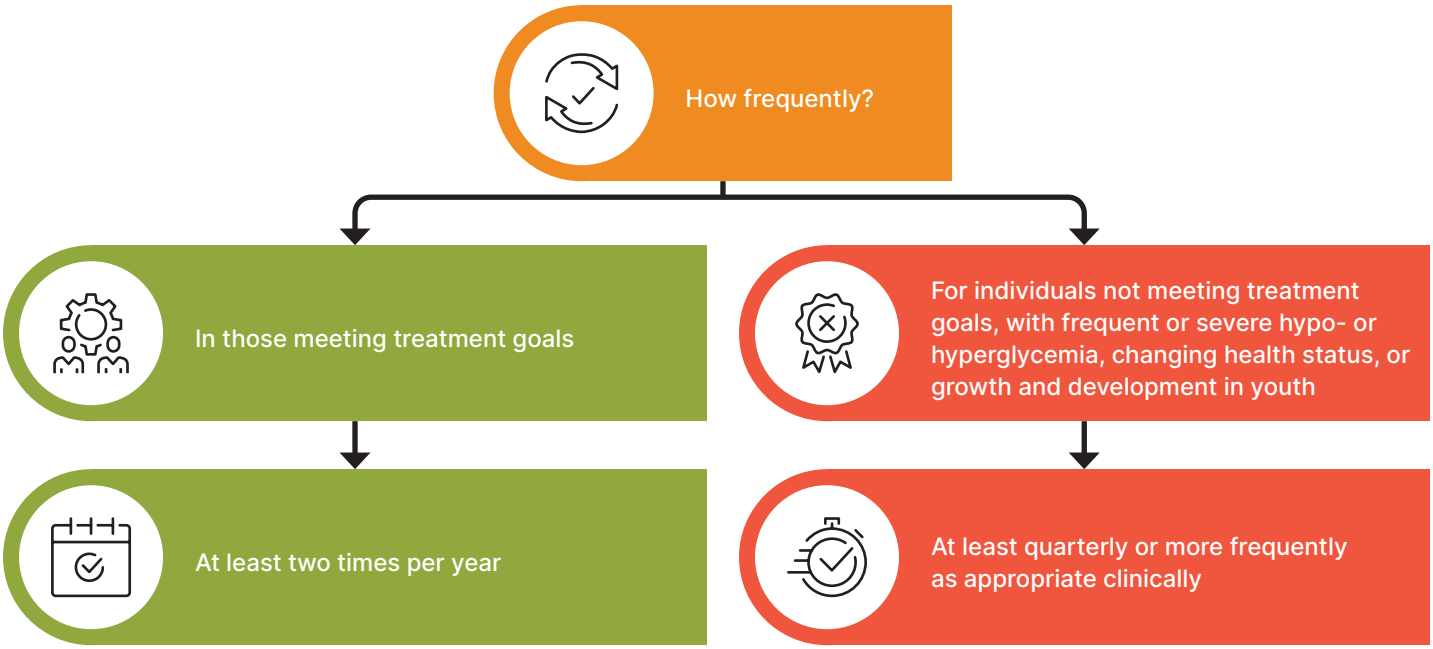
Glycemic Goals and Hypoglycemia

Assessment of Glycemic Status

How to Assess

- A1C measurement
- Continuous glucose monitoring (CGM) using appropriate metrics (e.g., time in range [TIR] and/or glucose management indicator [GMI])

When to Assess



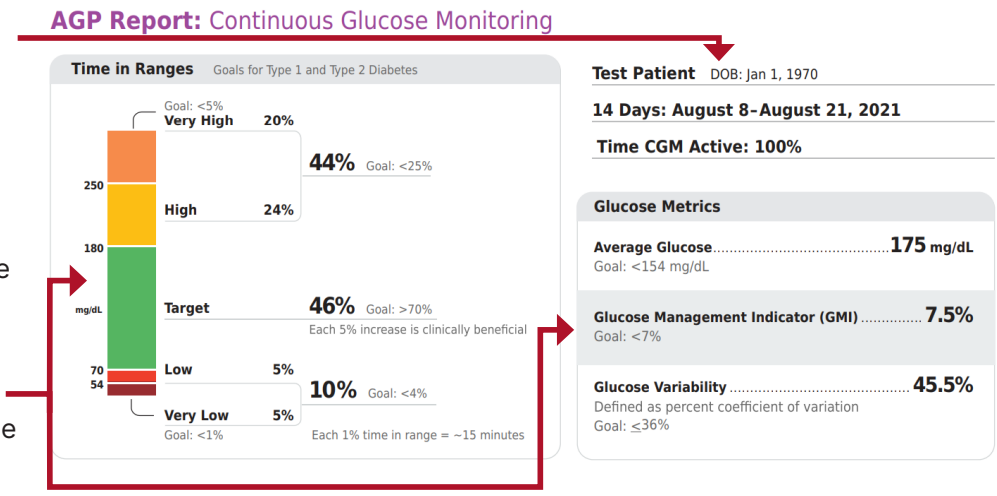
Clinical Notes

- Limitations:
  - Accuracy can be affected by conditions that affect red blood cell turnover (e.g., hemolytic and other anemias, glucose-6-phosphate dehydrogenase deficiency, recent blood transfusion, use of drugs that stimulate erythropoiesis, end-stage kidney disease, and pregnancy).
  - Some hemoglobin variants can interfere with some A1C assays, although this problem has been minimized with newer assays.
  - A1C does not assess glycemic variability or hypoglycemia.
- Consider alternative measures, such as fructosamine and glycated albumin, when necessary.
- Assess glycemic variability using a combination of results from blood glucose monitoring/CGM and A1C.

Suggested citation: American Diabetes Association Primary Care Advisory Group. 6. Glycemic goals and hypoglycemia: *Standards of Care in Diabetes—2024* abridged for primary care professionals. Clin Diabetes 2024;42:196–200 (doi: 10.2337/cd24-a006).

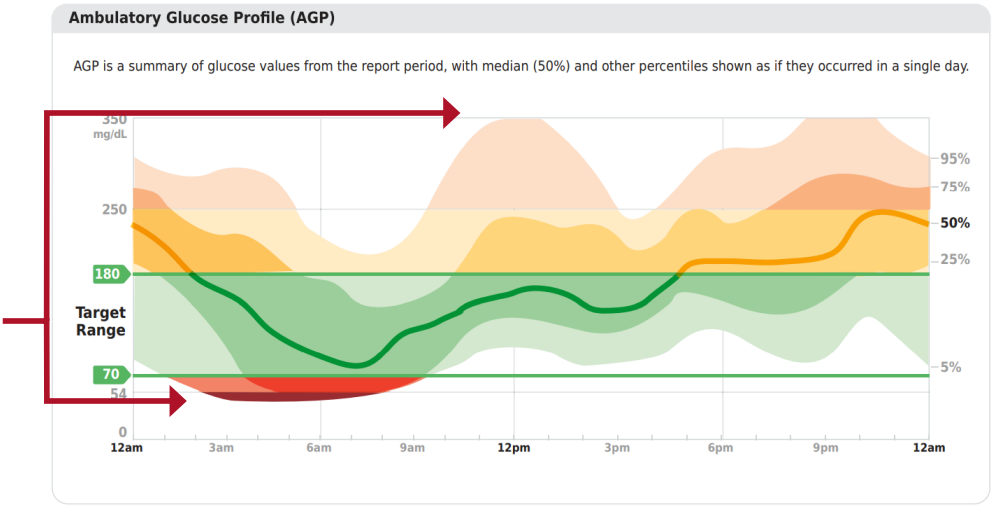
Glucose Assessment via CGM: The Ambulatory Glucose Profile (AGP) Report

1. Ensure sufficient data for analysis; CGM active at least 70% of the time over 14 days is recommended.
2. Discuss individuals' daily self-management routine.
3. Ask individuals to identify and explain what they observe on the report.
4. Check overall CGM metrics:

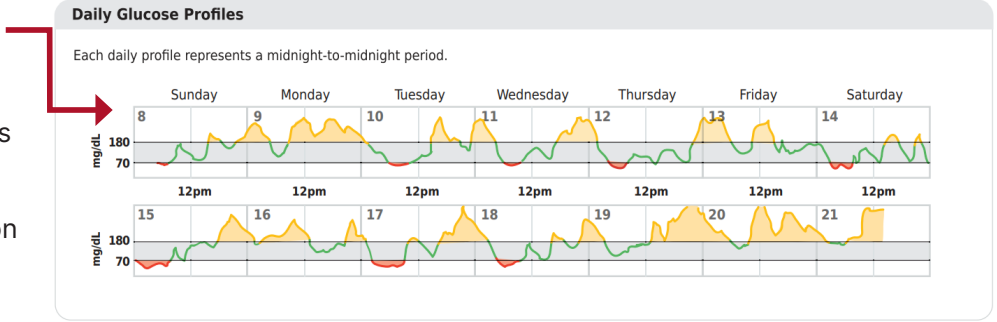


- Time below range (TBR): percentage of readings and time with glucose <70 mg/dL (<3.9 mmol/L)
- TIR: percentage of readings and time with glucose 70–180 mg/dL (3.9–10.0 mmol/L)
- Time above range (TAR): percentage of readings and time >250 mg/dL (>13.9 mmol/L)
- Mean glucose
- Glucose management indicator (GMI): an estimate of A1C
- Glycemic variability: expressed as percent coefficient of variation; target ≤36%

5. Identify any hypoglycemia first, and then look for hyperglycemia patterns. Review the time spent in these patterns on the overall profile and daily graphs.



6. Discuss identified patterns and ask individuals to reflect on potential causes and possible solutions.
7. If you use CGM metrics to assess glycemia, goals for nonpregnant adults or those with frailty will vary; set glycemic goals based on the general guidelines below.
8. Use shared decision-making to develop an action plan.



Correlation Between A1C and Estimated Average Glucose (eAG)

A calculator for converting A1C results into eAG, in either mg/dL or mmol/L, is available at professional.diabetes.org/eAG.

Data in parentheses are a 95% CI.

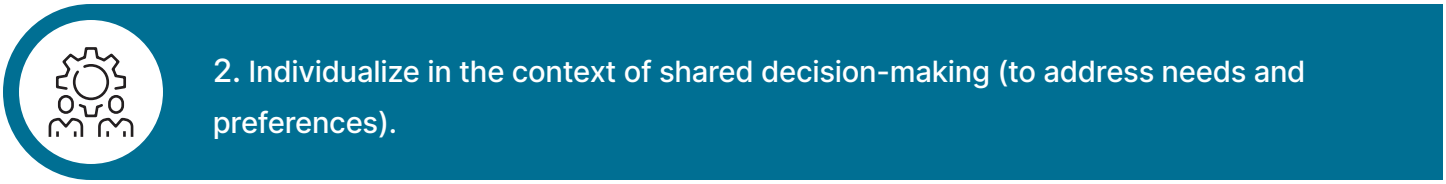
A1C (%)	mg/dL	mmol/L
5	97 (76–120)	5.4 (4.2–6.7)
6	126 (100–152)	7.0 (5.5–8.5)
7	154 (123–185)	8.6 (6.8–10.3)
8	183 (147–217)	10.2 (8.1–12.1)
9	212 (170–249)	11.8 (9.4–13.9)
10	240 (193–282)	13.4 (10.7–15.7)
11	269 (217–314)	14.9 (12.0–17.5)
12	298 (240–347)	16.5 (13.3–19.3)

Adapted from Nathan DM, Kuenen J, Borg R, Zheng H, Schoenfeld D; A1c-Derived Average Glucose Study Group. Translating the A1C assay into estimated average glucose values. Diabetes Care 2008;31:1473–1478.

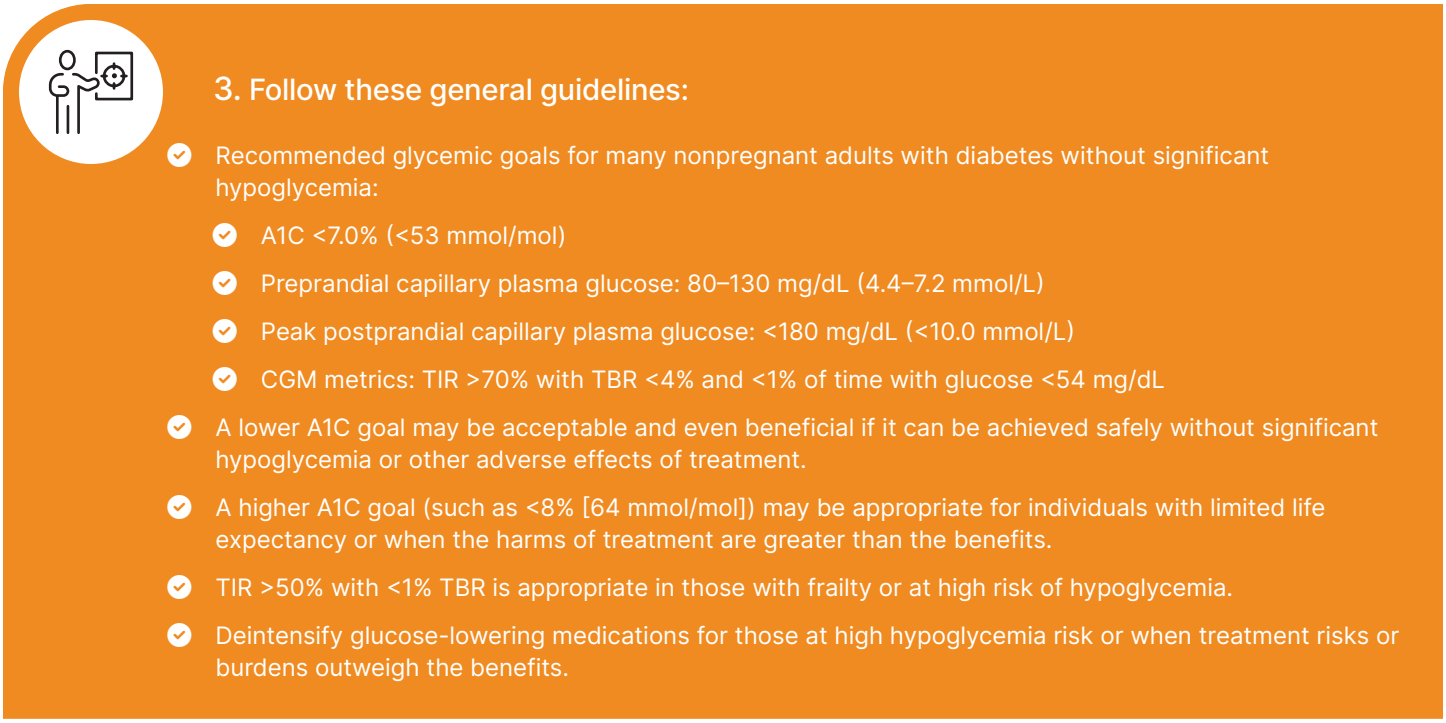
Setting and Modifying Glycemic Goals

Glycemic goals should be individualized and periodically reevaluated.

1. Individualize based on key characteristics of the person with diabetes.



2. Individualize in the context of shared decision-making (to address needs and preferences).



3. Follow these general guidelines:

- Recommended glycemic goals for many nonpregnant adults with diabetes without significant hypoglycemia:
  - A1C <7.0% (<53 mmol/mol)
  - Preprandial capillary plasma glucose: 80–130 mg/dL (4.4–7.2 mmol/L)
  - Peak postprandial capillary plasma glucose: <180 mg/dL (<10.0 mmol/L)
  - CGM metrics: TIR >70% with TBR <4% and <1% of time with glucose <54 mg/dL
- A lower A1C goal may be acceptable and even beneficial if it can be achieved safely without significant hypoglycemia or other adverse effects of treatment.
- A higher A1C goal (such as <8% [64 mmol/mol]) may be appropriate for individuals with limited life expectancy or when the harms of treatment are greater than the benefits.
- TIR >50% with <1% TBR is appropriate in those with frailty or at high risk of hypoglycemia.
- Deintensify glucose-lowering medications for those at high hypoglycemia risk or when treatment risks or burdens outweigh the benefits.

Approach to Individualization of Glycemic Targets

Patient/Disease Features	More Stringent < A1C 7% > Less Stringent
Risks potentially associated with hypoglycemia and other drug-related adverse effects	Low — High
Disease duration	Newly Diagnosed — Long Standing
Life expectancy	Long — Short
Important comorbidities	Absent — few/mild — Severe
Established vascular complications	Absent — few/mild — Severe
Individual needs and preference	Highly motivated, excellent self-care capabilities — Preference for less burdensome therapy
Resources and support system	Readily available — Limited

Person and disease factors used to determine optimal glycemic targets. Characteristics and predicaments toward the left justify more stringent efforts to lower A1C; those toward the right suggest less stringent efforts. A1C 7% = 53 mmol/mol.

Adapted with permission from Inzucchi SE, Bergenstal RM, Buse JB, et al. Management of hyperglycemia in type 2 diabetes, 2015: a patient-centered approach: update to a position statement of the American Diabetes Association and the European Association for the Study of Diabetes. Diabetes Care 2015;38:140–149.

Hypoglycemia Assessment, Prevention, and Treatment

Hypoglycemia is categorized into three levels based on blood glucose concentrations and symptom severity. Level 1 is glucose <70 mg/dL (<3.9 mmol/L) but ≥54 mg/dL (≥3.0 mmol/L). Level 2 is glucose <54 mg/dL (<3.0 mmol/L). Level 3 is a severe event characterized by altered mental and/or physical status requiring assistance for treatment of hypoglycemia, irrespective of glucose level.

Assessment and medication selection	
	Review hypoglycemia history at every clinical encounter in all at-risk individuals.
	Screen for impaired hypoglycemia awareness in all at-risk individuals.
	Consider hypoglycemia risk when selecting diabetes medications and setting glycemic goals.
Prevention and management of hypoglycemia	
	Use CGM for individuals at high risk for hypoglycemia.
	Glucose is the preferred treatment for hypoglycemia in conscious individuals with glucose levels <70 mg/dL (<39 mmol/L), although any form of fast-acting carbohydrate can be used. Re-test and re-treat, if needed, after 15 minutes.
	Ensure that glucagon is prescribed for all those taking insulin and those at high risk for hypoglycemia, with education provided on its use and proper storage.
	Offer structured education on hypoglycemia prevention and treatment to all individuals taking insulin and those at high risk for hypoglycemia.
	Upon occurrence of one or more episodes of level 2 or level 3 hypoglycemia, promptly reevaluate the treatment plan, including considering whether to deintensify or switch medications.
	Refer individuals with impaired hypoglycemia awareness to a trained health care professional for evidence-based interventions to help reestablish awareness of hypoglycemia symptoms.
	Conduct ongoing assessments of cognitive function, ensuring extra caution and support for hypoglycemia if impaired or declining cognition is identified.