Keeping Up with the Trends: A How-To for CGM Implementation and Interpretation

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Disclosures

- Dr. Schumacher serves on the Speakers Bureau for Abbott.
- Drs. Allison and Van Dril have no actual or potential conflicts of interest to disclose.

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Learning Objectives

Pharmacists

- Differentiate among the various CGM products available.
- Examine billing and revenue opportunities for pharmacists involved in continuous glucose monitoring.
- Design a patient-centered diabetes treatment plan considering continuous glucose monitoring data.

Pharmacy Technicians

- Differentiate among the various CGM products available.
- Examine billing and revenue opportunities for pharmacists involved in continuous glucose monitoring.
- Describe the necessary components to operate and maintain a CGM system.

CGM Overview

- CGM systems are either owned by the user (personal-use) or the health system (professional-use)
- Require the insertion of a thin filament under the skin which measures interstitial glucose every 1 to 5 minutes
- A small sensor connects to the filament and sends readings via a wireless transmitter to a receiver or a compatible smart device every 5 to 15 minutes

Hirsch IB, et al. Role of Continuous Glucose Monitoring in Diabetes Treatment. Arlington, Va., American Diabetes Association, 2018.

Guideline Recommendations

Personal-Use CGM in T1D

- Should be considered in all children and adolescents with type 1 diabetes
- To lower A1C and/or reduce hypoglycemia in adults who
  - Are not meeting glycemic goals
  - Have hypoglycemia unawareness
  - Have episodes of hypoglycemia

Personal-Use CGM in T2D

- Recommend real-time CGM (rtCGM) and intermittently scanned CGM (isCGM) systems in conjunction with insulin therapy to lower A1C and hypoglycemia in adults not meeting glycemic targets

American Diabetes Association. Diabetes Care. 2021;44(Suppl. 1):S85-99.
Grunberger G, et al. Endocr Pract. 2021;27:505-537.
Garber A, et al. Pract. 2020;26(1):107-39.

Guideline Recommendations

Professional-use CGM

- Not using personal-use CGM
- Recommend in addition to diabetes self-management education and medication therapy management to improve glycemic management in persons with T1D or T2D
- May be helpful in identifying and correcting patterns of hyper- and hypoglycemia and improving A1C levels in persons with diabetes on noninsulin as well as basal insulin regimens
- Persons who would like to learn more about CGM

American Diabetes Association. Diabetes Care. 2021;44(Suppl. 1):S85-99.
Grunberger G, et al. Endocr Pract. 2021;27:505-537.
Garber A, et al. Pract. 2020;26(1):107-39.

Evidence Supporting Use

Study	Design	Outcomes
DIAMOND Phase I (n = 158)	• Adults with T1D on MDI • Baseline A1C: 8.6% • Dexcom G4 Platinum CGM vs. SMBG • Duration: 24 weeks	• -0.6% A1C between groups (p<0.001) • Time <70 mg/dL was 43 vs. 80 min/day (p=0.002) • Nocturnal hypoglycemia (<70 mg/dL) 1.8% vs. 5.2% (p=0.003)
DIAMOND Phase II (n = 158)	• Adults with T2D on MDI • Baseline A1C: 8.5% • Dexcom G4 Platinum CGM vs. SMBG • Duration: 24 weeks	• -0.3% A1C between groups (p<0.022) • No change in hypoglycemia or quality of life outcomes
COMISAIR (n = 94)	• Adults with T1D • Observational nonrandomized study design • Baseline A1C: 8.2% • 4 groups: CGM + MDI; CGM + CSII; SMBG + MDI; SMBG + CSII • Duration: 3 years	• -0.87% A1C with CGM + MDI vs. SMBG + MDI (p=0.0016) • -0.9% A1C with CGM + CSII vs. SMBG + CSII (p<0.0001) • CGM lowers A1C independent of insulin delivery method

Abbreviations: CSII – continuous subcutaneous insulin infusion; MDI – multiple daily injections

Beck RW, et al. JAMA. 2017;317(4):371-8.
Beck RW, et al. Ann Intern Med. 2017;167(6):365-74.
Soupal J, et al. Diabetes Care. 2020;43:37-43.

New Evidence in T2DM with Basal Insulin

Design

- Multi-center RCT
- Primary care population, uncontrolled HbA1c, on long or intermediate acting basal insulin
- Randomized 2:1, n=175: CGM 116, SMBG 59
- Primary outcome: change in A1C at 8 months

Baseline Characteristics

- HbA1c 9.1% (range 7.1%-11.6%)
- Mean age 57 years, diabetes duration of ~15 years
- Majority Private insurance or Medicare
- 35% taking 1 medication, 48% taking 2 non-insulin glucose lowering medications

Outcomes

- Primary: A1C change from baseline -0.4 (95% CI, -0.8 to -0.1), p=0.02
- % time-in-range: CGM 59, SMBG 43 (<0.001)
- % time >250: CGM 11, SMBG 27 (<0.001)
- Mean glucose: CGM 179, SMBG 206 (<0.001)

Martens T, et al. *JAMA*. 2021;325(22):2262-72.

Types of CGM Systems

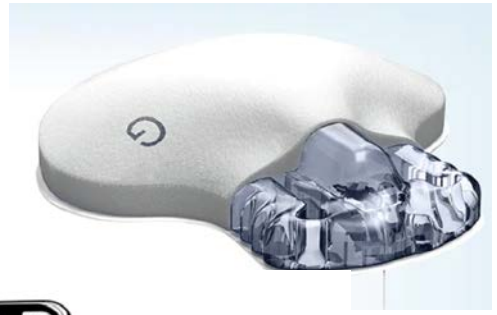
Real-Time CGM (rtCGM)

- Continuously transmits glucose data in real time to a receiver or smart device
- Family members, caregivers, and clinicians can view rtCGM data using mobile applications and data-sharing platforms
- Trend arrows
- Real-time alarms to warn patients of rising and falling glucose levels

Intermittently Scanned (isCGM)

- Requires scanning of the sensor to view glucose data and projected trends on a reader or smart device
- Must be scanned at least every 8 hours
  - Gaps in glycemic tracings will occur
- Real-time data sharing now available through LibreLink App
- Trend arrows
- Real-time alarms for high or low glucose levels (FreeStyle Libre 2 only)

www.freestylelibre.us



www.medtronic.com

www.dexcom.com

http://diabetesviews.com/

Personal-Use Systems

- Dexcom G6
- Abbott FreeStyle Libre 2
- Medtronic Guardian Connect with Guardian Sensor 3
- Eversense

Professional-Use Systems

- Dexcom G6 Pro
- Abbott FreeStyle Libre Pro
- Medtronic iPro2

Personal-Use CGM

	Dexcom G6	Abbott FreeStyle Libre 2	Medtronic Guardian Connect with Guardian Sensor 3	Eversense
Components	• Disposable sensor • Reusable data transmitter which attaches to the sensor • Receiver for data display/storage	• Disposable sensor/transmitter • Reader for data display/storage	• Medtronic Guardian Sensor 3 and Guardian Link 3 rechargeable transmitter • Reusable data transmitter which attaches to the sensor • Does not include a receiver	• Implantable under-the-skin sensor • Removable and rechargeable transmitter • Does not include a receiver
Insulin pump integration	T:Slim; Omnipod 5?	No Integrates with Bigfoot Unity System	Medtronic 670G, 630G (Guardian 3)	No
Receiver	Smart phone or receiver	Smart phone or reader	Smart phone (Guardian Connect)	Smart phone

Dexcom. https://provider.dexcom.com. Accessed August 8, 2021.
Abbott Diabetes Care. https://www.freestylelibre.us/. Accessed August 8, 2021.
Medtronic. https://www.medtronicdiabetes.com/. Accessed August 8, 2021.
Senseonics. https://www.eversensediabetes.com/safety-info/. Accessed August 8, 2021.

Personal-Use CGM

	Dexcom G6	Abbott FreeStyle Libre 2	Medtronic Guardian Connect with Guardian Sensor 3	Eversense
Maximum wear time	10 days	14 days	7 days	90 days
Approved sites	Abdomen – all ages, Upper buttocks – ages 2-17 years	Upper arm	Abdomen, upper arm	Upper arm
Warm-up time	2 hours	1 hour	Up to 2 hours	24 hours
Calibrations required per day	0	0	2-4 + occasional diagnostic	2
Downloading software	Dexcom Clarity, Glooko, Tidepool	LibreView, Tidepool	Carelink, Tidepool	Eversense data management system, Glooko, Tidepool

Dexcom. https://provider.dexcom.com. Accessed August 8, 2021.
Abbott Diabetes Care. https://www.freestylelibre.us/. Accessed August 8, 2021.
Medtronic. https://www.medtronicdiabetes.com/. Accessed August 8, 2021.
Senseonics. https://www.eversensediabetes.com/safety-info/. Accessed August 8, 2021.

Personal-Use CGM

	Dexcom G6	Abbott FreeStyle Libre 2	Medtronic Guardian Connect with Guardian Sensor 3	Eversense
FDA approved for medication dosing based on readings	Yes	Yes	No	Yes
Alarms for high/low	Yes	Yes	Yes	Yes
Interfering substances	Hydroxyurea	Ascorbic acid (>500 mg/day)	Acetaminophen	Mannitol, tetracycline
Water resistance, depth and duration	8 feet, 24 hours	3 feet, 30 minutes	8 feet, 30 minutes	3.2 feet, 30 minutes
FDA approved ages (years)	≥2	≥4	Guardian Sensor 3: >2 Guardian Connect: ≥14	≥18

Dexcom. https://provider.dexcom.com. Accessed August 8, 2021.
Abbott Diabetes Care. https://www.freestylelibre.us/. Accessed August 8, 2021.
Medtronic. https://www.medtronicdiabetes.com/. Accessed August 8, 2021.
Senseonics. https://www.eversensediabetes.com/safety-info/. Accessed August 8, 2021.

Self-Assessment Question #1

Which of the following continuous monitoring systems should be calibrated at least 2 times daily?

A. Dexcom G6
B. FreeStyle Libre 14-day
C. FreeStyle Libre 2
D. Medtronic Guardian Connect

Professional-Use CGM

Purchased and owned by the clinic or practice

- Used intermittently by the patient and the health care team to help facilitate diabetes management

Data collection can be either blinded or unblinded

- Requires clinicians to retrospectively review data of glycemic patterns to make clinical decisions regarding the patient's diabetes management

Blinded vs. Unblinded Professional-Use CGM

Unblinded CGM systems allows patients to see their glucose data in real time

- Ability to make treatment and behavioral decisions throughout the wear period

Blinded CGM data is not able to be viewed by the patient or clinician until downloaded in the office

- Does not influence behavior in response to alerts and sensor glucose readings
- Patients should keep a log of their dietary intake, activity and medication use so CGM data outliers can be associated with specific events
- Patients should continue to perform SMBG as previously recommended

Professional-Use CGM

	Dexcom G6 Pro	Abbott FreeStyle Libre Pro	Medtronic iPro2
Components	• Disposable sensor/transmitter • Receiver for data display/storage, which is owned and kept at the health care clinic • Optional compatibility with individual smart phone	• Disposable sensor/transmitter • Receiver for data display/storage, which is owned and kept at the health care clinic	• Disposable sensor • Reusable data transmitter (recorder) which attaches to the sensor • iPro2 recorder dock for data upload
Transmitter care	Disposable one-time use	Disposable one-time use	Clean and disinfect transmitter between uses
Blinded or unblinded	Blinded or unblinded	Blinded	Blinded

Abbott Diabetes Care. https://provider.myfreestyle.com/pdf/Simulator-FreeStyle-Libre-Pro.pdf. Accessed August 8, 2021.
Dexcom. https://provider.dexcom.com/faqs-categories/dexcom-g6-pro. Accessed August 8, 2021.
Medtronic. www.medtronicdiabetes.com. Accessed August 8, 2021.

Professional-Use CGM

	Dexcom G6 Pro	Abbott FreeStyle Libre Pro	Medtronic iPro2
Maximum wear time	10 days	14 days	6 days
Approved sites	Abdomen	Back of upper arm	Abdomen
Calibrations required	0	0	3-4 per day
Data Software	Clarity	LibreView	Carelink
Alarms for high/low	Yes, in unblinded mode	No	No
Interfering substances	Hydroxyurea	Salicylic acid and ascorbic acid (>500 mg/day)	Acetaminophen
FDA approved age (years)	≥2	≥18	≥18

Abbott Diabetes Care. https://provider.myfreestyle.com/pdf/Simulator-FreeStyle-Libre-Pro.pdf. Accessed August 8, 2021.
Dexcom. https://provider.dexcom.com/faqs-categories/dexcom-g6-pro. Accessed August 8, 2021.
Medtronic. www.medtronicdiabetes.com. Accessed August 8, 2021.

Which Patients May Benefit from Professional-Use CGM?

Gastroparesis	Discordant A1C and SMBG	A1C >9%	Post-prandial hyperglycemia
Change in diabetes treatment plan	Frequent hypoglycemia or hypoglycemia unawareness	Lack of SMBG data	Renal disease
When health care providers need more data	Considering personal-use CGM	Insurance does not cover personal-use CGM	View impact of diet, activity, lifestyle and medications

American Association of Diabetes Educators and American Association of Nurse Practitioners. http://assets.aanp.org/documents/2019/Prof_CGM_Playbook_AADE_AANP.pdf. Accessed August 8, 2021.

Coverage for CGM Systems

Most commercial payers offer coverage for personal-use CGM for those with T1D

Many payers will also cover CGM for persons with T2D using multiple daily injections

Depending on the insurance type, coverage may be through medical or pharmacy benefits

Medicaid plans

Coverage varies depending on the state and payer

Medicare currently covers the G6 and FreeStyle Libre for persons with T1D and T2D meeting certain requirements

Coverage Criteria for Personal-Use CGM: Medicare

Personal-use CGM and related supplies are covered by Medicare when all the following coverage criteria are met:

- The beneficiary has diabetes mellitus
- ~~The beneficiary has been using a blood glucose monitor and performing frequent testing, defined as ≥4 times per day~~
- The beneficiary is insulin-treated with ≥3 daily administrations of insulin per day or CSII
- The beneficiary's insulin treatment regimen requires frequent adjustment by the beneficiary based on blood glucose monitoring or CGM
- Within 6 months prior to ordering CGM, the treating practitioner has an in-person visit with the beneficiary to evaluate their diabetes management and determine if the above criteria are met
- Every 6 months following the initial prescription of CGM, the treating practitioner has an in-person visit with the beneficiary to assess adherence to CGM and the diabetes treatment plan

Centers for Medicare & Medicaid Services. https://www.cms.gov/medicare-coverage-database/details/lcd-details.aspx?lcdid=33822. Accessed August 8, 2021.

Coverage Criteria for Personal-Use CGM: IL Medicaid

Personal-use CGM† and related supplies are covered by IL Medicaid when all the following coverage criteria are met:

- Diagnosis of T1D, T2D, gestational, or CF-related diabetes
- Intensive insulin regimen or CSII
- Frequently testing SMBG levels
- Patient has been or will be trained on device and is competent for use

T2D-specific criteria

- Hypoglycemic unawareness
- Recurrent documented hypoglycemia
- Recurrent nocturnal hypoglycemia
- Recurrent ketoacidosis
- Suboptimal glycemic control including wide glycemic swings

†Dexcom is preferred CGM (PA required); covered under pharmacy benefits
Abbreviations: CSII – continuous subcutaneous insulin infusion

Where Can Patients Obtain Personal-Use CGM? – *Dexcom*

Private	Medicare	Medicaid
• Pharmacy • Medical distributor/DME supplier	• Pharmacy (Walgreens via Part B) • Medical distributor/DME supplier	• Pharmacy

Abbreviations: DME – Durable Medical Equipment

Where Can Patients Obtain Personal-Use CGM? – *Freestyle Libre*

Private	Medicare	Medicaid
• Pharmacy • Medical distributor/DME supplier	• Medical distributor/DME supplier	• N/A not preferred

Abbreviations: DME – Durable Medical Equipment

Examples of Medical Distributors/DME Suppliers

- Advanced Diabetes Supply
- Byram Healthcare
- CCS Medical
- Edgepark Medical Supplies
- Edwards Health Care Services
- Solara Medical Supplies
- US Med

Ambulatory Pharmacy Pearls

- Build a smart phrase that includes all necessary components of documentation
- Understand where the CGM prescription should be sent based on insurance coverage
- Take advantage of billing opportunities
- Train a technician to complete PAs electronically
- Submit letter of medical necessity in the event the PA is denied, but patient meets clinical criteria

Retail Pharmacy Pearls: Libre

- Libre 14 day and Libre 2 have different NDCs!
- FreeStyle Libre 14 day compatible with *LibreLink* phone app
- FreeStyle Libre 2 compatible with FreeStyle Libre 2 phone app
  - Might not see a prescription for reader

- Components and day supply calculations
  - Reader (1 per ~3 years)
  - Sensor kit (2 kits per 28 days)
    - Sensor is changed every 14 days
    - Each sensor kit contains applicator and alcohol wipes

- Abbott has a discount card for eligible patients
  - $75 for 2 sensors
  - $65 for reader

www.freestylelibre.us
https://provider.myfreestyle.com/freestyle-libre-resources.html

Retail Pharmacy Pearls: Dexcom

- Receiver (1 per year)
- Transmitter (1 per 90 days)
  - *Sits on top of sensor not to throw away when replacing sensor*
- Sensors (3 per 30 days)
  - Changed every 10 days
- Compatible with phone app
  - Patient can use receiver and app at the same time
- Commercial patients can use one time voucher
  - Up to $140 off receiver and transmitter

www.dexcom.com

Retail Pharmacy Pearls: Adhesion Issues or Malfunction

Sensor may fall off early

- Products that help prevent adhesive failure:
  - Bidirectional adhesives make the skin stickier → Skin Prep, Skin Tac™, Mastisol®
  - Adhesive patches or tapes → IV3000, Tegaderm HP

Sensor may give error message/stop working

- Patient should contact device specific technical support

Skin irritation

- Fluticasone nasal spray (apply topically)

Patient should be able to get replacement device shipped from the company

Retail Pharmacy Pearls: Insurance Rejections

PA required

- Plan-specific CGM requirements must be met, and documentation must be received prior to approval

Medicare Part D exclusion

- Must go through Part B
  - If Libre: via DME
  - If Dexcom: via pharmacy or DME

Plan exclusion

- Patient can try obtaining through medical benefits via DME

Documentation Requirements for CGM Systems

Documentation requirements

May exist depending on the type of insurance and may differ depending on the type of diabetes mellitus

Specified requirements must be addressed or coverage may be denied

May need to provide a 30- or 60-day SMBG log demonstrating ≥4x/day testing depending on payor

Documentation of a recent provider visit and continued documentation after device is purchased

Billing for CGM Services

CPT Code	Description
95249 **Personal-use CGM startup/training**	Requires documented ambulatory CGM data for a minimum of 72 hours Patient-provided equipment, sensor placement, hook-up, calibration of monitor, patient training, and printout of recording
95250 **Professional-use CGM placement**	Requires documented ambulatory CGM data for a minimum of 72 hours Physician- or other qualified health care professional (office)-provided equipment, sensor placement, hook-up, calibration of monitor, patient training, removal of sensor, and printout of recording
95251 **Personal- and professional-use CGM interpretation**	Requires documented ambulatory CGM data for a minimum of 72 hours; analysis, interpretation, and report

Centers for Medicare & Medicaid Services. https://www.cms.gov/apps/physician-fee-schedule/overview.aspx. Accessed August 8, 2021.

Billing for CGM Services

Reporting Frequency	Medicare Physician Fee Schedule (2021 averages)	Hospital Outpatient Prospective System (2021 averages)	Commercial Payer List Price† (2021 averages)
CPT 95249 (personal-use CGM startup/training)			
Can be submitted only once during the time period that the patient owns the device	$58.62	$55.66 APC 5733	$128
CPT 95250 (professional-use CGM placement)			
Can be submitted once per month Do not bill more than one time per month†	$157.37	$118.74 APC 5012	$309
CPT 95251 (personal- and professional-use CGM interpretation)			
Can be submitted once per month Do not bill more than one time per month	$35.59	Paid under physician fee schedule	$97

†May vary by payer based on contracting price
Abbreviations: APC – Ambulatory Payment Classification

Centers for Medicare & Medicaid Services. https://www.cms.gov/apps/physician-fee-schedule/overview.aspx. Accessed August 8, 2021.
Dexcom. https://provider.dexcom.com/coding/medicare-coding. Accessed August 8, 2021.

Billing for CGM Services

CPT 95249

- Any trained health care professional
  - e.g., nurses, certified diabetes care and education specialists, or pharmacists
- Incident-to requirements are met
  - Providing the service directed by a physician or other qualified health care provider

CPT 95250

- Any trained health care professional
- Incident-to requirements are met
  - Providing the service directed by a physician or other qualified health care provider

CPT 95251

- A physician or licensed non-physician provider as outlined by their scope of practice in individual state practice acts
- Can be billed on the same day as 95249 or 95250

Centers for Medicare & Medicaid Services. https://www.cms.gov/apps/physician-fee-schedule/overview.aspx. Accessed August 8, 2021.

CGM Billing Timeline

Sensor Placement

CGM system set-up, training, and education

≥72 hours

Follow-up Appointment

Download data, provide disease state management

Bill CPT 95249 or 95250 incident-to the provider

Next Provider Appointment

Download data, provide and review AGP report collaboratively with provider

Provider may bill CPT code 95251

Abbreviations: AGP – ambulatory glucose profile

Tips for Implementing Professional-Use CGM in the Outpatient Setting

Ordering

- Readers are one-time purchase
  - Consider purchasing 2, one as a back-up
- Order sensors based on need
  - Start with with a small number, 6-8 sensors, until workflow established
  - May consider more frequent follow-up appointments during sensor wear periods
- Establish ordering and inventory process

Contact IT to download software

Establish a training process

CGM Use in the Inpatient Setting

ICU

- CGM prevents severe hypo- and hyperglycemia, allows for more accurate insulin dose adjustments, and decreases nursing workload in ICU
- Need for regular calibration because of measurement lag and substance interference
- Lack of data on accuracy of sensors in patients with arterial hypotension, hypothermia or hypoxia

Non-ICU Setting

- Limited evidence supporting use of rtCGM devices in non-ICU hospitalized patients
- Clinical guidelines have not supported use due to lack of larger safety and efficacy outcomes studies
    - Support continuation of outpatient CGM in hospital under specific circumstances if the institution has implemented guidelines and procedures

Umpierrez GE, Klonoff DC. Diabetes Care. 2018;41:1579-89.

CGM Interpretation and Training Resources

Innovating Decisions and Empowering Action (IDEA) in Diabetes Management

- Available from: https://nf01.diabeteseducator.org/eweb/DynamicPage.aspx

Association of Diabetes Care and Education Specialists (ADCES) Personal Continuous Glucose Monitoring Implementation Playbook

- Available from: https://www.diabeteseducator.org/docs/default-source/practice/educator-tools/cgm-playbooks/personal-cgm-playbook.pdf?sfvrsn=2

Association of Diabetes Care and Education Specialists (ADCES) Professional Continuous Glucose Monitoring Implementation Playbook

- Available from: https://www.diabeteseducator.org/docs/default-source/opencms_test/prof-cgm-playbook.pdf?sfvrsn=2

Self-Assessment Question #2

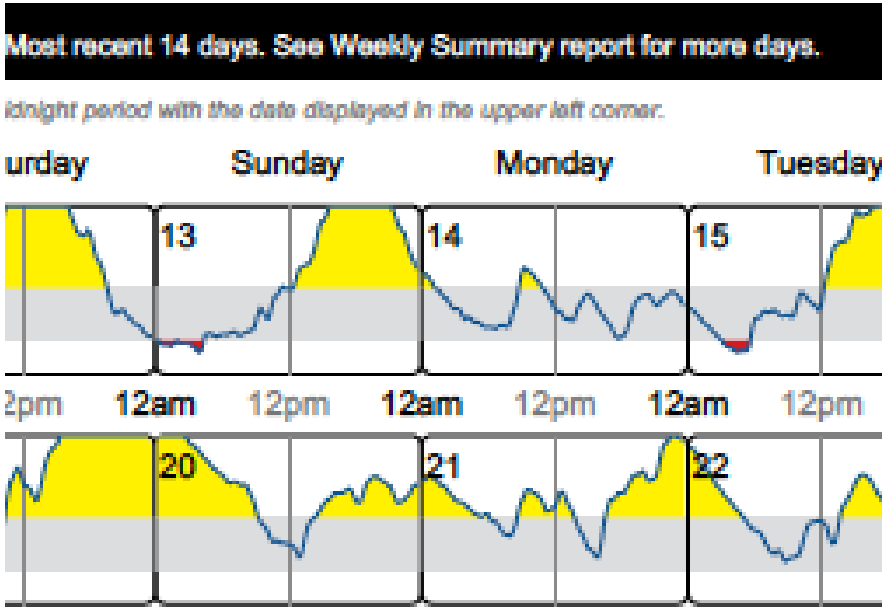
Which of the following Current Procedural Terminology (CPT) codes can only be submitted once during the time the patient owns the CGM?

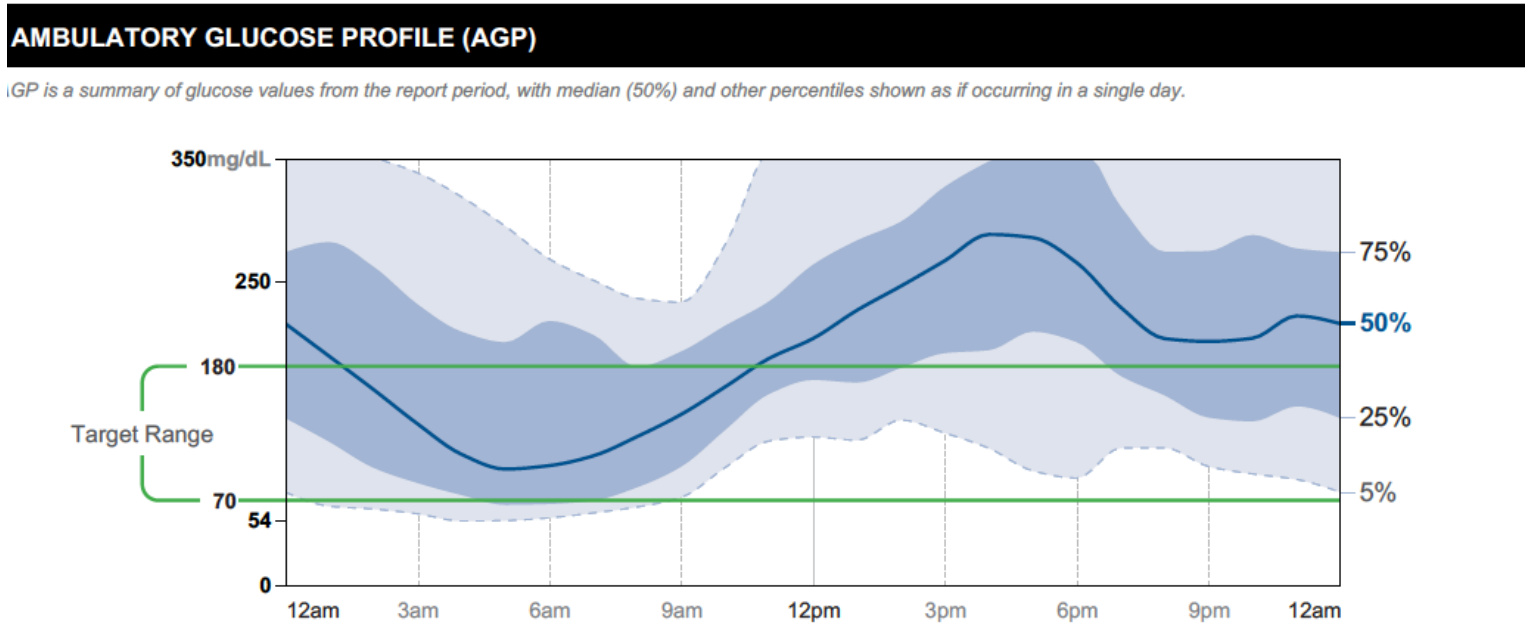
A. 95249
B. 95250
C. 95251
D. 99211

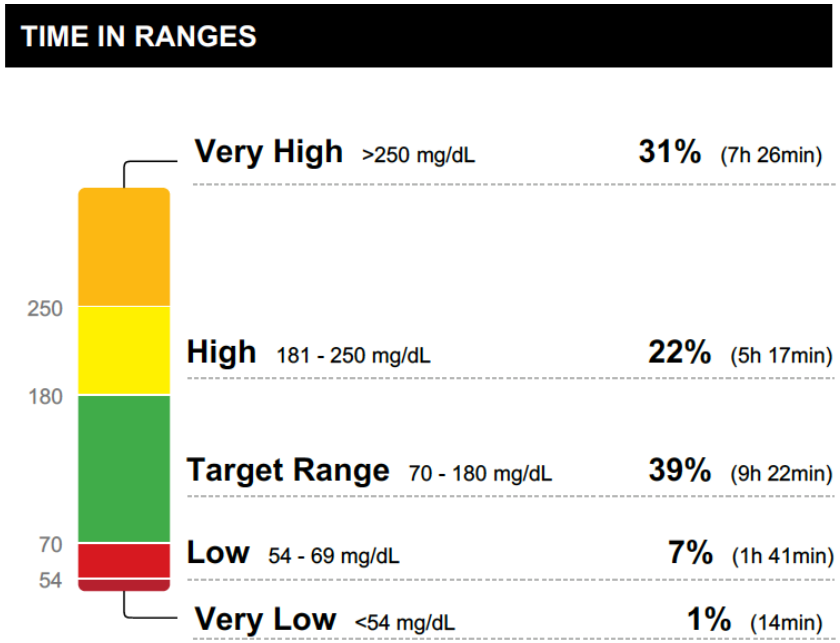
Self-Assessment Question #3

Which of the following is a requirement for CPT code 95250?

A. The person with diabetes is on a basal/bolus insulin regimen
B. The person with diabetes is performing SMBG 4 times daily
C. There is at least 72 hours of CGM data documented
D. Type 1 diabetes is documented in the electronic medical record







CGM Interpretation

Standardized Metrics for CGM Data Interpretation

Key Metric	Measure
Number of days of active CGM use	14 days
Percentage of data available from active CGM use	Recommend >70% wear time over 14 days
Mean glucose	Average glucose over wear period
Glucose management indicator (GMI)	CGM version of estimated hemoglobin A1C
Glycemic variability (coefficient of variation)	Standard deviation/mean, stable ≤36%
Time-above-range (TAR) level 2	% readings and time >250 mg/dL
Time-above-range (TAR) level 1	% readings and time 181-250 mg/dL
Time-in-range (TIR)	% readings and time 70-180 mg/dL
Time-below-range (TBR) level 1	% readings and time 54-69 mg/dL
Time-below-range (TBR) level 2	% readings and time <54 mg/dL

Battelino T et al. Diabetes Care. 2019; 42(8):1593-1603.
Grunberger G, et al. Endocr Pract. 2021;27:505-537.

CGM Targets

T1D/T2D

- TIR 70-180 mg/dL: > 70%
- %TBR < 70 mg/dL: < 4%
- %TBR < 54 mg/dL: < 1%
- %TAR > 180 mg/dL: < 25%
- %TAR > 250 mg/dL: < 5%

Older/High Risk T1D/T2D

- TIR 70-180 mg/dL: > 50%
- %TBR < 70 mg/dL: < 1%
- %TBR < 54 mg/dL: 0%
- %TAR < 250 mg/dL: < 10%

Pregnancy: T1D

- TIR 63-140 mg/dL: > 70%
- %TBR < 63 mg/dL: < 4%
- %TBR < 54 mg/dL: 1%
- %TAR > 140 mg/dL: < 25%

Grunberger G, et al. Endocr Pract. 2021;27:505-537.

Time-In-Range and A1C Correlations

TIR%	Average A1C (95% CI)
40%	8.1% (7.1% - 9.1%)
50%	7.7% (6.7% - 8.7%)
60%	7.3% (6.3% - 8.3%)
70%	6.9% (5.9% - 7.9%)
80%	6.5% (5.5% - 7.5%)

Battelino T et al. Diabetes Care. 2019; 42(8):1593-1603.

The AGP Report

AGP Report

August 10, 2017 - August 24, 2017 (15 Days)

LibreView

GLUCOSE STATISTICS AND TARGETS

August 10, 2017 - August 24, 2017	**15 Days**
% Time CGM is Active	**100%**

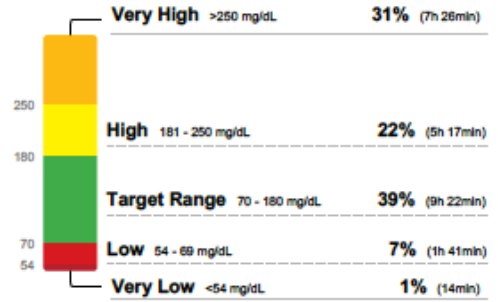
Ranges And Targets For	Type 1 or Type 2 Diabetes
Glucose Ranges	**Targets** % of Readings (Time/Day)
Target Range 70-180 mg/dL	Greater than 70% (16h 48min)
Below 70 mg/dL	Less than 4% (58min)
Below 54 mg/dL	Less than 1% (14min)
Above 180 mg/dL	Less than 25% (6h)
Above 250 mg/dL	Less than 5% (1h 12min)

Each 5% increase in time in range (70-180 mg/dL) is clinically beneficial.

Average Glucose	**207** mg/dL
Glucose Management Indicator (GMI)	**8.3%**
Glucose Variability	**51.8%**

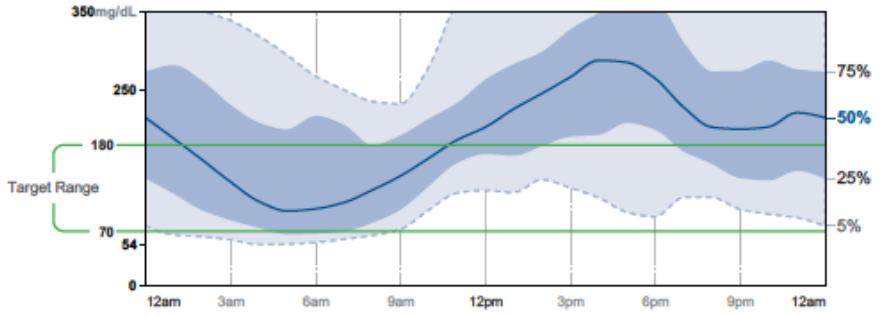
Defined as percent coefficient of variation (%CV); target ≤36%

TIME IN RANGES



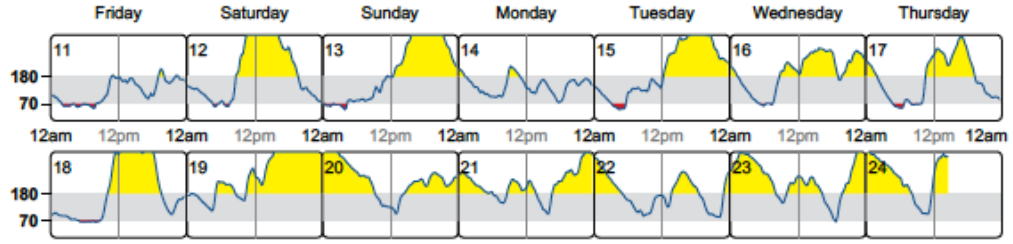
AMBULATORY GLUCOSE PROFILE (AGP)

AGP is a summary of glucose values from the report period, with median (50%) and other percentiles shown as if occurring in a single day.



DAILY GLUCOSE PROFILES Most recent 14 days. See Weekly Summary report for more days.

Each daily profile represents a midnight to midnight period with the date displayed in the upper left corner.



Source: Battelino, Tadej, et al. "Clinical Targets for Continuous Glucose Monitoring Data Interpretation: Recommendations From the International Consensus on Time in Range." Diabetes Care, American Diabetes Association, 7 June 2019, https://doi.org/10.2337/dci19-0028.

Breaking down the AGP Report: Glucose Statistics and Targets

GLUCOSE STATISTICS AND TARGETS

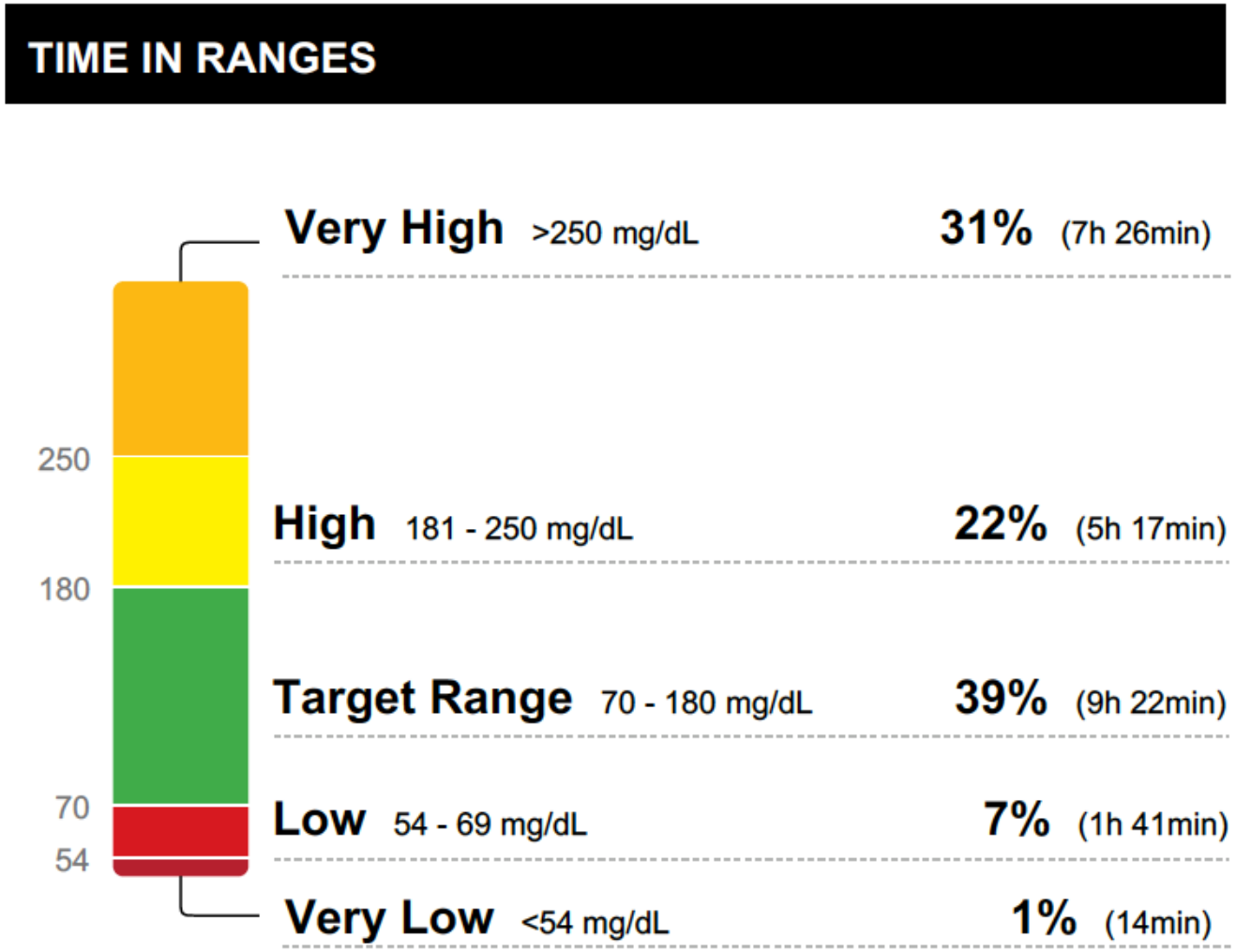
August 10, 2017 - August 24, 2017	**15 Days**
% Time CGM is Active	**100%**

Ranges And Targets For	Type 1 or Type 2 Diabetes
Glucose Ranges Target Range 70-180 mg/dL	**Targets** % of Readings (Time/Day) Greater than 70% (16h 48min)
Below 70 mg/dL	Less than 4% (58min)
Below 54 mg/dL	Less than 1% (14min)
Above 180 mg/dL	Less than 25% (6h)
Above 250 mg/dL	Less than 5% (1h 12min)
Each 5% increase in time in range (70-180 mg/dL) is clinically beneficial.	

Average Glucose	**207** mg/dL
Glucose Management Indicator (GMI)	**8.3%**
Glucose Variability	**51.8%**

Defined as percent coefficient of variation (%CV); target ≤36%

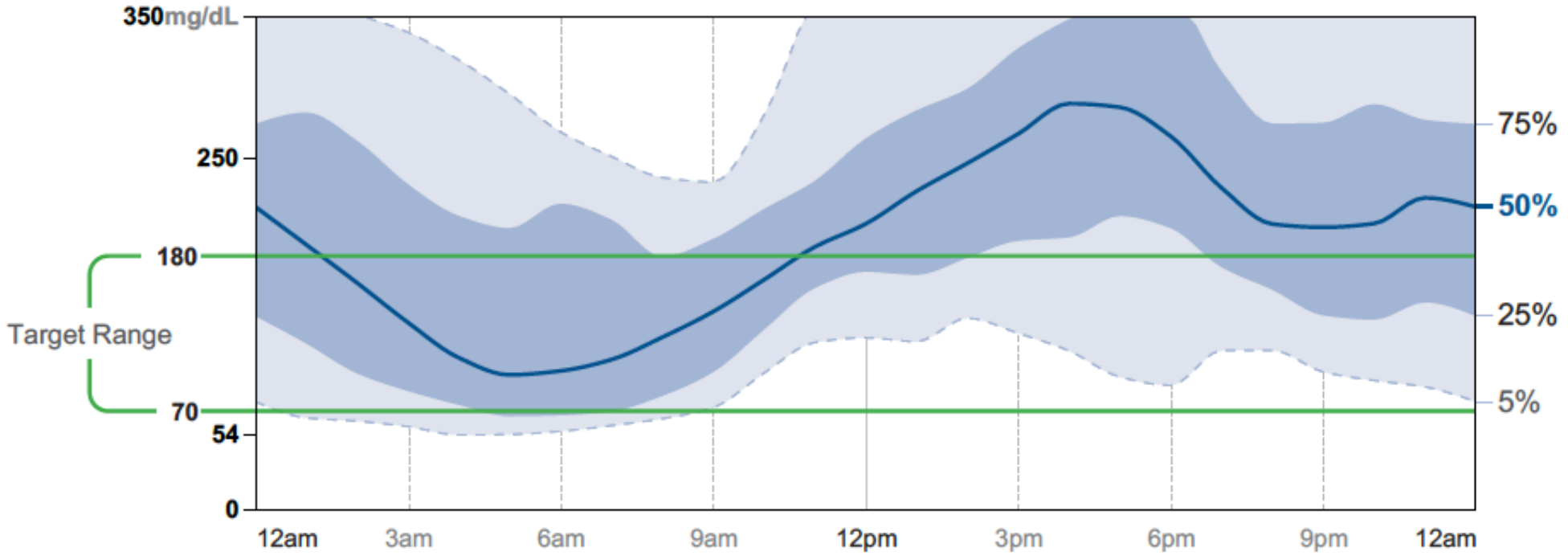
Breaking down the AGP Report: Time In Ranges



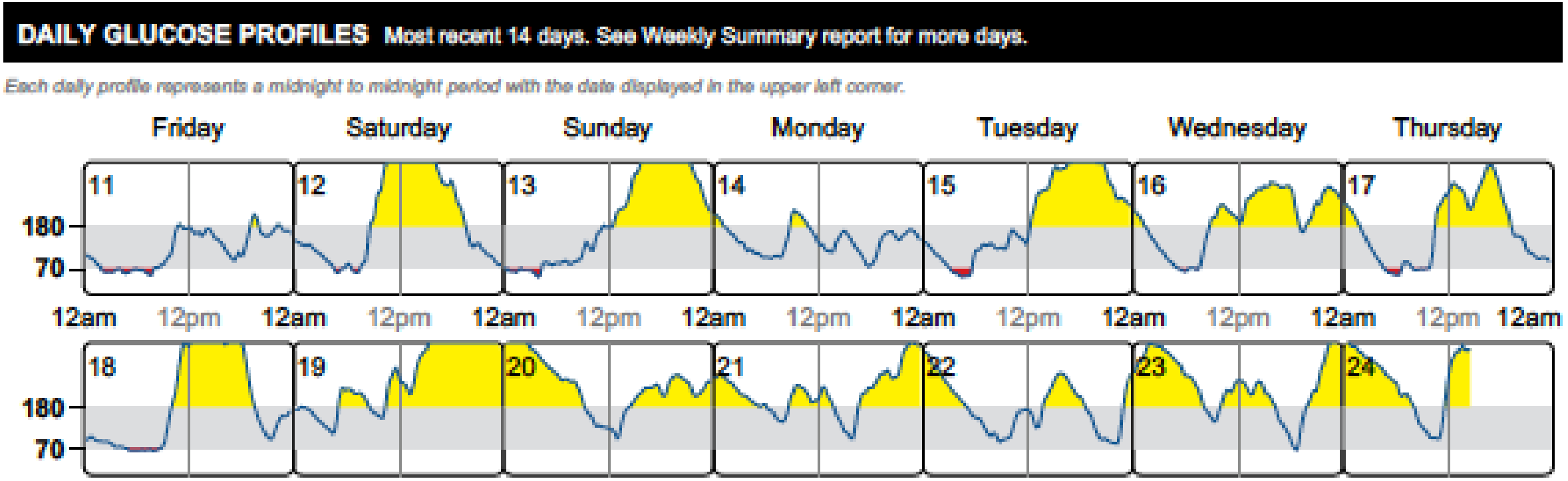
Breaking down the AGP Report: Ambulatory Glucose Profile

AMBULATORY GLUCOSE PROFILE (AGP)

AGP is a summary of glucose values from the report period, with median (50%) and other percentiles shown as if occurring in a single day.



Breaking down the AGP Report: Daily Glucose Profiles

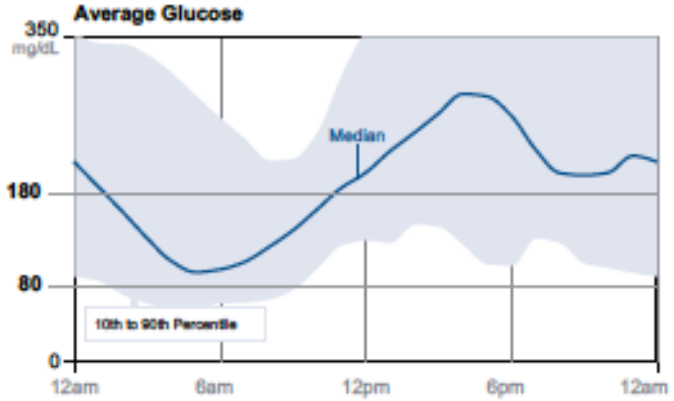


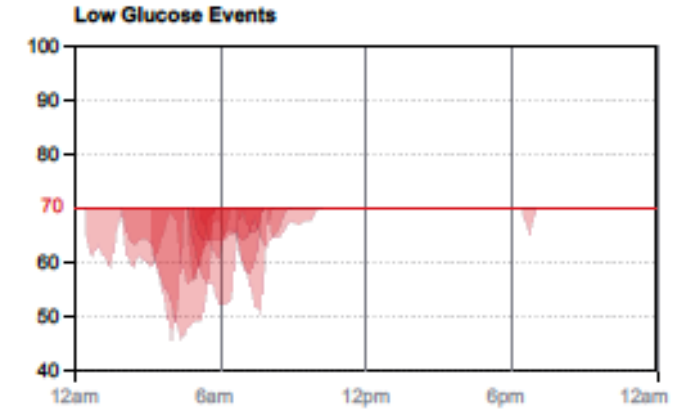
Snapshot: Average Glucose and Hypoglycemia Patterns

Glucose

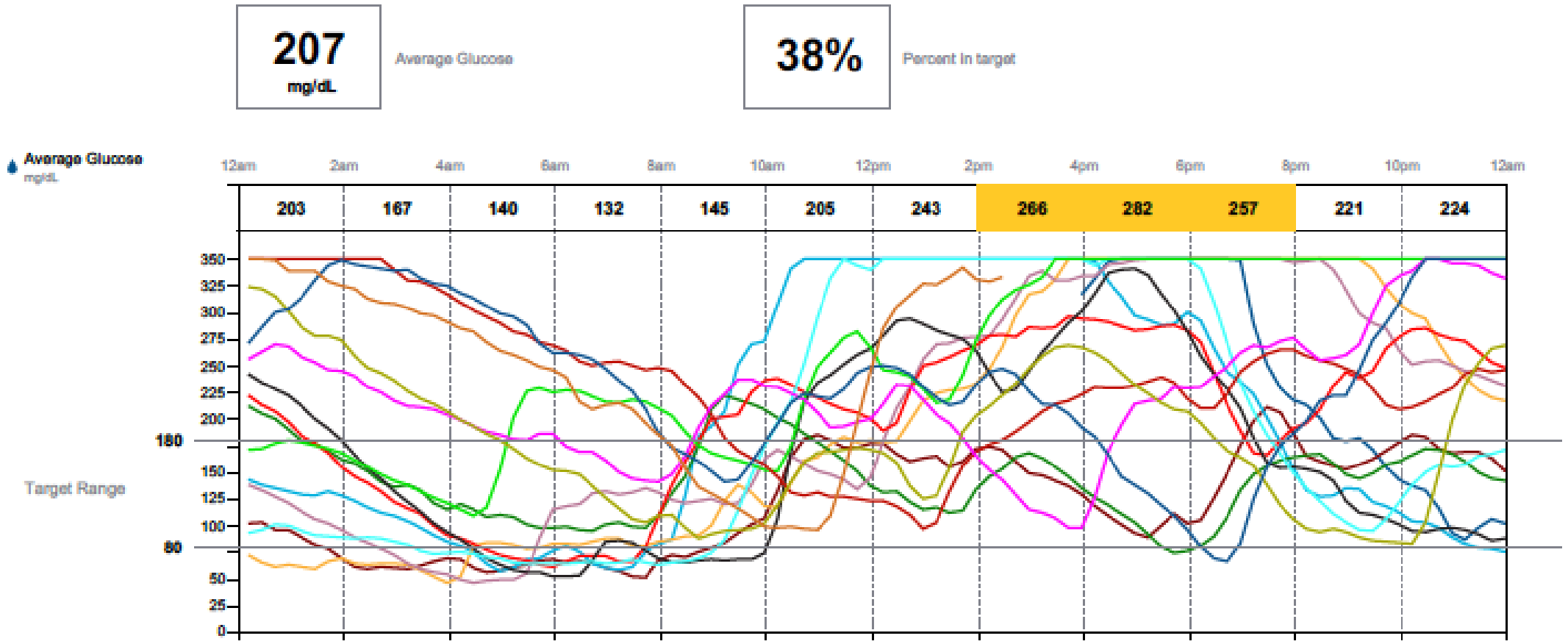
AVERAGE GLUCOSE	207 mg/dL
% above target	52 %
% in target	38 %
% below target	10 %

LOW GLUCOSE EVENTS	10
Average duration	170 Min





Spaghetti Graph



Self-Assessment Question #4

Which of the following best describes the recommended percent time-in-range (70-180 mg/dL) for an elderly person with type 2 diabetes?

A. > 50%

B. > 60%

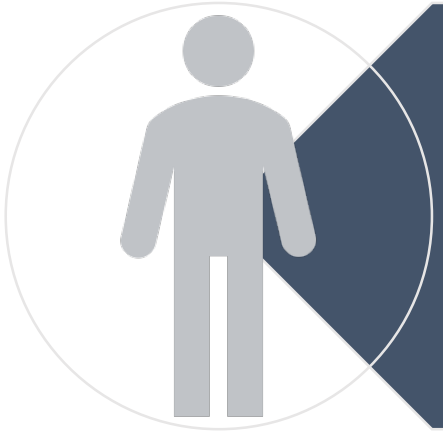
C. > 70%

D. > 80%

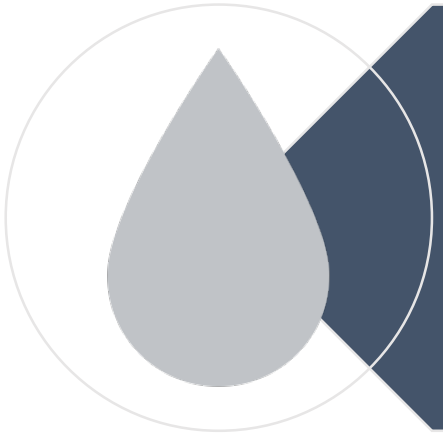
Self-Assessment Question #5

Which of the following is included in the Ambulatory Glucose Profile (AGP) report?

A. Number of low glucose events
B. Daily glucose profiles
C. Spaghetti graph
D. Number of times the CGM sensor was scanned



Patient Case
Meet RV



Using CGM in discordant A1C and SMBG

Meet RV

- CC: RV is a 71-year-old year old Hispanic man presenting for a follow-up visit for chronic disease management for T2DM, HTN, HLD, cirrhosis, PVD, and smoking cessation.

- PMH: type 2 diabetes, hypertension, tobacco use, previous cocaine abuse, severe PVD, alcoholic liver cirrhosis (now abstains from alcohol), bioprosthetic AV replacement, osteomyelitis of right toe. Right unilateral LE angioplasty to femoral artery on 8/22/18, and atherectomy of right proximal and distal superficial femoral artery.

Meet RV

- Self-reported SMBGs
  - Only checking FPGs upon wakening at 6 am
    - 135, 126, 119, 86, 83, 94, 115, 111, 64 mg/dL
  - Reports he “feels low” when he wakes up

Date	A1C	Fasting Plasma Glucose
8/11/2020	8.8%	114 mg/dL
3/9/2020	8.5%	85 mg/dL
12/24/2019	8.0%	125 mg/dL

Meet RV

Medications for Type 2 Diabetes
Metformin 1000 mg twice daily
Glipizide 10 mg twice daily
Insulin degludec (Tresiba) 55 units daily
Subcutaneous semaglutide (Ozempic) 1 mg weekly
Empagliflozin (Jardiance) 25 mg daily

What adjustments would you make to RV's medication regimen?

What counseling points would you provide RV?

Patient Case: RV

AGP Report

August 21, 2020 - September 3, 2020 (14 Days)

LibreView

GLUCOSE STATISTICS AND TARGETS

August 21, 2020 - September 3, 2020	**14 Days**
% Time CGM is Active	**100%**

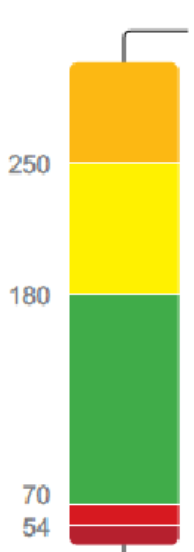
Ranges And Targets For	Type 1 or Type 2 Diabetes
Glucose Ranges Target Range 70-180 mg/dL	**Targets** % of Readings (Time/Day) Greater than 70% (16h 48min)
Below 70 mg/dL	Less than 4% (58min)
Below 54 mg/dL	Less than 1% (14min)
Above 180 mg/dL	Less than 25% (6h)
Above 250 mg/dL	Less than 5% (1h 12min)

Each 5% increase in time in range (70-180 mg/dL) is clinically beneficial.

Average Glucose	**187** mg/dL
Glucose Management Indicator (GMI)	**7.8%**
Glucose Variability	**42.3%**

Defined as percent coefficient of variation (%CV); target ≤36%

TIME IN RANGES

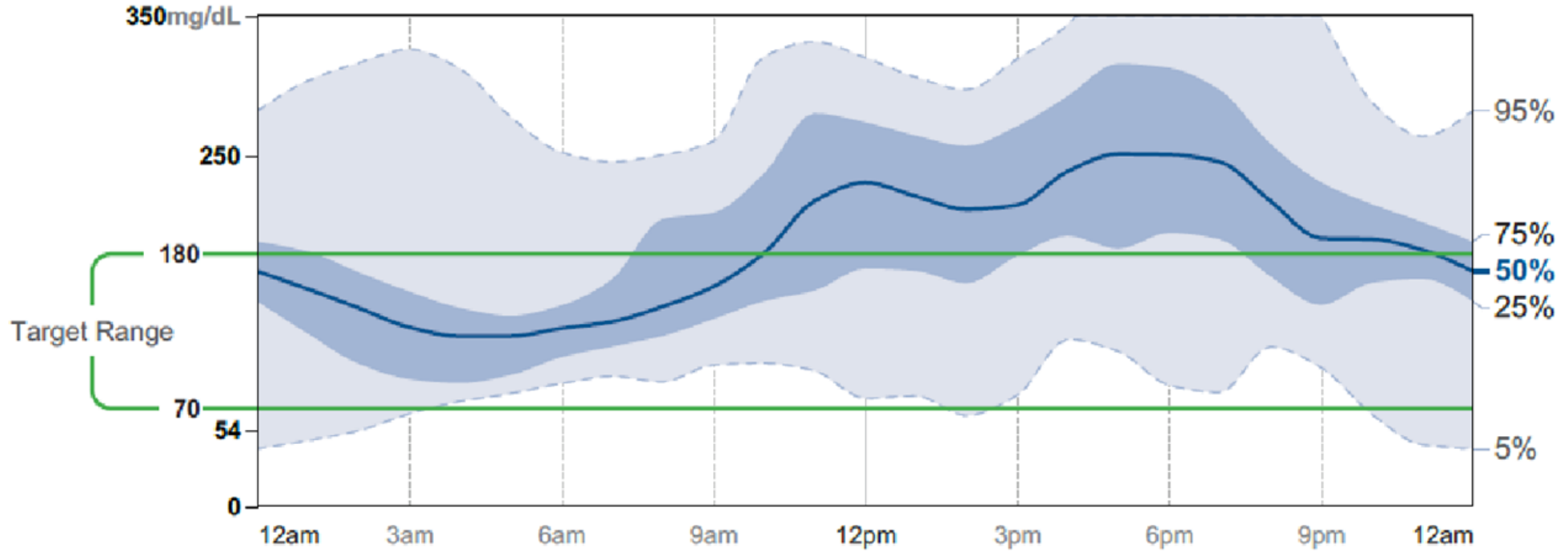


Very High	>250 mg/dL	**21%**	(5h 2min)
High	181 - 250 mg/dL	**28%**	(6h 43min)
Target Range	70 - 180 mg/dL	**47%**	(11h 17min)
Low	54 - 69 mg/dL	**2%**	(29min)
Very Low	<54 mg/dL	**2%**	(29min)

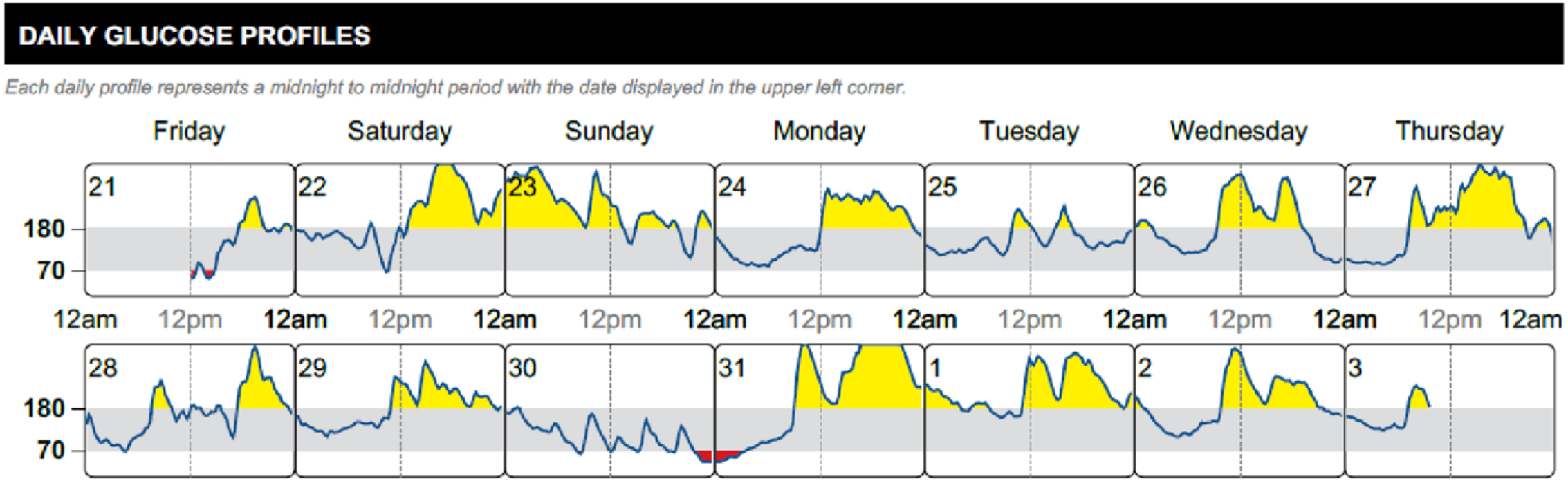
Patient Case: RV

AMBULATORY GLUCOSE PROFILE (AGP)

AGP is a summary of glucose values from the report period, with median (50%) and other percentiles shown as if occurring in a single day.



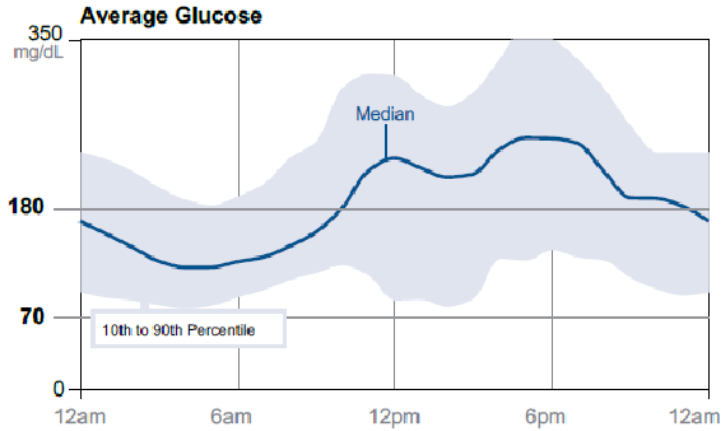
Patient Case: RV



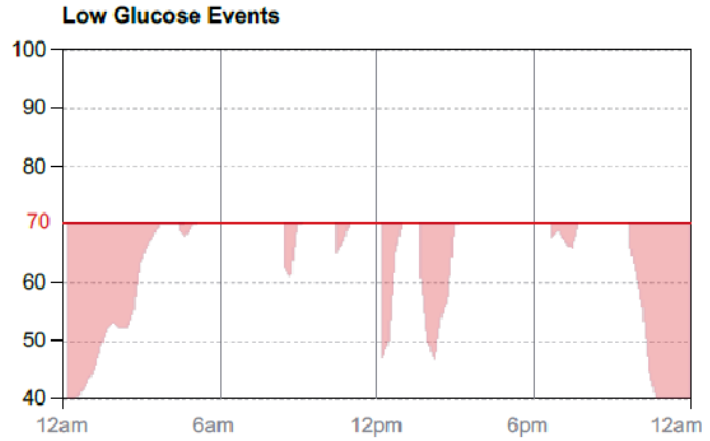
Patient Case: RV

Glucose

AVERAGE GLUCOSE	**187**	mg/dL
% above target	**49**	%
% in target	**47**	%
% below target	**4**	%



LOW GLUCOSE EVENTS	**7**	
Average duration	**105**	Min



What adjustments would you make to RV's medication regimen?

What counseling points would you provide RV?

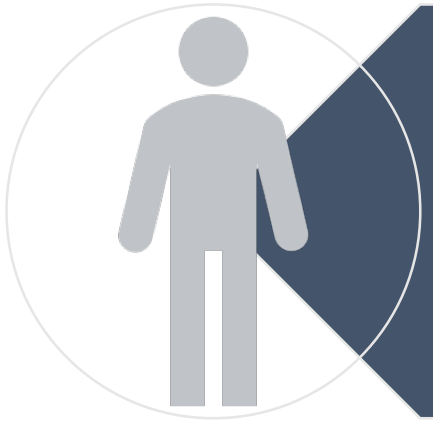
Visit #2 Plan

01

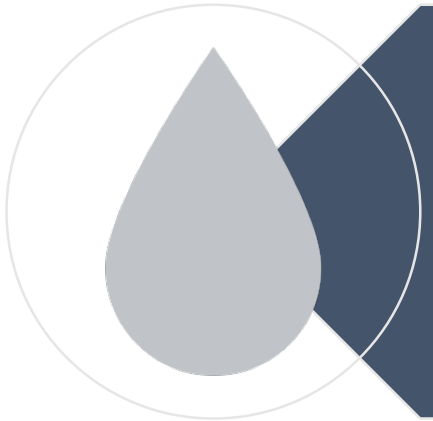
Start mealtime insulin 4 units before each meal

02

Taper off glipizide at future visit



Patient Case
Meet MS



Using CGM to optimize medication adherence and BG control acutely prior to surgery

Meet MS

- CC: MS is 57 y/o African American male presenting to Endo clinic for follow-up of T2DM. He was seen in pre-op clinic prior to scheduled prostatectomy and found to have a BG of 294 mg/dL and HbA1c of 11.3%. Last Endocrinology visit was 4 months prior.

- PMH: T2DM complicated by peripheral neuropathy, HLD, newly diagnosed prostate cancer

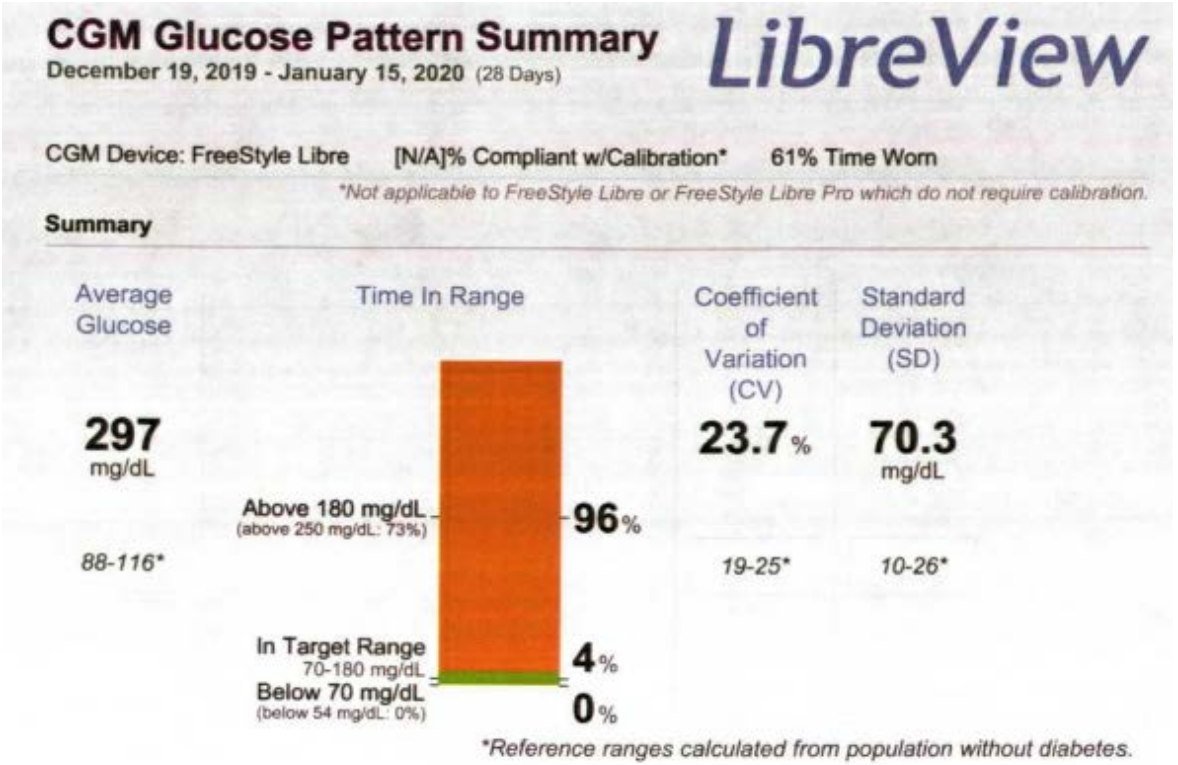
Meet MS

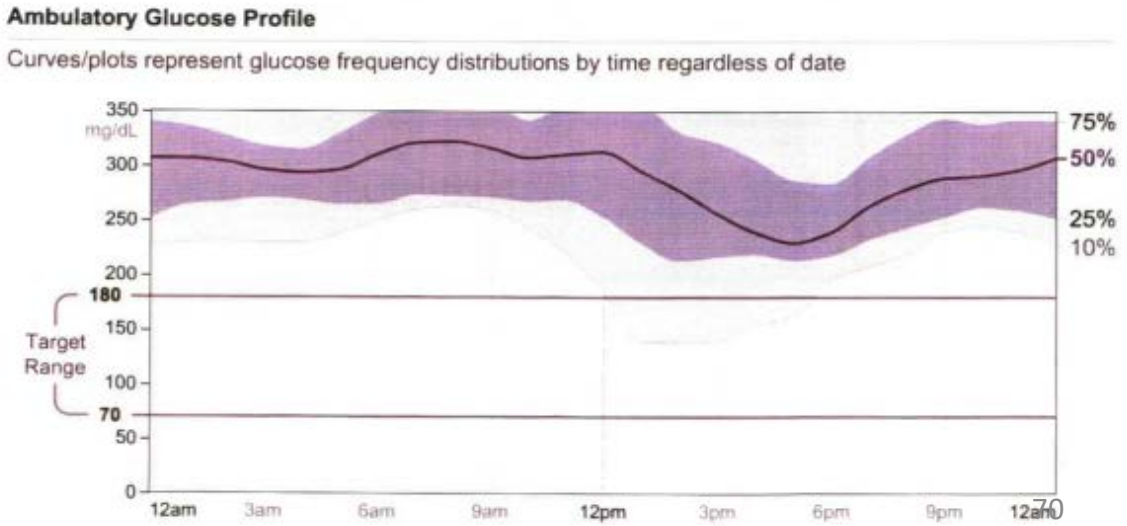
Date	A1C
7/30/2019	10.5%
12/30/2019	11.3%
01/10/2020	10.9%

Medications for Type 2 Diabetes
Metformin ER 500 mg daily
Dapagliflozin (Farxiga) 5 mg daily
Liraglutide (Victoza) 1.8 mg daily
Insulin aspart (Fiasp) mealtime hyperglycemia correction for BG > 200 mg/dL
Insulin glargine (Lantus) 10 units daily

Patient Case: MS

- What questions do you have for MS?

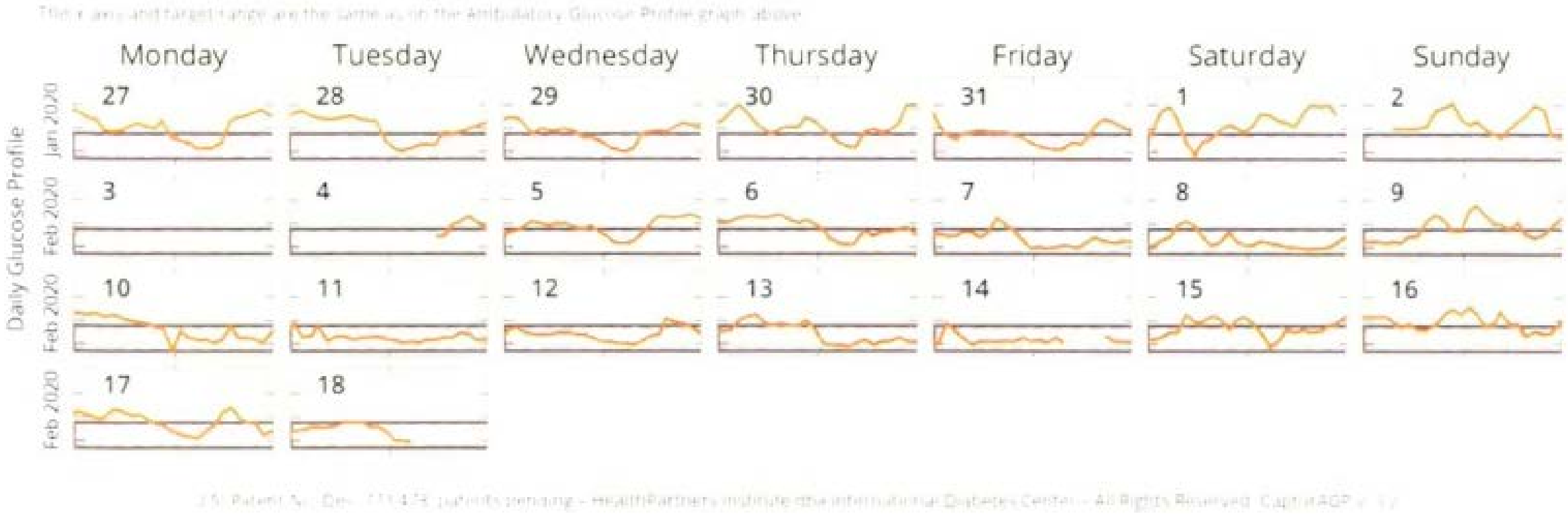




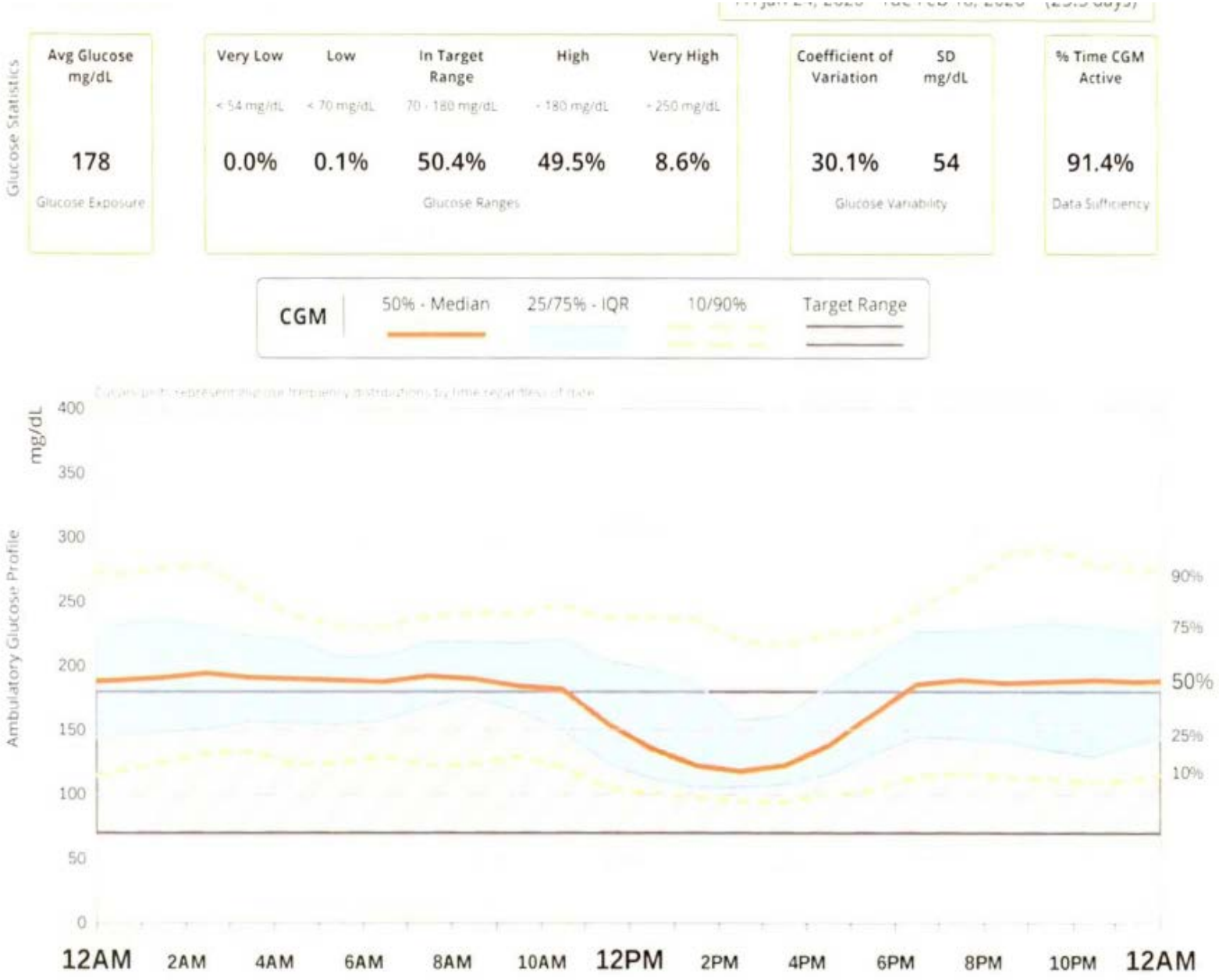
MS Visit #1 Plan

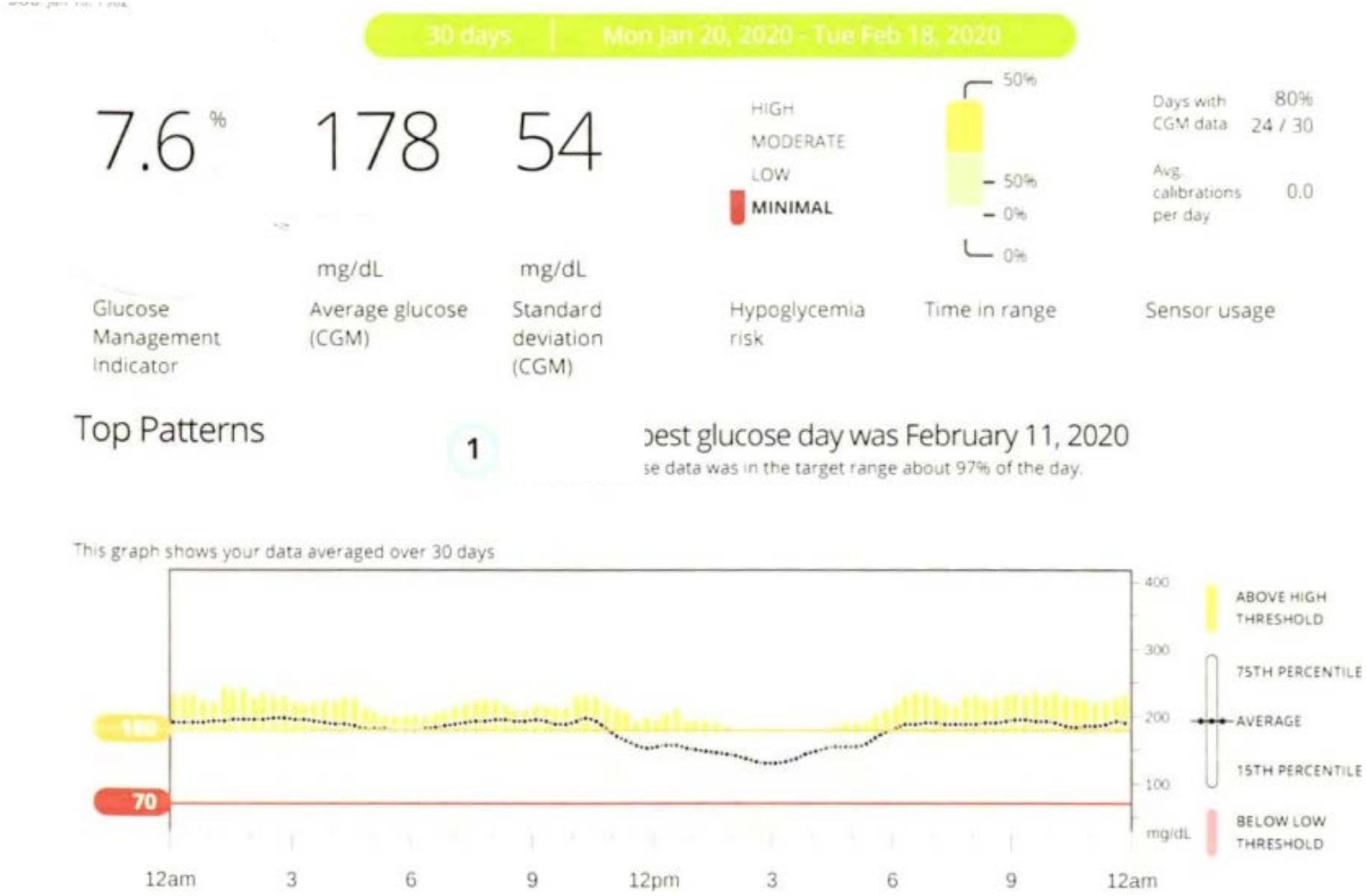
- Increase liraglutide (Victoza) from 0.6 mg to 1.2 mg
- Start insulin aspart (Fiasp) 3 units with carbohydrate containing meals plus hyperglycemia correction of 1:50>200
- Continue insulin glargine (Lantus), dapagliflozin, metformin ER
- Switch to Dexcom due to insurance formulary change
- Follow-up weekly for the next 4 weeks

Daily Glucose Profile



AGP


Glucose Statistics
Avg Glucose mg/dL
178
Glucose Exposure
Very Low
< 54 mg/dL
0.0%
Low
< 70 mg/dL
0.1%
In Target Range
70 - 180 mg/dL
50.4%
High
> 180 mg/dL
49.5%
Very High
> 250 mg/dL
8.6%
Glucose Ranges
Coefficient of Variation
30.1%
SD mg/dL
54
Glucose Variability
% Time CGM Active
91.4%
Data Sufficiency
CGM
50% - Median
25/75% - IQR
10/90%
Target Range
Ambulatory Glucose Profile
mg/dL
400
350
300
250
200
150
100
50
0
90%
75%
50%
25%
10%
12AM
2AM
4AM
6AM
8AM
10AM
12PM
2PM
4PM
6PM
8PM
10PM
12AM


30 days
Mon Jan 20, 2020 - Tue Feb 18, 2020
7.6 %
178 mg/dL
54 mg/dL
HIGH
MODERATE
LOW
MINIMAL
50%
50%
0%
0%
Days with CGM data 80%
24 / 30
Avg. calibrations per day 0.0
Glucose Management Indicator
Average glucose (CGM)
Standard deviation (CGM)
Hypoglycemia risk
Time in range
Sensor usage
Top Patterns
1
best glucose day was February 11, 2020
se data was in the target range about 97% of the day.
This graph shows your data averaged over 30 days
180
70
400
300
200
100
mg/dL
ABOVE HIGH THRESHOLD
75TH PERCENTILE
AVERAGE
15TH PERCENTILE
BELOW LOW THRESHOLD
12am
3
6
9
12pm
3
6
9
12am

What BG patterns can you identify with MS's CGM data?

What counseling points would you provide MS?

Insights from AGP and Patient Discussion

TIR	• Best from the hours of 9am-4pm while he is at work during the week • Coworkers help him remember to take insulin and help dose calculation
TAR	• Nights and weekends blood sugar is consistently 250-300 mg/dL • Missing doses of insulin at dinner or forgets insulin at home when gone on the weekend
Post-Prandial Hyperglycemia	• Forgets to take before eating and doses sometimes 3-4 hours after a meal
Hypoglycemia	• BG was in the 400s in the middle of the night, took 8 units of insulin aspart (Fiasp) and BG dropped to 70 mg/dL • This influenced his pattern of adherence to insulin aspart (Fiasp) in the following days because he was nervous about hypoglycemia

Counseling Points

- Keep insulin pen in a place you will see it for meals; pack a bag the night before an event with insulin pens and leave by the door
- Timing of insulin administration around meals, ideally 15 minutes prior to eating
- Set phone alarms/reminders at mealtimes to remember to take insulin
- Confirm understanding of hyperglycemia correction scale

Let's Review MS

- 57 y/o M following closely with Endocrinologist and PharmD over course of 1 month to improve BG control prior to surgery. He has a known history of medication non-adherence and poor health literacy.

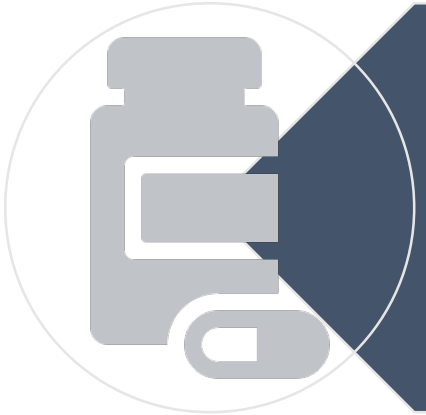
- On 2/18/20, repeat A1C 7.6%

- Medication adjustments made at last visit prior to surgery
  - Insulin glargine (Lantus) decreased to 8 units
  - Insulin aspart (Fiasp) only with carb-containing meals

Sensor Glucose	Fiasp Dose
Less than 80 mg/dL	Eat without any insulin
80 - 180	3 units of Fiasp
181 - 220	4 units of Fiasp
221 - 260	5 units of Fiasp
261 - 300	6 units of Fiasp
301 - 330	7 units of Fiasp
Over 330	8 units of Fiasp

- Prostatectomy occurred 2/21/20

Patient Case
Meet SM



Using CGM to Optimize Medication Therapy

Meet SM

- HPI: SM is a 78-year-old man presenting for an initial visit for chronic disease management for T2DM, Parkinson's disease, CAD s/p PCI

- A1C was 8.0% one month prior to initial visit
- Self-reported SMBGs
  - Testing 2 times daily
  - 90-110 mg/dL upon awakening
  - Reports he wakes up every night shaking and sweating at 3am
    - SMBG shows blood glucose is 50-60 mg/dL

Meet SM

Medications for Type 2 Diabetes
Metformin ER 750 mg 2 tablets daily
Insulin glargine (Lantus) 14 units daily
Insulin lispro (Humalog) 10 mg TID with meals

Visit #1 Plan

01

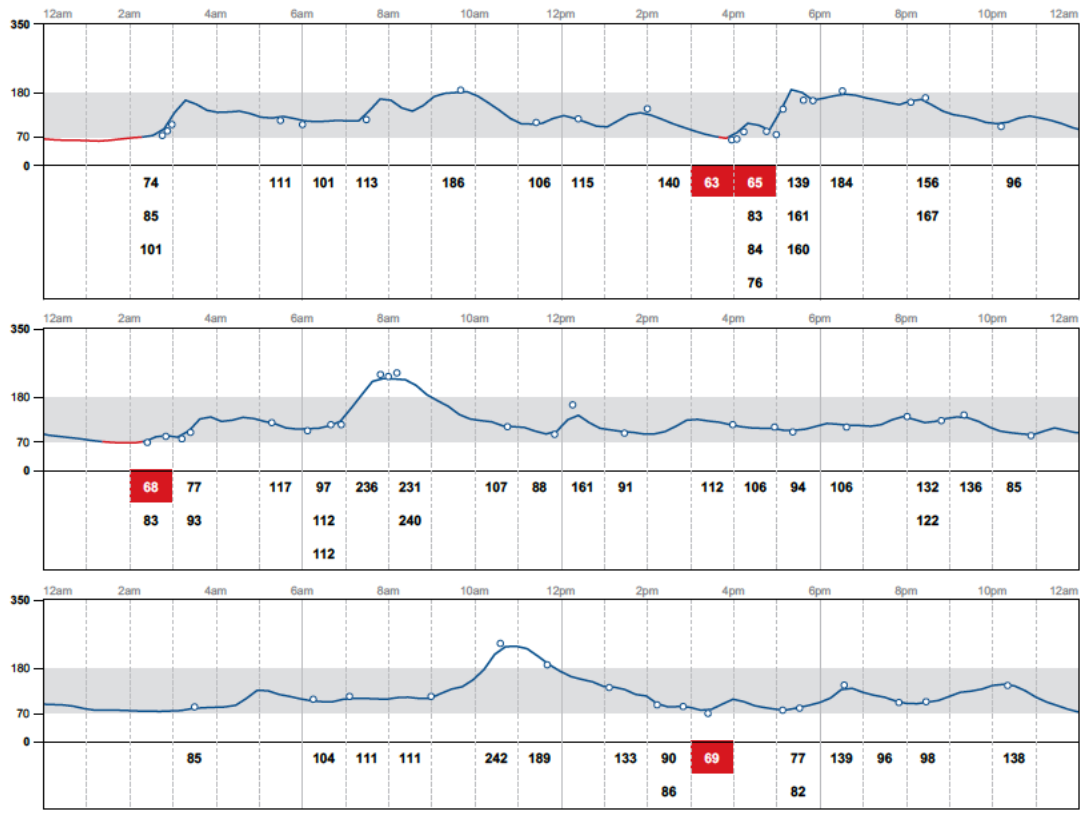
Decrease insulin glargine to 10 units daily

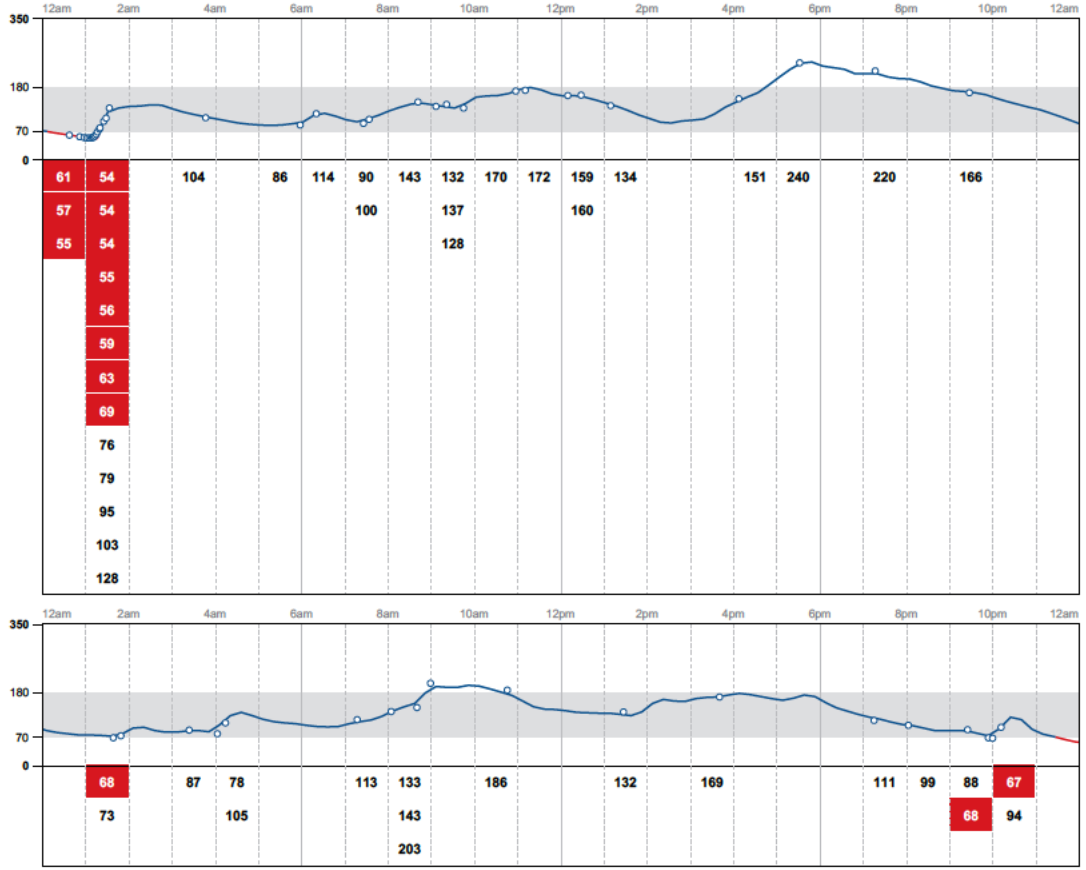
02

Order FreeStyle Libre 2 CGM

www.freestylelibre.us

Visit #2 – 5 days later (daily graph view)





What adjustments would you make to SM's medication regimen?

What counseling points would you provide SM?

Visit #2 Plan

01

Stop insulin glargine 10 units daily

02

Decrease insulin lispro from 10 to 8 units with meals

03

Start empagliflozin 10 mg daily

04

Continue metformin ER 750 mg 2 tablets daily

Visit #3 – 1 week later

AGP Report

May 13, 2021 - May 26, 2021 (14 Days)

LibreView

GLUCOSE STATISTICS AND TARGETS

May 13, 2021 - May 26, 2021	**14 Days**
% Time CGM is Active	**100%**

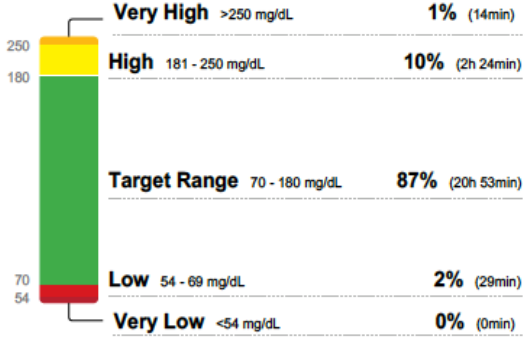
Ranges And Targets For	Type 1 or Type 2 Diabetes
Glucose Ranges	**Targets** % of Readings (Time/Day)
Target Range 70-180 mg/dL	Greater than 70% (16h 48min)
Below 70 mg/dL	Less than 4% (58min)
Below 54 mg/dL	Less than 1% (14min)
Above 180 mg/dL	Less than 25% (6h)
Above 250 mg/dL	Less than 5% (1h 12min)

Each 5% increase in time in range (70-180 mg/dL) is clinically beneficial.

Average Glucose	**128** mg/dL
Glucose Management Indicator (GMI)	**6.4%**
Glucose Variability	**32.6%**

Defined as percent coefficient of variation (%CV); target ≤36%

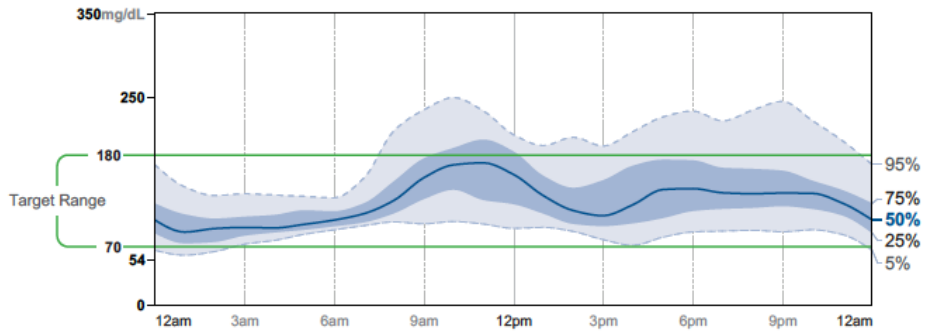
TIME IN RANGES

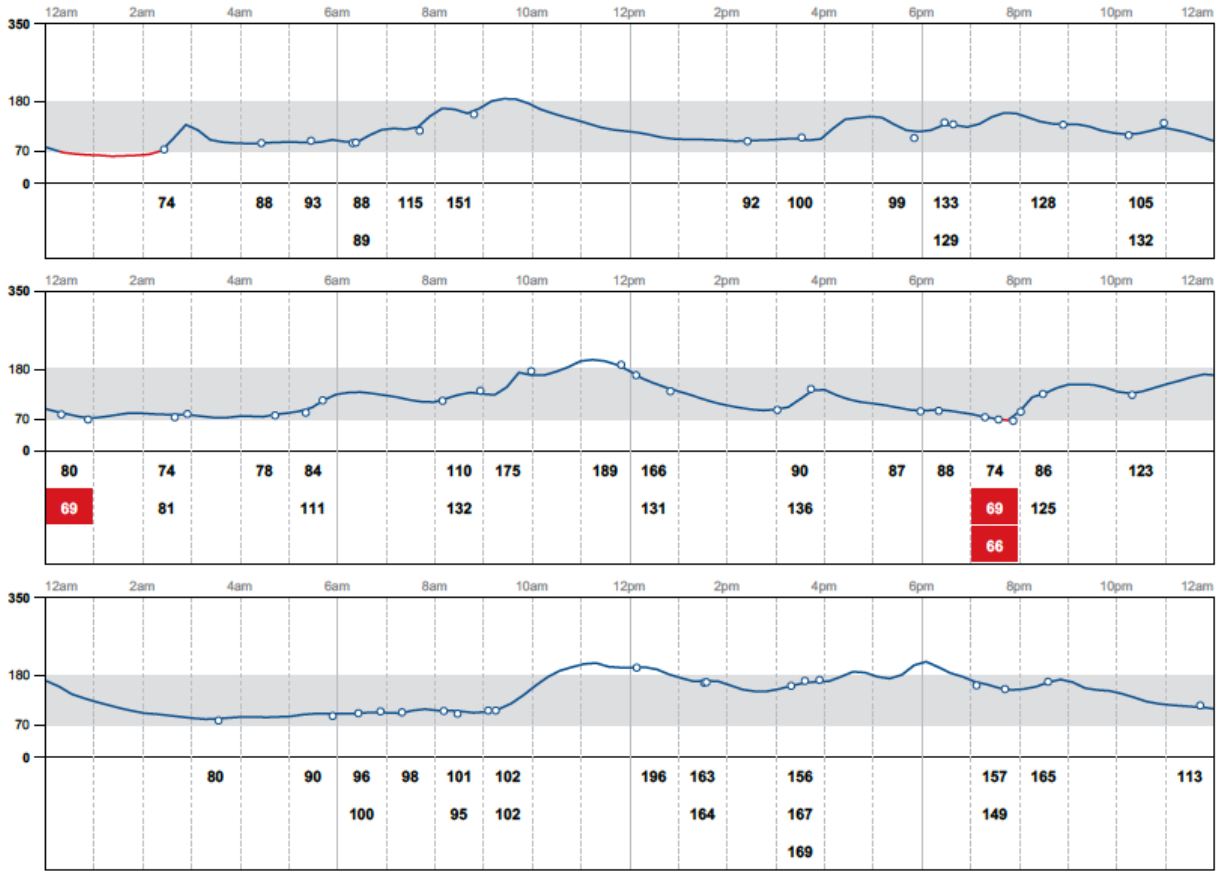


Very High >250 mg/dL	**1%**	(14min)
High 181 - 250 mg/dL	**10%**	(2h 24min)
Target Range 70 - 180 mg/dL	**87%**	(20h 53min)
Low 54 - 69 mg/dL	**2%**	(29min)
Very Low <54 mg/dL	**0%**	(0min)

AMBULATORY GLUCOSE PROFILE (AGP)

AGP is a summary of glucose values from the report period, with median (50%) and other percentiles shown as if occurring in a single day.





Visit #3 Plan

01

Continue empagliflozin 10 mg daily

- Only 1 week on therapy

02

Decreased insulin lispro from 8 units to 4 units with meals

- Counseled on carbohydrate consumption to reduce post-prandial glucose excursions

03

Continue metformin ER 750 mg 2 tablets daily

- No basal insulin at this time

Visit #4
(2 weeks later)

AGP Report

May 27, 2021 - June 9, 2021 (14 Days)

LibreView

GLUCOSE STATISTICS AND TARGETS

May 27, 2021 - June 9, 2021	**14 Days**
% Time CGM is Active	**100%**

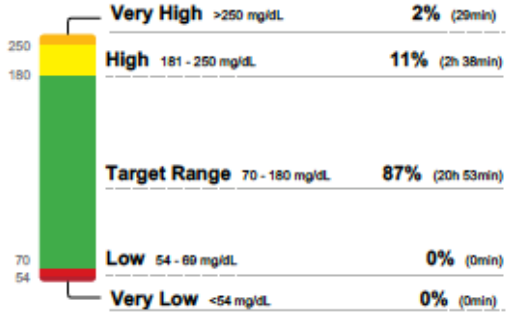
Ranges And Targets For	Type 1 or Type 2 Diabetes
Glucose Ranges	**Targets** % of Readings (Time/Day)
Target Range 70-180 mg/dL	Greater than 70% (16h 48min)
Below 70 mg/dL	Less than 4% (58min)
Below 54 mg/dL	Less than 1% (14min)
Above 180 mg/dL	Less than 25% (6h)
Above 250 mg/dL	Less than 5% (1h 12min)

Each 5% increase in time in range (70-180 mg/dL) is clinically beneficial.

Average Glucose	**140** mg/dL
Glucose Management Indicator (GMI)	**6.7%**
Glucose Variability	**28.2%**

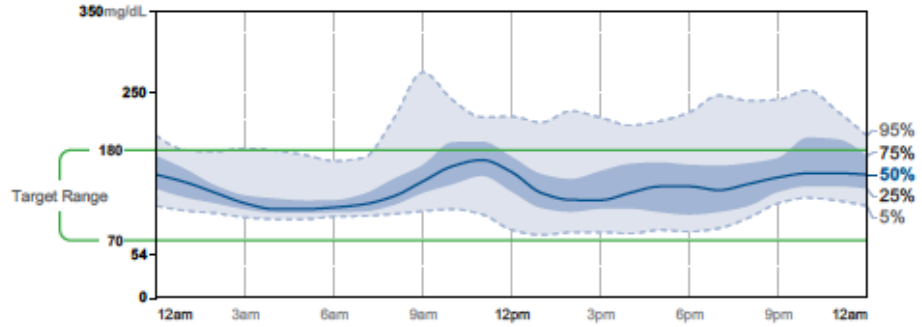
Defined as percent coefficient of variation (%CV); target ≤36%

TIME IN RANGES



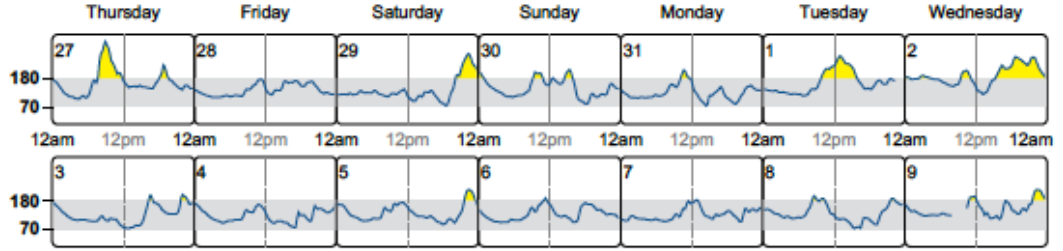
AMBULATORY GLUCOSE PROFILE (AGP)

AGP is a summary of glucose values from the report period, with median (50%) and other percentiles shown as if occurring in a single day.



DAILY GLUCOSE PROFILES

Each daily profile represents a midnight to midnight period with the date displayed in the upper left corner.



What adjustments would you make to SM's medication regimen?

Visit #4 Plan

01

Discontinue insulin lispro

02

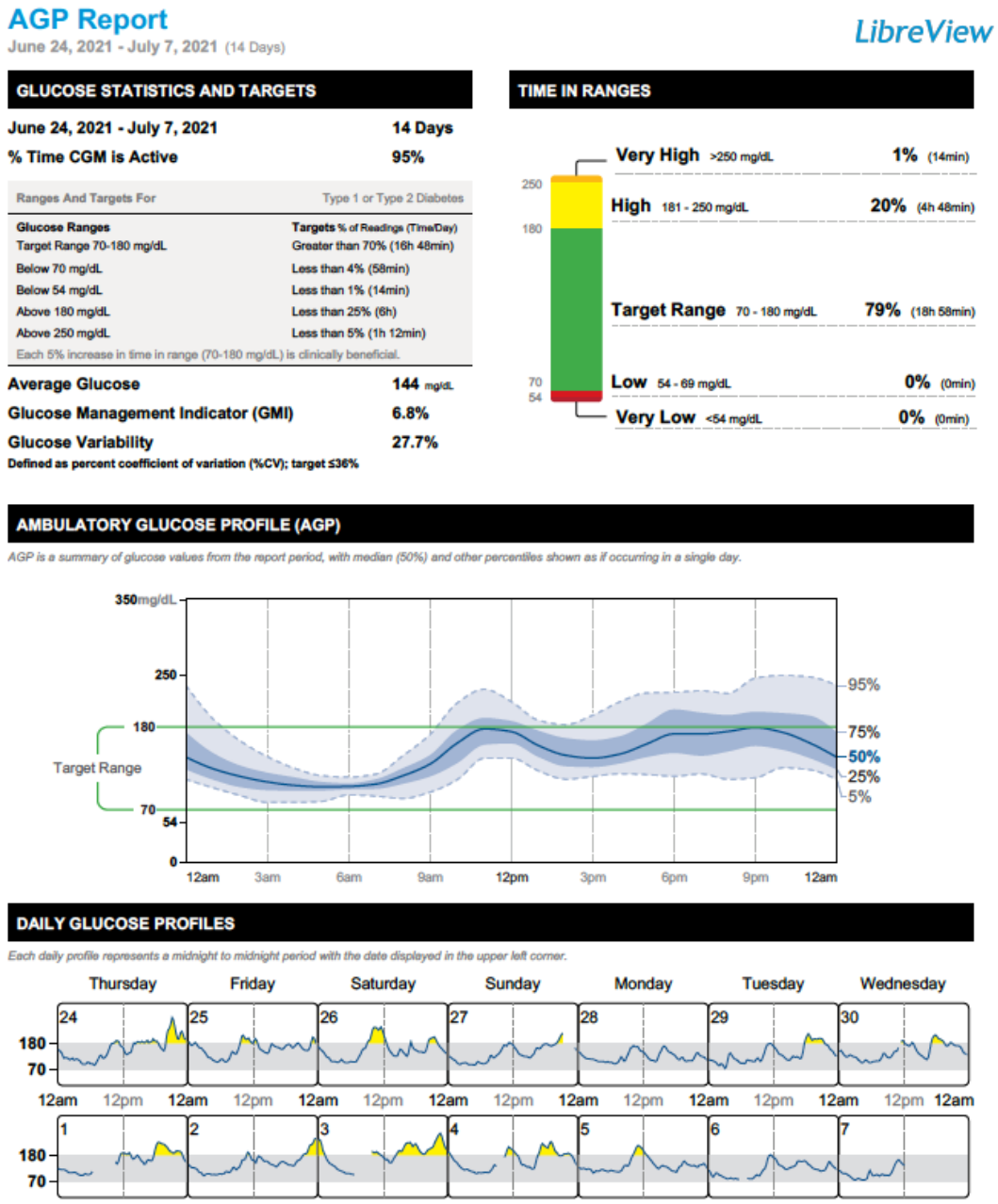
Increase empagliflozin to 25 mg daily

03

Continue metformin 750 mg 2 tablets every morning

Let's Review

- SM is a 78-year-old year old man presenting for chronic disease management for T2DM, Parkinson's disease, CAD s/p PCI
- Current T2DM Medications:
  - Metformin ER 750 mg 2 tablets every morning
  - Empagliflozin 25 mg daily
- Repeat A1C 7.1%



Self-Assessment Question #6

Which of the following is a requirement by Medicare for coverage of personal-use CGM?

A. The beneficiary has been using a blood glucose monitor and performing frequent testing, defined as ≥4 times per day
B. The beneficiary is insulin-treated with ≥3 administrations of insulin per day
C. Within the year prior to ordering CGM, the treating practitioner has an in-person visit with the beneficiary to evaluate their diabetes management
D. Following the initial prescription of CGM, the treating practitioner has an in-person visit with the beneficiary at least once yearly to assess adherence to CGM and the diabetes treatment plan

Self-Assessment Question #7

A 34-year-old male with type 2 diabetes presents to clinic for a diabetes management visit. His AGP report shows that he has worn his CGM 76% of the time over the past 14 days and his glycemic management indicator (GMI) is 7.4%. Which of the following best describes this person's glycemic management?

A. He has high glycemic variability
B. He has low glycemic variability
C. His A1C is expected to be ~7.4%
D. No conclusions can be made since he only wore his CGM 76% of the time

Key Points

Personal-use CGM systems should be considered for all patients on multiple daily injections of insulin
Professional-use CGM is an option for many patients who cannot afford or do not meet criteria for personal-use CGM
Guidelines encourage CGM use for persons with diabetes to help improve glycemic management
Pharmacists can incorporate CGM into their clinical practice to optimize care for persons with diabetes
CGM data provides valuable information to engage in a meaningful discussion with the person with diabetes to come up with an individualized treatment plan

Questions