# Case Study Workbook

# Case Study: Daniel

**History**: 70 y.o. male with 12-year history of type 2 diabetes

**Problem list:** Type 2 diabetes, hypertension, hyperlipidemia, obesity, glaucoma

**Chief complaint: "**When I start my day in the morning, my blood sugar is good, but I can't seem to get my A1c down. I know I should probably eat better and get more exercise, but even when I do it feels like nothing helps – I seem to have high blood sugars regularly anyway, usually after I eat."

**Social history:** Married, two adult children, retired

**Physical exam:** Height 70 inches, weight 250 lbs (114 kg), BMI 35.9, BP 129/64 mmHg

**Health habits:** nonsmoker, occasional alcohol; no regular physical activity

**Glucose monitoring:** Libre 3 CGM, no routine BGM; no reported symptoms of hypoglycemia

**Nutrition history:** Eats 2 bigger meals each day. Meals can be variable but typically has his largest meal in the late morning. Typical meal might be meat, potatoes, cooked vegetables such as corn, and a large glass of milk. Snacks are usually nuts or something sweet (chocolate candies or licorice). Drinks milk, water, and juice. His wife cooks for them so he says that meals are often out of his control.

**Laboratory results:**
- A1C 8.5%; fasting BG 148 mg/dL
- Lipids: LDL 51 mg/dL, HDL 43 mg/dL, triglycerides 91 mg/dL
- eGFR >60 mL/min
- albumin/creatine ratio 9 mg/g
- AST 23 units/L

**Current 10-year ASCVD risk**: very high, >20%

**Current medications:**
**Metformin XR x 1,000 mg 2 times per day**
**Dulaglutide 3 mg per week**
**Glargine U-300 85 units per day, in the evening**
Lisinopril: 20 mg per day
Atorvastatin: 40 mg per day
Aspirin: 81 mg per day

# AGP Report

# Daniel

## GLUCOSE STATISTICS AND TARGETS

| | |
|---|---|
| **July 19, 2020 - August 1, 2020** | **14 Days** |
| **% Time CGM is Active** | **86%** |

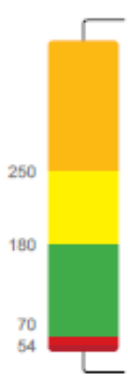
| Ranges And Targets For | Type 1 or Type 2 Diabetes |
|---|---|
| **Glucose Ranges** | **Targets % of Readings (Time/Day)** |
| Target Range 70-180 mg/dL | Greater than 70% (16h 48min) |
| Below 70 mg/dL | Less than 4% (58min) |
| Below 54 mg/dL | Less than 1% (14min) |
| Above 180 mg/dL | Less than 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** | **234** mg/dL |
| **Glucose Management Indicator (GMI)** | **8.9%** |
| **Glucose Variability** | **38.3%** |

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

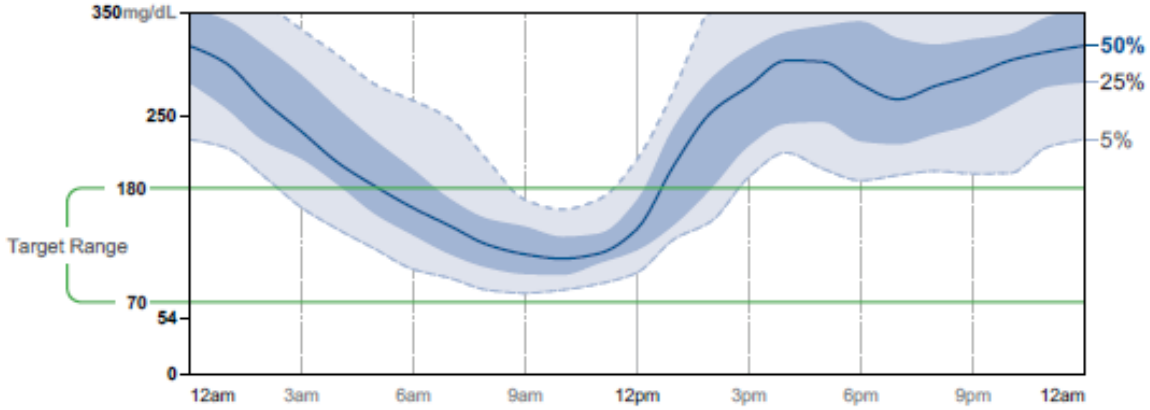
## TIME IN RANGES




| | | | |
|---|---|---|---|
| **Very High** | >250 mg/dL | **45%** | (10h 48min) |
| **High** | 181 - 250 mg/dL | **24%** | (5h 46min) |
| **Target Range** | 70 - 180 mg/dL | **31%** | (7h 26min) |
| **Low** | 54 - 69 mg/dL | **0%** | (0min) |
| **Very Low** | <54 mg/dL | **0%** | (0min) |

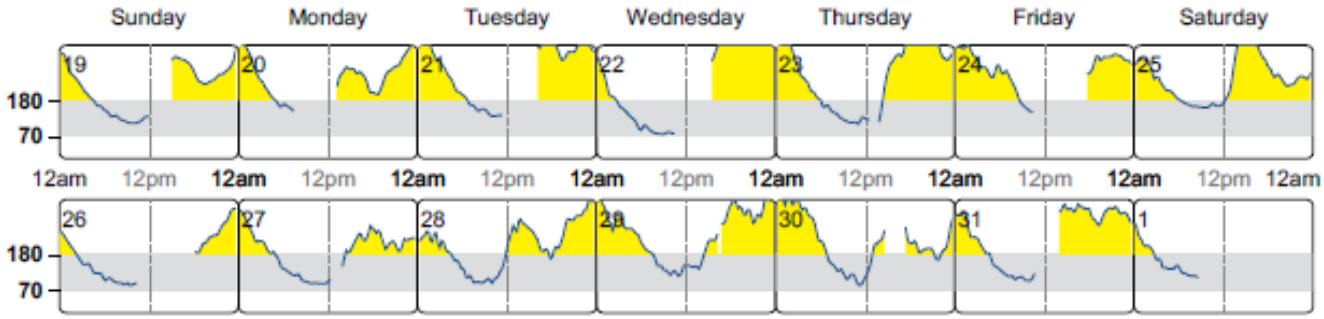
## AMBULATORY GLUCOSE PROFILE (AGP)

*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.*




## DAILY GLUCOSE PROFILES

*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.

# Case Study: Assessment

**Review Daniel's AGP Report and answer the following questions:**

**Question 1:** What is your overall impression of his glucose management based on the AGP Report?

_____
_____
_____

**Question 2:** Do you have any concerns about his glucose management regimen? If so, what are they?

_____
_____
_____
_____

**Question 3:** What glucose pattern(s) would you focus on today?

_____
_____
_____

**Question 4:** What medication/insulin regimen changes would you recommend? Why?

_____
_____

**Question 5:** When would you follow-up and why?

_____
_____

# Case Study: Juanita

**History**: 56 y.o. female with recent diagnosis of T2D

**Problem list:** Type 2 diabetes; hypertension; hyperlipidemia; class 2 obesity; atrial fibrillation; metabolic dysfunction-associated steatotic liver disease (MASLD)

**Chief complaint:** “I can’t get my glucose to come down and am trying to work on my diet.”

**Social history:** Single, no children, works from home (customer service)

**Physical exam:** Height 63 inches, weight 194 lbs (88 kg), BMI 34.4, BP 135/90 mmHg, normal foot exam and pulses

**Health habits:** Hx tobacco use (quit 6 years ago), no alcohol use; no regular physical activity

**Glucose monitoring:** Interested in trying a CGM to work on her diet and lifestyle so she tried a FreeStyle Libre 3.

**Nutrition history:** Meals are variable. She is trying to have smaller portions.

**Laboratory results:**

- A1C 7.4%; fasting BG 166 mg/dL
- Lipids: Total chol 152, LDL 77 mg/dL, HDL 55 mg/dL, triglycerides 102 mg/dL
- AST 25 units/L
- eGFR >60 mL/min
- albumin/creatine ratio 15 mg/g

**Current 10-year ASCVD risk**: 4.8%

**Current medications:**

**Metformin XR 2000 mg per day**

Atorvastatin: 20 mg per day

Losartan: 50 mg per day

# AGP Report

## Juanita

### GLUCOSE STATISTICS AND TARGETS

| | |
|---|---|
| **February 18, 2023 - March 3, 2023** | **14 Days** |
| **% Time CGM is Active** | **91%** |

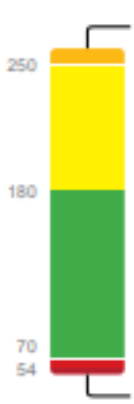
| Ranges And Targets For | Type 1 or Type 2 Diabetes |
|---|---|
| **Glucose Ranges** | **Targets** % of Readings (Time/Day) |
| Target Range 70-180 mg/dL | Greater than 70% (16h 48min) |
| Below 70 mg/dL | Less than 4% (58min) |
| Below 54 mg/dL | Less than 1% (14min) |
| Above 180 mg/dL | Less than 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** | **178** mg/dL |
| **Glucose Management Indicator (GMI)** | **7.6%** |
| **Glucose Variability** | **20.2%** |

**Defined as percent coefficient of variation (%CV)**

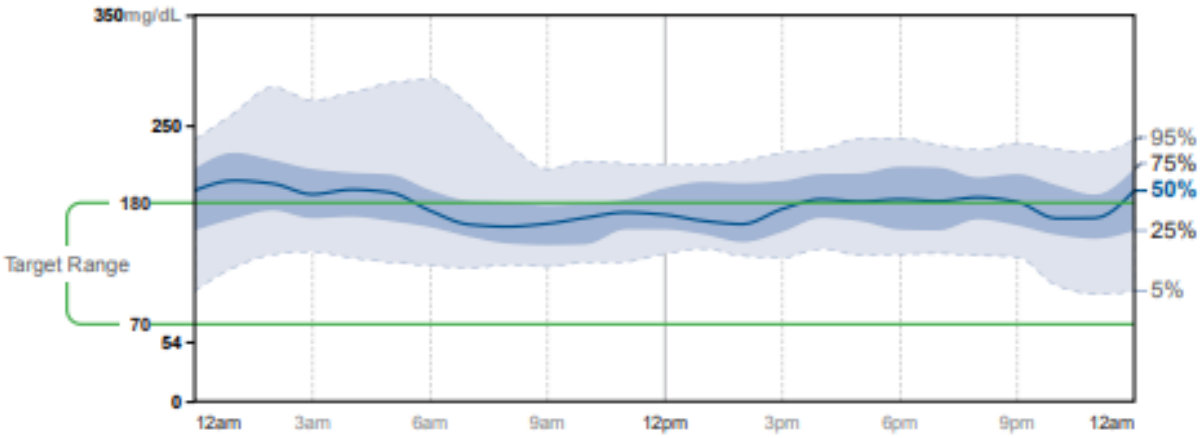
### TIME IN RANGES




| | | |
|---|---|---|
| **Very High** | >250 mg/dL | **3%** (43min) |
| **High** | 181 - 250 mg/dL | **41%** (9h 50min) |
| **Target Range** | 70 - 180 mg/dL | **56%** (13h 27min) |
| **Low** | 54 - 69 mg/dL | **0%** (0min) |
| **Very Low** | <54 mg/dL | **0%** (0min) |

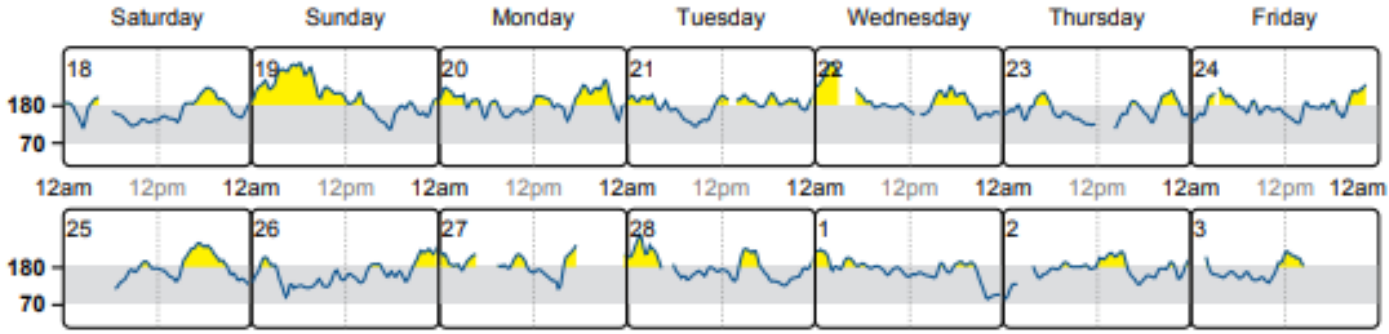
### AMBULATORY GLUCOSE PROFILE (AGP)

*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.*




### DAILY GLUCOSE PROFILES

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



# Case Study: Assessment

**Review Juanita's AGP Report and answer the following questions:**

**Question 1:** What is your overall impression of her glucose management based on the AGP Report?

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_____
_____

**Question 2:** Do you have any concerns about her glucose management regimen? If so, what are they?

_____
_____
_____
_____

**Question 3:** What glucose pattern(s) would you focus on today?

_____
_____
_____

**Question 4:** What medication/insulin regimen changes would you recommend? Why?

_____
_____

**Question 5:** When would you follow-up and why?

_____
_____

# Case Study: Sayeed

**History**: 52 y.o. male with a 3-year history of T2D

**Problem list:** Type 2 diabetes; hypothyroidism; hyperlipidemia; obstructive sleep apnea

**Chief complaint:** "I really want to avoid more medications for my diabetes. I want to improve my numbers with my diet. I know that plays a big part."

**Social history:** married, small business owner

**Physical exam:** Height 76 inches, weight 220 lbs (100 kg), BMI 27, BP 122/83 mmHg, trace edema, normal foot exam

**Health habits:** No current tobacco use, no alcohol use; no regular physical activity

**Glucose monitoring:** BGM testing occasionally; no reported symptoms of hypoglycemia; wants to try a CGM

**Nutrition history:** Eats 3 meals/day with occasional small snacks. Breakfast is often a granola bar with toast and milk. Lunch is usually a sandwich and chips or something to go. Sometimes he has a fruit with lunch. Dinner is usually rice or potatoes with some vegetables and meat.

**Laboratory results:**

- A1C 7.5%; fasting BG 121 mg/dL
- Lipids: Total chol 187, LDL 122 mg/dL, HDL 35 mg/dL, triglycerides 149 mg/dL
- eGFR >60 mL/min
- albumin/creatine ratio 8 mg/g

**Current 10-year ASCVD risk**: 9.5%

**Current Medications:**
**Metformin XR 2000 mg per day**
**Empagliflozin 25 mg per day**
Simvastatin 10 mg per day
Levothyroxine 100 mcg per day

# Sayeed’s CGM Data

## AGP

**11 days** | Wed Aug 9, 2023 - Sat Aug 19, 2023

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### Time in Ranges

Goals for Type 1 and Type 2 Diabetes

Each 5% increase in the Target Range is clinically beneficial.
Each 1% time in range = about 15 minutes per day



| | | |
|---|---|---|
| 8% Very High<br>Goal: <5% | 53% | Goal: <25% |
| 45% High | | |
| 47% In Range<br>Goal: >70% | | |
| 0% Low | 0% | Goal: <4% |
| 0% Very Low<br>Goal: <1% | | |

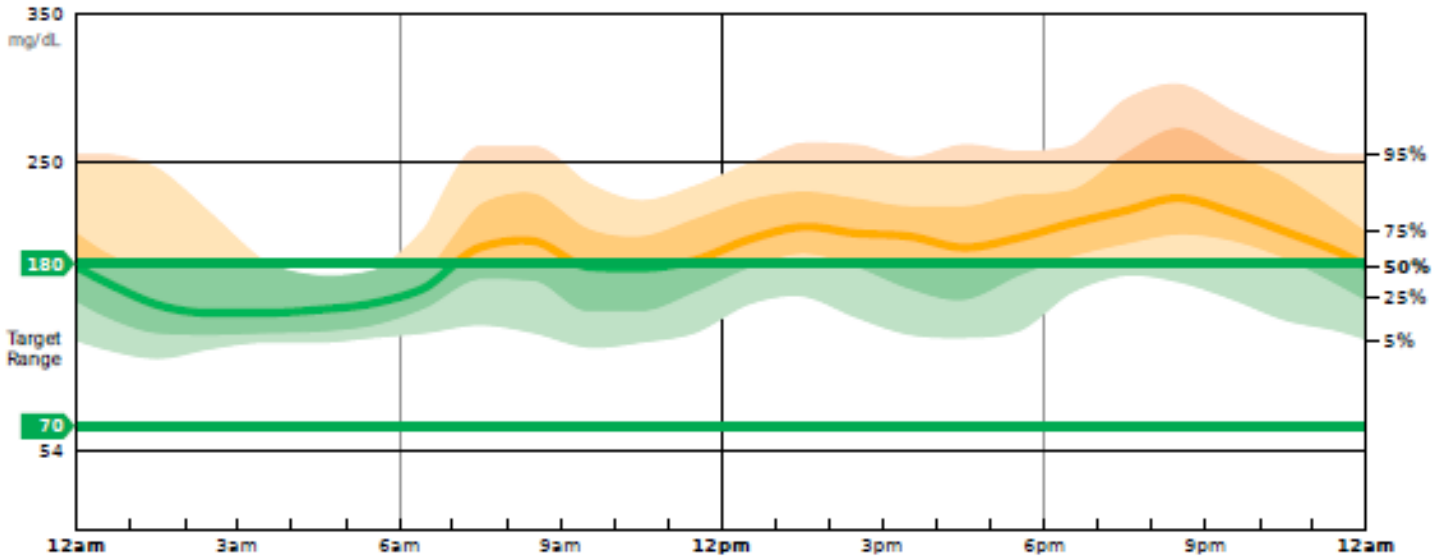
**Target Range:** 70-180 mg/dL
**Very High:** Above 250 mg/dL
**Very Low:** Below 54 mg/dL

### Glucose Metrics

| | |
|---|---|
| Average Glucose<br>Goal: <154 mg/dL | 188 mg/dL |
| GMI<br>Goal: <7% | 7.8% |
| Coefficient of Variation<br>Goal: <36% | 21.9% |
| Time CGM Active | 100.0% |

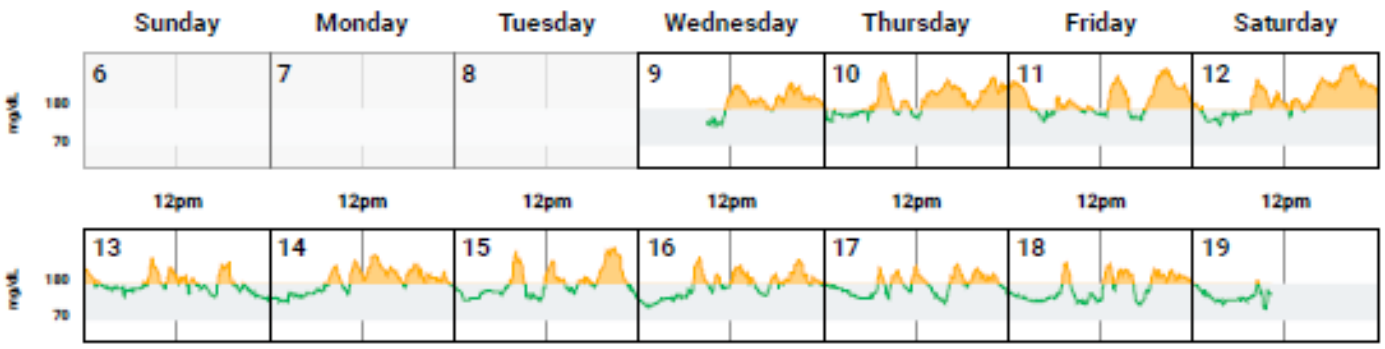
### Ambulatory Glucose Profile (AGP)

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




### Daily Glucose Profile

Each daily profile represents a midnight-to-midnight period.



# Case Study: Assessment

**Review Sayeed's AGP Report and answer the following questions:**

**Question 1:** What is your overall impression of his glucose management based on the AGP Report?

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_____

_____

**Question 2:** What glucose pattern(s) would you focus on today?

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_____

**Question 3:** What questions could you ask about his diet and lifestyle?

_____

_____

**Question 4:** What lifestyle (nutrition and physical activity) recommendations could you suggest?

_____

_____

_____

**Question 5:** When would you follow-up and why?

_____

_____