acting on the data it yields.

Figure 1 outlines the steps we recommend for reviewing and interpreting the standardized AGP data report provided by all commercial CGM systems (48). This process is the same whether as RPM or during in-person or virtual visits. Beyond the day-to-day information people with diabetes may glean from their use of CGM and other technologies, it is imperative that the data be used in the health care setting to optimize diabetes management and improve outcomes.

Documenting all technology-related interactions and RPM in the EHR is essential, as it creates a clear record supporting the diagnostic need and indication for technology use. For some EHRs, so-called "smart phrases" or templates may be created for repetitive common terms or data fields. One example would be a template for AGP report data, where time in range, time below range, time above range, average glucose, and glycemic variability

(SD and/or coefficient of variation) could be filled in using the template created in the EHR. Some additional diabetes technology practice pearls based on the authors' clinical experience are provided in Table 3.

In summary, prescribing diabetes-related technology and instituting RPM can be challenging, but familiarizing yourself in advance with key processes, defining and assigning responsibilities, and developing efficient workflows will go a long way toward overcoming barriers and allowing you to provide these beneficial services to patients with diabetes.

DUALITY OF INTEREST

E.M. is an advisory board member/speaker for AstraZeneca, Boehringer Ingelheim, Eli Lilly, Merck, Novo Nordisk, and Sanofi and has received research support from Abbott and Pendulum. No other potential conflicts of interest relevant to this article were reported.

AUTHOR CONTRIBUTIONS

Both authors researched data and wrote, reviewed, and edited the manuscript. E.L.J. is the guarantor of this work and, as such, takes responsibility for the integrity of this content presented.

PRIOR PRESENTATION

Some of the content in this article was previously presented by the authors as part of the American Diabetes Association's nine-part online continuing education series for HCPs titled "Making Diabetes Technology Work." The authors' presentation, "Module 7: Connecting the Dots: Efficiently Managing Workflow and Logistics for Remote Monitoring of Patients with Diabetes," is available online from professionaleducation@diabetes.org as of November 2021.

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