DiabetesEd Services | ONLINE UNIVERSITY

Virtual DiabetesEd Training Conference 2026 – Day 1

Beverly Thomassian, RN, MPH, BC-ADM, CDCES
Founder - www.DiabetesEd.net

Welcome Everyone

Good Morning and Welcome.

Grab your coffee, tea or other beverage, a healthy snack and get comfy.

We will start promptly at 8:00 AM Pacific Time.

If you are having any technical difficulty, please chat with Bryanna at www.DiabetesEd.net or call 530 / 893-8635 or email at info@diabetesed.net

Land Acknowledgment

“We acknowledge that we are gathered on the traditional territory of the Kumeyaay Nation. We pay respect to their elders, both past and present, and acknowledge their enduring relationship to this land and their continuing sovereignty and cultural traditions in the San Diego community".

Diabetes Education Services Inclusion Statement

Based on the IDEA Initiative inspired by CDR

- Inclusion
- Diversity
- Equity
- Access

- We are committed to promoting diversity and inclusion in our educational offerings.
- We recognize, respect, and include differences in ability, age, culture, ethnicity, gender, gender identity, sexual orientation, size, and socioeconomic characteristics.
- Our goal is to promote equity and access, acknowledging historical and institutional inequities.
- We are committed to practicing cultural humility and cultivating our cultural competence.
- We wish to create a safe space within our community where one's beliefs, experiences, identity, and differences in ability, age, size, socio-cultural/socioeconomic characteristics, and political affiliations are considered and respected.

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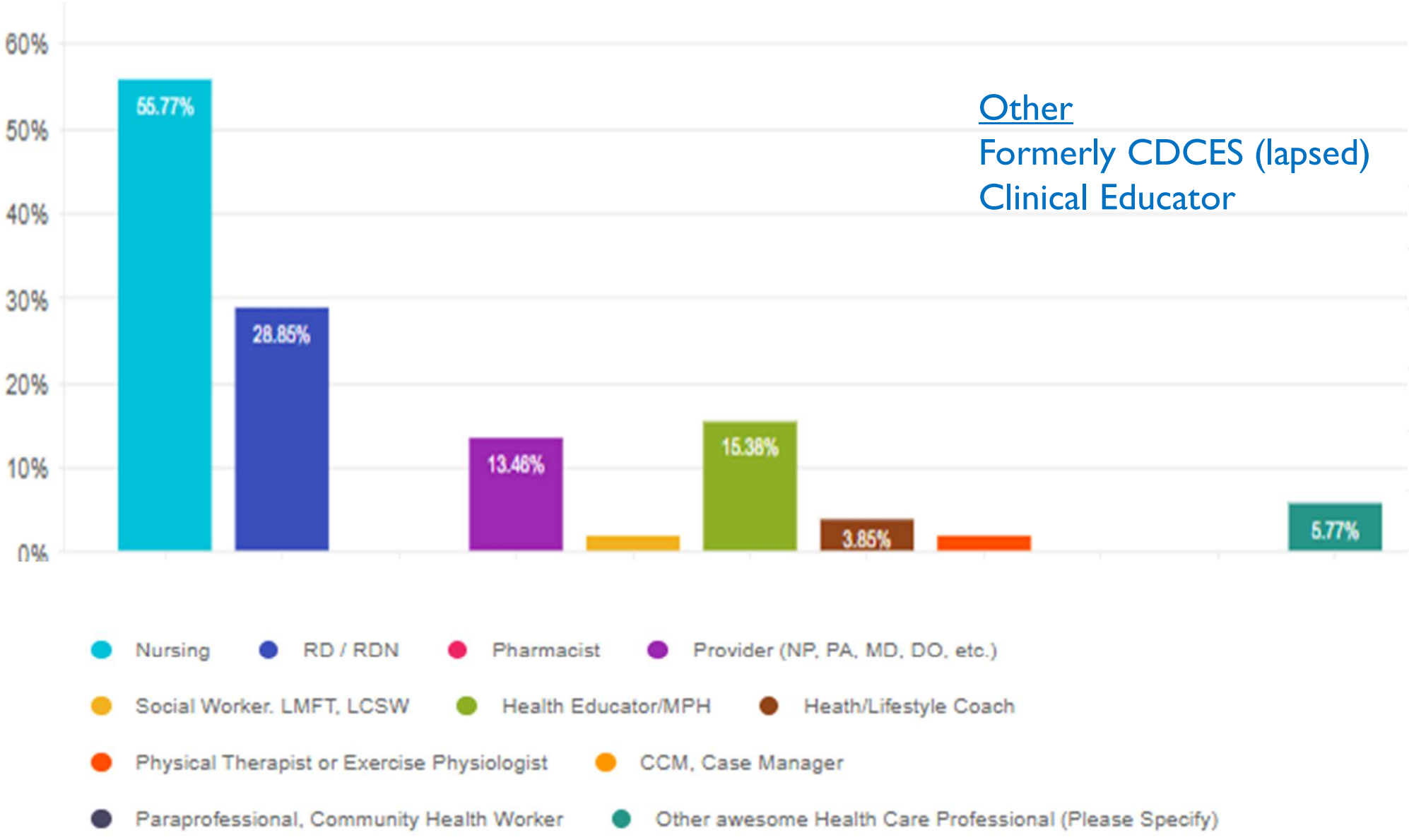
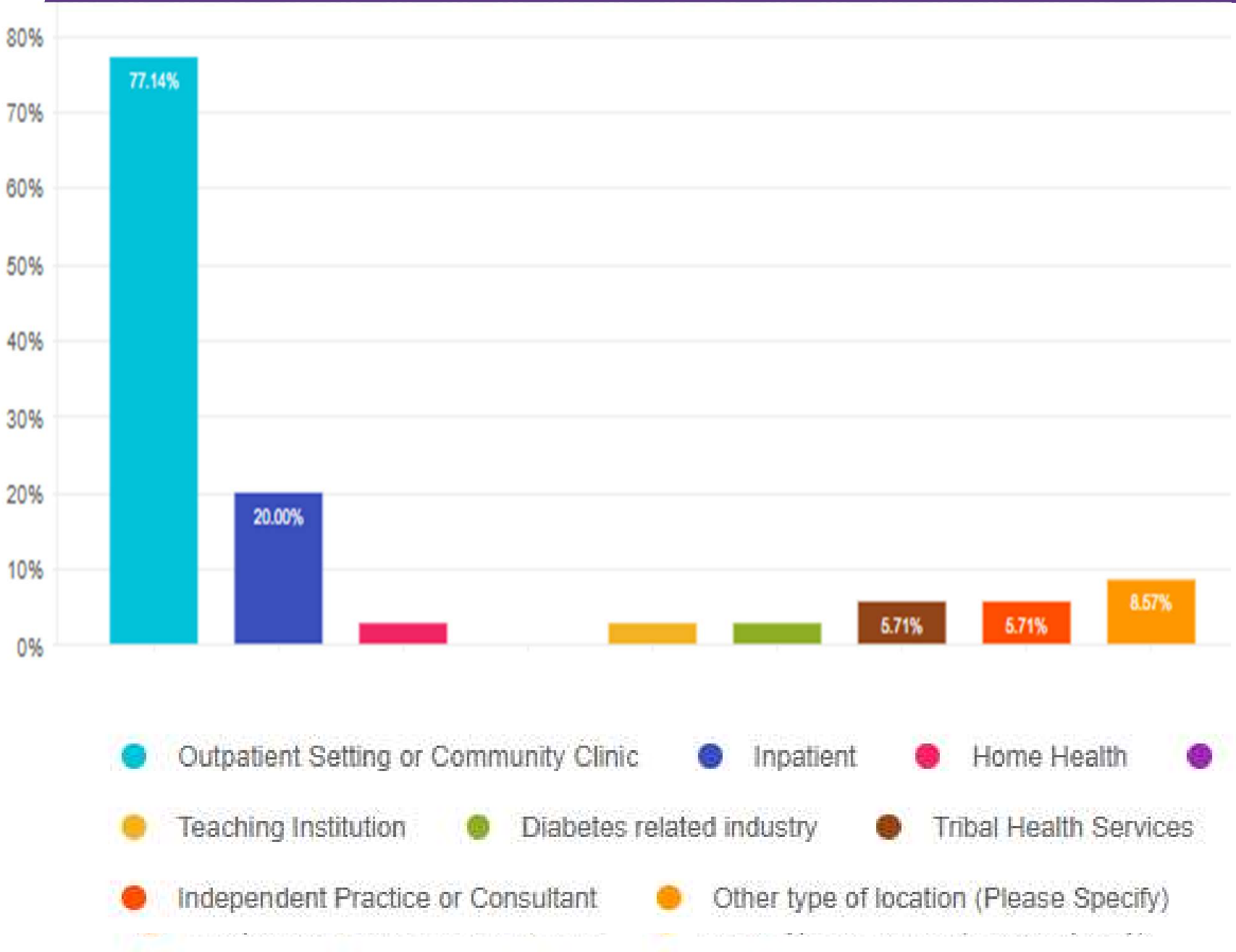
www.DiabetesEd.net

Who is attending this conference?



Other
Formerly CDCES (lapsed)
Clinical Educator

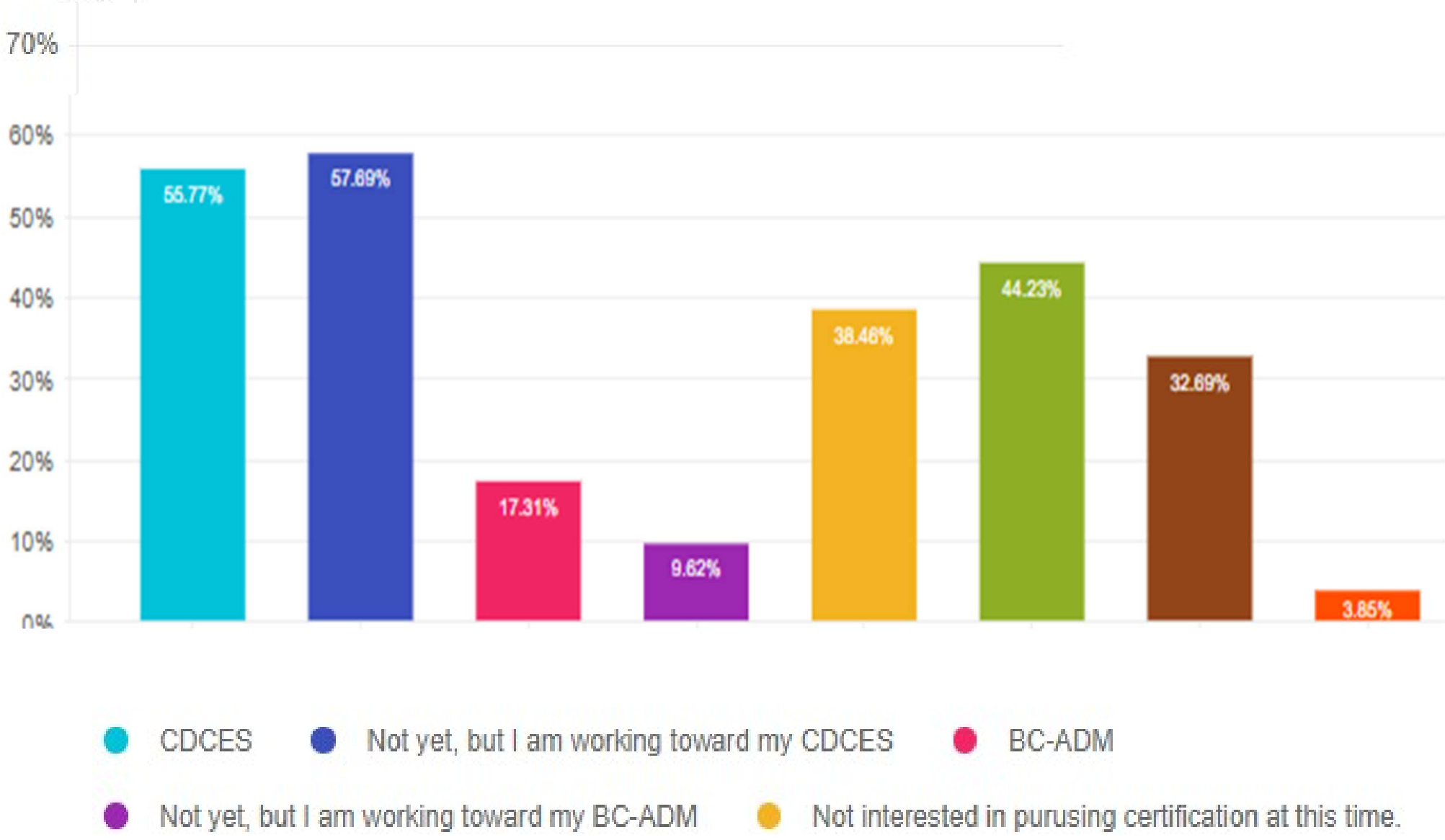
What is your job setting?



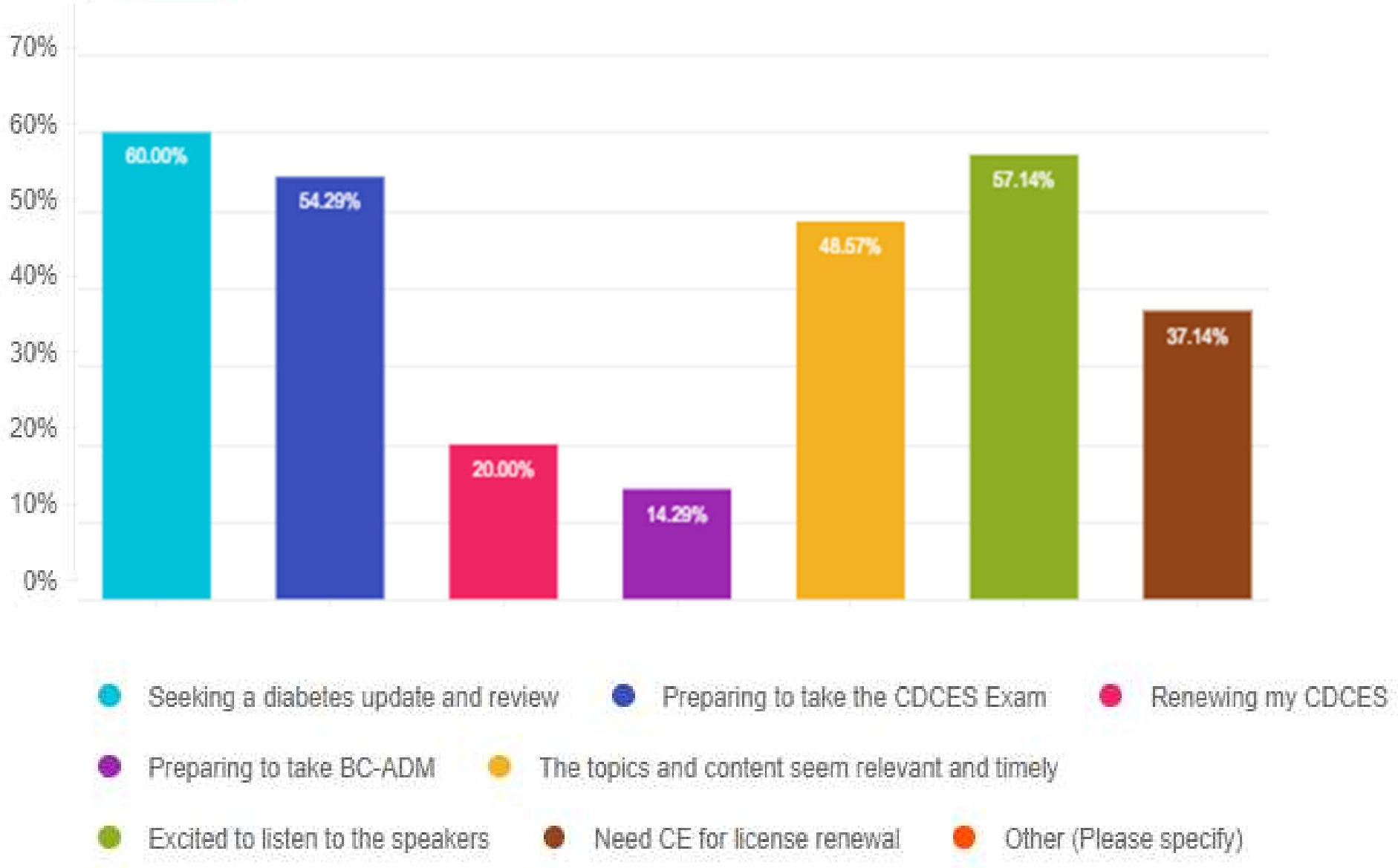
Other

- Community Nutrition
Public Health
- Industry
- Diabetes Clinic

Certifications?



What motivated you to attend?



FREE Bonus Courses on Online University

- We can't cover it all in this live course.
- So, we provide supplemental courses.
- Now includes "Learning Theories made Easy"

Thank you for Being a Part of This Awesome Community

Thank you to my Boys

Course Schedule – Day 1 April 15, 2026

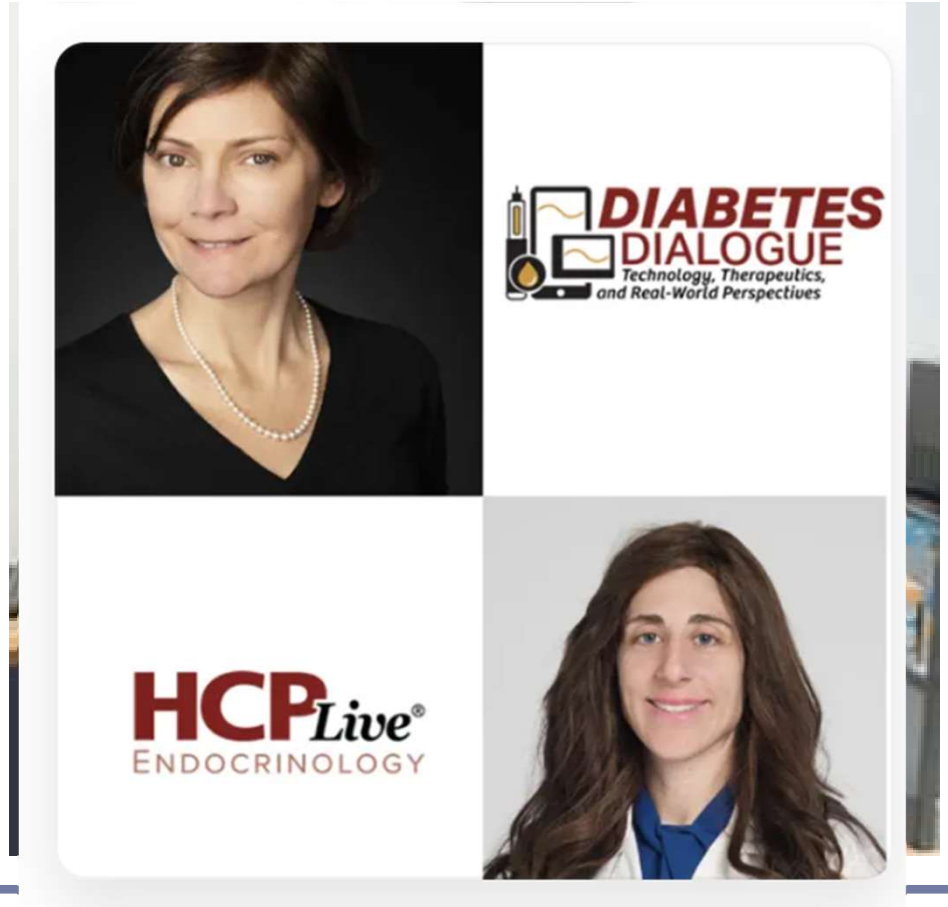
Time	Topic	Speakers
7:30 – 8:00am	Login / Welcome	
8:00 – 10:00	Current State of Diabetes ADA Standards of Care Person Centered Care for Type 1, Type 2, LADA, GDM	Beverly Dyck Thomassian, RN, BC-ADM, MPH, CDCES and Diana Isaacs, PharmD, BCPS, BCACP, CDCES, BC-ADM, FADCES, FCCP
10:00 – 10:15	Break	
10:15 – 12:00	Medical Evaluation, Risk Identification Diabetes Prevention Glycemic targets across the Lifespan	
12:00 – 1:00	Lunch Break	
1:00 – 2:30	Hypoglycemia prevention & treatment Landmark Studies Medications for Type 2	
2:30 – 2:45	Break	
2:45– 3:15	Pharmacology Algorithms – Application in clinical settings	
3:30 – 4:45	Cardiovascular Monitoring and Risk Management Wrap up and Evaluation	

Handouts & Resource Page

Coach Bev has no Conflict of Interest

- She’s not on any speaker's bureau
- Does not invest or have any financial relationships with diabetes related companies.
- Gathers information from reading package inserts, research and articles
- The ADA Standards of Medical Care is main resource for course content

Diana Isaacs, PharmD, BCPS, BCACP, BC-ADM, CDCES, FADCES, FCCP



- Provides diabetes care to diverse population including T1D, T2D, transplant, pregnancy and other high-risk individuals
- Engaged in clinical research and diabetes advocacy
- Usually sees about 10 clients a day – Constantly mentoring
- Author, Researcher, Podcaster, Thought Leader

Endocrine Clinical Pharmacy Specialist
Director, Education & Training in Diabetes Technology
Co-Director Center for Endocrine Disorders in Pregnancy
Cleveland Clinic Endocrinology and Metabolism Institute
ADCES Educator of the Year in 2020 ADA Diabetes Educator of Year 2026

DI1

Conflict of Interest

Partners for Advancing Clinical Education

Diabetes Education Services™

Faculty and Disclosure of Conflicts of Interest

Partners requires every individual in a position to control educational content to disclose all financial relationships with ineligible companies that have occurred within the past 24 months. Ineligible companies are organizations whose primary business is producing, marketing, selling, re-selling, or distributing healthcare products used by or on patients.

All relevant financial relationships for anyone with the ability to control the content of this educational activity are listed below and have been mitigated according to Partners policies. Others involved in the planning of this activity have no relevant financial relationships.

Faculty	Financial Relationships
Beverly Thomassian	Has no relevant financial relationships.
Diana Isaacs	Consultant, Advisor, Speaker: Abbott, Dexcom, MiniMed, Novo Nordisk, Insulet, Lilly, Cequr, Sanofi, Beta Bionics, and Sequel

Slide 16

DI1 Updated my disclosures.
Diana Isaacs, 2026-04-07T00:20:31.176

Diabetes Overview and Glycemic Goals

Objectives:

1. Discuss current Diabetes ADA Standards
2. Describe person-centered care for Type 1, Type 2, LADA, GDM
3. List steps for Medical Evaluation, Risk Identification and Prevention
4. State glycemic targets across the lifespan
5. Discuss hypoglycemia prevention & treatment
6. Describe significance of Landmark Diabetes Studies
7. List medications considerations for Type 2
8. Describe the pharmacology Algorithms
9. Discuss most recent cardiovascular risk mitigation strategies and goals.

17. Diabetes Advocacy

- People living with diabetes deserve to be free from the burden of discrimination.
- We need to all be a part of advocating to ensure a healthy and productive life for people living with diabetes.
- Make sure cost is not a barrier to diabetes self-management.

Diabetes Care needs to meet outlined standards in all settings.

- In school setting
- Young children in childcare
- For Drivers
- In work settings
- In Detention Facilities
- Insulin Access & Affordability

CDC Announces

35% of Americans will have Diabetes by 2050

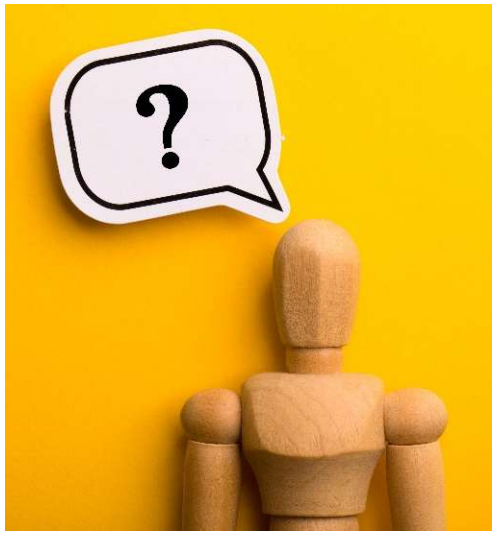
Boyle, Thompson, Barker, Williamson

2010, Oct 22:8(1)29

www.pophealthmetrics.com

Poll Question 1

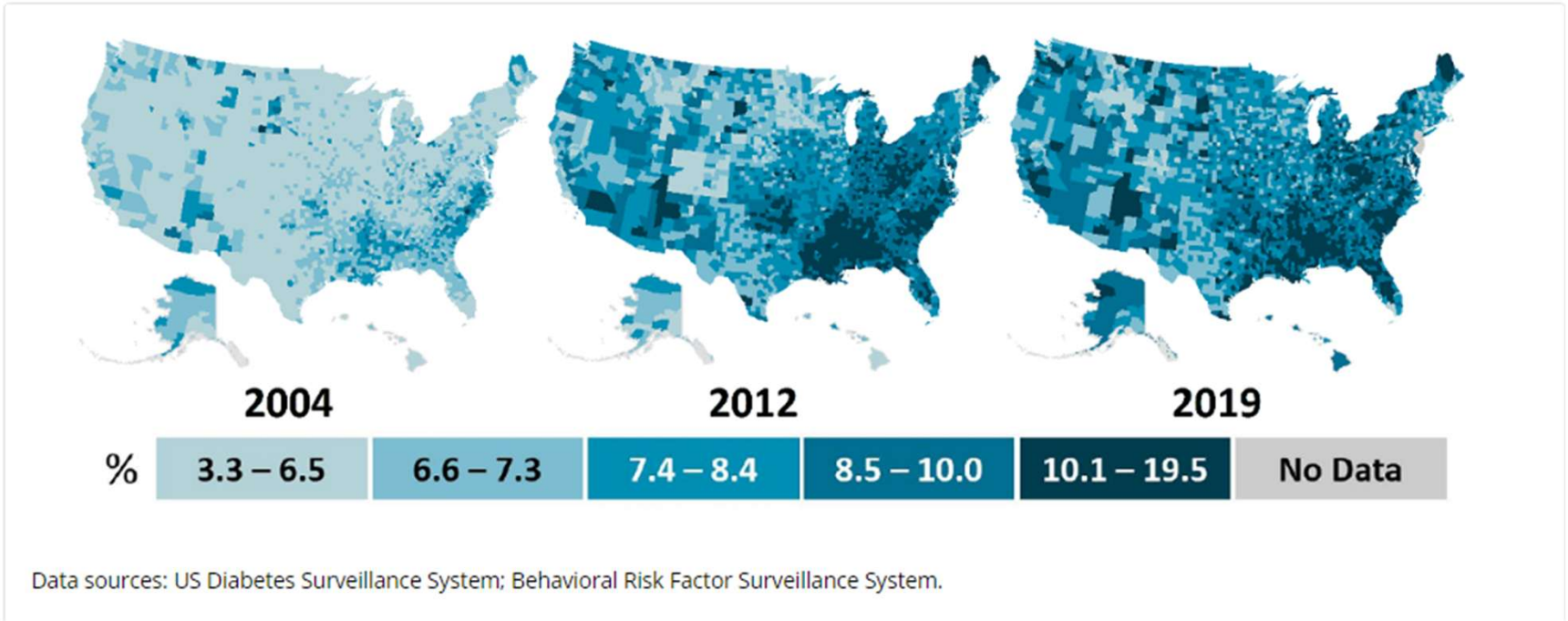
- What percent of total people in the U.S. are living with undiagnosed and diagnosed type 2 diabetes?
- A. About 30%
- B. 11.3%
- C. 14.7%
- D. 25.6%



Type 2 Diabetes in America 2026

- 14.7% with Diabetes - 38 million adults
  - 25% don't know they have it
- 38% with Prediabetes – 100+ million adults

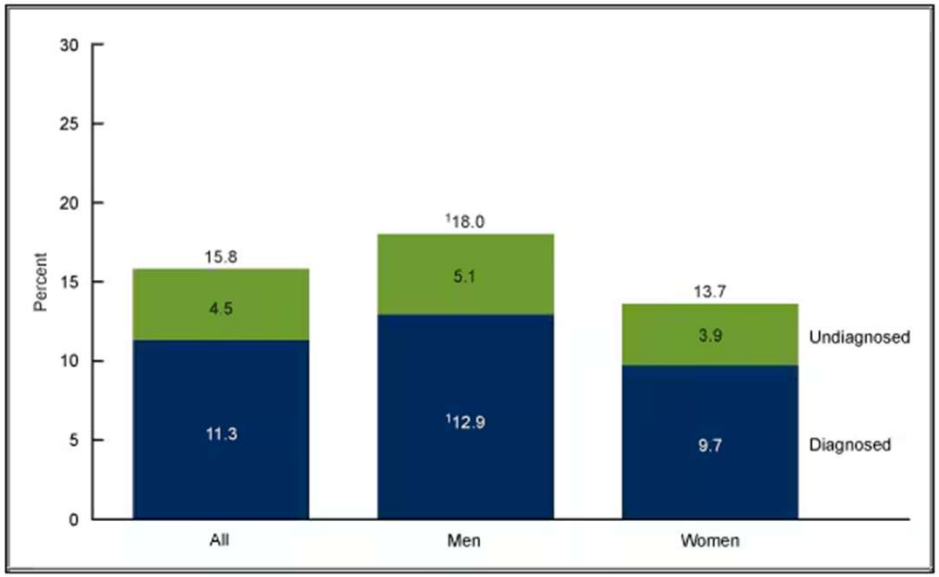
Figure 3. Age-adjusted, county-level prevalence of diagnosed diabetes among adults aged 20 years or older, United States, 2004, 2012, and 2019



Data sources: US Diabetes Surveillance System; Behavioral Risk Factor Surveillance System.

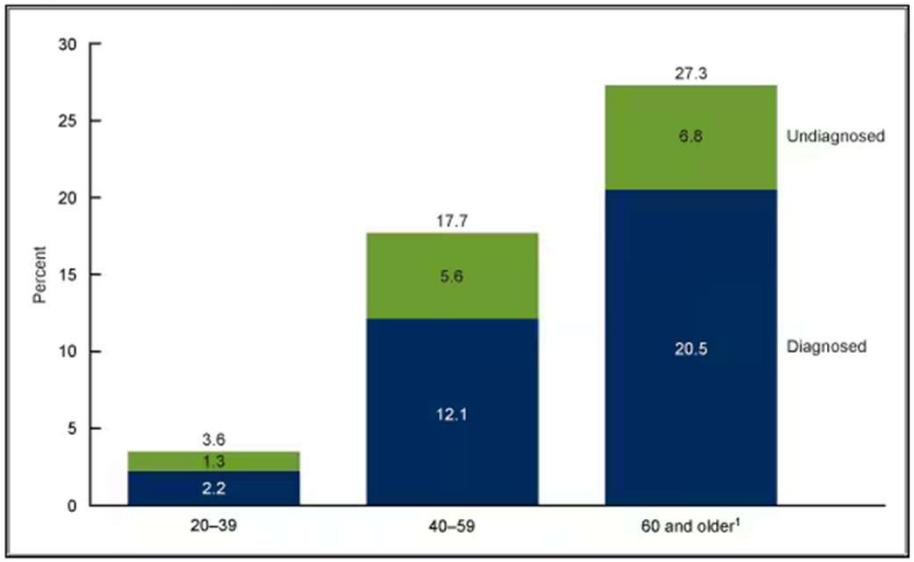
https://gis.cdc.gov/grasp/diabetes/diabetesatlas-statsreport.html

Figure 1. Prevalence of total, diagnosed, and undiagnosed diabetes in adults age 20 and older, by sex: United States, August 2021–August 2023



[1]Significantly different from women ($p < 0.05$).

Figure 2. Prevalence of total, diagnosed, and undiagnosed diabetes in adults age 20 and older, by age group: United States, August 2021–August 2023



https://www.cdc.gov/nchs/products/databriefs/db516.htm

Figure 3. Prevalence of total, diagnosed, and undiagnosed diabetes in adults age 20 and older, by weight status: United States, August 2021–August 2023

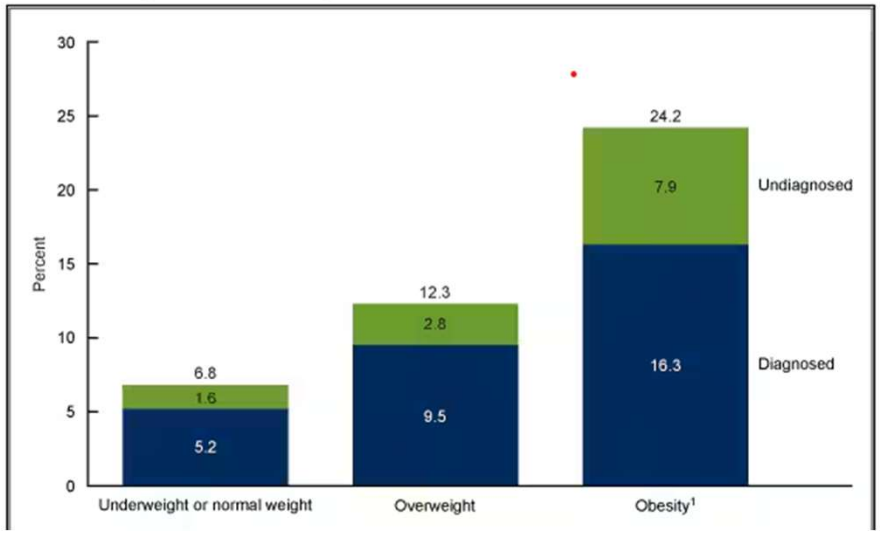
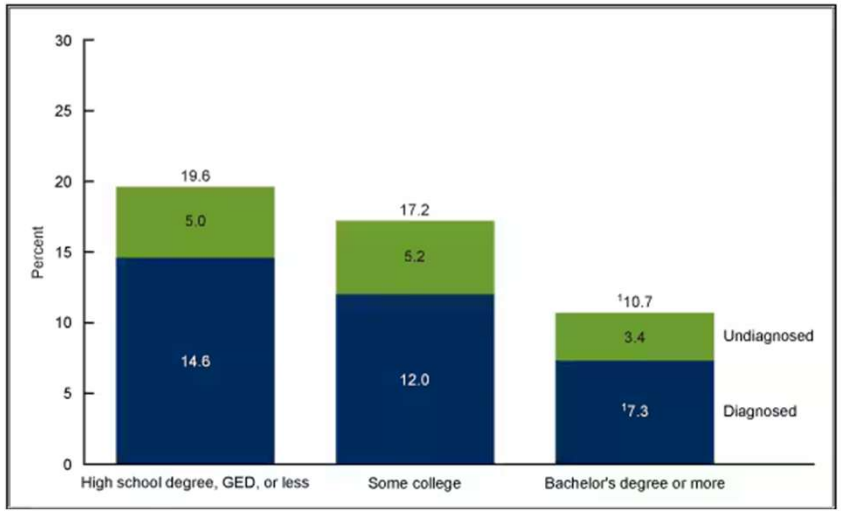


Figure 4. Prevalence of total, diagnosed, and undiagnosed diabetes in adults age 20 and older, by educational attainment: United States, August 2021–August 2023



1. Improving Care - Population Health

- "Health outcomes of a group of individuals
  - including the distribution of health outcomes within the group"
- These outcomes can be measured in terms of health outcome:
  - mortality, morbidity, health, and functional status
  - disease burden
    - (incidence and prevalence)
  - behavioral and metabolic factors
    - (exercise, diet, A1C, etc.)

ADA Standards 2026

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Diabetes Prevalence Stats

- **For adults in U.S., diabetes prevalence:**
  - American Indians and Alaska Natives – highest rates
  - Non-Hispanic Blacks (17.4%),
  - People of Hispanic origin (15.5%),
  - Non-Hispanic Asians (16.7%)
  - White Individuals (13.6%)

- **Education and SES and Location**
  - Less than high school ed (13.1%)
  - More than high school (6.9%)
  - Living below federal poverty (13.1%)
  - Living at 500% of federal poverty (5.1%)
  - Rural living (9.5%)
  - Metropolitan (8.1%)

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Social Determinants of Health (SDOH)

- Factors often beyond an individual's direct control and potentially representing lifelong risks—play a significant role in both clinical and psychosocial outcomes.

To improve health, support overall well-being, and eliminate disparities, it is crucial to address these determinants, particularly for individuals from racial and ethnic minoritized communities, underserved geographic areas (rural or urban), and those facing socioeconomic barriers to care and health

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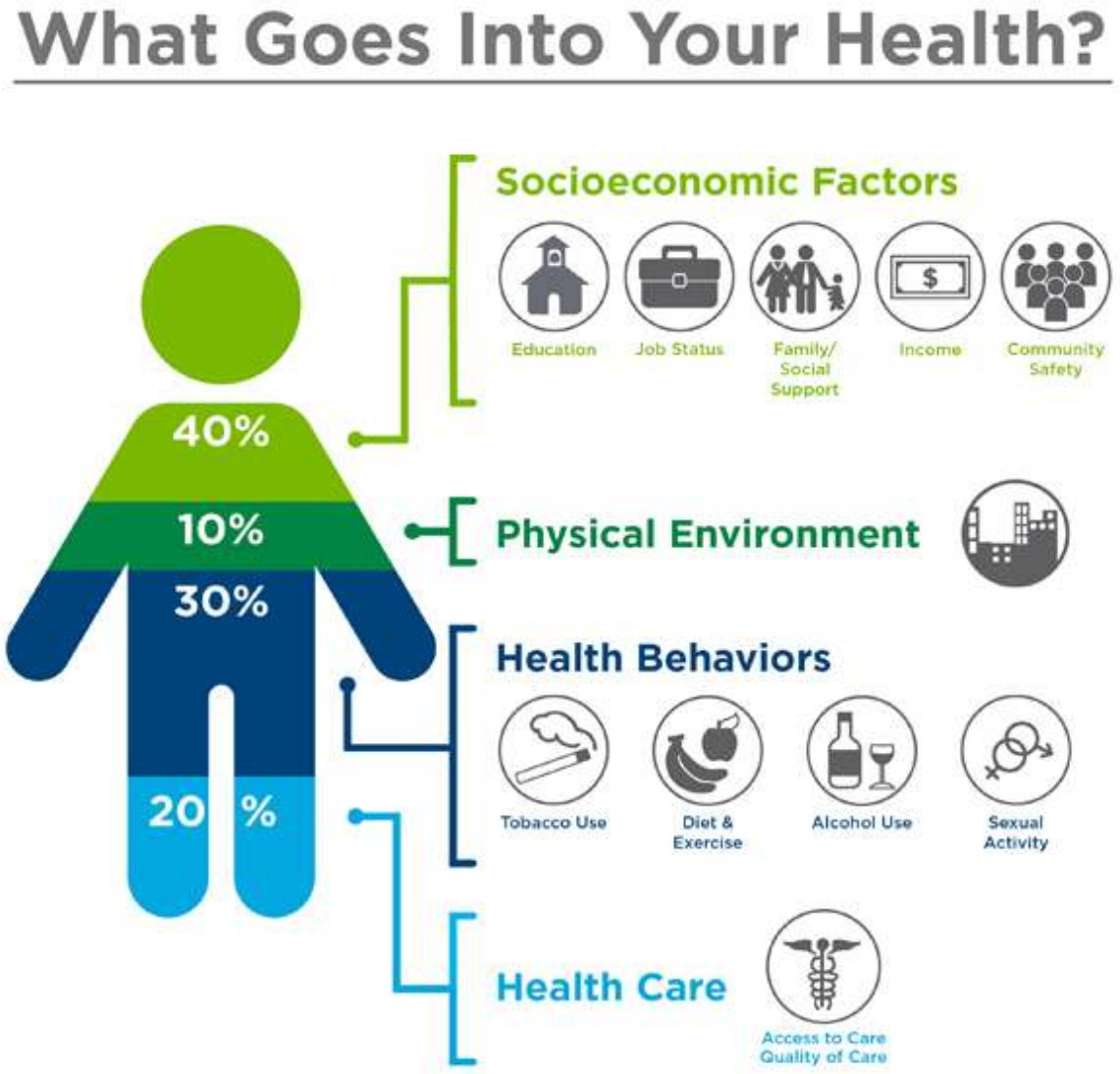
Address Barriers to Self Management

- **Barriers exist** within health system, payer, health care professional & individual.
- **Address barriers** through innovation, including community health workers, telehealth, other digital health solutions.
- **Consider social drivers of health** in the target population when designing care.



Source: Institute for Clinical Systems Improvement, Going Beyond Clinical Walls: Solving Complex Problems (October 2014)

https://coveragetoolkit.org/health-equity/defining-health-equity/

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Improving Care and Promoting Health in Populations

- For optimal outcomes individualize individual's context and care needs across life span.
- Improve population health through a combination of policy-level, system-level, and person-level approaches.

- Person-centered care:
  - care that considers an individual's comorbidities and prognoses
  - respectful of and responsive to individual preferences, needs, and values;
  - ensures that the individual's values guide all clinical decisions

Status of Diabetes Care

- In 2015–2018, U.S. community-dwelling adults with diabetes achieved:
  - A1C <7% by 50.5%
    - 75.4% achieved A1C <8%.
  - BP target of <130/80 achieved by 47.7%
    - 70.4% achieved blood pressure <140/90 mmHg.
  - Lipid control (non-HDL cholesterol) <130 mg/dL, achieved by 55.7%
- 22.2% met targets for all three risk factors
- Many not receiving adequate lifestyle or pharmacotherapy.

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Rising Complication Rates

- Since 2010, adults with diabetes across the U.S. complication rates are increasing for:
  - kidney failure,
  - nontraumatic lower-extremity amputations,
  - stroke,
  - heart failure, and
  - hyperglycemic crises

Rates of myocardial infarction have plateaued, reversing decades of earlier improvements

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Slide 29

BT1 new

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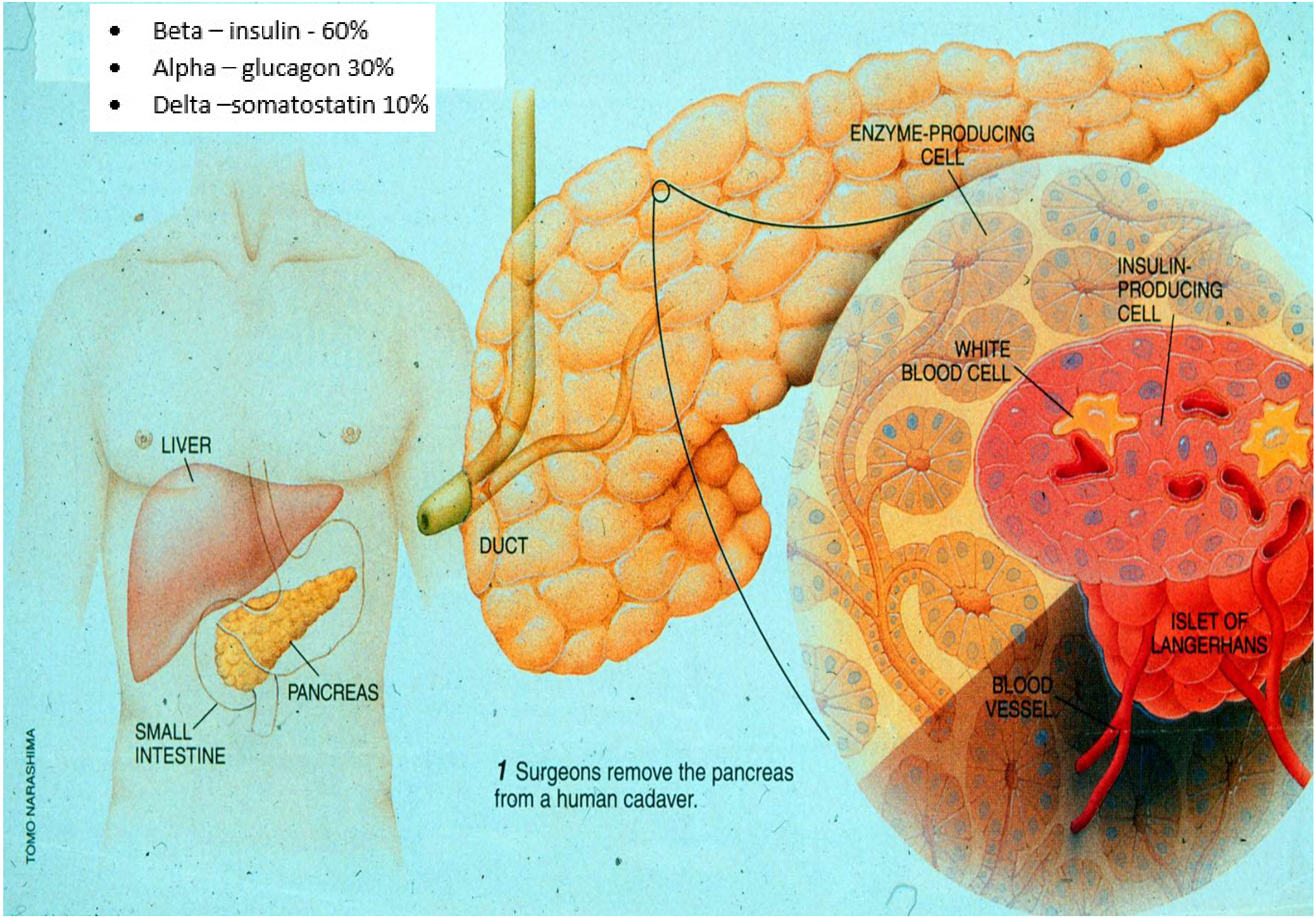
- Beta – insulin - 60%
- Alpha – glucagon 30%
- Delta –somatostatin 10%



1 Surgeons remove the pancreas from a human cadaver.

BT1

Hormones Effect on Glucose

Hormone	Effect
Glucagon (pancreas)	↑
Stress hormones (kidney)	↑
Epinephrine (kidney)	↑
Insulin (pancreas)	↓
Amylin (pancreas)	↓
Gut hormones	↓

- Incretins (GLP-1) released by L cells of small intestine and colon
- GIP found in K cells in duodenum and some in small intestine
- Beta cells have receptors

Slide 31

BT1 Added gut hormone info
Beverly Thomassian, 2025-08-25T01:23:14.042

BT1 0 updated
Beverly Thomassian, 2026-04-07T18:44:43.634

BT1

Pre Diabetes & Type 2- Screening Guidelines (ADA 2026 Clinical Practice Guidelines)

1. Start screening all people at age 35.
2. Screen at any age if BMI ≥ 25 (Asians BMI ≥ 23) plus one or > additional **risk factor**:

- First-degree relative w/ diabetes
- Member of a high-risk ethnic population
- Habitual physical inactivity
- History of heart disease
- Check more frequently if taking high risk meds; antiretrovirals, 2nd generation antipsychotics or steroids, thiazide diuretics, statins
- History of pancreatitis, prediabetes, GDM, periodontal disease

Slide 32

BT1 updated

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BT1

Diabetes Screening Guidelines

(ADA 2026 Clinical Practice Guidelines – Cheat Sheet)

Recommendations for Diagnosis and Classification of Diabetes – 2026

Criteria for Screening for Diabetes and PreDiabetes in Asymptomatic Adults – Table 1

DIABETES TYPE	RISK FACTORS and FREQUENCY OF SCREENING and TESTING FOR DIABETES
Type 1	Screen those at risk for presymptomatic type 1 diabetes, by testing autoantibodies to insulin, GAD, islet antigen 2 or ZnT8. Also test antibodies for those with type 1 phenotypic risk (younger age, weight loss, ketoacidosis , etc.)
Type 2	1. Test all adults starting at age **35** for prediabetes and diabetes using Fasting Plasma Glucose, A1C or OGTT. 2. Perform risk-based screening if BMI ≥ 25 or BMI ≥ 23 in Asian Americans 10yrs+ with 1 or more risk factors: • History of cardiovascular disease • First degree relative with diabetes • High risk ethnicity or ancestry • Other conditions associated with insulin resistance (PCOS, Acanthosis Nigricans, Steatosis, Obesity) • Physical inactivity • HDL ≤ 35 mg/dl or triglyceride ≥ 250 mg/dl • Hypertension ≥ $^{130}/_{80}$ or on therapy for HTN 3. If results normal, repeat test at a minimum of 3-year intervals or more frequently based on risk status. 4. **Test Yearly** if A1C ≥ 5.7% or Impaired Fasting Glucose or History of GDM (test at least every 1- 3 years) 5. **Closely monitor high-risk groups**- people with HIV, exposure to high-risk medicines, evidence of periodontal disease, history of pancreatitis.

Slide 33

BT1 updated

Beverly Thomassian, 2026-03-31T01:32:02.096

Poll Question 2

- Which of the following level is considered pre-diabetes range?

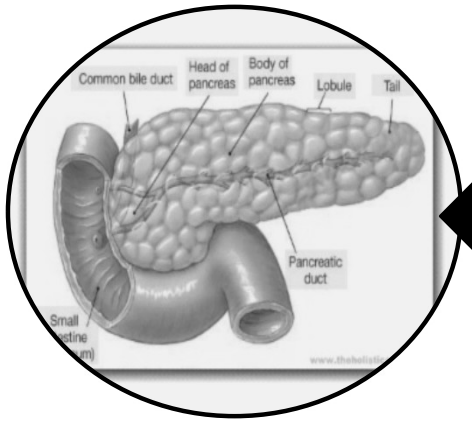
a. Fasting BG of 62

b. A1c of 5.9 %

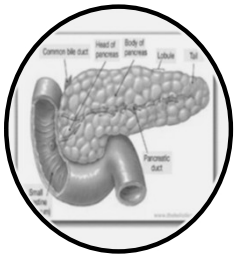
c. After meal BG of 137

d. A1c of 7.1 %

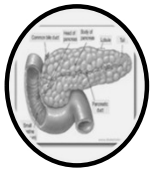
Natural History of Diabetes



Yes!



NO



Healthy

FBG <100

Random <140

A1c <5.7%

Prediabetes

FBG 100-125

Random 140 - 199

A1c ~ 5.7- 6.4%

50% working pancreas

Diabetes

FBG 126 +

Random 200 +

A1c 6.5% or +

20% working pancreas

Development of type 2 diabetes happens over years or decades

> Diabetes. 2009 Apr;58(4):773-95. doi: 10.2337/db09-9028.

Banting Lecture. From the triumvirate to the ominous octet: a new paradigm for the treatment of type 2 diabetes mellitus

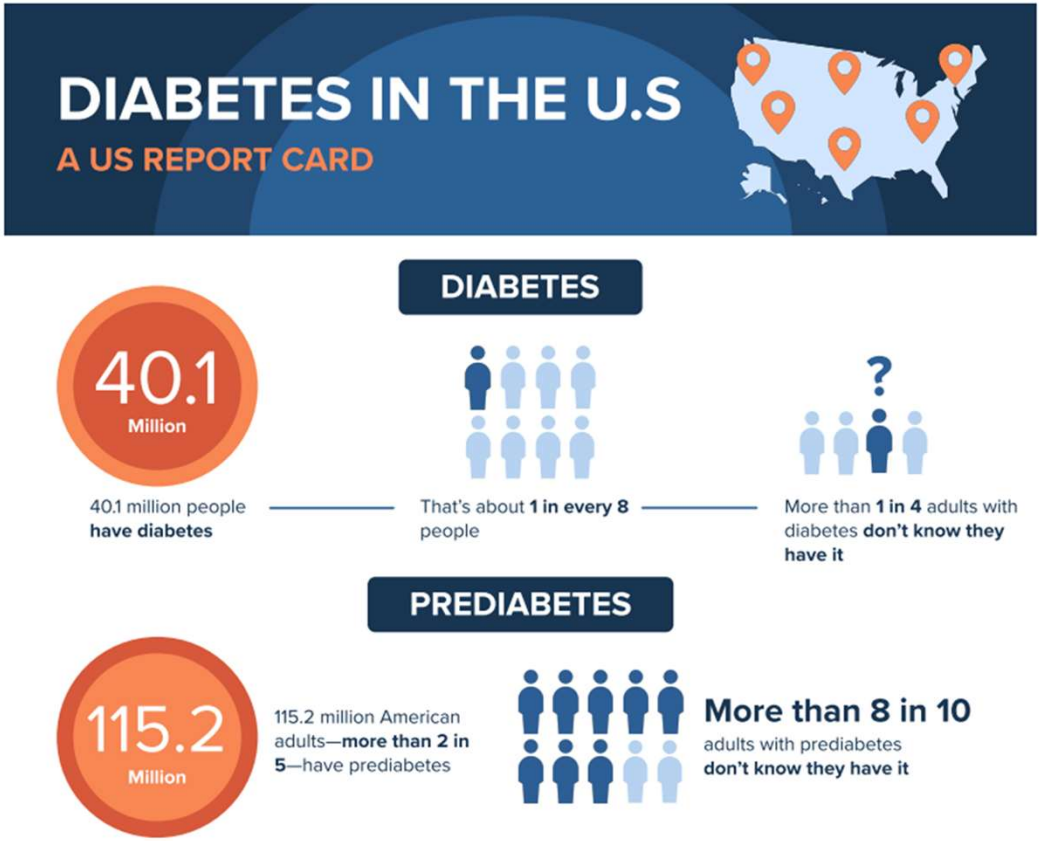
Ralph A Defronzo [1]

Poll Question 3

- What best describes prediabetes?
  a. Prediabetes affects 18-20% of people above the age of 20.
  b. The prevalence of prediabetes and diabetes are almost equal.
  c. Most people with BMI of 30 or greater have prediabetes.
  d. Prediabetes is associated with increased risk of CV disease

BT1

PreDiabetes is FREAKING ME OUT



Do I look like I am freaking out?

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- Associated with higher rates of heart attack, stroke, neuropathy and vessel disease

Slide 37

BT1 updated

Beverly Thomassian, 2026-04-07T18:45:00.896

3. Prevent or Delay Diabetes for those with Prediabetes

- Prediabetes defined as:
  - A1c 5.7 – 6.4% or fasting BG 100 -125mg/dl
- Action:
  - Screen yearly for diabetes
  - For adults with BMI 23/25
    - Refer to DPP approved programs
    - Includes intensive behavioral lifestyle interventions with 5-7% wt reduction goal + 150 min exercise week
    - Provide in person or certified assisted programs

3. Prevention or Delay of Diabetes and Associated Comorbidities: Standards of Care in Diabetes—2026

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3. Detecting PreDiabetes Matters

- Given the effectiveness of the Diabetes Prevention Program (DPP)
  - Refer adults with BMI 25+ at risk of diabetes to DPP
    - Achieve/maintain wt reduction of 5-7% through evidence-based eating patterns (Mediterranean, low carb, DASH.)
    - Participate in 150+ minutes activity a week
  - Should be covered by third-party payers,
  - Address inconsistencies in access – leverage technology
- Monitor people with prediabetes at least annually for development of type 2 diabetes.

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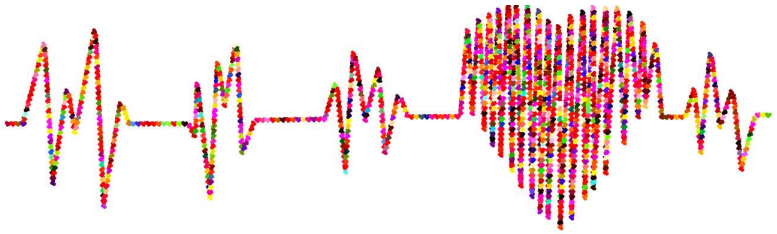
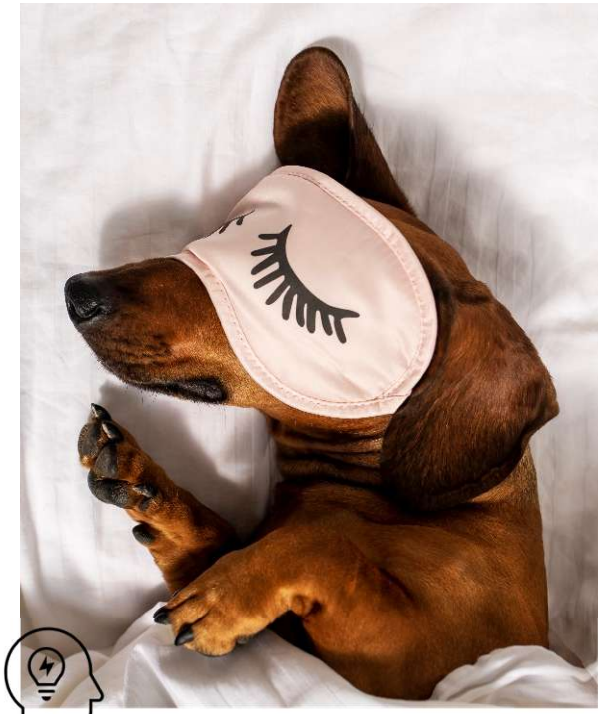


BT1

Sleep quality and Diabetes Risk

- Sleep quality “an individual’s self-satisfaction with all aspects of sleep experience.”
- Sleep modulates important metabolic, endocrine, cardiovascular processes.
- Poor sleep quality associated with 40% increased risk of developing type 2 diabetes
- Night owls have 2.5 higher odds for type 2 than early birds (chronotype)



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BT1 0 new

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BT1

3. Metformin & Prediabetes

- Use metformin for prevention of type 2 for those at high risk:
  - 25–59 yrs with BMI ≥35
  - A1C 6.0% or more
  - History of GDM
- Periodic assess of B12, esp if have anemia, peripheral neuropathy.
- Consider Metformin to prevent hyperglycemia in high-risk individuals:
- Ind's treated with Chemo medications:
  - Phosphatidylinositol 3-kinase α (PI3Kα) inhibitor (e.g., alpelisib and inavolisib).
  - High dose steroids

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BT1

GLP-1 Therapy for Prediabetes?

- The use glucagon-like peptide 1–based therapies for weight management in individuals with BMI of 25+ is highly beneficial and should be considered.
- Every kilogram of weight loss confers a 16% reduction in risk of progression over 3.2 years

3. Prevention or Delay of Diabetes and Associated Comorbidities: Standards of Care in Diabetes—2026 FREE

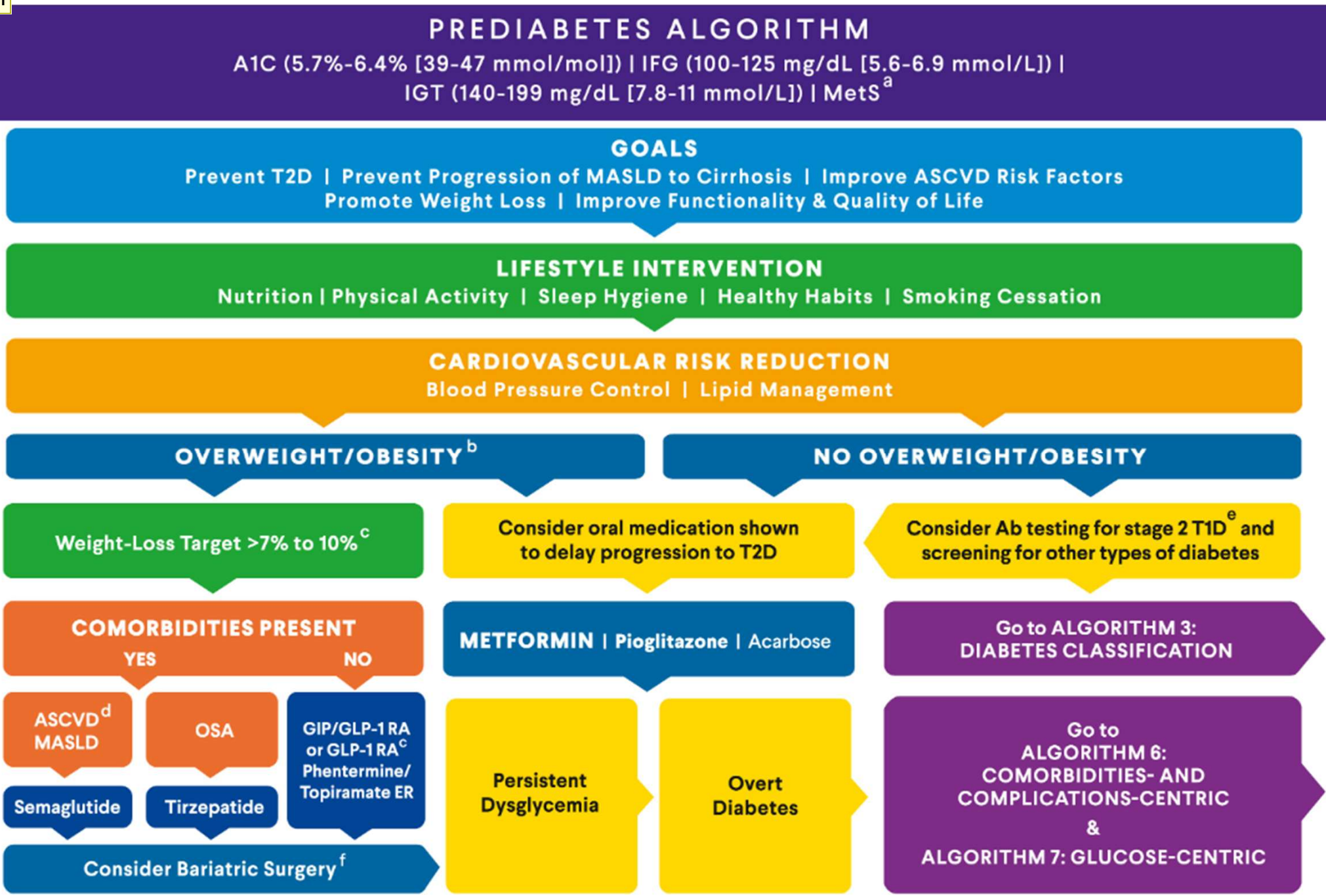
American Diabetes Association Professional Practice Committee for Diabetes*

Slide 42

BT1 new

Beverly Thomassian, 2026-03-31T01:32:50.930

BT1



American Association of Clinical Endocrinology Consensus Statement: Algorithm for Management of Adults With Type 2 Diabetes – 2026 Update

Slide 43

BT1 new

Beverly Thomassian, 2026-04-07T18:45:18.636

Diabetes is Complex

- Goal – achieve well being and negotiated outcomes
- Psychological factors:
  - Environmental
  - Social
  - Behavioral
  - Emotional
- Keep it person centered while integrating care into daily life
  - Consider the individual

Remember by Joy Harjo – Poet Laureate

- Remember the earth whose skin you are:
  red earth, black earth, yellow earth, white earth, brown earth, we are earth.

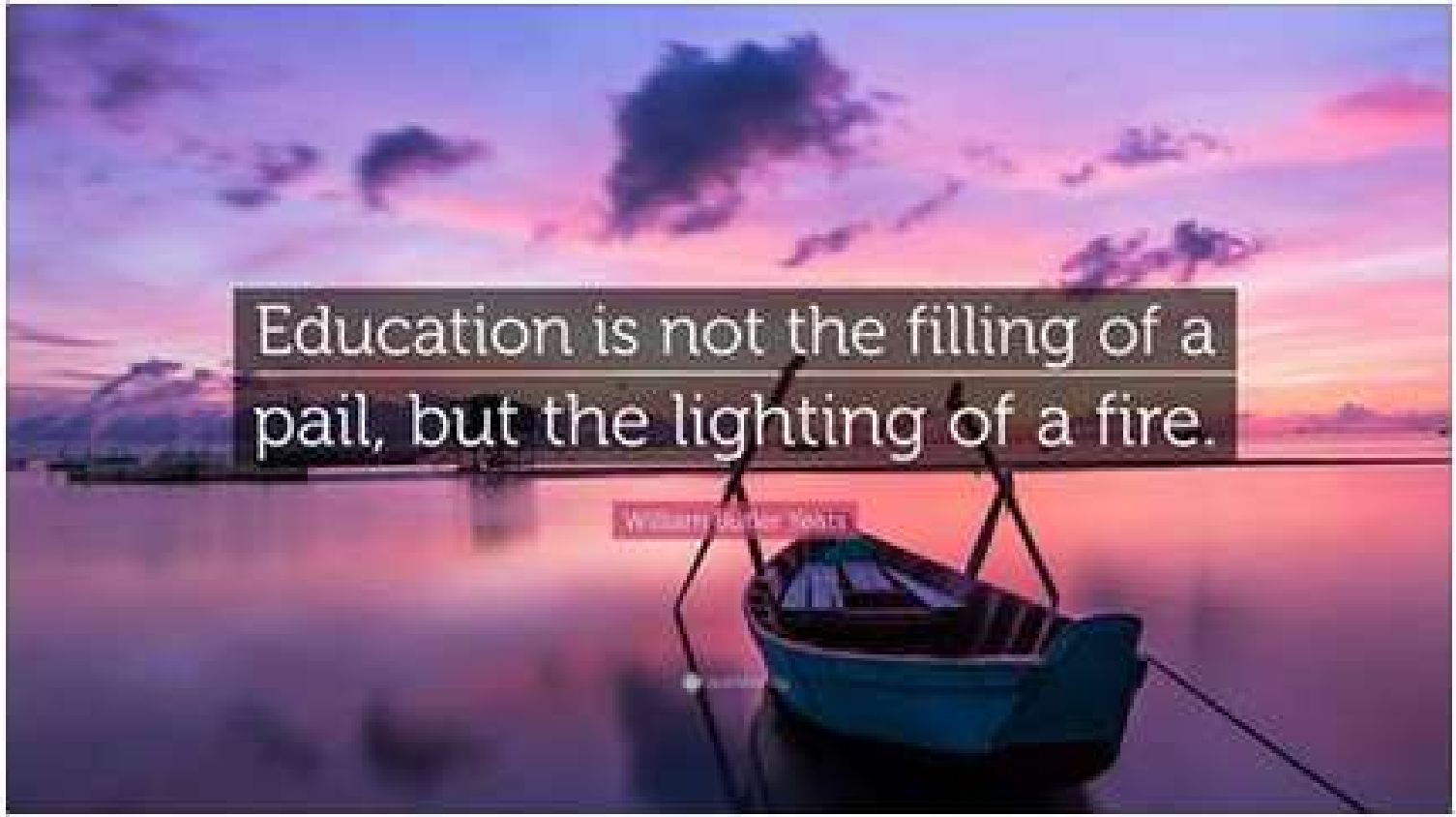
- Remember the plants, trees, animal life who all have their tribes, their families, their histories, too. Talk to them, listen to them. They are alive poems.

- Remember the wind. Remember her voice. She knows the origin of this universe.

- Remember you are all people and all people are you.
  Remember you are this universe and this universe is you.
  Remember all is in motion, is growing, is you.
  Remember language comes from this.
  Remember the dance language is, that life is.
  Remember.

We are all connected

Let’s meet people where they are at.



Type 1 ~ Immune Mediated
5-10% of Diabetes

ADCES In Practice - March 2024

Recent Advances in Type 1 Diabetes: Teplizumab (Tzeild®)

Karen S. Fiano, PHARMD, BCACP, Devada Singh-Franco, PHARMD, CDCES, Young M. Kwon, BS, PHD

1.5 Million people have type 1 in U.S.

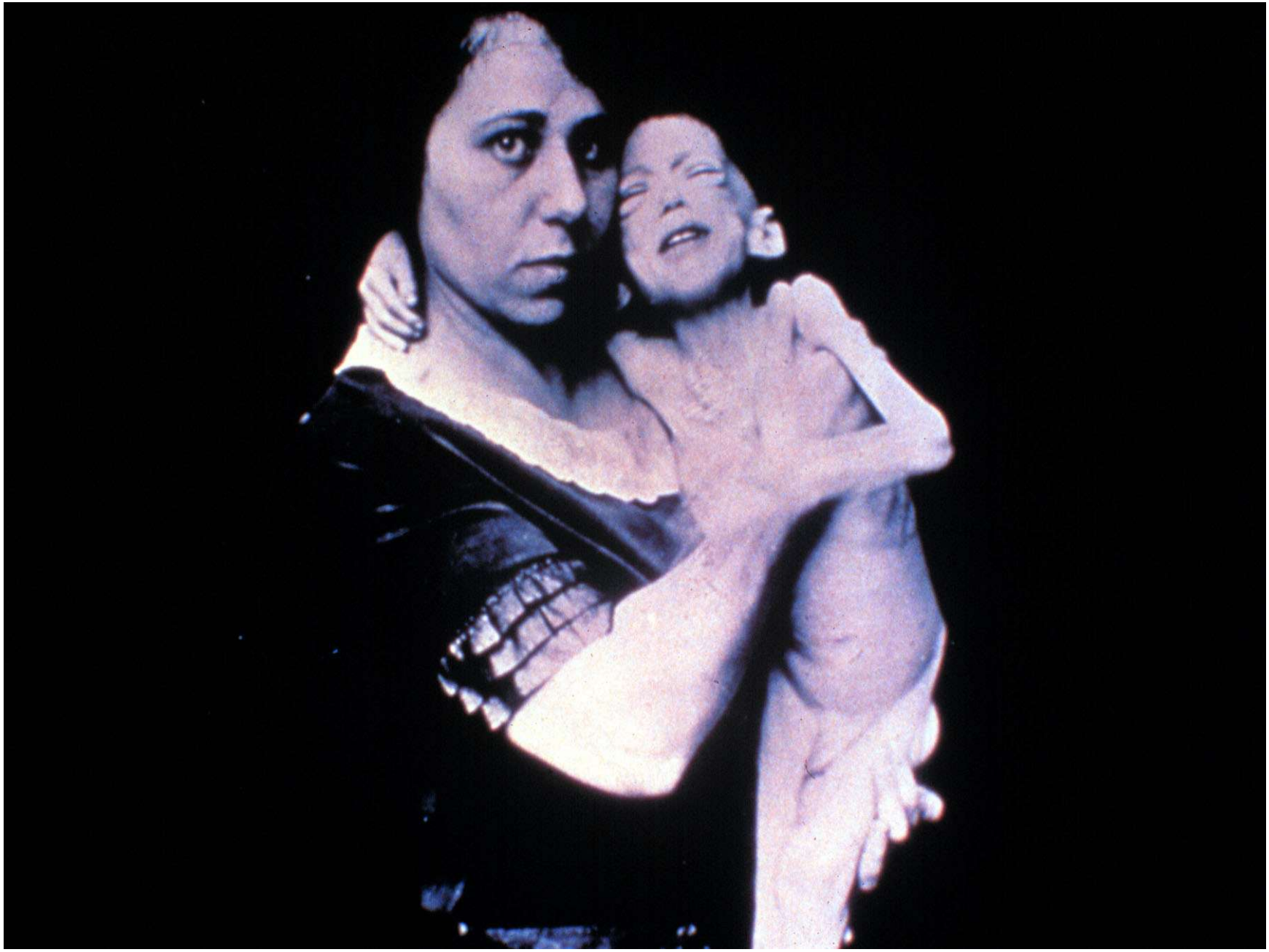
Prevalence increasing:

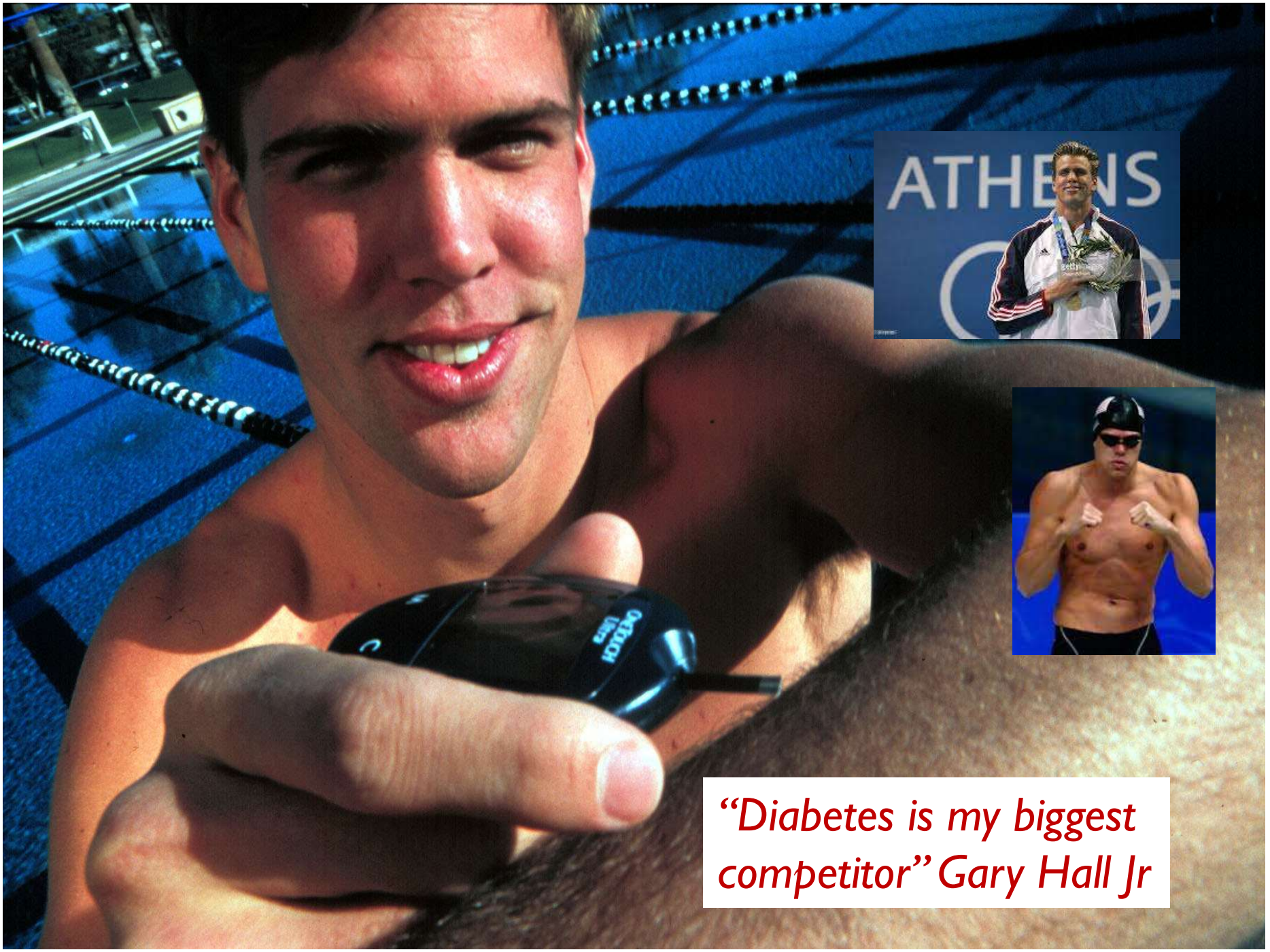
2001 – 1.48 per 1000 youths diagnosed with diabetes

2017 - 2.15 per 1000 youths diagnosed with diabetes

Incidence & Prevalence increasing

Highest incidence in Finland or Northern Europe.



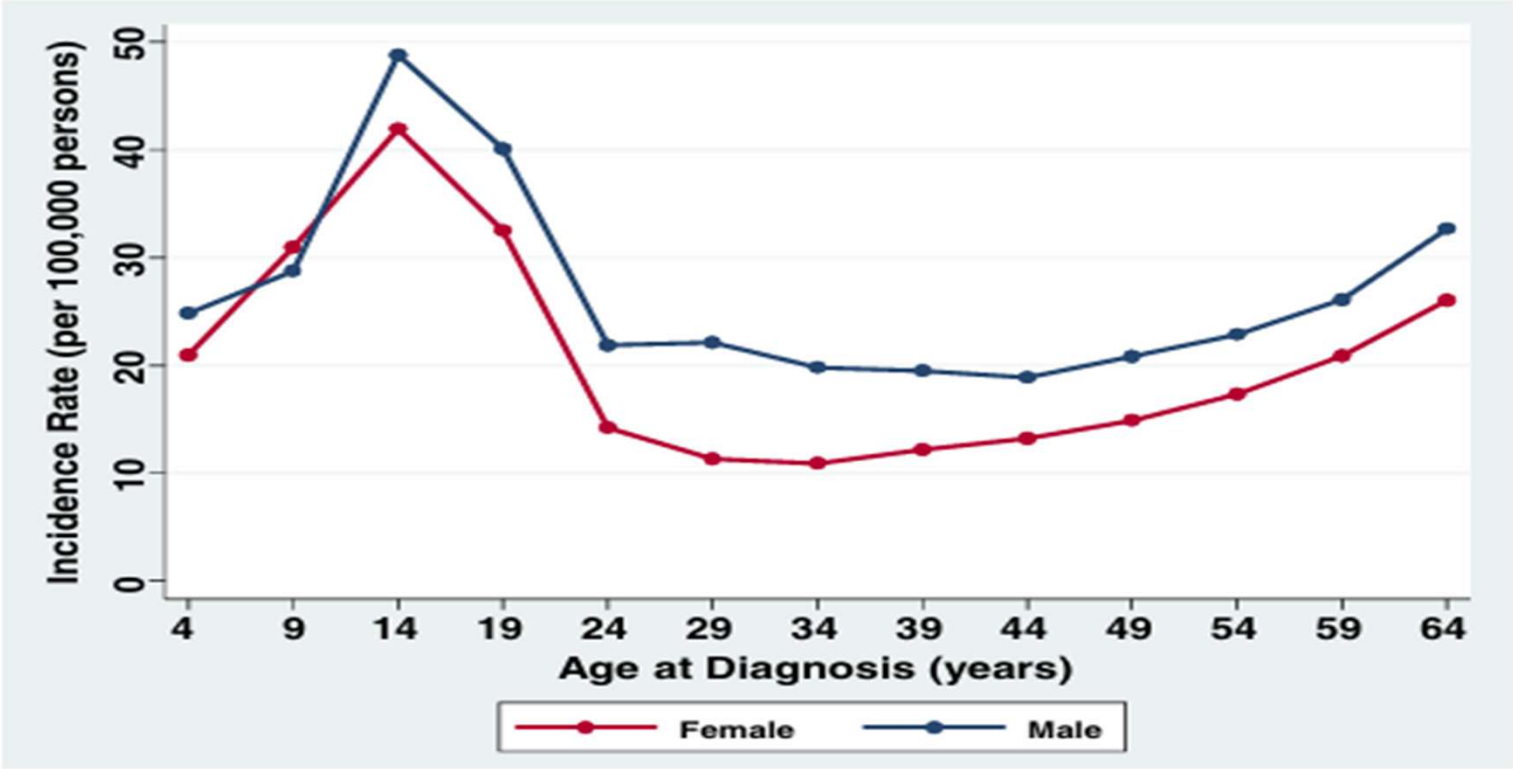


"Diabetes is my biggest competitor" Gary Hall Jr

Type 1 is 5- 10% of all Diabetes

- Auto-immune pancreatic beta cells destruction
- Most commonly expressed at age 10 – 14
- Insulin sensitive (require 0.5 - 1.0 units/kg/day)
- Expression due to a combo of genes and environment:
  - Autoimmunity tends to run in families
  - Exposure to virus or other environmental factors

Clinical onset of T1D can occur at any age



* A longitudinal study comprising 32,476 commercially insured Americans aged 0-64 years who developed T1D between 2001 and 2015.

Rogers MAM, et al. BMC Med. 2017;15(1):199.

T1D is Often Misdiagnosed as T2D in Adults

TYPE 1 Diabetes

~40% of adults with T1D are initially **misdiagnosed**

75% of those are misdiagnosed as T2D[1]*†

TYPE 2 Diabetes

Poor disease management from **misdiagnosis** can have **severe outcomes**[2,3]

- **Inadequate glucose control**[2]
- **Diabetic ketoacidosis (DKA)**[2]
- **Poor quality of life**[3]

*Three quarters of T1D is misdiagnosed as T2D. †Based on a US retrospective online survey of 2526 adults (aged >18 years) with T1D or caregiver of child with T1D.

T1D=type 1 diabetes; T2D=type 2 diabetes.

1. Munoz C, et al. *Clin Diabetes.* 2019;37(3):276–281. **2.** Manov AE, et al. *Cureus*. 2023;15(7):e42459. **3.** The Lancet Regional Health-Europe. *Lancet Reg Health Eur*. 2023;29:100661.

Screen people at increased risk of T1D

Screening for T1D autoantibodies is recommended by

American Diabetes Association.

ISPAD
International Society for Pediatric and Adolescent Diabetes

Breakthrough T1D™
Formerly JDRF

First-degree relatives of individuals with T1D

~15x greater risk

of T1D versus the general population

Individuals with personal or family history of select autoimmune diseases

2-3X greater risk of T1D in individuals with select autoimmune diseases

Thyroid disorders

- Hashimoto's thyroiditis
- Graves' disease

Celiac disease

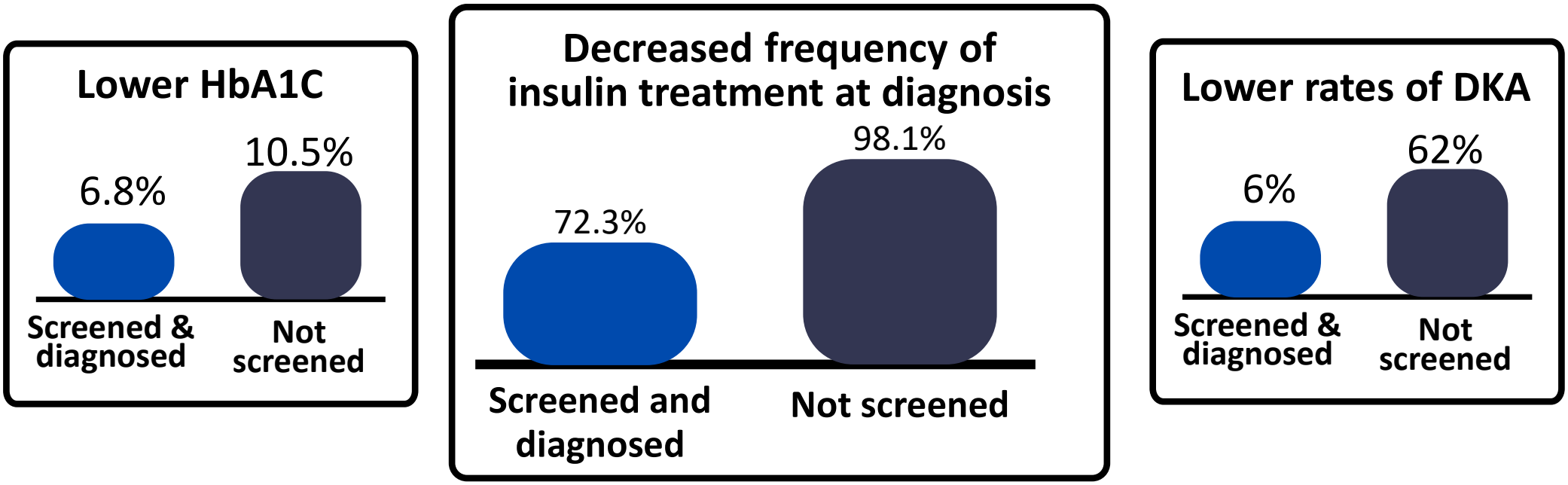
Also screen those with phenotypic risk factors that overlap with T1D (ex. Younger age at diagnosis, intentional weight loss, ketoacidosis, short to insulin treatment)

DI1

Slide 53

DI1 Updated text at bottom.
Diana Isaacs, 2026-04-07T00:22:16.169

Benefits of early detection of pre-symptomatic T1D



Sims E. et al. Diabetes. 2022 Apr 1;71(4):610-623.
Hummel S, et al. Diabetologia. 2023 Sep;66(9):1633-1642

Ordering Autoantibodies

AAbs are currently the only available serum immune marker to identify T1D prior to hyperglycemia and/or symptom onset

	GADA	IAA	IA-2A	ZnT8A	ICA	**Blood draw location**	**Sampling method**
Local laboratories (e.g, Guest diagnostics, Labcorp)	✓	✓	✓	✓	✓	Local laboratory or healthcare provider's office	Blood draw
Online ordering, delivery to doctor's office	✓	✓	✓			Testing kits from vendors such as Enable Biosciences through online ordering	In-clinic finger poke blood test
TrailNet			✓	✓	✓	TrailNet-sponsored event, health fair, at-home kit (by mail)	Blood draw or at-home finger poke
Autoimmunity screening for kids	✓	✓	✓	✓		Barbra Davis Center, Children's Hospital Colorado, UC Health Laboratory, at-home kit (by mail)	Blood draw or at-home finger poke

Glutamic acid decarboxylase 65 autoantibody (GADA)
Insulin autoantibody (IAA)
Insulinoma-associated antigen 2 autoantibody (IA-2A)
Zinc transporter 8 autoantibody (ZnT8A)
Islet cell autoantibody (ICA)

Stages of T1D DI1

	Stage 1	Stage 2	Stage 3
Characteristics	• Autoimmunity	• Autoimmunity	• Autoimmunity
	• Normoglycemia	• Dysglycemia	• Overt hyperglycemia
	• Presymptomatic	• Presymptomatic	• Symptomatic
Diagnostic criteria	• 2 or more islet autoantibodies Glucose levels are in normal range FBG<100mg/dL A1C<5.6% 2-h PG <140mg/dL	• 2 or more islet autoantibodies Dysglycemia: Elevated IFG and/or IGT • FPG 100–125 mg/dL • 2-h PG 140–199 mg/dL • A1C 5.7–6.4% or ≥10% increase in A1C	• Autoantibodies may disappear over time (5-10% may not express antibodies) • Diabetes diagnosed by standard criteria

Slide 56

DI1 Removed old content.
Diana Isaacs, 2026-04-07T00:22:57.881

DI1

Pharmacologic Intervention to Delay Stage 3 T1D

- Teplizumab-Tzield (CD3-monoclonal antibody)
- 14-day infusion can delay the onset of symptomatic T1D (stage 3)
- An option for individuals aged ≥8 years with stage 2 T1D

- In a single trial, 44 individuals received 14-day course of teplizumab vs 32 in placebo
- The median time to delay stage 3 T1D was 2 years
  - 48.4 months in teplizumab group vs. 24.4 months placebo
- Financial assistance available

Herold KC, et al; Type 1 Diabetes TrialNet Study Group. An Anti-CD3 Antibody, Teplizumab, in Relatives at Risk for Type 1 Diabetes. N Engl J Med. 2019 Aug 15;381(7):603-613.

Slide 57

DI1 Updated citation

Diana Isaacs, 2025-08-24T01:57:54.886

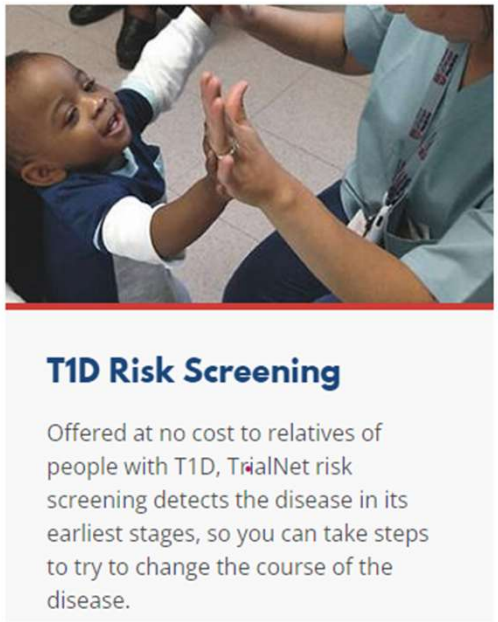
Monitoring for T1D Progression

3. Prevention or Delay of Diabetes and Associated Comorbidities: Standards of Care in Diabetes—2026 FREE

American Diabetes Association Professional Practice Committee for Diabetes*

DI1

- In people with presymptomatic T1D; Monitor for disease progression
  - A1C every 6 months
  - 75- OGTT every year
  - Modify screening frequency based on number/type of antibodies, age and glycemic metrics.
  - May benefit from CGM to monitor progression
- In kids, monitor every 3 months



Trialnet.org

Phillip M, et al. Diabetes Care. 2024 Aug 1;47(8):1276-1298.

Slide 58

DI1 updated

Diana Isaacs, 2026-04-07T00:29:52.852

Type 1 & Lifestyle Prevention

- Observational studies in those with antibodies, shed light on factors that ***increase*** β-cell demand:
  - Less physical activity
  - Consuming higher glycemic index foods
  - Sugar intake

- Factors that **reduced risk** of progression from TEDDY study:
- Daily minutes spent doing vigorous physical exercise.

- More info needed

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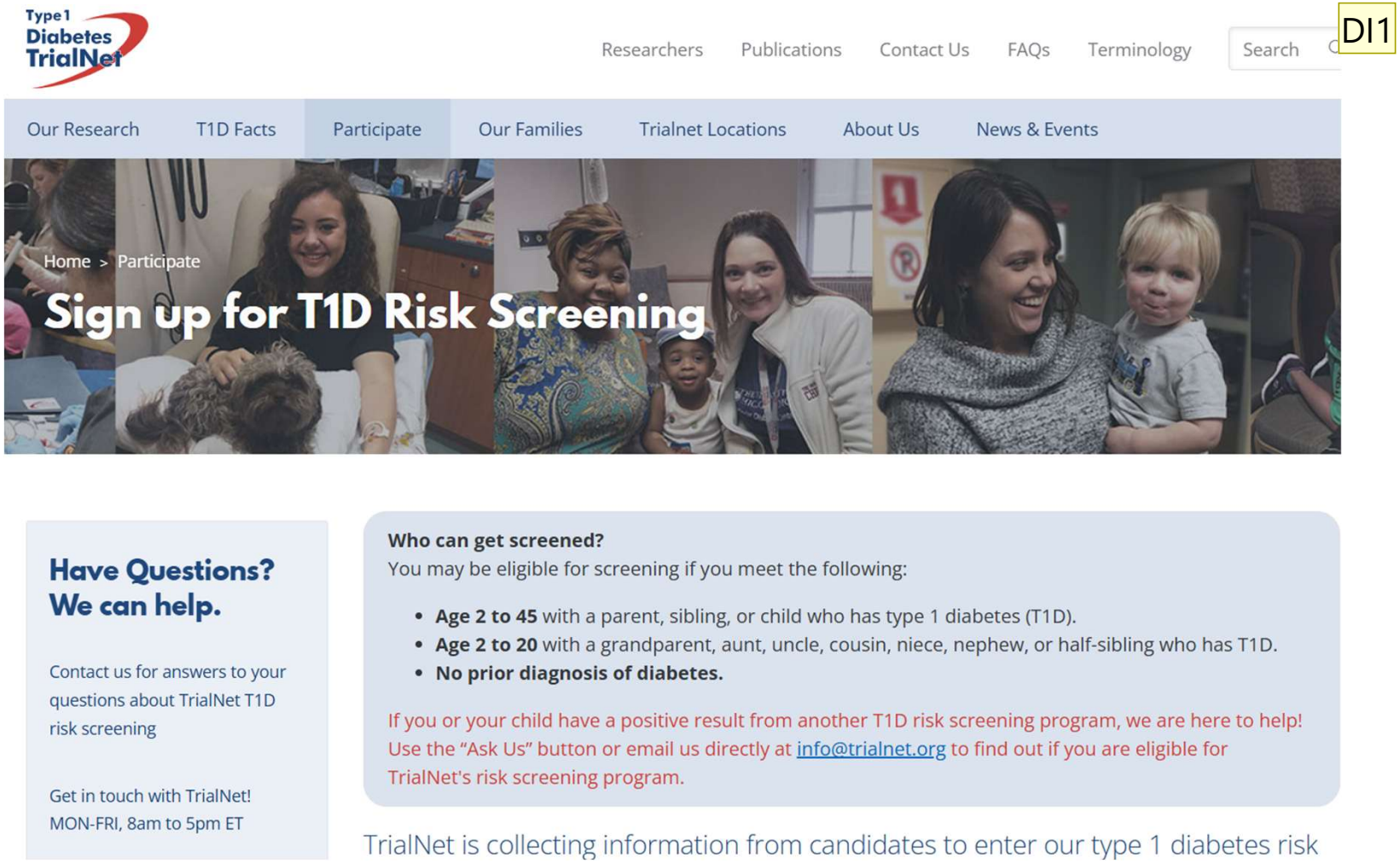
Quick Question 4

- **Question:** LT is diagnosed with stage 1, type 1 diabetes. He has 2 positive autoantibodies and his glucose is slightly elevated. He asks you if he is a candidate for "that therapy" that can protect beta cells and slow progression of type 1 diabetes. **What is the most accurate response?**
  a. Unfortunately, you are not a candidate, since you already have 2 positive autoantibodies.
  b. Let's talk to your provider about the possibility of starting Teplizumab therapy.
  c. With your blood sugar elevation, the best early intervention is insulin therapy.
  d. Since you are in stage 1, the therapy is not indicated, but let's talk about monitoring.

www.TrialNet.org

- **How to get families linked to screening?**



Slide 61

DI1 Updated website and picture.
Diana Isaacs, 2026-04-07T00:53:54.367

Determine if Type 1 - Use AABBCC Approach

- **A**ge
  - e.g., for individuals <35 years old, consider type 1 diabetes
- **A**utoimmunity
  - e.g., personal or family history of autoimmune disease or polyglandular autoimmune syndromes
- **B**ody habitus
  - e.g., BMI <25 kg/m2
- **B**ackground
  - e.g., family history of type 1 diabetes
- **C**ontrol
  - e.g., level of glucose control on noninsulin therapies
- **C**omorbidities
  - e.g., treatment with immune checkpoint inhibitors for cancer can cause acute autoimmune type 1 diabetes or presence of other autoimmune conditions

Type 1 Diabetes Features?

Misdiagnosis is common and can occur in ~40% of adults with new type 1 diabetes

- For JR, a 28 admitted to the ICU with a blood glucose of 476 mg/dl, pH of 7.1, anion gap of 15. Recently lost 13 pounds.

Type 1 Most Discriminative Features

- Younger than 35 years at diagnosis
- Lower BMI (<25 kg/m^2)
- Unintentional weight loss
- Ketoacidosis
- Glucose 360 mg/dl or greater.

2. Diagnosis and Classification of Diabetes: Standards of Care in Diabetes—2026 FREE

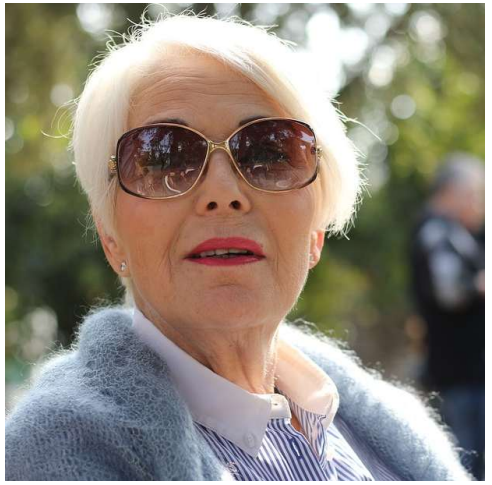
American Diabetes Association Professional Practice Committee for Diabetes*

Medalist Study – Harvard Joslin Diabetes Center

- After 50 years with diabetes
  - Many still produced some insulin
  - Many had no eye disease

What kind of Diabetes?

- 58 yr old, states she has had type 1 diabetes for 18 years. Quit smoking a year ago and gained about 20 lbs. BMI 25.
- Meds
  - Lispro 18-23 units before each meal
  - Glargine 28 units at bedtime
  - Metformin 500mg TID
- What tests would you recommend?



25% of ind's with Type 1 also have type 2 diabetes.

ADA Post Grad, 2010

Type 1 & Type 2 - Double Diabetes?

- May be appropriate to recognize a person with type 1 diabetes *and* features classically associated with type 2 diabetes (e.g., insulin resistance, obesity, and other metabolic abnormalities.
- Can help facilitate access to appropriate treatment:
  - (e.g., GLP-1 RA or SGLT-2 inhibitor therapies for potential weight and other cardiometabolic benefits) and monitoring systems.

2. Diagnosis and Classification of Diabetes: Standards of Care in Diabetes—2026 FREE

American Diabetes Association Professional Practice Committee for Diabetes*

What type of Diabetes?

- 72 Years old
- A1c 3 months prior 6.2%
- A1c now 13.9%
- BMI 24.5
- Lost about 10 pounds over last month

Latent AutoImmunity Diabetes in Adults (LADA)

- Antibody positive to 1-2 of below
  - GAD-65 autoantibodies
  - Insulin Autoantibodies
  - Islet Cell antigen-2
  - ZnT8
- Adult Age at onset
- Usually benefit from insulin w/in first 6 months of diagnosis
- Early insulin therapy may preserve beta cell function

Latent Autoimmune Diabetes

Venkatraman Rajkumar; Steven N. Levine.

Author Information and Affiliations

Last Update: June 21, 2022.

Diabetes Care 26:536-538, 2003
Jerry P. Palmer, MD and Irl B. Hirsch, MD

LADA Clinical Features Compared to Type 2

Feature	LADA	Type 2
Age <50	63%	19%
Acute hyperglycemia	66	24
BMI < 25	33	13
Hx of autoimmune dx	27	12
Family hx autoimmune	46	35

Latent Autoimmune Diabetes

Venkatraman Rajkumar; Steven N. Levine.

Author Information and Affiliations

Last Update: June 21, 2022.

Practical Diabetology March 08, Unger MD

What about Latent Autoimmunity Diabetes in Adults (LADA)

- Slowly progressive autoimmune diabetes with an adult onset should be termed:
  - LADA or type 1 diabetes.
  - Slow autoimmune β-cell destruction can lead to a long duration of marginal insulin secretory capacity.
  - For this classification, all forms of diabetes mediated by autoimmune β-cell destruction independent of age of onset are included under the rubric of type 1 diabetes.

2. Diagnosis and Classification of Diabetes: Standards of Care in Diabetes—2026 FREE

American Diabetes Association Professional Practice Committee for Diabetes*

Patti Labelle

"divabetic"

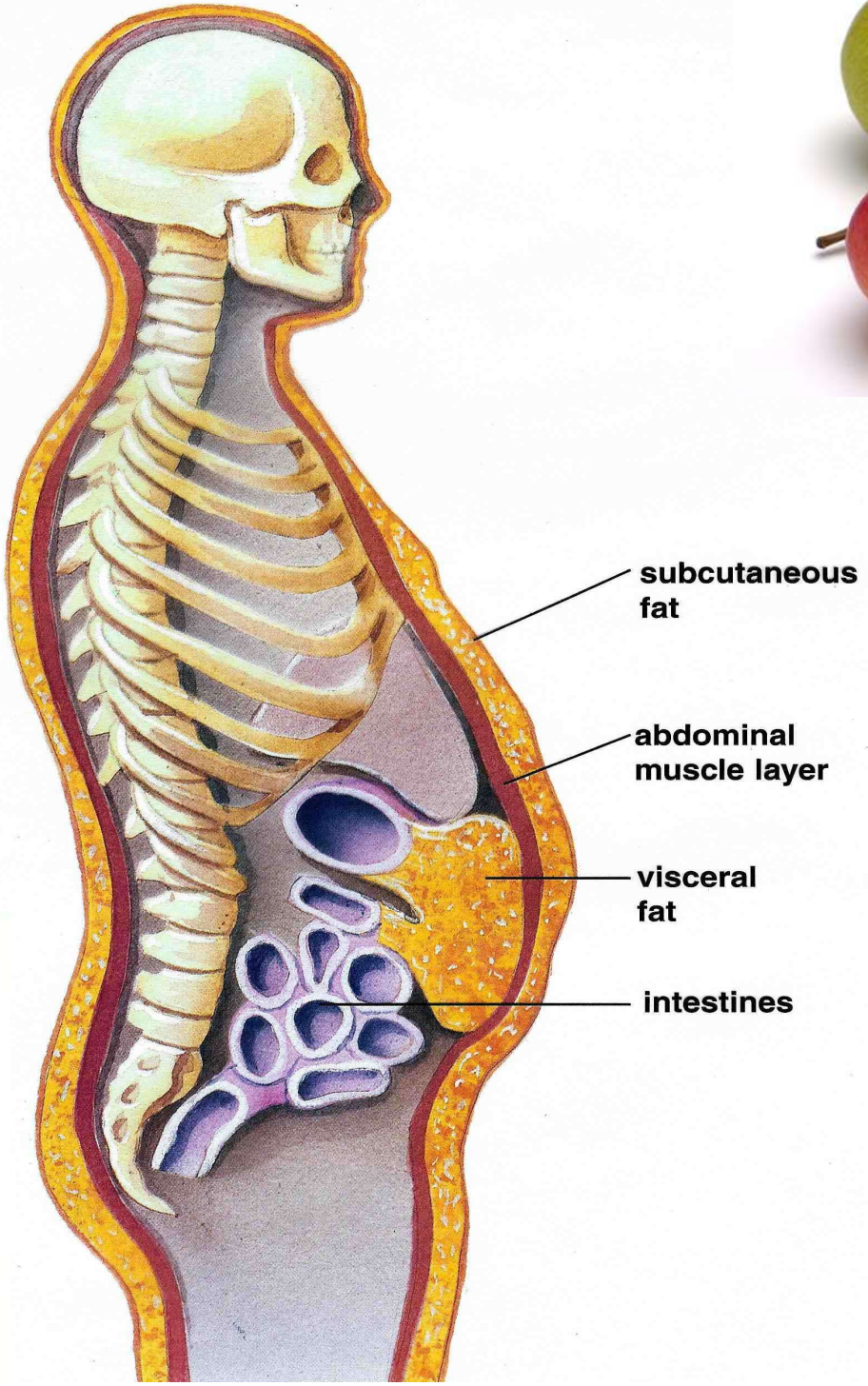
“I have diabetes, it doesn’t have me”

Signs of Diabetes

- Polyuria
- Polydipsia
- Polyphasia
- Weight loss
- Fatigue
- Skin and other infections
- Blurry vision

- Glycosuria, H_2O losses
- Dehydration
- Fuel Depletion
- Loss of body tissue, H_2O
- Poor energy utilization
- Hyperglycemia increases incidence of infection
- Osmotic changes

Visceral Fat and Subcutaneous Fat



BT1

What is Type 2 Diabetes?

- Type 2 diabetes is associated with insulin secretory defects related to
  - genetic predisposition,
  - epigenetic changes (how genes are expressed)
  - inflammation, and
  - metabolic stress.

2. Diagnosis and Classification of Diabetes: Standards of Care in Diabetes—2026 FREE

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- Future classification schemes for diabetes will likely focus on the pathophysiology of the underlying β-cell dysfunction.

Slide 74

BT1 new

Beverly Thomassian, 2026-03-20T22:54:47.789

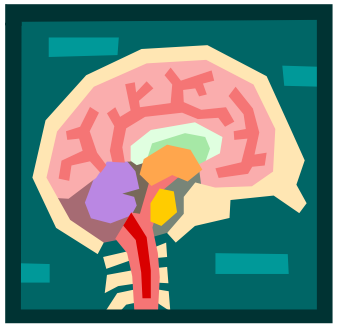
Life Study – Mrs. Jones

MJ is 62 years old, with a BMI of 36 and complains of feeling tired and urinating several times a night. Has a urinary tract infection. Her A1c is 8.3%, glucose 237.

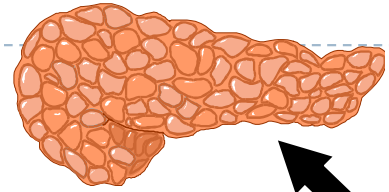
MJ is hypertensive with a history of gestational diabetes. No ketones in urine.

- What are risk factors and signs of diabetes?
- You find a few moments to teach and MJ asks you some questions.

The Noxious Nine – Pathophysiology T2D

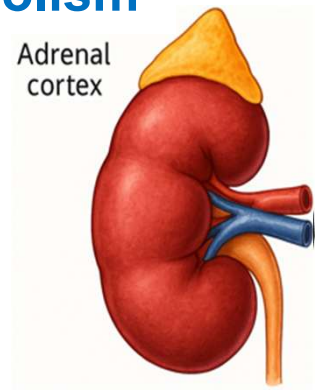


Neurotrans-
mission
dysfunction

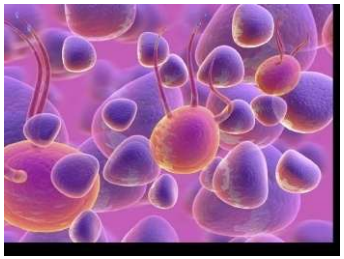


Decreased
Insulin β-cell secretion

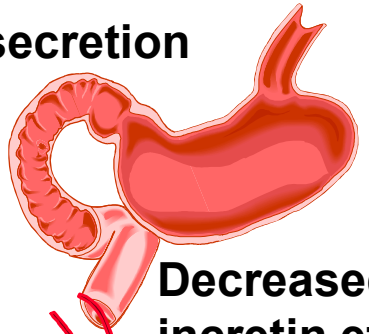
Hypercortisolism



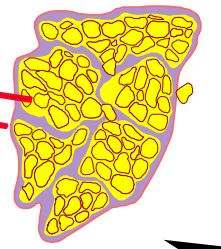
Increased renal
glucose
reabsorption



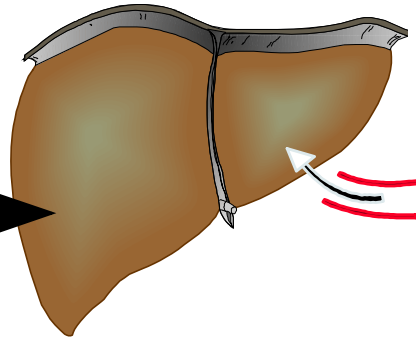
Increased glucagon
α-cell secretion



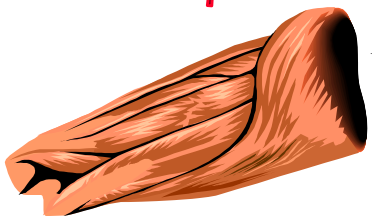
Decreased
incretin effect
Gut hormones



Increased
lipolysis



Increased
hepatic
glucose
production



Decreased muscle
glucose uptake

DeFronzo, Auchus-Hypercortisolism June 2025

BT1

Hypercortisolism in Type 2

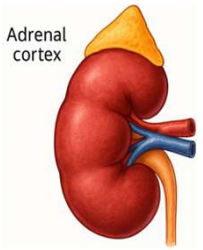
Cortisol increases gluconeogenesis in the liver

Reduces peripheral glucose uptake → insulin resistance

Stimulates protein catabolism and lipolysis

Chronic cortisol elevation → persistent hyperglycemia and hypertension

- Can lead to "Difficult to Control Type 2 Diabetes"



- CATALYST study revealed about 24% of people with elevated BG despite meds, may be due to hypercortisolism.
- Treatment with mifepristone decreased weight and BG.

DeFronzo, Auchus-Hypercortisolism June 2025

pmc.ncbi.nlm.nih.gov+3HCP

Slide 77

BT1 Added this slide

Beverly Thomassian, 2025-08-26T01:27:55.691

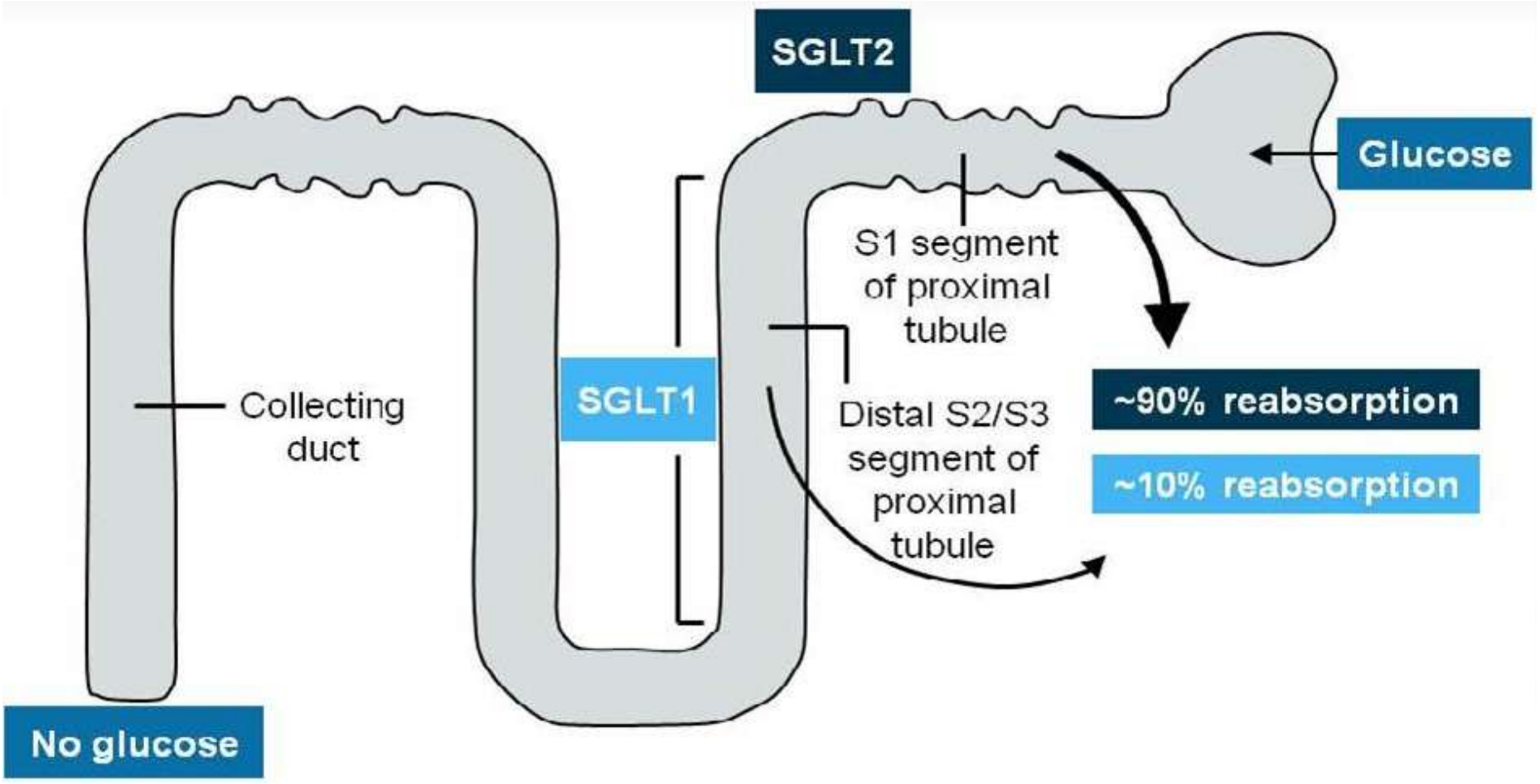
Comparison of Type 1,Type 2, LADA

	Type 1	Type 2	LADA
Excess weight	x	xxx	x
Insulin dependence	xxx	30%	6mos
Respond to oral agents	0	xxx	x
Ketosis	xxx	x	x
Antibodies present	xxx	0	xx
Typical Age of onset	teens	adult	adult
Insulin Resistance	0	xxx	x

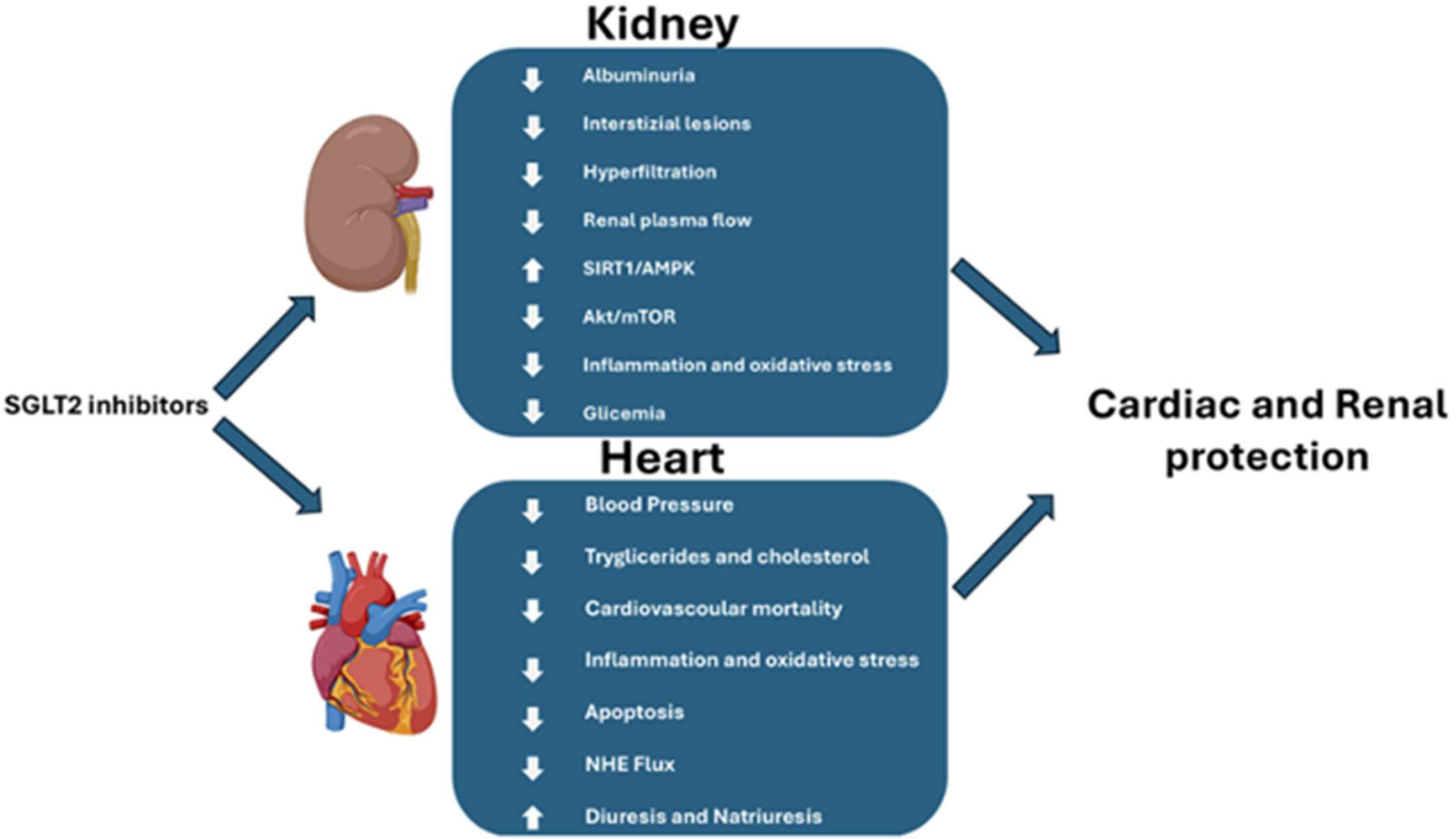
Break

SGLT-2 Inhibitors

SGLT and the Kidney



Additional SGLT2 Inhibitor Effects



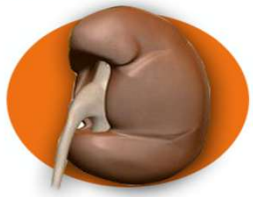
Gaggini M, et al. Cells. 2025 Mar 6;14(5):387. doi: 10.3390/cells14050387.

Poll Question 5

- FZ has type 2 diabetes and heart failure. He was recently diagnosed with an A1C of 7.1%. What is the best medication to start?

a. Pioglitazone
b. Tirzepatide
c. Metformin
d. Dapagliflozin

SGLT-2 Inhibitors- "Flozins" DI1



- **Action**: decreases renal reabsorption of glucose in the proximal tubule of kidneys (reset renal threshold)
- **Preferred** diabetes treatment for people with heart and kidney failure. Decreases BG & CV Risk
- AWP: ~$650 a month

Class/Main Action	Name(s)	Daily Dose Range	Considerations
SGLT2 Inhibitors "Glucoretic" • Decreases glucose reabsorption in kidneys	Canagliflozin*† (Invokana) Dapagliflozin*† (Farxiga) Empagliflozin*† (Jardiance) Ertugliflozin (Steglatro) Bexagliflozin (Brenzavvy)	100 - 300 mg 1x daily 5 - 10 mg 1x daily 10 - 25 mg 1x daily 5 – 15 mg 1x daily 20 mg 1x daily	**Side effects:** hypotension, UTIs, genital infections, increased urination, weight loss, ketoacidosis. **Heart Failure, CV & Kidney Protection:** 1st line therapy for Heart Failure (HF), Kidney Disease (CKD), Cardiovascular Disease, before or with metformin **Considerations:** If GFR ≥ 20, use SGLT-2 to reduce CVD, Heart Failure and Chronic Kidney Disease. Limited BG lowering effect if GFR <45. See package insert for GFR cut-offs and dosing. **Benefits:** SGLT-2s* reduce BG, CV death & HF, slow CKD. †Approved for peds, 10 yrs +. Lowers A1C 0.6% to 1.5%.

DI1 Changed to flozins.
Diana Isaacs, 2026-04-07T01:07:42.418

SGLT-2 Inhibitor Dosing and Renal Adjustments

Drug	Dose	Renal Adjustment
Ertugliflozin (Steglatro)	5-15 mg daily	Not recommended for eGFR <45
Dapagliflozin (Farxiga)	5-10 mg daily	Not recommended to initiate with eGFR <45 (glycemic control) or <25 (other conditions): may continue for CV, CKD benefits
Empagliflozin (Jardiance)	10-25 mg daily	Not recommended to initiate for eGFR <30 (glycemic control) , may continue for CV, CKD benefits
Canagliflozin (Invokana)	100-300 mg daily	eGFR 30 to <60: 100 mg once daily eGFR <30: avoid initiation, may continue 100mg daily for kidney benefits
Bexagliflozin (Brenzavvy)	20 mg daily	Not recommended for eGFR <30

Package inserts, dailymed.nlm.nih.gov

SGLT-2 Inhibitor Indications

Drug	Lowers BG	Reduces CV Risk?	Heart Failure Indication?	Kidney Indication?
Dapagliflozin (Farxiga)	Yes, for 10 yrs and older	Yes	Yes +/- Diabetes	Yes +/- Diabetes
Empagliflozin (Jardiance)	Yes for 10 yrs and older	Yes	Yes +/- Diabetes	Yes +/- Diabetes
Canagliflozin (Invokana)	Yes , for 10 yrs and older	Yes	Yes w/ Diabetes	Yes w/ Diabetes
Ertugliflozin (Steglatro)	Yes	No	No	No
Bexagliflozin (Brenzavvy)	Yes	No	No	No

Benefits of SGLT-2 Inhibitors

- A1C lowering
- Modest weight loss
- Cardiovascular
- Renal
- Heart failure
- Blood pressure lowering

Side Effects of SGLT-2 Inhibitors

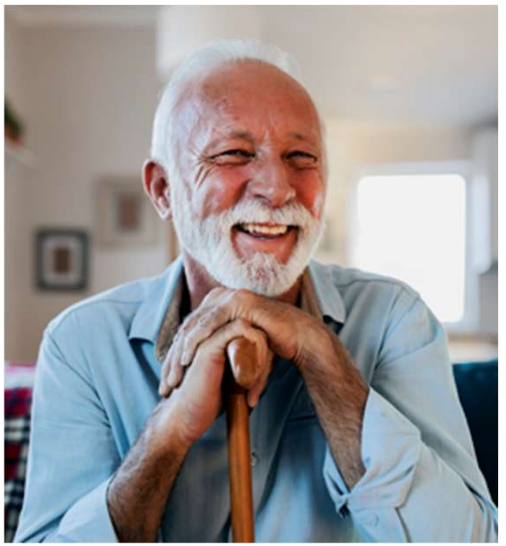
- Tip: Hold for 3 days prior to surgery or procedures with prolonged fasting

Genitourinary infections	Volume depletion	Increased urination
Hypotension	Electrolyte changes	Diabetes ketoacidosis (DKA)

Amputation risk, Bone fracture (Canagliflozin)

Managing Adverse Effects

- Maintain good hygiene to reduce risk of genital mycotic infections
  - Higher risk with higher glucose
- DKA risk
  - Use caution with reducing insulin dose
  - Report nausea, vomiting and malaise
- Monitor BP
  - May need to reduce antihypertensive meds
- UTI risk greater with hyperglycemia



Where do SGLT2-2 Inhibitors Fit within the Guidelines?

DI1

Use of glucose-lowering medications in the management of type 2 diabetes

(For recommendations for specific conditions, including non-glucose-lowering medications, refer to pertinent sections)

Healthy lifestyle behaviors; diabetes self-management education and support; social determinants of health

To avoid therapeutic inertia, reassess and modify treatment regularly (3–6 months)

Goal: cardiovascular and kidney risk reduction*

+ASCVD†

+Indicators of high CVD risk

+ASCVD/indicators of high CVD risk‡

- GLP-1 RA[#] with proven CVD benefit
- SGLT2i[§] with proven CVD benefit

If glycemia is above goal

- For individuals on a GLP-1 RA, consider adding SGLT2i with proven CVD benefit or vice versa
- Pioglitazone^

+HF

SGLT2i[§] with proven HF benefit in current or prior symptom s of HFrEF or HFpEF

SGLT2i and/or either dual GIP/GLP-1 RA or GLP-1 RA with proven benefit in symptomatic HFpEF and obesity

+CKD

eGFR <60 mL/min/1.73 m² or albuminuria (ACR ≥3.0 mg/mmol [30 mg/g]). Repeat measurement is required to confirm CKD

+CKD (on maximally tolerated dose of ACEi or ARB)

SGLT2i[§] with primary evidence of reducing CKD progression

- SGLT2i can be started wit h eGFR ≥20 mL/min/1.73 m²
- Glucose-lowering efficacy is reduced with eGFR <45 mL/min/1.73 m²

OR

GLP-1 RA[#] with proven CKD benefit

If glycemia is above goal, for individuals on SGLT2i, consider incorporating a GLP-1 RA or vice versa

Goal: achievement and maintenance of weight and glycemic goals

+Weight management

Efficacy for weight loss

Very high: Semaglutide, tirzepatide

High: Dulaglutide, liraglutide

Intermediate: GLP-1 RA (not listed above), SGLT2i

Neutral: Metformin, DPP-4i

+Achievement and maintenance of glycemic goals

Metformin or other agent (including combination therapy) that provides adequate efficacy to achieve and maintain glycemic treatment goals.

Prioritize avoidance of hypoglycemia in high risk individuals

Efficacy for glucose lowering

Very high: Dulaglutide (high dose), semaglutide, tirzepatide, insulin

Combination oral, combination injectable (GLP-1 RA and insulin)

High: GLP-1 RA (not listed above), metformin, pioglitazone, SGLT2i, sulfonylurea

Intermediate: DPP-4i

If additional cardiovascular and kidney risk reduction, management of other metabolic comorbidities, and/or glycemic lowering is needed

If glycemia is above goal or significant hypoglycemia or hyperglycemia or barriers to care are identified

- Refer to DSMES to support self-efficacy in achievement of treatment goal
- Consider technology (e.g., diagnostic or personal CGM) to identify therapeutic gaps and tailor therapy
- Identify and address SDOH that affect achievement of treatment goals

+Mitigating risk of MASLD or MASH

Agents with proven or potential benefit in MASLD or MASH

GLP-1 RA, dual GIP and GLP-1 RA, pioglitazone, or combination of GLP-1 RA with pioglitazone

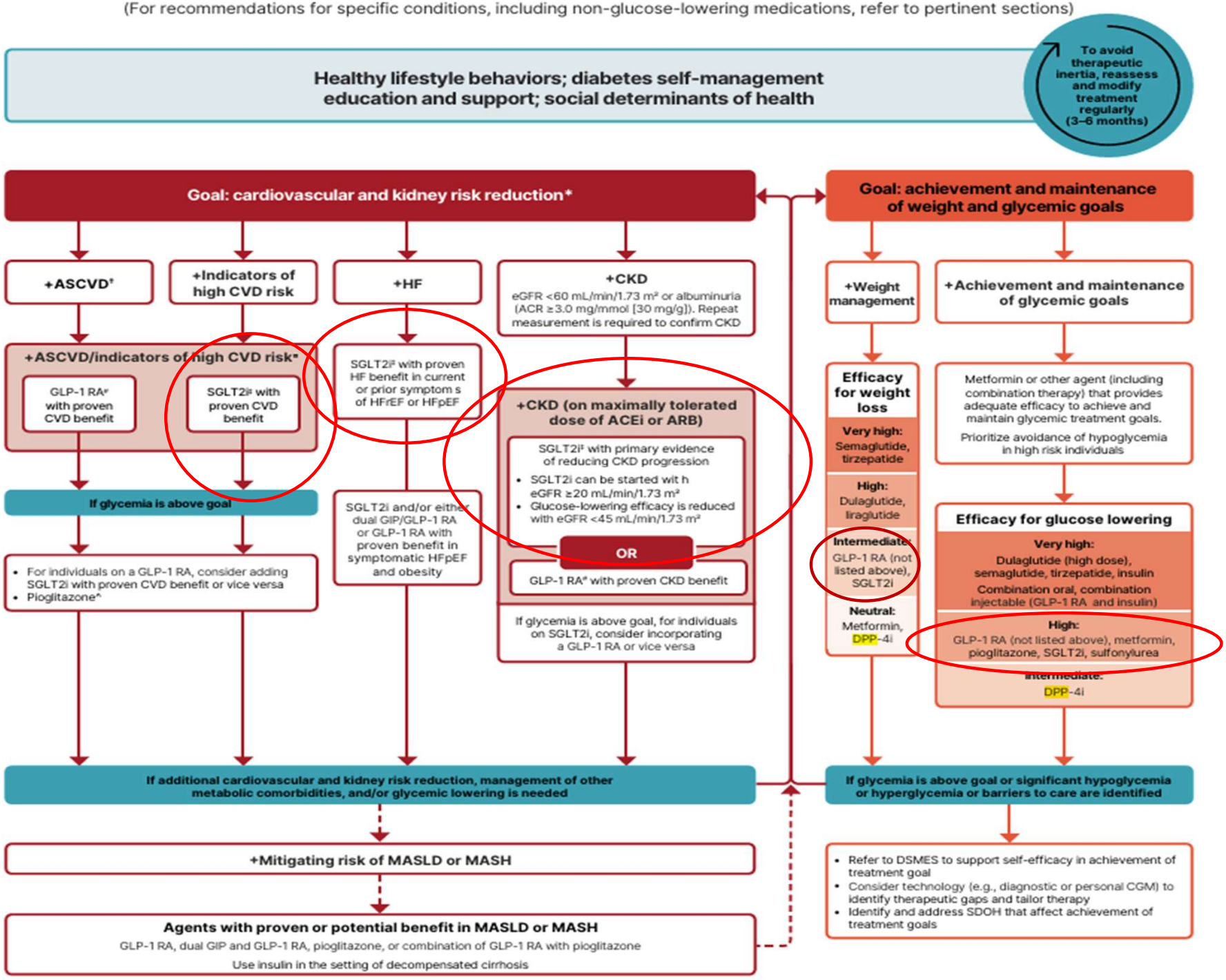
Use insulin in the setting of decompensated cirrhosis

DI1 Updated with 2026 algorithm
Diana Isaacs, 2026-02-25T04:20:06.519

DI1

Use of glucose-lowering medications in the management of type 2 diabetes

(For recommendations for specific conditions, including non-glucose-lowering medications, refer to pertinent sections)

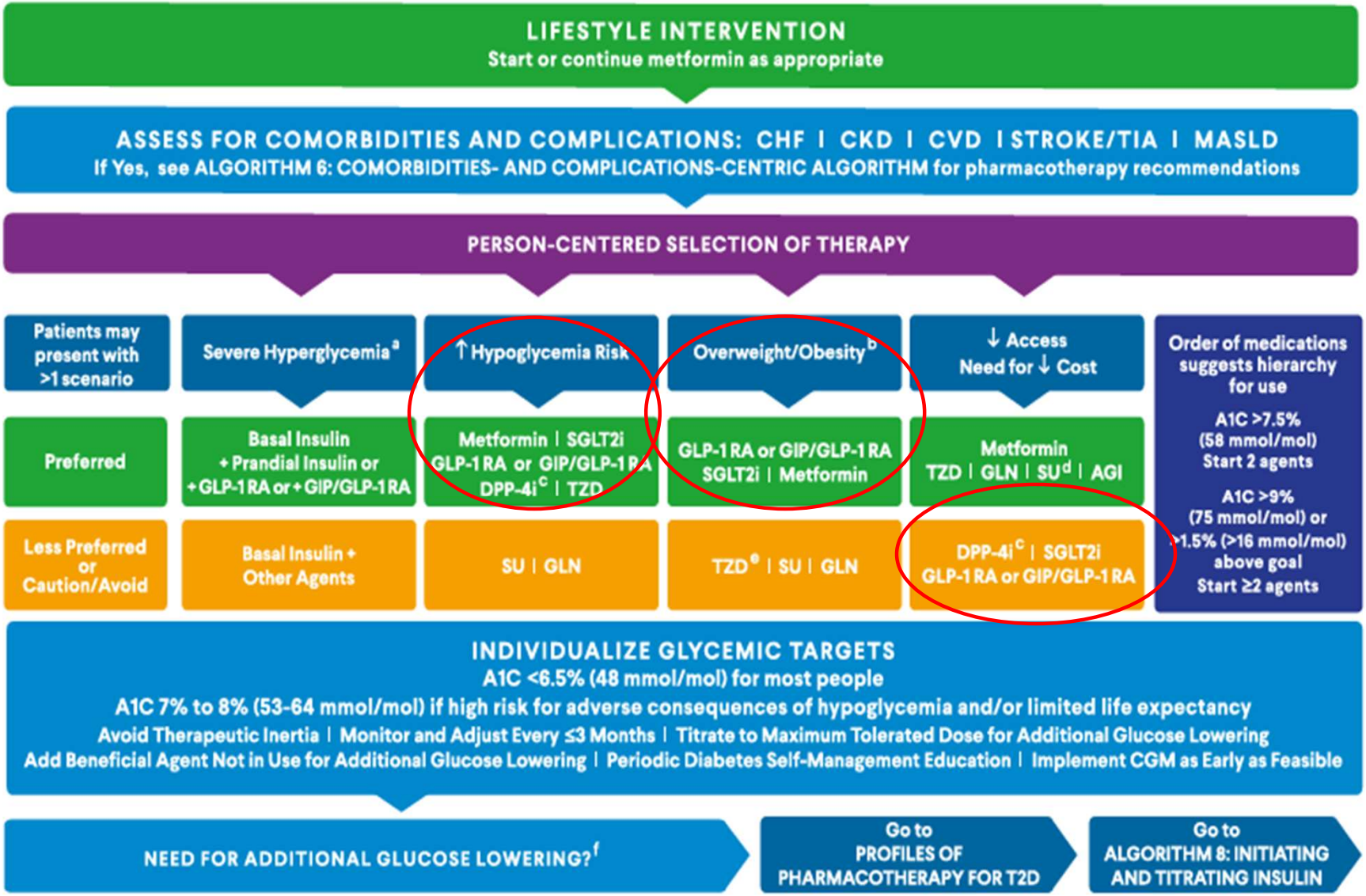


Slide 92

DI1 Updated with 2026 algorithm

Diana Isaacs, 2026-02-25T04:20:06.519

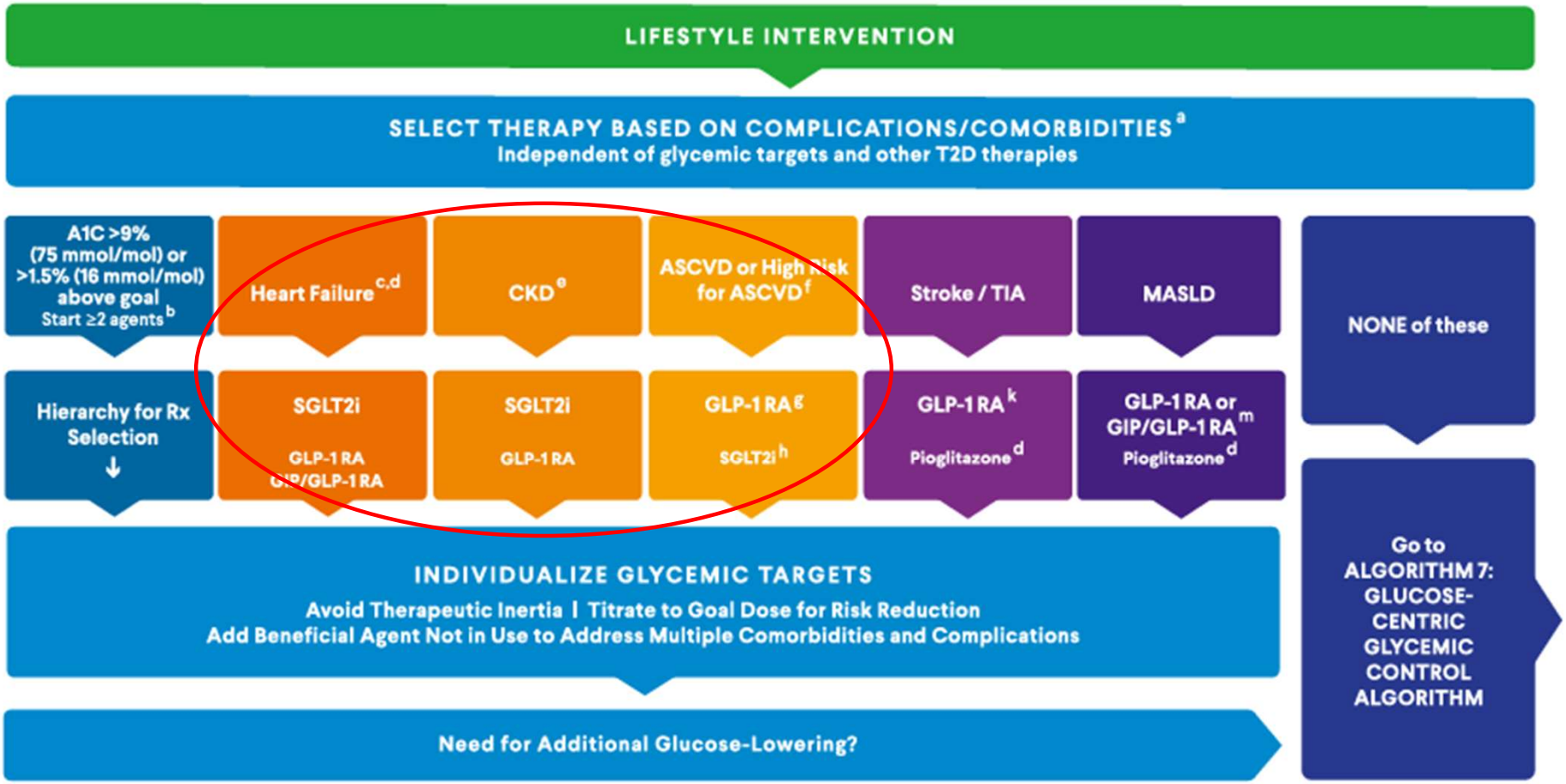
GLUCOSE-CENTRIC GLYCEMIC CONTROL ALGORITHM



[a]For SEVERE HYPERGLYCEMIA (A1C >10% [>86 mmol/mol] and/or glucose >300 mg/dL [16.7 mmol/L] with symptoms), strongly consider basal insulin (Go to ALGORITHM 8: INITATING AND TITRATING INSULIN). Avoid use of GLP-1 RA or GIP/GLP-1 RA alone in severe hyperglycemia. These agents require titration over weeks which can delay glycemic control. After glucose toxicity is resolved, reassess medical therapy and consider other agents. [b]See **AACE Algorithm for the Treatment of Obesity/Adiposity-Based Chronic Disease-2025 Update.** [c]DPP-4i and GLP-1 RA or GIP/GLP-1 RA should not be combined. [d]SUs may be inappropriate in older adults due to risk of hypoglycemia. [e]TZDs can cause increased weight partially attributable to fluid retention. [f]If despite appropriate therapy and adherence, glucose levels remain above target, also reconsider ALGORITHM 3: DIABETES CLASSIFICATION.

Abbreviations: **A1C**, hemoglobin A1C; **AGI**, alpha-glucosidase inhibitor; **CGM**, continuous glucose monitoring; **CHF**, congestive heart failure; **CKD**, chronic kidney disease; **CVD**, cardiovascular disease; **DPP-4i**, dipeptidyl peptidase 4 inhibitor; **GIP**, glucose-dependent insulinotropic polypeptide; **GLN**, glinide; **GLP-1 RA**, glucagon-like peptide 1 receptor agonist; **MASLD**, metabolic dysfunction-associated steatotic liver disease; **SGLT2i**, sodium glucose transporter 2 inhibitor; **SU**, sulfonylurea; **TIA**, transient ischemic attack; **T2D**, type 2 diabetes; **TZD**, thiazoladinedione

COMORBIDITIES- AND COMPLICATIONS-CENTRIC GLYCEMIC CONTROL ALGORITHM



[a]CVOTs included metformin as baseline therapy. [b]For SEVERE HYPERGLYCEMIA (A1C >10% [>86 mmol/mol] and/or glucose >300 mg/dL [16.7 mmol/L]) with symptoms, strongly consider basal insulin (Go to ALGORITHM 8: INITIATING AND TITRATING INSULIN). Avoid use of GLP-1 RA or GIP/GLP-1 RA alone in severe hyperglycemia. These agents require titration over weeks delaying glycemic control. [c]Use SGLT2i with proven benefit (dapagliflozin, empagliflozin). Semaglutide/tirzepatide have potential benefit in obesity-related HFpEF. [d]TZDs are contraindicated in NYHA Class III/IV HF. Start at 15 mg, and balance benefits vs risks of weight gain. Allow >4 weeks at each dose before titration. [e]CKD: Use SGLT2i with proven benefit (canagliflozin, dapagliflozin, empagliflozin) or GLP-1 RA (semaglutide injection). [f]High risk for ASCVD: age ≥55 AND albuminuria or proteinuria, hypertension and LV hypertrophy, LV systolic or diastolic dysfunction, ankle-brachial index <0.9. [g]GLP-1 RA: oral or subcutaneous semaglutide, liraglutide, or dulaglutide. [h]SGLT2i: canagliflozin, empagliflozin, or dapagliflozin. [k]Stroke: semaglutide subcutaneous or dulaglutide. [m]MASLD: semaglutide or tirzepatide.

Abbreviations: **A1C**, hemoglobin A1c; **ASCVD**, atherosclerotic cardiovascular disease; **CKD**, chronic kidney disease; **CVOT**, cardiovascular outcomes trial; **eGFR**, estimated glomerular filtration rate; **GIP**, glucose-dependent insulinotropic polypeptide; **GLP-1 RA**, glucagon-like peptide-1 receptor agonist; **HF**, Heart Failure; **HFpEF**, heart failure with preserved ejection fraction; **LV**, left ventricular; **MASLD**, metabolic dysfunction-associated steatotic liver disease; **NYHA**, New York Heart Association; **Rx**, prescription; **SGLT2i**, sodium glucose cotransporter 2 inhibitor; **T2D**, type 2 diabetes; **TIA**, transient ischemic attack; **TZD**, thiazolidinedione; **UACR**, urine albumin-creatinine ratio

Case Study: Rick

- Rick is a 51yoM diagnosed with type 2 diabetes 5 years ago.
- He takes metformin 1000mg twice daily and semaglutide 2mg weekly. His A1C=6.7%.
- In the last 3 months, he was diagnosed with kidney disease. He has albuminuria and eGFR=50.
- Weight: 205lbs, 5”7, BMI=32kg/m^2
- He lost 20lbs in the last year

Case Study: Rick

DI1

- What is the best drug to add to Rick's regimen?

A. Glipizide
B. Empagliflozin
C. Pioglitazone
D. Linagliptin
E. No medication needed since A1C is at goal

Slide 96

DI1 Updated question
Diana Isaacs, 2026-04-07T01:51:30.952

SGLT2 Inhibitors- How do they rate?

Question	Answer
Cause hypoglycemia?	No
Cause weight gain?	No
Affordable?	No
Lowers Cardiorenal risk?	Yes
Can most tolerate /use?	Yes

Other Types of Diabetes

- Gestational
- Other specific types of diabetes

BT1

Diabetes in Pregnancy Background

- Prevalence of diabetes in pregnancy is increasing
- Definitions
  - Pre-gestational diabetes: pre-existing type 1 or type 2 diabetes in pregnancy
  - Gestational diabetes: diabetes diagnosed in the 2nd or 3rd trimester of pregnancy

Slide 99

BT1 added

Beverly Thomassian, 2026-04-07T18:45:59.406

Poll question 6

- What best describes gestational diabetes?

a. Diabetes discovered within the first 12 weeks of pregnancy.
b. Diabetes discovered in the 24-28 weeks of pregnancy.
c. Risk of getting diabetes before pregnancy.
d. Diabetes discovered at any point during pregnancy.

Rates of Gestational Diabetes (GDM) and Diabetes in Pregnancy increasing

- 1% to 2% have type 1 or type 2 during pregnancy
- 6% to 9% develop GDM
- From 2000 to 2010
  - GDM rates increased 56%
  - Type 1 or type 2 before pregnancy increased 37%.
- Asian and Hispanic women have higher rates of GDM
- Black and Hispanic women have higher rates of type 1 or type 2 diabetes during pregnancy.

CDC
https://www.cdc.gov/reproductivehealth/maternalinfanthealth/diabetes-during-pregnancy.htm

BT1

Screening in Early Pregnancy

- Before 15 weeks, screen those with **risk factors** (B)
- Consider screening **everyone** before 15 weeks (E)

- If BG in normal range, recheck at 24-28 weeks for Gestational Diabetes using OGTT

- If fasting BG 110+ or A1C 5.9%+
  - At higher risk of adverse outcomes and more likely to experience GDM and need insulin.

2. Diagnosis and Classification of Diabetes: Standards of Care in Diabetes—2026 Diabetes Care 2026;49(Suppl. 1):S27–S49 | https://doi.org/10.2337/dc26-S002

Slide 102

BT1 added

Beverly Thomassian, 2026-04-07T18:46:06.719

Gestational DM ~ 9% of all Pregnancies

- Detected at 24-28 weeks of pregnancy (most insulin resistant phase)
- Rates are increasing:
  - Women getting pregnant later
  - Higher rates of obesity
- 50% chance of getting diabetes post delivery
- Offspring at greater risk of insulin resistance and diabetes

BT1

See Diabetes and Pregnancy Level 2

Screening and Diagnosis of Diabetes Cheat Sheet

GESTATIONAL DIABETES (GDM)*

PREGNANCY SCREENING	TEST	DIAGNOSTIC CRITERIA
Screen to identify abnormal glucose metabolism before 15 weeks gestation Test those w/ risk factors (table 1) to identify undiagnosed prediabetes or diabetes at first prenatal visit.	Standard Diagnostic Testing and Criteria as listed in Diagnosing Diabetes –Table 2	Standard Diagnostic Testing and Criteria as listed in Diagnosing Diabetes –Table 2 Those with fasting of 110-125 or A1C of 5.9% to 6.4% are at higher risk of adverse outcomes (GDM, need insulin, preeclampisa and other)
Screen for GDM at 24–28 wks gestation for those without known diabetes. Screen those with GDM for diabetes 4 - 12 wks postpartum with 75-g OGTT. Lifelong screening at least every 3 yrs. *Please see reference below for complete guidelines.*	Can use either IADPSG consensus: **"One Step" 75-g OGTT** fasting and at 1 and 2 h (perform after overnight fast of at least 8 h) **"Two step" NIH Consensus – Step 1:** 50gm glucose load (non fasting) w/ plasma BG test at 1 hr. If BG ≥ 130-140*, go to **Step 2 >**	**One Step:** GDM diagnosis when ANY of following BG values are exceeded: • Fasting ≥92 mg/dl, • 1 h ≥180 mg/dl • 2 h ≥153 mg/dl **Two Step -Step 2** - 100g OGTT (fasting) GDM diagnosis if at least 2 of 4 BG measured at fasting, 1h, 2h, 3h after OGTT meet or exceed 95, 180, 155, 140 mg/dL respectively.

***Reference** – Diagnosis & Classification of Diabetes. American Diabetes Association Standards of Medical Care in Diabetes. Diabetes Care 2026 Jan; 49 (Supplement 1): S27-S49. **Compliments of Diabetes Education Services www.DiabetesEd.net**

Slide 104

BT1 updated

Beverly Thomassian, 2026-03-20T22:55:25.295

BT1

Specific type of diabetes due to other causes

- Medications:
  - Steroids
  - Anti-retroviral meds,
  - Antipsychotic meds
  - Transplant meds
  - Checkpoint inhibitors

- Exocrine pancreas disease:
  - Cystic fibrosis
  - Type 3c
  - Pancreatitis
- Monogenic diabetes syndromes
- Agent Orange

2. Diagnosis and Classification of Diabetes: Standards of Care in Diabetes—2026 FREE

American Diabetes Association Professional Practice Committee for Diabetes*

Slide 105

BT1 updated
Beverly Thomassian, 2026-04-07T18:46:14.565

BT1

Type 3c Diabetes (Pancreatogenic)

- Includes both structural and functional loss of insulin secretion in the context of exocrine pancreatic dysfunction.
- About 5-10% of diabetes, often misdiagnosed as type 2 diabetes.
- Insulin sensitive
- Assess wt loss, fatty stools – indications may need pancreatic enzyme replacement therapy (PERT).

- The diverse set of etiologies includes:
  - pancreatitis (acute and chronic) ~70%
  - trauma or pancreatectomy
  - neoplasia
  - cystic fibrosis
  - hemochromatosis
  - fibrocalculous pancreatopathy

Screen for diabetes within 3-6 months of pancreatitis & annually.

2. Diagnosis and Classification of Diabetes: Standards of Care in Diabetes—2026 FREE

American Diabetes Association Professional Practice Committee for Diabetes*

Slide 106

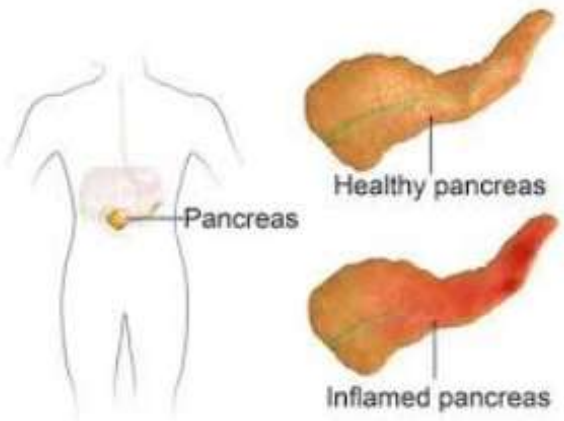
BT1 updated

Beverly Thomassian, 2026-03-20T22:55:07.181

BT1

Pancreatitis

- People with diabetes 2xs risk of acute pancreatitis
- After episode of pancreatitis, one third of people will get prediabetes or diabetes
  - About 25% to 80% of people with chronic pancreatitis develop Type 3c diabetes.
- Pancreatitis is an exocrine dysfunction:
  - Disrupts global architecture or physiology of pancreas
  - Results in both exocrine and endocrine dysfunction.



Healthy Pancreas vs Pancreatitis

2. Diagnosis and Classification of Diabetes: Standards of Care in Diabetes—2026 FREE

American Diabetes Association Professional Practice Committee for Diabetes*

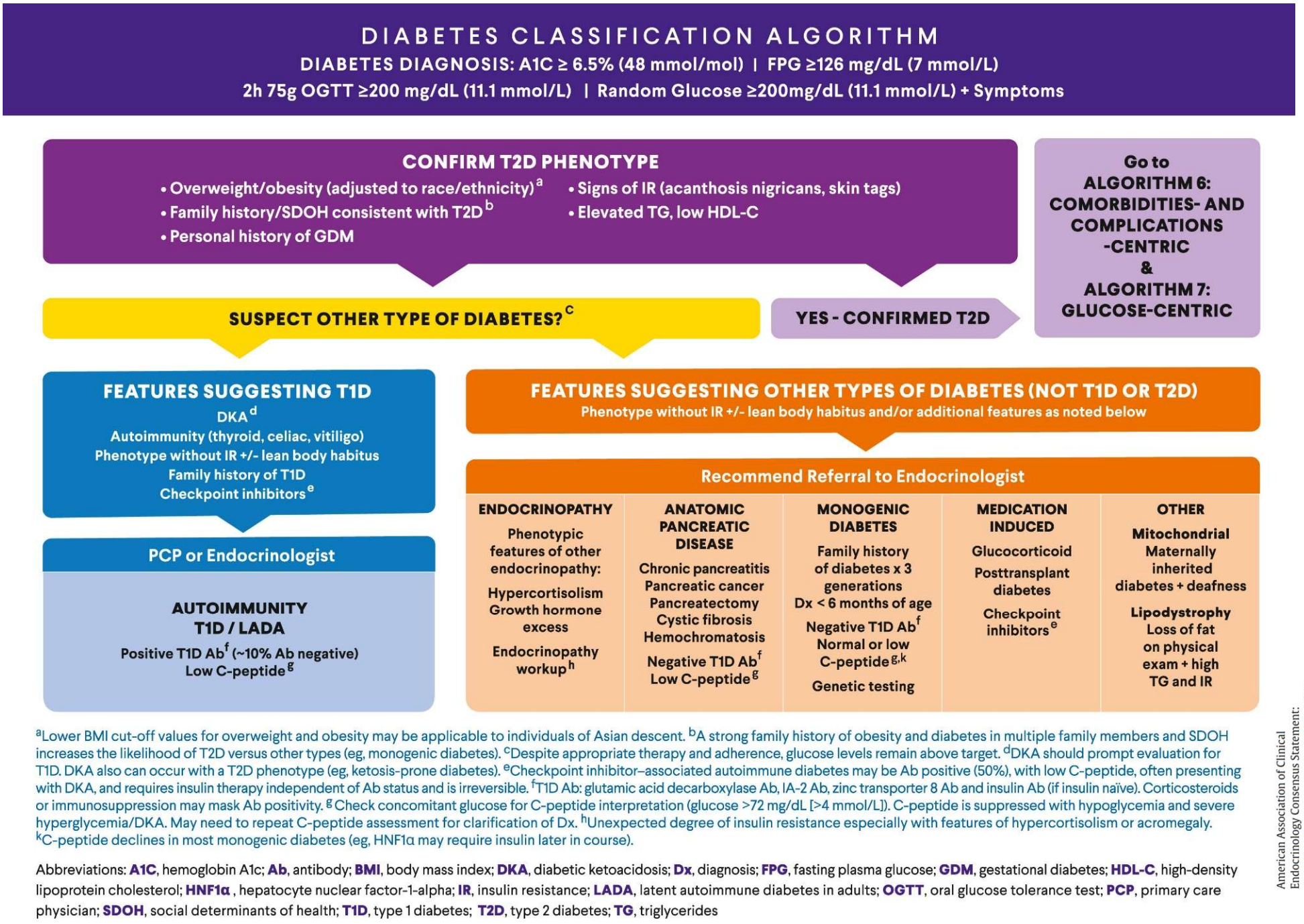
Screen people for diabetes within 3–6 months following an episode of acute pancreatitis and annually thereafter

Slide 107

BT1 updated

Beverly Thomassian, 2026-03-20T22:55:15.658

AACE 2026 Classification Algorithm



[a]Lower BMI cut-off values for overweight and obesity may be applicable to individuals of Asian descent. [b]A strong family history of obesity and diabetes in multiple family members and SDOH increases the likelihood of T2D versus other types (eg, monogenic diabetes). [c]Despite appropriate therapy and adherence, glucose levels remain above target. [d]DKA should prompt evaluation for T1D. DKA also can occur with a T2D phenotype (eg, ketosis-prone diabetes). [e]Checkpoint inhibitor–associated autoimmune diabetes may be Ab positive (50%), with low C-peptide, often presenting with DKA, and requires insulin therapy independent of Ab status and is irreversible. [f]T1D Ab: glutamic acid decarboxylase Ab, IA-2 Ab, zinc transporter 8 Ab and insulin Ab (if insulin naïve). Corticosteroids or immunosuppression may mask Ab positivity. [g]Check concomitant glucose for C-peptide interpretation (glucose >72 mg/dL [>4 mmol/L]). C-peptide is suppressed with hypoglycemia and severe hyperglycemia/DKA. May need to repeat C-peptide assessment for clarification of Dx. [h]Unexpected degree of insulin resistance especially with features of hypercortisolism or acromegaly. [k]C-peptide declines in most monogenic diabetes (eg, HNF1α may require insulin later in course).

Abbreviations: **A1C**, hemoglobin A1c; **Ab**, antibody; **BMI**, body mass index; **DKA**, diabetic ketoacidosis; **Dx**, diagnosis; **FPG**, fasting plasma glucose; **GDM**, gestational diabetes; **HDL-C**, high-density lipoprotein cholesterol; **HNF1α** , hepatocyte nuclear factor-1-alpha; **IR**, insulin resistance; **LADA**, latent autoimmune diabetes in adults; **OGTT**, oral glucose tolerance test; **PCP**, primary care physician; **SDOH**, social determinants of health; **T1D**, type 1 diabetes; **T2D**, type 2 diabetes; **TG**, triglycerides

American Association of Clinical Endocrinology Consensus Statement: Algorithm for Management of Adults With Type 2 Diabetes – 2026 Update

Diabetes Bingo “DiaBingo”
Shout out Right Answer

DiaBingo

B Frequent skin and yeast infections

B A BMI of ____ or greater indicates increased pre/diabetes risk?

B To reduce complications, control **A**1c, **B**lood pressure, **C**holesterol

B PreDiabetes – fasting glucose level of ___ to ____

B Erectile dysfunction indicates greater risk for ____

B Diabetes – fasting glucose level____ or greater

B Type 1 diabetes is best described as an _____ disease

B People with diabetes are _____ times more likely to die of heart dx

B Elevated triglycerides, < HDL, smaller dense LDL

B Each percentage point of A1C = _____ mg/dl glucose

B At dx of type 2, about __% of the beta cell function is lost

B Diabetes – random glucose ____ or greater

Incretins:
GLP-1 & GLP-1/GIP Receptor Agonists

GLP-1: glucagon like peptide 1
GIP: glucose-dependent insulinotropic polypeptide

The Rise of GLP-1 Agonists

- 1st available in 2005 (exenatide)
- Semaglutide FDA approval 2017
- Tirzepatide FDA approval 2022
- 12% (1 in 8 adults) said they have taken a GLP-1 agonist

KFF Health Tracking Poll May 2024: The Public's Use and Views of GLP-1 Drugs | KFF

Polling Question 6A

GLP-1 Medications are approved for all of the following conditions except:

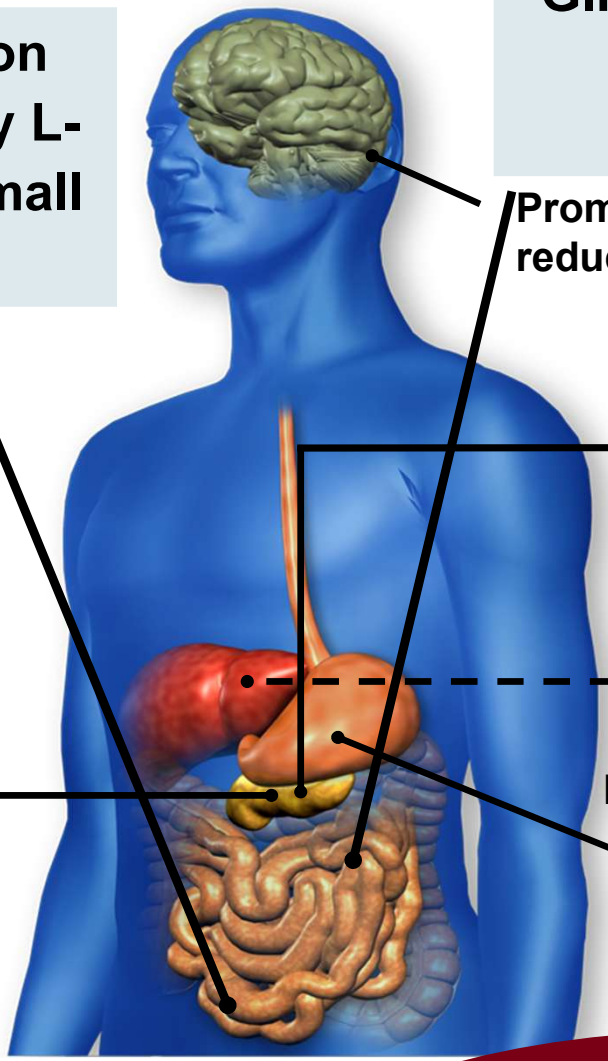
A. Obesity
B. Type 2 Diabetes
C. Sleep apnea
D. Alcohol use disorder
E. Kidney disease

DI1

Understanding the Natural Role of Incretins

GLP-1 secreted upon ingestion of food by L-cells in the distal small intenstine

GIP secreted by K-cells upon ingestion of food in the proximal small intestine



Promotes satiety and reduces appetite

↑ Beta-cell response

Alpha cells:
↓ Postprandial glucagon secretion

Liver:
↓ Glucagon reduces hepatic glucose output

Beta cells:
Enhances glucose-dependent insulin secretion

Stomach:
Helps regulate gastric emptying

GLP-1 degraded by DPP-4 w/in minutes

Adapted from Flint A, et al. *J Clin Invest.* 1998;101:515-520
Adapted from Larsson H, et al. *Acta Physiol Scand.* 1997;160:413-422
Adapted from Nauck MA, et al. *Diabetologia.* 1996;39:1546-1553
Adapted from Drucker DJ. *Diabetes.* 1998;47:159-169

Slide 114

DI1 New slide

Diana Isaacs, 2026-04-07T02:04:56.320

GLP-1 and GIP

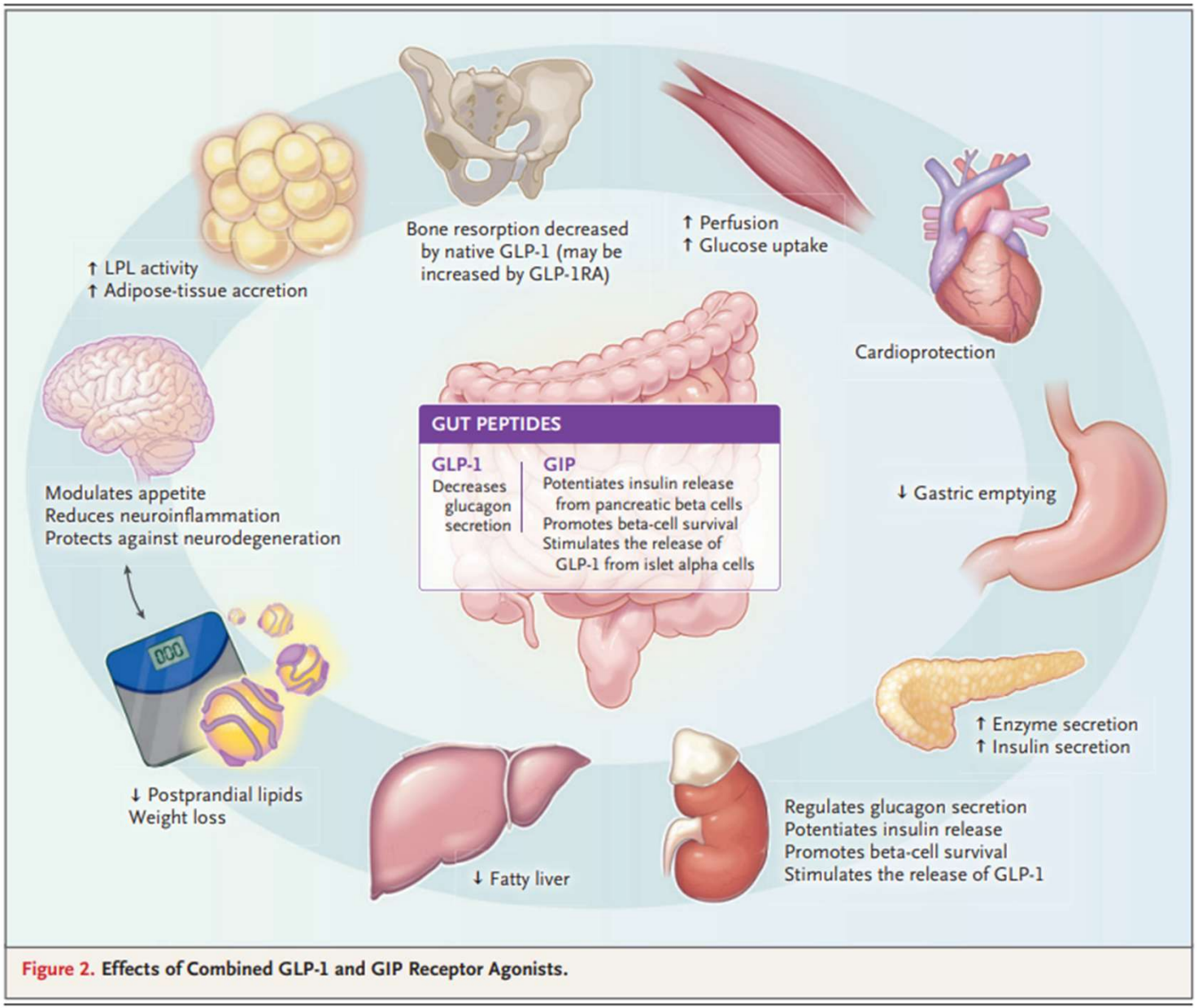


Figure 2. Effects of Combined GLP-1 and GIP Receptor Agonists.

Rosen CJ, Ingelfinger JR. GLP-1 Receptor Agonists. N Engl J Med. 2026 Apr 2;394(13):1313-1324.

Pocket Card: GLP-1 & GIP RA

GLP-1 & GIP for Diabetes & Weight Loss

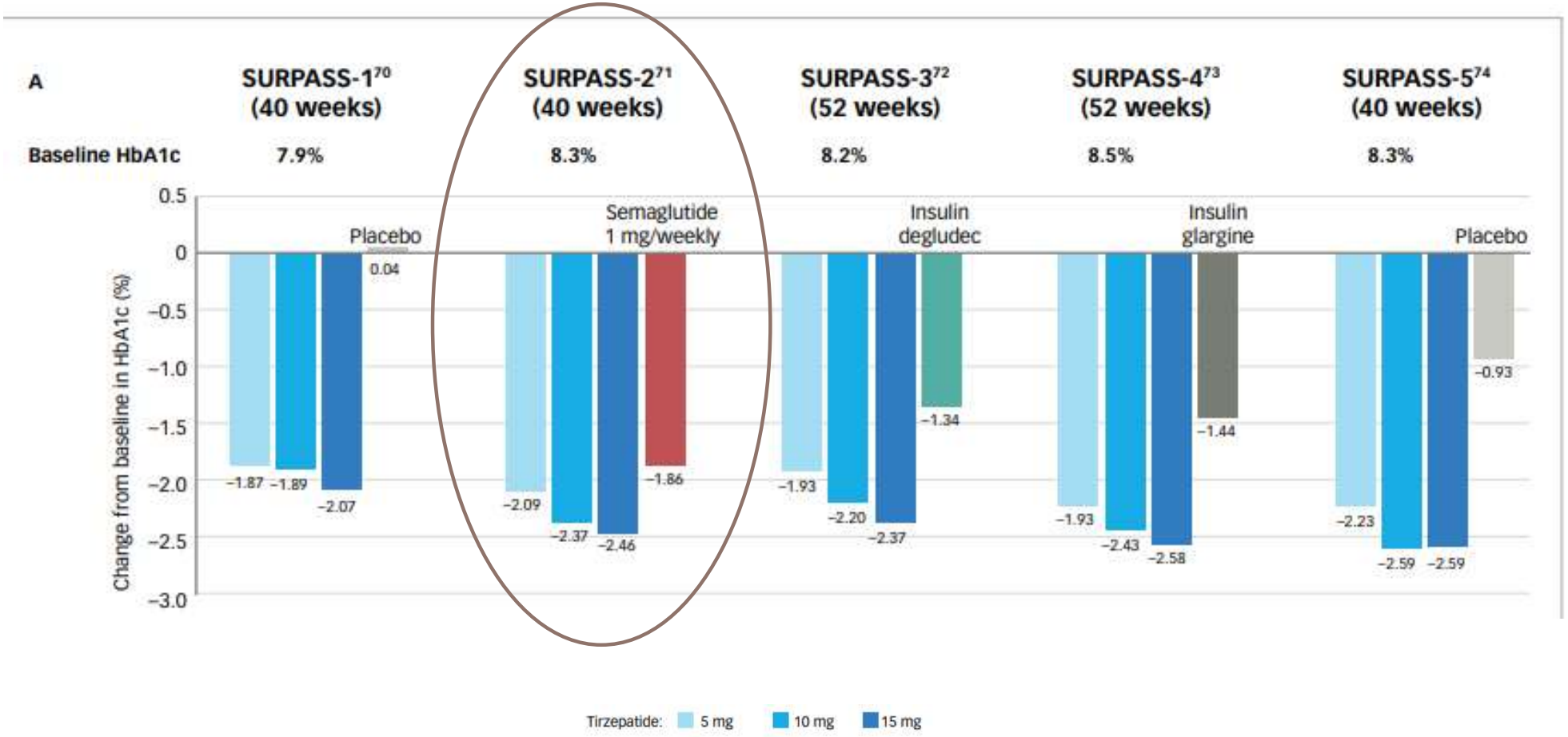
Class/Action	Generic Name	Diabetes Version Dose & Indications	Wt loss Version Max Dose & Indications	Considerations
GLP-1 RA - Glucagon Like Peptide Receptor Agonist **"Incretin Mimetic"** • Increases insulin release with food • Slows gastric emptying • Promotes satiety • Suppresses glucagon	exenatide 2x day injection	exenatide 5 and 10 mcg		**Side effects:** N/V, wt loss. Report signs of pancreatitis or ileus, stop med. **Black box warning:** Avoid if family history medullary thyroid tumor. All FDA approved to reduce risk of CV disease, death, MI, stroke (except exenatide, Saxenda). †Approved for peds 10-17 yrs ††Approved for Peds 12-17 years Lowers A1C ~ 0.5 - 1.6% Wt loss: 4-9% (Diabetes versions)
	liraglutide 1x day injection	Victoza† 0.6, 1.2, 1.8mg	Saxenda†† - 3.0mg	
	dulaglutide 1x week injection	Trulicity† 0.75, 1.5, 3.0, 4.5mg		
	semaglutide 1x week injection	Ozempic 0.25, 0.5, 1.0, 2.0mg Tx for CKD	Wegovy†† - 2.4mg High Dose - 7.2mg Tx for MASH	
	semaglutide Daily Oral - fasting w/ H20	Oral Ozempic 1.5, 4, 9 mg Rybelsus 3, 7, 14 mg	Wegovy - 25mg Oral tablet	
GLP-1 & GIP Receptor Agonist Activates receptors for GLP-1 (see above) & Glucose-dependent Insulinotropic Polypeptide (GIP).	tirzepatide 1x week injection. Single dose via prefilled pen or vial.	Mounjaro† 2.5, 5.0, 7.5, 10, 12.5, 15 mg Gradually adjust dose based on shared decision, individual goals.	Zepbound Max dose 15mg Tx for sleep apnea	**Side effects:** N/V, wt loss. Report pancreatitis or signs of ileus, stop med. **Black box warning:** Avoid if family hx of medullary thyroid tumor. †Approved for peds 10-17 yrs Lowers A1C ~ 1.8 - 2.4% Wt loss: 7-14% (Diabetes versions)

Incretin Device Show/Tell

Oral Semaglutide (Rybelsus, Ozempic)

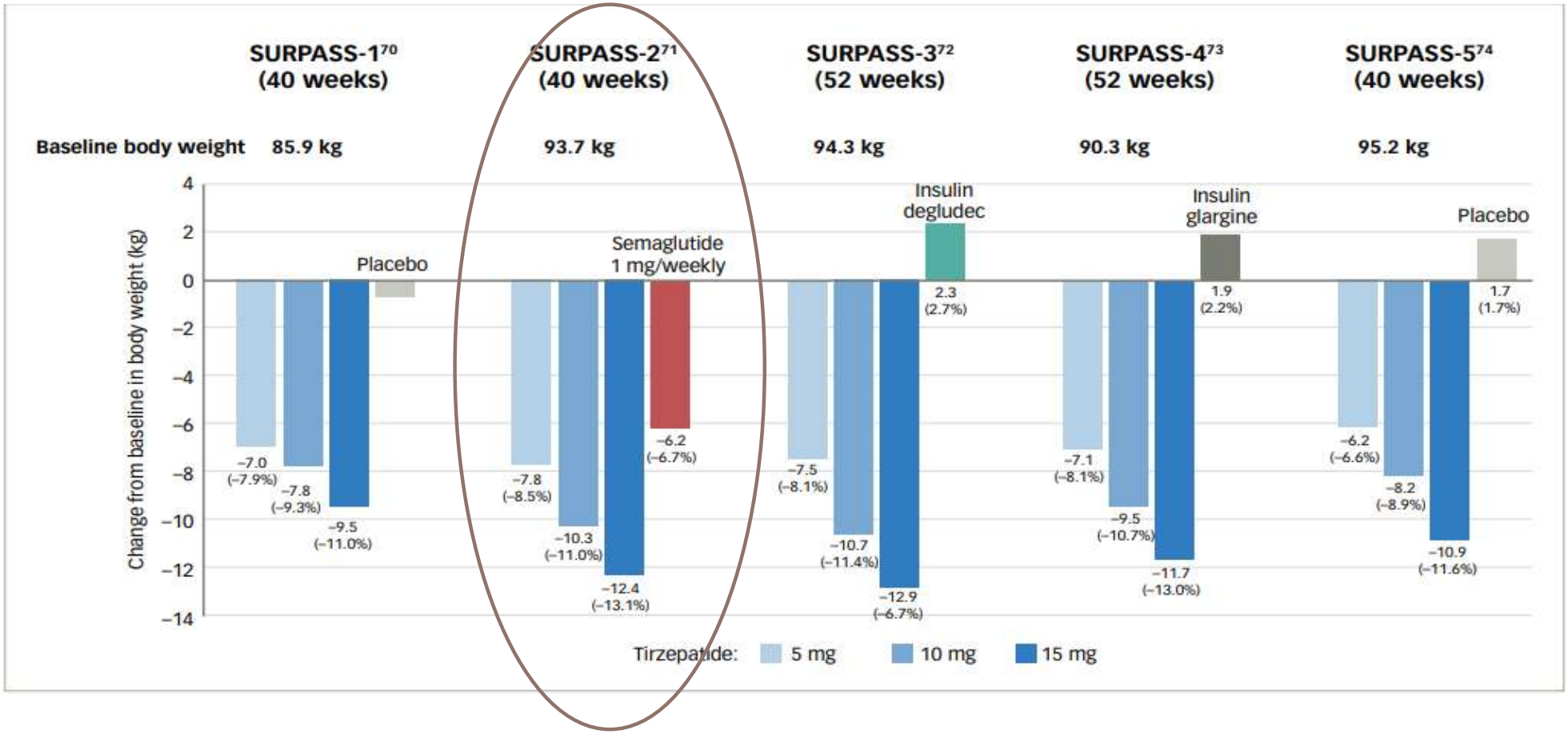
- Barriers to GLP-1 oral absorption:
  - Degradation by gastrointestinal enzymes
  - pH induced conformational changes
  - Limited protein permeability of the intestinal membrane
- Semaglutide co-formulated with sodium N-(8-[2-hydroxybenzoyl] amino) caprylate (**SNAC**), an absorption enhancer
- Absorbed in stomach where SNAC causes a localized increase in pH, leading to higher solubility and protection against proteolytic degradation
- Take daily at least 30 mins before first food, beverage, or other oral meds
- Take with no more than 4 ounces of plain water
- Swallow tablets whole (don't cut or crush)

SURPASS (Tirzepatide): A1C Change



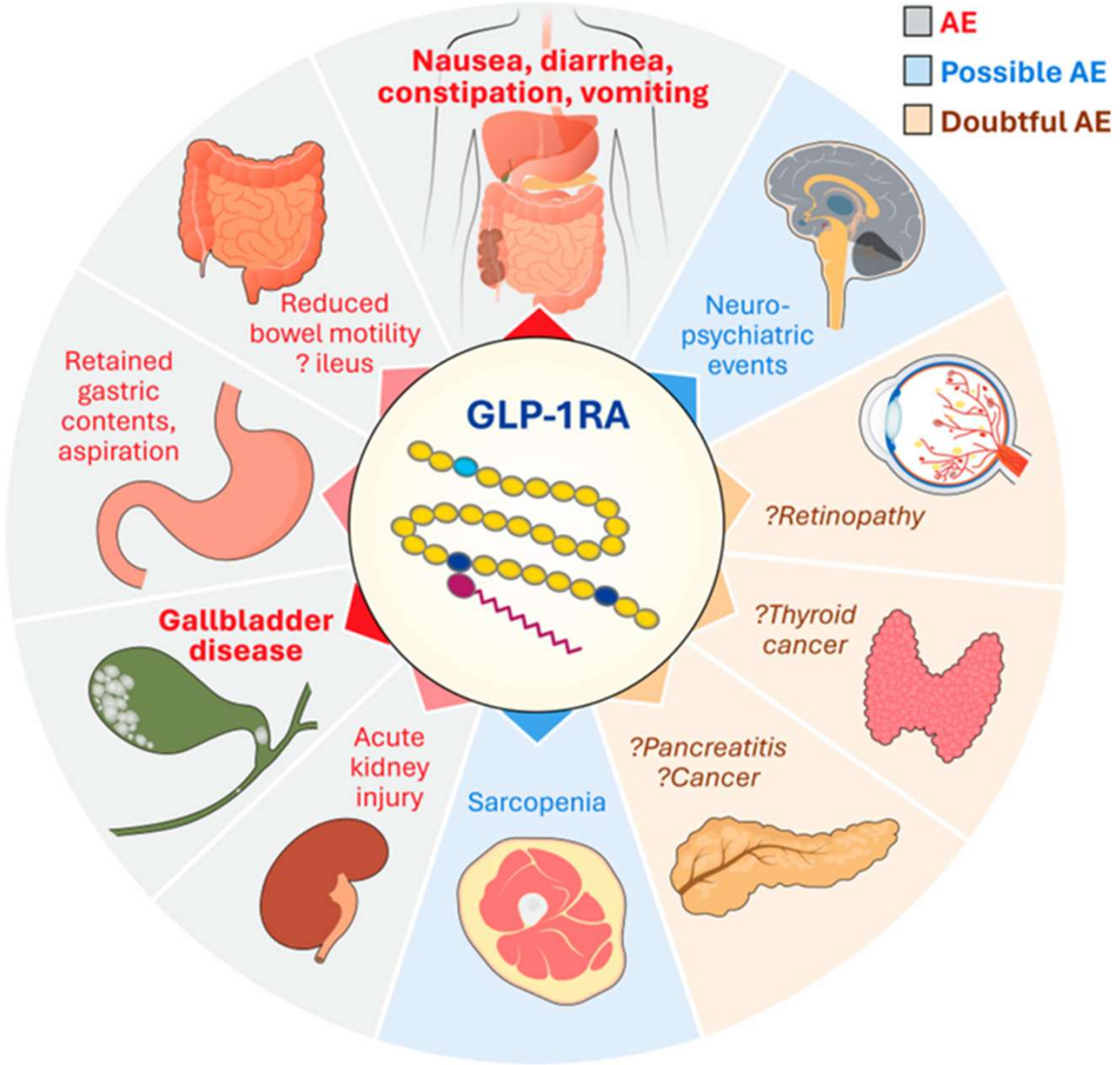
Rosenstock J, et al. Lancet. 2021;398:143–55. Frias JP, et al. N Engl J Med. 2021;358:503–15. 82. Ludvik B, et al. Lancet. 2021;398:583–98. 83. Del Prato S et al. Lancet. 2021;398:1811–24. 84. Dahl Det al. Diabetologia. 2021:64(Suppl. 1):S13. Abstr 20. Kaneko S.. touchREV Endocrinol. 2022 Jun;18(1):10-19.

SURPASS (Tirzepatide): Body Weight Change



Rosenstock J, et al. Lancet. 2021;398:143–55. Frias JP, et al. N Engl J Med. 2021;358:503–15. 82. Ludvik B, et al. Lancet. 2021;398:583–98. 83. Del Prato S et al. Lancet. 2021;398:1811–24. 84. Dahl Det al. Diabetologia. 2021:64(Suppl. 1):S13. Abstr 20. Kaneko S.. touchREV Endocrinol. 2022 Jun;18(1):10-19.

GLP-1 Safety Profile



Drucker DJ. Efficacy and Safety of GLP-1 Medicines for Type 2 Diabetes and Obesity. Diabetes Care. 2024 Nov 1;47(11):1873-1888.

DI1

Poll Question 7

Alice injects tirzepatide once a week.
Which of the following is true?

a. May experience constipation
b. May cause hypoglycemia
c. Muscle aches are common
d. Doubles risk of pancreatic cancer

Slide 122

DI1 Changed choice a, to make it a little harder.
Diana Isaacs, 2025-08-24T23:36:07.947

GLP-1 Adverse Effects

- GI side effects
  - Nausea, appetite loss, diarrhea, constipation, dyspepsia, abdominal pain
- Pancreatitis
- Hypoglycemia with concomitant use of insulin or secretagogues
- Acute kidney injury
- Thyroid C-Cell tumors –black box warning
  - Avoid if personal or family history of medullary thyroid carcinoma or personal history of MEN-2
- Acute gallbladder disease
- Worsening retinopathy

Package inserts.

DI1

GLP-1 FDA Warning

- Pulmonary Aspiration During General Anesthesia or Deep Sedation
- Rare post marketing reports of pulmonary aspiration in patients receiving GLP-1 RA undergoing elective surgeries or procedures requiring general anesthesia or deep sedation who had residual gastric contents despite following preoperative fasting recommendations
- Instruct patients to inform healthcare providers prior to any planned surgeries or procedures if they are taking a GLP-1 RA

Slide 124

DI1 Slightly modified wording

Diana Isaacs, 2025-08-24T23:38:31.225

Holding GLP-1 RA Before Surgery?

- Balance withholding GLP-1 RA with risk of hyperglycemia
- Consider rapid sequence intubation, longer liquid fast or POC ultrasound to reduce risk of aspiration
- Bridging off therapy can be resource intensive, and lead to other SE-hyperglycemia or hypoglycemia
- If decision to hold, general guidance
  - 1 day for daily formulations
  - 1 week for weekly formulations

- Joshi, Girish P. et al. Preprocedure Care of Patients on Glucagon-like Peptide-1 Receptor Agonists: A Multisociety Clinical Practice Guidance. Anesthesiology 141(6):p 1208-1209, December 2024.

Counseling Points: GLP-1 RA & GLP-1/GIP

- Avoid if personal or family history of medullary thyroid cancer or personal history of MEN-2
- Avoid in combo with DPP-4 inhibitors
- Watch for intestinal obstruction
- Increased risk of biliary disease
- Education: Eat smaller meals to reduce nausea and limit high fat meals
- Use of non-FDA *compounded* products not recommended

DI1

Slide 126

DI1 Added NAION and biliary disease and aspiration warning.
Diana Isaacs, 2026-02-25T04:41:07.416

DI1 0 Split into 2 slides
Diana Isaacs, 2026-02-25T04:46:16.583

Counseling Points: GLP-1 RA & GLP-1/GIP

- Potential risk of pancreatitis
- If on tirzepitide, use back up contraception for first 4 weeks
- Warning about aspiration during surgery
- Ask about recent eye exam
  - Potential increase in diabetes retinopathy
  - Nonarteritic anterior ischemic optic neuropathy (NAION) reported (rare incidence)

DI1

Slide 127

DI1 Added NAION and biliary disease and aspiration warning.
Diana Isaacs, 2026-02-25T04:41:07.416

Poll Question 8

AR is 36 years old with type 2 diabetes and a BMI of 41kg/m^2. Current diabetes medications include: metformin, sitagliptin (Januvia) and empagliflozin (Jardiance) at maximum doses. AR is prescribed tirzepatide (Mounjaro). Based on this information, what action do you recommend to the provider?

A. Verify kidney function first.
B. Stop the sitagliptin when initiating tirzepatide
C. Decrease the dose of metformin to prevent hypoglycemia.
D. Evaluate thyroid function before starting tirzepatide.

Injectable Incretins Approved for Weight Loss

- Liraglutide:
  - Victoza 1.8 mg (diabetes)
  - Saxenda 3 mg (wt loss)

- Semaglutide inj:
  - Ozempic 2mg (diabetes)
    - Wegovy 7.4mg (wt loss)

- Tirzepatide
  - Mounjaro 15mg (diabetes)
  - Zepbound 15mg (wt loss)

All 3 Approved for use in adults with :

- BMI of ≥ 30 or
- BMI of ≥ 27 or greater who have hypertension, type 2 diabetes, or dyslipidemia.

Semaglutide (Wegovy) also indicated for those overweight/obesity & ASCVD to reduce CVD events and for those with metabolic dysfunction-associated steatohepatitis (MASH)
Tirzepatide (Zepbound) also indicated for those with obesity & Sleep Apnea

DI1

Oral GLP-1 RA Approved for Weight Loss

- Semaglutide oral:
  - Rybelsus 14mg (Diabetes)
  - Ozempic 9mg (Diabetes)
  - Wegovy 25mg (wt. loss)

- Orforglipron oral
  - Foundayo 17.2 mg (wt loss)

Both Approved for use in adults with :

- BMI of ≥ 30 or
- BMI of ≥ 27 or greater who have hypertension, type 2 diabetes, or dyslipidemia.

Oral Semaglutide (Wegovy) also indicated for those overweight/obesity & ASCVD to reduce CVD events

Slide 130

DI1 New slide

Diana Isaacs, 2026-04-07T02:33:37.988

GLP-1/GIP Receptor Agonist Indications

Indication Chart for GLP/GIP Receptor Agonists - Diabetes, Weight, CVD and Others

Drug	Type 2 Diabetes	Weight Loss Indication	CV Indication	Other Indication
Exenatide Immediate Release (IR)	Yes	No	No	
Dulaglutide (Trulicity)	Yes, 10 yrs and older	No	Yes	
Liraglutide (Victoza)	Yes, 10 yrs and older	No	Yes	
Liraglutide (Saxenda)	No	Yes, 12 yrs and older	No	
Semaglutide (Ozempic)	Yes	No	Yes	CKD
Semaglutide (Wegovy)	No	Yes, 12 yrs and older	Yes	MASH
Oral Semaglutide (Rybelsus)	Yes	No	Yes	
Oral Semaglutide (Wegovy)	No	Yes	Yes	
Tirzepatide (Mounjaro)	Yes	Yes, 12 yrs and older	No	
Tirzepatide (Zepbound)	No	Yes	No	Sleep Apnea

Package inserts, dailymed.nlm.nih.gov 2026

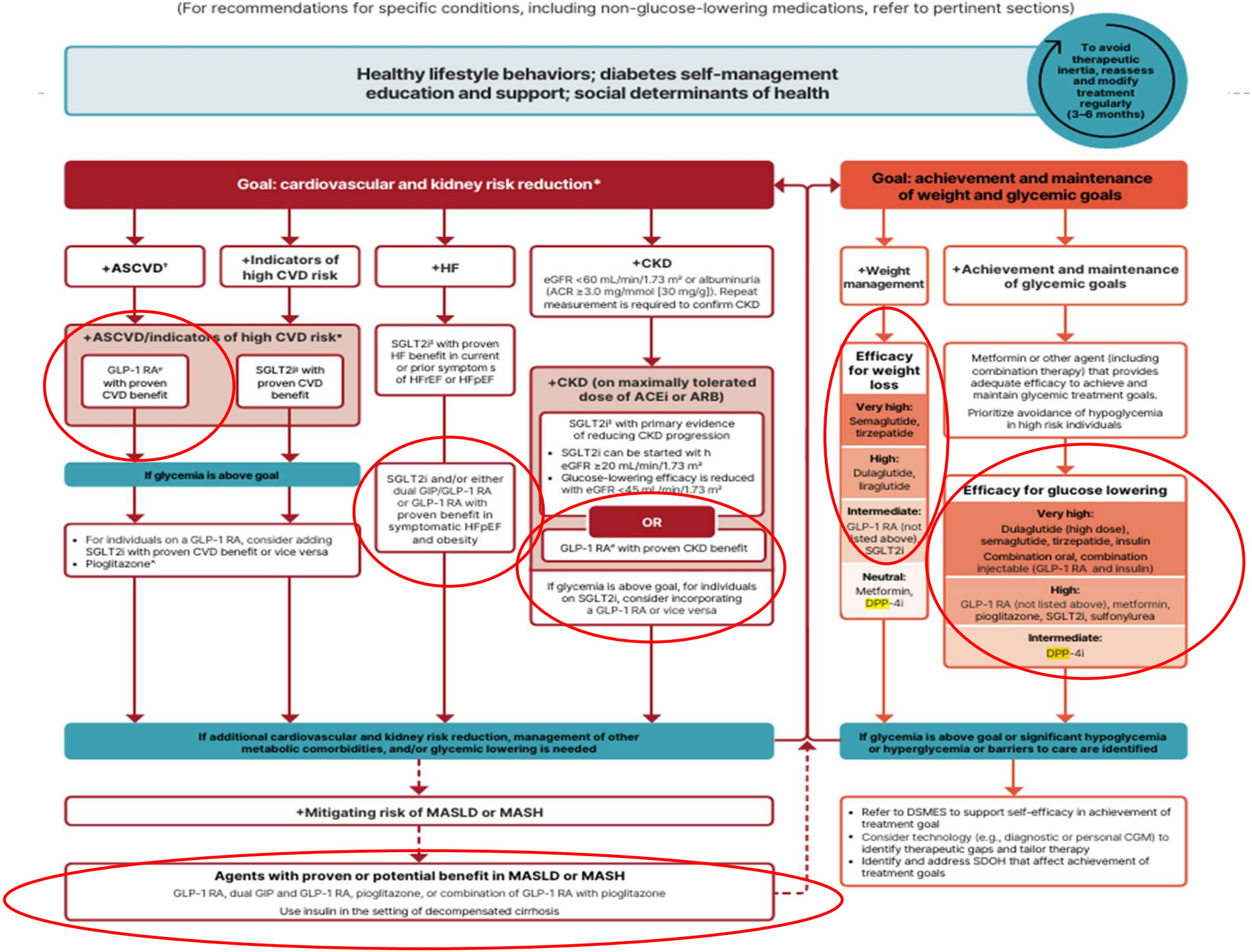
Where Do Incretins Fit within the Guidelines for Diabetes?

Click to edit Master subtitle style

DI1

Use of glucose-lowering medications in the management of type 2 diabetes

(For recommendations for specific conditions, including non-glucose-lowering medications, refer to pertinent sections)



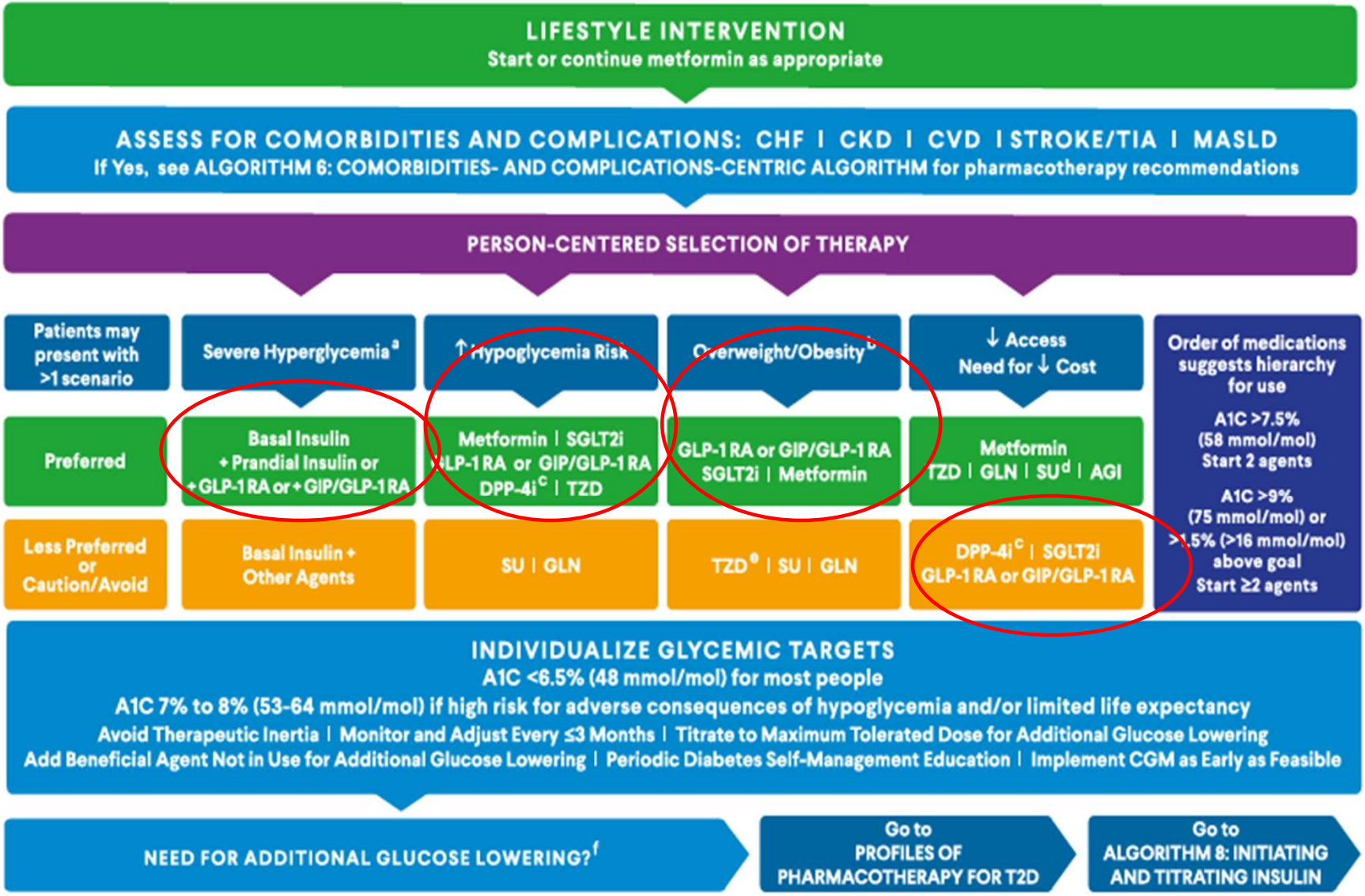
Slide 133

DI1 Updated with 2026 algorithm

Diana Isaacs, 2026-02-25T04:20:06.519

DI1

GLUCOSE-CENTRIC GLYCEMIC CONTROL ALGORITHM



[a]For SEVERE HYPERGLYCEMIA (A1C >10% [>86 mmol/mol] and/or glucose >300 mg/dL [16.7 mmol/L] with symptoms), strongly consider basal insulin (Go to ALGORITHM 8: INITATING AND TITRATING INSULIN). Avoid use of GLP-1 RA or GIP/GLP-1 RA alone in severe hyperglycemia. These agents require titration over weeks which can delay glycemic control. After glucose toxicity is resolved, reassess medical therapy and consider other agents. [b]See **AACE Algorithm for the Treatment of Obesity/Adiposity-Based Chronic Disease-2025 Update.** [c]DPP-4i and GLP-1 RA or GIP/GLP-1 RA should not be combined. [d]SUs may be inappropriate in older adults due to risk of hypoglycemia. [e]TZDs can cause increased weight partially attributable to fluid retention. [f]If despite appropriate therapy and adherence, glucose levels remain above target, also reconsider ALGORITHM 3: DIABETES CLASSIFICATION.

Abbreviations: **A1C**, hemoglobin A1C; **AGI**, alpha-glucosidase inhibitor; **CGM**, continuous glucose monitoring; **CHF**, congestive heart failure; **CKD**, chronic kidney disease; **CVD**, cardiovascular disease; **DPP-4i**, dipeptidyl peptidase 4 inhibitor; **GIP**, glucose-dependent insulinotropic polypeptide; **GLN**, glinide; **GLP-1 RA**, glucagon-like peptide 1 receptor agonist; **MASLD**, metabolic dysfunction-associated steatotic liver disease; **SGLT2i**, sodium glucose transporter 2 inhibitor; **SU**, sulfonylurea; **TIA**, transient ischemic attack; **T2D**, type 2 diabetes; **TZD**, thiazoladinedione

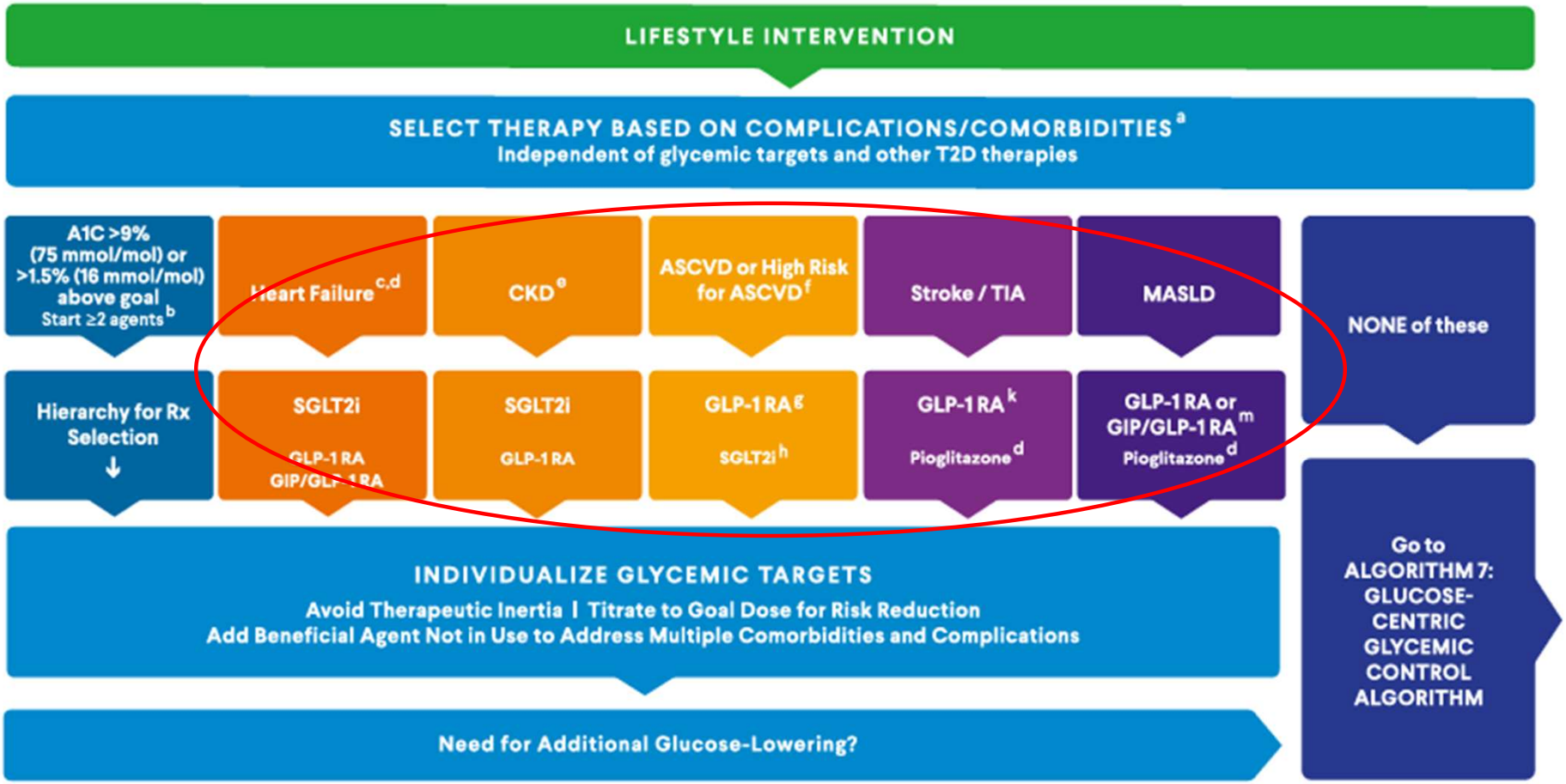
Slide 134

DI1 Updated algorithm

Diana Isaacs, 2026-04-07T02:45:27.116

DI1

COMORBIDITIES- AND COMPLICATIONS-CENTRIC GLYCEMIC CONTROL ALGORITHM



[a]CVOTs included metformin as baseline therapy. [b]For SEVERE HYPERGLYCEMIA (A1C >10% [>86 mmol/mol] and/or glucose >300 mg/dL [16.7 mmol/L]) with symptoms, strongly consider basal insulin (Go to ALGORITHM 8: INITIATING AND TITRATING INSULIN). Avoid use of GLP-1 RA or GIP/GLP-1 RA alone in severe hyperglycemia. These agents require titration over weeks delaying glycemic control. [c]Use SGLT2i with proven benefit (dapagliflozin, empagliflozin). Semaglutide/tirzepatide have potential benefit in obesity-related HFpEF. [d]TZDs are contraindicated in NYHA Class III/IV HF. Start at 15 mg, and balance benefits vs risks of weight gain. Allow >4 weeks at each dose before titration. [e]CKD: Use SGLT2i with proven benefit (canagliflozin, dapagliflozin, empagliflozin) or GLP-1 RA (semaglutide injection). [f]High risk for ASCVD: age ≥55 AND albuminuria or proteinuria, hypertension and LV hypertrophy, LV systolic or diastolic dysfunction, ankle-brachial index <0.9. [g]GLP-1 RA: oral or subcutaneous semaglutide, liraglutide, or dulaglutide. [h]SGLT2i: canagliflozin, empagliflozin, or dapagliflozin. [k]Stroke: semaglutide subcutaneous or dulaglutide. [m]MASLD: semaglutide or tirzepatide.

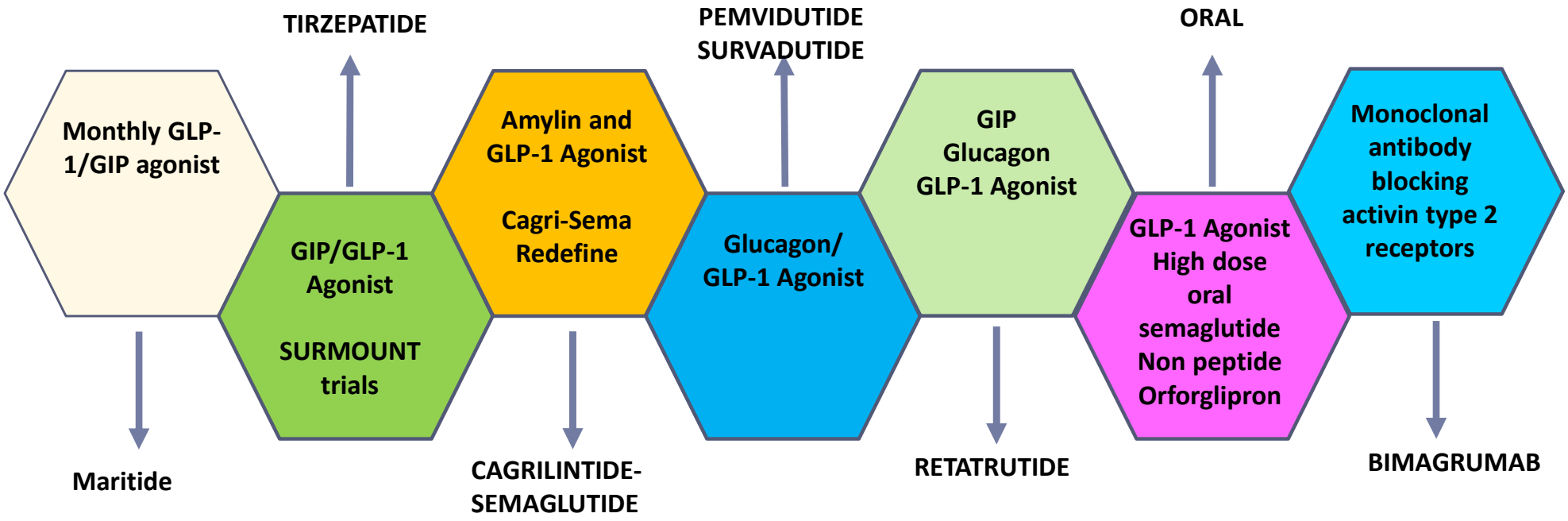
Abbreviations: **A1C**, hemoglobin A1c; **ASCVD**, atherosclerotic cardiovascular disease; **CKD**, chronic kidney disease; **CVOT**, cardiovascular outcomes trial; **eGFR**, estimated glomerular filtration rate; **GIP**, glucose-dependent insulinotropic polypeptide; **GLP-1 RA**, glucagon-like peptide-1 receptor agonist; **HF**, Heart Failure; **HFpEF**, heart failure with preserved ejection fraction; **LV**, left ventricular; **MASLD**, metabolic dysfunction-associated steatotic liver disease; **NYHA**, New York Heart Association; **Rx**, prescription; **SGLT2i**, sodium glucose cotransporter 2 inhibitor; **T2D**, type 2 diabetes; **TIA**, transient ischemic attack; **TZD**, thiazolidinedione; **UACR**, urine albumin-creatinine ratio

Slide 135

DI1 Updated algorithm

Diana Isaacs, 2026-04-07T02:45:35.013

The Future of Incretins is Bright



Medication Taking Behaviors

- Adequate medication taking is defined as 80% of prescribed doses
- 23% of time, if A1c, B/P, lipids above target - due to med taking behavior
- Assess for barriers
- If taking meds 80% of time and goals not met, consider medication intensification

Barriers include:
Forgetting to fill Rx, forgetting to take, fear, depression, health beliefs, med complexity, cost, knowledge gap, system factors, etc.

Work on targeted approach for specific barrier

6. Glycemic Goals & Hypo

A1C

Blood Pressure

Cardiovascular risk reduction

BT1

ADA 2026 ABC Goals

A1c less than 7% (individualize)

- Pre-meal BG 80-130
- Post meal BG <180
- Time in Range (70-180) 70% of time

Blood Pressure

<130/80

<120/80 for high risk

Cholesterol

- Statin therapy based on age & risk status
- If 40+ with ASCVD Risk, decrease LDL by 50%, LDL <70
- If 40+ with ASCVD, decrease LDL by 50%, LDL <55

Slide 139

BT1 updated

Beverly Thomassian, 2026-04-07T18:46:52.708

Poll Question 9

- Which of the following methods can be used to assess glycemic status?
  - A. A1C
  - B. Blood glucose monitoring
  - C. Time in Range
  - D. Fructosamine
  - E. All of the above

6. Assess Glycemic Status

- A1C measurement
- Blood glucose monitoring (BGM)
  - by capillary (finger-stick) devices
- Continuous glucose monitoring (CGM)
  - using time in range (TIR) or
  - mean CGM glucose.
- Fructosamine – 2-4 wk glucose average
  - glycated albumin for those with anemia or hemoglobinopathies

6. Glycemic Goals, Hypoglycemia, and Hyperglycemic Crises: Standards of Care in Diabetes—2026 FREE

American Diabetes Association Professional Practice Committee for Diabetes*

6. Glycemic Targets for Non-Pregnant Adults

- **A1c < 7%** - a reasonable goal for adults.
- **A1c < 6.5%** - for those without significant risk of hypoglycemia
- **A1c < 8%** - for those with history of hypoglycemia, limited life expectancy, or those with longstanding diabetes and vascular complications.
- **A1c Check Frequency:**
  - If meeting goal - At least 2 times a year
  - If *not* meeting goal – Quarterly

- **Also review Ambulatory Glucose Profile**

6. Glycemic Targets
Individualize Targets – ADA

- Pre-Prandial BG 80- 130
- 1-2 hr post prandial < than 180

  *for nonpregnant adults
- Time in Range: 70%
  - BG of 70-180 mg/dL

A1c and Estimated Avg Glucose (eAG)

A1c (%)	eAG
5	**97** (76-120)
6	**126** (100-152)
7	**154** (123-185)
8	**183** (147-217)
9	**212** (170 -249)
10	**240** (193-282)
11	**269** (217-314)
12	**298** (240-347)

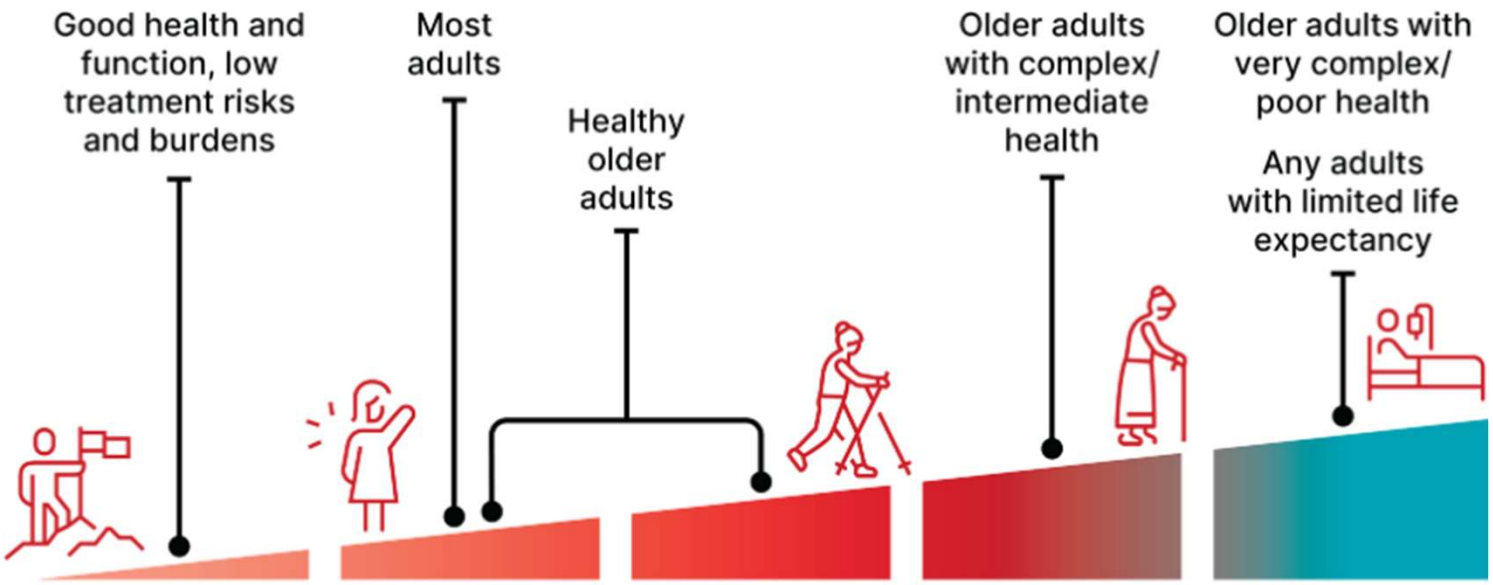
6. Glycemic Goals, Hypoglycemia, and Hyperglycemic Crises: Standards of Care in Diabetes—2026 FREE

American Diabetes Association Professional Practice Committee for Diabetes*

eAG = 28.7 x A1c-46.7 ~ 29 pts per 1%

Translating the A1c Assay Into eAG – ADAG Study

BT1



A1C goals	<6.5%	<7.0%	<7.5%	<8.0%	No A1C goal
CGM goals TIR:	—	>70%	—	>50%	—
• TBR <70	—	<4%	—	<1%	<1%
• TBR <54	—	<1%	—	<1%	<1%
• TAR >180	—	<25%	—	<50%	Avoid symptomatic hyperglycemia
• TAR >250	—	<5%	—	<10%	

Modifying Factors

Favor more stringent goal	Favor less stringent goal
Short diabetes duration	Long diabetes duration
Low hypoglycemia risk	High hypoglycemia risk
Low treatment risks and burdens	High treatment risks and burdens
Pharmacotherapy with cardiovascular, kidney, weight, or other benefits	Pharmacotherapy without nonglycemic benefits
No cardiovascular complications	Established cardiovascular complications
Few or minor comorbidities	Severe, life-limiting comorbidities

6. Glycemic Goals, Hypoglycemia, and Hyperglycemic Crises: Standards of Care in Diabetes—2026 FREE

American Diabetes Association Professional Practice Committee for Diabetes*

Slide 146

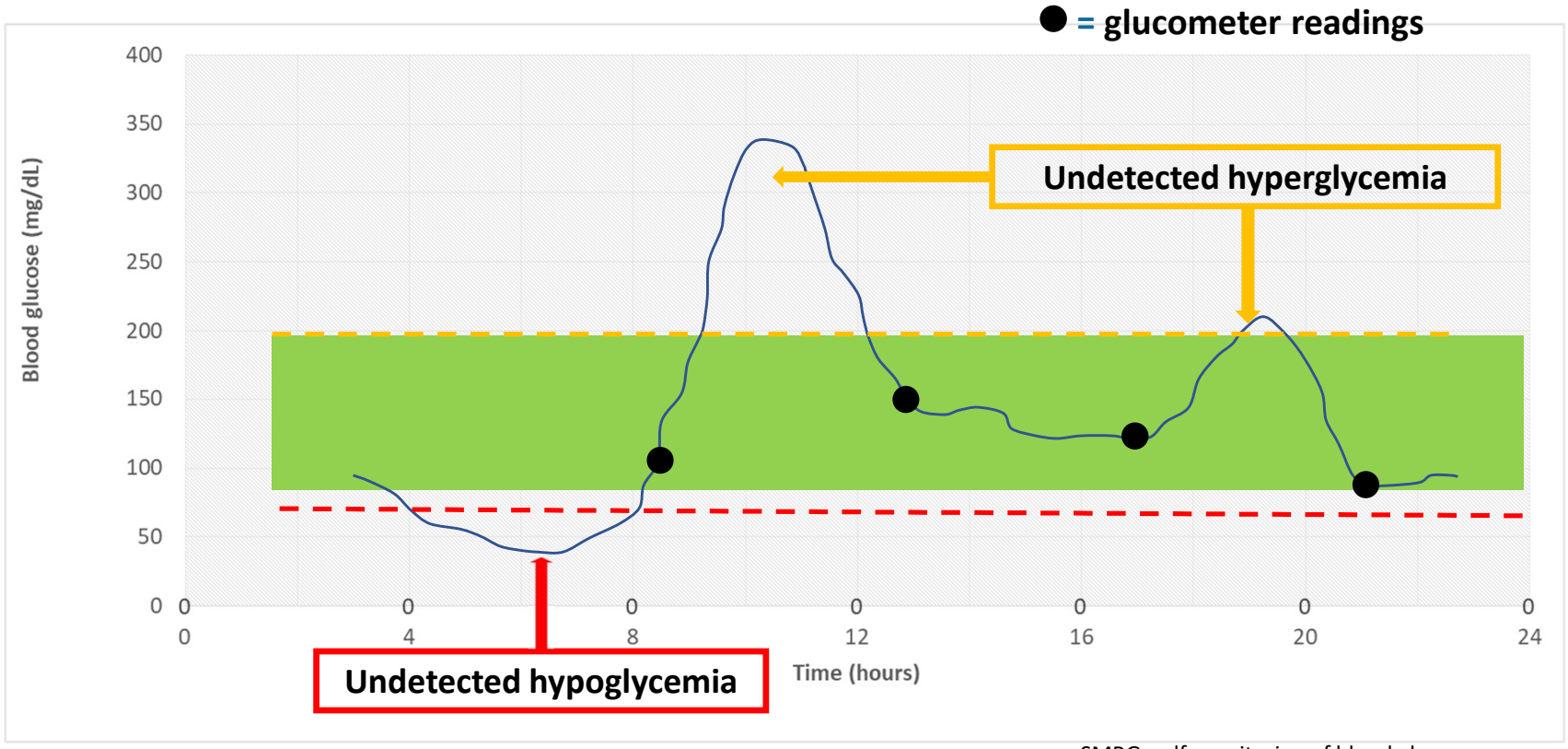
BT1 Updated

Beverly Thomassian, 2026-01-13T05:33:37.591

Enjoy Lunch Break 12:00 to 12:55 PDT

Question and Answer Session from 12:55 to 1pm

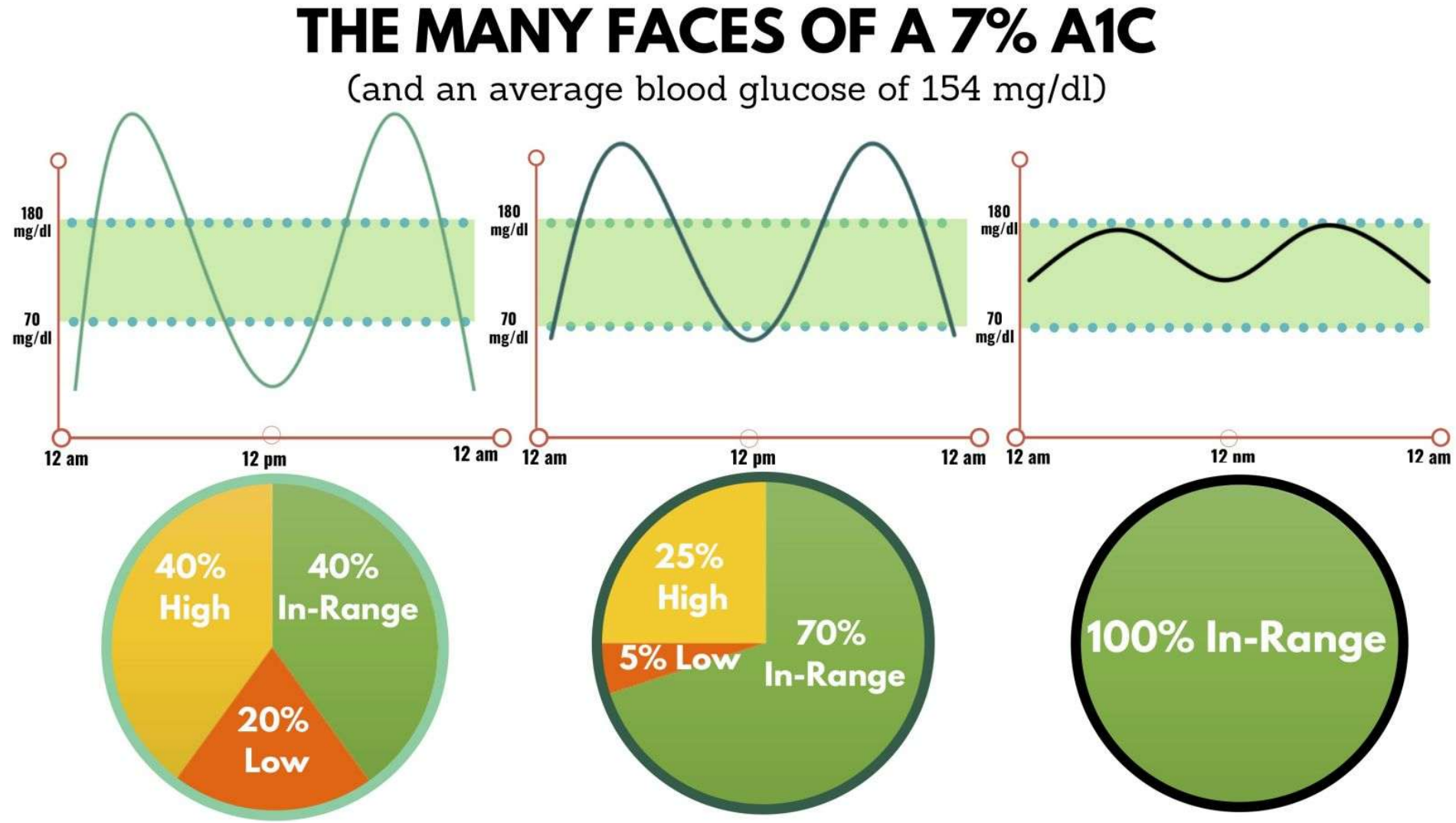
Blood Glucose Monitoring vs. Continuous Glucose Monitoring (CGM)



SMBG, self-monitoring of blood glucose.

Image created and permission to use granted by John Moorman, PharmD.

A1C Alone is Not Enough



https://diatribe.org/time-range.

Ambulatory Glucose Profile

- Standardized report with visual cues for those on CGM devices; time in range
- For most with type 1 or type 2 diabetes
  - > 70% of readings within BG range of 70-180mg/dL
  - < 4% of readings < 70 mg/dL
  - < 1% of readings < 54 mg/dL
  - < 25% of readings > 180 mg/dL
  - < 5% of readings > 250 mg/dL

For those with frailty or at high risk of hypoglycemia recommend:

- Target of 50% time in range
- Less than 1% time below range

6. Glycemic Goals, Hypoglycemia, and Hyperglycemic Crises: Standards of Care in Diabetes—2026 FREE

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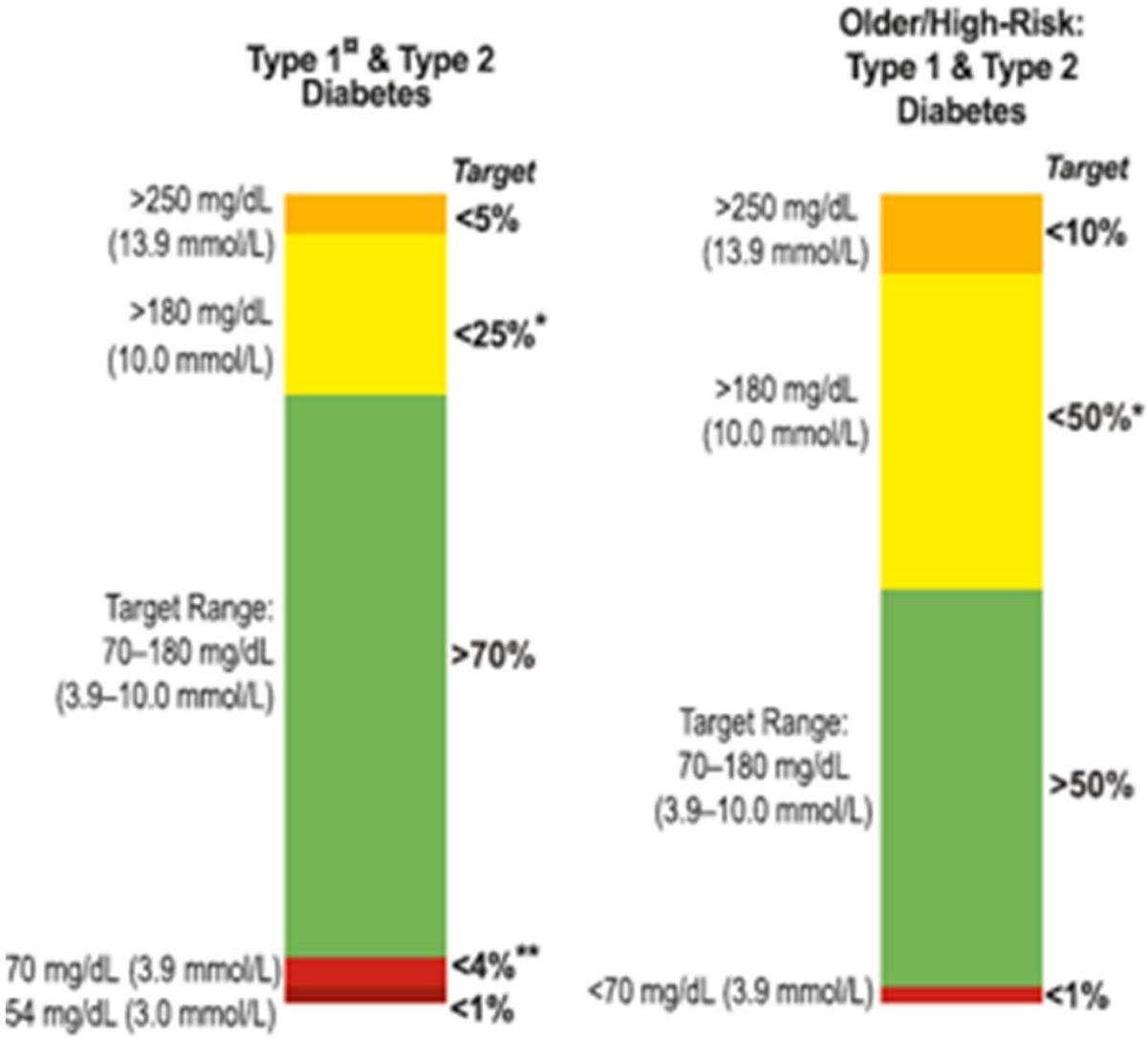
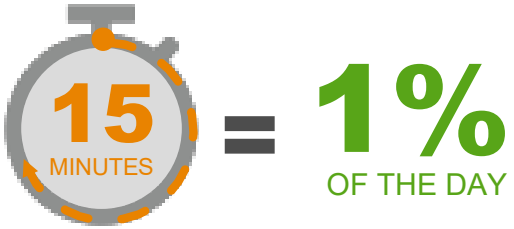
Time in Range





Strong correlation between TIR and A1C, with a goal of 70% TIR aligning with an A1C of ~7%

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

6. Glycemic Goals, Hypoglycemia, and Hyperglycemic Crises: Standards of Care in Diabetes—2026 FREE

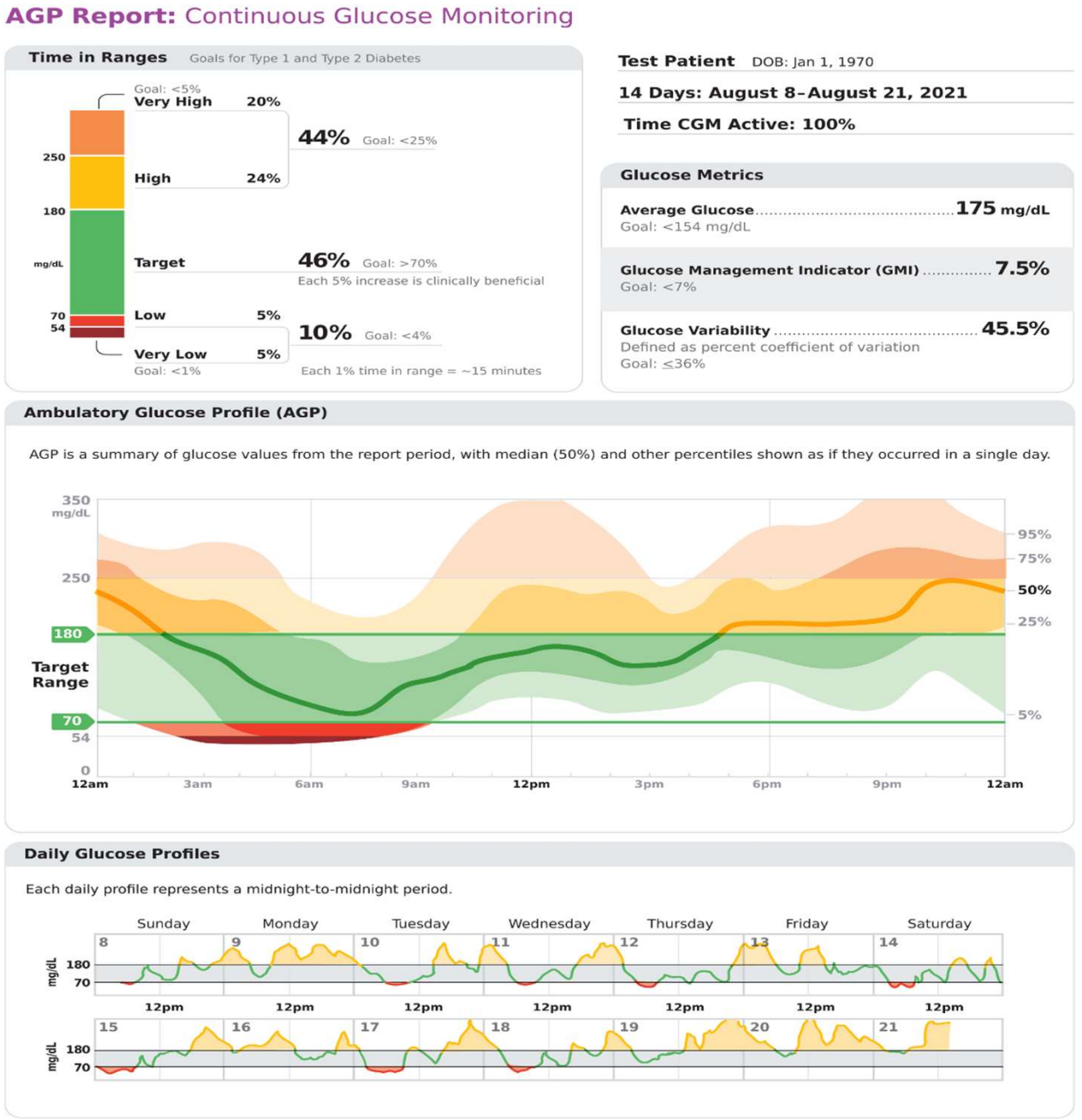
American Diabetes Association Professional Practice Committee for Diabetes*

Ambulatory Glucose Profile Report

1. CGM key metrics

1. AGP

2. Daily tracings



Glucose Monitoring in Pregnancy

- Check FBG and 1 or 2 hour PPG
- Pre-existing type 1, need to also check premeal BG
- CGM can help to achieve A1C targets when used in addition to pre- and postprandial glucose monitoring
- Recommended for T1D and may be beneficial for other types of diabetes in pregnancy
  - Can reduce macrosomia and neonatal hypoglycemia in pregnancy complicated by type 1 diabetes.

DI1

15. Management of Diabetes in Pregnancy: Standards of Care in Diabetes—2026 Diabetes Care 2026;49(Suppl. 1):S321–S338

Slide 153

DI1 updated

Diana Isaacs, 2026-03-24T11:14:14.840

DI1

Glucose Targets in Pregnancy

	Blood Glucose Goal		
Glucose measurement	T1D or T2D	GD treated with insulin	GD not treated with insulin
Fasting glucose	70-95 mg/dL	70-95 mg/dL	<95 mg/dL
1 hr post-prandial glucose	110-140 mg/dL	110-140 mg/dL	<140 mg/dL
2 hr post-prandial glucose	100-120 mg/dL	100-120 mg/dL	<120 mg/dL

Monitor at least 4 times daily (FBG, PPG after each meal) or use CGM)

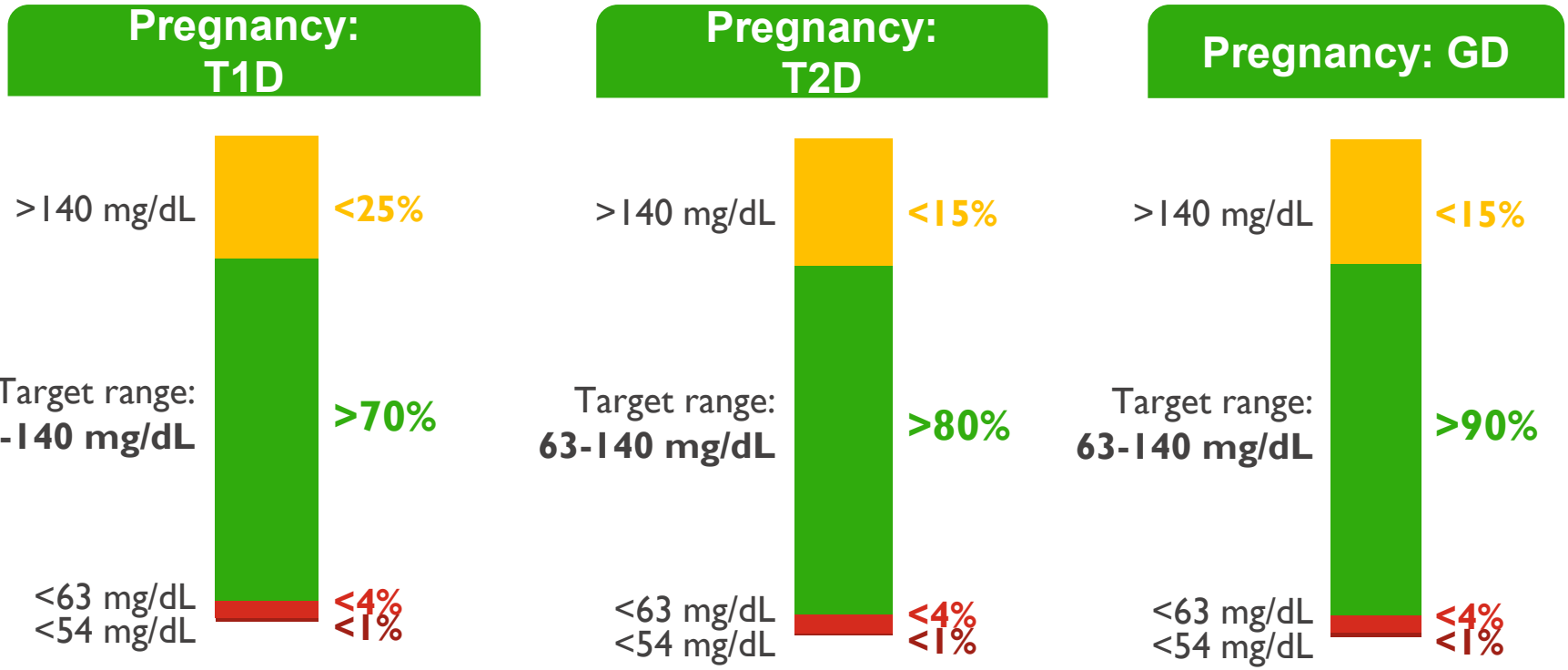
ADA. Diabetes Care. 2026; 49(Suppl 1): S27-49

Slide 154

DI1 New slide

Diana Isaacs, 2026-01-25T14:59:16.648

CGM targets in Pregnancy



Battelino T, et al. *Diabetes Care.* 2019;42(8):1593-1603.
Benhalima K, et al. *Lancel Diab*, 2025. doi: 10.1016/S2213-8587(25)00335-3

DI1

Slide 155

DI1 New slide.
Diana Isaacs, 2026-01-25T15:28:41.316

Pharmacologic Treatment during Pregnancy

- Insulin is preferred therapy for all forms of diabetes in pregnancy
  - Does not cross placenta
  - Can overcome insulin resistance assoc w/ type 2
- Sulfonylureas pass through placenta / associated with neonatal hypo (glyburide)
- Metformin – lower risk of hypo and maternal wt gain but may increase prematurity rate/childhood obesity
  - Passes through placenta
  - If using for PCOS, stop by end of first trimester
- Refer to specialized center

DI1

Pregnancy and Hypertension

- If pregnant with diabetes and hypertension
  - Blood pressure target of 110–135/85 mmHg
    - Reduces risk for accelerated maternal hypertension
    - Minimizes impaired fetal growth
  - Stop potentially harmful medications in prep for pregnancy
    - Avoid ACE inhibitors, angiotensin receptor blockers (ARBs), statins in sexually active women of childbearing age if not using reliable contraception
    - Preferred HTN meds: labetolol, nifedipine , clonidine, methyldopa
    - Other beta blockers except atenolol can be used

15. Management of Diabetes in Pregnancy: Standards of Care in Diabetes—2026 Diabetes Care 2026;49(Suppl. 1):S321–S338

Slide 157

DI1 Updated.
Diana Isaacs, 2026-04-07T03:04:28.251

Case Study - Janet

Janet is a 36yoF with a history of GDM and newly diagnosed with type 2 diabetes. A1C=7.4%. Normal kidney function. Past medical history includes hypertension for which she takes HCTZ 25mg daily.

Weight: 140lbs, BMI=26kg/m^2

Social history

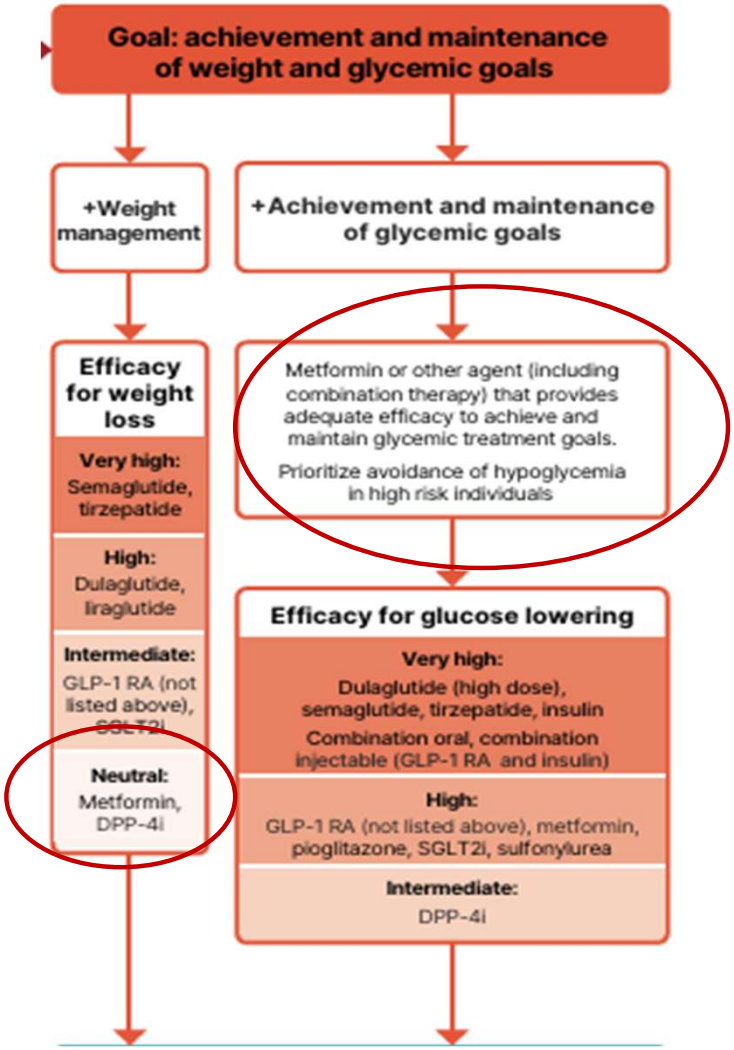
- Works full time as an accountant
- Skips breakfast, eats a small lunch, eats a large dinner, snacks in evening
- No Exercise
- Loves Starbucks Frappuccino's

Poll 11. What Treatment Should Janet Be Started On?

A. Semaglutide (GLP-1 inhibitor)
B. Linagliptin (DPP-4 inhibitor)
C. Empagliflozin (SGLT-2 inhibitor)
D. Metformin (Biguanide)
E. Lifestyle modifications only

DI1

Why Metformin?



- Longstanding evidence
- High efficacy and safety
- Inexpensive - 3 months for $12
- Weight neutral

- Reduces risk of microvascular complications, cardiovascular events, and death

Slide 160

DI1 Updated with 2026 algorithm

Diana Isaacs, 2026-02-25T04:19:53.866

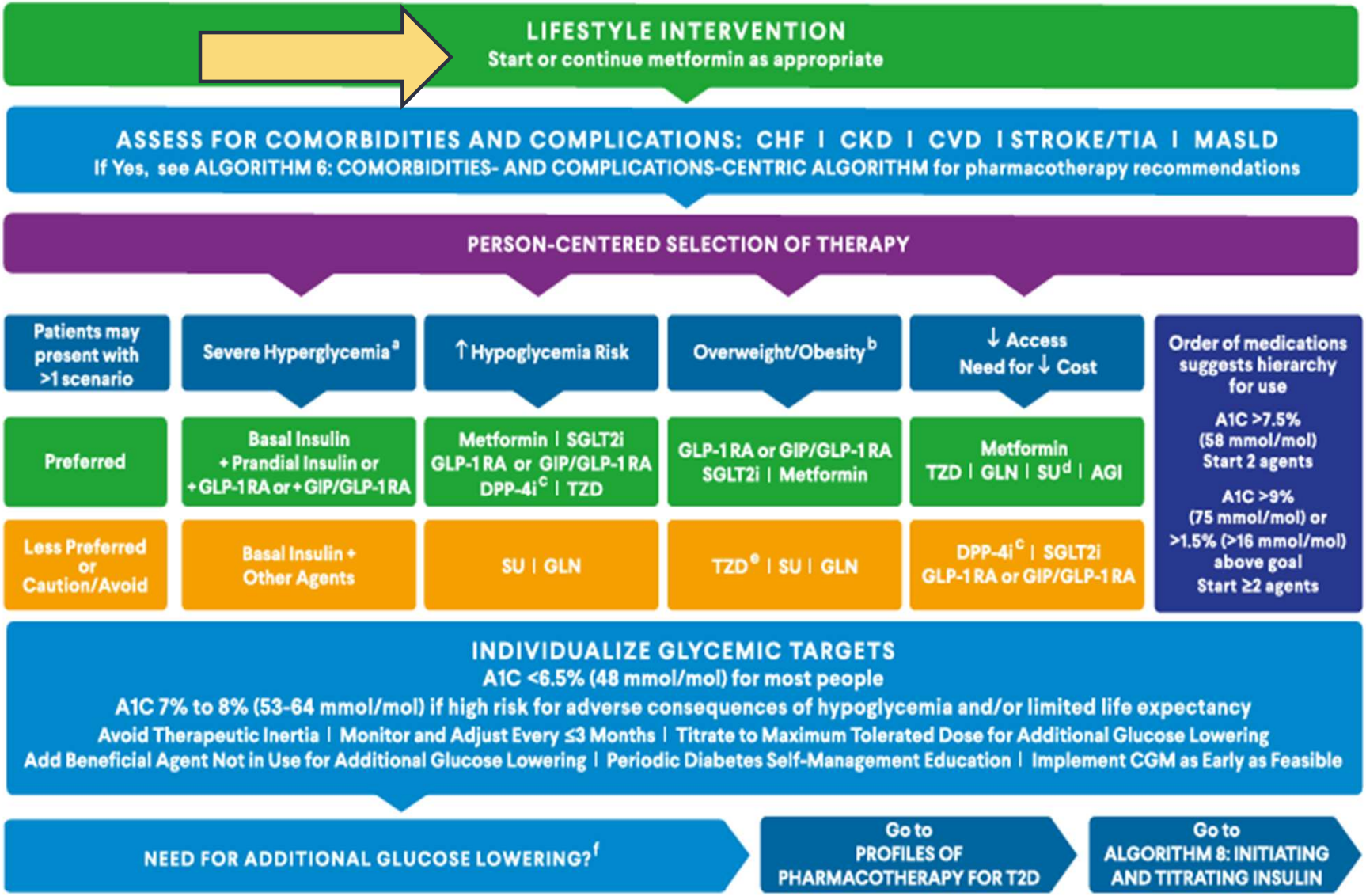
Metformin Dosing and Mechanism

- Mechanism: decreases hepatic glucose production
  - Do not initiate when eGFR < 45
  - May be safely continued with eGFR of 30-45 mL/min/1.73m^2 with dose reductions
  - Max effective dose: 2000mg/day, max dose 2550mg/day
- Monitor vitamin B12 levels and renal function
- GI issues: nausea, vomiting, diarrhea
  - Consider long-acting formulation, dose reduction

Metformin

Class/Main Action	Name(s)	Daily Dose Range	Considerations
Biguanides • Decreases hepatic glucose output	metformin (Glucophage) Riomet (liquid metformin)	500 - 2550 mg (usually BID w/ meal) 500 - 2550 mg 500mg/5mL	**Side effects:** nausea, bloating, diarrhea, B12 deficiency. To minimize GI Side effects, use XR and take w/ meals. **Obtain GFR before starting.** • If GFR <30, do not use. • If GFR <45, don't start Meformin • If pt on Metformin and GFR falls to 30-45, eval risk vs. benefit; consider decreasing dose. **For dye study,** if GFR <60, liver disease, alcoholism or heart failure, restart metformin after 48 hours if renal function stable. **Benefits:** lowers cholesterol, no hypo or weight gain, cheap. Approved for pediatrics, 10 yrs + Lowers A1c 1.0%-2.0%.
	Extended Release-XR (Glucophage XR) (Glumetza) (Fortamet)	(1x daily w/dinner) 500 – 2000 mg 500 – 2000 mg 500 – 2500 mg	
Sulfonylureas • Stimulates sustained insulin release	glyburide: (Diabeta) (Glynase PresTabs)	 1.25 – 20 mg 0.75 – 12 mg	Can take once or twice daily before meals. Low cost generic. **Side effects**: hypoglycemia and weight gain. Eliminated via kidney. **Caution**: Glyburide most likely to cause hypoglycemia. Lowers A1c 1.0% – 2.0%.
	glipizide: (Glucotrol) (Glucotrol XL)	2.5 – 40 mg 2.5 – 20 mg	
	glimepiride (Amaryl)	1.0 – 8 mg	

GLUCOSE-CENTRIC GLYCEMIC CONTROL ALGORITHM



[a]For SEVERE HYPERGLYCEMIA (A1C >10% [>86 mmol/mol] and/or glucose >300 mg/dL [16.7 mmol/L] with symptoms), strongly consider basal insulin (Go to ALGORITHM 8: INITATING AND TITRATING INSULIN). Avoid use of GLP-1 RA or GIP/GLP-1 RA alone in severe hyperglycemia. These agents require titration over weeks which can delay glycemic control. After glucose toxicity is resolved, reassess medical therapy and consider other agents. [b]See **AACE Algorithm for the Treatment of Obesity/Adiposity-Based Chronic Disease-2025 Update.** [c]DPP-4i and GLP-1 RA or GIP/GLP-1 RA should not be combined. [d]SUs may be inappropriate in older adults due to risk of hypoglycemia. [e]TZDs can cause increased weight partially attributable to fluid retention. [f] If despite appropriate therapy and adherence, glucose levels remain above target, also reconsider ALGORITHM 3: DIABETES CLASSIFICATION.

Abbreviations: **A1C**, hemoglobin A1C; **AGI**, alpha-glucosidase inhibitor; **CGM**, continuous glucose monitoring; **CHF**, congestive heart failure; **CKD**, chronic kidney disease; **CVD**, cardiovascular disease; **DPP-4i**, dipeptidyl peptidase 4 inhibitor; **GIP**, glucose-dependent insulinotropic polypeptide; **GLN**, glinide; **GLP-1 RA**, glucagon-like peptide 1 receptor agonist; **MASLD**, metabolic dysfunction-associated steatotic liver disease; **SGLT2i**, sodium glucose transporter 2 inhibitor; **SU**, sulfonylurea; **TIA**, transient ischemic attack; **T2D**, type 2 diabetes; **TZD**, thiazoladinedione

Poll Question 12

- Ricki is started on Metformin 500mg BID. Which of the following is true?

a. Hold metformin if blood glucose is below 80 mg/dL
b. Alcohol is contraindicated when taking metformin
c. Metformin is weight neutral.
d. Metformin can cause kidney damage.

Metformin – How Does it Rate?

Question	Answer
Cause hypoglycemia?	No
Cause weight gain?	No
Affordable?	Yes
Lowers CV risk?	Yes
Can most tolerate /use?	Yes/No (GI, CKD)

BT1

Risk-Based Screening for Prediabetes or Type 2 in Children and Youth

- Test youth with excess weight (BMI >85% percentile)
- Plus any ONE of following risk factors:
  - Maternal diabetes or GDM during child's gestation
  - Family history type 2 in 1st or 2nd degree relative
  - Native American, African American, Latino, Asian American, Pacific Islander
  - Signs of insulin resistance (acanthosis nigricans, HTN, dyslipidemia, Polycystic Ovary Syndrome – PCOS, large or small for gestational-age birth weight

2. Diagnosis and Classification of Diabetes: Standards of Care in Diabetes—2026 FREE

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- Test at 10 yrs or puberty (whichever is first and at least every 3 yrs or more frequently if indicated. Consider earlier screening if multiple risk factors.

Slide 166

BT1 Updated

Beverly Thomassian, 2026-01-13T05:29:51.849

Type 2 and Kids Goals

- A1c goal of 7% if on oral meds alone
- A1c goal of 7.5% if at risk for hypoglycemia
- Some children may benefit from A1c of 6.5% or less

- Initiate pharmacologic therapy, in addition to lifestyle therapy, at diagnosis
- Confirm diagnosis with antibody testing
- Treat glucose, B/P and lipids
- Engage in lifestyle coaching
- **Please see Kids and Diabetes Level 2 Course**

BT1

14. Children & Adolescents: Individualize Glycemic Goals

- Generally, goal is <7.0%
- A goal <6.5% may be considered for those at low risk of excessive hypoglycemia
- Less stringent goal of <7.5% may be needed for safety
- CGM metrics are recommended to be used in conjunction with or without A1C whenever possible.

14. Children and Adolescents: Standards of Care in Diabetes—2026

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Please see Peds and Diabetes Level 2 Course

Slide 168

BT1 updated
Beverly Thomassian, 2026-03-31T01:39:35.296

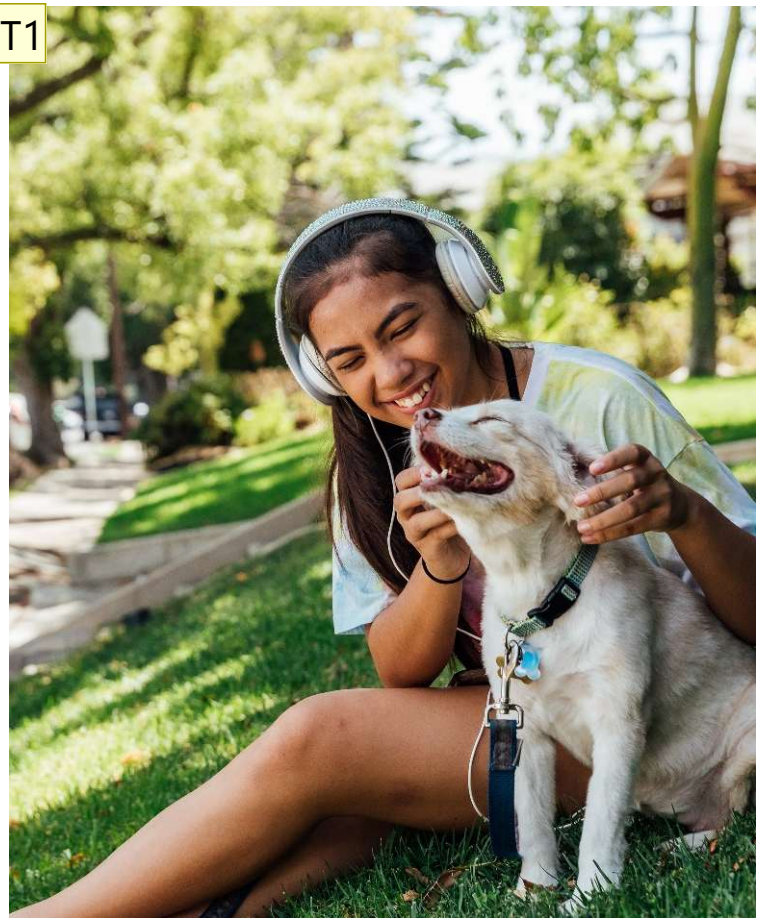
Tobacco, Electronic Cigarettes, Alcohol, and Cannabis

- Screen adolescents and young for tobacco or nicotine, electronic cigarettes, substance use, and alcohol use at diagnosis and regularly thereafter.

Discourage all youth with diabetes not to use cannabis recreationally in all form. Increase risks of hyperemesis syndrome.

- For adolescents with type 1 diabetes presenting with hyperglycemic emergencies, consider hyperglycemic ketosis-cannabis hyperemesis syndrome in individuals with pH ≥7.4 and bicarbonate >15 mmol/L in the presence of ketosis.

BT1



14. Children and Adolescents: Standards of Care in Diabetes—2026

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Slide 169

BT1	added Beverly Thomassian, 2026-01-26T06:54:45.564
BT1 0	updated Beverly Thomassian, 2026-03-31T01:39:52.918

When Does Old Age Start?

Poll Question 13

- What percent of the population over the age of 65 has prediabetes?

A. 50%
B. 18%
C. 29%
D. 34%

13. Older Adults Goals – Whole Picture

- Consider the assessment of medical, psychological and self-care domains to provide context to determine targets and therapeutic approaches for management.
- Screen for geriatric issues
  - polypharmacy,
  - cognitive impairment, depression
  - urinary incontinence, falls, and persistent pain

  that can affect diabetes self-management and diminish quality of life

See Level 2 Course, Older Adults and Diabetes

Treatment Goals Based On:

- Length of time living with diabetes (new onset, undiagnosed for many years or longer history)
- Presence or absence of complications
- Comorbidities
- Degree of frailty
- Cognitive function
- Life expectancy (often longer than expected)
- Functional status

Poll Question 14

- RT, is a healthy 74-year-old who is on metformin 1000mg BID. Has had diabetes for 11 years. Latest A1c was 7.3% What is best response?
  - A. Good job, let's get the A1c less than 7%
  - B. Have you been snacking more than usual?
  - C. What do you think about your A1c level?
  - D. Let's add on another medication to get your A1c to target.

BT1

13. Older Adults
Healthy & Good Functional Status

- Assess the medical, psychological, functional (self-management abilities), and social domains
- Screen annually for geriatric syndromes (e.g., cognitive impairment, depression, urinary incontinence, falls, persistent pain, and frailty), hypoglycemia, and polypharmacy
  - may affect diabetes management and diminish quality of life.
- If on insulin or hx of hypo, eval for CGM or AIDS
- **Goals:**
  - Reasonable A1c goal <7.0 - 7.5%
  - TIR ~ 70%, Below range ≤4%
  - Fasting BG 80 – 130
  - Bedtime Glucose 80-180
  - Blood Pressure < 130/80
  - Statin unless contraindicated or not tolerated

65 or older
- 29% have diabetes
- 50% have prediabetes

Please see Older Adults Level 2 Course

Slide 175

BT1 updated
Beverly Thomassian, 2026-03-31T01:39:03.459

Poll 15 – Review Question

- HR is a 78-year-old with a stroke and limited cognition. She has had diabetes for 8 years and is on intensive insulin therapy: Bolus coverage at meals and basal at night. Her A1c is 6.2%. She has a part time care taker. What do you suggest?
- A. Evaluate food intake
- B. Discuss de-intensifying insulin regimen
- C. Move Glargine to morning
- D. Stop insulin and start on oral medications

Older Adults and Medications

- In older **adults** at increased risk of hypoglycemia, meds with low risk of hypoglycemia are preferred.
- Overtreatment of diabetes is common in older adults and should be avoided.
- Deintensification (or simplification) of complex regimens is recommended to reduce the risk of hypoglycemia, if it can be achieved within the individualized A1C target.

BT1

Older Adults with Complications and Reduced Functionality - Less Intense Goals

- Intermediate remaining life expectancy, high treatment burden, hypo and fall risk.
- Consider DE-Intensification
- Goals:
  - Reasonable A1c goal <8.0%
  - TIR ≥ 50%, Below range ≤1%
  - Fasting BG 90 – 150
  - Bedtime BG 100-180
  - Blood Pressure < 130/80
  - Statin unless contraindicated or not tolerated

13. Older Adults: Standards of Care in Diabetes—2026 FREE

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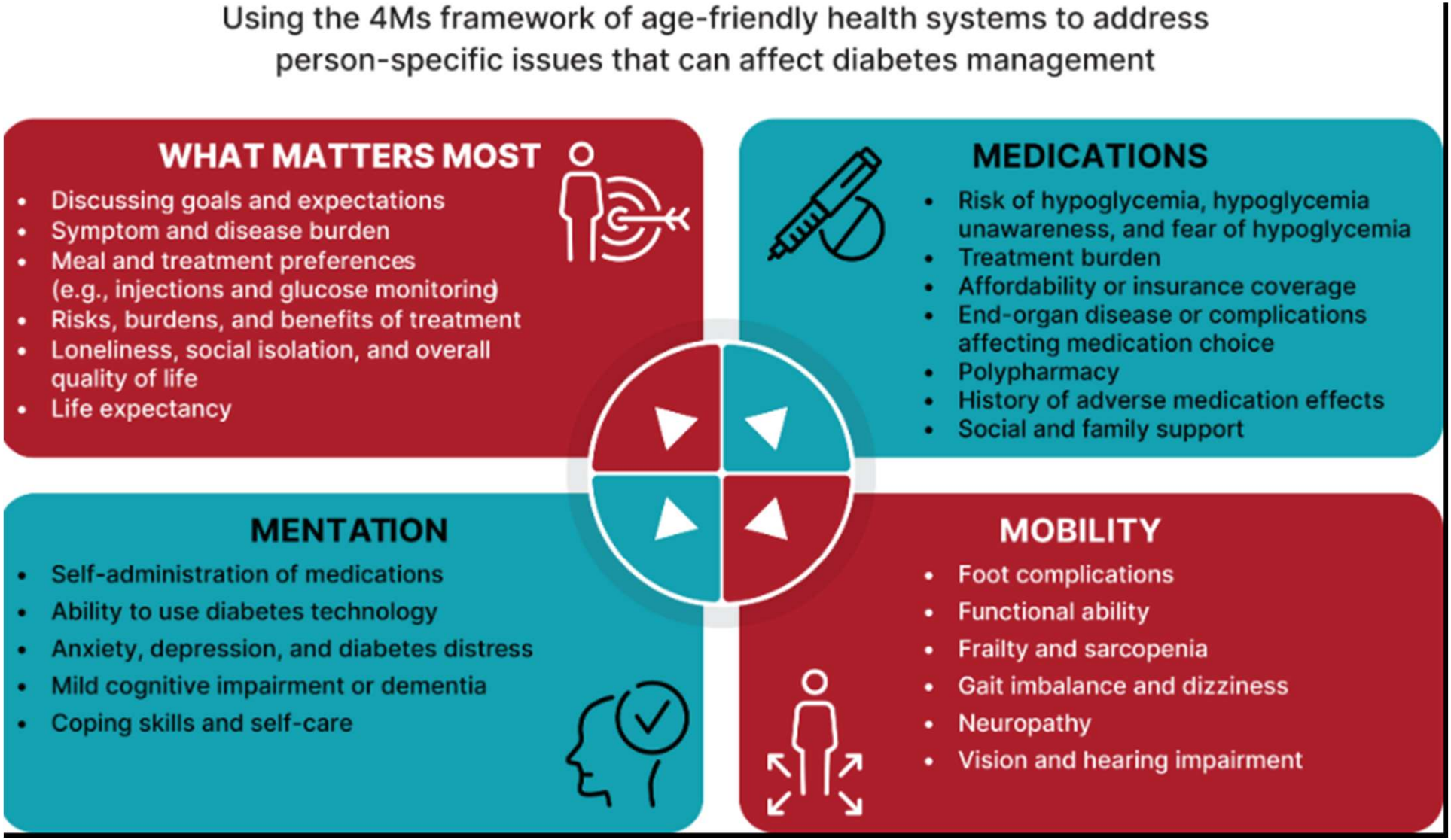
Slide 178

BT1 updated
Beverly Thomassian, 2026-03-31T01:39:24.242

4 M's Framework of Age Friendly Health Systems



13. Older Adults: Standards of Care in Diabetes—2026 FREE

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4. Comprehensive Medical Evaluation and Assessment of Comorbidities

- Use person-centered communication, culturally sensitive, strength-based language and active listening;
- Elicit individual preferences and beliefs; develop self-management plan together.
- Diabetes Care coordinated by multi disciplinary team:
  - CDCES, Providers, nurses, dietitians, exercise specialists, pharmacists, dentists, podiatrists, and behavioral health professionals.
- Goal is to optimize health outcomes and quality of life.

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: Standards of Care in Diabetes—2026 FREE

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Decision cycle for person-centered glycemic management in type 2 diabetes

ASSESS KEY PERSON CHARACTERISTICS

- The individual's preferences, values, and goals
- Current lifestyle and health behaviors
- Comorbidities (i.e., CVD, CKD, and HF)
- Clinical characteristics (i.e., age, A1C, and weight)
- Mental health, cognition and functional status
- Social determinants of health

CONSIDER SPECIFIC FACTORS THAT IMPACT CHOICE OF TREATMENT

- Individualized glycemic and weight goals
- Impact on weight, hypoglycemia, cardiovascular and kidney protection, and MASLD
- Underlying physiological factors
- Side effect profiles of medications
- Complexity of treatment plan (i.e., frequency and mode of administration)
- Treatment choice to optimize medication use and reduce treatment discontinuation
- Access, cost and availability of medication(s), and lifestyle choices

USE SHARED DECISION-MAKING TO CO-CREATE A MANAGEMENT PLAN

- Ensure access to DSMES
- Involve an educated and informed person (and the individual's family or caregiver)
- Explore personal preferences
- Language matters (include person-first, strengths-based, empowering language)
- Include motivational interviewing, goal setting, and shared decision-making

AGREE ON MANAGEMENT PLAN

- Specify SMART goals:
  - **S**pecific
  - **M**easurable
  - **A**chievable
  - **R**ealistic
  - **T**ime limited

IMPLEMENT MANAGEMENT PLAN

- Ensure there is regular review; more frequent contact initially is often desirable for DSMES

PROVIDE ONGOING SUPPORT AND MONITORING OF:

- Emotional well-being
- Lifestyle and health behaviors
- Tolerability of medications
- Surrogate measures of treatment, including BGM and CGM, weight, step count, A1C, BP, and lipids

REVIEW AND AGREE ON MANAGEMENT PLAN

- Review management plan
- Mutually agree on changes
- Ensure agreed modification of therapy is implemented in a timely fashion to avoid therapeutic inertia
- Undertake decision cycle regularly (at least once or twice a year)
- Operate in an integrated system of care

GOALS OF CARE

- **Prevent complications**
- **Optimize quality of life**

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: Standards of Care in Diabetes—2026 FREE

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Slide 181

BT1 Updated

Beverly Thomassian, 2026-01-13T05:30:59.701

Diabetes Goals and Treatment Plan

The goals of treatment for diabetes are to prevent or delay complications and optimize quality of life.

Goals and plans co-created by the care team and individual based on preferences, values, and goals.

Management plan considers the person's:

Age, cognitive abilities, school/work schedule and conditions,	Health beliefs, support systems, social situation, financial concerns, cultural factors, literacy and numeracy	Eating patterns, physical activity, (mathematical literacy)	Diabetes history (duration, complications, and current use of medications), comorbidities, disabilities, health priorities, other medical conditions	Preferences for care, access to health care services, and life expectancy

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: Standards of Care in Diabetes—2026 FREE

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BT1

Table 4.1—Components of the comprehensive diabetes medical evaluation at initial, follow-up, and annual visits

	Visit		
	Initial	Every follow-up	Annual
Past medical and family history			
Diabetes history			
• Characteristics at onset (e.g., age and symptoms and/or signs)	✓		
• Review of previous treatment plans and response	✓		
• Assess frequency, cause, and severity of past hospitalizations	✓		
Family history			
• Family history of diabetes in a first-degree relative	✓		
• Family history of autoimmune disorders	✓		
Personal history of complications and common comorbidities			
• Common comorbidities (e.g., obesity, OSA, and MASLD)	✓		✓
• High blood pressure or abnormal lipids	✓		✓
• Macrovascular and microvascular complications	✓		✓
• Hypoglycemia: awareness, frequency, causes, and timing of episodes	✓	✓	✓
• Presence of hemoglobinopathies or anemias	✓		✓
• Last dental visit	✓		✓
• Last foot exam	✓		✓
• Last dilated eye exam	✓		✓
• Visits to specialists	✓		
• Disability assessment and use of assistive devices (e.g., physical, cognitive, vision and auditory, history of fractures, and podiatry)	✓	✓	✓
• Personal history of autoimmune disease	✓		
Surgical and procedure history			
• Surgeries (e.g., metabolic surgery and transplantation)	✓	✓	✓
Interval history			
• Changes in medical or family history since last visit		✓	✓
Behavioral factors			
• Physical activity, sleep behaviors, eating patterns and weight history	✓	✓	✓
• Assess familiarity with carbohydrate counting (e.g., type 1 diabetes or type 2 diabetes treated with MDI)	✓		✓
• Screen for OSA	✓	✓	✓
• Tobacco, alcohol, and substance use	✓		✓
Medications and vaccinations			
• Current medication plan	✓	✓	✓
• Medication-taking behavior, including rationing of medications and/or medical equipment	✓	✓	✓

Standard 4 – Diabetes Medical Evaluation

Table 4.1—Components of the comprehensive diabetes medical evaluation at initial, follow-up, and annual visits

Laboratory evaluation			
• A1C, if the results are not available within the past 3 months or if earlier assessment is necessary	✓	✓	✓
• Lipid profile, including total, LDL, and HDL cholesterol and triglycerides‡	✓		
• Liver function tests (i.e., FIB-4)‡	✓		✓
• Spot urinary albumin-to-creatinine ratio	✓		✓
• Serum creatinine and estimated glomerular filtration rate§	✓		✓
• Thyroid-stimulating hormone in people with type 1 diabetes‡	✓		✓
• Celiac disease screening in people with type 1 diabetes‖	✓		
• Vitamin B12 if taking metformin for >5 years	✓		✓
• CBC with platelets	✓		✓
• Serum potassium levels in people treated with ACE inhibitors, ARBs, or diuretics§	✓		✓
• Calcium, vitamin D, and phosphorous as appropriate	✓		✓

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: Standards of Care in Diabetes—2026 FREE

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Slide 183

BT1 updated

Beverly Thomassian, 2026-02-22T23:47:27.370

Assessment and Treatment of Disabilities

- Diabetes associated with increased risks of disability due to neuropathy, visual impairment and lower limb complications
- Refer to specialist
- Take preventive action to maximize quality of life.

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: Standards of Care in Diabetes—2026 FREE

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Assess for disability at the initial visit and for decline in function at each subsequent. If a disability is impacting functional ability or capacity to manage their diabetes, refer to appropriate specialist.

Lab Eval at Initial & Annual Visit

- A1c (each 3-6 mo's)
- Each year
  - Lipids, CBC with platelets
  - Liver function
  - Spot urinary albumin-to-creat ratio (UACR))
  - Serum creat and GFR
  - TSH, celiac (type 1)
  - B12 if on metformin >5yrs
  - Calcium, Vita D, and phosphorus if appropriate
- Serum K
  - If on ACE, ARBs or diuretics

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: Standards of Care in Diabetes—2026 FREE

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Referrals for Initial Care Mgmt

- Eye professional – annual check
- Family planning
- RDN for Med Nutrition Therapy
- DSMES - Diabetes Self-Management Education Support
- Dentist for comprehensive dental examination
- Behavioral health professional
- Audiology if indicated
- Social worker/community resources
- Rehab medicine for cog/disability eval

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: Standards of Care in Diabetes—2026 FREE

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Immunization Schedule for Diabetes 2026

Vaccine	Who by Age	Series and Frequency
Hepatitis B Vaccine	Adults ≤ 60 years*	2-3 dose series
RSV	Adults ≥ 60 years	Single dose
Influenza (avoid live attenuated vaccine)	All	Annually
Tetanus, diphtheria, pertussis (Tdap)	All adults; extra dose during pregnancy	Booster every 10 years.
Zoster	Adults ≥ 50 years	2 dose Shingrix
COVID-19	Starting at age 6 mo's	Initial vaccination and boosters
Pneumonia (PPSV23) Pneumovax	Adults19-64*	See Standards for schedule and details and for those 65 or older.
*Pneumococcal Conjugate Vaccine (PCV15, PCV20)	Adults 19-64 with underlying risk factors or no previous vaccination*	May need PPSV23 follow-up vaccine ≥1 year.* If 65+, discuss with provider.

2026 ADA Standards, Vol.49, s67 – s68
*See Table 4.3 for detailed info/considerations

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: Standards of Care in Diabetes—2026 FREE

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Slide 187

BT1 Updated

Beverly Thomassian, 2026-01-13T05:31:13.898

VACCINE RECOMMENDATIONS FOR ADULTS WITH DIABETES MELLITUS

CDC IMMUNIZATION RECOMMENDATIONS FOR ADULTS WITH DIABETES MELLITUS[a]

VACCINE	RECOMMENDATION
Age-Appropriate Vaccines	All people should receive according to the CDC/ACIP immunization schedules.
COVID-19	One or more doses per current CDC recommendations and FDA approvals
Hepatitis B	Adults ≤59 years: Complete a 2-, 3-, or 4-dose series Adults ≥60 years: Based on risk and quality of immune response
Influenza	Annually
Pneumococcal	Adults with DM ages ≥19 years: • 1 dose PCV21 OR • 1 dose PCV20 OR • 1 dose PCV15 followed by PPSV23 at ≥1 year (or ≥8 weeks for adults who are immunocompromised) Also see current CDC recommendations for details.
RSV	Adults with DM ≥60 years: One dose Adults ≥50 years: One dose for those at increased risk for severe RSV[c]
TDAP	Every 10 years following completion of the primary series
Zoster (RZV)	All adults ≥50 years: Two doses 2 to 6 months apart

CDC STANDARDS FOR ADULT IMMUNIZATION PRACTICE[b]

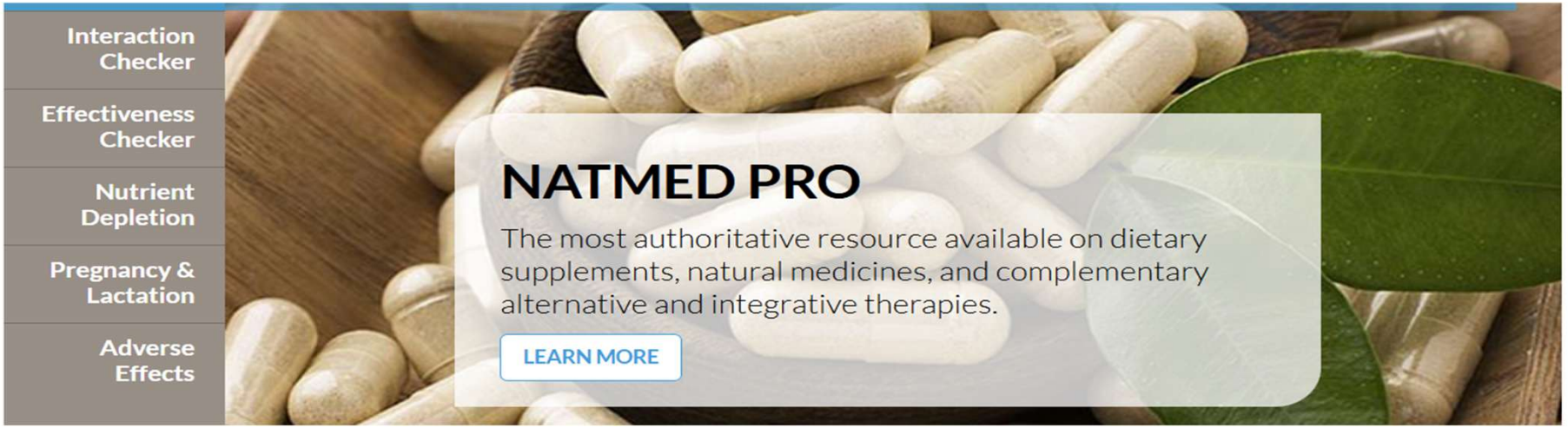
ASSESS	**Assess immunization status of all individuals at every encounter.** • Incorporate into workflow. • Stay up to date on the latest recommendations of the CDC Advisory Committee on Immunization Practices. Updated immunization schedules are released annually.
RECOMMEND	**STRONGLY recommend vaccines based on age/risk factors.** • Address questions and concerns. • Highlight positive experiences and benefits of vaccines.
ADMINISTER/ REFER	**Administer or refer patients for immunization.** • Stock routine vaccines or know your local vaccine providers for referral.
DOCUMENT	**Document receipt of vaccine in-state immunization registry and electronic health record.**

[a]https://www.cdc.gov/vaccines/hcp/imz-schedules/adult-age.html. For child/adolescent specific recommendations, see https://www.cdc.gov/vaccines/hcp/imz-schedules/child-adolescent.html
[b]https://www.cdc.gov/vaccines-adults/hcp/imz-standards/index.html
[c]High risk for severe RSV: DM complicated by CKD, neuropathy, retinopathy, end-organ damage, on insulin, on SGLT2i. Also, chronic cardiovascular, pulmonary, liver disease and/or severe obesity (BMI >40 kg/m^2). https://www.cdc.gov/rsv/hcp/clinical-overview/index.html

Abbreviations: **ACIP**, Advisory Committee on Immunization Practices; **CDC**, Centers for Disease Control and Prevention; **COVID-19**, coronavirus disease 2019; **DM**, diabetes mellitus; **FDA**, U.S. Food and Drug Administration; **PCV**, pneumococcal conjugate vaccine; **PPSV23**, pneumococcal polysaccharide vaccine; **RSV**, respiratory syncytial virus; **RZV**, recombinant zoster vaccine; **SGLT2i**, sodium glucose cotransporter 2 inhibitor; **TDAP**, tetanus, diphtheria, acellular pertussis

Herbal Supplements

- Berberine
- Zinc
- Vitamin D
- Cinnamon
- Ginseng
- Aloe Vera
- Chromium
- Alpha lipoic acid
- Magnesium
- Gymnema



Deciding to Take Herbal Supplements

- Lack of regulation with herbal supplements
- Provide reliable education on costs/benefits/risks
- Empower patients to make informed decisions

Patient handout for Berberine

English
Spanish
French

- Overview
- Safety
- Adverse Effects
- Effectiveness
- Dosing & Administration
- Drug Interactions
- Supplement Interactions
- Condition Interactions
- Lab Interactions
- Overdose
- Commercial Products
- Pharmacokinetics
- Mechanism of Action
- References

Berberine

SCIENTIFIC NAME
9,10-Dimethoxy-5,6-dihydro-2H-7λ5-[1,3]dioxolo[4,5-g]isoquinolino[3,2-a]isoquinolin-7-ylium , 5,6-Dihydro-9,10-dimethoxybenzo[g]-1,3-benzodioxolo[5,6-a]quinolizinium , 7,8,13,13a-Tetradehydro-9,10-dimethoxy-2,3-(methylenedioxy)berbinium

FAMILY

CAUTION: Berberine is a constituent of European Barberry, Goldenseal, Goldthread, Greater Celandine, Oregon Grape, Phellodendron, and Tree Turmeric. These plants are discussed in separate monographs.

Other Common Names

Overview

Berberine is a bitter-tasting, yellow-colored alkaloid that is found in the roots, rhizomes, and stem bark of various plants, including European barberry, goldenseal, goldthread, greater celandine, Oregon grape, phellodendron, and tree turmeric (34203,91951). It was first isolated in the early 20th century from plants used in traditional Chinese medicine (91956).

Hypoglycemia (Glucose) Alert Values

- **BG <70mg/dl – Level 1**
- Follow 15/15 rule and contact provider make needed changes

- **BG < 54mg/dl – Level 2**
- Indicates serious hypo. Contact provider for med change. Glucagon Emergency Kit

- **Severe Hypoglycemia – Level 3**
- Requires external assistance – no threshold

6. Glycemic Goals, Hypoglycemia, and Hyperglycemic Crises: Standards of Care in Diabetes—2026 FREE

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Hypoglycemia: Identify, Treat, & Prevent

Step 1

Identify your signs of hypoglycemia or low blood sugar:

- Sweaty
- Shaky
- Hungry
- Can't think straight
- Headache
- Irritated, grouchy
- Other

Step 2

If have signs of hypo, treat with carbs until glucose reaches 70+, then eat usual meal.

- Sugary drink, 4–8oz
- Piece of fruit
- Raisins, handful
- Glucose tabs, 4+
- Honey/glucose gel
- Skittles candy, 15+

Step 3

Have glucagon rescue meds available.

In case of severe hypo, identify someone (ahead of time) who can get medical help & give a glucagon rescue medication.

Notify your provider of low blood sugar events.

Hypoglycemia Levels:

Level 1 – Glucose less than 70
Level 2 – Glucose less than 54
Level 3 - Severe, needs assistance

Identify Causes of Hypo & Problem Solve to Prevent Future Episodes

» Low carb meal
» Extra activity
» Drinking alcohol
» Delayed, missed meal
» Too much insulin/meds
» Insulin timing

Hypo Marker of CV Events & Mortality

Severe hypoglycemia is strongly associated with cardiovascular events and mortality.

HCP need to be vigilant in preventing hypoglycemia.

Avoid aggressively attempting to achieve near-normal A1C levels if such goals cannot be safely and reasonably achieved.

6. Glycemic Goals, Hypoglycemia, and Hyperglycemic Crises: Standards of Care in Diabetes—2026 FREE

American Diabetes Association Professional Practice Committee for Diabetes*

SDOH and Hypoglycemia

Food insecurity, housing instability, underinsured, under-resourced living areas is associated with increased risk of hypoglycemia-related emergency department visits

Identify if fasting part of religious observances

Young children and older adults at highest risk due to lack of recognition of hypo symptoms

Insulin pumps with automated low-glucose suspend and automated insulin delivery systems have been shown to be effective in reducing hypoglycemia in type 1 diabetes

6. Glycemic Goals, Hypoglycemia, and Hyperglycemic Crises: Standards of Care in Diabetes—2026 FREE

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Assess for Hypo

- Review history of hypoglycemia at every clinical encounter for all individuals at risk for hypoglycemia
- Evaluate hypoglycemic events
- Screen for impaired hypoglycemia awareness at least annually or as needed.
- Consider individual's risk for hypoglycemia when selecting diabetes medications and glycemic goals.
- Use of CGM is beneficial and recommended for individuals at high risk for hypoglycemia.

6. Glycemic Goals, Hypoglycemia, and Hyperglycemic Crises: Standards of Care in Diabetes—2026 FREE

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BT1

Hypoglycemia: Clinical Risk Factors

Table 6.5—Assessment of hypoglycemia risk among individuals treated with insulin, sulfonylureas, or meglitinides

Clinical and biological risk factors	Social, cultural, and economic risk factors
Major risk factors	Major risk factors
• Recent (within the past 3–6 months) level 2 or 3 hypoglycemia • Intensive insulin therapy* • Impaired hypoglycemia awareness • Kidney failure • Cognitive impairment or dementia • History of metabolic surgery	• Food insecurity • Low-income status§ • Housing insecurity • Fasting for religious or cultural reasons • Underinsurance
Other risk factors	Other risk factors
• Multiple recent episodes of level 1 hypoglycemia • Basal insulin therapy* • Age ≥75 years† • Female sex • High glycemic variability‡ • Polypharmacy • Cardiovascular disease • Chronic kidney disease (eGFR <60 mL/min/1.73 m^2 or albuminuria) • Neuropathy • Retinopathy • Major depressive disorder • Severe mental illness • Gastroparesis • β-Blocker therapy	• Low health literacy • Alcohol or substance use disorder

6. Glycemic Goals, Hypoglycemia, and Hyperglycemic Crises: Standards of Care in Diabetes—2026 FREE

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Slide 196

BT1 updated
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Tx of Level 2 & 3 Hypoglycemia

- If can swallow w/out risk of aspiration, try gel, honey, etc. inside cheek
- If unable or unwilling to swallow, D50 IV or Glucagon
- If on Insulin at risk for high risk for hypoglycemia, prescribe Glucagon ER Kit.
- Glucagon injection (need Rx)
  - Inform and instruct caregivers, school personnel, fami of hypo signs and appropriate action
  - Dosing: Adults 1mg, Children <20kg 0.5mg
  - Glycemic effect 20 - 30mg, short lived
  - Must intake carb as soon as able
- Re-evaluate diabetes med treatment plan.

Poll Question 16

- JL is 78 and drinks a "few cocktails" every night. Lives with partner and takes basal insulin at night and bolus insulin as needed. Has had a few low blood glucose levels in past week of 62, 49 and 51. What is the most important recommendation?

- A. Decrease alcohol intake
- B. Check BG at least 4 times a day.
- C. Double check injection sites.
- D. Get glucagon rescue medication.

Sulfonylureas - Secretagogues or "Squirters"

- Mechanism: Stimulate beta cells to release insulin
- Dosed 1-2x daily before meals
- Adverse effects
  - Hypoglycemia, weight gain, watch renal function
- Low cost, $12 for 3 months supply
- Can help with glucose toxicity, lowers A1C 1-2%

Sulfonylureas • Stimulates sustained insulin release	glyburide: (Diabeta) (Glynase PresTabs)	 1.25 – 20 mg 0.75 – 12 mg	Can take once or twice daily before meals. Low cost generic. **Side effects**: hypoglycemia and weight gain. Eliminated via kidney. **Caution**: Glyburide most likely to cause hypoglycemia. Lowers A1c 1.0% – 2.0%.
	glipizide: (Glucotrol) (Glucotrol XL)	2.5 – 40 mg 2.5 – 20 mg	
	glimepiride (Amaryl)	1.0 – 8 mg	

Meglitinides - Squirts

- **Action**: stimulate insulin secretion (rapid and short duration) when glucose present
- **Names**:
  - Repaglinide (Prandin)
    - **Dosing**: 0.5 to 4 mg a.c. max dose 16mg
    - Metabolized by liver and mostly excreted in feces (some renally).
  - Nateglinide (Starlix)
    - **Dosing**: 120 mg tid with meals
    - Metabolized by liver, excreted by kidney
- Efficacy:
  - Decreases peak postprandial glucose
  - Decreases plasma glucose 60-70 mg/dl
  - Reduce A1C 0.5-1%

Case Study Ken – Poll 17

Ken is a 67yoM with type 2 diabetes x 5 years. He complains of dizziness/shakiness 3x/week. Last A1C=6.7%. Which of his medications is most likely causing hypoglycemia?

A. Metformin

B. Sitagliptin

C. Glimepiride

D. Pioglitazone

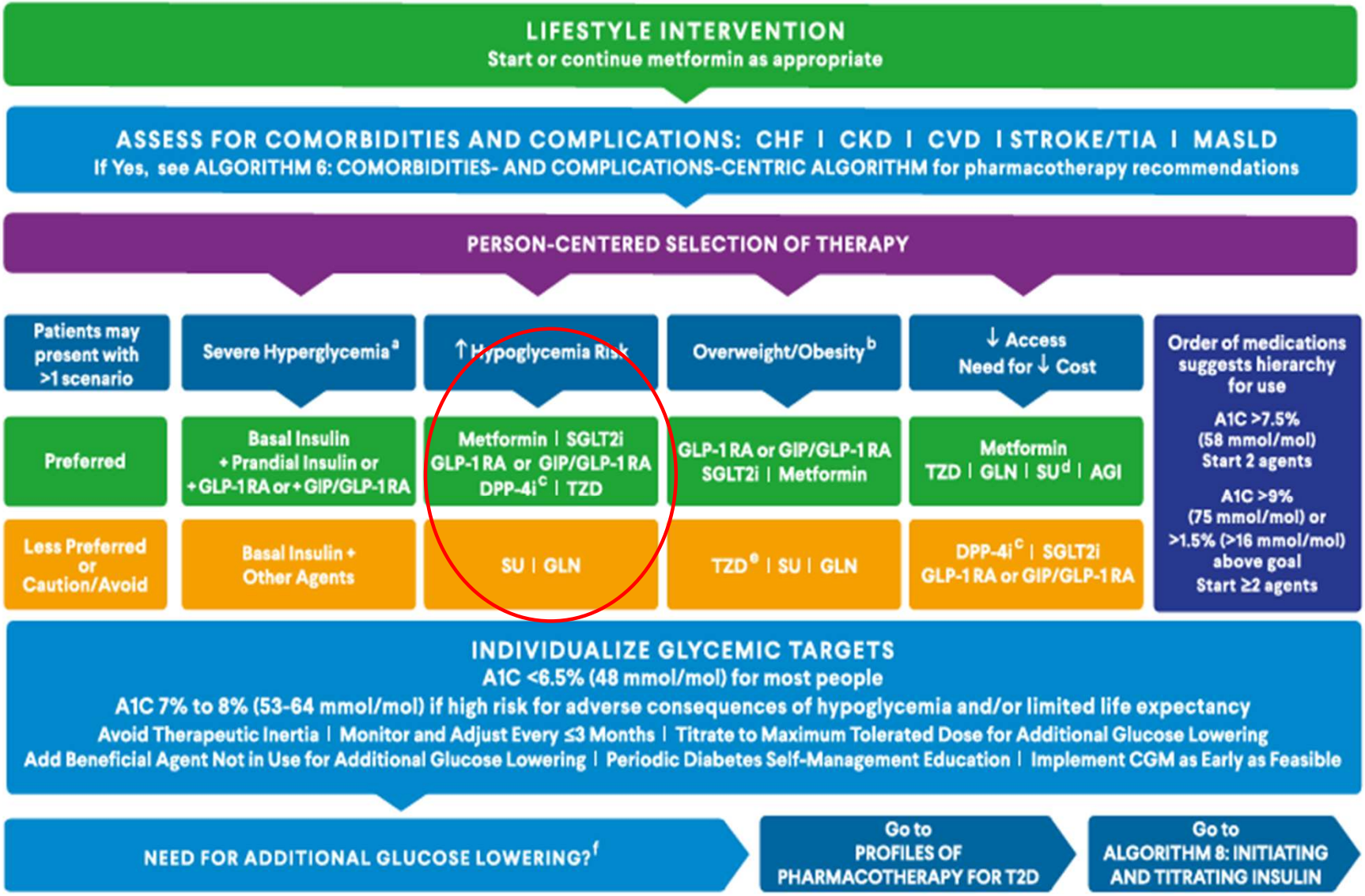
Reducing Hypoglycemia

- Which are the only diabetes meds that directly cause hypoglycemia?

- ❑ Insulin
- ❑ Secretagogues (sulfonylureas, glitinides)

DI1

GLUCOSE-CENTRIC GLYCEMIC CONTROL ALGORITHM



[a]For SEVERE HYPERGLYCEMIA (A1C >10% [>86 mmol/mol] and/or glucose >300 mg/dL [16.7 mmol/L] with symptoms), strongly consider basal insulin (Go to ALGORITHM 8: INITATING AND TITRATING INSULIN). Avoid use of GLP-1 RA or GIP/GLP-1 RA alone in severe hyperglycemia. These agents require titration over weeks which can delay glycemic control. After glucose toxicity is resolved, reassess medical therapy and consider other agents. [b]See **AACE Algorithm for the Treatment of Obesity/Adiposity-Based Chronic Disease-2025 Update.** [c]DPP-4i and GLP-1 RA or GIP/GLP-1 RA should not be combined. [d]SUs may be inappropriate in older adults due to risk of hypoglycemia. [e]TZDs can cause increased weight partially attributable to fluid retention. [f]If despite appropriate therapy and adherence, glucose levels remain above target, also reconsider ALGORITHM 3: DIABETES CLASSIFICATION.

Abbreviations: **A1C**, hemoglobin A1C; **AGI**, alpha-glucosidase inhibitor; **CGM**, continuous glucose monitoring; **CHF**, congestive heart failure; **CKD**, chronic kidney disease; **CVD**, cardiovascular disease; **DPP-4i**, dipeptidyl peptidase 4 inhibitor; **GIP**, glucose-dependent insulinotropic polypeptide; **GLN**, glinide; **GLP-1 RA**, glucagon-like peptide 1 receptor agonist; **MASLD**, metabolic dysfunction-associated steatotic liver disease; **SGLT2i**, sodium glucose transporter 2 inhibitor; **SU**, sulfonylurea; **TIA**, transient ischemic attack; **T2D**, type 2 diabetes; **TZD**, thiazoladinedione

Slide 203

DI1 Updated algorithm

Diana Isaacs, 2026-04-07T02:45:27.116

Glucagon Rescue Medications for Diabetes-Related Hypoglycemia

Name/Delivery	Supplied	Dose Range		Age / Route / Storage
		Adult	Peds / Age WT Dosing	
Glucagon Emergency Kit Injection requires mixing glucagon powder	1mg / 1mL vial + syringe	1mg	0.03mg/kg or < 6yrs or < 25 kgs | 0.5mg ≥ 6yrs or > 25kgs | 1mg	All ages approved SubQ or IM admin Expires in 2 years at room temp.
Baqsimi Nasal glucagon powd				m temp d tube).
Gvoke Injectable liquid sta glucagon solution				gh, m temp
Dasiglucagon (Zegalogue) Stable liquid glucago analog				ocks, m temp. case).

***All raise BG 20+ points** — **t dose, give**
2nd dose in 15 m — **info.**
All PocketCar

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Table 6.6—Median monthly (30-day) AWP and NADAC of glucagon formulations in the U.S.

Product	Form	Median AWP* (min, max)	Median NADAC* (min, max)	Dosage
Glucagon	Injection powder with diluent for reconstitution	$303 ($180, $337)	$242 ($207, $242)	1 mg
Glucagon	Nasal powder	$357	$285	3 mg
Glucagon	Prefilled pen, prefilled syringe	$391	$303 ($303, $304)	0.5 mg, 1 mg
Dasiglucagon	Prefilled pen, prefilled syringe	$371	$298	0.6 mg

AWP, average wholesale price; max, maximum; min, minimum; NADAC, National Average Drug Acquisition Cost. AWP and NADAC prices are as of 1 July 2025. *Calculated per unit (AWP [192] or NADAC [193]); median AWP or NADAC is listed alone when only one product and/or price is described).

Quick Question 18

- JZ is excited about his A1c of 5.4%. He takes rapid acting insulin 3 times a day using a pen to keep his BG to target. Plus, he adjusts glargine as needed if his pm BG is elevated. What is your biggest concern?

A. Does he change his needle each time?

B. How is he adjusting glargine?

C. Is he adjusting insulin for exercise?

D. How many hypoglycemic events per week?

Preventing Hypoglycemia

In people taking insulin or secretagogues

Nocturnal Lows

- If bedtime glucose <110, reduce meds
- If increased daytime activity, may need extra snack
- Eval pre-dinner insulin/meds

Other

DI1

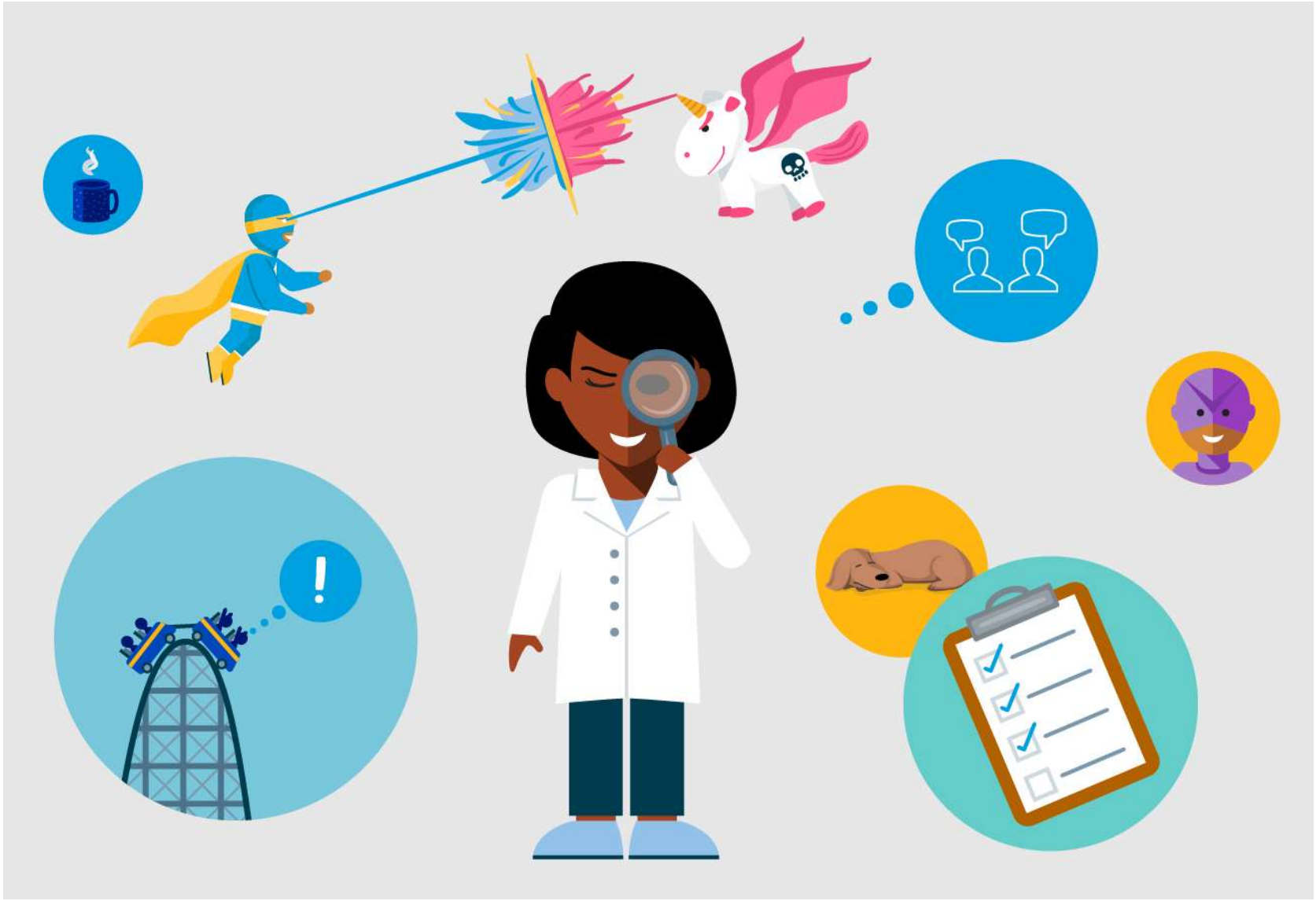
- Monitor kidney function / wt loss
- Monitor BG trends
- Too much meds?
- Skipped /delayed meals?
- Plan ahead
- Alcohol precautions
- Exercise planning
- CGM

Slide 206

DI1 Added note at the top

Diana Isaacs, 2025-08-25T01:19:52.215

Landmark Trials



Quick Question 19

Which study demonstrated that keeping A1c less than 7% reduces complications for Type 1?

a. Diabetes Prevention Trial
b. Diabetes Control and Complications Trial
c. United Kingdom Prospective Diabetes Study
d. YOUTH Trial

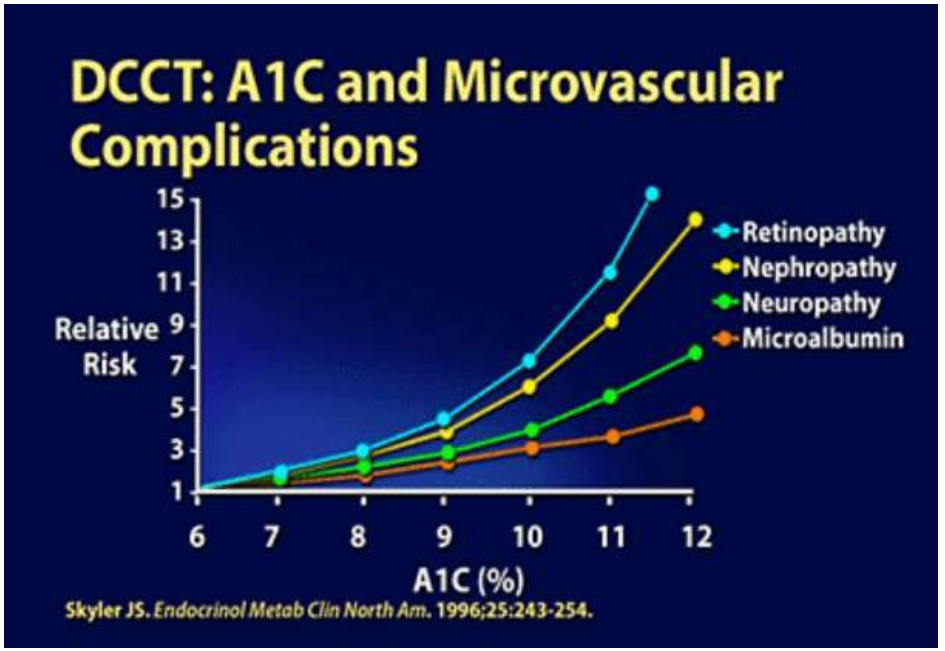
Diabetes Control and Complications Trial (DCCT) Type 1 – Does getting A1c <7% matter?

The largest, most comprehensive diabetes study ever conducted.

10 year study involved more than 1400 subjects with Type 1 DM.

Compared the effects of two treatment regimens:

- standard therapy and
- intensive control-on the complications of diabetes.



DCCT Conclusions

By maintaining A1C < 7%:

- Eye disease - 76% reduced risk
- Kidney disease - 50% reduced risk
- Nerve disease - 60% reduced risk

Management elements included:

- SMBG 4 or more times a day
- 4 daily insulin injections or insulin pump
- Greater risk of hypoglycemia
- More associated weight gain

UKPDS Results

United kingdom Prospective Diabetes Study

- Conducted over 20 years involving over 5,100 patients with Type 2 diabetes

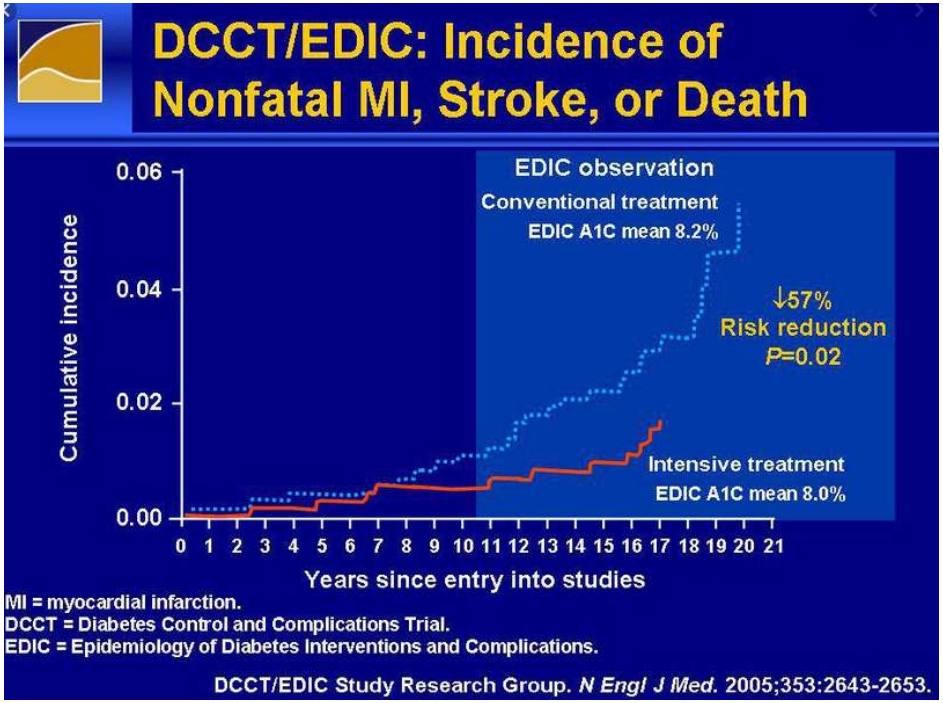
- 1% decrease in A_1c reduces microvascular complications by 35%
- 1% decrease in A_1c reduces diabetes related deaths by 25%

- B/P control (144/82) reduced risk of:
  - Heart failure (56%)
  - Stroke (44%)
  - Death from diabetes (32%)

Lancet 352: 837-865, 1998

“Legacy Effect”

- For participants of DCCT and UKPDS
  - long lasting benefit of early intensive BG control prevents
    - Microvascular complications
    - Macrovascular complications (15-55% decrease)
  - Even though their BG levels increased over time
  - Message – Catch early and Treat aggressively



Diabetes Bingo “DiaBingo”
Shout out Right Answer

DiaBingo- G

G ADA goal for A1c is less than ____%

G People with DM need to see their provider at least every month

G Blood pressure goal is less than

G People with DM should see eye doctor every

G The goal for triglyceride level is less than

G Goal for LDL cholesterol if 40+ with diabetes is ____

G The goal for blood sugars 1-2 hours after a meal is less than:

G People with DM need this shot every year

G People with DM need to get urine tested yearly for _____

G Periodontal disease indicates increased risk for heart disease

G The goal for blood sugar levels before meals is:

G The activity goal is to do ___ minutes on most days

DI1

How Many Drug Options for Diabetes?

- Biguanide
- Sulfonylureas
- Meglitinides
- Glucagon-like-peptide-1 (GLP-1) receptor agonists
- GLP/GIP receptor agonist
- Sodium glucose cotransporter-2 (SGLT-2) inhibitors
- Thiazolidinediones (TZD's)
- Dipeptidylpeptidase-4 (DPP-4) inhibitors
- Alpha-glucosidase inhibitors
- Bile acid sequestrant
- Dopamine-2-agonist
- Insulin
- Glucagon

GIP: glucose-dependent insulinotropic polypeptide

Slide 215

DI1 updated
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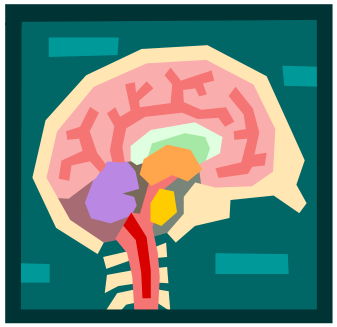
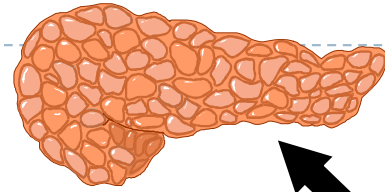
Drug Targets in T2D: Back to the Noxious 9

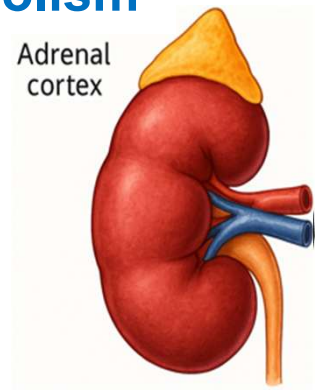


Neurotrans-
mission
dysfunction

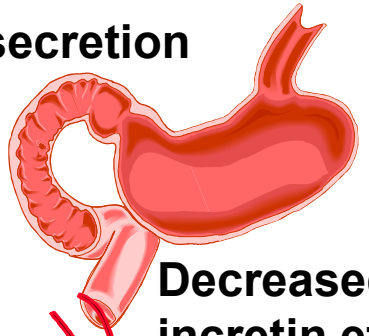


Decreased
Insulin β-cell secretion

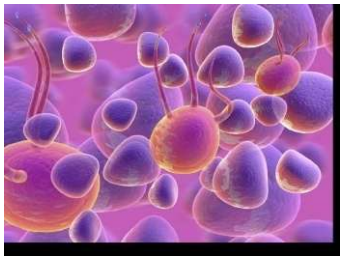
Hypercortisolism



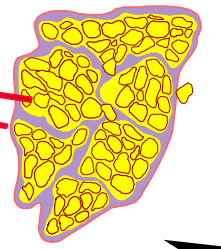
Increased renal
glucose
reabsorption



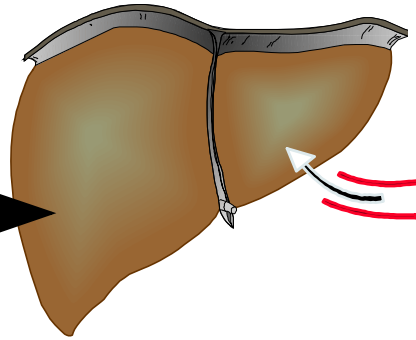
Decreased
incretin effect
Gut hormones



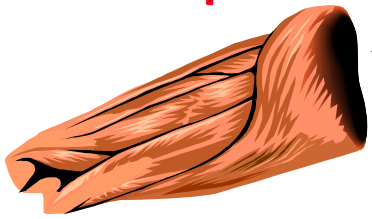
Increased glucagon
α-cell secretion



Increased
lipolysis



Increased
hepatic
glucose
production



Decreased muscle
glucose uptake

DeFronzo, Auchus-Hypercortisolism June 2025

Insulin Sensitizers

- **Action**: decrease insulin resistance by making muscle and adipose cells more sensitive to insulin; decrease free fatty acids
- **Names**:
  - pioglitazone (Actos) – bladder cancer warning
    - Dosing: 15-45 mg daily
    - Consider adding low dose if history of stroke or have steatosis
- **Efficacy/ Considerations**
  - Reduce A1C ~0.5-1.0%
  - 6 weeks for maximum effect
  - pioglitazone $5 a month, rosiglitazone $300 a month
  - Can cause fluid retention, not indicated w/ CHF

Thiazolidinediones "TZDs" • Increases insulin sensitivity	pioglitazone (Actos)	15 – 45 mg daily	Pioglitazone is recommended for people with diabetes after a stroke and/or to treat steatosis. May increase bladder cancer risk. Start with low dose, increase if needed. Monitor for edema. Increases fracture risk. Lowers A1C 0.5 – 1.0%.

DI1

Use of glucose-lowering medications in the management of type 2 diabetes

(For recommendations for specific conditions, including non-glucose-lowering medications, refer to pertinent sections)

Healthy lifestyle behaviors; diabetes self-management education and support; social determinants of health

To avoid therapeutic inertia, reassess and modify treatment regularly (3–6 months)

Goal: cardiovascular and kidney risk reduction*

+ASCVD†

+ASCVD/indicators of high CVD risk‡

- GLP-1 RA[#] with proven CVD benefit
- SGLT2i[§] with proven CVD benefit

If glycemia is above goal

- For individuals on a GLP-1 RA, consider adding SGLT2i with proven CVD benefit or vice versa
- Pioglitazone^

+Indicators of high CVD risk

+ASCVD/indicators of high CVD risk‡

- GLP-1 RA[#] with proven CVD benefit
- SGLT2i[§] with proven CVD benefit

If glycemia is above goal

- For individuals on a GLP-1 RA, consider adding SGLT2i with proven CVD benefit or vice versa
- Pioglitazone^

+HF

SGLT2i[§] with proven HF benefit in current or prior symptom s of HFrEF or HFpEF

SGLT2i and/or either dual GIP/GLP-1 RA or GLP-1 RA with proven benefit in symptomatic HFpEF and obesity

+CKD

eGFR <60 mL/min/1.73 m² or albuminuria (ACR ≥3.0 mg/mmol [30 mg/g]). Repeat measurement is required to confirm CKD

+CKD (on maximally tolerated dose of ACEi or ARB)

SGLT2i[§] with primary evidence of reducing CKD progression

- SGLT2i can be started wit h eGFR ≥20 mL/min/1.73 m²
- Glucose-lowering efficacy is reduced with eGFR <45 mL/min/1.73 m²

OR

GLP-1 RA[#] with proven CKD benefit

If glycemia is above goal, for individuals on SGLT2i, consider incorporating a GLP-1 RA or vice versa

If additional cardiovascular and kidney risk reduction, management of other metabolic comorbidities, and/or glycemic lowering is needed

+Mitigating risk of MASLD or MASH

Agents with proven or potential benefit in MASLD or MASH

GLP-1 RA, dual GIP and GLP-1 RA, pioglitazone, or combination of GLP-1 RA with pioglitazone

Use insulin in the setting of decompensated cirrhosis

Goal: achievement and maintenance of weight and glycemic goals

+Weight management

Efficacy for weight loss

- **Very high:** Semaglutide, tirzepatide
- **High:** Dulaglutide, liraglutide
- **Intermediate:** GLP-1 RA (not listed above), SGLT2i
- **Neutral:** Metformin, DPP-4i

+Achievement and maintenance of glycemic goals

Metformin or other agent (including combination therapy) that provides adequate efficacy to achieve and maintain glycemic treatment goals.

Prioritize avoidance of hypoglycemia in high risk individuals

Efficacy for glucose lowering

- **Very high:** Dulaglutide (high dose), semaglutide, tirzepatide, insulin
- Combination oral, combination injectable (GLP-1 RA and insulin)
- **High:** GLP-1 RA (not listed above), metformin, pioglitazone, SGLT2i, sulfonylurea
- **Intermediate:** DPP-4i

If glycemia is above goal or significant hypoglycemia or hyperglycemia or barriers to care are identified

- Refer to DSMES to support self-efficacy in achievement of treatment goal
- Consider technology (e.g., diagnostic or personal CGM) to identify therapeutic gaps and tailor therapy
- Identify and address SDOH that affect achievement of treatment goals

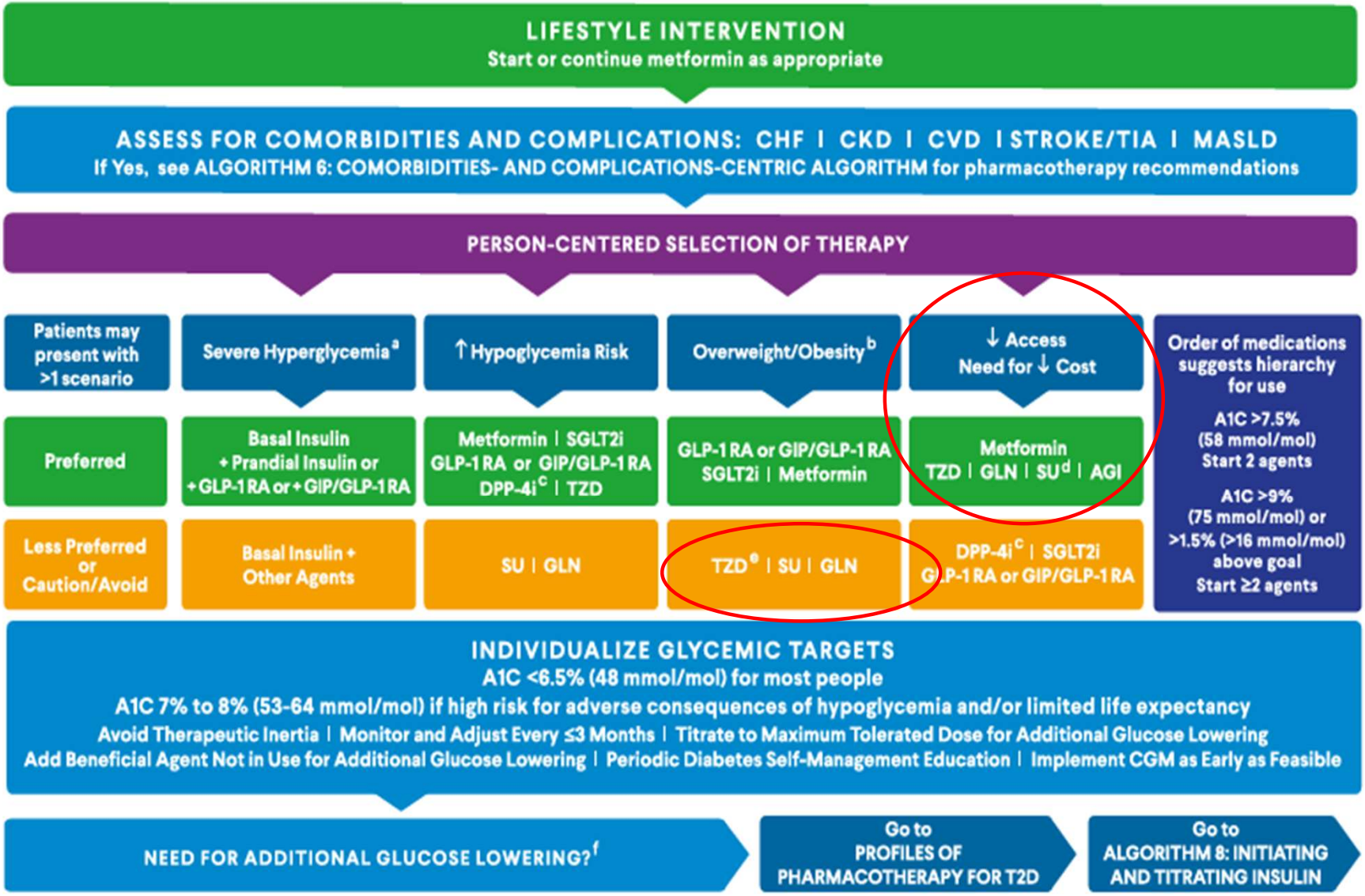
Slide 218

DI1 Updated with 2026 algorithm

Diana Isaacs, 2026-02-25T04:20:06.519

DI1

GLUCOSE-CENTRIC GLYCEMIC CONTROL ALGORITHM



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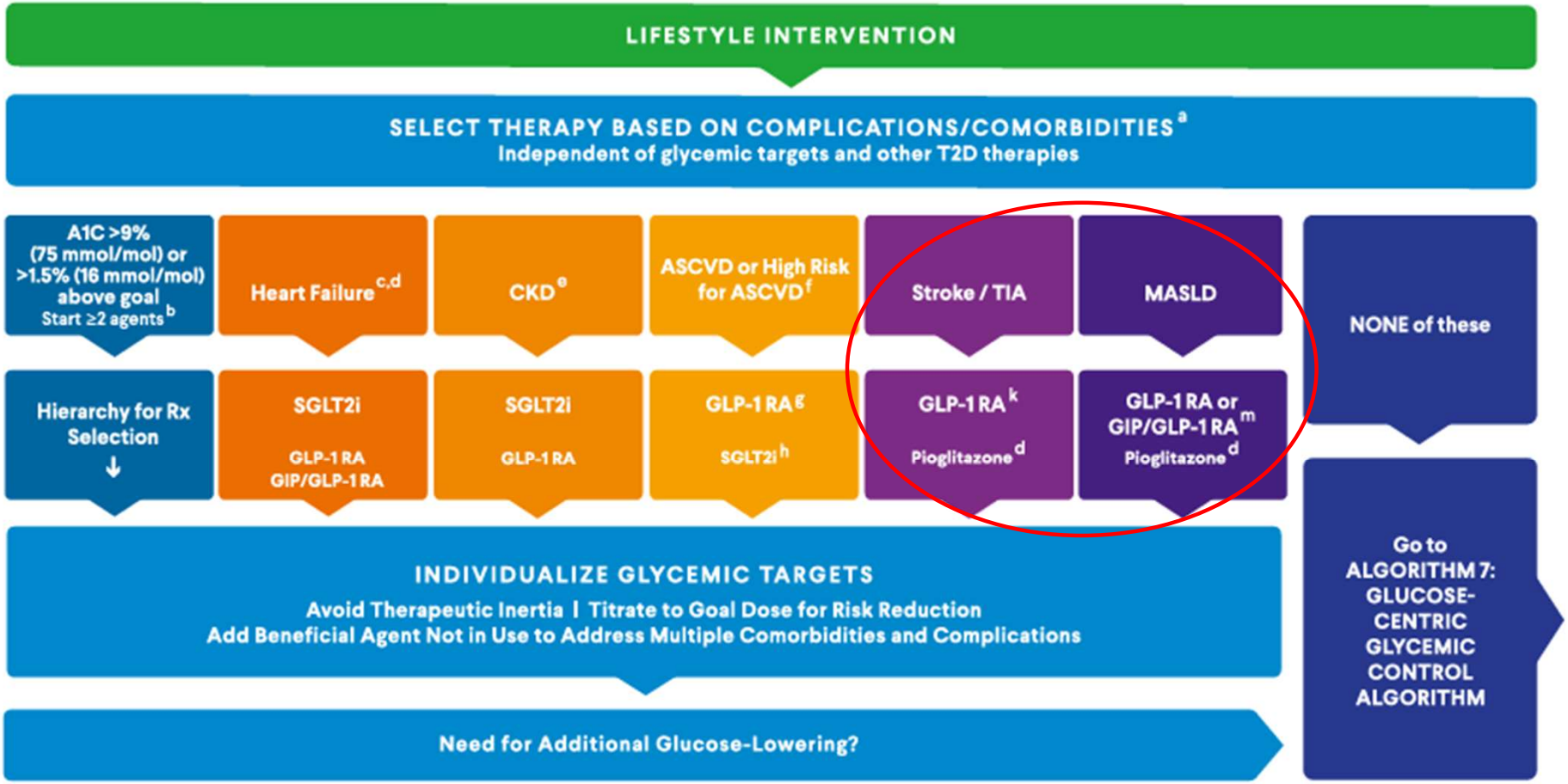
Slide 219

DI1 Updated algorithm

Diana Isaacs, 2026-04-07T02:45:27.116

COMORBIDITIES- AND COMPLICATIONS-CENTRIC GLYCEMIC CONTROL ALGORITHM



[a]CVOTs included metformin as baseline therapy. [b]For SEVERE HYPERGLYCEMIA (A1C >10% [>86 mmol/mol] and/or glucose >300 mg/dL [16.7 mmol/L]) with symptoms, strongly consider basal insulin (Go to ALGORITHM 8: INITIATING AND TITRATING INSULIN). Avoid use of GLP-1 RA or GIP/GLP-1 RA alone in severe hyperglycemia. These agents require titration over weeks delaying glycemic control. [c]Use SGLT2i with proven benefit (dapagliflozin, empagliflozin). Semaglutide/tirzepatide have potential benefit in obesity-related HFpEF. [d]TZDs are contraindicated in NYHA Class III/IV HF. Start at 15 mg, and balance benefits vs risks of weight gain. Allow >4 weeks at each dose before titration. [e]CKD: Use SGLT2i with proven benefit (canagliflozin, dapagliflozin, empagliflozin) or GLP-1 RA (semaglutide injection). [f]High risk for ASCVD: age ≥55 AND albuminuria or proteinuria, hypertension and LV hypertrophy, LV systolic or diastolic dysfunction, ankle-brachial index <0.9. [g]GLP-1 RA: oral or subcutaneous semaglutide, liraglutide, or dulaglutide. [h]SGLT2i: canagliflozin, empagliflozin, or dapagliflozin. [k]Stroke: semaglutide subcutaneous or dulaglutide. [m]MASLD: semaglutide or tirzepatide.

Abbreviations: **A1C**, hemoglobin A1c; **ASCVD**, atherosclerotic cardiovascular disease; **CKD**, chronic kidney disease; **CVOT**, cardiovascular outcomes trial; **eGFR**, estimated glomerular filtration rate; **GIP**, glucose-dependent insulinotropic polypeptide; **GLP-1 RA**, glucagon-like peptide-1 receptor agonist; **HF**, Heart Failure; **HFpEF**, heart failure with preserved ejection fraction; **LV**, left ventricular; **MASLD**, metabolic dysfunction-associated steatotic liver disease; **NYHA**, New York Heart Association; **Rx**, prescription; **SGLT2i**, sodium glucose cotransporter 2 inhibitor; **T2D**, type 2 diabetes; **TIA**, transient ischemic attack; **TZD**, thiazolidinedione; **UACR**, urine albumin-creatinine ratio

TZDs – How Do They Rate?

Question	Answer
Cause hypoglycemia?	No
Cause weight gain?	Yes
Affordable?	Generic
Lowers CV risk?	Yes
Can most tolerate /use?	Watch HF

Dipeptidyl Peptidase-4 (DPP-4) Inhibitors

- Mechanism of action
  - Prevents the breakdown of GLP-1 and GIP, resulting in 2-3X increased endogenous incretin levels
- Efficacy
  - Hemoglobin A1C reduction by **0.6%–0.8%**
  - Primarily lowers postprandial glucose levels
  - Not as effective as GLP-1 agonists
  - CV neutral, increased HF hospitalization with alogliptin/saxagliptin
- Adverse effects
  - Generally well tolerated, dosed once daily
  - Avoid in combo with GLP-1 agonist
  - Caution with h/o pancreatitis
  - Potential joint pain

DPP4 Inhibitor Dosing

Drug	Dose	Renal Adjustment
Sitagliptin	100 mg daily	50 mg/day eGFR 30–45 mL/min/1.73m^2 25 mg/day eGFR <30 mL/min/1.73m^2
Linagliptin	5 mg daily	None necessary
Saxagliptin	5 mg daily	2.5 mg/day eGFR < 45 mL/min/1.73m^2
Alogliptin	25 mg daily	12.5 mg/day eGFR 30–59 mL/min/1.73m^2 6.25 mg/day for eGFR <30 mL/min/1.73m^2

Where do DPP4 inhibitors fit within the treatment algorithm?

DI1

Slide 223

DI1 Modified slightly

Diana Isaacs, 2025-08-25T01:41:03.658

DI1

Use of glucose-lowering medications in the management of type 2 diabetes

(For recommendations for specific conditions, including non-glucose-lowering medications, refer to pertinent sections)

Healthy lifestyle behaviors; diabetes self-management education and support; social determinants of health

To avoid therapeutic inertia, reassess and modify treatment regularly (3–6 months)

Goal: cardiovascular and kidney risk reduction*

- **+ASCVD†**
  - **+ASCVD/indicators of high CVD risk‡**
    - GLP-1 RA[#] with proven CVD benefit
    - SGLT2i[§] with proven CVD benefit
  - **If glycemia is above goal**
    - For individuals on a GLP-1 RA, consider adding SGLT2i with proven CVD benefit or vice versa
    - Pioglitazone^
- **+Indicators of high CVD risk**
  - **+ASCVD/indicators of high CVD risk‡**
    - GLP-1 RA[#] with proven CVD benefit
    - SGLT2i[§] with proven CVD benefit
  - **If glycemia is above goal**
    - For individuals on a GLP-1 RA, consider adding SGLT2i with proven CVD benefit or vice versa
    - Pioglitazone^
- **+HF**
  - SGLT2i[§] with proven HF benefit in current or prior symptom s of HFrEF or HFpEF
  - SGLT2i and/or either dual GIP/GLP-1 RA or GLP-1 RA with proven benefit in symptomatic HFpEF and obesity
- **+CKD**
  - eGFR <60 mL/min/1.73 m² or albuminuria (ACR ≥3.0 mg/mmol [30 mg/g]). Repeat measurement is required to confirm CKD
  - **+CKD (on maximally tolerated dose of ACEi or ARB)**
    - SGLT2i[§] with primary evidence of reducing CKD progression
      - SGLT2i can be started wit h eGFR ≥20 mL/min/1.73 m²
      - Glucose-lowering efficacy is reduced with eGFR <45 mL/min/1.73 m²
    - **OR**
    - GLP-1 RA[#] with proven CKD benefit
  - If glycemia is above goal, for individuals on SGLT2i, consider incorporating a GLP-1 RA or vice versa

If additional cardiovascular and kidney risk reduction, management of other metabolic comorbidities, and/or glycemic lowering is needed

- **+Mitigating risk of MASLD or MASH**
  - **Agents with proven or potential benefit in MASLD or MASH**
    - GLP-1 RA, dual GIP and GLP-1 RA, pioglitazone, or combination of GLP-1 RA with pioglitazone
    - Use insulin in the setting of decompensated cirrhosis

Goal: achievement and maintenance of weight and glycemic goals

- **+Weight management**
  - **Efficacy for weight loss**
    - **Very high:** Semaglutide, tirzepatide
    - **High:** Dulaglutide, liraglutide
    - **Intermediate:** GLP-1 RA (not listed above), SGLT2i
    - **Neutral:** Metformin, DPP-4i
- **+Achievement and maintenance of glycemic goals**
  - Metformin or other agent (including combination therapy) that provides adequate efficacy to achieve and maintain glycemic treatment goals.
  - Prioritize avoidance of hypoglycemia in high risk individuals
  - **Efficacy for glucose lowering**
    - **Very high:** Dulaglutide (high dose), semaglutide, tirzepatide, insulin
    - Combination oral, combination injectable (GLP-1 RA and insulin)
    - **High:** GLP-1 RA (not listed above), metformin, pioglitazone, SGLT2i, sulfonylurea
    - **Intermediate:** DPP-4i

If glycemia is above goal or significant hypoglycemia or hyperglycemia or barriers to care are identified

- Refer to DSMES to support self-efficacy in achievement of treatment goal
- Consider technology (e.g., diagnostic or personal CGM) to identify therapeutic gaps and tailor therapy
- Identify and address SDOH that affect achievement of treatment goals

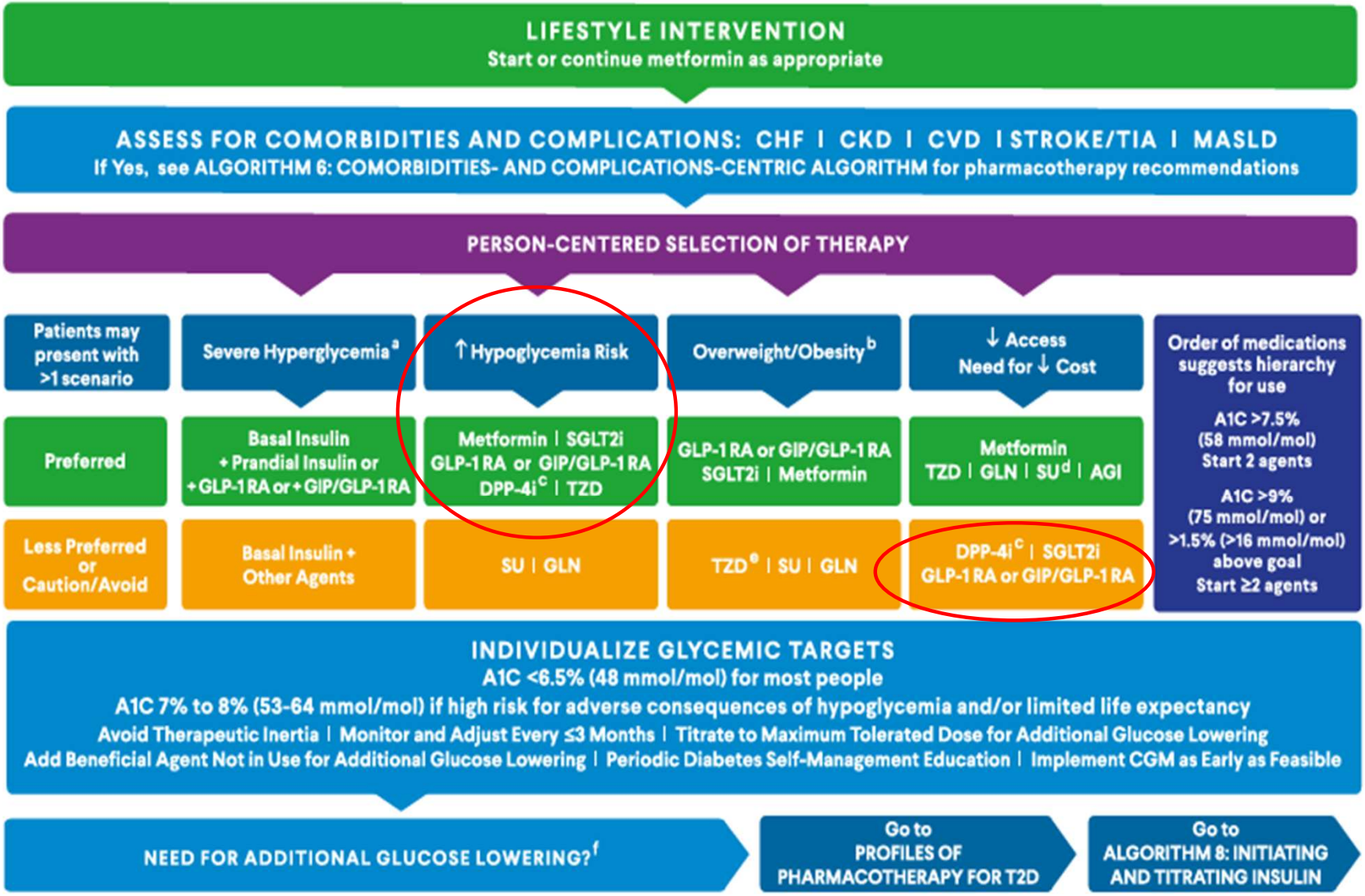
Slide 224

DI1 Updated with 2026 algorithm

Diana Isaacs, 2026-02-25T04:20:06.519

DI1

GLUCOSE-CENTRIC GLYCEMIC CONTROL ALGORITHM



[a]For SEVERE HYPERGLYCEMIA (A1C >10% [>86 mmol/mol] and/or glucose >300 mg/dL [16.7 mmol/L] with symptoms), strongly consider basal insulin (Go to ALGORITHM 8: INITATING AND TITRATING INSULIN). Avoid use of GLP-1 RA or GIP/GLP-1 RA alone in severe hyperglycemia. These agents require titration over weeks which can delay glycemic control. After glucose toxicity is resolved, reassess medical therapy and consider other agents. [b]See **AACE Algorithm for the Treatment of Obesity/Adiposity-Based Chronic Disease-2025 Update.** [c]DPP-4i and GLP-1 RA or GIP/GLP-1 RA should not be combined. [d]SUs may be inappropriate in older adults due to risk of hypoglycemia. [e]TZDs can cause increased weight partially attributable to fluid retention. [f]If despite appropriate therapy and adherence, glucose levels remain above target, also reconsider ALGORITHM 3: DIABETES CLASSIFICATION.

Abbreviations: **A1C**, hemoglobin A1C; **AGI**, alpha-glucosidase inhibitor; **CGM**, continuous glucose monitoring; **CHF**, congestive heart failure; **CKD**, chronic kidney disease; **CVD**, cardiovascular disease; **DPP-4i**, dipeptidyl peptidase 4 inhibitor; **GIP**, glucose-dependent insulinotropic polypeptide; **GLN**, glinide; **GLP-1 RA**, glucagon-like peptide 1 receptor agonist; **MASLD**, metabolic dysfunction-associated steatotic liver disease; **SGLT2i**, sodium glucose transporter 2 inhibitor; **SU**, sulfonylurea; **TIA**, transient ischemic attack; **T2D**, type 2 diabetes; **TZD**, thiazoladinedione

DI1 Updated algorithm
Diana Isaacs, 2026-04-07T02:45:27.116

Alpha-glucosidase Inhibitors

- **Action**: blocks enzymes that digest starches in the small intestine
- **Name**: acarbose (Precose) or miglitol (Glyset)
  - Dosing: 25-100mg TID, max 300mg/day
- Efficacy
  - Decrease postprandial glucose 40-50 mg/dl
  - Decrease A1C 0.5-1.0%
- Other Effects
  - Flatulence or abdominal discomfort
  - Contraindicated in patients with inflammatory bowel disease or cirrhosis
- Special Consideration
  - In case of hypoglycemia, treat with glucose tabs or milk
  - (other starches are blocked by medication)

Other Oral Diabetes Medications

Class/Main Action	Name(s)	Daily Dose Range	Considerations
Thiazolidinediones "TZDs" • Increases insulin sensitivity	pioglitazone (Actos) rosiglitazone (Avandia)	15 – 45 mg daily 4 – 8 mg daily	Black Box Warning: TZDs may cause or worsen CHF. Monitor for edema and weight gain. Increased peripheral fracture risk. Actos may increase risk of bladder cancer. Lowers A1c 0.5% – 1.0%
Glucosidase Inhibitors • Delays carb absorption	acarbose (Precose) miglitol (Glyset)	25 – 100 mg w/meals; 300 mg max daily dose	Start low dose, increase at 4-8 wk intervals to decrease GI effects. Caution with liver or kidney problems. In case of hypo, treat w/ glucose tabs. Lowers A1c 0.5– 1.0%.
Meglitinides • Stimulates rapid insulin burst	repaglinide (Prandin)	0.5 – 4 mg w/meals (metabolized in liver)	Take before meals. Side effects may include hypoglycemia and weight gain. Lowers A1c 1.0% – 2.0%.
	nateglinide (Starlix)	60 – 120 mg w/meals (eliminated via kidney)	
Dopamine Receptor Agonists • Resets circadian rhythm	bromocriptine mesylate—Quick Release "QR" (Cycloset)	1.6 to 4.8 mg a day (each tab 0.8 mg)	Take within 2 hrs of waking. Side effects: nausea, headache, fatigue, hypotension, syncope, somnolence. Lowers A1c 0.6% – 0.9%.
Bile Acid Sequestrants • Decreases cholesterol / BG levels.	Colesevelam HCL (Welchol)	Up to six (6) 625 mg pills (3 tabs am, 3 tabs pm) 3.75gm packet in 4-8 ounces of fluid	Do not use if history of bowel obstruction, triglycerides >500, or pancreatitis. Can decrease absorption of certain meds, soluble vitamins. Lowers LDL by 15-30%. Side effects GI in nature. Lowers A1c 0.5%

Non-Insulin Drug Comparison

Class	Efficacy	Hypo	Weight	Effect on MACE	Heart Failure	Kidney	MASH	Cost
Metformin	High	No	Neutral/ Loss	Potential benefit	Neutral	Neutral	Neutral	Low
SGLT2 Inhibitors	Intermediate to High	No	Loss, intermediate	Benefit	Benefit	Benefit	Unknown	High
GLP-1 RA	High to Very High	No	Loss, intermediate to very high	Benefit	Benefit: sema	Benefit	Benefit	High
GIP and GLP-1 RA	High to Very High	No	Loss, very high	Under investigation	Under investigation	Under investigation	Potential Benefit	High
DPP-4 Inhibitors	Intermediate	No	Neutral	Neutral	Risk: saxa/alogliptin	Neutral	Unknown	High
Pioglitazone	High	No	Gain	Potential benefit	Risk	Neutral	Potential Benefit	Low
Sulfonylurea	High	Yes	Gain	Neutral	Neutral	Neutral	Unknown	Low

DI1

PROFILES OF PHARMACOTHERAPY FOR TYPE 2 DIABETES

		METFORMIN	GLP-1 RA	GIP/GLP-1 RA	SGLT2i	TZD	DPP-4i	SU	GLN	AGI	INSULIN
EFFICACY FOR GLUCOSE LOWERING[a]		++	++/+++	++/++++	+/++	++	+/++	++/+++	+/++	+/++	++++
ASCVD	MACE		Benefit[b]	Benefit[b]	Benefit[c]						
	STROKE		Benefit[d]	Benefit[d]	Benefit[c]	Benefit					
CHF[e]			Potential Benefit[e]	Potential Benefit[e]	Benefit	Contraindicated NYHA Class III/IV[f]	Saxagliptin Alogliptin[g]				Moderate
CKD			Benefit[d]	Benefit	Benefit						
RENAL IMPAIRMENT		Decrease Dose for eGFR 30 to 45[h] Contraindicated for eGFR <30[h]	Exenatide for eGFR 30 to 45[k] Exenatide Contraindicated for eGFR <30		↓Glycemic Efficacy at Lower eGFR Check Drug-Specific eGFR Thresholds[m]		Adjust Dose[n]	↑ Hypoglycemia Risk	↑ Hypoglycemia Risk	Contraindicated eGFR<25 or Serum Cr >2 mg/dL	↑ Hypoglycemia Risk
HYPOGLYCEMIA RISK								Moderate to High[o]	Low to Moderate		Moderate to High
WEIGHT		Slight Loss	Loss	Loss	Mild Loss	Gain[f]		Gain			Gain
MASLD[p]	HEPATIC STEATOSIS		Benefit[q]	Potential Benefit	Potential Benefit	Potential Benefit					Potential Benefit
	MASH		Benefit[q]	Potential Benefit		Potential Benefit					
	FIBROSIS PROGRESSION		Benefit[q]	Potential Benefit		Potential Benefit					
	FIBROSIS REGRESSION		Benefit[q]	Potential Benefit	Potential Benefit	Potential Benefit					
GI ADVERSE SYMPTOMS		Mild to Moderate	Moderate[r]	Moderate[r]						Moderate	
OTHER CONSIDERATIONS			MTC/MEN2	OSA MTC/MEN2	GU Infections Euglycemic DKA[s] ↑ Fracture Risk[t]	↑ Fracture Risk[t] Bladder Cancer	Rare Arthralgias/ Myalgias				
ACCESS/COST		$	$$$	$$$	$$$	$	$-$$	$	$-$$	$-$$	$ - $$$

Benefits | Use with caution | Contraindicated | Neutral, not studied, or insufficient evidence

[a]Each "+" approximates 0.5% A1C lowering. [b]GLP-1 RA MACE benefits with liraglutide, dulaglutide, semaglutide (oral or subcutaneous). Tirzepatide is non-inferior to dulaglutide for MACE. [c]SGLT2i MACE benefits and potential hemorrhagic stroke benefit with empagliflozin, canagliflozin. [d]Stroke and CKD benefits with dulaglutide, semaglutide. Tirzepatide is non-inferior to dulaglutide for stroke. [e]Obesity-related HFpEF. [f]TZDs increase fluid retention and edema and are contraindicated in CHF NYHA Class III/IV. [g]Increased CHF hospitalization risk with saxagliptin and alogliptin. [h]Contraindicated in CKD4 (eGFR <30 ml/min/1.73 m^2). For CKD3b (eGFR 30 to <45 mL/min/1.73 m^2), do not initiate or initiate with caution to maximum 500 mg twice per day. Hold for acute kidney injury or intravenous contrast. [k]Exenatide CKD3b (eGFR 30 to <45 mL/minute/1.73 m^2) use not recommended or monitor closely. [m]The eGFR thresholds for initiation and/or continuation in CKD vary among SGLT2i. Check drug-specific eGFR thresholds. Not for use for eGFR <20 ml/min/1.73 m^2. [n]Only linagliptin does not require adjustment. [o]Single-agent risks of hypoglycemia may be low but increases when combined with other agents or with CKD (glyburide > glipizide/glimepiride/gliclazide). [p]Adapted from Cusi et al. 2025. [q]Shown for semaglutide. [r]Use slow titration, portion control, and reduce to prior tolerated dose if disruptive. [s]Precipitants include significant concurrent illness, surgery, inappropriate/rapid insulin dose reduction, and fasting. [t]Reported with canagliflozin, dapagliflozin, and pioglitazone.

DI1 New from aace algorithm

Diana Isaacs, 2026-04-07T03:37:18.650

Check Your Knowledge - 20

Which of the following medications is **least** affordable?

A. Pioglitazone (Actos)
B. Metformin (Glucophage)
C. Glimepiride (Amaryl)
D. Semaglutide (Ozempic)

Medication Cost Considerations

- Lowest cost medications - AWP for a month
  - Metformin - $3
  - Sulfonylureas $3
  - Pioglitazone $3
  - Bexagliflozin -$48,
  - Insulin-$35 co-pay or lower cost insulin (ex. NPH)
- Highest cost medications – AWP for a month
  - GLP-1 RA - $1000
  - GLP-1/GIP RA - 1000+
  - SGLT2i - $650
  - DPP4i - $550-600
  - Lilly and Novo Nordisk have direct purchase programs

Cost Related Barriers

- Among people with chronic illnesses, 2/3 of those who reported not taking medications as prescribed due to CRB never shared this with their physician.
- Especially associated with diabetes medications and insulin.

Combo Oral Medications PocketCard™

Medications	Doses in mg	Medications	Doses in mg	Medications	Doses in mg
Trijardy XR (3 meds) empagliflozin linagliptin metformin XR	 5 - 25 2.5 -5 1000	Janumet (sitagliptin/ metformin)	50/500 50/1000	Prandimet (repaglinide/ metformin)	1/500 2/500
ACTOplus Met* (pioglitazone/ metformin)	15/500 15/850	Janumet XR (sitagliptin/ metformin)	50/500 50/1000 or 100/1000	Qtern (saxagliptin / dapagliflozin)	5/10
ACTOplus Met XR (pioglitazone/ metformin	15/1000 30/1000	Jentadueto (linagliptin/ metformin)	2.5/500 2.5/850 or 2.5/1000	Segluromet (ertugliflozin/ metformin)	2.5/500 or 2.5/1000 or 7.5/500 or 7.5/1000
Duetact* (pioglitazone/ glimepiride)	30/2 30/4	Kazano (alogliptin/ metformin)	12.5/500 12.5/1000	Steglujan (ertugliflozin/ sitagliptin)	5/100 or 15/100
Glucovance* (glyburide/ metformin)	1.25/250 2.5/500 5/500	Metaglip* (glipizide/ metformin)	2.5/250 2.5/500 or 5/500	Synjardy (empagliflozin/ metformin)	5/500 or 12.5/500 5/1000 or 12.5/1000
Glyxambi (empagliflozin and linagliptin)	10/5 25/5	Oseni (alogliptin/ pioglitazone)	12.5/15 or 25/15 12.5/30 or 25/30 12.5/45 or 25/45	Synjardy XR† (empagliflozin/ metformin XR)	5/1000 or 10/1000 12.5/1000, 25/1000 †Approved for peds
Invokamet (canagliflozin/ metformin)	50/500 or 50/1000 150/500 or 150/1000			Xigduo XR (dapagliflozin/ metformin)	5/500 or 10/500 5/1000 or 10/1000

Available in generic. Observe precautions of each component drug.

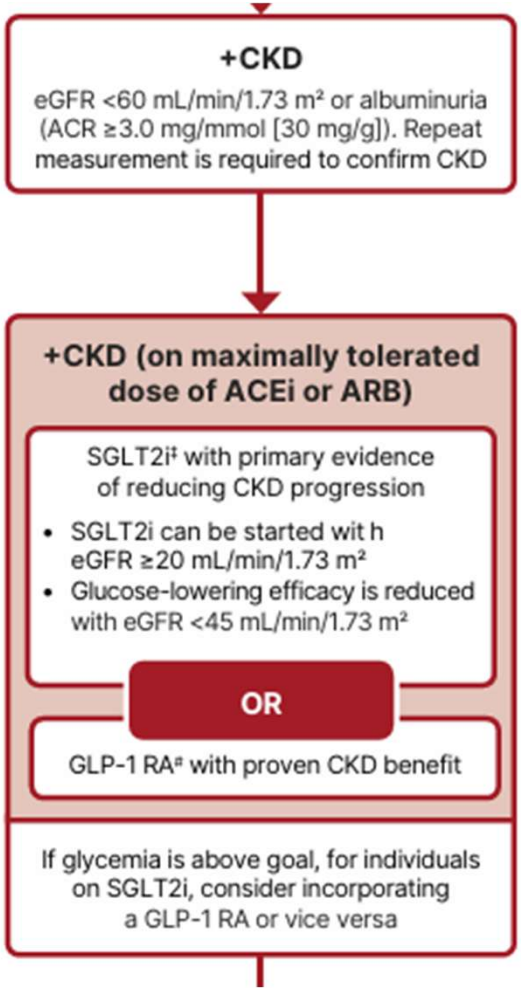
Diabetes + CKD – Increases CVD Risk

- Chronic kidney disease (CKD) is a frequent complication in diabetes
  - Type 1 diabetes **~**30%
  - Type 2 diabetes **~up to** 40%
- In several studies, participants on SGLT2i with GFRs of 30-60 (stage 3) reduced ASCVD risk and improved renal function
  - Slowed kidney disease or death
  - Reduced albuminuria

National Kidney Foundation.
https://www.kidney.org/atoz/content/diabetes

DI1

Chronic Kidney Disease - Choosing glucose-lowering medication



New in 2026: In adults with T2D and advanced CKD (eGFR <30), a GLP-1 RA is preferred for glycemic management due to lower risk of hypoglycemia and for CV event reduction

In kidney disease, use SGLT-2 in people with GFR ≥ 20 and continue until initiation of dialysis or transplantation.
(When GFR <45, SGLT-2's don't lower BG much.)

Or
GLP-1 RA with proven CVD CKD benefit

*Semaglutide improves kidney function (FLOW trial)

Slide 235

DI1 Updated with 2026 algorithm

Diana Isaacs, 2026-02-25T05:08:59.646

Risk of CKD Progression, CVD

11. Chronic Kidney Disease and Risk Management: Standards of Care in Diabetes—2026 FREE

American Diabetes Association Professional Practice Committee for Diabetes*

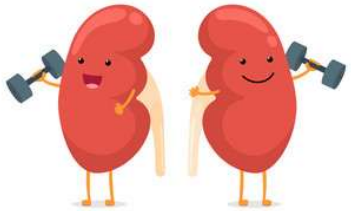
CKD is classified based on:

- **GFR (G)**
- **Albuminuria (A)**

GFR categories (mL/min/1.73 m²) Description and range				Albuminuria categories Description and range		
				A1	**A2**	**A3**
				Normal to mildly increased	Moderately increased	Severely increased
				<30 mg/g <3 mg/mmol	30-299 mg/g 3-29 mg/mmol	≥300 mg/g ≥30 mg/mmol
	G1	Normal or high	**≥90**	Screen 1	Treat 1	Treat and refer 2
	G2	Mildly decreased	**60-89**	Screen 1	Treat 1	Treat and refer 2
	G3a	Mildly to moderately decreased	**45-59**	Treat 1	Treat 2	Treat and refer 3
	G3b	Moderately to severely decreased	**30-44**	Treat 2	Treat and refer 3	Treat and refer 3
	G4	Severely decreased	**15-29**	Treat and refer 3	Treat and refer 3	**Treat and refer 4+**
	G5	Kidney failure	**<15**	**Treat and refer 4+**	**Treat and refer 4+**	**Treat and refer 4+**

- Low risk (if no other markers of kidney disease, no CKD)
- Moderately increased risk
- High risk
- Very high risk

Treating CKD



DI1

- Use max tolerated ACEI or ARB
- Optimize glucose and BP to protect kidneys
- Aim to reduce urinary albumin by ≥30% in people with CKD

  - *SGLT-2i's with proven benefit
    - Empagliflozin (Jardiance), canagliflozin (Invokana), dapagliflozin (Farxiga)
  - *GLP-1 RA's with proven benefit
    - Semaglutide (Ozempic)-has indication, liraglutide (Victoza), dulaglutide (Trulicity)

11. Chronic Kidney Disease and Risk Management: Standards of Care in Diabetes—2026 FREE

American Diabetes Association Professional Practice Committee for Diabetes*

Slide 237

DI1 Updates to some wording

Diana Isaacs, 2026-04-07T03:45:22.558

New in 2026: GLP-1 in Kidney Disease

DI1

- In adults with T2D and advanced CKD (eGFR <30), a GLP-1 RA is preferred for glycemic management due to lower risk of hypoglycemia and for CV event reduction.
- Individuals on dialysis can be safely initiated or continued on GLP-1 based therapy to reduce CV risk and mortality
- Reminder: only GLP-1 with renal restrictions are exenatide and lixisenatide

11. Chronic Kidney Disease and Risk Management: Standards of Care in Diabetes—2026 FREE

American Diabetes Association Professional Practice Committee for Diabetes*

Slide 238

DI1 New slide

Diana Isaacs, 2026-02-25T05:10:28.108

SGLT2 Inhibitor CKD Evidence Summary

Trial Name	SGLT2 Inhibitor vs placebo	Outcomes (Primary Bolded)
CREDENCE	Canagliflozin	N=4401, Median follow-up 2.6 years, Prior CVD 50.4% **ESRD, doubling of creatinine or death from renal or CV cause** (primary): HR 0.70 (0.59-0.82) 3 point MACE 0.80 (0.67-0.95)
DAPA-CKD	Dapagliflozin	N=4304, 2906 with diabetes, Median follow-up 2.4 years, Prior CVD 37.4% **>50% decline in eGFR, ESKD or renal/CV death (primary**): HR 0.61 (0.51-0.72)
EMPA-Kidney	Empagliflozin	N=6609, Median follow-up 2.0 years, Prior CVD 27%, 46% with DM **ESRD, >40% decline in eGFR, ESKD, or renal/CV death (primary**): HR 0.72 (0.64-0.82), stopped early due to positive benefit

Perkovic V, Jardine MJ, Neal B, et al. Canagliflozin and renal outcomes in type 2 diabetes and nephropathy. N Engl J Med. 2019;380:2295–2306.
Heerspink HJL, Stefansson BV, Correa-Rotter R, et al. Dapagliflozin in patients with chronic kidney disease. N Engl J Med. 2020;383:1436–1446.
EMPA-KIDNEY Collaborative Group, Herrington WG, Staplin N, Wanner C, et al. Empagliflozin in Patients with Chronic Kidney Disease. N Engl J Med. 2022 Nov 4. doi: 10.1056/NEJMoa2204233. Epub ahead of print. PMID: 36331190.

GLP-1 Receptor Agonists in CKD

Effects of Semaglutide on Chronic Kidney Disease in Patients with Type 2 Diabetes (FLOW)	
Study Design	Phase III randomized, double-blind, placebo-controlled trial
Size & Duration	N = 3,533; median follow-up: 3.4 years
Intervention	Semaglutide 1 mg per week vs. placebo
Patient Population	Adults aged ≥ 18 years with type 2 diabetes (A1C level ≤10%) • **eGFR 25 to <50 mL/min/1.73m² and UACR > 100 mg/g to 5000 mg/g** OR • **eGFR 50 to 75 mL/min/1.73m² and UACR ≥ 300 mg/g to 5000 mg/g** • On stable, max-tolerated ACEI or ARB; or patients with documented intolerance
Endpoints	Primary Composite Endpoint[1] • HR 0.76 (0.66–0.88); **NNT 23** → ≥50% reduction from baseline in eGFR: HR 0.73 (0.59–0.89) → Death from cardiovascular causes: HR 0.71 (0.56–0.89)

[1] Primary composite endpoint: onset of kidney failure (dialysis, transplantation, or an eGFR of <15 ml per minute per 1.73 m^2), at least a 50% reduction in the eGFR from baseline, or death from kidney-related or cardiovascular causes

Perkovic V, et al. N Engl J Med. 2024;391(2):109-121.

Finerenone Resource

In people with CKD and albuminuria, a nonsteroidal MRA effective if eGFR 25+

New nonsteroidal MRAs for Type 2 and Chronic Kidney Disease

Nonsteroidal Selective Mineralocorticoid Antagonist

Indicated for people with chronic kidney disease (CKD) associated with Type 2 diabetes. Reduces the risk of kidney function decline, kidney failure, cardiovascular death, non-fatal heart attacks, and hospitalization for heart failure in adults with chronic kidney disease associated with type 2 diabetes. The mineralocorticoid receptor antagonist blocks the effects of aldosterone and reduces the risk of kidney function decline as well as heart failure.

Class / Action	Generic / Trade Name	Daily Dose	Frequency	Considerations
Nonsteroidal, selective mineralocorticoid antagonist. Blocks mineralocorticoid receptor mediated sodium reabsorption and mineralocorticoid overactivation in epithelial (for example kidneys) and nonepithelial (for example heart, blood vessels) tissues.	**Finerenone / Kerendia**	**10-20 mg**	**Once daily**	Monitor potassium 4 weeks after initiation or dose adjustment (although impact on potassium is much less than non-slective mineralocorticoid antagonists like spironolactone). Since medication is a CYP3A4 substrate, avoid taking with other strong cype3A4 inhibitors. Avoid grapefruit or grapefruit juice. May take with or without food.

Contributor: Diana Isaacs, PharmD, BCPS, BCACP, BC-ADM, CDCES, FADCES, FCCP 2022

Kidney Goals and MNT

- Nutrition Recommendations
- For people with non–dialysis-dependent stage 3 or higher chronic kidney disease
  - dietary protein intake aimed to a target level of 0.8 g/kg body weight per day.
- For those on dialysis,
  - consider protein intake of 1.0–1.2 g/kg/day since protein energy wasting is a major problem in some individuals on dialysis
- Refer to nephrology
  - If GFR < 30 or uncertain CKD etiology

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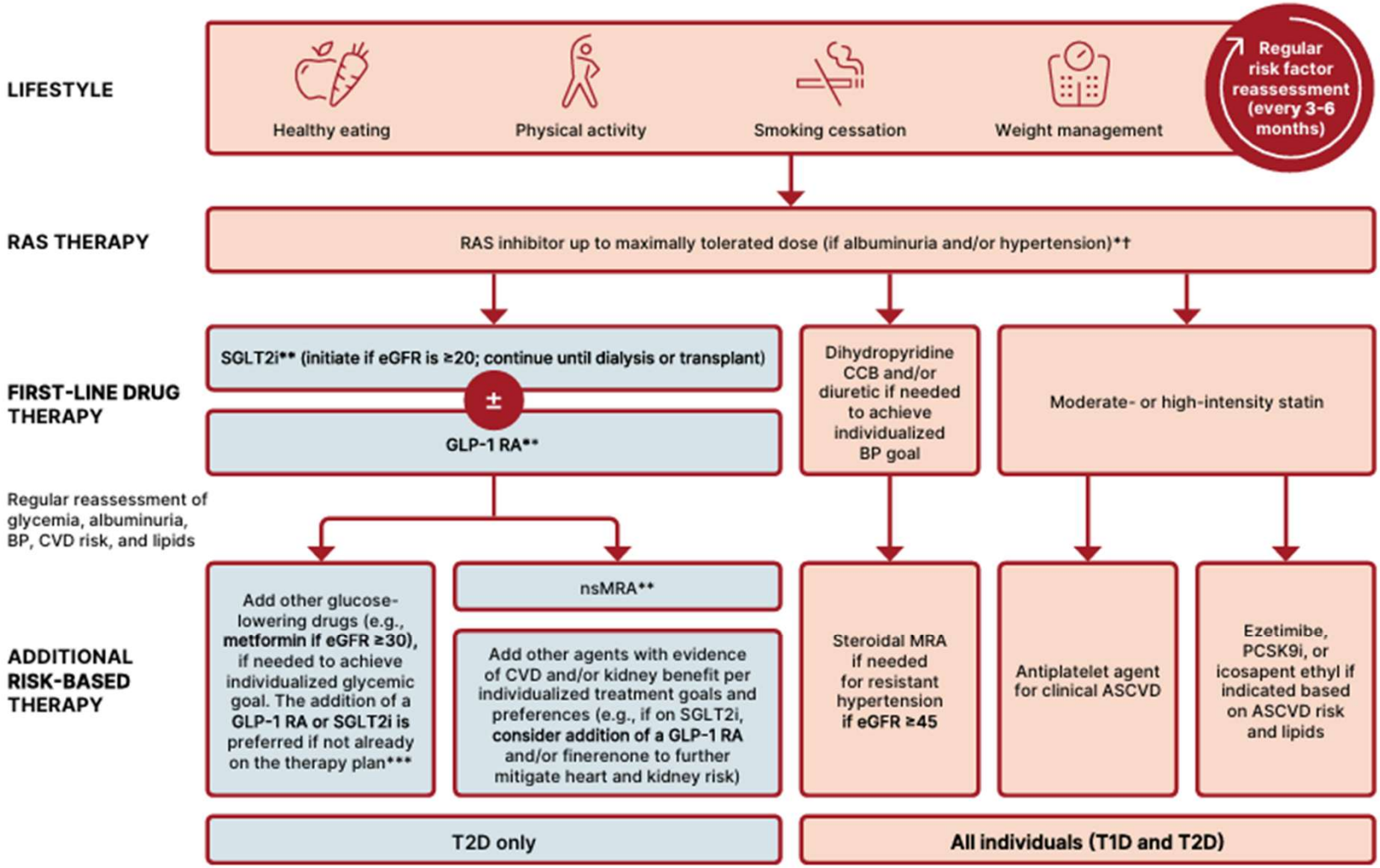
DI1

Figure 11-12 Holistic Approach to Diabetes + CKD



*The majority of participants in SGLT2i, GLP-1 RA and nsMRA kidney outcome trials were receiving background optimized RAS inhibitor therapy.
**With demonstrated benefit in this population
***Glucose-lowering efficacy of GLP-1 RAs is preserved at low eGFR; glucose-lowering efficacy of SGLT2i is diminished at lower eGFR.

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Slide 243

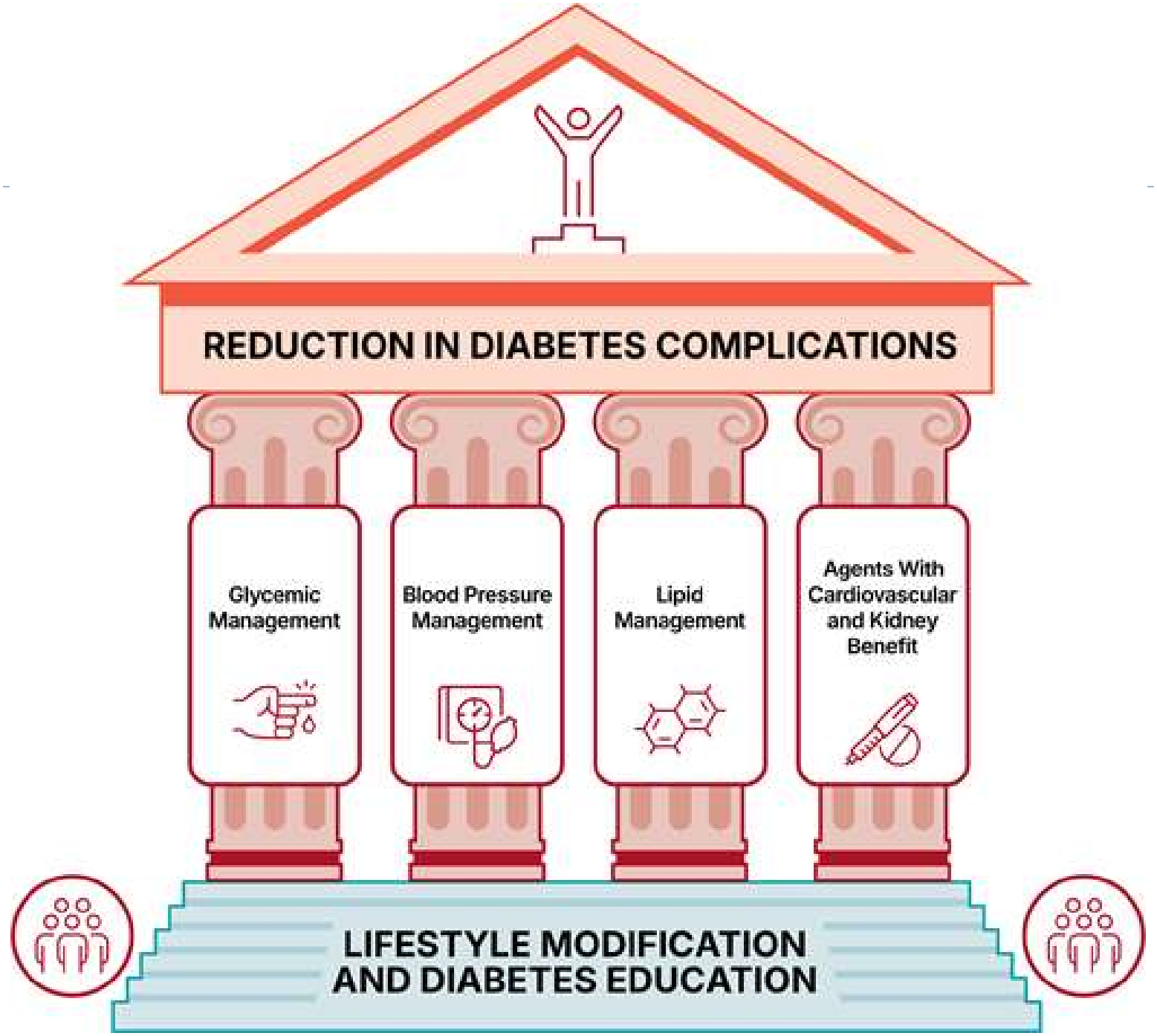
DI1 New slide
Diana Isaacs, 2025-08-25T02:19:23.837

DI1 0 Updated with this year’s aglorithm
Diana Isaacs, 2026-04-07T03:52:05.179

Diabetes Bingo “DiaBingo”
Shout out Right Answer

DiaBingo - O

- SGLT-2 Inhibitors main action
- Sitagliptin (Januvia) belongs to which class?
- These classes of diabetes pills increase insulin release
- People with high am glucose may benefit from pm
- On Acarbose (Precose) should treat hypo with ___
- On Metformin (Glucophage) stop med if GFR ___
- On which med should ind's know about hypoglycemia
- Possible side effects of TZD's include
- Metformin can damage kidney function
- What warning for DPP- IV and GLP-1 RA
- GLP-1 Receptor agonists cause increased satiety
- If GI side effects on Metformin try ____



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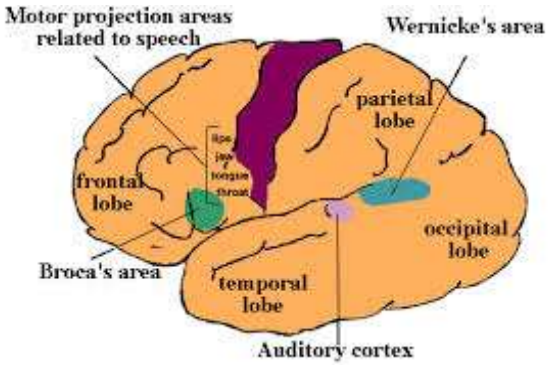
Stroke and Heart Attack

- Pain or discomfort in your arms, back, jaw, neck, or stomach
- Shortness of breathing
- Sweating
- Nausea
- Light-headedness

Make sure people with diabetes know the signs and seek immediate help.

People with diabetes may not experience intense chest or jaw pain during heart attack due to neuropathy.

Stroke of Luck



DI1

10. Cardiovascular Disease and Risk Management

- CVD includes ASCVD and heart failure
- ASCVD
  - Acute coronary syndrome
  - Myocardial infarction (MI)
  - Stable or unstable angina
  - Coronary or other arterial revascularization
  - Stroke, transient ischemic attack
  - Peripheral artery disease (PAD) including aortic aneurysm
- CVD is the leading cause of morbidity and mortality in people with diabetes

Large benefits are seen when multiple CV risk factors are addressed simultaneously

With more aggressive goals, rates of CVD have decreased.
CV Risks predicted to increase in future.

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Slide 249

DI1 Updated.
Diana Isaacs, 2026-04-07T03:55:15.840

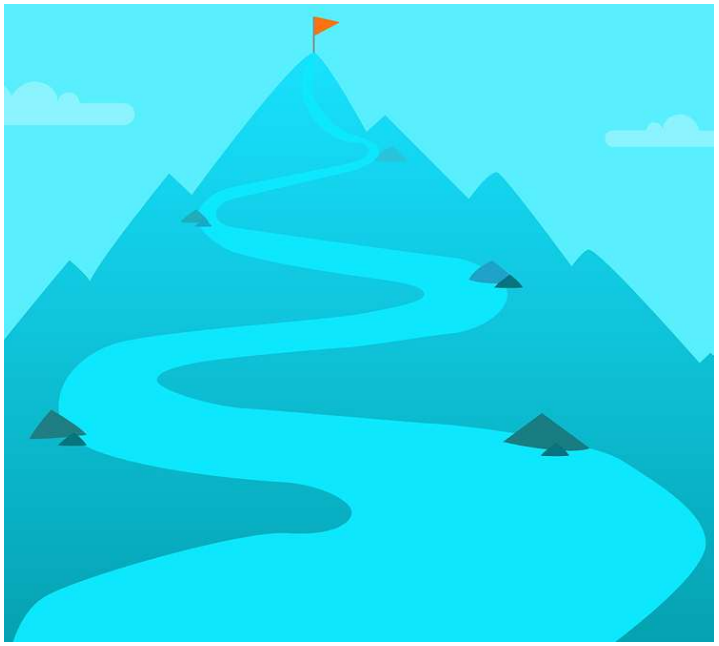
Assess ASCVD and Heart Failure Risk

- Duration of diabetes
- BMI
- Hypertension
- Dyslipidemia
- Smoking
- Family history of premature coronary disease
- Chronic kidney disease – presence of albuminuria
- ASCVD risk factors and 10-year ASCVD risk assessment

Treat modifiable risk factors as described in ADA guidelines.

Reducing CV Risk Factors

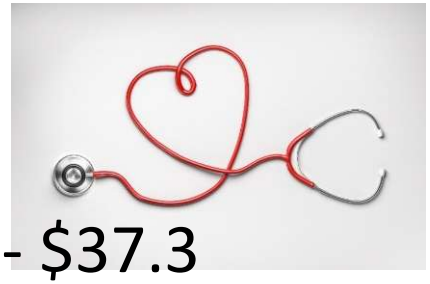
- Modifiable
  - Sleep
  - Smoking
  - Oral Care
  - Weight
  - Dietary Habits
  - Glucose
  - Blood Pressure
  - Lipids
  - UACR



- Make small, achievable goals. We are in this for the long run.

ASCVD Targets

- Targets Achieved in US Adults 2015-2018
  - A1C <7% by 50.5%
  - BP target of <130/80 achieved by 47.7%
  - Lipid control (non-HDL cholesterol) <130 mg/dL, achieved by 55.7%
- 22.2% met targets for all three risk factors



  - Largest contributor to direct and indirect costs - $37.3 billion/year
  - Rates of heart failure hospitalization are 2x higher in people with diabetes.

1. Improving Care and Promoting Health in Populations: Standards of Care in Diabetes—2026 FREE

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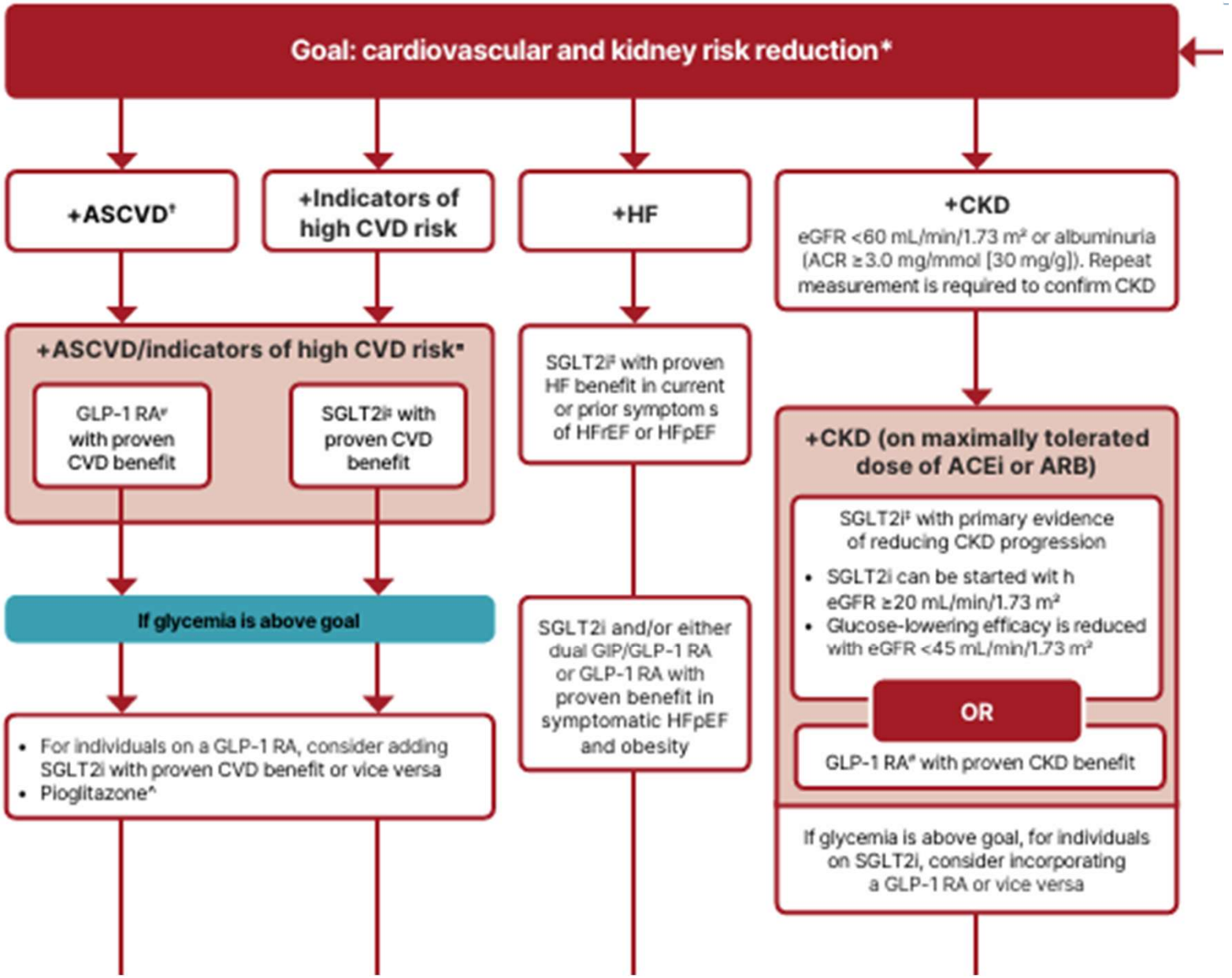
High Risk or Establish CVD, CKD, HF



Slide 253

DI1 Updated treatment algorithm to 2026.
Diana Isaacs, 2026-03-04T01:07:58.835

DI1

Indicators of High CV Risk

- Over 55 years with 2 or more additional risk factors:
  - Obesity
  - Hypertension
  - Smoking
  - Dyslipidemia
  - Albuminuria

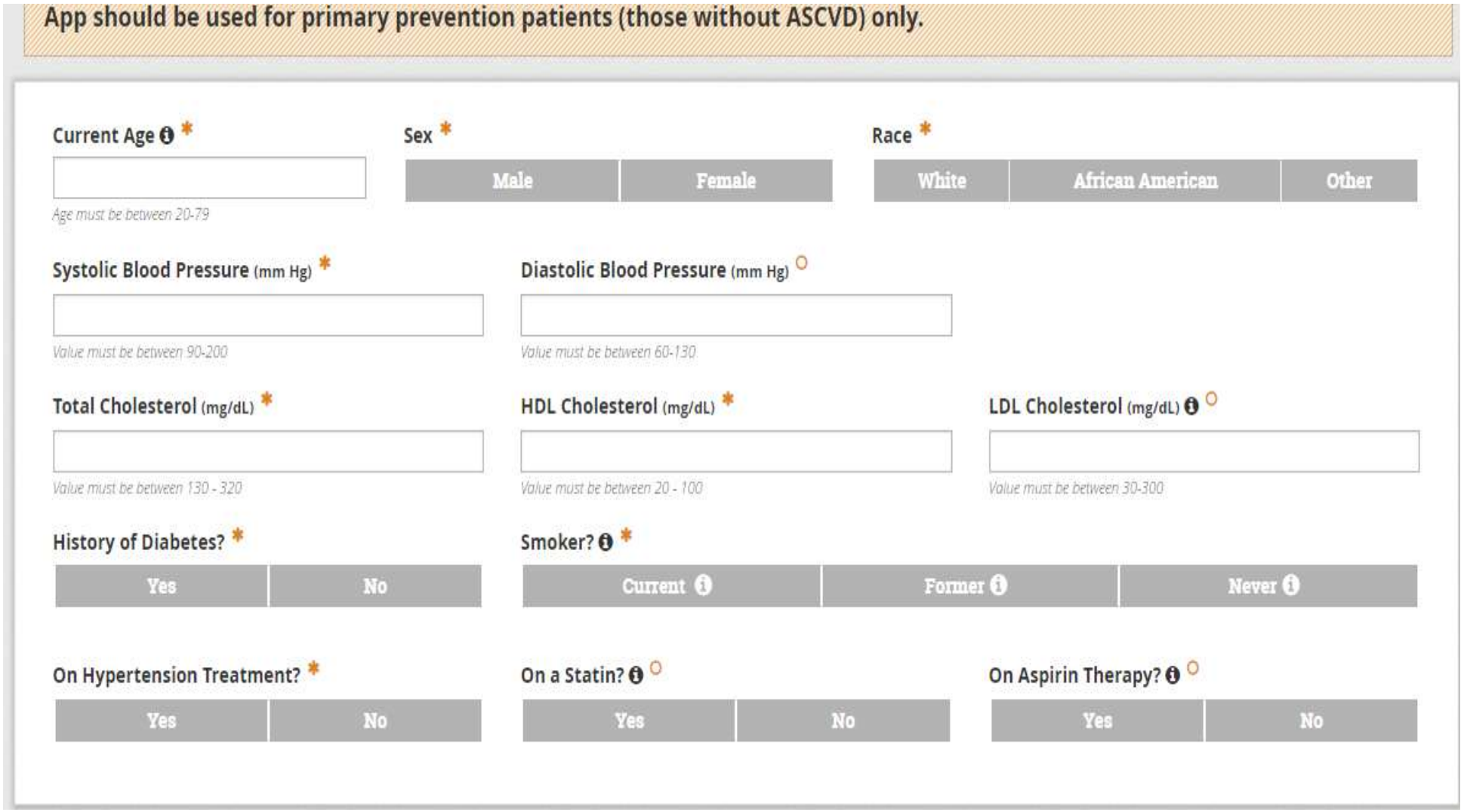
Slide 254

DI1 New for this slide deck

Diana Isaacs, 2026-03-04T02:23:41.777

Calculating ASCVD Risk

- http://tools.acc.org/ASCVD-Risk-Estimator-Plus/#!/calculate/estimate/



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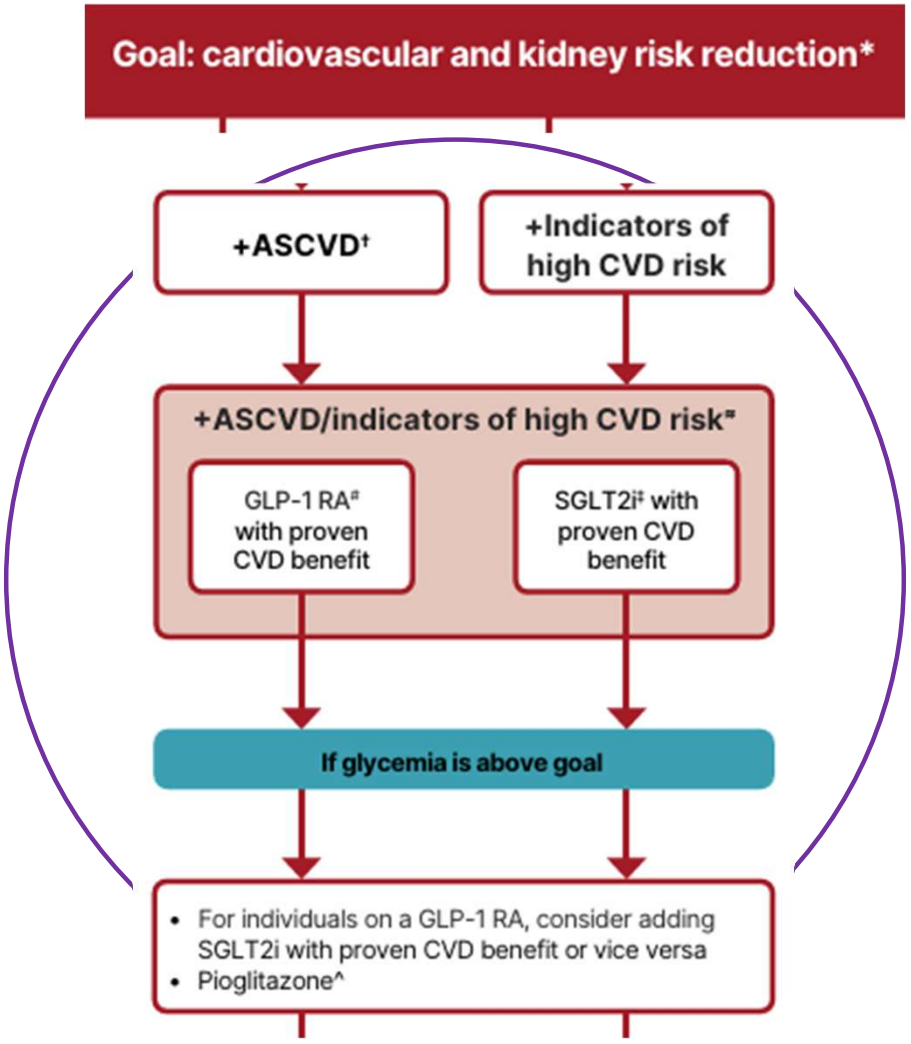
Cardiovascular Disease or High Risk



ASCVD = atherosclerotic cardiovascular disease
MACE: major adverse cardiovascular events

Most effective meds based on Cardiovascular Outcomes Trial (CVOT) to Reduce MACE

GLP-1 RA's Preferred
semaglutide (Ozempic),
liraglutide (Victoza),
dulaglutide (Trulicity)

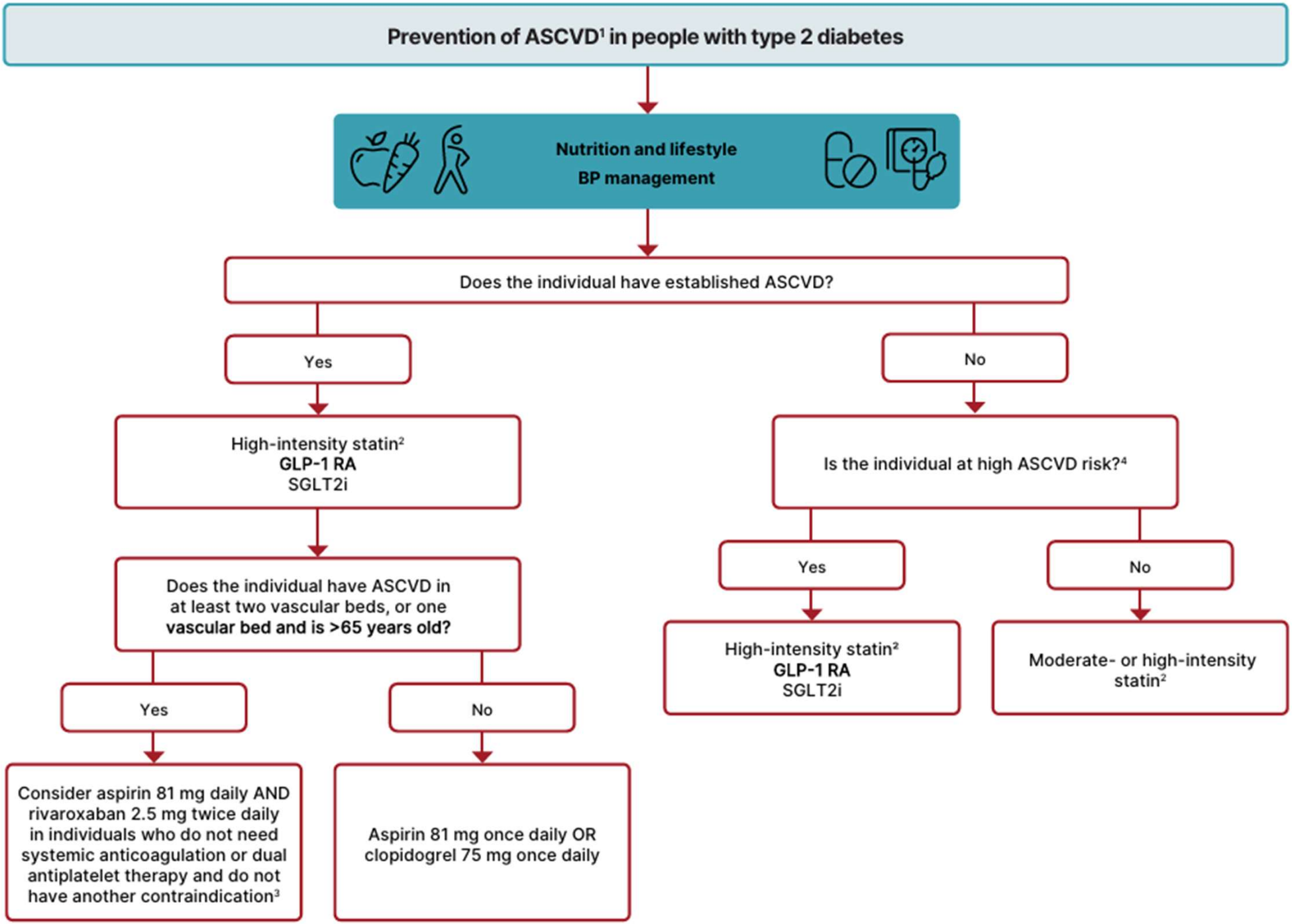
~ Or~

SGLT2i
empagliflozin (Jardiance),
canagliflozin (Invokana),
Dapagliflozin (Farxiga)

Slide 256

DI1 New for this slide deck

Diana Isaacs, 2026-03-04T02:23:51.678


Prevention of ASCVD[1] in people with type 2 diabetes
Nutrition and lifestyle
BP management
Does the individual have established ASCVD?
Yes
No
High-intensity statin[2]
GLP-1 RA
SGLT2i
Is the individual at high ASCVD risk?[4]
Does the individual have ASCVD in at least two vascular beds, or one vascular bed and is >65 years old?
Yes
No
Yes
No
High-intensity statin[2]
GLP-1 RA
SGLT2i
Moderate- or high-intensity statin[2]
Consider aspirin 81 mg daily AND rivaroxaban 2.5 mg twice daily in individuals who do not need systemic anticoagulation or dual antiplatelet therapy and do not have another contraindication[3]
Aspirin 81 mg once daily OR clopidogrel 75 mg once daily

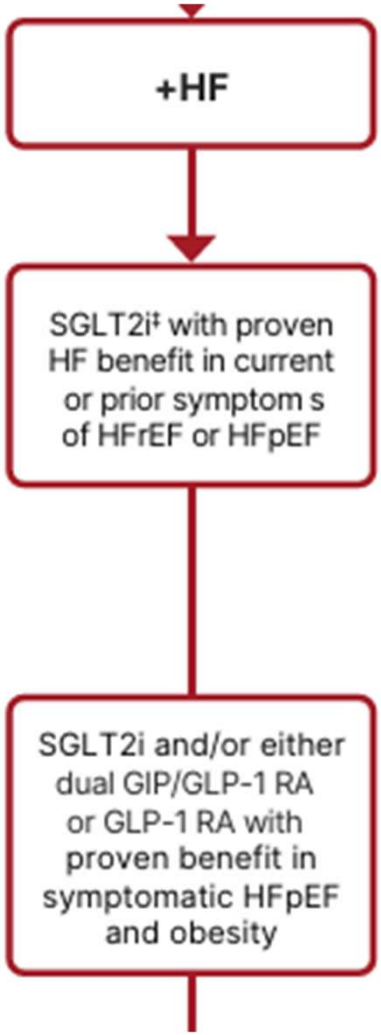
Slide 257

DI1 New slide

Diana Isaacs, 2026-03-04T08:01:01.516

DI1

Heart Failure



In people with heart failure, use SGLT2i because they improve heart failure and kidney outcomes.

New for 2026:

9.9 In adults with T2D, obesity, and symptomatic HFpEF, the glucose-lowering treatment plan should include a GIP/GLP-1 agonist or GLP-1 agonist with demonstrated benefits for HF-related symptoms and reduction in HF events (irrespective of A1C).

GLP-1 RA
Semaglutide
GLP-1/GIP RA
Tirzepatide

SGLT2i
Empagliflozin
Canagliflozin
Dapagliflozin
Ertugliflozin

HFpEF Heart failure with preserved ejection fraction ≥40%)

(HFrEF) Heart failure with reduced ejection fraction ≤40%)

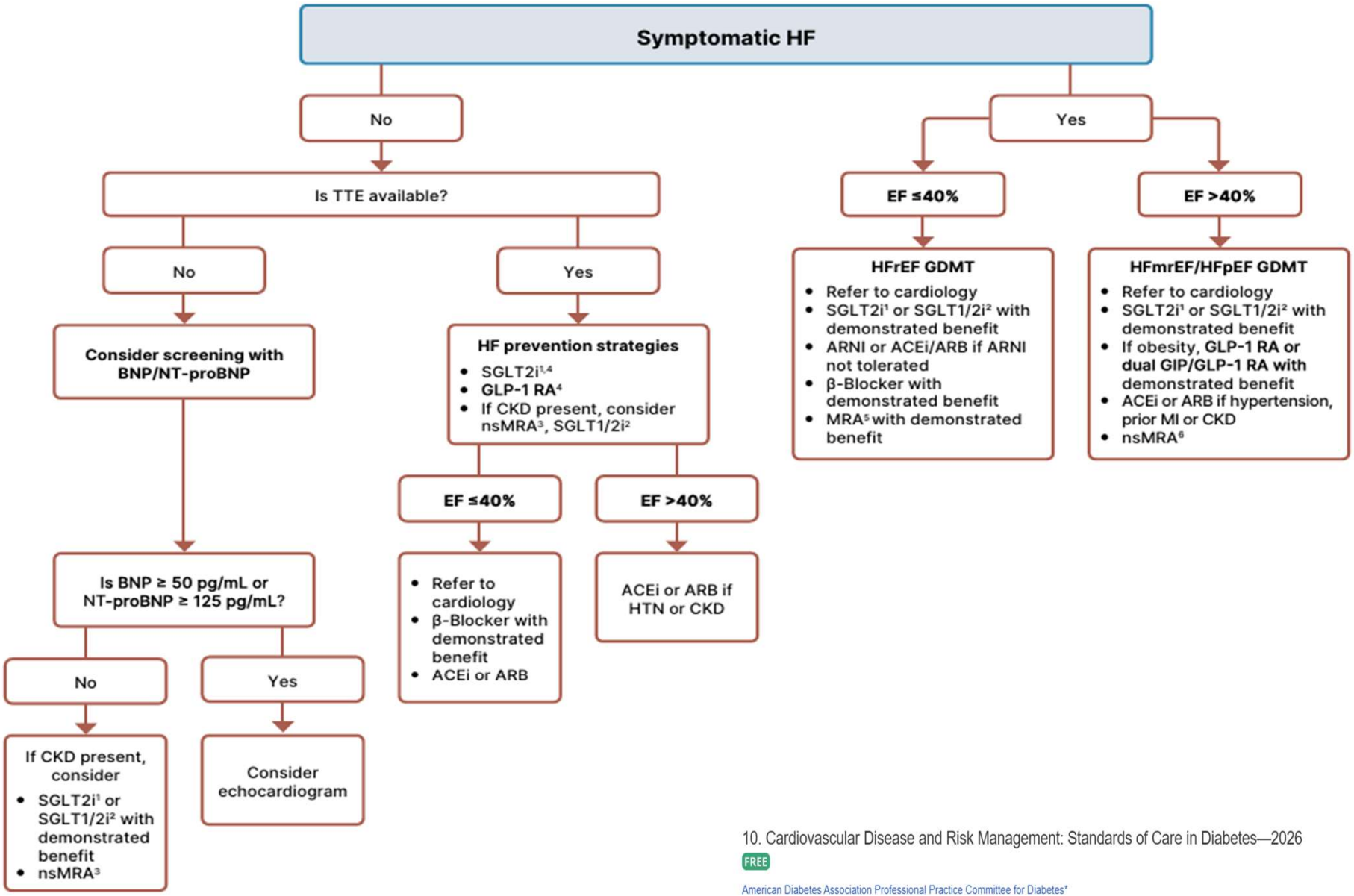
Slide 258

DI1 New for this slide deck

Diana Isaacs, 2026-03-04T02:24:13.156

Heart Failure in People with Diabetes

DI1



10. Cardiovascular Disease and Risk Management: Standards of Care in Diabetes—2026

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DI1 Updated algorithm

Diana Isaacs, 2026-03-04T02:28:34.695

SGLT2 Inhibitor HF/ASCVD Evidence Summary

Trial Name	SGLT2 Inhibitor vs. placebo	Outcomes (Primary Bolded)
EMPA-REG Outcome	Empagliflozin	N=7020, Median follow-up 3.1 years, Prior CVD 99% **3 Point MACE (primary)**: 0.86 (0.74-0.99), CV death: 0.62 (0.49-0.77)
EMPEROR Reduced	Empagliflozin	N=3730, 1856 with diabetes, Median follow-up 1.3 years, 100% HF with reduced EF **CV death or HF hospitalization (primary)** 0.75 (0.65-0.86)
EMPEROR Preserved	Empagliflozin	N=5988, 2938 with diabetes, Median follow-up 2.2 years, 100% HF with EF > 40% **CV death or HF hospitalization (primary)** 0.79 (0.69-0.90)
CANVAS Program	Canagliflozin	N=10142, Median follow-up 3.6 years, Prior CVD 65.6% **3 point MACE (primary)**: 0.86 (0.75-0.97), Worsening nephropathy 0.60 (0.47-0.77)
DECLARE-TIMI 58	Dapagliflozin	N=17160, Median follow-up 4.2 years, Prior CVD 40% **3 point MACE (primary)**: 0.93 (0.84-1.03) CV death or HF hospitalization: 0.83 (0.73-0.95),
DAPA-HF	Dapagliflozin	N=4744 (1983 with diabetes), Median follow-up 1.5 years, 100% HF **Worsening Hf or CV death (primary)** 0.74 (0.65-0.85)
DELIVER	Dapagliflozin	N=6263, 2807 with diabetes, Median follow-up 2.3 years, 100% with HF with EF > 40% **Worsening HF or CV death (primary)** 0.82 (0.73-0.92)
VERTIS-CV	Ertugliflozin	N=8246, Median follow-up 3.5 years, Prior CVD 99.9% **3 point MACE (primary)** 0.97 (0.85-1.11), HF hospitalization 0.70 (0.51-0.90)

American Diabetes Association. 10. Cardiovascular disease and risk management: Standards of Care in Diabetes—2023. Diabetes Care 2023;46(Suppl. 1):S158–S190

Sotagliflozin (Impefa)

- SGLT1/SGLT2 inhibitor
- Indicated to reduce risk of CV death, hospitalization for HF, and urgent HF visit in adults with:
  - HF or
  - T2D, CKD, and other CV risk factors
- Dose: 200mg once daily not more than 1 hour before first meal
- Titrate up to 400mg daily after at least 2 weeks
- Studied in the SCORED and SOLOIST trials.
- SCORED: A total of 10.584 people with T2D and additional CV risk factors
  - After 16 months, rate of primary endpoint (death from CV causes, hospitalization for HF and urgent visits for GF) was reduced (5.6 events/100 patient years with sotagliflozin compared to 7.5/100 patient years with placebo)

SGLT-2 Inhibitor Dosing & Indication

Once an SGLT2i is initiated, it is reasonable to continue an SGLT2i even if the eGFR falls below 20 ml/min/1.73 m2 , unless it is not tolerated or kidney replacement therapy is initiated.

Drug	Dose	FDA Approved Indications
Ertugliflozin (Steglatro)	5-15 mg daily	As an adjunct to diet and exercise to improve glycemic control in adults with T2DM (All)
Dapagliflozin (Farxiga)	5-10 mg daily	• To reduce the risk of hospitalization for HF in adults with T2DM and established CVD or multiple CV risk factors. • To reduce the risk of CV death and hospitalization for HF, and urgent HF visit in adults **with HF.** • To reduce the risk of sustained eGFR decline, ESKD, CV death, and hospitalization for HF in **adults with CKD** at risk of progression.
Empagliflozin (Jardiance)	10-25 mg daily	• To reduce the risk of CV death in adults with T2DM and established CVD. • To reduce the risk of CV death and hospitalization for HF in **adults with HF** • **To reduce the risk of sustained decline in eGFR, ESKD, CV death, and hospitalization in adults with CKD at risk of progression.**
Canagliflozin (Invokana)	100-300mg daily	• To reduce MACE in adults with T2DM and established CVD. • To reduce the risk of ESKD, doubling of serum creatinine, CV death, and hospitalization for HF in adults with T2DM and diabetic nephropathy with albuminuria >300 mg/day.
Bexagliflozin (Brenzavvy)	20mg daily	As an adjunct to diet and exercise to improve glycemic control in adults with T2DM

- Package inserts, dailymed.nlm.nih.gov

DI1

GLP-1 CV Evidence Summary

Trial name	GLP-1 agent/ comparator	Outcomes (primary bolded)
SUSTAIN-6[d]	Semaglutide injection/placebo	60% Prior CVD, 3-point MACE 0.74 (0.58-0.95) N = 3297, Median follow-up 2.1 y Worsening nephropathy 0.64 (0.46-0.88)
LEADER[b]	Liraglutide/placebo	81% Prior CVD, 3-point MACE 0.87 (0.58-0.95) N = 9340, Median follow-up 3.8 y Worsening nephropathy 0.78 (0.67-0.92)
ELIXA[c]	Lixisenatide/placebo	100% Prior CVD, 4-point MACE 1.02 (0.89-1.17) N = 6068, Median follow-up 2.1 y
SOUL[e]	Semaglutide oral/placebo	56.6% Prior CVD, 3-point MACE 0.79 (0.77-0.96) N = 9650, Median follow-up 4.1 y
EXSCEL[f]	Exenatide–(weekly)/placebo	73.1% Prior CVD, 3-point MACE 0.86 (0.83-1.00) N = 14,752, Median follow-up 3.2 y
REWIND[g]	Dulaglutide/placebo	32% Prior CVD, 3-point MACE 0.88 (0.79-0.99) N = 9901, Median follow-up 5. 4 y Worsening nephropathy 0.85 (0.77-0.93)
SURPASS-CVOT[h]	Tirzepatide/placebo	100% Prior CVD, Composite of death from CV causes, MI, or stroke 0.92 (0.83-1.01) N = 13,165, Median follow-up 4 y

Slide 263

DI1 updated
Diana Isaacs, 2026-04-07T04:03:18.427

Meet Alice

Alice is a 56yo AAF presenting for follow-up for type 2 diabetes. Alice reports that her blood pressure has been higher lately. Denies s/sx of hypoglycemia.

- **PMH**
  - Type 2 diabetes x5 years
  - HTN x 5 years
  - Depression
- **Meds**
  - Metformin1000mg PO bid
  - Glipizide 10mg PO qam
  - Chlorthalidone 25mg PO daily
  - Escitalopram 10mg PO daily
- **PE**
  - Ht: 5'3" Wt: 185lbs , BMI:32.8kg/m^2
  - BP: 140/88mmHg
  - A1c=6.9%, K: 4.5mEq/L, Scr:0.8mg/dL, ACR 202 mg/g
  - Tchol=204mg/dL, HDL=34mg/dL, LDL=120mg/dL, TG=250mg/dL

- Social history
  - (+)Alcohol: 1-2 drinks/week
  - (+) Tobacco use: 1/2ppd
  - Exercise: walks 15 min twice/week
  - Occ: receptionist
- Home monitoring
  - FBG and pre-meal: 110-130 mg/dL
  - BP: 140-150/80-90mmHg

Questions to Think About

- What are Alice's blood pressure, cholesterol and glucose targets?
- What lifestyle changes should be advised to reduce cardiovascular risk?
- What changes should be made to optimize Alice's medication regimen?

Hypertension Management in People with Diabetes

Classifying Hypertension

BP Category	SBP		DBP
Normal	<120 mmHg	And	<80mmHg
Elevated	120-129mmHg	And	<80mmHg
Hypertension			
Stage 1	130-139 mmHg	Or	80-89mmHg
Stage 2	≥140mmHg	Or	≥90mmHg

Individuals with SBP and DBP in 2 categories should be designated to the higher BP category

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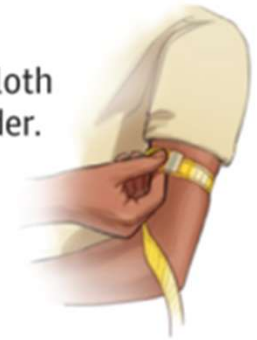
Taking an accurate Blood Pressure

Choosing the correct blood pressure cuff size

Measure the circumference of your upper arm with a cloth measuring tape midway between the elbow and shoulder. Choose a cuff size that includes this measurement.



Position for taking your blood pressure at home

1. Rest for 5 minutes before measuring your blood pressure.
2. Sit in a chair with both feet flat on the ground and back straight.
3. Place your arm at the level of your heart or chest.
4. Stay still and do not talk as your blood pressure machine operates.

Measure your blood pressure in the morning right after you wake up or in the evening before you go to bed.

Try to measure your blood pressure at the same time every day.

BP and Diabetes Targets 2026

- **BP target <130/80**
  (if it can be safely attained)

- A systolic BP <120 should be encouraged in individuals with high CV or kidney risk
- Confirm systolic BP ≥ 130 or diastolic BP ≥ 80 using multiple readings, including measurements on a separate day, to diagnose hypertension.
- If BP ≥ 180/110, can be diagnosed at single visit
- BP target based on individual assessment, shared decision making and potential adverse effects
- Monitor BP at each office visit and home for those with HTN
- During pregnancy, BP Target of 110 -135/85

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Slide 269

DI1 Added first bullet and updated last 2 bulelts.
Diana Isaacs, 2026-03-04T01:00:32.073

Cost vs Benefit of BP Target<130/80

- Consider potential adverse effects of BP medications
  - Hypotension, syncope, falls, acute kidney injury, and electrolyte abnormalities
  - Older people, those with CKD, and frailty have been shown to be at higher risk
  - People with orthostatic hypotension, substantial comorbidity, functional limitations, or polypharmacy higher risk and may prefer relaxed BP targets to enhance quality of life.

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BP Treatment in addition to Lifestyle

- **First Line BP Drugs if 130/80 +**
  - With albuminuria or CAD
    - Start either ACE or ARB*
  - No albuminuria - Any of the 4 classes of BP meds can be used:
    - ACE Inhibitors, ARBs, thiazide-like diuretics or calcium channel blockers.
    - Monitor K+/Scr 7-14 days after initiation and dose increase for diuretics, ACEI/ARB
  - Avoid ACE and ARB at same time
  - Multiple Drug Therapy often required
- **If BP ≥ 150 /90 start 2 drug combo**

*Albuminuria = Urinary albumin creatinine ratio of 30+

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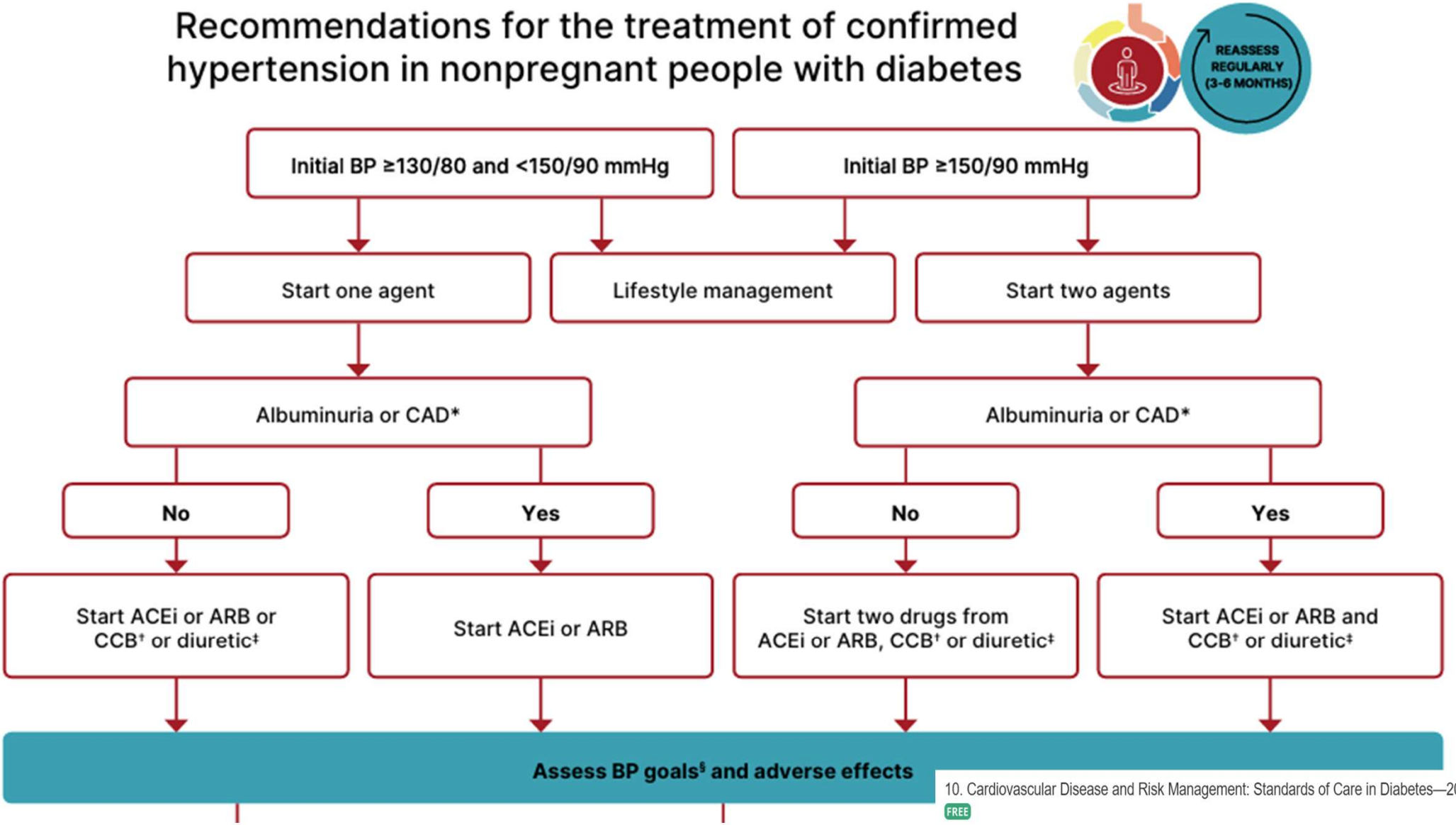
Hypertension Management



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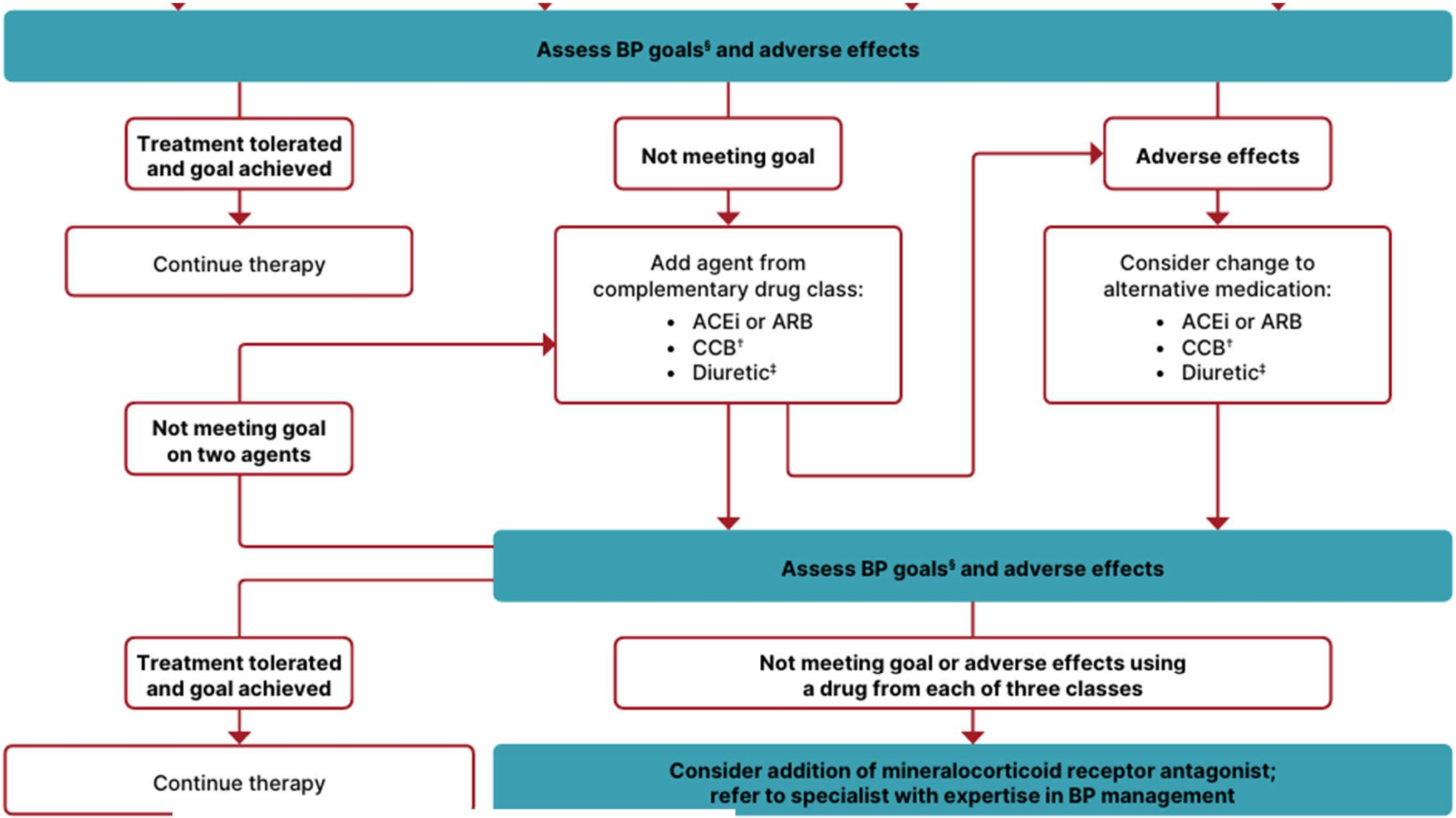
Hypertension Management (Cont)



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Slide 273

DI1 New slide, added second part of the diagram

Diana Isaacs, 2026-03-04T01:02:52.085

HTN Lifestyle Treatment Strategies

- If BP > 120/80, start with lifestyle
- DASH Diet
- Weight loss if indicated
- Sodium intake <2,300mg/day
- Eat more fruits & veggies (8-10 a day)
- Low fat dairy products (2-3 servings/day)
- Limit alcohol 1-2 drinks a day
- Increase activity level

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American Diabetes Association Professional Practice Committee for Diabetes*

Cardiac and Renal Disease

- The combination of 3 comorbidities has been termed *cardiorenal metabolic disease* or *cardiovascular-kidney-metabolic* health
  - ASCVD, heart failure, and chronic kidney disease (CKD)
- Recognized interrelationship of cardiometabolic risk factors leading to cardiovascular disease and adverse kidney outcomes in people with diabetes.
  - 3 comorbidities frequently associated with metabolic risk factors & extra weight
  - Incidence of all three conditions rises with *increasing* A1C levels.

Back to Alice

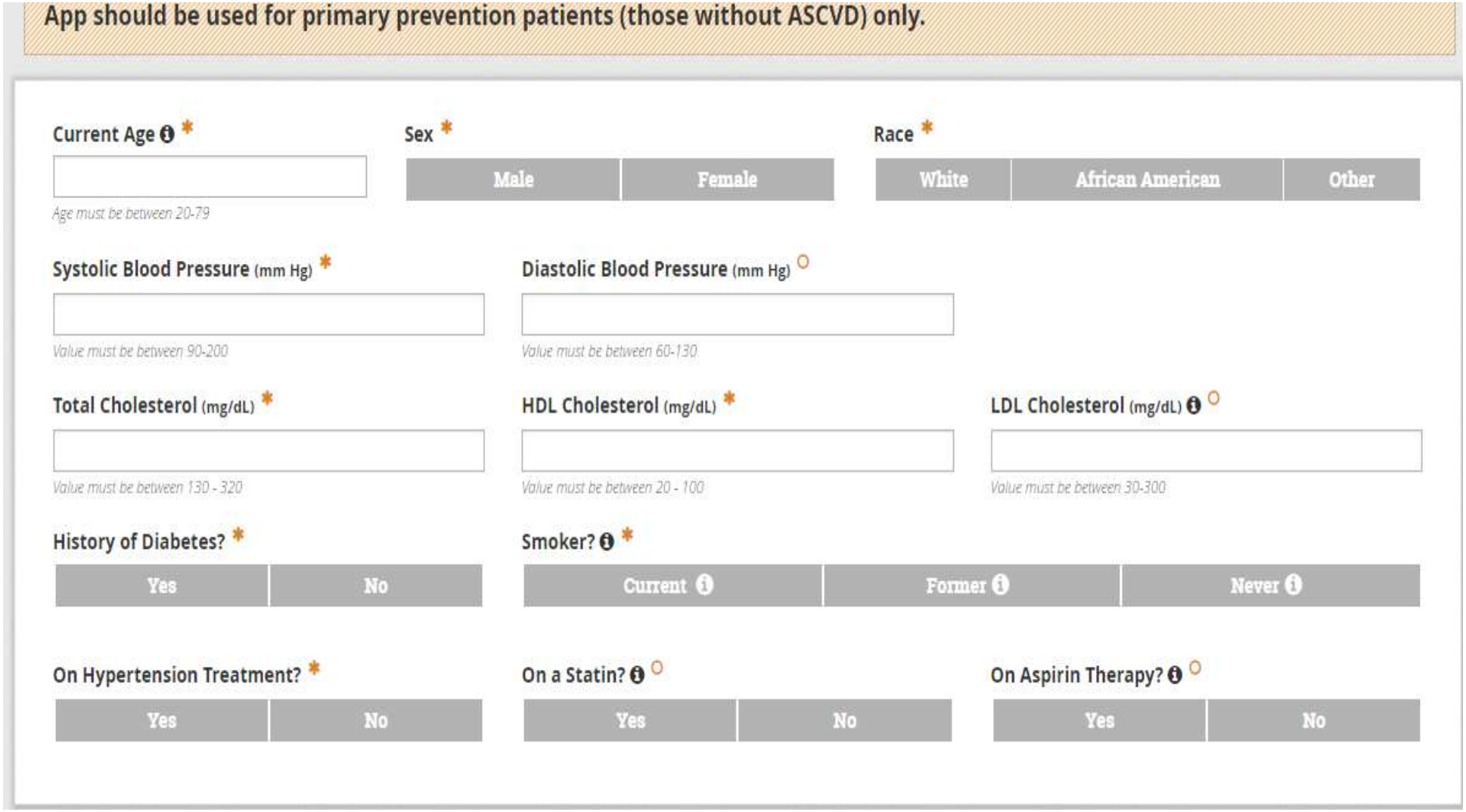
Alice is a 56yo AAF presenting for follow-up for type 2 diabetes. Alice reports that her blood pressure has been higher lately. Denies s/sx of hypoglycemia.

- **PMH**
  - Type 2 diabetes x5 years
  - HTN x 5 years
  - Depression
- **Meds**
  - Metformin1000mg PO bid
  - Glipizide 10mg PO qam
  - Chlorthalidone 25mg PO daily
  - Escitalopram 10mg PO daily
- **PE**
  - Ht: 5'3" Wt: 185lbs , BMI:32.8kg/m^2
  - BP: 140/88mmHg
  - A1c=6.9%, K: 4.5mEq/L, Scr:0.8mg/dL, ACR 202 mg/g
  - Tchol=204mg/dL, HDL=34mg/dL, LDL=120mg/dL, TG=250mg/dL

- Social history
  - (+)Alcohol: 1-2 drinks/week
  - (+) Tobacco use: 1/2ppd
  - Exercise: walks 15 min twice/week
  - Occ: receptionist
- Home monitoring
  - FBG and pre-meal: 110-130 mg/dL
  - BP: 140-150/80-90mmHg

Calculating ASCVD Risk

- http://tools.acc.org/ASCVD-Risk-Estimator-Plus/#!/calculate/estimate/



What Is Alice's ASCVD risk?

- 42% risk of a cardiovascular event in the next 10 years
- This puts Alice at HIGH risk

Poll 1 - What is the blood pressure goal for Alice?

A. BP<120/80 mmHg

B. BP<130/80 mmHg

C. BP<140/80 mmHg

D. BP<140/90 mmHg

What drugs should we use to treat?

BP & Lipid Meds Cheat Sheet

Antihypertensive Medications

ACE and ARBs are preferred therapy if experiencing hypertension and albuminuria – If B/P not at goal with either of these agents, add a diuretic or other class. Do not use during pregnancy or in persons w/ renal or hepatic dysfunction. Start w/ low dose, gradually increase. If one class is not tolerated, the other should be substituted. For those treated with an ACE inhibitor, angiotensin receptor blocker, or diuretic, serum creatinine/estimated glomerular filtration rate and serum potassium levels should be monitored at least annually. ADA Standards CV Disease Risk Management

Class / Action	Generic / Trade Name	Usual Daily Dose Range	Frequency	Considerations
ACE Inhibitors Angiotensin Converting Enzyme **Action** - Block the conversion of AT-I to AT-II. Also stimulates release of nitric oxide causing vasodilation.	benazepril / Lotensin†	10 – 40 mg	1 x a day	Try to take same time each day. Effects seen w/in 1 hr of admin, max effects in 6 hrs. **Side effects**: Can cause cough (due to increased bradykinin) – can try different med in same class. Also can cause fatigue, dizziness, hypotension. †These meds are also available as a combo w/ low dose HCTZ (hydrochlorothiazide). ‡These meds are also available as a combo w/ CCB (calcium channel blocker) usually amlodipine
	captopril /Capoten*†	12.5 - 100 mg	2-3 x a day	
	Enalopril/ Vasotec*†	2.5 - 40 mg	1-2 x a day	
	Fosinopil / Monopril†	10- 40 mg	1 x a day	
	Lisinopril *† Prinivil Zestril	 10 – 40 mg 10 - 40 mg		
	Ramipril / Altace*†	2.5 – 10 mg		
	Moexipril / Univasc†	3.75 - 15 mg		
	Perindopril/Aceon‡ Perindopril/ Indapamide combo (Coversyl)	2-16 mg 2 - 8 mg 0.625 - 2.5 mg		
	Quinapril /Accupril†	5 – 40 mg		
	Trandolapril/ Mavik Trandolapril/ Verapamil combo (TARKA)	1.0 – 4 mg 1-4 mg 180 to 240 mg		
ARBs -Angiotensin Receptor Blockers **Action** -Block AT-I receptor which reduces aldosterone secretion and vasoconstriction	Azilsartan/Edarbi Azilsartan/ Chlorthalidone combo (Edarbyclor)	40 - 80 mg 40 mg 12.5 - 25 mg	1 x daily	Try to take same time each day **Side effects**- Can cause dizziness, drowsiness, diarrhea, hyperkalemia, hypotension.
	Candesartan/Atacand†	8 – 32 mg		
	Eprosartan/Teveten†	400 - 600 mg		

ACE Inhibitors

Class / Action	Generic / Trade Name	Usual Daily Dose Range	Frequency	Considerations
ACE Inhibitors Angiotensin Converting Enzyme **Action** - Block the conversion of AT-I to AT-II. Also stimulates release of nitric oxide causing vasodilation.	benazepril / Lotensin†	10 – 40 mg	1 x a day	Try to take the same time each day. **Side effects**: Can cause cough (due to increased bradykinin) may cause hypotension. Monitor: changes in potassium and renal function †These meds are also available as a combo w/ low dose HCTZ (hydrochlorothiazide). ‡These meds are also available as a combo w/ CCB (calcium channel blocker) usually amlodipine
	captopril /Capoten*†	12.5 - 150 mg	2-3 x a day	
	Enalopril/ Vasotec*†	2.5 - 40 mg	1-2 x a day	
	Fosinopil / Monopril†	10- 40 mg	1 x a day	
	Lisinopril *† Prinivil, Zestril	10 – 40 mg		
	Ramipril / Altace*†	2.5 – 20 mg		
	Moexipril / Univasc†	3.75 - 30 mg		
	Perindopril/Aceon‡	2-16 mg		
	Perindopril/ Indapamide combo (Coversyl)	2 - 8 mg 0.625 - 2.5 mg		
	Quinapril /Accupril†	5 – 80 mg		
	Trandolapril/ Mavik	1.0 – 4 mg		
	Trandolapril/ Verapamil combo (TARKA)	1-4 mg 180 to 240 mg		

Initial dose adjustment may be needed for renal dysfunction or elderly

See Med Cheat Sheets

Angiotensin Receptor blockers (ARB's)

Class / Action	Generic / Trade Name	Usual Daily Dose Range	Frequency	Considerations
ARBs -Angiotensin Receptor Blockers **Action** -Block AT-I receptor which reduces aldosterone secretion and vasoconstriction	Azilsartan/Edarbi	40 - 80 mg	1 x daily	Try to take the same time each day. **Side effects**- may cause hypotension. Monitor: changes in potassium and renal function ‡†These meds are also available as a combo w/ low dose HCTZ (hydrochlorothiazide) or w/ CCB (calcium channel blocker) usually amlodipine. For Sacubitril/Valsartan (Entresto): 36hr washout period required if previously on ACE
	Azilsartan/ Chlorthalidone combo (Edarbyclor)	40 mg 12.5 - 25 mg		
	Candesartan/Atacand†	8 – 32 mg		
	Eprosartan/Teveten†	400 - 600 mg		
	Irbesartan/ Avapro†	75 – 300 mg		
	Losartan / Cozaar*†	25 – 100 mg		
	Olmesartan / Benicar†‡ Tribenzor (triple combo)	20 – 40 mg		
	Telmisartan / Micardis	20 – 80 mg		
	Valsartan / Diovan†‡ Exforge HCT(combo)	80 – 320 mg		
Inhibits neprilysin	Sacubitril/Valsartan (Entresto)	24/26-97/103 mg	2x daily	
	Valsartan/Nebivolol (Byvalson) (combo)	80 mg 5 mg		

Initial dose adjustment may be needed for renal dysfunction or elderly Med Cheat Sheets

ACEI/ARB Adverse Effects

- Adverse effects
  - Dry cough with ACEI
    - Caused by inhibition of bradykinin breakdown
  - Hyperkalemia
  - Angioedema (< 1%)
    - Occurs 2-4x more frequently in African Americans
  - Bump in SCr
    - Up to 30% is acceptable
  - Orthostatic hypotension (initial dose)
  - Skin rash (captopril)

- Contraindications
  - Pregnancy
  - Bilateral renal artery stenosis

Thiazide diuretics

Class	Drug	Usual Dose, Range (mg/d)*	Daily Frequency	Comments
Agents recommended for initial therapy				
Thiazide-type diuretics	Chlorthalidone	12.5-25	1	Chlorthalidone has a longer half-life and is more potent than hydrochlorothiazide on a mg-to-mg basis. Monitor for hyponatremia and hypokalemia, increased glucose, uric acid, and calcium levels. Monitor patients with history of acute gout unless patient is on uric acid-lowering therapy.
	Hydrochlorothiazide	25-50	1	
	Indapamide	1.25-2.5	1	

See Med Cheat Sheets

Calcium Channel Blockers

Class / Action	Generic / Trade Name	Usual Daily Dose Range	Frequency	Considerations
Calcium Channel Blocker *Nondihydropyridine* Relaxes coronary blood vessels to decrease heart rate and cardiac output.	**Diltiazem immediate release formulation***	30 – 360 mg	4 x day	**Monitor** BP, heart rate, liver enzymes and cardiac function a baseline and periodically. Take at the same time each day (with meals if possible). Take in evening if experience drowsiness. **Side Effects**: Watch for cardiac conduction abnormalities, bradycardia, CHF and edema. Can cause peripheral edema and constipation. Metabolized through CYP3A4, so review package insert for drug and food interactions (ie grapefruit).
	Diltiazem twice daily formulation*	120 – 480 mg	2 x day	
	Diltiazem once daily formulation* Cardizem CD Tiazac Dilacor, Diltia		1 x day	
	Verapamil immediate release* Calan	80 -480 mg	3 x day	
	Verapamil sustained release* Calan SR, Veralan	120 mg – 480 mg	1 -2 x day	
	Verapamil extended release* Covera-HS Verelan PM	120 – 480 mg 100 – 400 mg	1 x day	
Calcium Channel Blocker – *Dihydropyridine* Causes vasodilation and decreases peripheral vascular resistance.	Amlodipine/Norvasc	2.5 – 10 mg	1 x day	
	Felodipine / Plendil	2.5 – 10 mg	1 x day	
	Isradipine controlled release DynaCirc CR	2.5 – 10 mg	1 x day	
	Nicardipine sustained release / Cardene SR	30 – 60 mg	2 x day	
	Nifedipine long-acting* Adalat CC /Procardia XL	30 – 120 mg	1 x day	
	Nisoldipine / Sular	10 – 40 mg	1 x day	

Resistant hypertension

- Not meeting BP targets on 3 classes of antihypertensive meds (including a diuretic) at optimal doses
- Add mineralocorticoid receptor antagonist
  - Spironolactone (Aldactone®) 25-100mg daily
  - Eplerenone (Inspira®) 50-100mg daily
- Monitor serum creatinine, potassium
- Avoid use with finerenone

Beta Blockers

- Use in recurrent MI, heart failure, angina
- Side effects: depression, sexual dysfunction, exercise intolerance, sedation, dizziness
- Monitor BP, lipids, heart rate, glucose
- When stopping, taper dose gradually
- Can elevate glucose and mask adrenergic symptoms of hypoglycemia (ex. tachycardia)
  - Sweating will still occur (cholinergic mediated)

Beta blockers—cardioselective	Atenolol	25-100	2	Beta blockers are not recommended as first-line agents unless the patient has CHD or HF. These are preferred in patients with bronchospastic airway disease requiring a beta blocker. Bisoprolol and metoprolol succinate are preferred in patients with HFrEF. Avoid abrupt cessation.
	Betaxolol	5-20	1	
	Bisoprolol	2.5-10	1	
	Metoprolol tartrate	100-200	2	
	Metoprolol succinate	50-200	1	
Beta blockers—cardioselective and vasodilatory	Nebivolol	5-40	1	Nebivolol induces nitric oxide-induced vasodilation. Avoid abrupt cessation.
Beta blockers—noncardioselective	Nadolol	40-120	1	Avoid use in patients with reactive airways disease. Avoid abrupt cessation.
	Propranolol IR	80-160	2	
	Propranolol LA	80-160	1	
Beta blockers—intrinsic sympathomimetic activity	Acebutolol	200-800	2	Generally avoid, especially in patients with CHD or HF. Avoid abrupt cessation.
	Penbutolol	10-40	1	
	Pindolol	10-60	2	
Combined alpha and beta blockers	Carvedilol	12.5-50	2	Use of carvedilol is preferred in patients with HFrEF. Avoid abrupt cessation.
	Carvedilol phosphate	20-80	1	
	Labetalol	200-1200	2	

AHA/ACC/AANP/AAPA/ABC/ACCP/ACPM/AGS/AMA/ASPC/NMA/PCNA/SGIM Guideline for the Prevention, Detection, Evaluation and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Aug 14, 2025.

Other Hypertension Meds

- Direct renin inhibitors (Alsikiren-Tekturna®)
  - Similar side effects to ACEI/ARB, rarely used in clinical practice

- Loop diuretics (Furosemide, Torsemide, Bumetanide)
  - Use when eGFR<30 or if greater diuresis is needed, monitor electrolytes

- Potassium sparing diuretics (ex. Amiloride, Triamterene)
  - Use in combination with thiazide to retain potassium, minimal effect on BP

DI1

Additional HTN Med Options

Central alpha-2-agonist and other centrally acting drugs	Clonidine oral	0.1-0.8	2	These are generally reserved as last-line choices because of significant CNS adverse effects, especially in older adults. Avoid abrupt discontinuation of clonidine, which may induce hypertensive crisis. Clonidine must be tapered to avoid rebound hypertension.
	Clonidine patch	0.1-0.3	1 weekly	
	Methyldopa	250-1000	2	
	Guanfacine	0.5-2	1	
Direct vasodilators	Hydralazine	100-200	2 or 3	These are associated with sodium and water retention and reflex tachycardia and should be used with a diuretic and beta blocker. Hydralazine is associated with a drug-induced lupus-like syndrome at higher doses. Minoxidil is associated with hirsutism and requires a loop diuretic. Minoxidil can induce pericardial effusion.
	Minoxidil	5-40	1-2	
Dual endothelin receptor antagonist	Aprocitentan	12.5	1	Associated with mild-to-moderate fluid retention usually occurring within the first 4-6 wks of therapy. Indicated as add-on therapy for patients whose BP is not adequately controlled on other antihypertensive medications. Avoid use in pregnancy.

AHA/ACC/AANP/AAPA/ABC/ACCP/ACPM/AGS/AMA/ASPC/NMA/PCNA/SGIM Guideline for the Prevention, Detection, Evaluation and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Aug 14, 2025.

Slide 290

DI1 New from new htn guideline

Diana Isaacs, 2025-08-25T02:40:22.755

Poll 2 - What Changes are Best to Make to Alice's Hypertension Regimen?

A. Add lisinopril
B. Replace chlorthalidone with lisinopril
C. Add amlodipine
D. Replace chlorthalidone with amlodipine

Assume all choices include lifestyle modifications

DI1

Lipid Goals – Primary Prevention

- For people with diabetes aged 40–75: use a **moderate intensity statin** + lifestyle
- Higher cardiovascular risk*
  - (*HTN, Smoke, CKD, BMI 30+ albuminuria, family hx ACSVD)
  - **Use High-intensity statin** therapy is recommended
- Reduce LDL cholesterol by at least 50% of baseline

  AND
- Target LDL <70 mg/dL.
- If intolerant to statin, use bempedoic acid
- If LDL >70mg/dL, It may be reasonable to add ezetimibe or a PCSK9 inhibitor to maximum tolerated statin therapy.

Slide 292

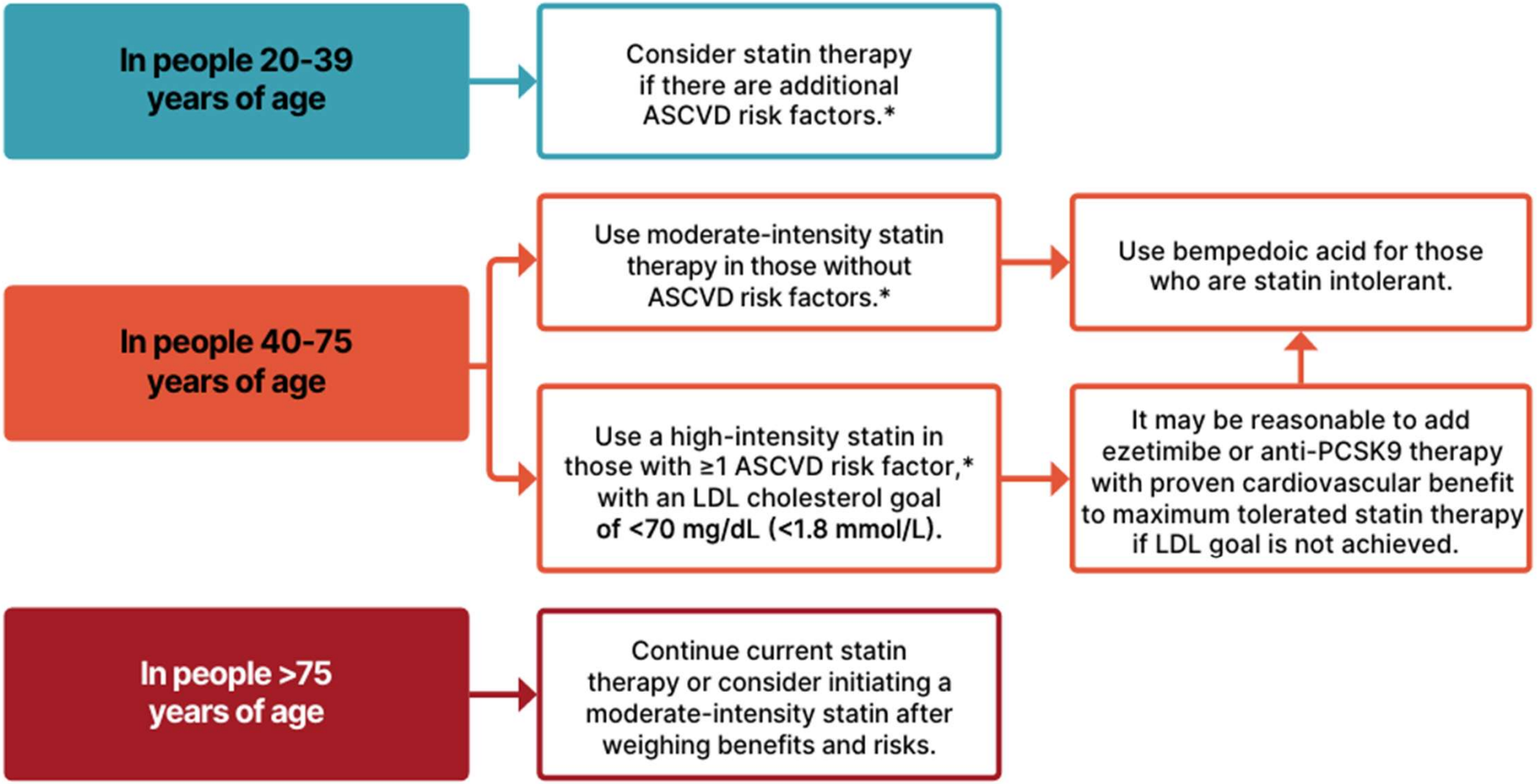
DI1 Updated, added bempedoic acid recommendation

Diana Isaacs, 2026-03-04T07:35:45.104

DI1

Lipid Therapy for Primary Prevention

Lipid management for primary prevention of atherosclerotic cardiovascular disease events in people with diabetes in addition to healthy behavior modification



Slide 293

DI1 Updated with 2026 algorithm

Diana Isaacs, 2026-03-04T07:30:53.180

Poll Question 3

RZ is 47 years old with type 2 diabetes and hypertension. RZ takes metformin 1000 mg BID, plus lisinopril 20mg daily. RZs LDL is 140 mg/dL. Based on the most recent ADA Standards, what is the LDL Cholesterol target for RZ?

A. LDL less than 100 mg/dL.

B. LDL less than 70mg/dL

C. LDL less than 55mg/dL

D. Determine LDL target based on ASCVD risk.

Lipid Goals/Therapy for People *with* ASCVD

- For people of all ages with diabetes and ASCVD:
  - Add high-intensity statin to lifestyle therapy.
  - **Reduce LDL cholesterol by 50% or greater from baseline with LDL goal <55.**
  - Addition of ezetimibe or a PCSK9 inhibitor with proven benefit is recommended if goal is not achieved on max tolerated statin therapy.

Lipid management for secondary prevention of atherosclerotic cardiovascular disease events in people with diabetes

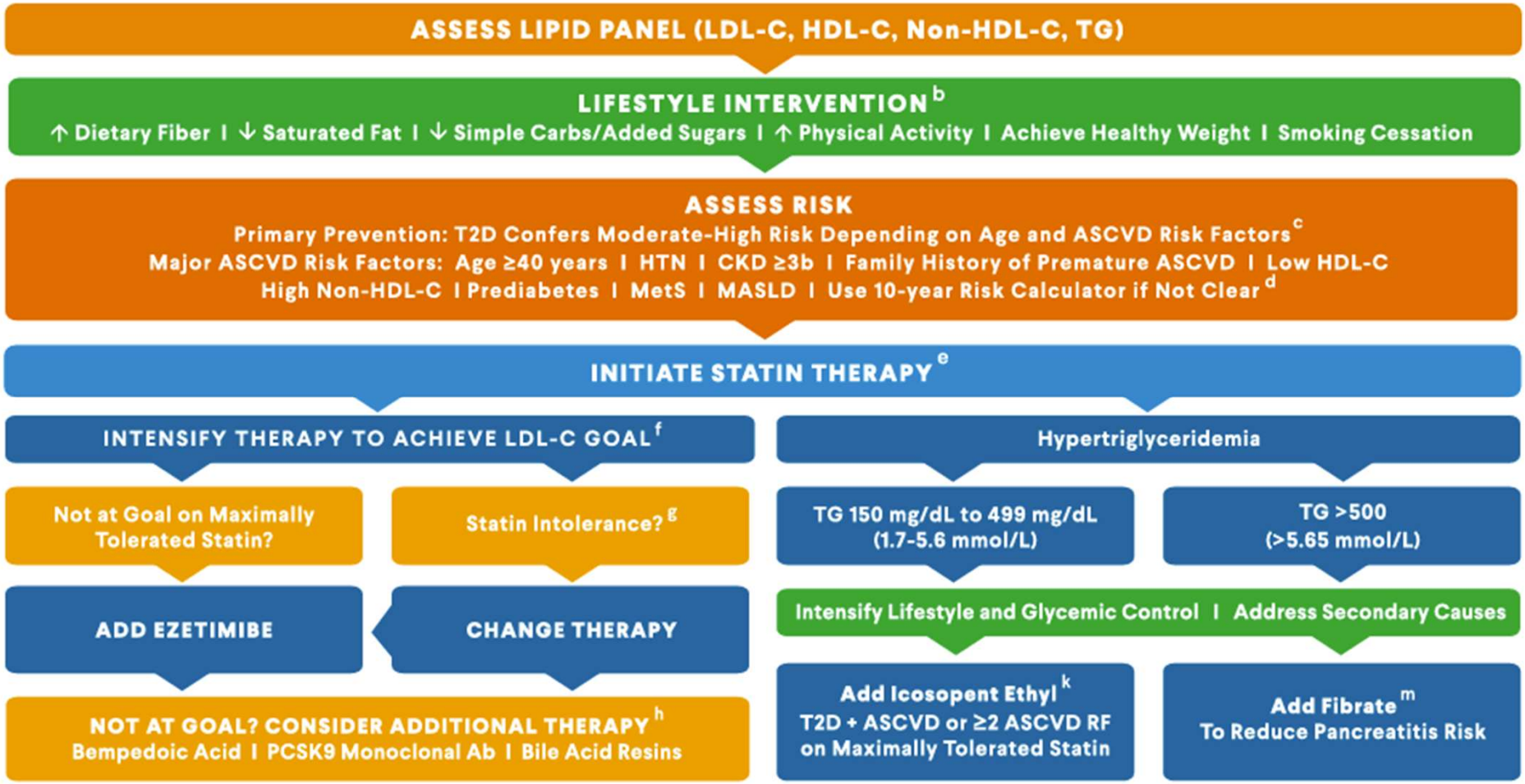
Use lifestyle and high-intensity statin therapy to reduce LDL **cholesterol by ≥50% from baseline to a goal of <55 mg/dL (<1.4 mmol/L).**	Add ezetimibe or anti-PCSK9 therapy with proven cardiovascular benefit if LDL cholesterol goals are not met on maximum tolerated statin therapy.	Use an alternative lipid-lowering treatment for those who are statin intolerant: • PCSK9 monoclonal antibody with proven cardiovascular benefit • Bempedoic acid • PCSK9 inhibition with siRNA inclisiran

Slide 295

DI1 Updated to 2026 algorithm-only a minor change to it.
Diana Isaacs, 2026-03-04T07:38:03.061

DI1

ASCVD RISK REDUCTION ALGORITHM: DYSLIPIDEMIA[a]



[a]See also **2025 AACE Algorithm on Management of Adults with Dyslipidemia**. [b]Diets shown to decrease ASCVD risk include Mediterranean, DASH, plant-based. [c]T2D alone confers moderate to high risk. High risk: Age 20 to 39 years with ≥2 RF or ≥40 years with ≥1 RF. Very High risk: Known ASCVD or ≥40 years with end organ damage. [d]Risk calculators are intended for primary ASCVD prevention. 10-year risk calculators include Framingham, AHA PREVENT, PAHO HEARTS (Latin American and Caribbean), SCORE2 (European), SCORE2-Diabetes, ACC PCE, QRISK. For secondary prevention, individuals with known ASCVD (coronary, cerebral, and/or peripheral vascular disease) should be treated with high-intensity statin (atorvastatin 40-80 mg, rosuvastatin 20-40 mg). Consider dual therapy for individuals with acute coronary syndrome. [e]Majority of individuals with T2D will have indications for a high-intensity statin for primary prevention. [f]Achieve 50% reduction in LDL-C with goal <70 mg/dL (<1.8 mmol/L) for T2D with ≥1 ASCVD RF. [g]Statin intolerance: Consider drug interactions. Correct underlying contributors (VitD deficiency, hypothyroidism). Try alternative statin with lower incidence of myopathy (eg, hydrophilic: rosuvastatin/pravastatin) or decrease dose and frequency. [h]Choose add-on agents with the best evidence for reducing ASCVD risk. Not all add-on agents decrease ASCVD risk despite LDL-C with goal lowering. Inclisiran is FDA-approved for LDL-C reduction but is not currently recommended by AACE for ASCVD risk reduction due to insufficient CVD outcomes data at this time. Some therapies only have regulatory approval in those with established ASCVD (alirocumab). [k]IPE for established ASCVD or T2D and ≥2 RF with TG >150 mg/dL (>1.7 mmol/L) on maximally tolerated statin with LDL-C at goal. AACE recommends EPA alone rather than DHA + EPA formulations. [m]Prevention of pancreatitis is a treatment priority for TG >885 mg/dL (10 mmol/L). Olezarsen is approved to reduce TG for familial chylomicronemia as an adjunct to a low-fat diet.

Abbreviations: **Ab**, antibody; **ACC**, American College of Cardiology; **AHA**, American Heart Association; **ASCVD**, atherosclerotic cardiovascular disease; **CAC**, coronary artery calcium; **CKD**, chronic kidney disease; **DASH**, Dietary Approaches to Stop Hypertension; **DHA**, docosahexaenoic acid; **EPA**, eicosapentaenoic acid; **FDA**, U.S. Food and Drug Administration; **HDL-C**, high-density lipoprotein cholesterol; **HTN**, hypertension; **IPE**, icosopent ethyl; **LDL-C**, low-density lipoprotein cholesterol; **MASLD**, metabolic dysfunction-associated steatotic liver disease; **MetS**, metabolic syndrome; **PAHO**, Pan American Health Organization; **PCE**, pooled cohort equations; **PREVENT**, Predicting Risk of Cardiovascular Disease Events; **PSCK9i**, proprotein convertase subtilisin-kexin type 9 inhibitor; **RF**, risk factor; **SCORE**, Systematic Coronary Risk Evaluation; **T2D**, type 2 diabetes; **TG**, triglycerides; **VitD**, vitamin D3.

Slide 296

DI1 New slide

Diana Isaacs, 2026-04-07T04:22:20.549

ASSESS LIPID PANEL (LDL-C, HDL-C, Non-HDL-C, TG, Apo B)[1]

LIFESTYLE INTERVENTION: increase ↑ dietary fiber | ↑ healthy fat | ↓ saturated fat | ↓ simple carbs | ↓ added sugars | ↑ physical activity | weight management

PREDIABETES OR T2D + RISK FACTORS: USE ASCVD 10-YEAR RISK CALCULATOR

Major ASCVD Risk Factors: Age >40 | HTN | CKD >3a | Smoking | Family History of Premature ASCVD | Low HDL-C | High Non-HDL-C

INITIATE STATIN THERAPY

	HIGH RISK <10% T2D <10 years <2 other risk factors No target organ damage	**VERY HIGH RISK 10%-20%** T2D >10 years Age >40 years No ASCVD No target organ damage ≥2 additional risk factors	**EXTREME RISK >20%** T2D & ASCVD Severe target organ damage: eGFR <45 mL/min/1.73 m^2, UACR >300, ABI <0.9, LV systolic/diastolic dysfunction
	Moderate-intensity statin	**High-intensity statin**	
GOAL LDL-C (mg/dL)	<100	<70	<55
GOAL Non-HDL-C (mg/dL)	<130	<100	<80
GOAL TG (mg/dL)	<150	<150	<150
GOAL Apo B (mg/dL)	<90	<80	<70

Monitor and titrate therapy every 3-6 months to achieve lipid targets according to risk[2]

Intensify statin and lifestyle & optimize glycemic control

Add ezetimibe

Consider additional therapy: bile acid sequestrant, bempedoic acid, PCSK9 inhibitor, inclisiran

HYPERTRIGLYCERIDEMIA MANAGEMENT:

TG 135-199 | TG 200-499[3] | TG ≥500 | TG >1000[4]

Intensify Lifestyle & Achieve Glycemic Targets

If TG >135: Consider addition of icosapent ethyl to statin if DM and CVD or ≥2 risk factors

Fibrate or/and Rx Grade Omega-3

TG target achieved: Continue lifestyle therapy, maximally tolerated statin and achieve glucose targets

+Niacin[5]

[1] Baseline LDL-C >190 mg/dL, consider familial hypercholesterolemia. [2] Statin intolerance: Use alternative statin with lower incidence of myopathy (pitavastatin, extended-release fluvastatin) or decrease dose/frequency, use non-statin Rx, check for Rx interactions, consider CoQ10. [3] If TG >200 and HDL <40, add fibrate/omega-2 to achieve apo B and non-HDL goals. [4] Elevated triglycerides >500 mg/dL to >1000 mg/dL can cause acute pancreatitis. Urgent intervention with dietary management and fibrate/omega 3 therapy is needed. Suspect familial chylomicronemia syndrome or lipodystrophy, refer to lipid specialist. [5] For severe hypertriglyceridemia >1000 refractory to previous interventions, consider niacin to reduce the risk of pancreatitis. Niacin may lower TG and Lp(a) but does not reduce ASCVD and can promote hyperglycemia.

Algorithm Figure 4-Dyslipidemia

Statin Dosing

High Intensity:
Lowers LDL ≥50%

- Atorvastatin (lipitor)
  - 40-80mg
- Rosuvastatin (crestor)
  - 20-40mg

*****If person can't tolerate intended statin dose, use maximally tolerated dose**

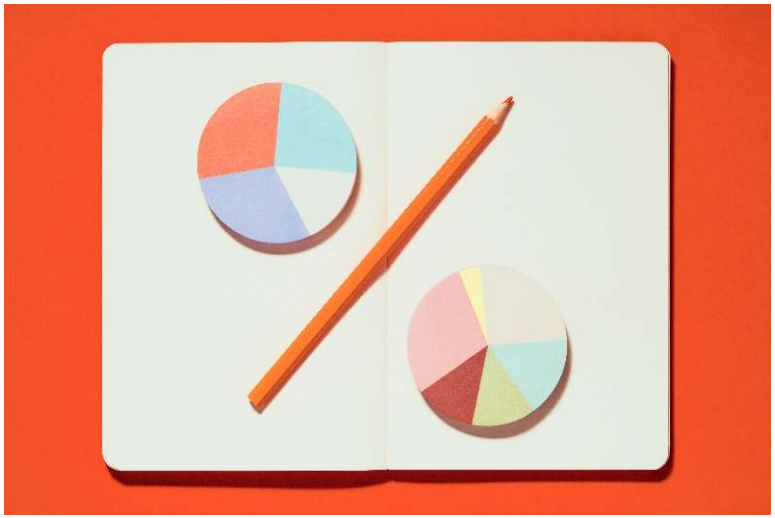
Moderate Intensity:
Lower LDL 30-<50%

- Atorvastatin (lipitor)
  - 10-20mg
- Rosuvastatin (crestor)
  - 5-10mg
- Simvastatin (zocor)
  - 20-40mg
- Pravastatin (pravachol)
  - 40 – 80mg
- Lovastatin (mevacor)
  - 40 mg
- Fluvastatin (lescol/XL)
  - 80mg
- Pitavastatin (livalo)
  - 2-4mg

See Med Cheat Sheets

Do Statins Work?

- Meta-analyses, including data from over 18,000 people with diabetes from 14 randomized trials of statin therapy (mean follow-up 4.3 years).



- Statin therapy demonstrated
  - 9% proportional reduction in all-cause mortality and
  - 13% reduction in vascular mortality for each 39 mg/dL reduction in LDL cholesterol

Additional Agents to Lower LDL

Bempedoic acid (Nexletol)

- Novel LDL cholesterol lowering agent acting in the same pathway as statin but without activity in skeletal muscle, which limits the muscle-related adverse effects
- Lowers LDL cholesterol levels by 15% for those on statins and 24% for those not taking statins
- CLEAR Outcomes trial found a reduction in 4 point MACE events by 13% compared with placebo for individuals with established ASCVD or high ASCVD risk
- Dose: 180mg orally once daily
- Available with ezetimibe as Nexlizet
- Once daily with or without food

Additional Agents to Lower LDL

PCSK9 Inhibitors

- Evolucumab (Repatha) and Alirocumab (Praluent)
- Auto-injector
- When added to max tolerated statin, decreases LDL from 52-65%
- No CV outcome trials for primary prevention
- For secondary prevention, significantly reduced the risk of MACE by 15-20% in FOURIER (evolucumab) and ODYSSEY (Alirocumab)
- Fewer skeletal muscle adverse effects compared to statins

PCSK9 Inhibitors Lipid Medications

Proprotein convertase subtilisin/kexin type 9

	Alirocumab (Praluent)	Evolocumab (Repatha)
FDA-approved indications	• Primary hyperlipidemia (HLD) • Homozygous familial hypercholesterolemia (HoFH) • Secondary prevention of cardiac events	
Dosing	• **HoFH:** 150 mg SC q2 weeks • **HLD or secondary cardiac prevention:** 75 mg SC q2 weeks or 300 mg SC q4 weeks; if adequate LDL response not achieved, may increase to max of 150 mg q2 weeks	• **HoFH:** 420 mg SC q4 weeks; may increase to 420 mg q2 weeks if meaningful response not achieved in 12 weeks • **HLD or secondary cardiac prevention:** 140 mg q2 weeks or 420 mg q4 weeks
Dosage forms	• Auto-injector 75 mg/mL or 150 mg/mL	• Repatha Sure Click (auto-injector) 140 mg/mL • Repatha Pushtronex System (single use infusor with pre-filled cartridge) 420 mg/3.5 mL – administered over 9 minutes
Storage	• Store in refrigerator in outer carton until used • Once used, keep at room temperature, use within 30 days	
Injection clinical pearls	• Do not shake or warm with water • Administer by SC injection into thigh, abdomen, or upper arm • Rotate injection site with each injection	
Drug interactions	• No known significant interactions	
Monitoring parameters	• Lipid panel before initiating therapy, 4-12 weeks after initiating, and q3-12 months thereafter	
Side effects	• Injection site reaction (4-17%) • Hypersensitivity reaction (9%) • Influenza (6%) • Myalgia (4-6%) • Diarrhea (5%)	• Nasopharyngitis (6-11%) • Upper respiratory tract infection (9%) • Diabetes mellitus (9%) • Influenza (8-9%) • Injection site reaction (6%) • Myalgia (4%)

From Meds Cheat Sheet Page – Diabetesed.net

Additional Agents to Lower LDL

Iclisiran (Leqvio)

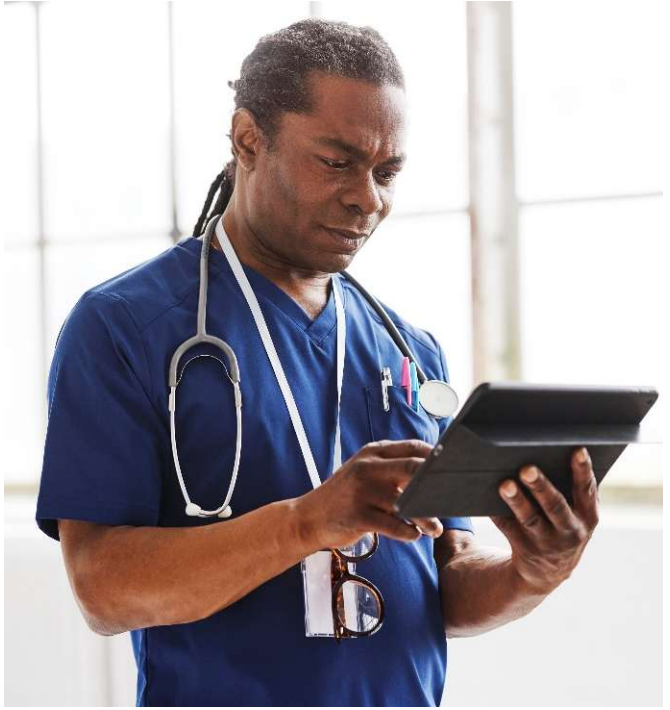
- Indicated as adjunct to diet and statin therapy to lower LDL
- Lowers LDL by ~50% when added to statin
  - Targets PCSK9
  - SC injection, day 1, 90 days, then every 6 months
- Exploratory analysis showed reduced CV events vs. placebo
- Ongoing CV outcome trial in people with established CVD and primary prevention

Treating High TG

- In adults with high fasting TG>150, evaluate secondary causes: diabetes, chronic liver or kidney disease, hypothyroidism, alcohol, meds that raise TG
- Consider fibrates or fish oil when TG>500mg/dL and definitely when TG>1000mg/dL
  - High TG puts people at increased pancreatitis risk
- In People with ASCVD or other CV risk factors on a statin with managed LDL but elevated TG (150-499mg/dL), adding icosapent ethyl (vascepa) can be considered to reduce CV risk (REDUCE-IT trial)
  - Individuals randomized to 2g BID who had either established CVD or diabetes + at least 1 risk factor, icosapent ethyl demonstrated a 25% risk reduction in 3 point MACE

Fibrates

- Statin plus **fibrate** combination therapy has not been shown to improve ASCVD outcomes and is generally not recommended. (A)
  - Fibrates include fenofibrate and gemfibrozil
  - May be appropriate for a person with very high TG



- Statin plus **niacin** combination therapy has not been shown to provide additional cardiovascular benefit above statin therapy alone, may increase the risk of stroke with additional side effects, and is generally not recommended. (A)

Cholesterol Medications

LDL Lowering Medications

Class / Action	Generic / Trade Name	Usual Daily Dose Range	LDL % Lowering	Considerations
"Statins" HMG- CoA Reductase Inhibitors Inhibits enzyme that converts HMG-CoA to mevalonate - limits cholesterol production	Atorvastatin / Lipitor*	10 – 80 mg	20- 60	Lowers TGs 7-30% Raise HDL 5-15% **Side effects**: weakness, muscle pain, elevated glucose levels. Review package insert for specific dosing adjustments based on drug, food interactions (ie grapefruit).
	Fluvastatin / Lescol* Lescol XL	20 – 80 mg 80 mg	20- 35	
	Lovastatin* Mevacor Altoprev XL	 20 - 80 mg 10 - 60 mg	20- 45	
	Pravastatin / Pravachol*	10 - 80 mg	20- 45	
	Rosuvastatin / Crestor	5 – 40 mg	20- 60	
	Simvistatin / Zocor*	20 – 40 mg	20- 55	
	Pitavastatin / Livalo	2 – 4 mg		
Bile Acid Sequestrants **Action:** Bind to bile acids in intestine, decreasing cholesterol production. Secondary action – raise HDL	Cholestyramine/ Questran*	4 to 16 g per day powder – 1 scoop 4g	Lower LDL by 15-30%	May raise TG levels. Raise HDL 3-5%. Avoid taking in same timeframe w/ other meds – may affect absorption (see package insert). Side effects: GI in nature
	Colesevelam / Welchol **Lowers A1c 0.5%**	3.75 x 1 daily 1.875 x 2 daily (625mg tablets)		
	Colestipol / Colestid	2 - 16 gms per day tabs Powder – 1 scoop = 5g 5 to 30 gm per day Mix w/ fluid		
Cholesterol Absorption Inhibitors	Ezetimibe / Zetia Zetia + Simvastatin (Vytorin)	10 mg – 1x daily 10/10 - 10/80 mg	15-20%	Usually used in combo w/statin. Headache, rash.
PCSK9 Inhibitors Proprotein convertase subtilisin/kexin type 9	Alirocumab (Praluent) Evolocumab (Repatha)	See last page	See last page	Subcutaneous injections See last page
Adenosine Triphosphate-citrate Lyase - ACL Inhibitor	Bempedoic acid (Nexletol) Bempedoic acid/ezetimibe (Nexlizet)	180 mg daily 180 mg /10mg daily	Add on for LDL reduction	May increase uric acid levels-use caution in gout
Plant Stenols	Benecol	3 servings daily	14%	Well tolerated
Plant Sterols	Take Control	2 servings daily	17%	

Lipid and HTN Meds Cheat Sheets

Website:
https://diabetesed.net/coach-bevs-diabetes-cheat-sheets/
On CDCES Coach App too

For exam, know major classes, when used, side effects and considerations.

For exam, be familiar with content on Cheat Sheets

Cholesterol Medications

LDL Lowering Medications

Class / Action	Generic / Trade Name	Usual Daily Dose Range	LDL % Lowering	Considerations
"Statins" HMG- CoA Reductase Inhibitors Inhibits enzyme that converts HMG-CoA to mevalonate - limits cholesterol production	Atorvastatin / Lipitor*	10 – 80 mg	20- 60	Lowers TGs 7-30% Raise HDL 5-15% Take at night. **Side effects**: weakness, muscle pain, elevated glucose levels. Review package insert for specific dosing adjustments based on drug, food interactions (ie grapefruit).
	Fluvastatin / Lescol* Lescol XL	20 – 80 mg 80 mg	20- 35	
	Lovastatin* Mevacor Altoprev XL	 20 - 80 mg 10 - 60 mg	20- 45	
	Pravastatin / Pravachol*	10 - 80 mg	20- 45	
	Rosuvastatin / Crestor	5 – 40 mg	20- 60	
	Simvistatin / Zocor*	20 – 80 mg	20- 55	
	Pitavastatin / Livalo	2 – 4 mg		
Bile Acid Sequestrants **Action:** Bind to bile acids in intestine, decreasing cholesterol production. Secondary action – raise HDL	Cholestyramine/ Questran*	4 to 16 g per day powder – 1 scoop 4g	Lower LDL by 15-30%	May raise TG levels. Raise HDL 3-5%. Avoid taking in same timeframe w/ other meds – may affect absorption (see package insert). Side effects: GI in nature
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Cholesterol Absorption Inhibitors	Ezetimibe / Zetia	10 mg – 1x daily	15-20%	Usually used in combo w/statin. Headache, rash.
Plant Stenols	Benecol	3 servings daily	14%	Well tolerated
Plant Sterols	Take Control	2 servings daily	17%	

- For CDCES – be familiar with the action, side effects and monitoring for the main BP meds and lipid meds.
- For BC-ADM, be familiar with list above, plus dosing parameters and be comfortable looking at research results.

Lipid Monitoring and Lifestyle Treatment Strategies

- Lipid Goals
  - HDL >40 (men), >50 (women)
  - Triglycerides <150
  - LDL target based on risk

Monitoring:
If **not** taking statins and underage of 40.
- check at time of diagnosis and every 5 yrs.

On statin
Monitor lipids at diagnosis, 4-12 weeks after starting statin or dose adjustment and yearly

- Weight loss if indicated
- Mediterranean or DASH Diet
- Reduction of saturated fat intake
- Increase of omega-3 fatty acids, viscous fibers and plant stanols/sterols
- Increase activity level
- BG lowering
- Reduce alcohol

DI1

Additional Lipid Screening Tests

Which Screening Tests Should be Used?

Screening Test	Recommendations Associated With This Question
Fasting Lipid Profile	R19. Use a fasting lipid profile to ensure the most precise lipid assessment; this should include total cholesterol, LDL-C, TG, and non-HDL-C. R20. Lipids, including TG, can be measured in the non-fasting state if fasting determinations are impractical.
LDL-C	R21. LDL-C may be estimated using the Friedewald equation: LDL-C = (total cholesterol – HDL-C) – TG/5; however, this method is valid only for values obtained during the fasting state and becomes increasingly inaccurate when TG levels are greater than 200 mg/dL, and becomes invalid when TG levels are greater than 400 mg/dL. R22. LDL-C should be directly measured in certain high-risk individuals, such as those with fasting TG levels greater than 250 mg/dL or those with diabetes or known vascular disease.
HDL-C	R23. Measurement of HDL-C should be included in screening tests for dyslipidemia.
Non-HDL-C	R24. Non-HDL-C (total cholesterol minus HDL-C) should be calculated to assist risk stratification in individuals with moderately elevated TG (200 to 500 mg/dL), diabetes, and/or established ASCVD. R25. If insulin resistance is suspected, non-HDL-C should be evaluated to gain useful information regarding the individual's total atherogenic lipoprotein burden.
Triglycerides	R26. TG levels should be part of routine lipid screening: moderate elevations (≥150 mg/dL) may identify individuals at risk for insulin resistance syndrome and levels ≥200 mg/dL may identify individuals at substantially increased ASCVD risk.
Apolipoproteins	R27. Apo B and/or an apo B/apo A1 ratio calculation and evaluation may be useful in at-risk individuals (TG ≥150, HDL-C <40, prior ASCVD event, T2DM, and/or insulin resistance syndrome [even at target LDL-C levels]) to assess residual risk and guide decision-making. R28. Apo B measurements (reflecting the particle concentration of LDL and all other atherogenic lipoproteins) may be useful to assess the success of LDL-C–lowering therapy.

Jellinger P, Handelsman Y, Rosenblit P, et al. *Endocr Pract*. 2017;23(4):479-497.

See online publication at **www.aace.com/publications** for evidence grading of Recommendations.

Slide 309

DI1 New slide from AACE algorithm

Diana Isaacs, 2025-08-25T02:47:39.771

DI1

- Impacts on CV events with different agents
- 2025 AACE Dyslipidemia Guidelines

TABLE 1: CHANGE IN HEART DISEASE RISK WITH MEDICATIONS COMPARED TO STANDARD OF CARE

	Mortality (death), stroke, coronary revascularization (bypass surgery)	Heart attack	Limb ischemia/amputation (PVD events)	Discontinuation of medication due to side effects
Evolocumab	No difference	11 fewer heart attacks per 1,000 participants *(small decrease)*	No difference	No difference
Alirocumab	No difference	18 fewer heart attacks per 1,000 participants *(small decrease)*	5 fewer PVD events per 1,000 participants *(trivial decrease)*	No difference
Inclisiran	No difference	No difference	No difference	No difference
Bempedoic acid	No difference	11 fewer heart attacks per 1,000 participants *(small decrease)*	6 fewer PVD events per 1,000 participants *(trivial decrease)*	21 more people stopped treatment per 1,000 participants *(moderate increase)*
EPA	No difference	8 fewer heart attacks per 1,000 participants *(small decrease)*	Not reported	No difference
EPA + DHA	No difference	No difference		27 more people stopped treatment per 1,000 participants *(moderate increase)*
Niacin	No difference	6 fewer heart attacks per 1,000 participants *(trivial decrease)*		98 more people stopped treatment per 1,000 participants *(moderate-large increase)*

- Standard of care could include other medications like statins and statins + ezetimibe, lifestyle changes, or no treatment.

Slide 310

DI1 New from aace

Diana Isaacs, 2025-08-25T11:51:34.795

Back to Alice

- Alice's lipid panel is as follows:
  - Total cholesterol: 204mg/dL
  - LDL: 120mg/dL
  - HDL: 34mg/dL
  - Triglycerides: 250mg/dL

- Which ASCVD risk factors does Alice have?

  Low HDL, smokes, obesity, HTN, albuminuria

- 10 year ASCVD risk=42%

Poll 4 - What is the best Lipid Recommendation for Alice?

A. Optimize lifestyle modifications only
B. Lifestyle + initiate a moderate intensity statin
C. Lifestyle + initiate a high intensity statin
D. Lifestyle + initiate high intensity statin + icosapent ethyl
E. Lifestyle + initiate high intensity statin + bempedoic acid

Antiplatelet Agents

10 - ADA Antiplatelet Agents

- Use aspirin therapy (75–162 mg/day) as a secondary prevention strategy in those with diabetes and a history of atherosclerotic cardiovascular disease.
  - Aspirin therapy dose (75–162 mg/day)
  - Increased bleeding risk
  - Dual antiplatelet therapy with a P2Y12 inhibitor for 1 year after acute coronary syndrome and may have benefits beyond
- Aspirin may be considered as a primary prevention strategy in diabetes (usually over age 50) with increased CV risk.
  - Requires **comprehensive discussion** w/ person on benefits versus increased risk of bleeding.
- Aspirin allergy, consider different agent

Should Alice start aspirin?

A. Yes

B. No

Individualized discussed with shared decision making

Would you change Alice's Diabetes Regimen?

- Current meds
  - Metformin1000mg PO bid
  - Glipizide 10mg PO qam
  - Chlorthalidone 25mg PO daily
  - Escitalopram 10mg PO daily
- Home monitoring
  - FBG and pre-meal: 110-130mg/dL
  - Denies s/sx hypoglycemia.
- A1C=6.9%

Which of the Following Changes Would you Make to Alice's regimen? Poll 5

A. No changes since A1C is at target
B. Add empagliflozin (Jardiance)
C. Add dulaglutide (Trulicity)
D. Add linagliptin (Tradjenta)

If you add an agent, would you stop or decrease any of the others?

ADA 2026 ABC Goal Summary

A1c less than 7% (individualize)

- Pre-meal BG 80-130
- Post meal BG <180
- Time in Range (70-180) 70% of time

Blood Pressure

<130/80

<120/80 for high risk

Cholesterol

- Statin therapy based on age & risk status
- If 40+ with ASCVD Risk, decrease LDL by 50%, LDL <70
- If 40+ with ASCVD, decrease LDL by 50%, LDL <55

Lifestyle Modifications to Reduce CV risk

Lifestyle modifications

Category	Recommendations
Nutrition	• Maintain optimal weight • Calorie restriction • Plant based diet-high in polyunsaturated and monounsaturated fats • Avoid trans fats, limit saturated fats • Consider DASH/Mediterranean meal plans • Increase omega-3 fatty acids, viscous fiber, plant stanols/sterols (lipids)
Physical Activity	• 150 minutes/week moderate exertion • Strength training
Sleep	6-8 hours per night
Alcohol	• 2 drinks/day for men • 1 drink/day for women
Tobacco Cessation	Avoid tobacco products
Salt Intake	<2300mg/day

Poll 6- What Lifestyle Modifications are Recommended for Alice?

A. Tobacco cessation
B. Weight loss
C. Increase physical activity
D. Reduce alcohol intake
E. Reduce salt intake

- Social history
  - (+)Alcohol: 1-2 drinks/week
  - (+) Tobacco use: 1/2ppd
  - Exercise: walks 15 min twice/week
  - Occ: receptionist
- BMI:32.8kg/m^2

Select all that apply

Thank You

Questions:

We are here to help!

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www.DiabetesEd.net

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