

# Improving Diabetes Care Efficiency: Glucose Meter Download Station in Medical Offices

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**Keywords:** Diabetes mellitus has become a public health pandemic. Nearly 1 in 9 adults in the U.S. have diabetes. This is expected to grow to 1 in 3 Americans by 2030. Diabetes management is time consuming for both the patient and the physician. It is recommended that people with diabetes perform self-monitoring blood glucose (SMBG) as part of their disease management. The SMBG reports can help both the patient and the physician make adjustments to diabetes treatment. These handwritten reports are frequently cumbersome to interpret and therefore difficult to make meaningful suggestions. Improving the efficiency in clinical office procedures can enhance the diabetes management outcomes. One such example is the glucometer download station. This manuscript reviews the how, when, and where download stations can help improve diabetes practice.

**Diabetes**

**Endocrinology**

**Office Procedures**

**Blood Glucose**

## INTRODUCTION

Despite advances in the knowledge of diabetes management and the advances in the treatment of diabetes it continues to be very challenging to manage. As there are more people with diabetes every year there is an increase in health care utilization and outpatient visits for these patients. While 1 in 9 Americans have diabetes today, it is projected to be 1 in 3 Americans by 2030.<sup>1</sup> In family medicine the physician treats most if not all of the patients' concerns and the increasing time needed for diabetes management has become a dilemma for the physician. It has been estimated that it takes 3 to 10 hours per day of physician time to manage chronic diseases.<sup>2</sup> The management of diabetes and its complications requires 4 diabetes-focused visits/patient/year. Improving the efficiency of these visits and enhancing pattern recognition to identify problems would shorten visit time and improve patient care. A glucose meter download station is one of those efficiency-enhancing mechanisms.

## WHAT IS A DOWNLOAD STATION?

A download station is a clinic-equipped office space with the necessary tools to extract data directly from patients' glucometers when they present to the clinic for their medical appointments. Most information can be organized and reports generated according to the provider's preference. A download station can be easily set up in a typical office space (i.e. 6 feet x 6 feet) with a computer

and a printer as the main components. Designated a medical assistant's workstation can also function as a download station if it is equipped with the necessary software and hardware. The goal of a download station is to systematically generate a clear, pre-configured blood glucose report prior to the consultation, allowing providers to simplify their decision-making process.

## WHY DO I NEED A DOWNLOAD STATION?

Successful management of diabetes mellitus greatly relies upon patients' self-care behaviors. Self-monitoring blood glucose (SMBG) has become the standard of care in effective management of diabetes therapy.<sup>3</sup> SMBG allows patients to better evaluate their individual responses to medications, dietary modifications, and physical activities with the aim to prevent hypoglycemia and make appropriate decisions on bolus insulin dosages (correlation scale and food coverage). Along with hemoglobin A1c, fasting and 2 hour post meal readings can help providers to safely and effectively manage diabetes, e.g., fasting and 2-hour post-prandial readings.

Most patients are encouraged to perform SMBG and to record their glucose readings in a logbook along with their daily food intake and exercise regimen; the frequency of monitoring depends on a particular patient's diabetes pharmacotherapy. However, these self-monitoring blood glucose logbooks are often not brought to the clinic for evaluation, or they may not accurately reflect the true readings from their glucometers.<sup>4</sup> In addition, it is not uncommon for patients to produce or report only the "good" values when asked to document the readings on a logbook.<sup>5</sup> Some patients will change their diets a few days prior to their next office visit with

their clinicians, allowing the reported blood glucose values to appear more acceptable than they normally are. To circumvent these potential discrepancies, retrieving the glucose data directly from the glucometer may provide a more comprehensive understanding of the glucose trend from the patient between office visits.

Similarly, patients may present to the office visit with Continuous Glucose Monitors (CGM). CGM continuously records the patient's glucose level every 5 to 15 minutes for a course of 3 to 7 days. In contrast to SMBG, which provides a single real-time glucose level, CGM provides complete glucose level information over a few days. The data recorded can be downloaded and analyzed with the use of a corresponding diabetes management system, and the additional information can further assist clinicians in making individualized-care and therapeutic-treatment recommendations.<sup>6</sup> CGM is particularly recommended for patients with repeated hypoglycemia, hypoglycemia unawareness and those whose diabetes goals are not achieved with SMBG.<sup>7</sup> Likewise, many insulin pumps available on the market are able to receive information from the sensor through the transmitter and are also able to store the patient's CGM glucose levels. Hence, this paper aims to provide clinicians with more information on the technical details with regards to setting up glucose reading download station for the major products currently available in the market.

## WHAT ARE THE NECESSARY SOFTWARE & HARDWARE NEEDED FOR THE DOWNLOAD STATION?

Various brands of glucose meters and insulin pumps, which patients could bring in with them to the clinic, are currently available on the market. The first step is to install the meters software onto the computer the medical team will use for downloading. Essentially, all of the meters have software, and data can be downloaded to a PC/Windows. Many are also compatible with MAC, especially if the MAC has Windows compatibility. Next, most of the meters come with a Universal Serial Bus (USB) cable that allows the team to connect the meter to the software on the computer. Some companies will supply the cords to the practices (i.e. Abbott CoPilot Health Management System version 4.2.1 for FreeStyle® Lite glucose meters), while other meters come with a cable for patient home downloading as well. Some meters are able to Bluetooth to a smart device. Software and hardware requirements for major blood glucose meters marketed in the U.S. are detailed in Tables 1 - 6 (pages 20-22), and requirements for insulin pumps and continuous glucose monitors (CGM) are listed in Table 7 (page 24).

Steps to initiate the data download process:

1. Double-click on the appropriate desktop icon to initiate the health management system software.
2. Firmly connect the appropriate cable to the computer on one end and connect the other end to the device's data port.
3. Search and locate the patient's profile to which the data to be downloaded; for new patients, a new profile will need to be created.
4. To begin data transfer, most meters need to be turned off. If communication is not established between the computer and the device, turn on the meter.

## ARE THERE ANY PROBLEMS WITH THE SYSTEMS?

Several issues have been identified. Some meters will not properly download if the time and date are not accurate. They may yield a blank report even though the meter clearly has readings. The download will only have the glucose readings the person actually performed. Some patients may be less like to check their glucose at extremes of glucose and will treat based on their symptoms. This will result in an under-representation of those extreme values. Despite not recommended by manufacturers, some patients would still share their glucose meters with their family members, thus healthcare providers should not download data from any devices that have data stored for more than one person. Each device is linked to its user so it allows you to collect data from many patients but not confuse the data.

## ARE THERE ANY UNIVERSAL DOWNLOAD SYSTEMS?

If you have a busy practice and have patients from many different insurers (who doesn't), having many different download stations becomes a problem since each of the meters has their own software and downloading capacities. One way to handle this is to utilize those meters that are most represented in your practice. However, what many providers long for is a universal platform to download devices.

Several health management systems are working on being compatible with other devices from different manufacturers. There are three companies that have "universal" platforms for both patients and providers. Examples of these systems include Diasend, Glooko, and Tidepool. These programs have the advantage of providing a single standardized report. However, some may require a subscription.

**Diasend** is a universal platform that enables providers to connect blood glucose meters, continuous glucose monitors, and insulin pumps to a single piece of mobile-enabled hardware. Data are uploaded online, so no software is needed on office computers. The Diasend system has over 100 compatible devices and consolidates the information into a structured web-based report; no matter what the device is or how the data are stored. This system also has a personal model that allows patients to download at home, print off their reports, and then bring them to the office to share with their providers.

**Glooko:** MeterSync Blue system enables patients to upload data via Bluetooth from over 30 glucose meters to Android and Apple apps. When a patient or provider wants to download data, they simply plug MeterSync Blue adapter into their meter, and results are sent wirelessly to the app. The MeterSync Blue adapter can be left plugged in continuously which essentially transforms those meters into 24/7 Bluetooth-enabled device. This device is not currently compatible with insulin pumps. This system also requires a subscription. We recommend that the patient buy the subscription at \$59.95 per year and then download their meter at home and bring in the reports.

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TABLE 1:

Abbot Freestyle® Glucose Meters

<b>Glucose Meters</b>					
	FreeStyle® Lite	FreeStyle® Freedom Lite	FreeStyle® InsuLinx	FreeStyle® Precision Neo	FreeStyle® Precision Xtra
<b>Connection Cable</b>	USB to 2.5mm stereo	USB to 2.5mm stereo	Micro USB	Mirco USB	USB with Strip Port
<b>Other compatible meter(s)</b>	FreeStyle® Freedom				
<b>FreeStyle® Auto-Assist</b>	Supported	Supported	Supported	-	Supported
<b>FreeStyle® LibreView™</b>	Supported				
<b>Software Requirements</b>	FreeStyle CoPilot Health anagement System version 4.2.1 Adobe® Acrobat or Adobe® Reader		Microsoft® Windows® XP, Vista, or 7 <b>Web Browser:</b> - Internet Explorer 10+ - Microsoft Edge - Google Chrome release 37.0+ - Mozilla Firefox release 32.0+		
	For Mac OS® X Mountain Lion or higher <b>Web Browser:</b> - Safari (View-only; upload utility is not supported)				
<b>Hardware Requirements</b>	2 GB free disk space or greater Display with a minimum screen resolution of 1024 x 768 pixels Internet connection (if using internet download installation) CD-ROM (optional unless installing from disk) Intel® Pentium® 3 processor 550MHz equivalent or higher		512 MB RAM or greater Mouse/Trackball Keyboard 1 free USB port Black and white or color printer		

TABLE 2:

Bayer Healthcare Contour® Glucose Meters

<b>Glucose Meters</b>					
	Contour®	BREEZE® 2	Contour® LINK	Contour® NEXT	Contour® NEXT EZ
<b>Connection Cable</b>	USB to 3.5mm stereo			Mirco USB	USB to 3.5mm stereo
<b>Other compatible meter(s)</b>	Contour® USB / Contour® NEXT USB / Contour® NEXT LINK				
<b>Software Requirements</b>	GLUCOFACTS® DELUXE Diabetes Management Software version 3.10.08 Adobe® Acrobat or Adobe® Reader		Mac OS® Operating System(s): - Leopard, Snow Leopard, Lion, Mountain Lion, Mavericks, Yosemite, or El Capitan		
	Microsoft® Windows® Operating System(s): - XP (SP3), Vista (SP2), 7, 8, or 10				
<b>Hardware Requirements</b>	2 GB free disk space or greater Graphics card that supports 1024 x 768 or higher Display with a minimum screen resolution of 1024 x 768 pixels Internet connection (if using internet download installation) CD-ROM (optional unless installing from disk)		Mouse/Trackball Keyboard 1 free USB port Black and white or color printer		

TABLE 3:

Lifescan OneTouch® Glucose Meters

<b>Glucose Meters</b>					
	OneTouch Ultra® 2	OneTouch UltraMini®	Verio®	Verio® Flex System	Verio® IQ
<b>Connection Cable</b>	USB to 3.5mm stereo	USB to 3.5mm stereo	Micro USB	Mirco USB	Mini USB
<b>OneTouch Reveal® Mobile Application</b>	-	-	-	Supported	-
<b>OneTouch Reveal® Web Application</b>	Supported				
<b>Software Requirements</b>	OneTouch Reveal® Data Transfer Tool Adobe® Acrobat or Adobe® Reader 10+		Microsoft® Windows® XP, Vista, or 7 <b>Web Browser:</b> - Mozilla Firefox® 11+ - Google Chrome™ 17+ - Internet Explorer® 9+ - Microsoft Edge®		
	For Mac OS® <b>Web Browser:</b> - Mozilla Firefox® 11+ - Safari® 7+				
<b>Hardware Requirements</b>	Microsoft® Windows® 7, 8.1, or 10 Mac OS® X 10.9, 10.10, 10.11 Internet Connction Black and white or color printer		Display with a minimum screen resolution of 1024 x 768 pixels Connection cables for other supported devices, please refer to: <a href="http://www.onetouchreveal.com/support/en_US/">www.onetouchreveal.com/support/en_US/</a>		

TABLE 4:

Nipro Diagnostics TRUEtrack® Glucose Meters

<b>Glucose Meters</b>					
	TRUE METRIX®	TRUEresult®	TRUEtrack®	TRUEbalance™	TRUEread®
<b>Connection Cable</b>	-	-	USB to 3.5mm stereo	USB to 3.5mm stereo	USB to 3.5mm stereo
<b>Docking Station</b>	Supported	Supported	Supported	-	-
<b>Software Requirements</b>	TRUEmanager® Diabetes Management Software Adobe® Acrobat or Adobe® Reader Microsoft® Windows® XP, Vista, or 7				
<b>Hardware Requirements</b>	1 GB of RAM or greater 2 GB free disk space or greater 1 free USB 2.0/3.0 port USB cable and/or docking station Mouse/Trackball Keyboard		Intel® Pentium® 4 processor 2GHz equivalent or higher Internet connectivity (if using internet download installation) CD-ROM (optional unless installing from disk) Graphics card that supports 1024 x 768 or higher Display with a minimum screen resolution of 1024 x 768 pixels Black and white or color printer		

TABLE 5:

Roche Diagnostics Accu-Chek® Glucose Meters

<b>Glucose Meters</b>	 Accu-Chek® Nano	 Accu-Chek® Aviva	 Accu-Chek® Aviva Expert	 Accu-Chek® Compact Plus
<b>Connection Cable</b>	USB / Infrared (IR)	USB / Infrared (IR)	USB / Infrared (IR)	USB / Infrared (IR)
<b>Other compatible meter(s)</b>	Accu-Chek® Compact Accu-Chek® Active Accu-Chek® Combo System	Accu-Chek® Spirit Insulin Pump Accu-Chek® Smart Pix Reader Accu-Chek® Go		Accu-Chek® D-TRONplus Accu-Chek® Aviva Connect
<b>Web-based Applications</b>	Accu-Chek® Connect Online Diabetes Management System			
<b>Software Requirements</b>	Accu-Chek 360° Diabetes Management System Adobe® Acrobat or Adobe® Reader		Microsoft® Windows® XP (SP3), Vista, 7, 8 or 10 <b>Web Browser:</b> - Internet Explorer 9+ - Microsoft Edge 25+ - Firefox 45+ - Google Chrome 49+	
<b>Hardware Requirements</b>	Intel® Pentium® processor 1 GHz equivalent or faster Display with a minimum screen resolution of 1024 x 768 pixels 5 GB free disk space or greater 512 MB of memory or greater Mouse/Trackball		Keyboard 1 free USB port CD-ROM Black and white or color printer	

TABLE 6:

ARK Care™ ReliON® glucose meters

<b>Glucose Meters</b>	 ReliOn® Prime	 ReliOn® Confirm	 ReliOn® Micro	 ReliOn® Ultima
<b>Connection Cable</b>	USB to 3.5mm stereo	USB to 3.5mm stereo	-	-
<b>Other compatible meter(s)</b>	GLUCOCARD® Expression GLUCOCARD® Vital	GLUCOCARD® 01 GLUCOCARD® Shine		
<b>Web-based Applications</b>	Supported	Supported	-	-
<b>Software Requirements</b>	ARK Care® Real-Time Diabetes Management System Microsoft® Windows® 7, 8, or 10 Internet Explorer 10+			
<b>Hardware Requirements</b>	1 free USB port CD-ROM Internet connection	Mouse/Trackball Keyboard	Display monitor Black and white or color printer	

Tidepool takes data from most glucose meters, continuous glucose sensors, and insulin pumps and then consolidates that data into a single consolidated report. Tidepool is also working to develop the Tidepool Uploader, a web-based software that will connect with multiple devices and upload the data, eliminating the need for unique software for every single device. Tidepool is a 501c3 non-profit entity that intends to offer its software for free to patients and providers.

**WHAT DO THE REPORTS LOOK LIKE?**

Examples of what these downloaded results would look like can be seen on pages 26 - 28.

**HOW DO I GET MY PATIENTS TO ENGAGE IN THIS TECHNOLOGY?**

Printing the reports off to show patients is very helpful. They can see what you see and you can discuss the patterns that can help them. Often noted can be written on these pages to provide reminders and instruction for treatment modifications. This reinforces the importance of SMBG. Finally as patients become advanced we ask them to look at their trends and make adjustments even between visits. While only a few become this advanced it is a pleasure to see when patients can maximize disease self management.

**CONCLUSIONS:**

In order to obtain a useful blood glucose report at every office visit to guide diabetes management, the health care team will need to help patients integrate self-monitor blood glucose into their daily routines. A suggestion would be to remind patients to set alarms or reminders on their smartphones to include blood glucose monitoring as part of the treatment plan. Further troubleshooting with patients to overcome barriers on checking blood glucose levels at home is instrumental in empowering these patients to help them take charge of their disease. The SMBG data is for them not just for the physician. This is one of the many ways to encourage and empower patients to take control of their diabetes.

Educating patients on interpreting their own blood glucose trends on the reports is equally important, as some patients will need the information for insulin self-titration. In addition, from a safety standpoint, patients can self-identify low blood glucose readings and/or trends of hypoglycemia influenced by their diabetes regimens, fully utilizing the data gathered on a daily basis.

**Key Recommendations:**

1. Diabetes management takes time and efforts, so we should utilize practice efficiencies whenever possible.
2. A glucose meter download station is free and can save you tremendous amount of time.
3. Glucose meter downloads will organize data to allow you quickly see: how often the patients are checking their blood glucose levels, are experiencing severe hyperglycemia or hypoglycemia, and what the current glucose patterns are.
4. Ultimately, glucose meter downloads are intended to be helpful for patient self management. You can use glucose downloads as a patient education tool to enhance the existing tools that you have already shared with your patients to empower them taking control of their diabetes.

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**TABLE 7:**

Insulin pump / Continuous Glucose Monitor (CGM)

Manufacturer	Abbott Diabetes Care	Animas Corporation	Dexcom	Insulet Corporation	Medtronic	Roche Diagnostics	Tandem Diabetes Care
Insulin pump / CGM	FreeStyle® Libre Pro	Animas® Vibe OneTouch Ping®	Dexcom G4® Platinum Dexcom G5® Mobile	OmniPod® + PDM OmniPod® + Dexcom G4	MiniMed® 530G + Enlite MiniMed® 630G + Enlite MiniMed® Paradigm® REAL-Time RevelTM MiniMed® 670G + Guardian® sensor 3	Accu-Chek® Combo system Accu-Chek® Spirit insulin pump	t:flex® Insulin Pump t:slim X2TM Insulin Pump t:slim G4TM Insulin Pump
Connection Cable	Micro USB	USB / Infrared (IR)	Micro USB	Mini USB	CareLink USB or Contour® NEXT LINK	USB / Infrared (IR)	Micro USB
Software Requirements	FreeStyle® Libre Pro Reporting Software Windows® 7, 8, 10 Mac OS X (El Capitan) (Refer to table 2)	Operating System: Microsoft® Windows® XP or later Mac® OS X 10.6.8 or later	Dexcom® STUDIO Software to open .doc files Software to open Excel files Adobe® Acrobat or Adobe® Reader Mac® OS X 10.8+ Web Browser: - Safari 6+ - Google Chrome - Mozilla Firefox Microsoft® Windows® XP (SP3), Vista (SP2), 7 (SP1), 8, 10 Web Browser: - Internet Explorer 9+ - Microsoft Edge - Google Chrome - Mozilla Firefox	FreeStyle® CoPilot Health Management System (Refer to Table 1) Adobe® Acrobat or Adobe® Reader PC or Mac® Web Browser: - Internet Explorer - Safari	CareLink® Pro Therapy Management Adobe® Acrobat or Adobe® Reader Microsoft® Windows® 7, 8, or 10 Mac® OS 10.5+ Web Browser: - Internet Explorer 10+ - Mozilla Firefox 38+ - Safari 4+	Accu-Chek 360° Diabetes Management System (Refer to Table 5)	Operating System: Mac® OS X® Mountain Lion, Mavericks, or Yosemite Microsoft® Windows® XP, Vista, 7, or 8; Web Browser: - Google Chrome 15.0+ - Mozilla Firefox 7.0+ - Safari 5.1+
Other Compatible Systems	Major Glucose Monitors from: Abbott Bayer Lifescan Roche	Major BG meters and CGMs*	Dexcom G4® CGM System Dexcom G5® CGM System	OmniPod® + PDM only† Major BG meters, insulin pumps, and CGMs‡	Major BG Meters and Insulin Pumps^	(Refer to Table 5)	BG Meters: OneTouch® Verio® IQ OneTouch® UltraMini OneTouch® Ultra2 Accu-Chek® Aviva Accu-Chek® Compact Plus FreeStyle® Lite FreeStyle® Freedom Lite
Web-Based Applications† **	LibreView® Diasend® Web application	Diasend® Web application Tidepool® Uploader	Dexcom® CLARITY Diasend® Web Application Glooko Web App Tidepool® Uploader	Diasend® Web application Glooko Web App Tidepool® Uploader	CareLink® Personal Therapy Management Glooko Web App	Accu-Chek® Online Diabetes Management System Diasend® Web application	t:connect® Diabetes Management Application Diasend® Web application Tidepool® Uploader
Hardware Requirements (Additional to basic computer setup)	Dual-core 1.6GHz processor or faster 2 GB RAM or higher 1 free USB port Internet connectivity (for internet download installation) (Refer to Table 2)	Internet connectivity USB cables for BG meters (if planned to upload information from meter)	1 free USB port CD-ROM (if installed from CD) Internet connectivity Windows® OS: 1.3 GHz processor equivalent or greater 1 GB RAM 100 MB free disk space Mac® OS: 2.3 GHz processor equivalent or greater 4 GB RAM 100 MB free disk space	Internet connectivity 1 free USB port USB cables for BG meters, insulin pumps, or CGMs USB Hub for Mac® OS X El Capitan (Refer to Table 1)	Internet connectivity 1 free USB port USB cables for BG meters or insulin pumps	(Refer to Table 5)	x86 compatible 1.6 GHz processor or faster Internet connectivity (for internet download installation) 1 GB RAM 1 GB free disk space 1 free USB port

PDM = Personal Diabetes Manager

† = For OmniPod® + Dexcom G4, please refer to information listed for Dexcom in table 6.

‡ = For more information on complete list of compatible devices, please refer to <https://www.glooko.com/compatibility>

\* = For more information on complete list of compatible devices, please refer to <https://www.diasend.com/us/patient>

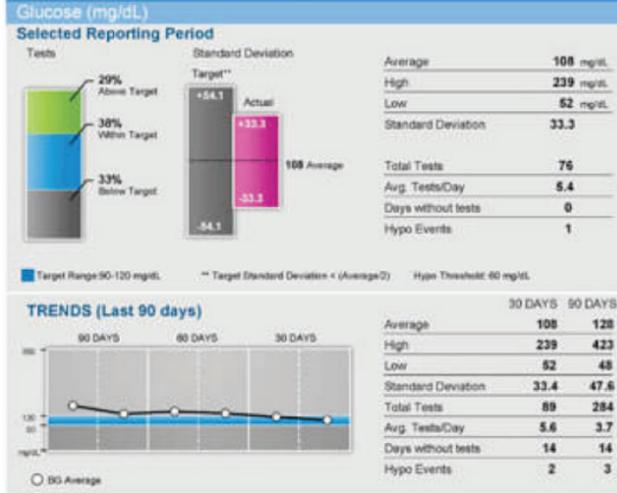
^ = For more information on complete list of compatible devices, please refer to <https://www.medtronicdiabetes.com/download-library>

¥ = For more information on complete list of compatible devices, please refer to <http://tidepool.org/products/tidepool-uploader/#devices>

**FREESTYLE AUTO ASSIST:**

**Snapshot**

Feb 03, 2012 - Feb 16, 2012 (14 days)



**Notes**

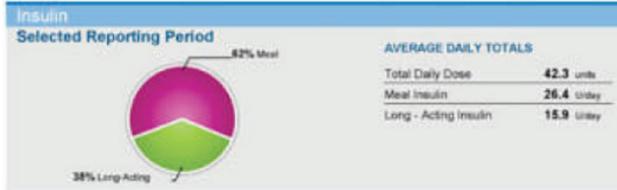
Pre-meal BG's are within target 95% of time (40 out of 42). For more information, see the Meal Event Averages Report.

Post-meal BG's are within target 67% of time (14 out of 16). For more information, see the Meal Event Averages Report.

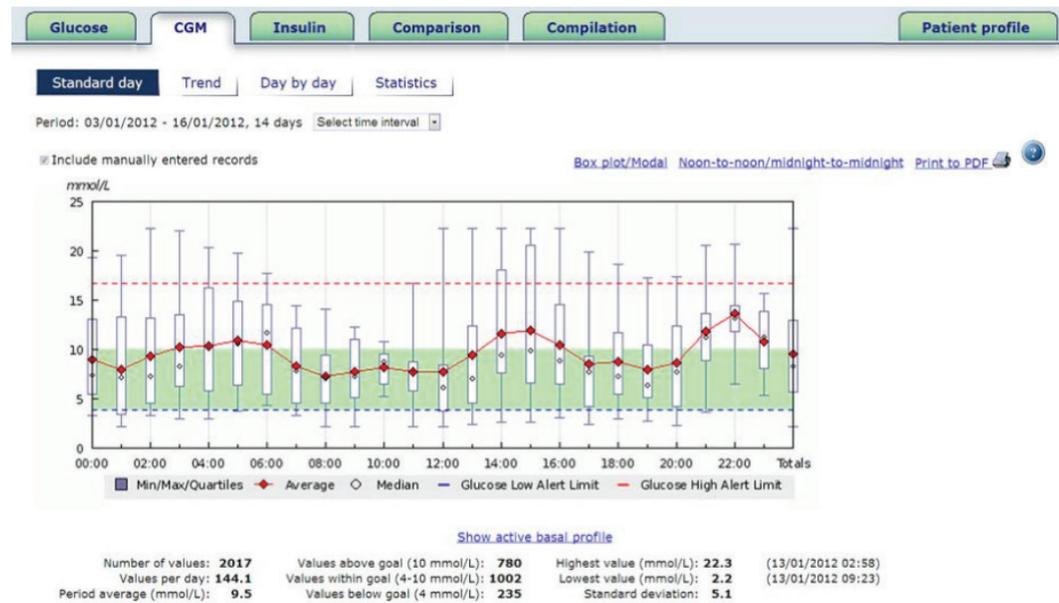
BG standard deviation may not be the best indicator of glycemic control because the average is outside the range of 110-180 mg/dL.\*

Has there been a change in medication, lifestyle, or health status?\*

Average number of tests per day increased 92% from previous reporting period.



**DIASEND:**



**TRUEMANAGER:**

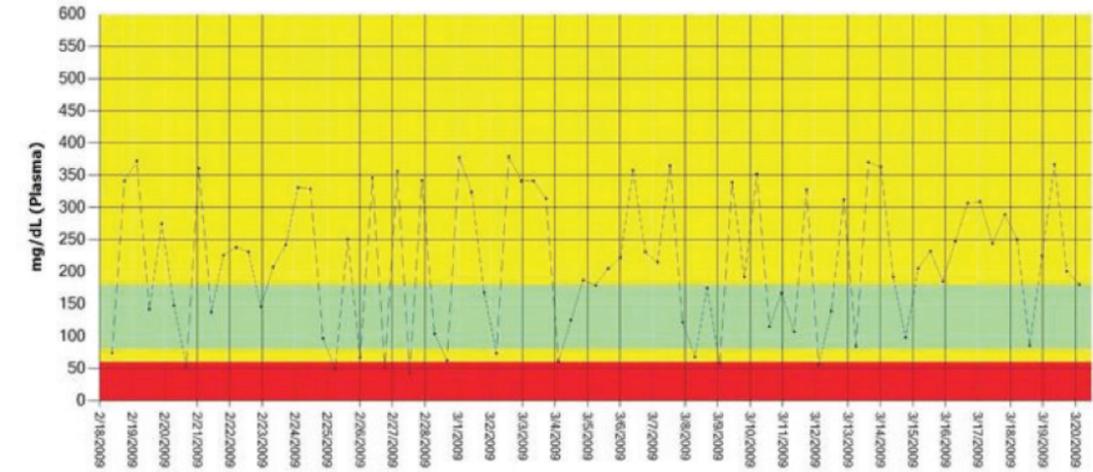


**Patient ID:** 2466  
**Patient:** Jonathan Smith  
**Before Meal Target:** 80 - 160  
**After Meal Target:** 85 - 180  
**Overall Target:** 80 - 180  
**Hypoglycemic Level:** 60

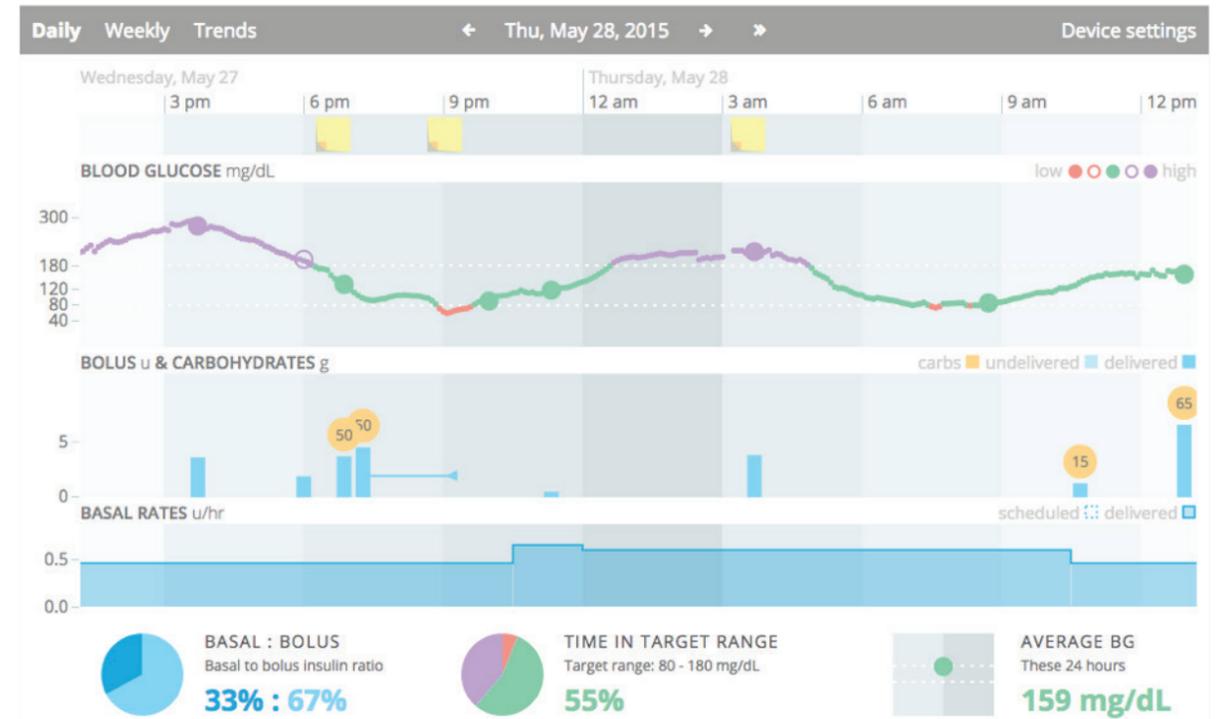
**Glucose Average:** 187  
**Standard Deviation:** 99  
**# of Readings:** 143  
**% Within Target:** 32.9%  
**% Above Target:** 49.0%  
**% Below Target:** 18.2%

**Glucose Trend Report**

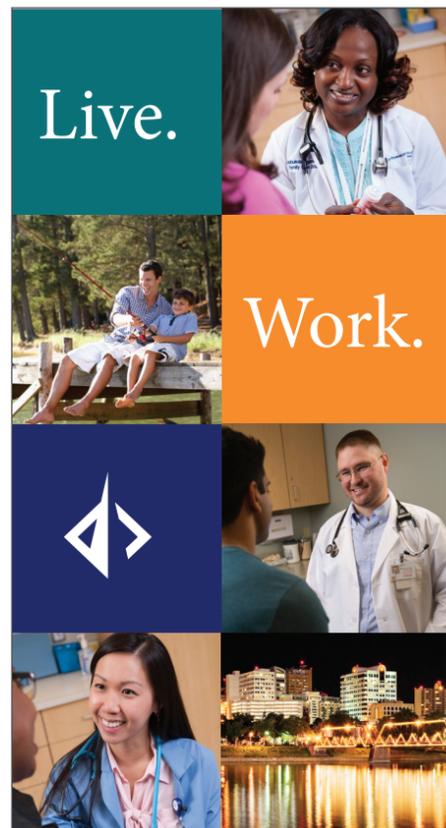
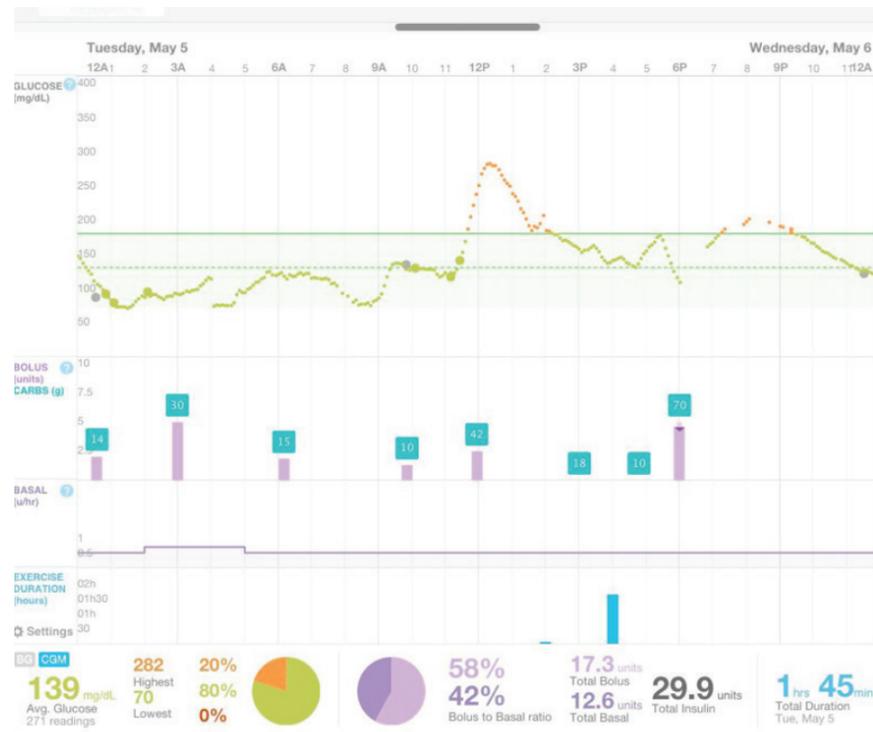
**Report Date:** 3/20/2009 2:41 PM  
**Date Range:** 2/18/2009 - 3/20/2009  
**Result Type:** mg/dL / Plasma  
**Doctor:** Dr. Goldman



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