Session 2: Clinician CGM Guided Management (CCGM) for People with T2D on Insulin

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HealthPartners® Institute

Disclosures

Anders Calson, faculty for this educational activity, has the following relevant financial relationships:

- Consultant, advisor, or speaker for Insulet, MannKind, Medtronic, Novo Nordisk, Sanofi, Zealand Pharma A/S.
- Researcher for Abbott, Dexcom Inc., Eli Lilly & Co., Insulet

All grants, honoraria and payments for the above activities are paid directly to my employer, the International Diabetes Center/Park Nicollet, and none are directly paid to Dr. Carlson.

Agenda

Effective use of CGM data to support shared decision making

Clinician CGM guided management of people with T2D on insulin therapy

3 Steps to Effectively Use an AGP

DETERMINE WHERE TO ACT

Follow these three steps recommended by the International Diabetes Center to efficiently interpret the AGP Report and guide shared decision making to optimize glucose management.

1 DETERMINE if action is needed

Review the time in ranges bar to **DETERMINE** if action is needed:

- **Is time in range (TIR) 70-180 mg/dL >70%?**
- **Is time below range (TBR) <70 mg/dL <4%?**

If yes to both, continue to optimize therapy and lifestyle changes.
If no to either question, move to step 2.

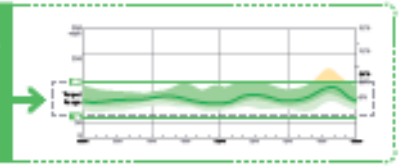
TIPS
- Aim for 14 days of data with the CGM being active at least 70% of the time.
- Aim for **MORE GREEN/LESS RED** in the time in ranges bar.

2 WHERE is action needed?

Review the AGP curve to determine **WHERE** action is needed.

- **Identify patterns of time below range, time above range, or significant variability.**
- **Use the daily profiles** to verify that patterns occur on multiple days and identify differences between days of the week (e.g. weekend vs weekday).
- **Ask the patient what THEY see** in the AGP Report.

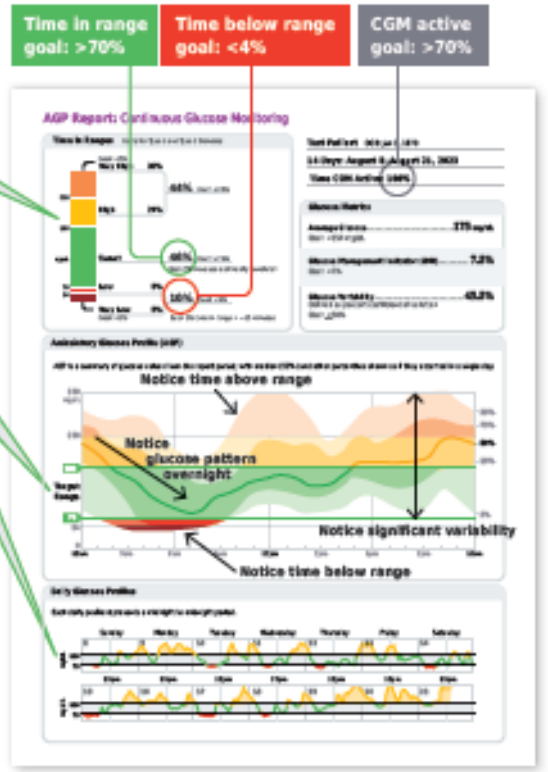
The goal for the AGP is: **Flat, Narrow and In-Range (FNIR)**



3 ACT on the data

Remember to:

- **Work with the patient** to adjust medications and/or lifestyle to optimize glucose management.
- **Use shared decision making.**
- **Focus on one area or change at a time.**
- **Continue to make adjustments** until glycemic targets are achieved. Adjusting is the key to success.



REMEMBER:

- **Focus** on patterns of hypoglycemia first.
- **Every 5% improvement in TIR** is clinically beneficial!

1 DETERMINE if action is needed

Review the time in ranges bar to DETERMINE if action is needed:

- **Is time in range (TIR) 70-180 mg/dL >70%?**
- **Is time below range (TBR) <70 mg/dL <4%?**

If yes to both, continue to optimize therapy and lifestyle changes.
If no to either question, move to step 2.

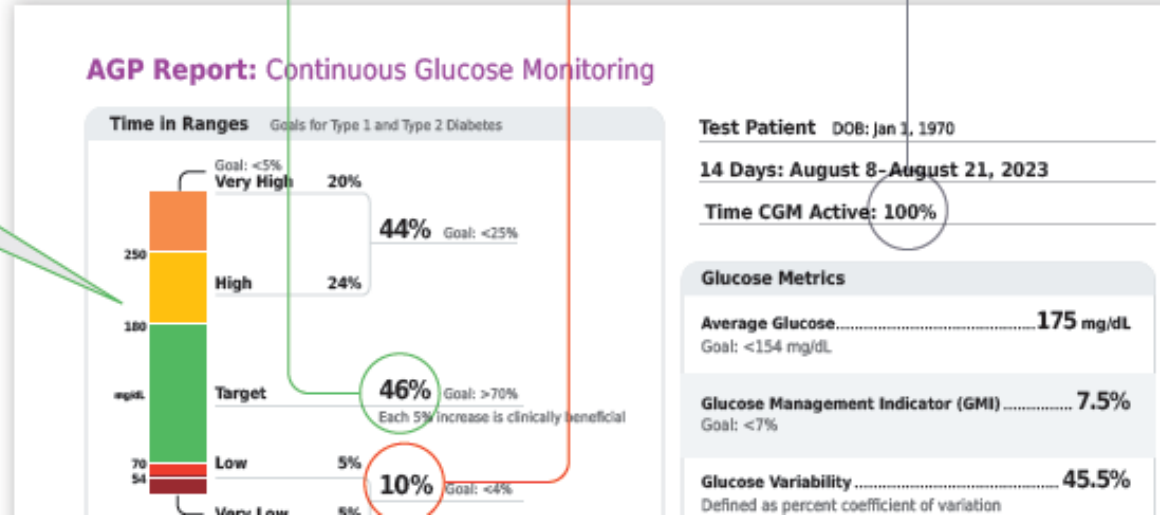
TIPS

- Aim for 14 days of data with the CGM being active at least **70%** of the time.
- Aim for **MORE GREEN/LESS RED** in the time in ranges bar.

Time in range goal: >70%

Time below range goal: <4%

CGM active goal: >70%

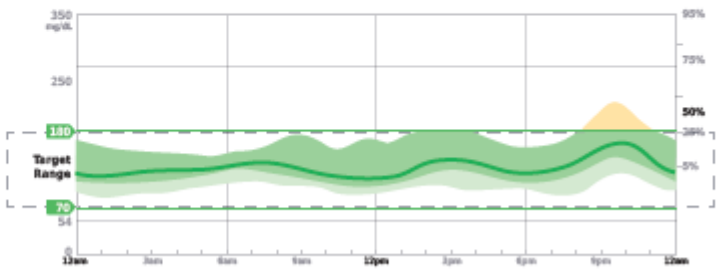


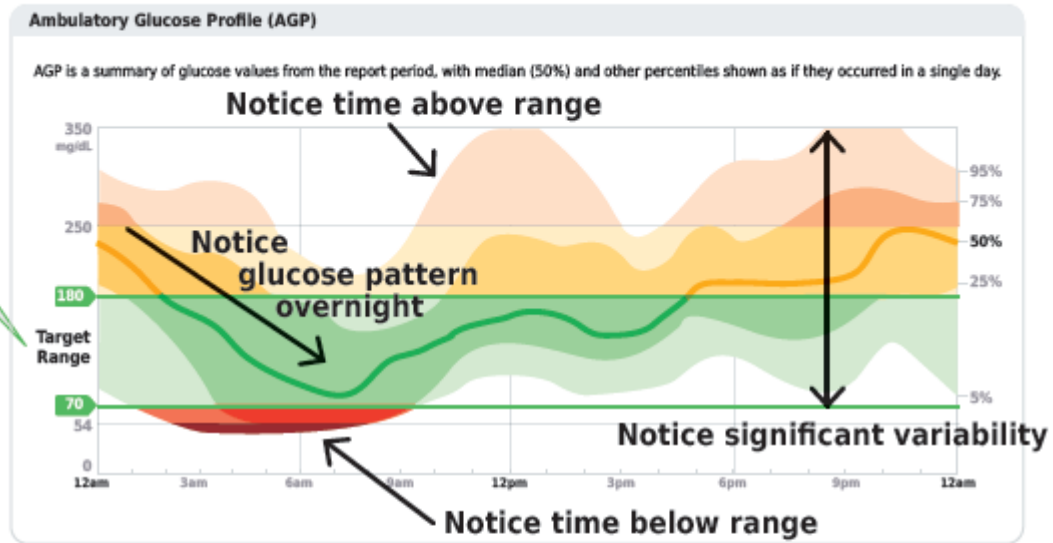
2 WHERE is action needed?

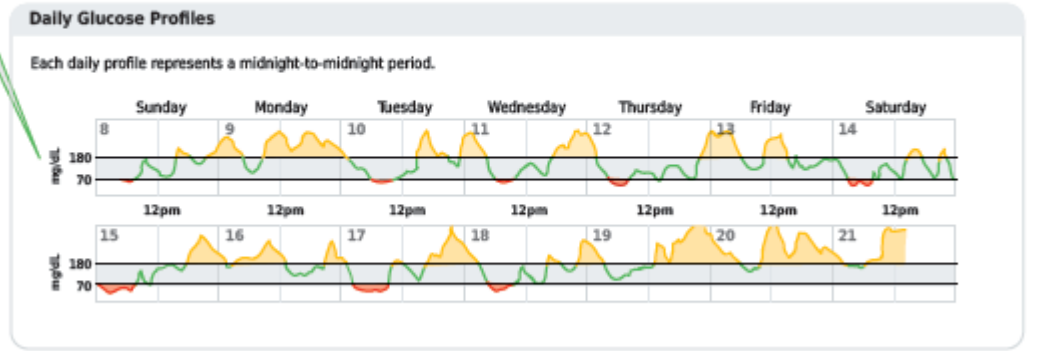
Review the AGP curve to determine WHERE action is needed.

- **Identify patterns of time** below range, time above range, or significant variability.
- **Use the daily profiles** to verify that patterns occur on multiple days and identify differences between days of the week (e.g. weekend vs weekday).
- **Ask the patient what THEY see** in the AGP Report.

The goal for the AGP is: **Flat, Narrow** and **In-Range (FNIR)**







3 **ACT on the data**

Remember to:

- **Work with the patient** to adjust medications and/or lifestyle to optimize glucose management.
- **Use shared decision making.**
- **Focus on one area** or change at a time.
- **Continue to make adjustments** until glycemic targets are achieved. Adjusting is the key to success.

REMEMBER:

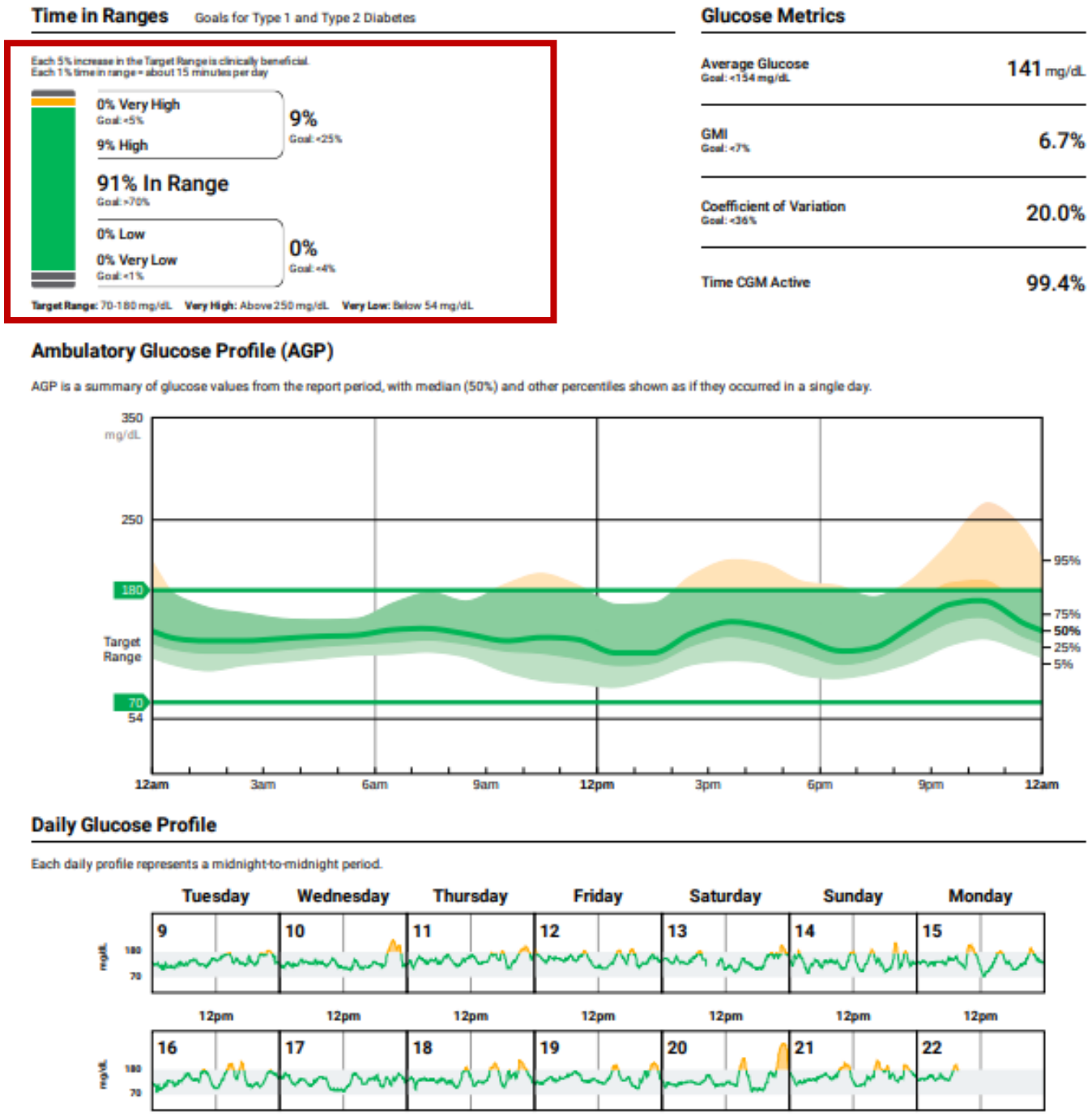
- **Focus** on patterns of hypoglycemia first.
- **Every 5% improvement in TIR** is clinically beneficial!

- Adjust lifestyle and medications to achieve **MGLR** and **FNIR**.
- Adjust, adjust, adjust!

Let's Look at an Example

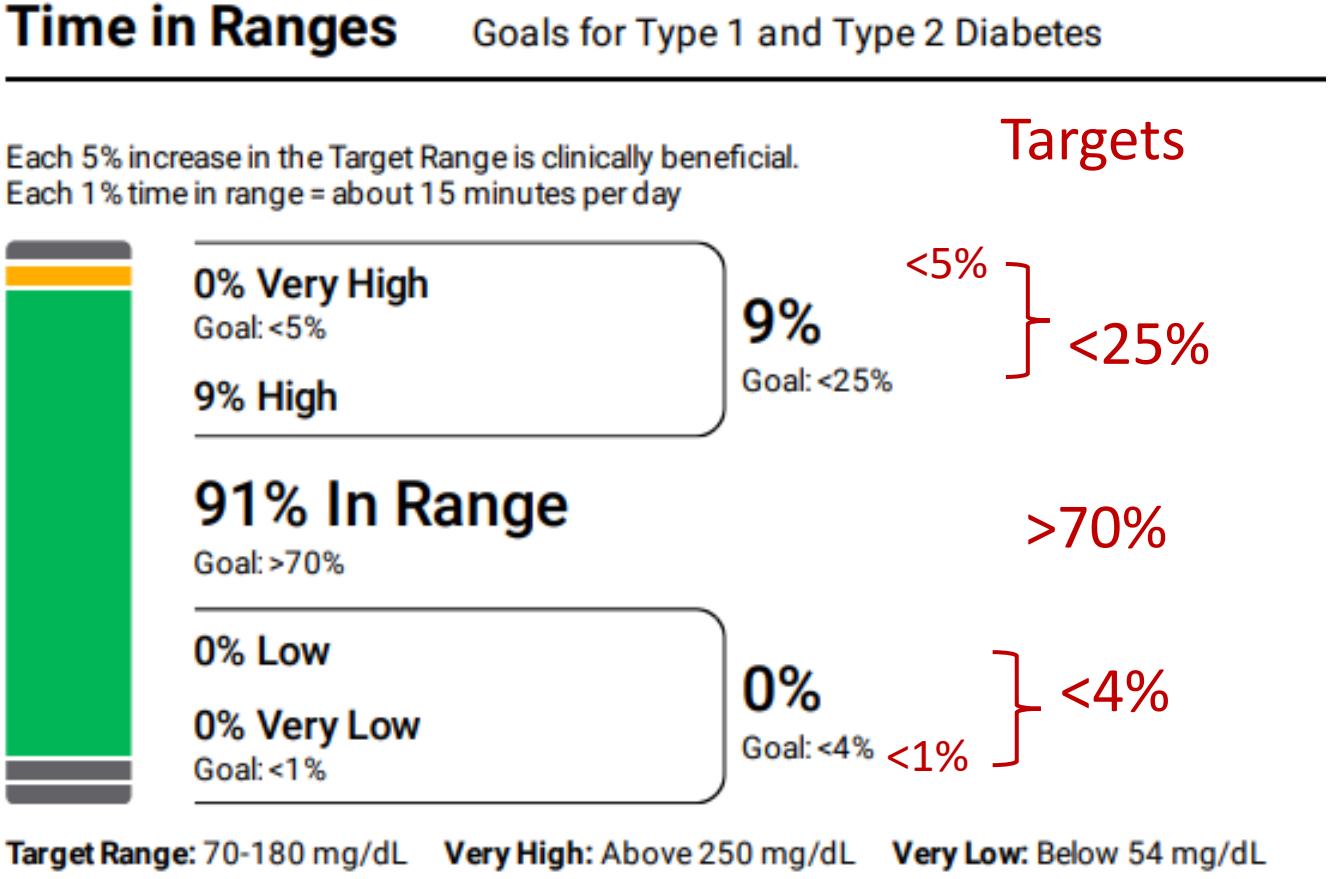
1 **DETERMINE if action is needed**

Review the time in ranges bar



1 DETERMINE if action is needed

Review the time in ranges bar



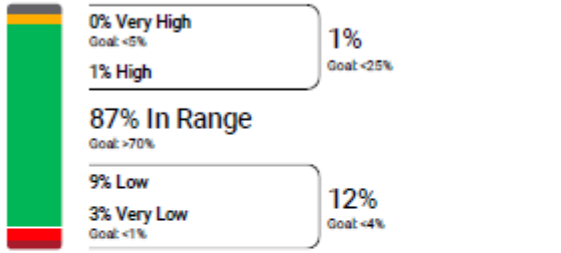
Acknowledge patient for all they have done to manage their diabetes; continue to optimize current therapy and reinforce lifestyle changes

Let’s Try Another One

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



0% Very High (Goal: <5%)	1%	Goal: <25%
1% High		
87% In Range (Goal: >70%)		
9% Low	12%	Goal: <4%
3% Very Low (Goal: <1%)		

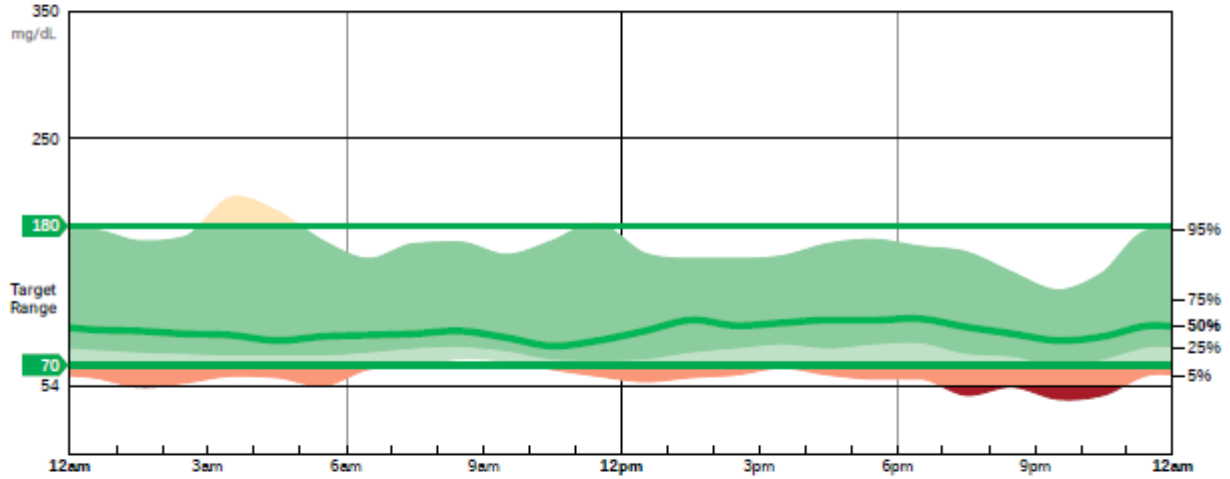
Target Range: 70-180 mg/dL **Very High:** Above 250 mg/dL **Very Low:** Below 54 mg/dL

Glucose Metrics

Average Glucose (Goal: <154 mg/dL)	104 mg/dL
GMI (Goal: <7%)	5.8%
Coefficient of Variation (Goal: <36%)	31.2%
Time CGM Active	93.3%

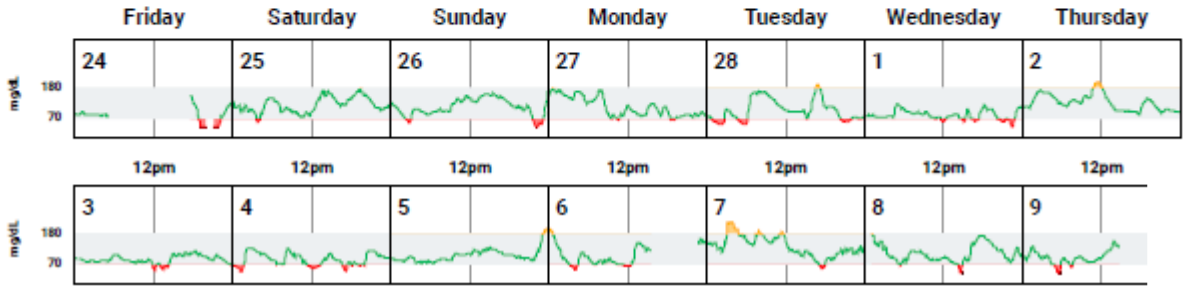
Ambulatory Glucose Profile (AGP)

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.



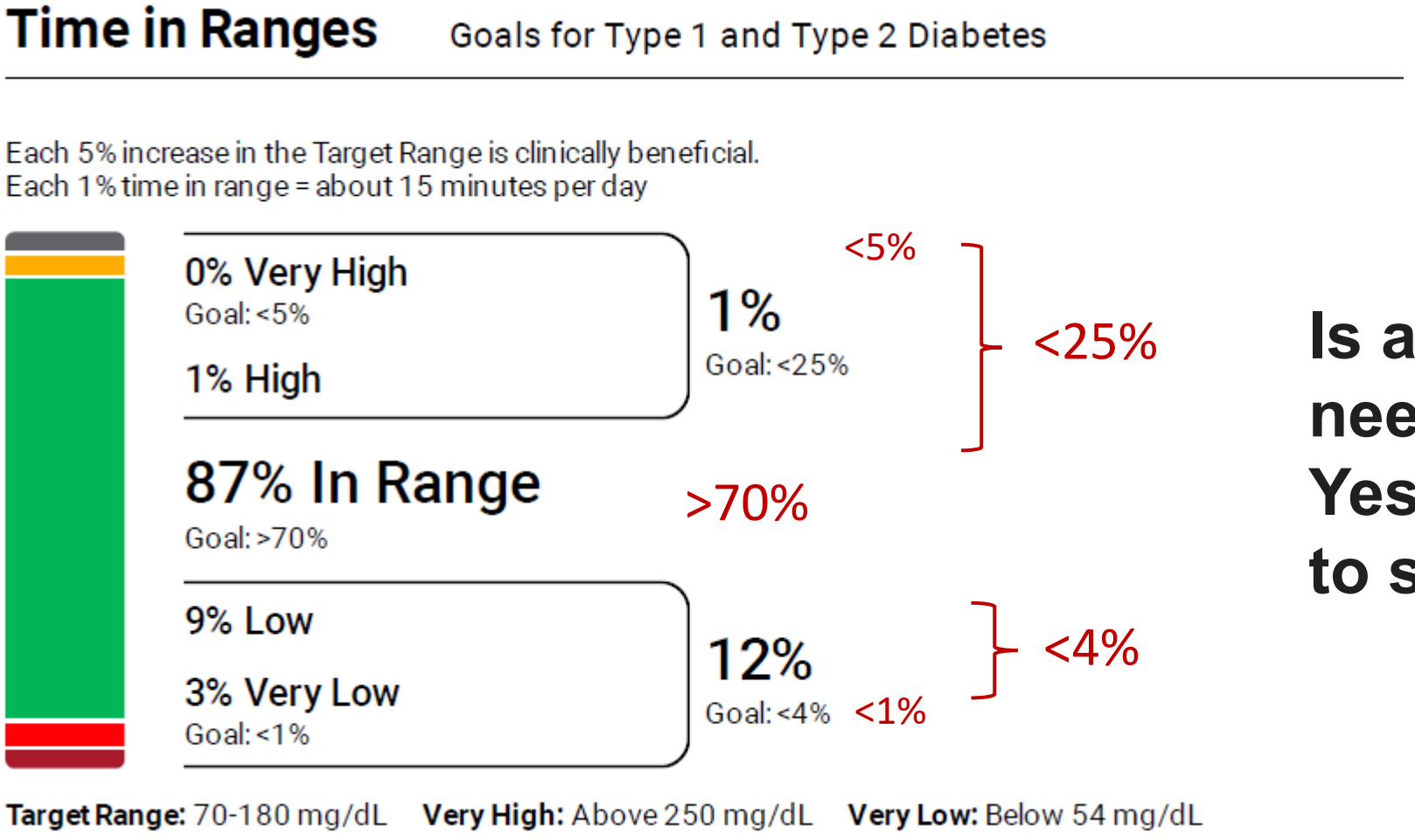
Daily Glucose Profile

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



1 DETERMINE if action is needed

Review the time in ranges bar



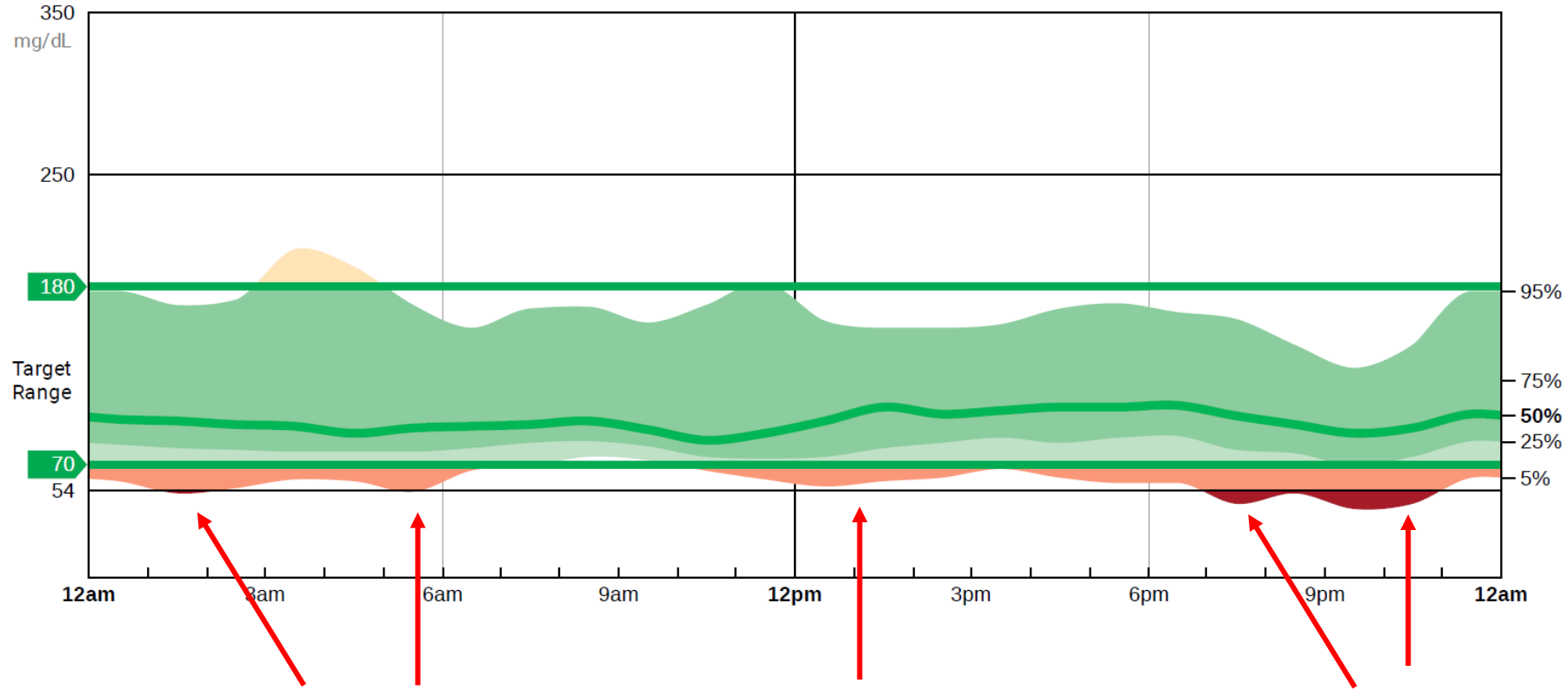
Is action needed? Yes, move to step 2

2 WHERE is action needed?

Review the AGP curve and daily profiles to determine WHERE action is needed.

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.

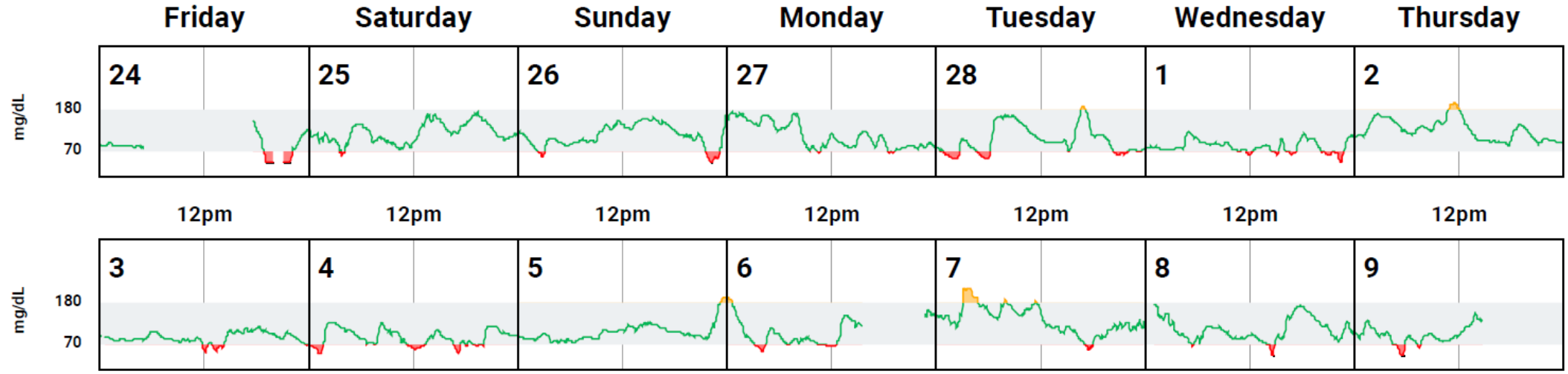


Partner for good™

AGP Report Daily Glucose Profiles

Daily Glucose Profile

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



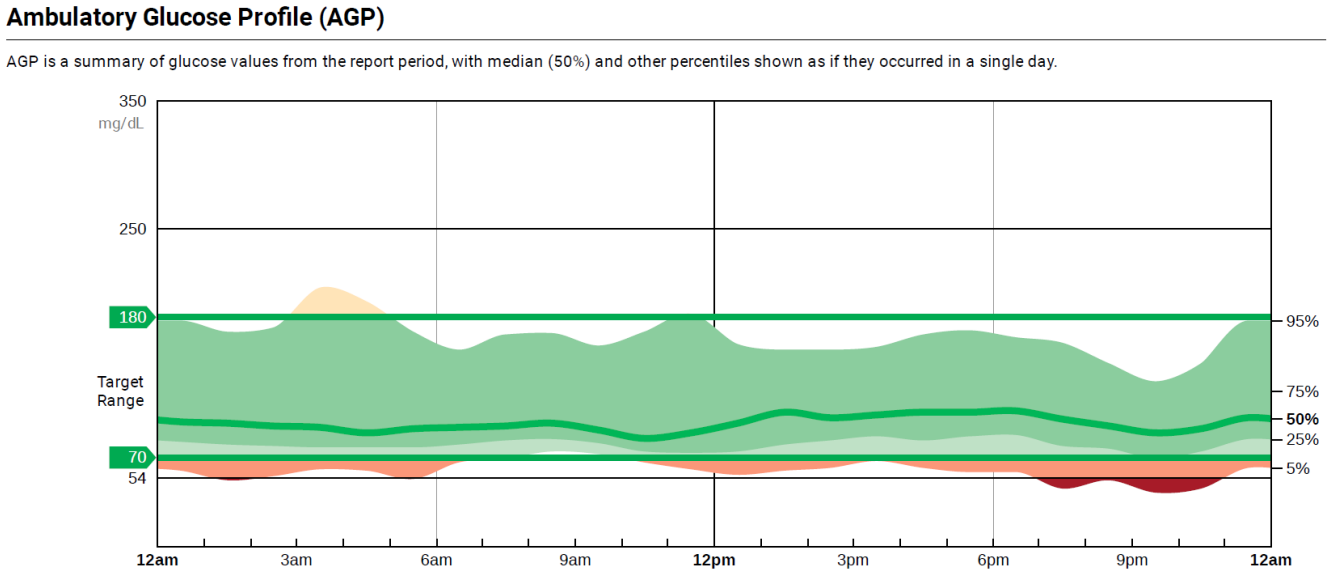
Look for obvious patterns of low or high glucose and if they are different based on day of the week (e.g. weekday vs. weekend)

Johnson et al. *Diab. Tech. Ther.* 2019; 21: S2 17-S2 25.

What action will you take?

3

ACT on the data



Engage in shared decision-making

1. Ask patient what they see in the AGP Report
2. Focus on one area/change at a time
3. Emphasize more-green and less-red (focus on hypoglycemia first)
4. Remember the goal of Flat-Narrow-In-Range (**FNIR**)

Remember to **adjust, adjust, adjust**

3 ACT on the data

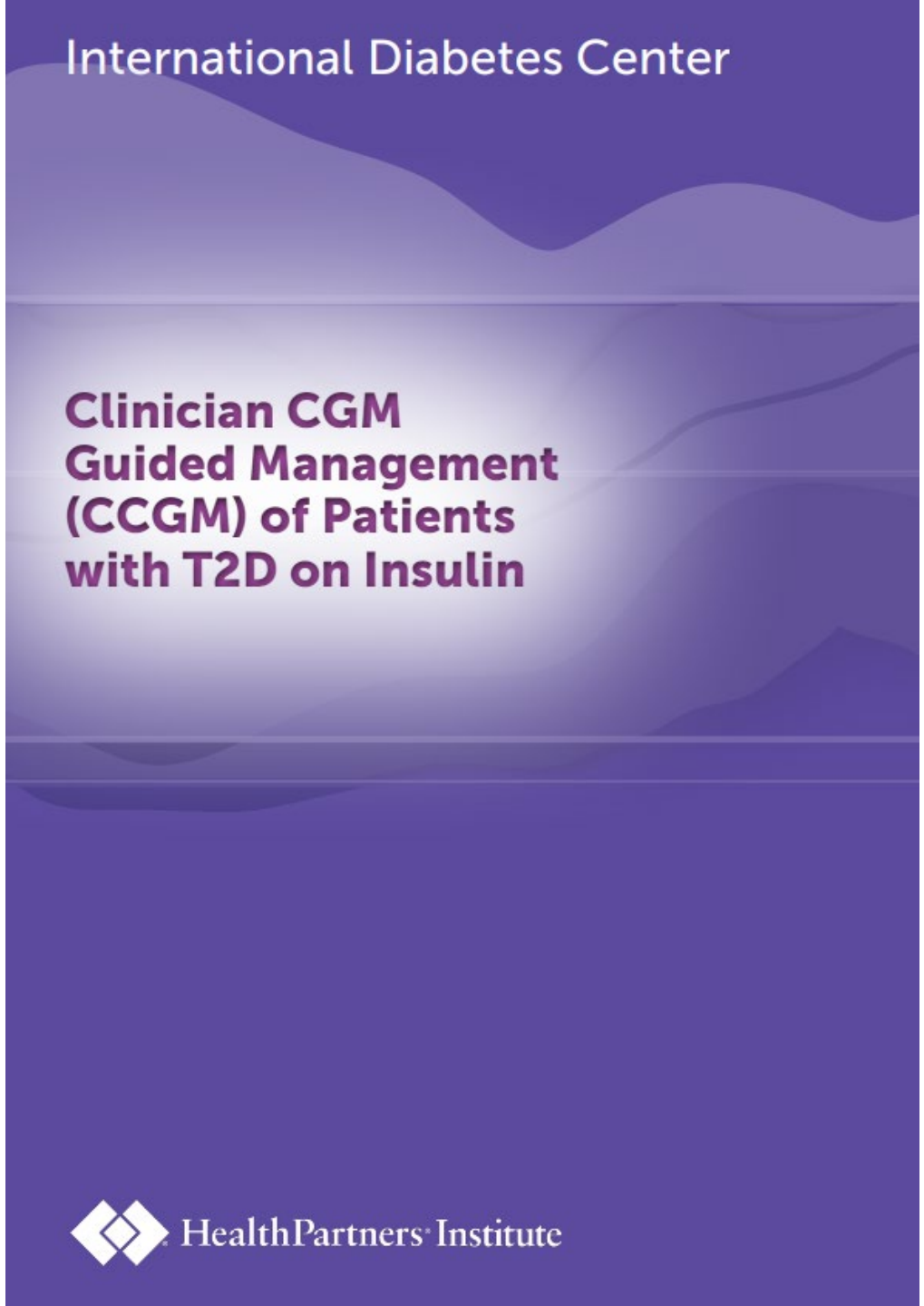
Remember to:

- **Work with the patient** to adjust medications and/or lifestyle to optimize glucose management.
- **Use shared decision making.**
- **Focus on one area** or change at a time.
- **Continue to make adjustments** until glycemic targets are achieved. Adjusting is the key to success.

REMEMBER:

- **Focus** on patterns of hypoglycemia first.
- **Every 5% improvement in TIR** is clinically beneficial!

What about patients with type 2 diabetes managed with insulin?



Before using the tables…

Step 2:
Is patient on sulfonylurea therapy in addition to insulin therapy?

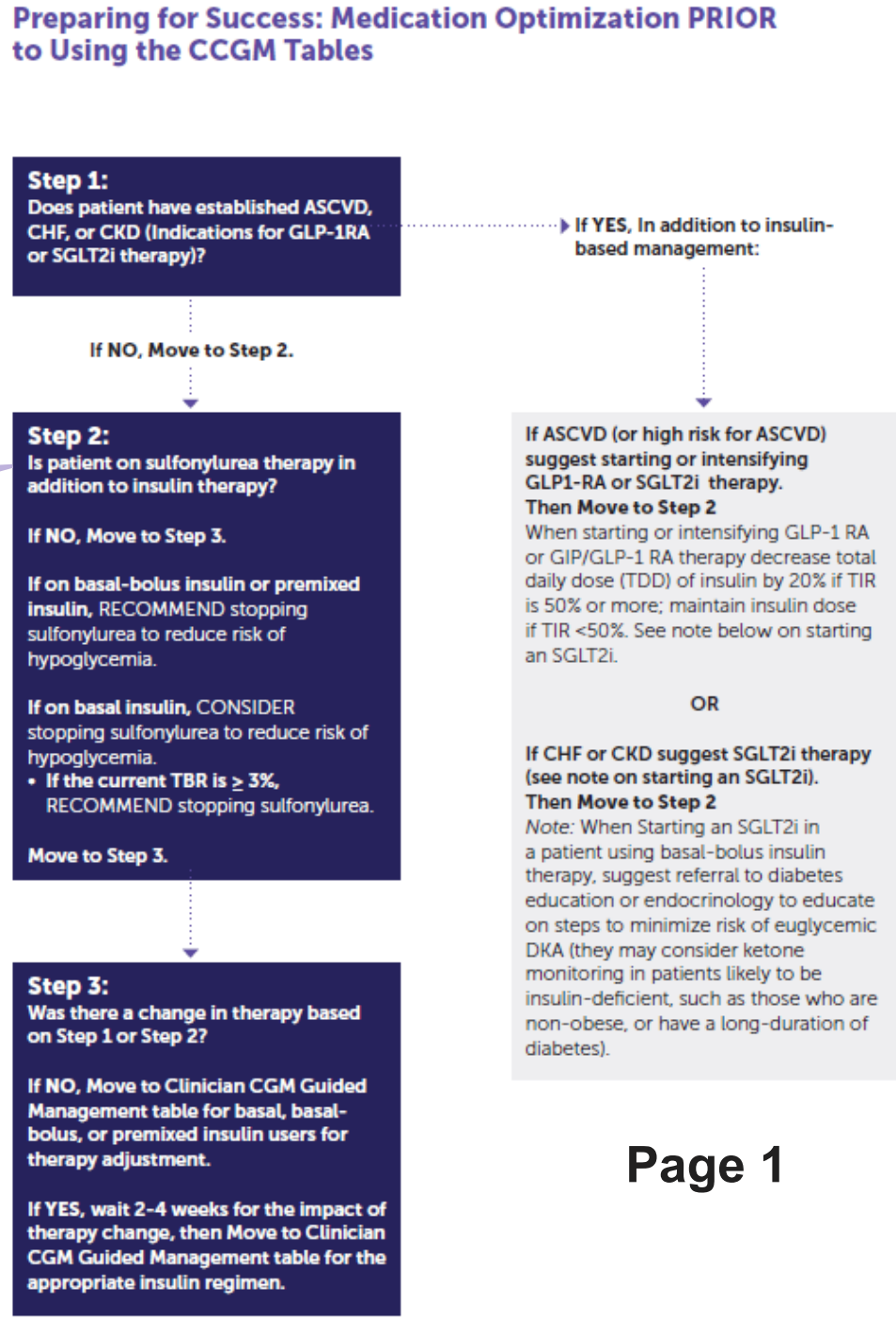
If **NO**, Move to Step 3.

If on basal-bolus insulin or premixed insulin, RECOMMEND stopping sulfonylurea to reduce risk of hypoglycemia.

If on basal insulin, CONSIDER stopping sulfonylurea to reduce risk of hypoglycemia.

- **If the current TBR is ≥ 3%,** RECOMMEND stopping sulfonylurea.

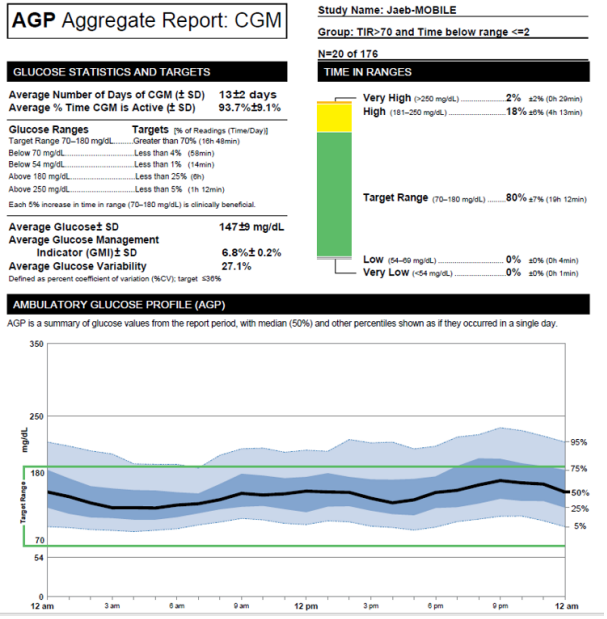
Move to Step 3.



Page 1

T2D on Basal Insulin: CCGM TIR/TBR categories

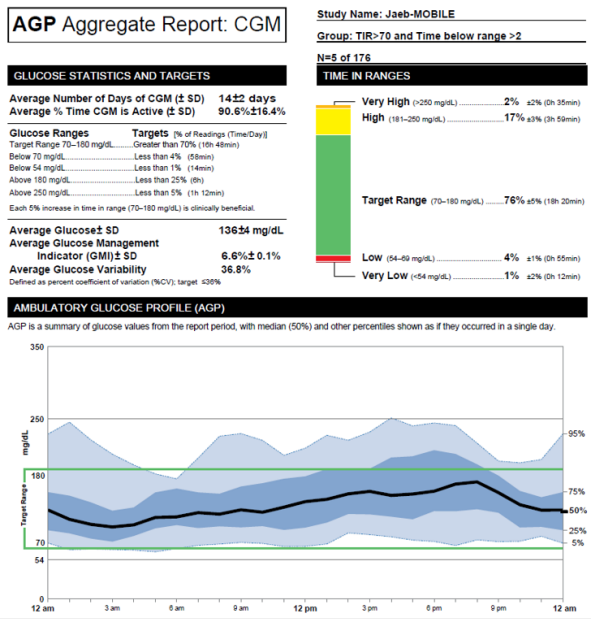
TIR >70%
TBR <3%
Category 1



Doing well- keep going!

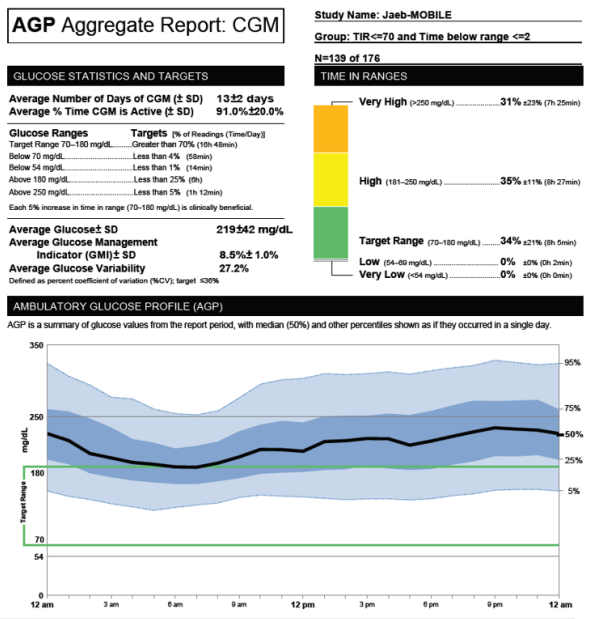
(CCGM) Clinician CGM Guided Management

TIR >70%
TBR ≥3%
Category 2



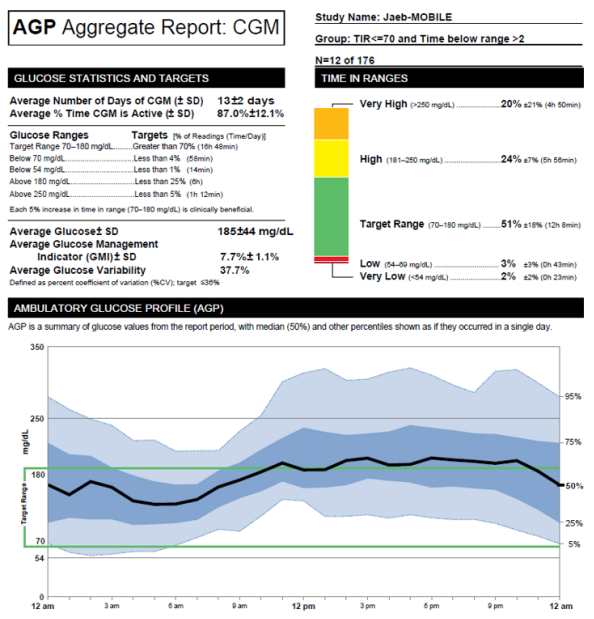
Too much hypoglycemia- decrease therapy

TIR ≤70%
TBR <3%
Category 3



Too much hyperglycemia - increase therapy

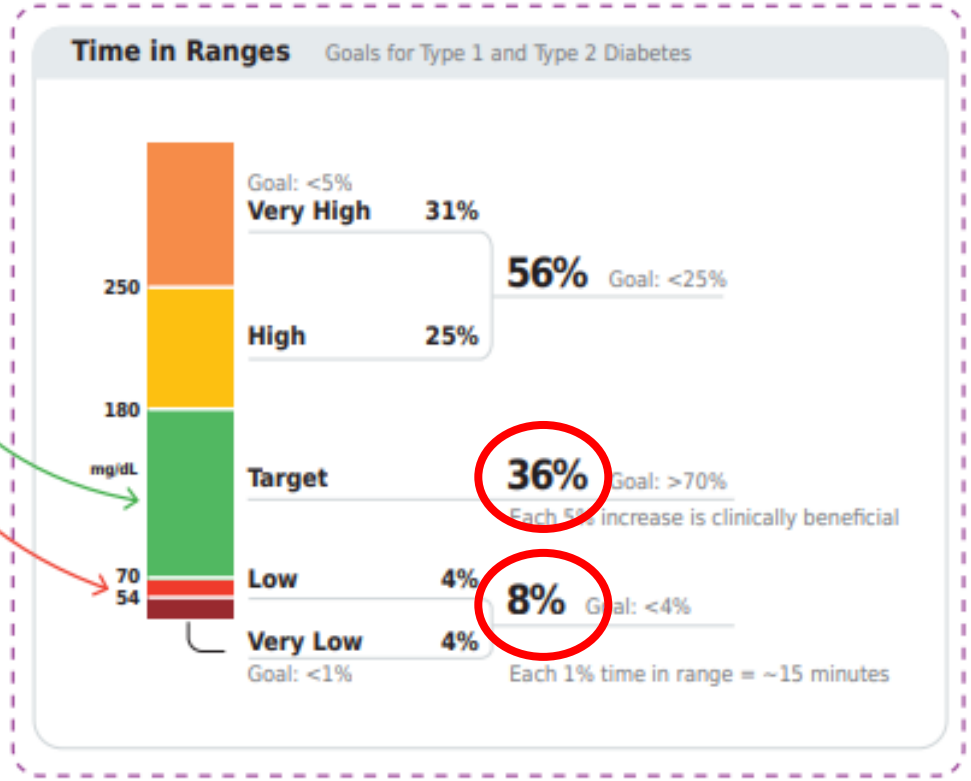
TIR ≤70%
TBR ≥3%
Category 4

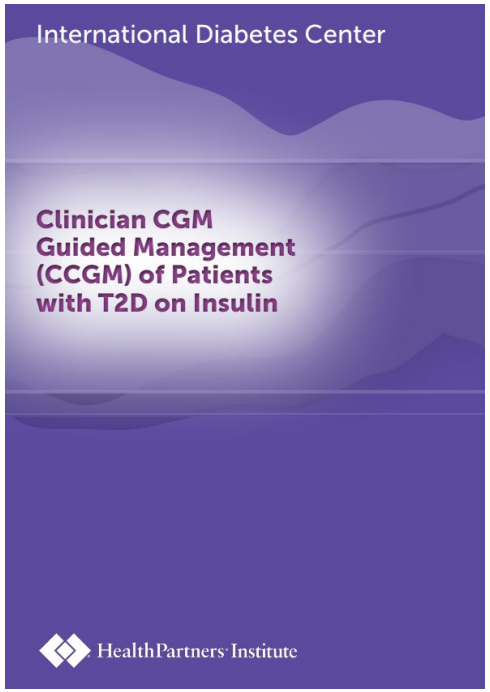


Too much hypoglycemia AND too much hyperglycemia - fix or advance therapy

C. Find the % time in range (**target range**) and % time below range (**low and very low**) from the AGP Report (see example below).
- Is time in range (TIR) [70-180 mg/dL] >70%?
  Example shows 36%
- Is time below range (TBR) [< 70 mg/dL] <3%?
  Example shows 8%

D. Find TIR/TBR category in the table for the appropriate insulin regimen. See page 4 for **Basal insulin,** page 6 for **Basal and Bolus insulin,** and page 8 for **Premixed Insulin.**





Page 3

	TIR/TBR Category	Action	Medication Adjustment Considerations
1	Time in range >70% and Time below range <3%	Continue regimen	Continue to optimize current therapy; reinforce lifestyle changes and taking medications as prescribed; consider increasing basal insulin by 5% if no low glucose on AGP curve* **Follow-up: 3-4 months**
2	Time in range >70% and Time below range ≥3%	Address hypoglycemia	Stop sulfonylurea if present; if TBR is >10% also decrease basal insulin dose by 10% If not on sulfonylurea, decrease basal insulin by 10% if TBR ≤10% and by 20% if TBR>10% **Follow-up: 2-4 weeks**
3	Time in range ≤70% and Time below range <3%	Address hyperglycemia	Start or increase dose of GLP-1 RA or GIP/GLP-1 RA **AND** if TIR is 50-70% either stop sulfonylurea (if present), or decrease basal insulin dose by 20% If GLP-1 RA or GIP/GLP-1RA not started, or on max tolerated dose: increase basal insulin by 20% if TIR <30%, otherwise increase basal insulin by 10% • If glucose is low overnight* after looking at AGP curve, maintain current basal insulin dose and refer to diabetes education or endocrinology for regimen assessment and adjustment **Follow-up: 2-4 weeks**
4	Time in range ≤70% and Time below range ≥3%	Address hypoglycemia today; also refer to diabetes education or endocrinology	To minimize hypoglycemia today: • Stop sulfonylurea if present AND if TBR is >10% also decrease basal insulin dose by 10% • If not on sulfonylurea, decrease basal insulin by 10% if TBR is ≤10% and by 20% if TBR >10% Work in conjunction with diabetes education or endocrinology based on local resources to improve hyperglycemia Options to treat hyperglycemia include: • Start or increase GLP-1 RA or GIP/GLP-1 RA (**preferred**) • Or add mealtime bolus insulin at 1, 2, or all meals (*see Table A*) **Follow-up: 2-4 weeks**

Basal insulin Pages 4-5

*Low glucose defined as 5% line dropping below 70 mg/dL on AGP curve AND not due to a single day after review of daily profiles

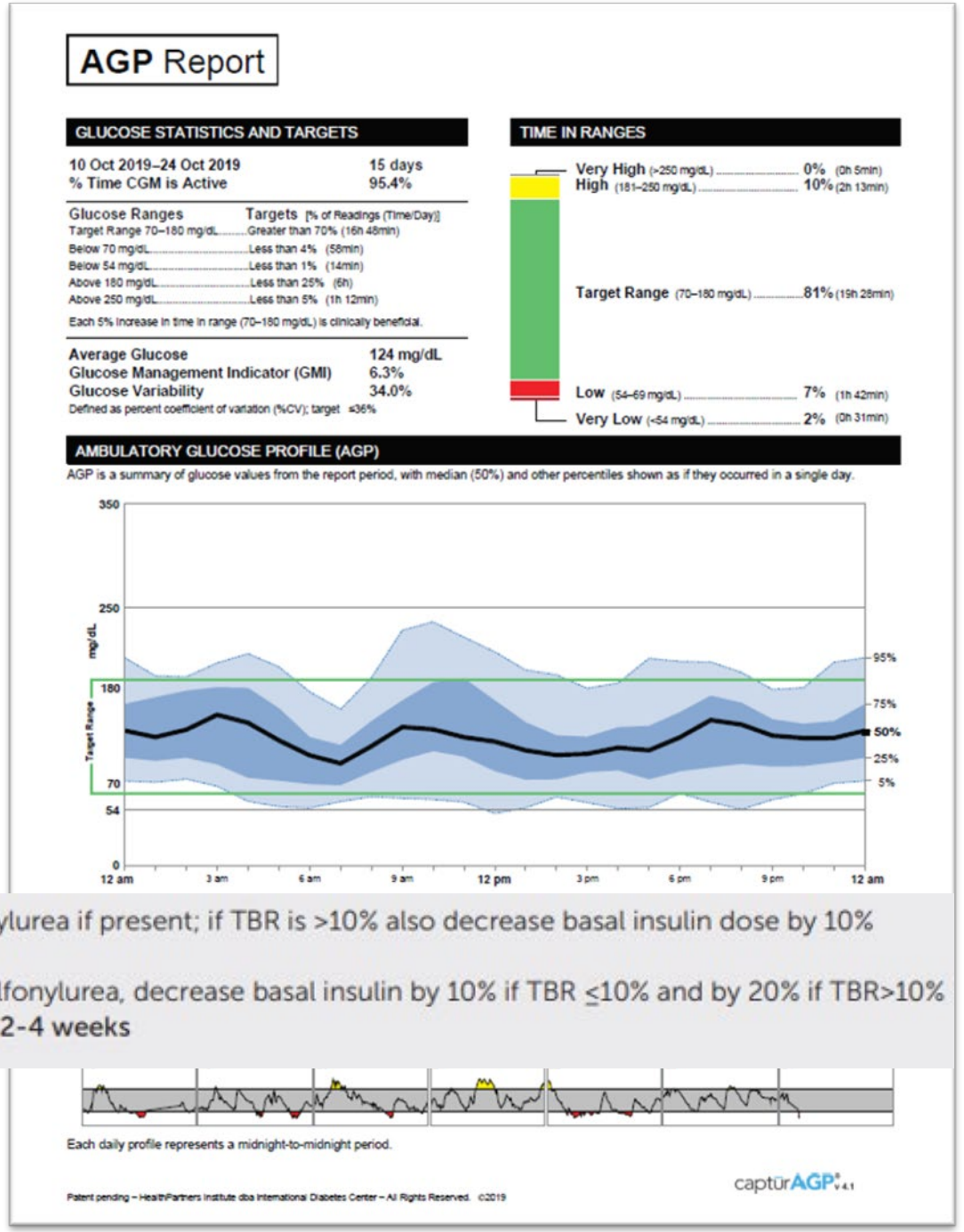
TIME IN RANGES

Very High (>250 mg/dL) 0% (0h 5min)
High (181–250 mg/dL) 10% (2h 13min)

Target Range (70–180 mg/dL) ..... 81% (19h 28min) **TIR 81%**

Low (54–69 mg/dL) ..... 7% (1h 42min) **TBR 9%**
Very Low (<54 mg/dL) 2% (0h 31min)

2	Time in range >70% and Time below range ≥3%	Address hypoglycemia	Stop sulfonylurea if present; if TBR is >10% also decrease basal insulin dose by 10% If not on sulfonylurea, decrease basal insulin by 10% if TBR ≤10% and by 20% if TBR>10% **Follow-up: 2-4 weeks**



AGP Report

GLUCOSE STATISTICS AND TARGETS

10 Oct 2019–24 Oct 2019	15 days
% Time CGM is Active	95.4%

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	124 mg/dL
Glucose Management Indicator (GMI)	6.3%
Glucose Variability	34.0%

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

TIME IN RANGES

Very High (>250 mg/dL) 0% (0h 5min)
High (181–250 mg/dL) 10% (2h 13min)
Target Range (70–180 mg/dL) 81% (19h 28min)
Low (54–69 mg/dL) 7% (1h 42min)
Very Low (<54 mg/dL) 2% (0h 31min)

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.

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

captürAGP v4.1

TIME IN RANGES

Very High (>250 mg/dL) 16% (3h 44min)

High (181–250 mg/dL) 23% (5h 40min)

Target Range (70–180 mg/dL) 60% (14h 26min)

Low (54–69 mg/dL) 1% (0h 8min)

Very Low (<54 mg/dL) 0% (0h 3min)

TIR 60%

TBR 1%

GLUCOSE STATISTICS AND TARGETS

1 Dec 2019–15 Dec 2019	15 days
% Time CGM is Active	91.5%

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	175 mg/dL
Glucose Management Indicator (GMI)	7.5%
Glucose Variability	35.8%

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

TIME IN RANGES

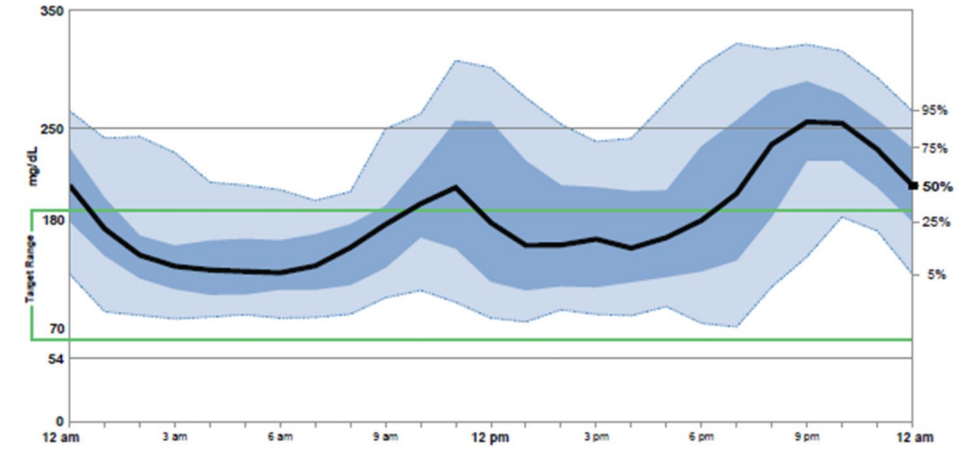
Target Range (70–180 mg/dL) 60% (14h 26min)

Low (54–69 mg/dL) 1% (0h 8min)

Very Low (<54 mg/dL) 0% (0h 3min)

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.

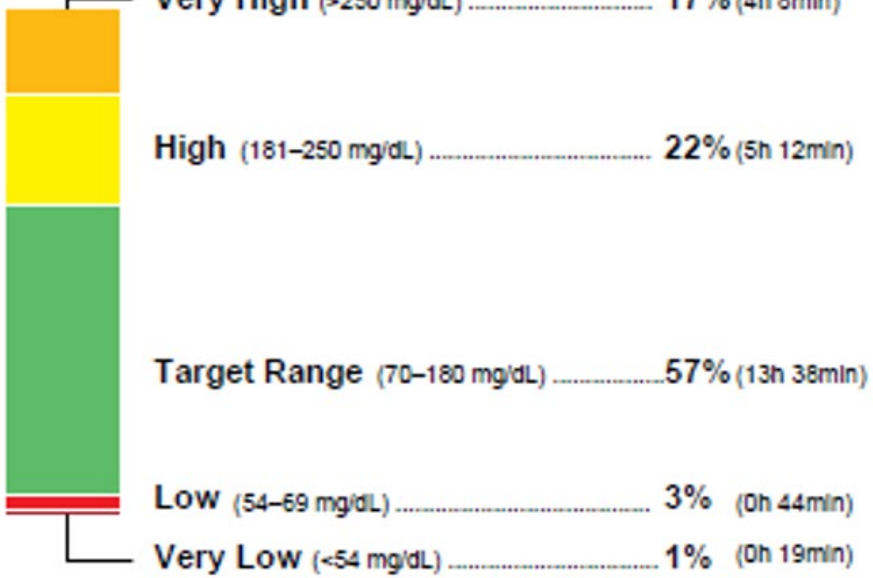


DAILY GLUCOSE PROFILES

3	Time in range ≤70% and Time below range <3%	Address hyperglycemia	Start or increase dose of GLP-1 RA or GIP/GLP-1 RA **AND** if TIR is 50-70% either stop sulfonylurea (if present), or decrease basal insulin dose by 20% If GLP-1 RA or GIP/GLP-1RA not started, or on max tolerated dose: increase basal insulin by 20% if TIR <30%, otherwise increase basal insulin by 10% • If glucose is low overnight* after looking at AGP curve, maintain current basal insulin dose and refer to diabetes education or endocrinology for regimen assessment and adjustment **Follow-up: 2-4 weeks**

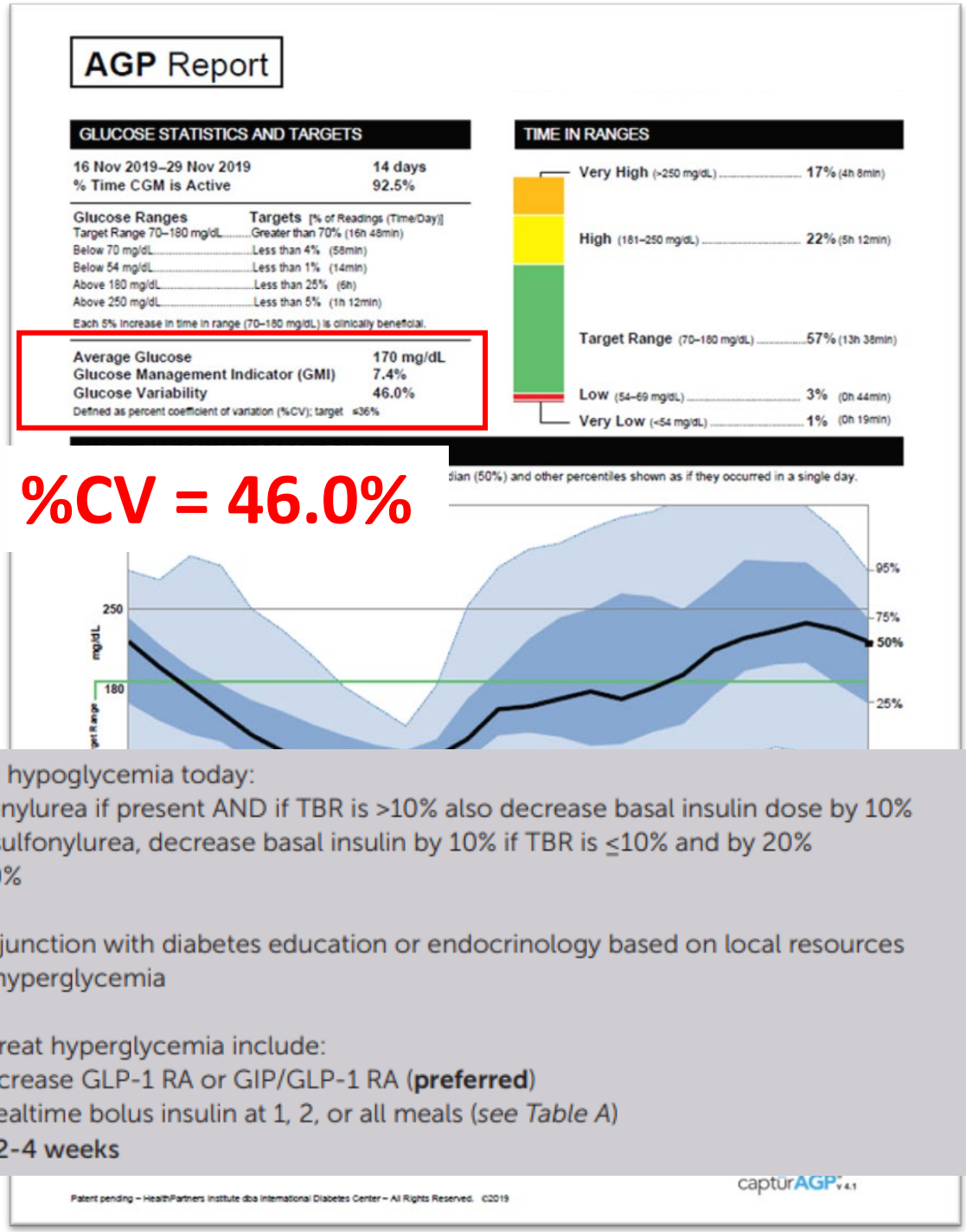
*Low glucose defined as 5% line dropping below 70 mg/dL on AGP curve AND not due to a single day after review of daily profiles

TIME IN RANGES



TIR 57%

TBR 4%



%CV = 46.0%

4	**Time in range ≤70%** and **Time below range ≥3%**	Address hypoglycemia today; also refer to diabetes education or endocrinology	To minimize hypoglycemia today: • Stop sulfonylurea if present AND if TBR is >10% also decrease basal insulin dose by 10% • If not on sulfonylurea, decrease basal insulin by 10% if TBR is ≤10% and by 20% if TBR >10% Work in conjunction with diabetes education or endocrinology based on local resources to improve hyperglycemia Options to treat hyperglycemia include: • Start or increase GLP-1 RA or GIP/GLP-1 RA (**preferred**) • Or add mealtime bolus insulin at 1, 2, or all meals (*see Table A*) **Follow-up: 2-4 weeks**

Beyond basal insulin . . .

Guiding principles:

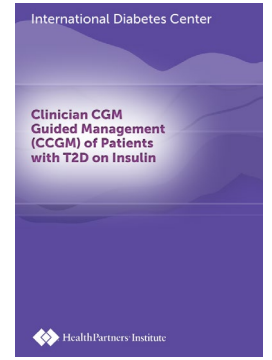
1. Consider addition of GLP-1 RA therapy (if not on) prior to mealtime insulin therapy
2. Consider the range of options of prandial insulin therapy (basal + 1 or 2, MDI, Premixed) based on patient preference, ability, and cost considerations
3. **Likelihood of success much higher with team-based management**
   - **IDC recommends referral to Diabetes Education for initiation of GLP-1 RA therapy and for management / titration of any basal + mealtime insulin regimen**

Clinician CGM Guided Management: For Patients on Basal and Bolus Insulin

	TIR/TBR Category	Action	Medication Adjustment Considerations
1	Time in range >70% and Time below range <3%	Continue regimen	Continue to optimize current therapy and reinforce lifestyle changes and taking medications as prescribed. CONSIDER further intensification of insulin if appropriate: • **Step 1:** Address postmeal hyperglycemia: If there is a postmeal rise of >50 mg/dL in the median line after any meal, increase the mealtime bolus insulin dose before that meal by 5% • **Step 2:** Address basal insulin: If there is a drop of >50 mg/dL in the median line between bedtime and morning meal, decrease basal insulin dose by 5% • **Step 3:** If no change based on steps 1 or 2: Increase basal insulin dose by 5% **Follow-up: 3-4 months**
2	Time in range >70% and Time below range ≥3%	Address hypoglycemia	If low* overnight decrease basal insulin** If low* at one specific time during the day decrease mealtime bolus dose** prior to the low If low* glucose occurs throughout the day and night decrease total daily insulin dose (TDD)** **Follow-up: 2-4 weeks**
3	Time in range ≤70% and Time below range <3%	Address hyperglycemia	Start or increase dose of GLP-1 RA or GIP/GLP-1 RA **AND** if TIR is 50-70% decrease total daily insulin dose (TDD) by 20% If GLP-1 RA or GIP/GLP-1 RA not started or increased, then adjust insulin doses according to current TIR: • If TIR <50%: —If **not** on all-meal coverage, move to all-meal coverage by increasing TDD by 10% and using Table B to calculate new regimen. —If **on** all meal coverage, increase TDD by 10% and redistribute insulin 50:50 between basal and bolus insulin • If TIR 50-70%: review AGP curve and adjust insulin based on **median line** as follows: —**Step 1:** Address postmeal hyperglycemia: If there is a postmeal rise of >50 mg/dL in the median line after any meal, either increase the mealtime bolus insulin dose before that meal by 10% or start mealtime bolus insulin at that meal (see stepwise approach, Table A) —**Step 2:** Address basal insulin: If there is a drop of >50 mg/dL in the median line between bedtime and morning meal, decrease basal insulin dose by 10%, unless basal insulin dose was reduced in Step 1 based on stepwise approach shown in Table A —**Step 3:** If no change based on steps 1 or 2: Increase basal insulin dose by 10% **Follow-up: 2-4 weeks**
4	Time in range ≤70% and Time below range ≥3%	Address hypoglycemia today; also refer to diabetes education or endocrinology	If low* overnight decrease basal insulin** If low* at one specific time during the day decrease mealtime bolus dose** prior to the low If low* glucose occurs throughout the day and night decrease total daily insulin dose (TDD)** **Refer to diabetes education or endocrinology** to treat hyperglycemia while avoiding hypoglycemia; they may recommend adding or adjusting GLP-1 RA or GIP/GLP-1 RA. If one of these is not started or increased, then insulin may be redistributed 50:50 between basal and bolus insulin and/or individual insulin doses titrated **Follow-up: 2-4 weeks**

*Low glucose defined as 5% line dropping below 70 mg/dL on AGP curve AND not due to just a single day after review of daily profiles

** Insulin dose reduction guidance: If TBR <10% reduce insulin dose(s) by 10%; if TBR ≥10% reduce insulin dose(s) by 20%



Pages 6-7

TIME IN RANGES

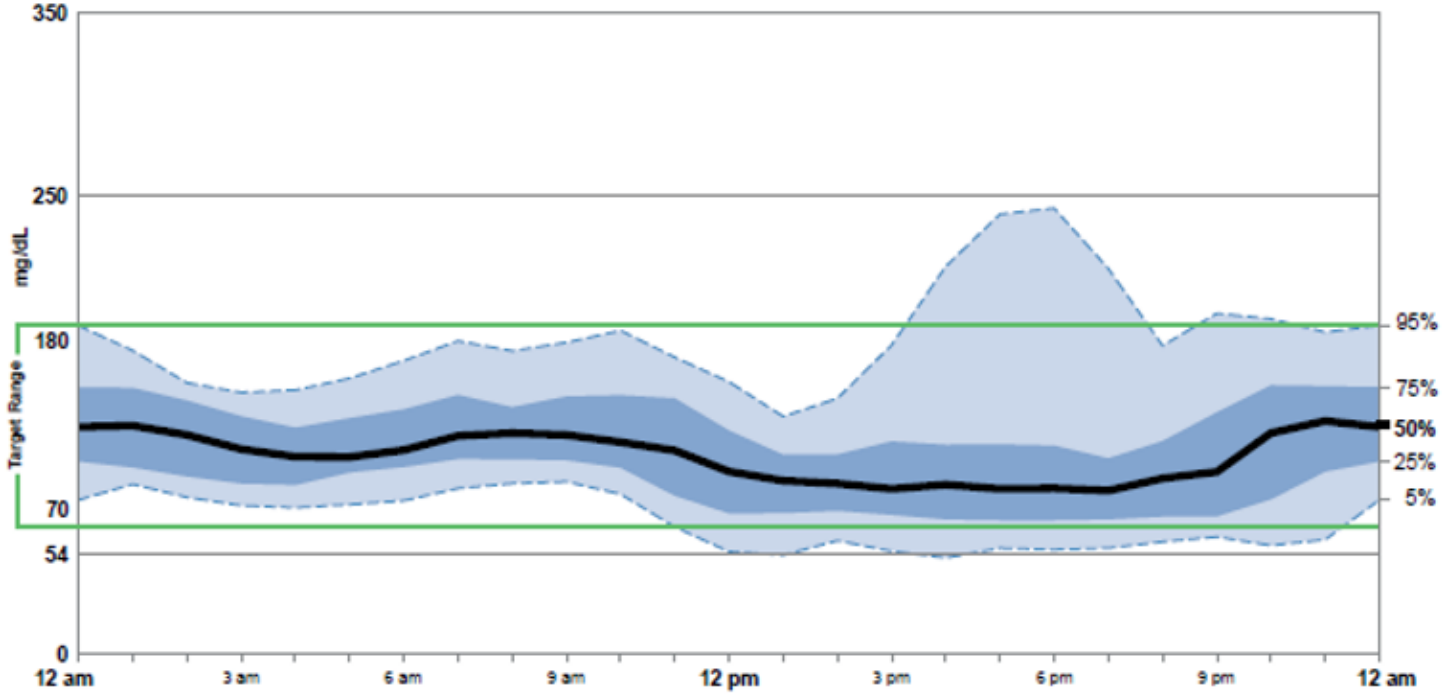
Very High (>250 mg/dL)	**0%**	(0h 6min)
High (181–250 mg/dL)	**4%**	(0h 53min)
Target Range (70–180 mg/dL)	**87%**	(20h 57min)
Low (54–69 mg/dL)	**7%**	(1h 41min)
Very Low (<54 mg/dL)	**2%**	(0h 22min)

TIR 87%

TBR 9%

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.



2 Time in range >70% and Time below range ≥3%

If low* overnight decrease basal insulin**

If low* at one specific time during the day decrease mealtime bolus dose** prior to the low

If low* glucose occurs throughout the day and night decrease total daily insulin dose (TDD)**

Follow-up: 2-4 weeks

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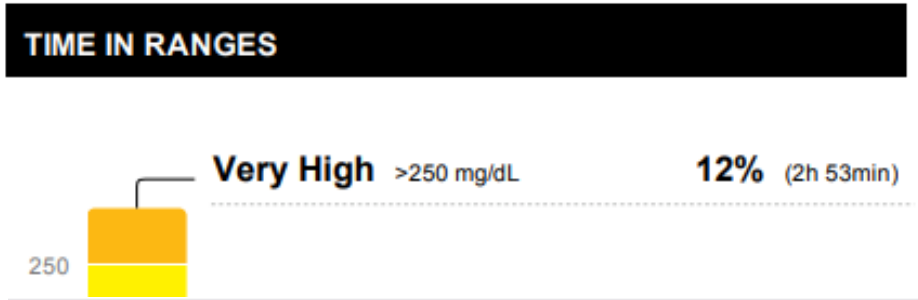

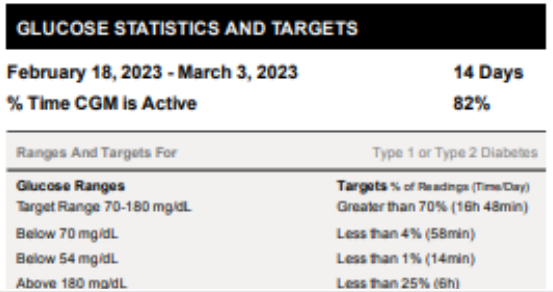

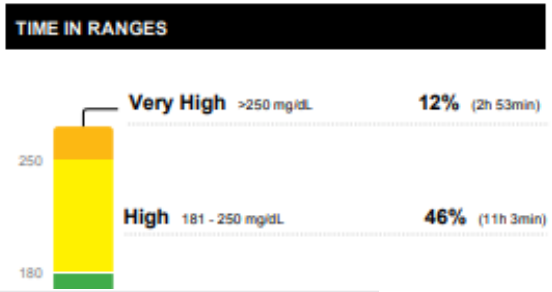

Start or increase dose of GLP-1 RA or GIP/GLP-1 RA **AND** if TIR is 50-70% decrease total daily insulin dose (TDD) by 20%

If GLP-1 RA or GIP/GLP-1 RA not started or increased, then adjust insulin doses according to current TIR:

- If TIR <50%:
  - —If **not** on all-meal coverage, move to all-meal coverage by increasing TDD by 10% and using Table B to calculate new regimen.
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Follow-up: 2-4 weeks

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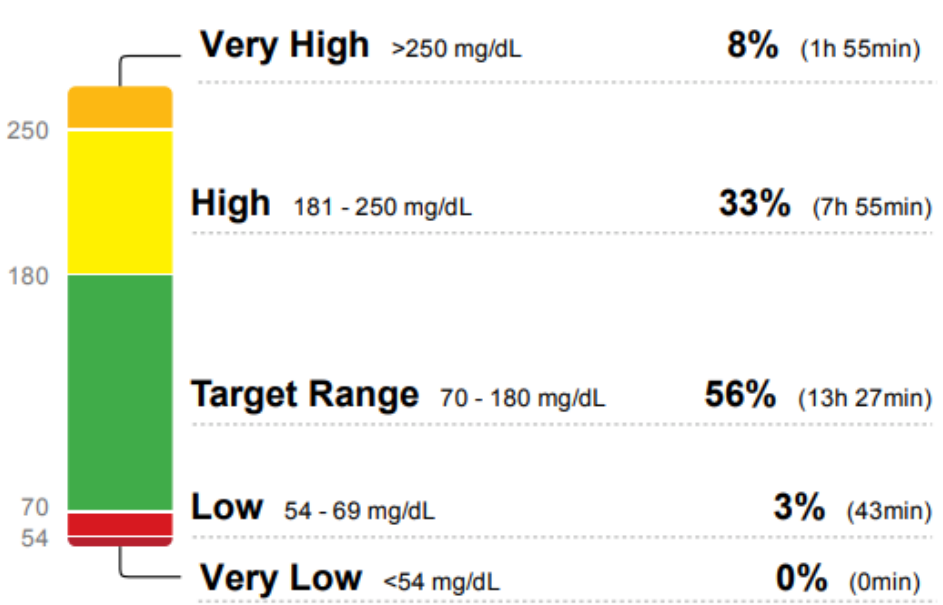


TIR 56%

TBR 3%

GLUCOSE STATISTICS AND TARGETS

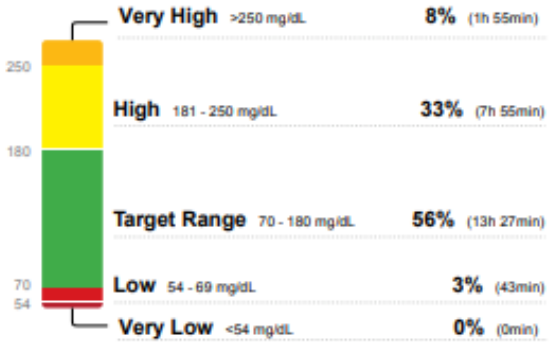
January 31, 2023 - February 13, 2023	14 Days
% Time CGM is Active	84%

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	170 mg/dL
Glucose Management Indicator (GMI)	7.4%
Glucose Variability Defined as percent coefficient of variation (%CV)	32.0%

TIME IN RANGES



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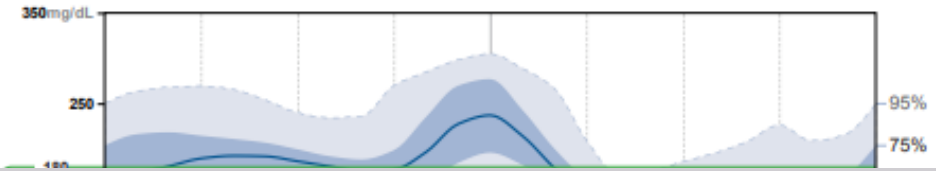

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Tips for Effective CGM-Based Insulin Titration

1. **Change therapy based on *patterns* of hypoglycemia or hyperglycemia, rather than isolated outlying values**
2. **If consistent rise in post-meal glucose**, consider if due to consumption of high carbohydrate foods/beverages
3. **Consider potential issues with insulin regimen:**
    - **Missed or rationed insulin or noninsulin therapies**
    - **Injecting incorrect insulin type**
    - **Timing of insulin dosing:**
        - **Not taking mealtime or premixed insulin before eating** (15 min for rapid-acting and 30 min for regular)
        - **Skipping meals** when using premixed insulin
        - **Timing of background insulin** (e.g. evening vs. morning)
    - **Lipohypertrophy** causing erratic absorption
    - **Possible need for mealtime insulin or GLP-1 RA** to treat post-meal hyperglycemia
    - **"Insulin stacking"** causing low glucose

Tips for Effective CGM-Based Insulin Titration, Cont'd

4. If sudden increase in time above range, consider acute reasons including expired/degraded insulin, improperly stored insulin, acute infection/illness, initiation of steroid therapy, rationed insulin, vacation

5. Verify if excessive alcohol intake could be the cause of hypoglycemia

6. Consider undiagnosed T1D

Questions?

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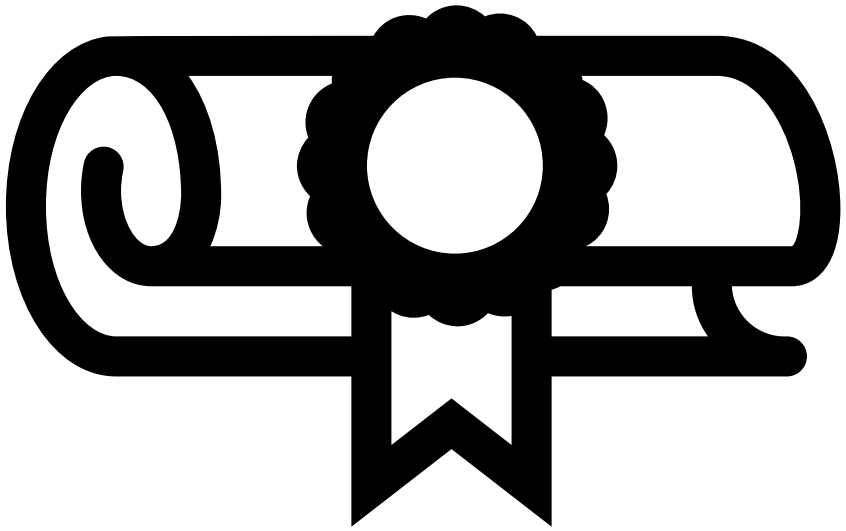

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