ECHO IDAHO

Diabetes and Metabolic Conditions

Individualizing Diabetes Care

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School of Health and Medical Professions

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Learning Objectives

- Introduce themes for later in the series
- Learn to recognize differences in physiology that affect treatment
- Appreciate the power of CGM
- See why primary care is *usually* the best place to treat diabetes
- We will cover this through 6 (quick) cases

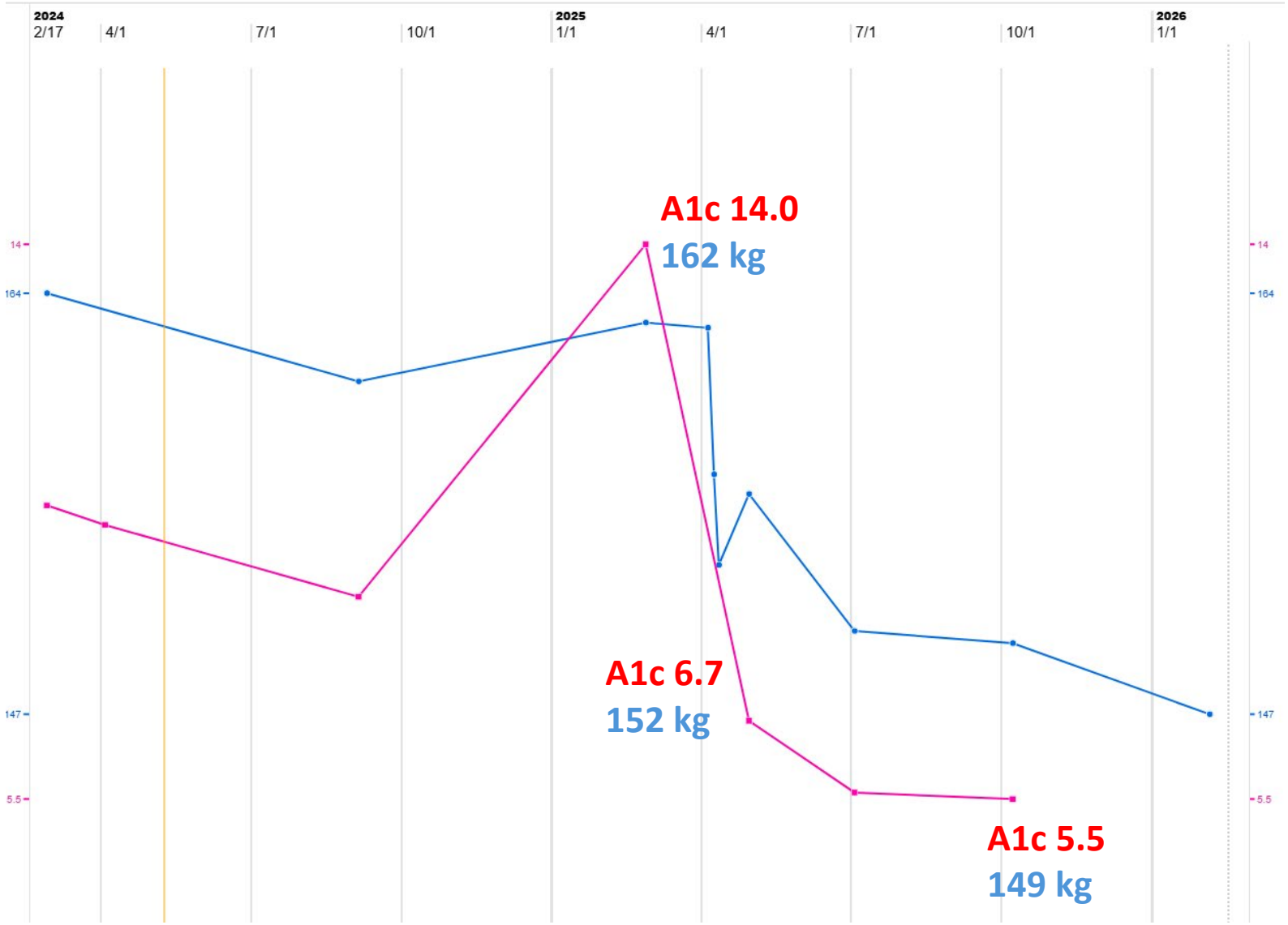
Case 1: 45 man with DM2

02/26/25	09:03	14.0
09/04/24	11:48	8.6
04/03/24	00:00	9.7
02/27/24	16:26	10.0
08/23/23	16:49	7.1
05/03/23	16:10	11.9
10/03/22	16:30	9.7
04/21/22	09:10	11.2
10/21/21	11:21	8.8
05/28/21	00:00	8.9
09/23/19	17:55	6.3
04/30/19	16:40	7.7
01/28/19	13:48	9.1
10/03/18	10:28	10.1
07/12/16	00:00	9.0
03/12/15	00:00	8.3
07/08/14	13:07	12.6
08/15/13	09:18	7.7
03/11/13	13:45	7.2
01/04/13	12:14	8.0
08/08/12	13:51	7.4
11/03/11	16:31	6.9
04/30/11	10:20	7.1

- Diagnosed age 25
- BMI 45
- Fluctuating control, A1c 7-14
- Financial concerns, high deductible
- Treatment:
  - Basal insulin
  - Metformin
  - Brief trials of GLP1, stopped due to cost
- h/o severe hyperglycemia with COVID-19 infection requiring short-acting insulin

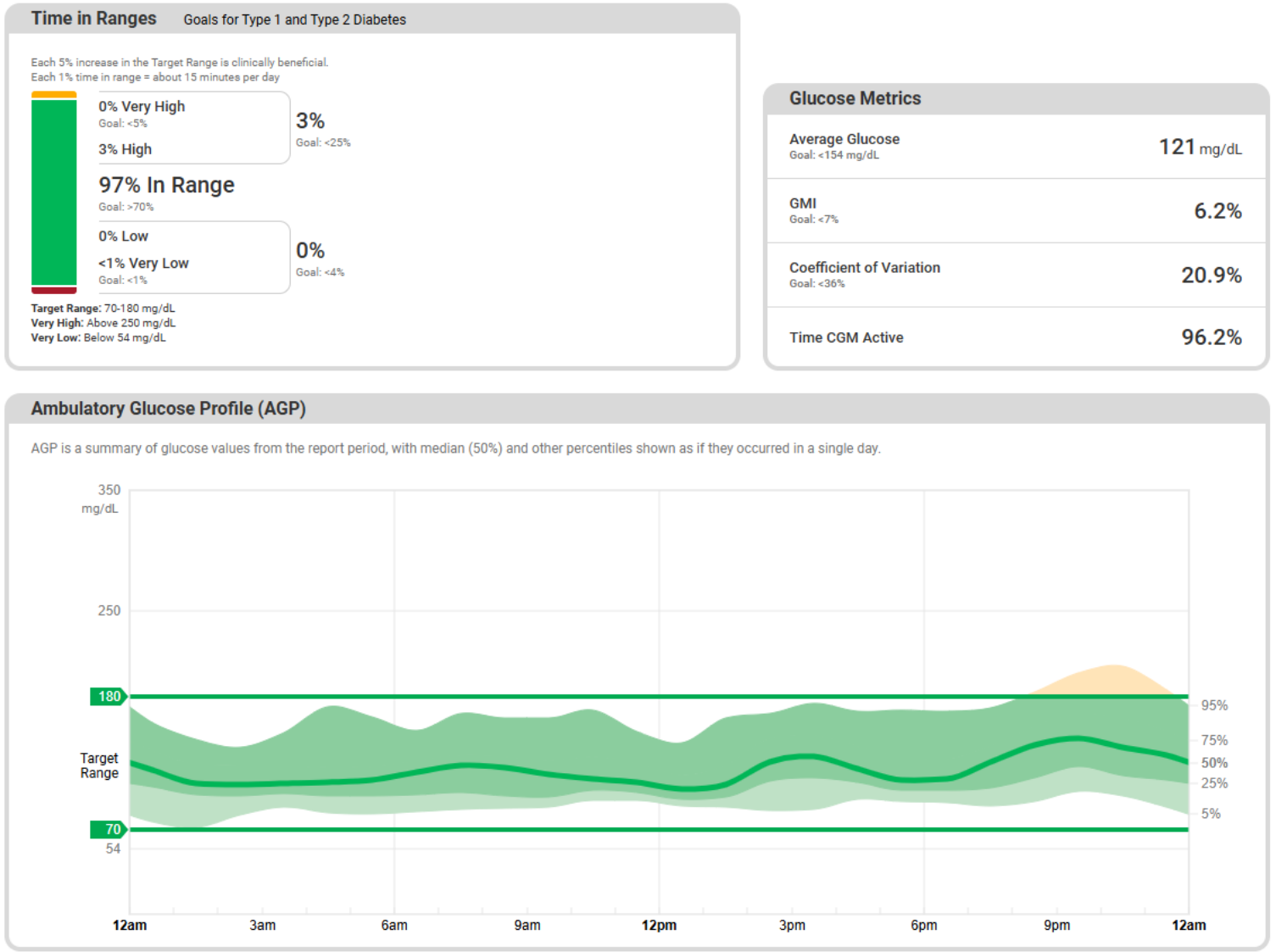
Case 1

- Started tirzepatide Feb 2025



Case 1

- Degludec 75 units daily
- Tirzepatide 12.5 mt weekly
- Stopped metformin due to side effects



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Case 1 Pearl

- Some patients are highly sensitive to GLP-1's

Case 2: 63 y/o man with DM2

- Age of diagnosis: early 40s
- Complications: neuropathy
- Works as a janitor
- BMI 36
- Chronic poor control, A1c 8.5-11 for years
- Complex regimen includes metformin, tirzepatide, pioglitazone, and U-500 insulin 80 units TID
- A1c last visit 11.4 (off of tirzepatide 2/2 insurance problems)

Case 2

- Comes to recent appointment and says he has stopped taking tirzepatide and U-500 insulin since starting carnivore diet about one month ago
- A1c at his appt 8.0

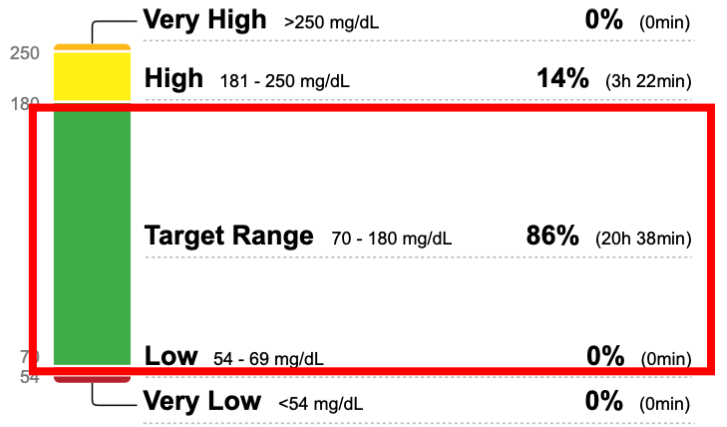
reportFrame ATISTICS AND TARGETS

January 6, 2026 - February 2, 2026	**28 Days**
Time CGM Active:	**99%**

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.	

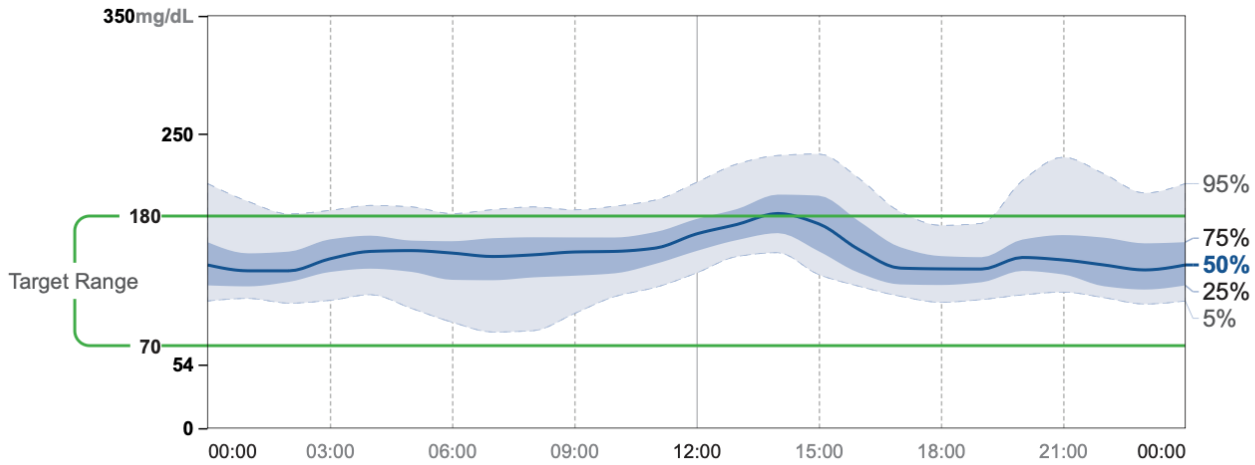
Average Glucose	**150** mg/dL
Glucose Management Indicator (GMI)	**6.9%**
Glucose Variability	**19.9%**
Defined as percent coefficient of variation (%CV); target ≤36%	

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.



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Case 2 pearls

- Diet REALLY matters in some patients
- There is no data on the safety of carnivore diets specifically
- Limited data for short term use of Very Low Carb Diets (VLCD) but data beyond 12 months is lacking[1].

Case 3: 29 woman with uncontrolled diabetes

- Age of diagnosis: dx with gestational diabetes at age 22, later diagnosed with diabetes at age 24
- BMI 35
- Treatment:
  - Did not tolerate metformin
  - glargine 30 units, lispro, not using consistently
  - Numerous efforts at weight loss, would like to lose enough weight so that she will no longer have diabetes
- Glucometer shows highest BG 361, lowest 23, 15% hypoglycemia

Case 3: clinical course

- GAD Ab 209.6, c-peptide 0.5 ng/mL
- Patient given diagnosis of type 1 diabetes (2016)
  - Met with dietician to learn carb counting
  - Started CGM
  - Began insulin pump in 2021
- Had gastric sleeve surgery in 2024
  - Total weight loss of 70 pounds (BMI 46 -> 34)
- A1c less than 8 since 2021

Case 3 pearls

- Not everyone with diabetes and obesity has type 2 diabetes
  - Over 40% of those those developing type 1 diabetes after age 30 are initially treated as having type 2 diabetes[2].
  - Discriminating factors:
    - Age < 35
    - BMI < 25
    - Unintentional weight loss
    - Ketoacidosis
    - Glucose at presentation > 360

Case 4: 44 y/o woman with retinopathy

- Established care after her optometrist noted changes c/w retinopathy. Age of diabetes: unclear.
  - Gestational diabetes requiring insulin
  - A1c at age 30 was 10.2
- BMI 19
- Vietnamese American, strong family history (almost everyone on maternal side)
- Has never been hospitalized
- A1c at presentation 11.6, POCT glucose 213

Case 4: initial treatment

- Start metformin and degludec 8 units daily
- Start CGM

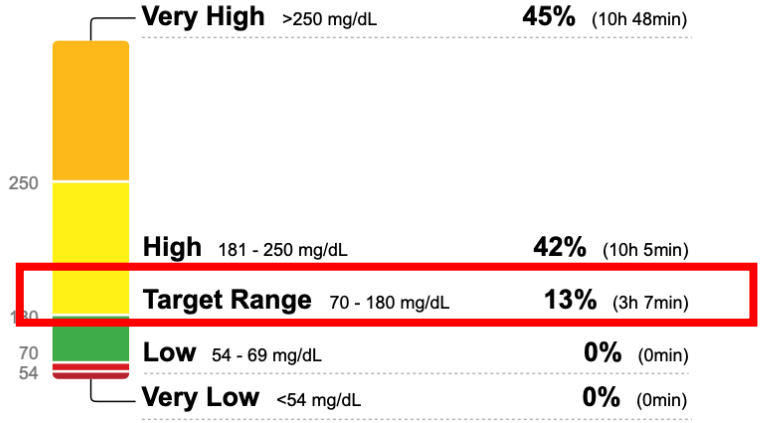
GLUCOSE STATISTICS AND TARGETS

January 7, 2025 - February 3, 2025	**28 Days**
Time CGM Active:	**57%**

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	**243** mg/dL
Glucose Management Indicator (GMI)	**9.1%**
Glucose Variability	**21.4%**
Defined as percent coefficient of variation (%CV); target ≤36%	

TIME IN RANGES



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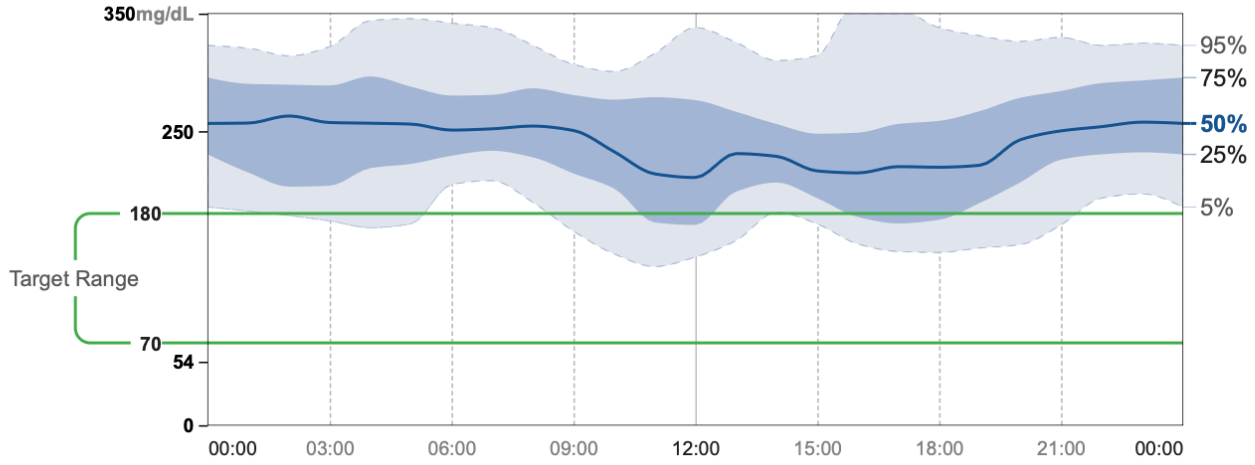

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Case 4: 4 months later

- Degludec up to 18 units
- Average sensor glucose 208, time in range (TIR) 33%, GMI 8.3
- I recommend starting short acting insulin, she wants to try GLP-1

Case 4: outcome

- Metformin 1000 mg bid
- Dulaglutide 1.5 mg weekly
- NO insulin

GLUCOSE STATISTICS AND TARGETS

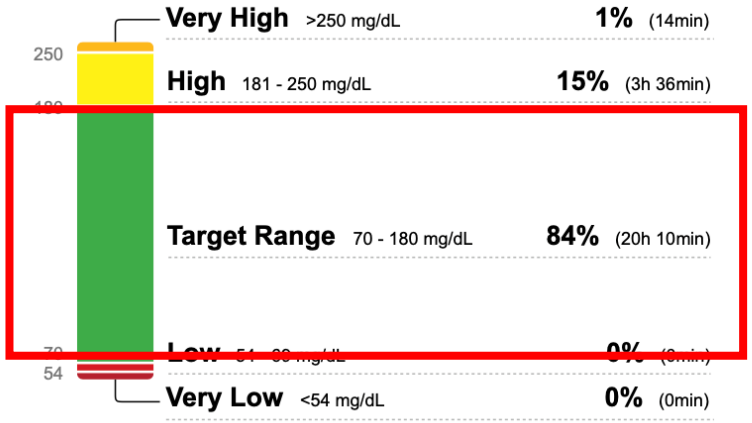
December 8, 2025 - January 4, 2026	**28 Days**
Time CGM Active:	**76%**

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	**152** mg/dl
Glucose Management Indicator (GMI)	**6.9%**
Glucose Variability	**20.8%**

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

TIME IN RANGES



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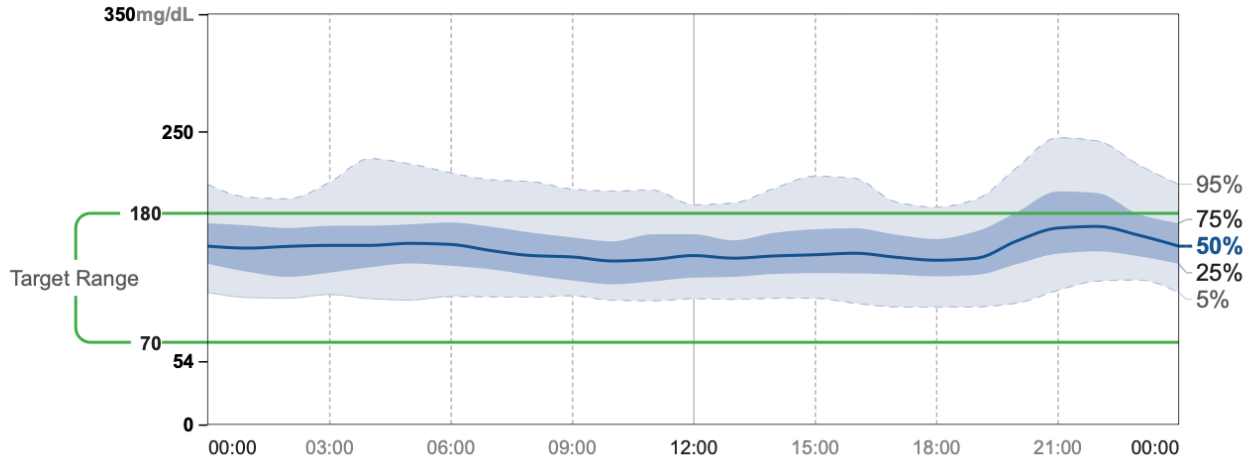

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Case 4 pearls

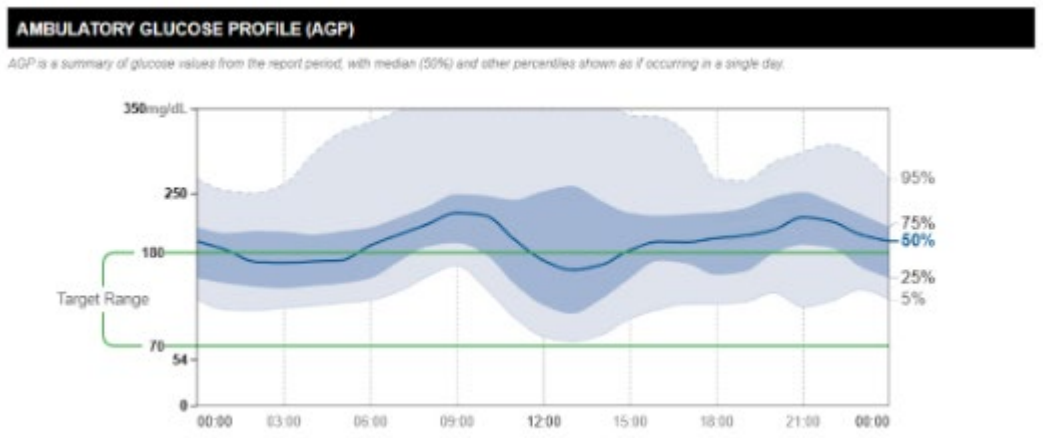
- Patients with normal weight can have type 2 diabetes
- Southeast and South Asian populations develop DM2 at younger ages and lower BMI. This is thought to be due to higher body fat percentage despite lower BMI, greater visceral and ectopic fat, earlier beta-cell dysfunction[3].
- ADA recommends screening adults for diabetes of Asian ancestry with BMI > 23 (instead of 25)[3].

Case 5: 56 y/o man with high risk DM2

- Diagnosed in early 20s
- Prior treatment:
  - Basal bolus regimen
  - U-500 (~450 units per day)
  - Intolerant of every GLP1: exenatide, liraglutide, semaglutide (SC and oral), tirzepatide.
  - Insurance repeatedly denied coverage for bariatric surgery
- Complications: CKD3b, A3 (proteinuria 1-3g/day), HTN, retinopathy, obesity BMI ~46, OSA
- Work-up: testing for hypercortisolism negative
- Admission in Jan 2025 for acute respiratory failure and DKA (HCO3 12, beta hydoxybutyrate 5.1)

Case 5

- Current treatment
  - Glargine U-300 95 units twice daily
  - Lispro U-200 90 units before breakfast, 60 units before lunch, 100 units before dinner
  - empaglifozen 25 mg daily
- A1c: 11.3
- TIR: 39%
- Cr: 2.2



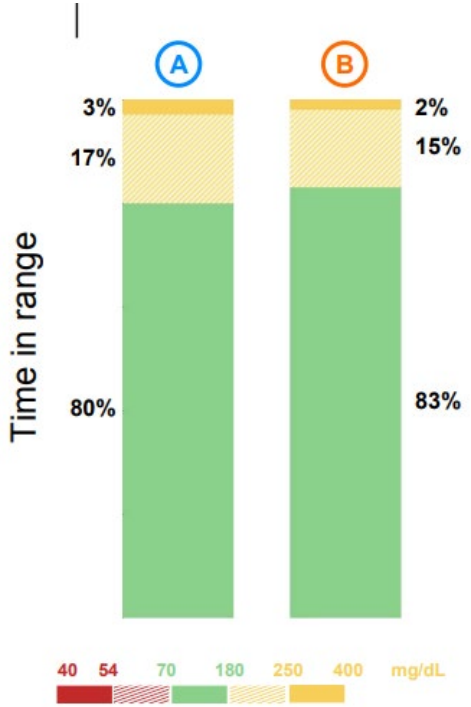
01/19/25	12:53	11.3
10/24/24	08:19	8.8
07/25/24	08:33	8.4
03/04/24	07:31	9.0
11/24/23	08:52	8.3
11/09/23	08:27	8.2
07/13/23	09:29	7.3
04/10/23	09:50	8.3
11/10/22	08:34	7.7
08/02/22	09:11	7.9
03/31/22	08:45	9.3
11/02/21	09:50	8.6
09/14/20	09:10	8.5
04/08/20	09:26	8.6
01/21/20	09:19	8.8
06/25/19	16:44	8.0
03/14/19	10:08	9.0
12/10/18	09:36	9.1
09/10/18	11:03	8.6
05/07/18	10:42	7.9
02/12/18	07:25	8.1
02/06/18	11:31	7.9
09/19/17	12:09	10.5
06/06/17	16:40	10.1
02/20/17	17:13	10.4
11/22/16	11:56	9.9
08/08/16	07:48	10.1
05/18/16	07:39	10.1
02/08/16	08:07	10.6
03/09/15	08:48	10.1
11/03/14	08:29	9.5
06/02/14	08:00	12.1
10/15/13	08:00	11.3
12/14/12	07:50	12.1
11/28/11	08:35	10.9

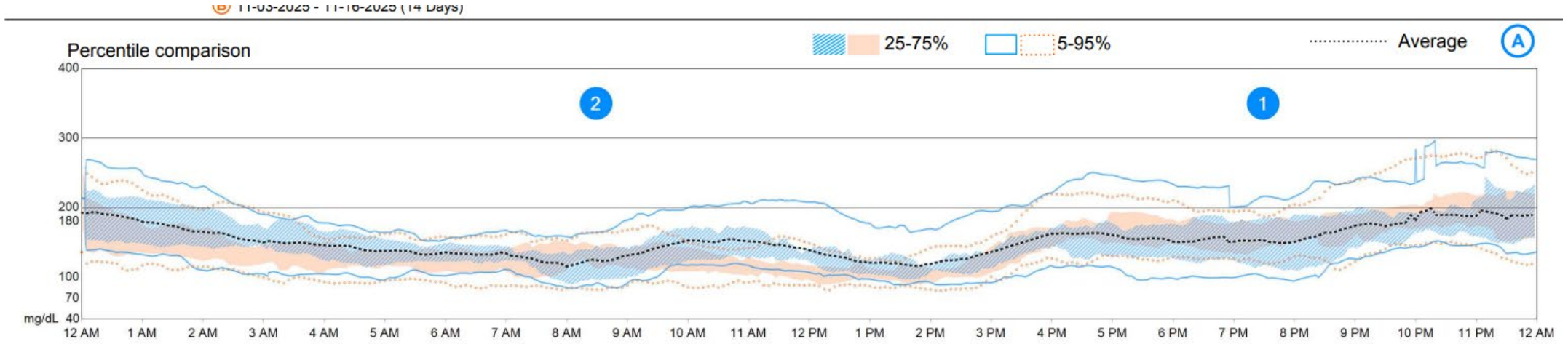
Case 5

- Developed plan to start insulin pump
  - Continue basal insulin
  - Utilize U-200 insulin in the pump
  - Simplified carb “counting”
- Enlisted help of clinical pharmacist, device rep
- Obtained insurance approval
- Started Medtronic 780G

Case 5

- TIR: 80%
- A1c: 7.2
- Total daily dose: 521 units





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Case 5 pearls

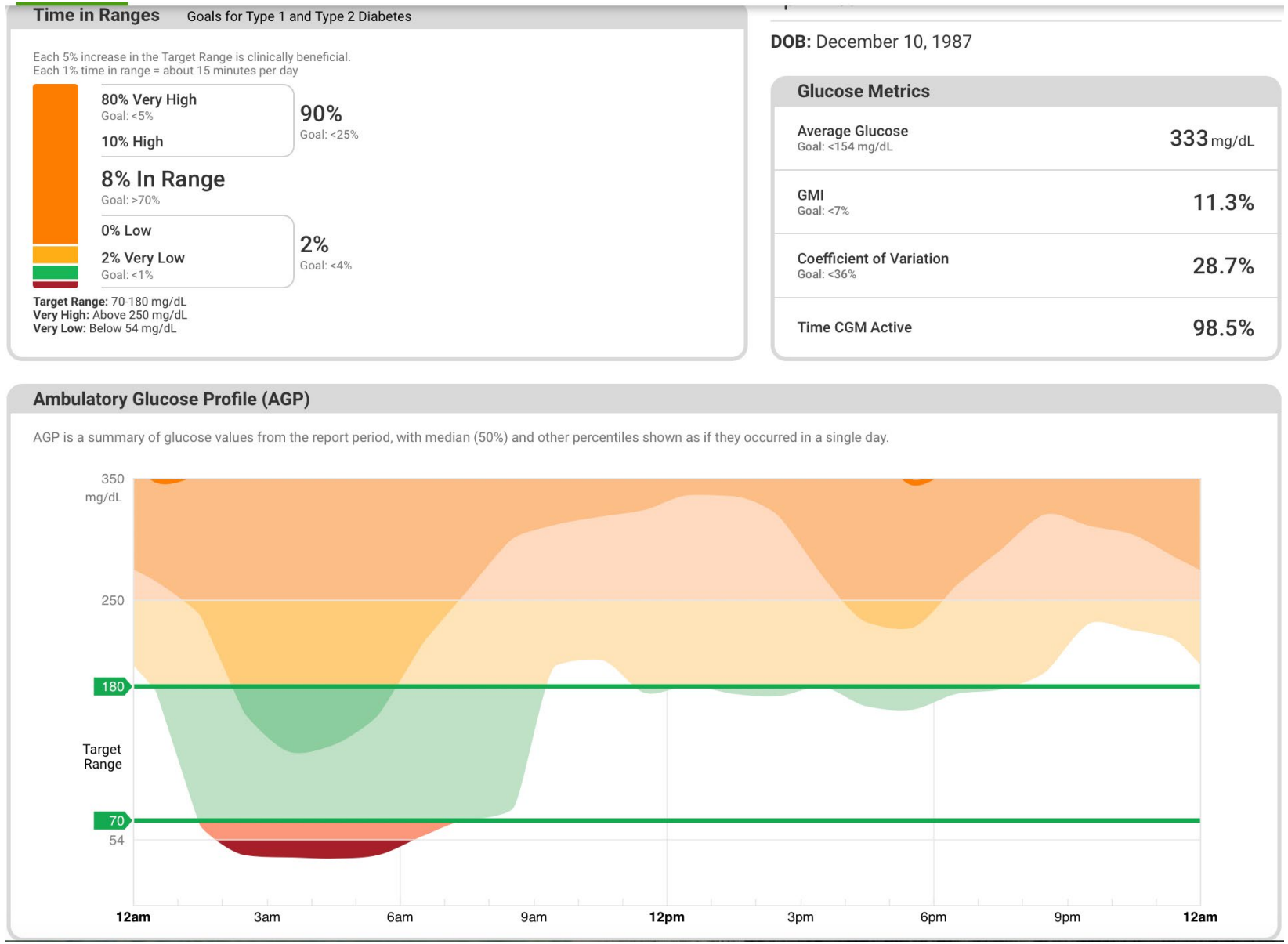
- Think creatively and collaborate with the patient
- Enlist help!
  - Pharmacy
  - Colleagues
  - Device rep

Case 6: 38 y/o woman w/ uncontrolled DM1

- Age of diagnosis 21
- Works as an RN
- BMI 23
- Using Tandem insulin pump with Dexcom CGM
- A1c > 9 for the past 3 years, most recently 12.9

Case 6

- Avg glucose 333
- TIR 8%
- GMI 11.3



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Case 6: what's going on?

- Depression
  - Long-standing history
  - Sudden death of partner couple years ago
- Intentional omission of insulin?
  - Prevalence of insulin restriction for weight control in type 1 diabetes is about 15%[5]
  - You don't know unless you ask

Case 6 pearls

- Address depression first!
- Even if you are uncomfortable managing a patient's type 1 diabetes, it is often focusing on the psychosocial aspects that will matter.

Key Points

- Diabetes often defies easy classification
- Be cautious about BMI
- Each patient's situation is truly unique
- CGM has several benefits
  - provides a fingerprint of a patient's diabetes to guide treatment
  - Helps you assess the success of your interventions and make you better
  - (empowers patients)
- Address psychosocial comorbidities and mental health first, starts in primary care clinic

References

1. *Goldenberg JZ, Day A, Brinkworth GD, et al. Efficacy and Safety of Low and Very Low Carbohydrate Diets for Type 2 Diabetes Remission: Systematic Review and Meta-Analysis of Published and Unpublished Randomized Trial Data.* BMJ*. 2021;372:m4743. doi:10.1136/bmj.m4743.*
2. *Holt RIG, DeVries JH, Hess-Fischl A, et al. The Management of Type 1 Diabetes in Adults. A Consensus Report by the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD).* Diabetes Care*. 2021;44(11):2589-2625.*
3. *Lim S, Buranapin S, Bao X, et al. Once-Weekly Semaglutide 2·4 Mg in an Asian Population With Obesity, Defined as BMI ≥25 Kg/M2, in South Korea and Thailand (STEP 11): A Randomised, Double-Blind, Placebo-Controlled, Phase 3 Trial.* Lancet Diabetes Endocrinol*. 2025;13(10):838-847.*
4. *American Diabetes Association Professional Practice Committee. 2. Diagnosis and Classification of Diabetes: Standards of Care in Diabetes-2026.* Diabetes Care*. 2026;49(Suppl 1):S27-S49. doi:10.2337/dc26-S002*
5. *American Diabetes Association Professional Practice Committee. 5. Facilitating Positive Health Behaviors and Well-Being to Improve Health Outcomes: Standards of Care in Diabetes—2026.* Diabetes Care*. 2026;49(Suppl 1):S89-S131. doi:10.2337/dc26-S005.*