



# Diabetes Technology in Primary Care: The Future Is Here, Almost

Mansur E. Shomali, Guest Editor

I recall a recent moment when “seeing” patients at my post–COVID-19 virtual medical office. I was alone in my consultation room with my mask and eye protection thankfully off for the moment. I had my patient’s electronic chart open on the monitor to my left. I had another window showing her recent continuous glucose monitoring (CGM) data. On a second monitor to my right, I could see, hear, and talk to her on a video call. My realization was that it was more important for me to have her data in front of me than to have her be physically present and that it was because of her data that I was able to adjust her diabetes treatment plan. I was grateful for the technology that let me view my patient’s data fairly easily, I was delighted that my patient was using the latest devices to get better results with less effort than the old-fashioned way, and both my patient and I were quite satisfied with the progress she was making.

In 2014, Bodenheimer (a family physician) and Sinsky (an internist) argued that we should pursue a quadruple aim in health care—that systemic interventions should not only be about “better care, better health, and lower costs,” but also about improving the work life of clinicians (1). Clinicians thrive on using their knowledge, skills, training, and experience to improve the health of their patients, but we are frequently over-burdened by cumbersome technology and extraneous documentation tasks. These challenges lead to dissatisfaction and burnout (1).

Will today’s even greater availability of technology, with its increased potential for data overload, contribute to more dissatisfaction, or can it help to restore some joy,

meaning, and satisfaction to the work that we do? In Figure 1, I make the case that the effective use of technology may result in the optimal balance among patient volume, quality and cost of care, and increased satisfaction for both patients and clinicians.

In this issue of *Clinical Diabetes*, a group of talented authors, diligent reviewers, and tireless staff have put together a series of articles exploring the use of diabetes technology in primary care. The common theme is that diabetes technologies such as blood glucose meters, CGM systems, numerous smartphone applications (apps), and insulin delivery systems have tremendous upsides, but also have implementation challenges.

These technologies are particularly challenging for practitioners in a generalist setting. Given the insufficient work force in both primary care and endocrinology and the growing incidence of diabetes, those of us who care for people with diabetes should invest some time in understanding how available technologies can help and how they can be optimally integrated into our clinic workflow. My intention is that many of the articles in this issue will serve as a primer on the use of these technologies in medical practice.

Patients and clinicians who are using technology face a number of challenges. Patients have to deal with the cost of technologies and with sometimes limited insurance coverage. Some patients may not be able to perform a fingerstick for blood glucose monitoring (BGM) or insert a CGM sensor without training. Others can watch an online video or go through a “quick start” guide independently without any trouble.

On the clinician side, most systems have unique Internet portals for viewing data. Every portal has its own log-in credentials and functionality. None are integrated with electronic patient charts. I sometimes cut and paste data or print a report and scan it into the electronic medical record (EMR). All of these issues create inefficiencies, waste paper, and slow us down.

The manufacturers of these technologies have a long way to go before their systems are interoperable and render

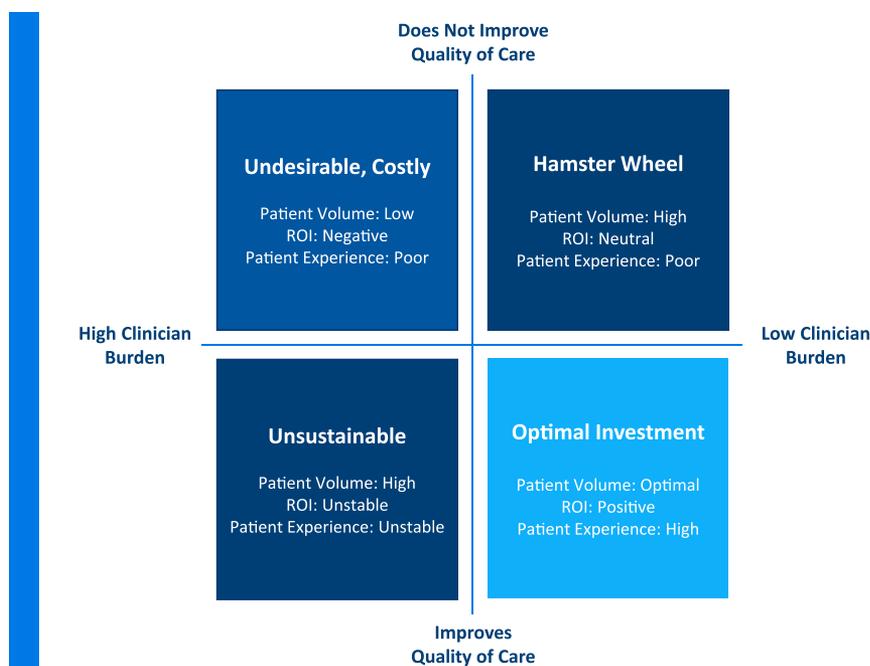
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**FIGURE 1** Effectively implemented diabetes technology has the potential to improve care, lower costs, and reduce burden on the health care team. ROI, return on investment.

data in a standard format. Still, I hope that in the very near future, most of these systems will work together with bi-directional EMR integration. We should be able to prescribe these technologies via the EMR, and the user data should be accessible with a single sign-on. Moreover, advances in artificial intelligence will allow for more effective clinical decision support that will help clinicians in making treatment plan changes and will coach patients on making more sense of their data.

Clinicians do not have to go at it alone. Some may practice in the proximity of a certified diabetes care and education specialist (CDCES, formerly certified diabetes educator) who has expertise in optimizing technology-enabled diabetes care (2). Others may designate a member of their office staff to be a “digital champion” who becomes an expert user and can onboard patients, troubleshoot problems, deal with insurance issues, and stay current on software and hardware updates (Table 1).

Some people with diabetes will immediately understand how to use their glucose data to self-manage their food, physical activity, and medications, but most will need help

in interpreting data obtained via BGM or CGM. Once they understand what it all means, the data become actionable, and the true power of the technology can be realized.

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**DUALITY OF INTEREST**

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**TABLE 1** Team Approach to Optimizing the Use of Diabetes Technologies to Enhance Outcomes

Technology Category	Clinician-Does-It-All Paradigm		Team Approach Solution		
	Clinician Responsibilities	Potential Outcomes	Clinician Responsibilities	CDCES or Digital Champion Responsibilities	Enhanced Outcomes
BGM	Clinician prescribes blood glucose meter.	Patient picks up meter but does not use it, uses it sporadically, or uses it regularly but does not use data for self-management and does not bring data to follow-up medical visits.	Clinician prescribes blood glucose meter.	Team member teaches the patient how to use the device and instructs the patient on structured testing and how to use the data to effectively self-manage. Patient downloads an app to facilitate data interpretation and remote sharing with the care team.	
CGM	Clinician prescribes CGM system.	Patient begins to use the device but does not understand how to use the data, including trend arrows, to appropriately self-manage glucose levels. Patient is frustrated by alarms and data overload. Clinician cannot access data.	Clinician prescribes CGM system.	Team member teaches the patient how to insert a sensor, connect to a mobile device, and set up data-sharing with care team; when to do confirmatory BGM; and how to use glucose and trend arrows to inform self-management (i.e., adjustments in food, physical activity, and medications, including insulin).	Patient is more engaged with diabetes self-management. Clinician is able to review data and recommend appropriate adjustments to the treatment plan.
Connected health devices*	Clinician asks patient to increase physical activity.	Patient agrees to be more active but fails to follow through.	Clinician asks patient to increase physical activity.	Team member recommends an app that connects to devices and tracks activity and other health parameters.	
Healthy-eating support	Clinician may not have the time or knowledge to discuss food choices or makes general suggestions only.	Patient does not get healthy-eating support.	Clinician may not have the time or knowledge to discuss food choices or makes general suggestions only.	Team member recommends an app that provides healthy-eating support. Patient learns healthy-eating behaviors and tracks food choices.	
Insulin-dosing support	Clinician prescribes a fixed dose of insulin with a correctional scale.	Patient takes insulin but is confused about the correctional scale. Glucose levels are not improved.	Clinician prescribes a fixed dose of insulin with a correctional scale.	Team member explains the insulin regimen to patient and helps patient download an app that provides an insulin bolus calculator and tracks insulin dosing. Glucose levels begin to improve.	

\*For example, for monitoring physical activity, sleep, blood pressure, or weight.



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One of Dr. Shomali's main research interests is in novel ways to treat patients with type 2 diabetes. He has served as principal investigator on numerous clinical studies of novel diabetes therapeutic agents and digital health tools. In addition to his numerous research articles and textbook chapters, this year he coauthored a series of three books: *Diabetes Essentials*, *The Complete Diabetes Guide*, and *The Diabetes Cookbook*. Currently, Dr. Shomali serves as an associate editor for the journal *Clinical Diabetes*. He enjoys taking care of his patients; teaching students, residents, and fellows; and working to translate science and technology for the betterment of patients and fellow health care providers.