DiabetesEd Training Conference Syllabus

October 22nd - 23rd, 2025

Presented By:

Coach Beverly Thomassian, RN, MPH, CDCES, BC-ADM

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

DiabetesEd Training Conference – San Diego
October 22nd - 23rd, 2025

Welcome

We are proud to welcome you to our 25th Annual DiabetesEd Training Conference. Your attendance demonstrates a commitment to advocating for the best diabetes care for the 38.4 million Americans with diabetes. We encourage you to share the new ideas and information garnered from this conference with your community and colleagues. As advocates, specialists, and coaches, we believe we can make a dramatic difference in improving the quality of life for people with diabetes using a person-centered, evidence-based, compassionate approach coupled with curiosity.

Faculty and Staff Biographies

Beverly Dyck Thomassian, RN, MPH, BC-ADM, CDCES

Beverly Thomassian is the president of Diabetes Education Services and an enthusiastic advocate for improving diabetes care through education, equity, and curiosity. A dynamic award-winning diabetes coach and educator, Beverly inspires excellence through her nationally recognized live courses and webinars. With over two decades of experience as a Diabetes Nurse Specialist and Board-Certified in Advanced Diabetes Management, she is a respected leader, innovator, and mentor in the field.

She is also the recent author of the groundbreaking book, *Healing through Connection: For Healthcare Professionals*—a heartfelt guide that invites clinicians to nurture their own well-being while deepening authentic, healing relationships with the people they serve. In addition to her work with Diabetes Education Services, Beverly stays grounded in clinical practice through her role at a local Indian Health Services Clinic, where she provides one-on-one diabetes education and consults with providers. Her commitment to person-centered, culturally responsive care drives her mission to advance equitable diabetes care for all.

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

Diana Isaacs is an Endocrinology Clinical Pharmacy Specialist. She serves as the Co-Director of Endocrine Disorders in Pregnancy and the Director of Education and Training in Diabetes Technology at the Cleveland Clinic Endocrinology and Metabolism Institute. Dr. Isaacs holds board certifications in pharmacotherapy, ambulatory care, and advanced diabetes management. She served on the American Diabetes Association (ADA) Professional Practice Committee from 2020-2023, the committee that updates the ADA Standards of Care. She has been actively involved with the American Association of Clinical Endocrinology (AACE) and serves on the leadership of the Diabetes Disease State Network.

She co-hosts a podcast titled “Diabetes Dialogue: Technology, Therapeutics and Real-World Perspectives.” She advocates access and choice to the latest technologies and therapeutics for all people with diabetes and speaks on diabetes related topics nationally and internationally. She was the ADCES Diabetes Care and Education Specialist of the Year in 2020 and was inducted into the SIUE Alumni Hall of Fame in 2022 for her far-reaching contributions.

Lonnie Vaughn, RNC, BSN, CDCES – Onsite Program Manager

As a leader in the field of diabetes management, Lonnie has been championing best care practices at Doctor's Hospital in Modesto for over 30 years. As a certified diabetes educator, trainer, mentor, and advocate, her passion and commitment to improving diabetes care is valued by patients and professionals alike. Lonnie’s expertise and experience uniquely qualify her to address a multitude of diabetes related topics that not only inform but also inspire.

We are overjoyed that you are joining us! Please let us know how we can be of more service!

Sincerely,

Coach Beverly Thomassian

Beverly Thomassian, RN, MPH, CDCES, BC-ADM
President and Founder, Diabetes Education Services

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Day One | October 22, 2025

Standards of Care, Meds for Type 2 & Addressing Cardiovascular Disease

Time	Topic	Speakers
7:30 – 8:00 am	**Breakfast & 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 pm	**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 - AACE and ADA**	
3:30 – 4:45	**Cardiovascular Monitoring and Management**	
5:30	**Optional – Book Signing Celebration with Coach Beverly on Terrace**	

**Content and Speakers subject to change.*

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Day Two | October 23, 2025

Insulin Pattern Management, Physical Assessment & Diabetes Technology

Time	Topic	Speakers
7:30 – 8:00 am	**Breakfast & Welcome**	
8:00 – 9:30	**Insulin - the Ultimate Hormone Replacement Therapy**	Diana Isaacs, PharmD, BCPS, BCACP, CDCES, BC-ADM, FADCES, FCCP
9:30 – 9:45	**Break**	
9:45 – 10:45	**Insulin Pattern Management and Dosing Strategies**	and
10:45– 12:00 pm	**Diabetes Interview – From Head to Toe** **Microvascular Risk Reduction**	Beverly Dyck Thomassian, RN, BC-ADM, MPH, CDCES
12:00 – 1:00	**Lunch Break**	
1:00 - 2:15	**Diabetes Technology-Monitors, Pumps, and Data Interpretation**	
2:15– 2:30	**Break**	
2:30 – 3:15	**Diabetes Technology-Monitors, Pumps, and Data Interpretation**	

**Content and Speakers subject to change.*

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LIVE SEMINAR

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DiabetesEd Training Seminar 2025 – Day 1

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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
- Author & contributor

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

Disclosures for Dr. Isaacs

- Diana Isaacs, PharmD, BCPS, BCACP, CDCES, BC-ADM, FADCES, FCCP declares the following disclosures:
- Speaker: Abbott, Dexcom, Novo Nordisk, Insulet, Medtronic, Lilly, Cequr, Sanofi, Mannkind, Sequel, Sanofi
- Consultant: Tandem

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.
- Decrease barriers 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

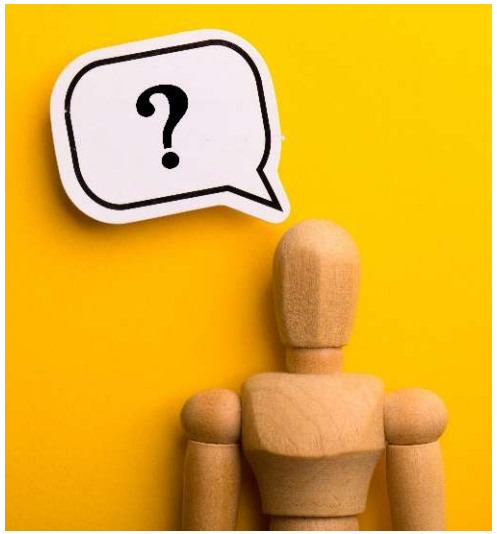
Boyle, Thompson, Barker, Williamson

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. 16.8%
- D. 25.6%

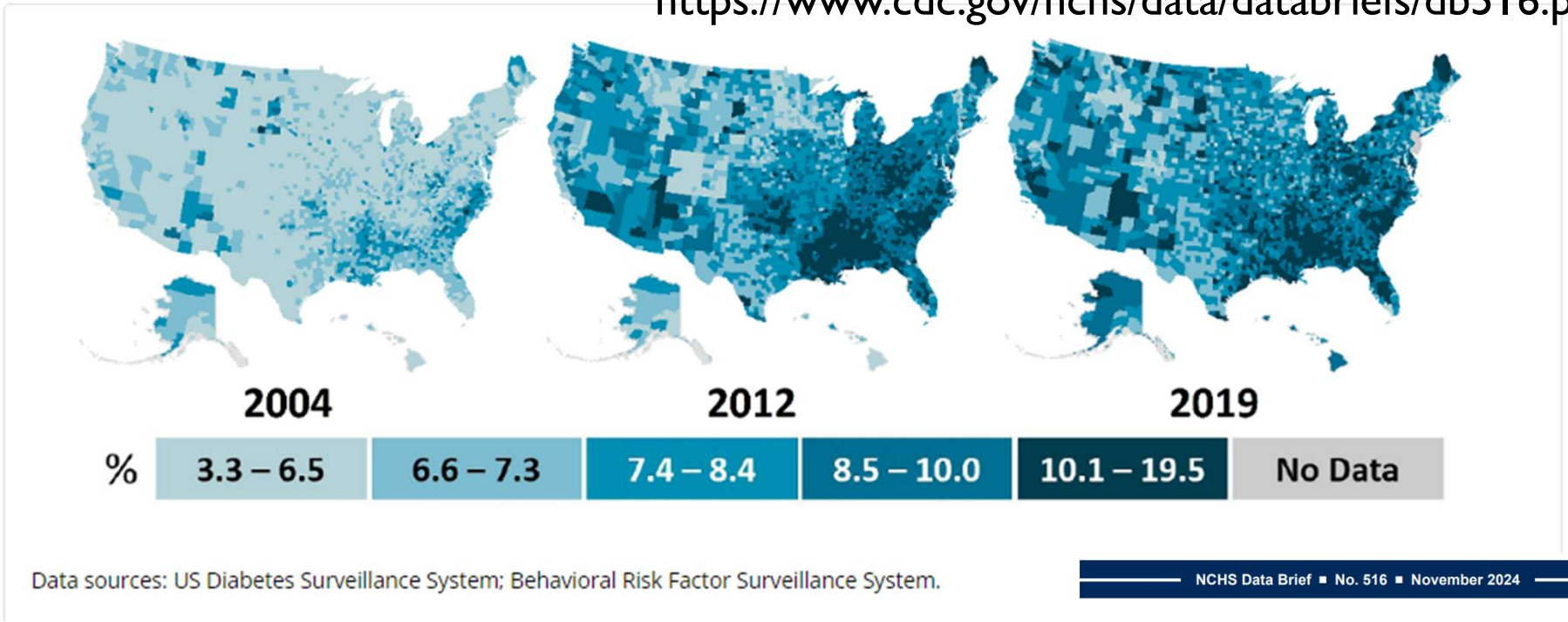


Type 2 Diabetes in America 2025

- 16.8% with Diabetes
  - 11% don't know they have it
- 38% with Prediabetes – 97 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

https://www.cdc.gov/nchs/data/databriefs/db516.pdf



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

NCHS Data Brief ■ No. 516 ■ November 2024

Prevalence of Total, Diagnosed, and Undiagnosed Diabetes in Adults: United States, August 2021–August 2023

Jane A. Gwira, M.D., M.P.H., Cheryl D. Fryar, M.S.P.H., and Qiuping Gu, M.D., Ph.D.

Centers for Disease Control and Prevention. National Diabetes Stats Report https://www.cdc.gov/diabetes/data/statistics-report/index.html. Accessed 1/23

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 2025

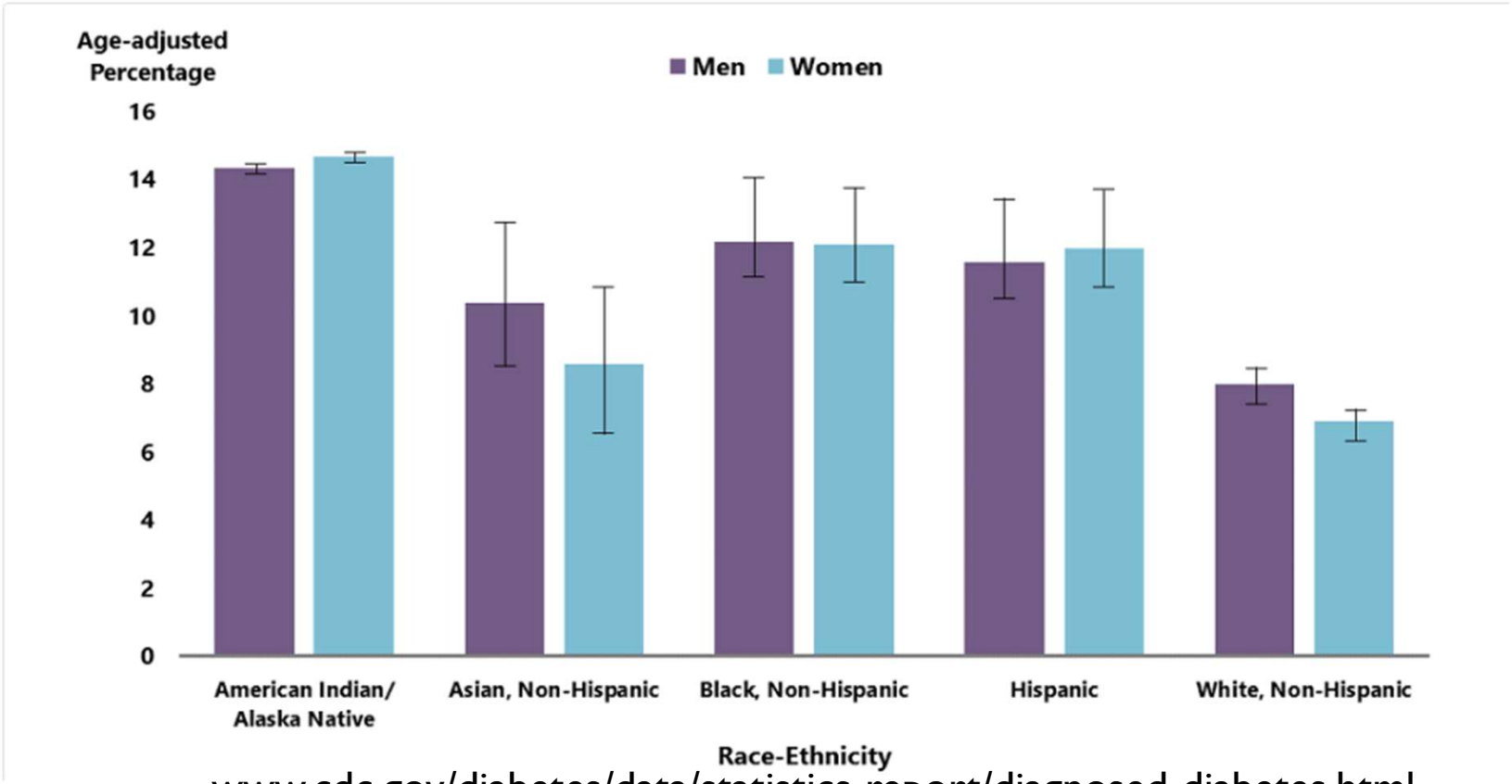
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Diabetes Prevalence by Ethnic Group

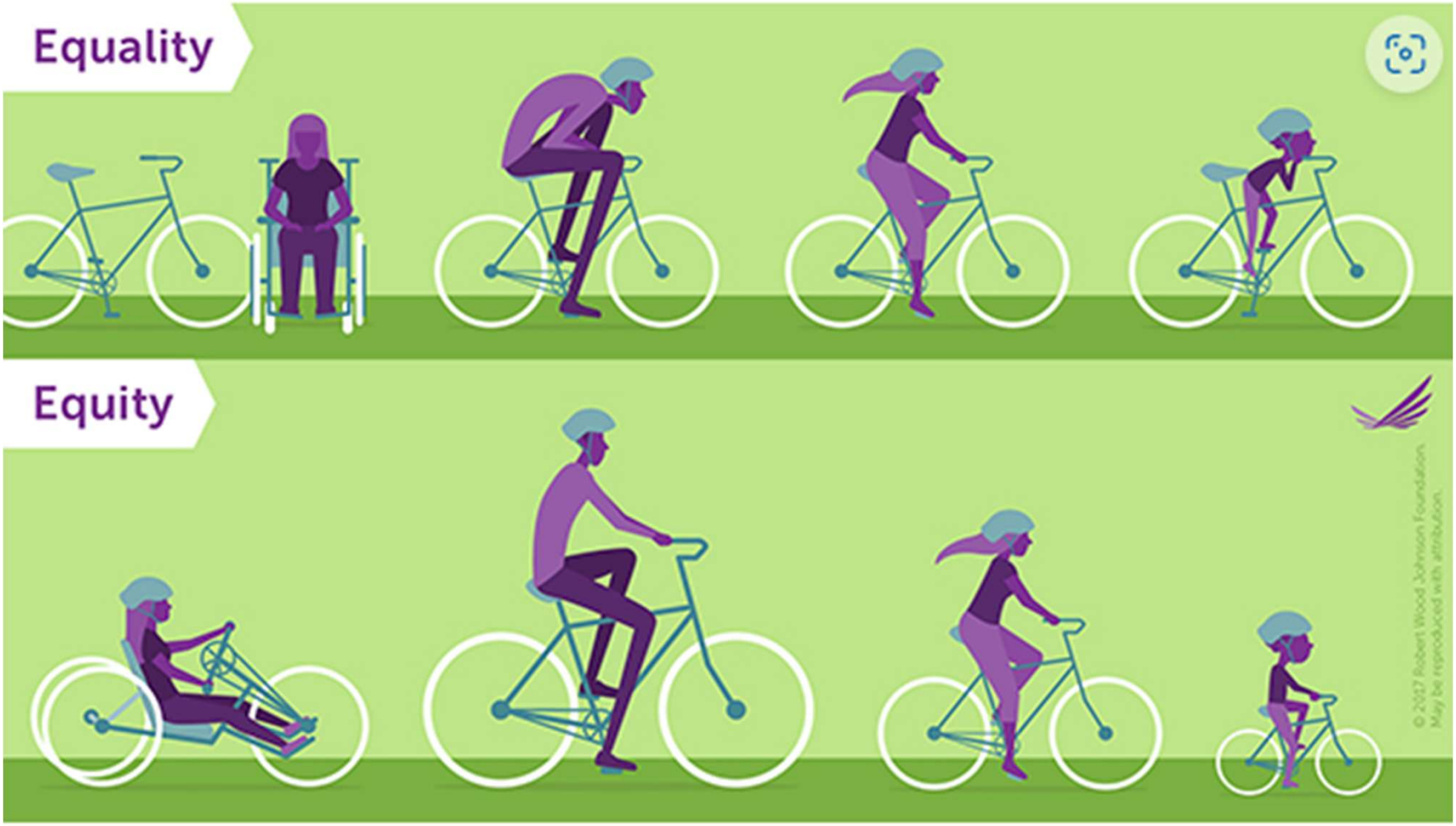
- For adults, diabetes prevalence highest among:
  - American Indians and Alaska Natives (14.5%),
  - Non-Hispanic Blacks (12.1%),
  - People of Hispanic origin (11.8%),
  - Non-Hispanic Asians (9.5%)

Figure 2. Age-adjusted estimated prevalence of diagnosed diabetes by race/ethnicity group and sex for adults aged 18 years or older, United States, 2018–2019



www.cdc.gov/diabetes/data/statistics-report/diagnosed-diabetes.html

Equality vs Equity



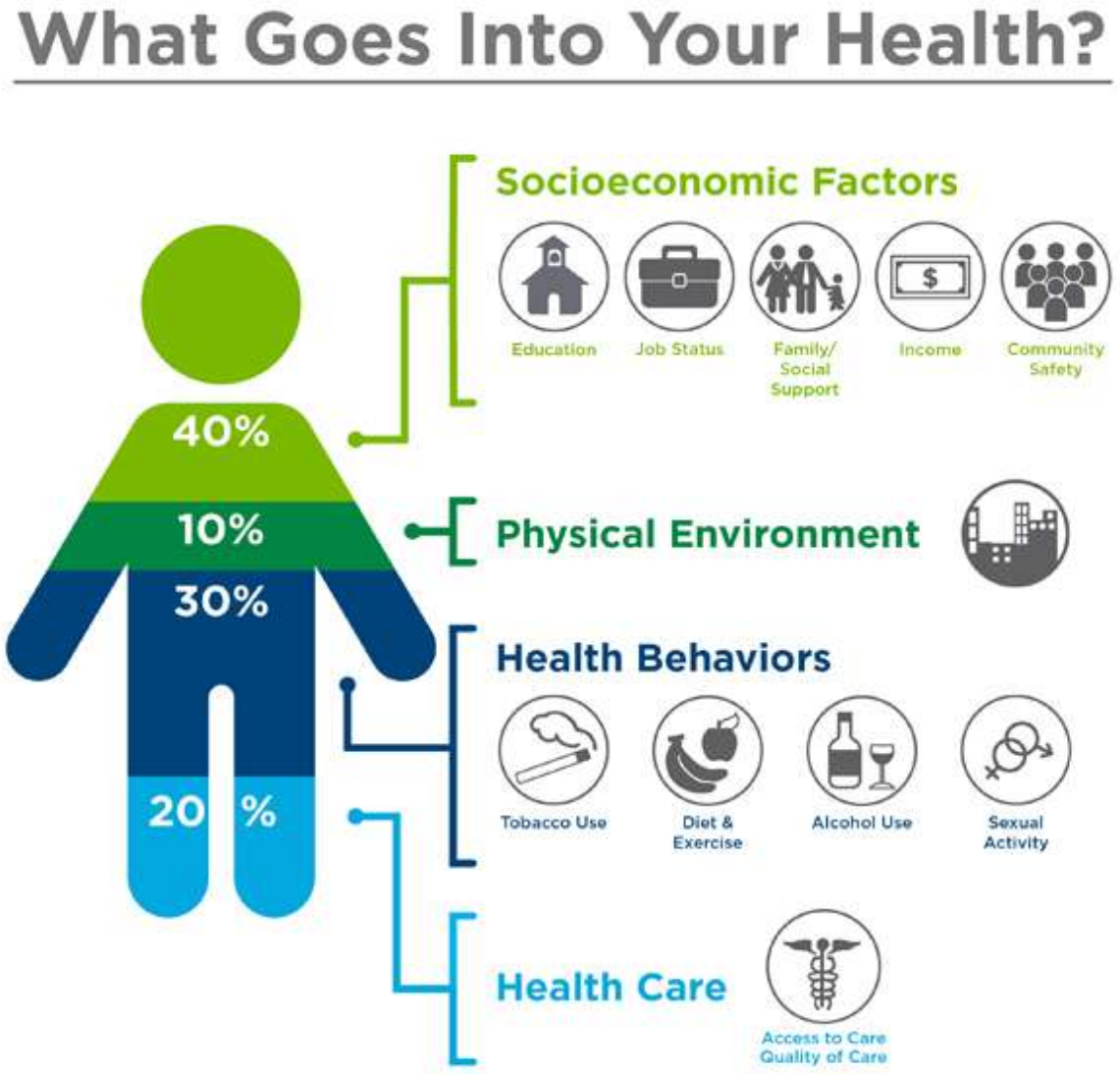
© 2017 Robert Wood Johnson Foundation

Design and deliver diabetes care with goal of **health equity** across all populations.

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

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 determinants 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/

5. Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes: Standards of Care in Diabetes—2025 FREE

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Social Determinants of Health

- The conditions in which people:
  - Play
  - Live
  - Work
  - Learn
  - Pray



Directly affects their health risks and outcome

AADE Population Health & Diabetes Educators Evolving Role 2019

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.

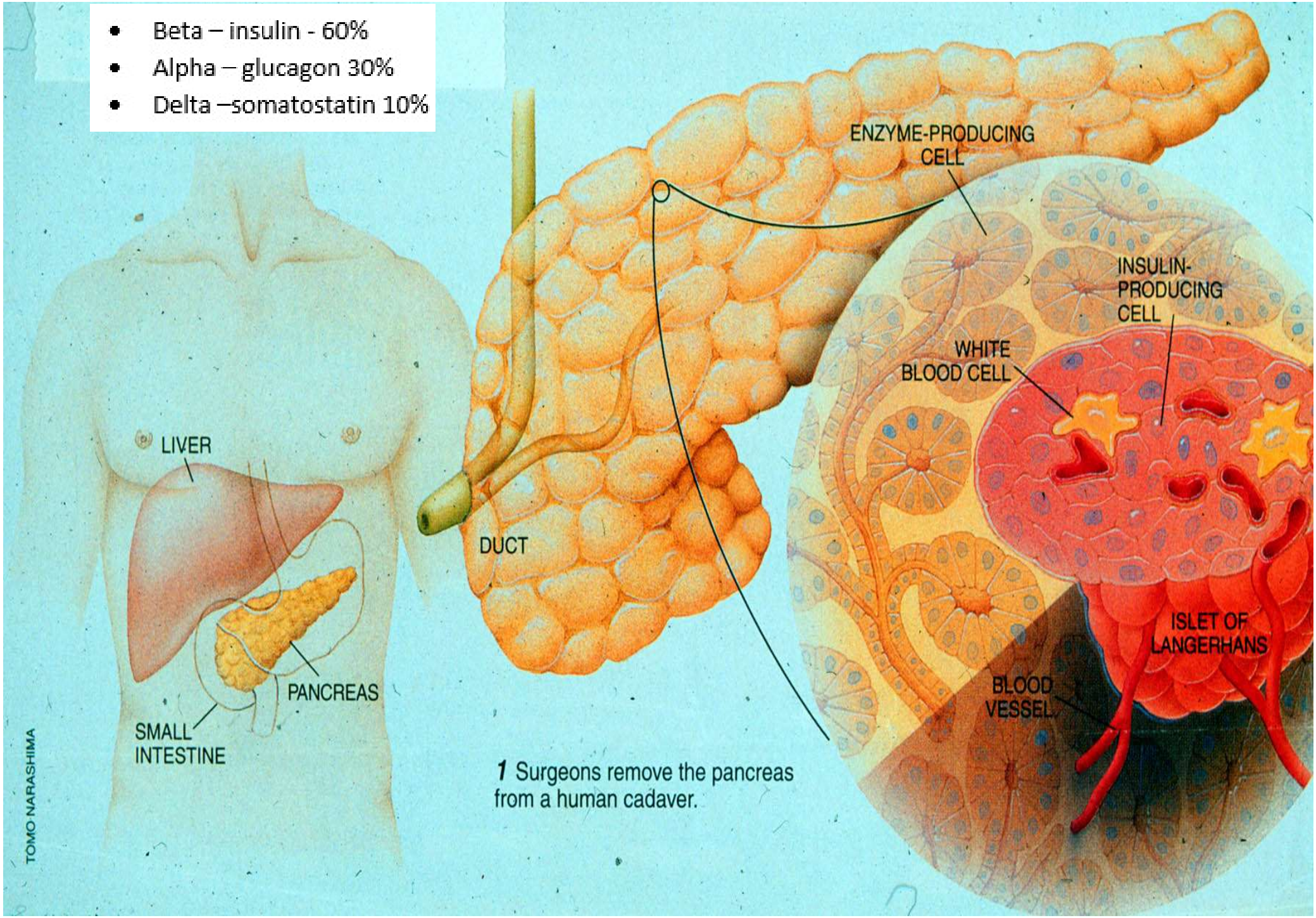


STANDARDS OF CARE | DECEMBER 09 2024

1. Improving Care and Promoting Health in Populations: Standards of Care in Diabetes—2025 FREE

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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	

Slide 17

BT1 Added gut hormone info

Beverly Thomassian, 2025-08-25T01:23:14.042

Pre Diabetes & Type 2- Screening Guidelines (ADA 2025 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, periodontitis

2. Diagnosis and Classification of Diabetes: Standards of Care in Diabetes—2025 FREE
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Diabetes 2 - Who is at Risk?

(ADA 2024 Clinical Practice Guidelines)



Screen using A1C, Fasting Blood Glucose or OGTT.

Repeat screening at least every 3 years if negative.

*If prediabetes or on high risk meds, recheck yearly

Risk factors cont'd

- HTN - BP > 130/80
- HDL < 35 or triglycerides > 250
- History of Gestational Diabetes Mellitus
- Polycystic ovary syndrome (PCOS)
- Other conditions associated w/ insulin resistance:
  - Elevated BMI, acanthosis nigricans (AN)

2. Diagnosis and Classification of Diabetes: Standards of Care in Diabetes—2025 FREE

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Diabetes Screening Guidelines

(ADA 2025 Clinical Practice Guidelines – Cheat Sheet)

RECOMMENDATIONS FOR DIAGNOSIS AND CLASSIFICATION OF DIABETES – 2025

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.)

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 or second degree relative with diabetes
   - High risk ethnicity or ancestry
   - Other conditions associated with insulin resistance (PCOS, Acanthosis Nigricans, Steatosis)
   - 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)

Closely monitor high-risk groups (before taking 2nd generation antipsychotics, steroids, thiazide diuretics, statins, HIV meds *and* after initiating therapy) with history of pancreatitis, or periodontal disease.

2. Diagnosis and Classification of Diabetes: Standards of Care in Diabetes—2025 FREE
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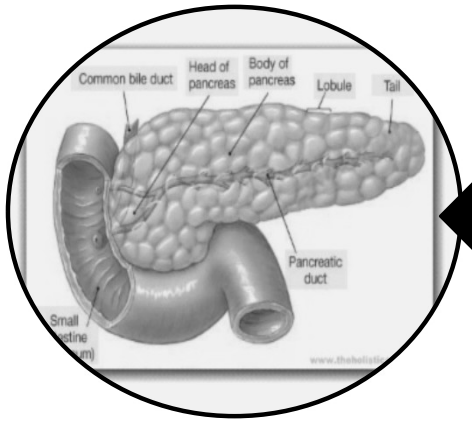
DiabetesEd Cheat Sheets

Poll Question 2

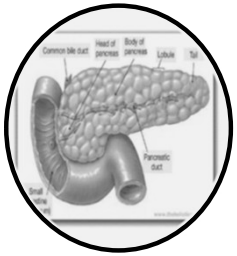
- Which of the following level is considered pre-diabetes range?
  a. Fasting BG of 62
  b. A1c of 5.9 %
  c. After meal BG of 137
  d. A1c of 7.1 %



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

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



PreDiabetes is FREAKING ME OUT

- 96 million people in US
- 80% don't know they have it
- In 3-5 years, about 30% of predm will get diabetes
- Associated with higher rates of heart attack, stroke, neuropathy and vessel disease



Do I look like I am freaking out?

3. Prevention or Delay of Diabetes and Associated Comorbidities: Standards of Care in Diabetes—2025 FREE

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3. Prevent or Delay Diabetes for those with Prediabetes



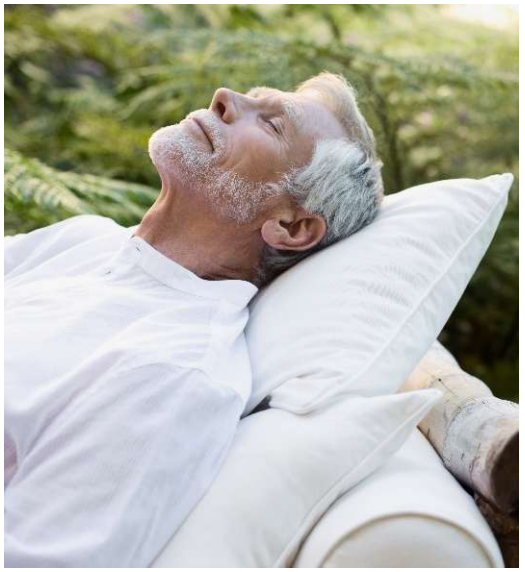
- Prediabetes defined as:
  - A1c 5.7 – 6.4% or fasting BG 100 -125mg/dl
- Action:
  - Screen yearly for diabetes
  - For adults with BMI 23/25
    - Refer to DPP approved programs
    - Includes intensive behavioral lifestyle interventions with 7% wt reduction goal + 150 min exercise week
    - Provide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

3. Prevention or Delay of Diabetes and Associated Comorbidities: Standards of Care in Diabetes—2025 FREE

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Get About 7 Hours of Quality Sleep to Prevent Diabetes

- Poor sleep quality was associated with a 40–84% increased risk of developing type 2 diabetes in a meta-analysis.
- Chronotype preference has been linked with many chronic diseases, including type 2 diabetes.
  - For those with a preference for evenings (i.e., going to bed late and getting up late)
    - 2.5-fold higher odds ratio for type 2 diabetes than for those with a preference for mornings (i.e., going to bed early and getting up early),
    - Independent of sleep duration and sleep sufficiency



3. Prevention or Delay of Diabetes and Associated Comorbidities: Standards of Care in Diabetes—2025 FREE
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The composition of the gut microbiome may also affect the likelihood of developing type 2 diabetes.

3. Pharmacologic Interventions

- Use more intensive approach for high-risk individuals:
  - BMI of 35+
  - If A1C is ~6.0 or FPG is 110
  - History of GDM
- No FDA approved med for prevention (off label)
- Consider Metformin Therapy for Prediabetes
  - Monitor B12 level (esp with neuropathy or anemia)

3. Prevention or Delay of Diabetes and Associated Comorbidities: Standards of Care in Diabetes—2025 FREE

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- CV Risk Mitigation important.
- Statin can increase BG, stop if notice elevation
- Consider low dose pioglitazone (Actos) if history of stroke.



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



Tailoring Treatment for Social Context

- "Social determinants of health (SDOH)—*often out of direct control of the individual* and potentially representing lifelong risk—contribute to health care and psychosocial outcomes and must be addressed to improve all health outcomes"



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The ADA recognizes this relationship and is taking action.

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.

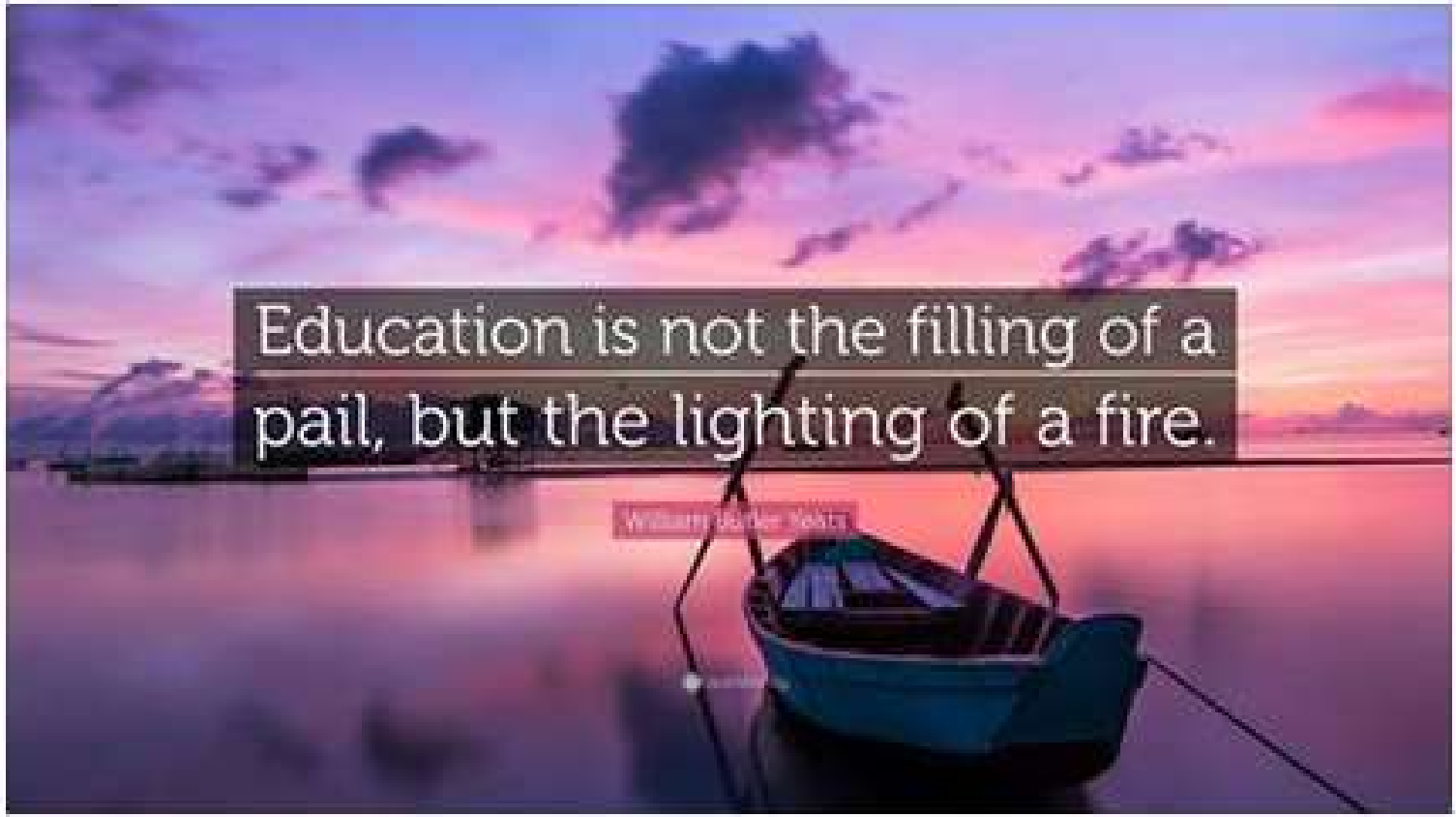
- Remember the wind. Remember her voice. She knows the origin of this universe.

- 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

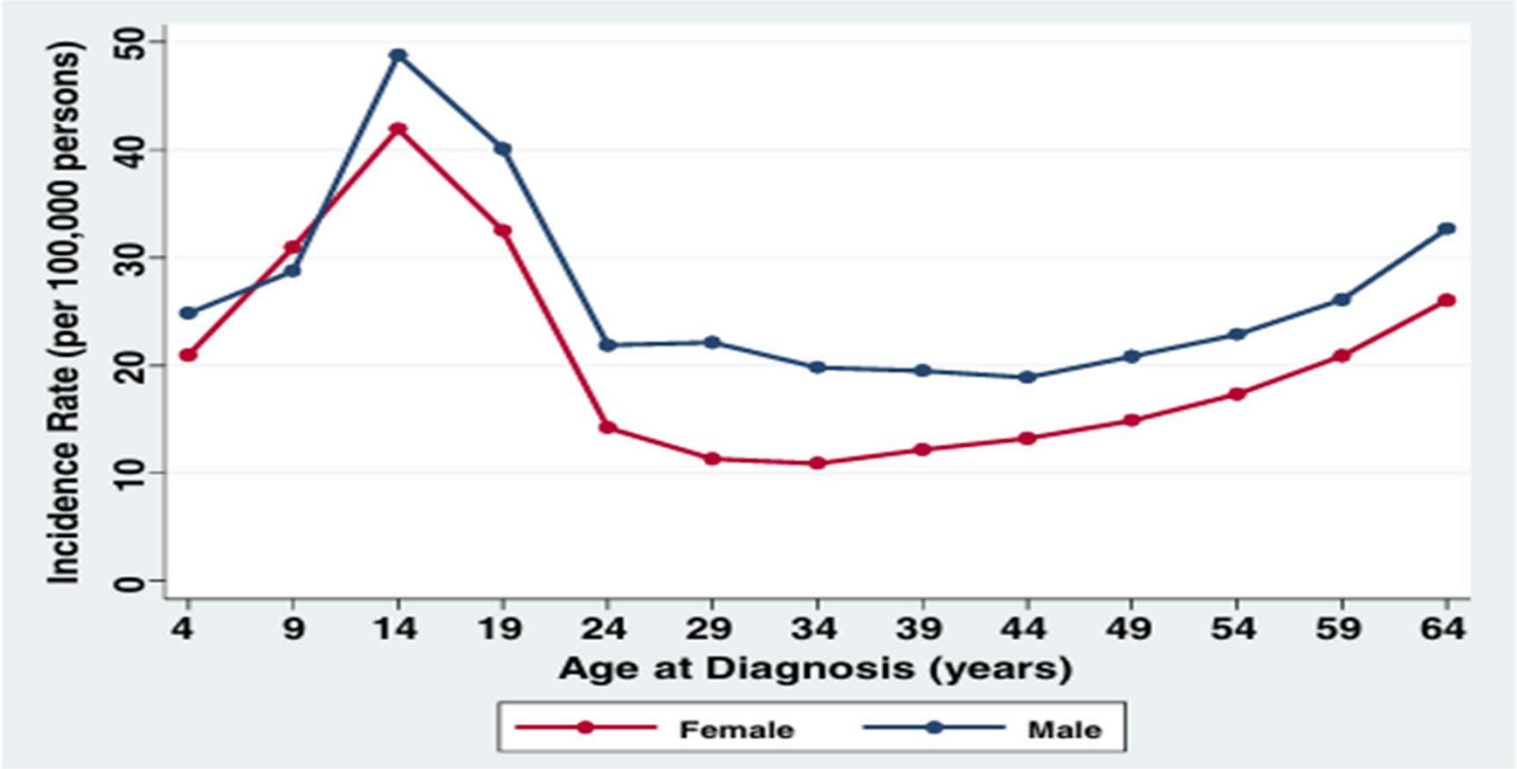
2017 - 2.15 per 1000 youths diagnosed with diabetes

Incidence & Prevalence increasing

Highest incidence in Finland or Northern Europe.

Clinical onset of T1D can occur at any age

DI1



* 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.

Slide 33

DI1 The diagram was messed up, so I went back to the original source and replaced.
Diana Isaacs, 2025-07-20T20:04:33.070

DI1

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.

Slide 34

DI1 New slide

Diana Isaacs, 2025-07-20T20:15:42.458

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



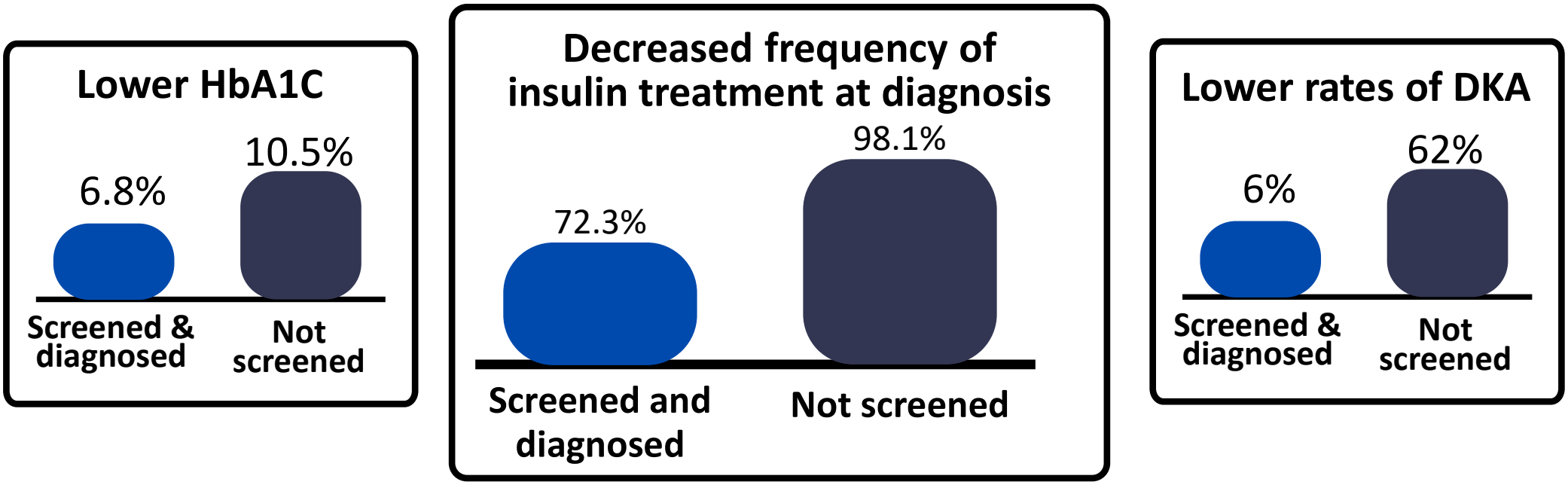
Thyroid disorders

- Hashimoto's thyroiditis
- Graves' disease



Celiac disease

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

Slide 36

DI1 Added citation

Diana Isaacs, 2025-07-20T20:09:56.981

DI1

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)

Slide 37

DI1 Added the abbreviations for AA at the bottom.
Diana Isaacs, 2025-08-24T01:55:16.461

Recommendations for Diagnosis and Classification of Diabetes – 2025

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.)

	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

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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 39

DI1 Updated citation

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

Monitoring for T1D Progression

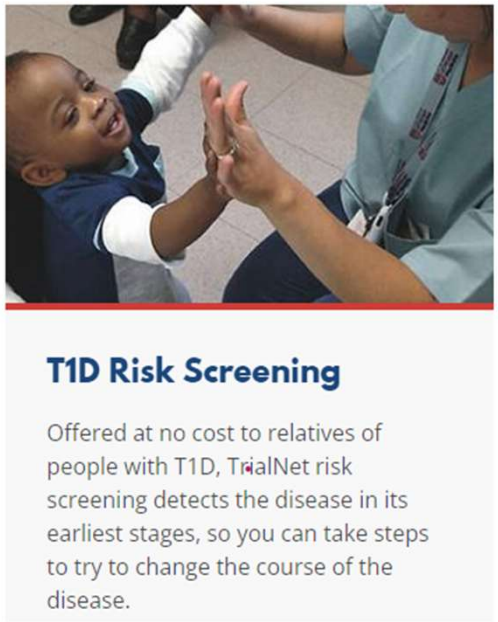
STANDARDS OF CARE | DECEMBER 09 2024

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DI1

- Screen for AAB's and if positive:
- How to monitor for stage 2 adults:
  - Screen A1C every 6 months
  - 75- OGTT every year
  - Modify screening based on antibodies 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 40

DI1 Changed action to how to monitor
Diana Isaacs, 2025-07-20T20:27:53.984

DI1 0 Updated title, citation and added last bullet on how to monitor in kids.
Diana Isaacs, 2025-08-24T02:06:20.607

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

DI1

- **Question:** LT has just been diagnosed with stage 1, type 1 diabetes. He has 2 positive autoantibodies and his blood sugars are 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.

DI1 Changed choice D to the therapy is not indicated.
Diana Isaacs, 2025-08-24T02:09:09.586

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.

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Medalist Study – Harvard Joslin Diabetes Center

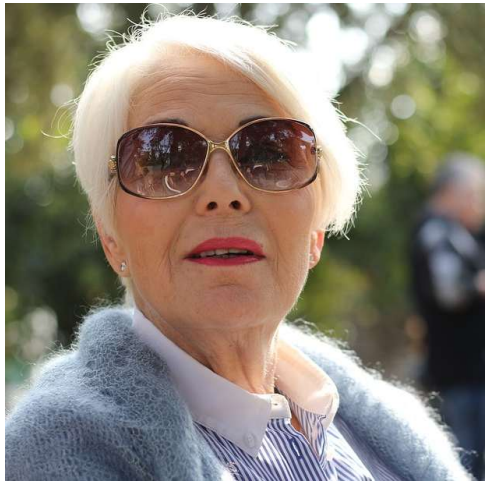
- After 50 years with diabetes
  - Many still produced some insulin
  - Many had no eye disease





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.



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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.



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Patti Labelle

"divabetic"

“I have diabetes, it doesn’t have me”



Signs of Diabetes

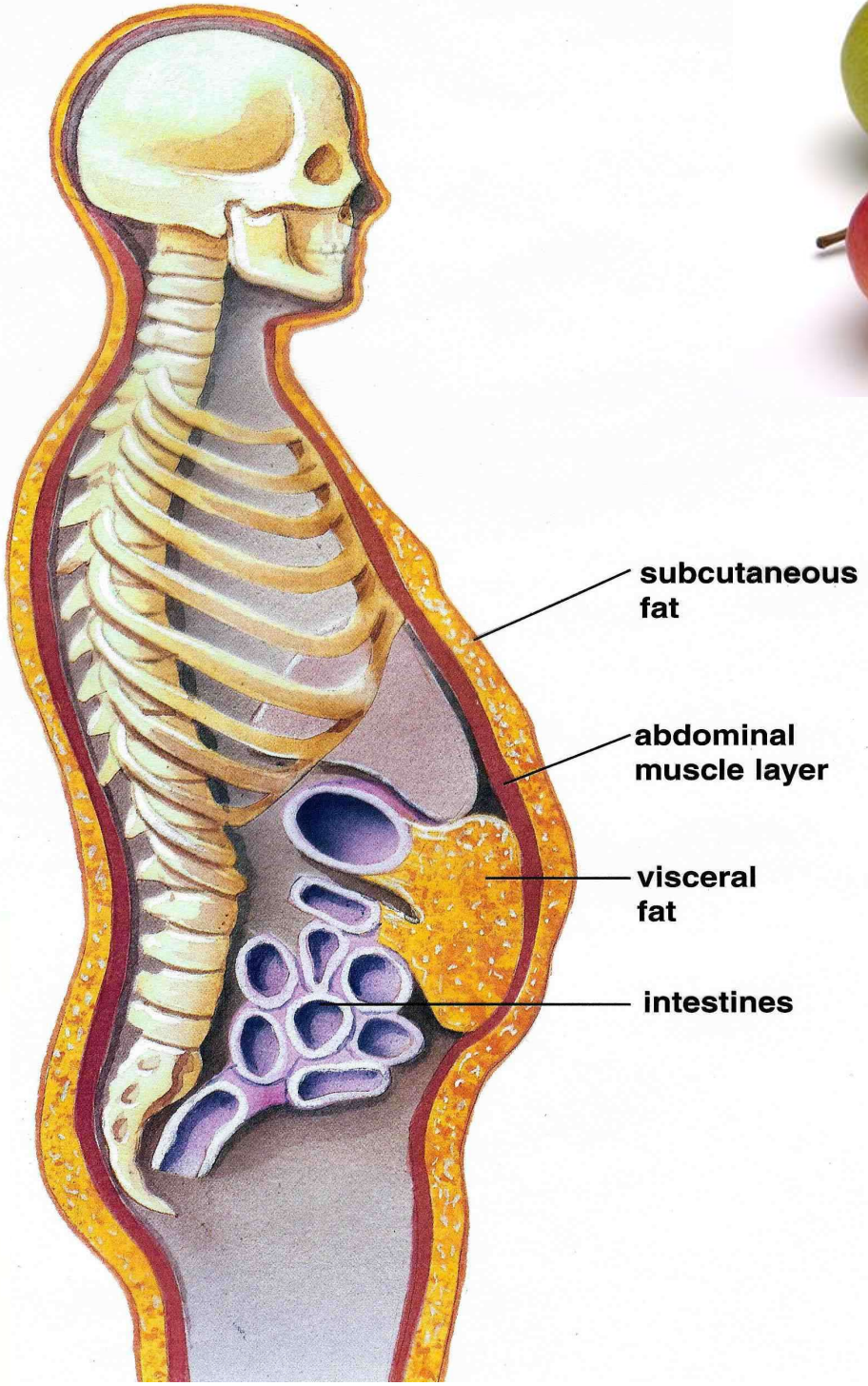
- Polyuria
- Polydipsia
- Polyphasia
- Weight loss
- Fatigue
- Skin and other infections
- Blurry vision

- 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



What is Type 2 Diabetes?

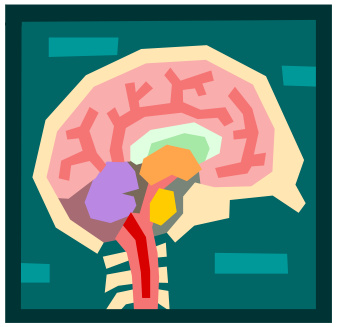
- Complex metabolic disorder ….
  (Insulin resistance and deficiency)

with social, behavioral and environmental risk factors unmasking the effects of genetic susceptibility.

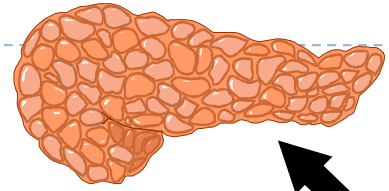
New Diagnosis?
Call 800 – DIABETES to request "Getting Started Kit"
www.Diabetes.org



The Noxious Nine – Pathophysiology T2D

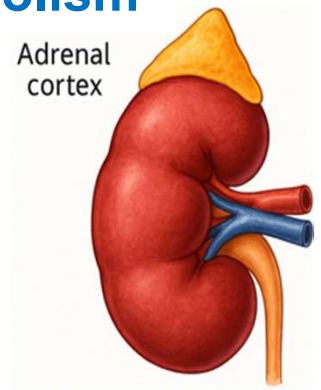


Neurotrans-
mission
dysfunction

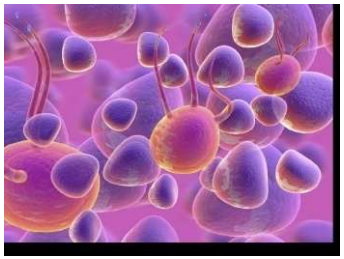


Decreased
Insulin β-cell secretion

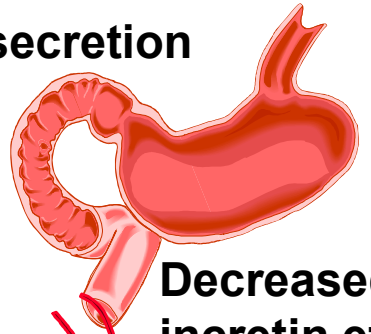
Hypercortisolism



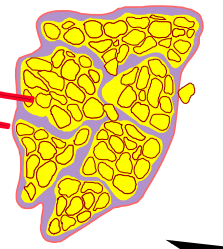
Increased renal
glucose
reabsorption



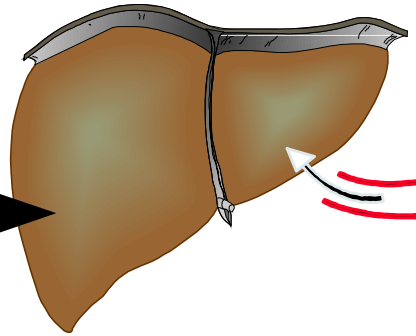
Increased glucagon
α-cell secretion



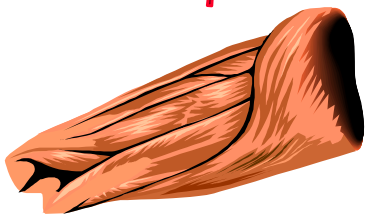
Decreased
incretin effect
Gut hormones



Increased
lipolysis



Increased
hepatic
glucose
production



Decreased muscle
glucose uptake

DeFronzo, Auchus-Hypercortisolism June 2025

BT1

Hypercortisolism in Type 2

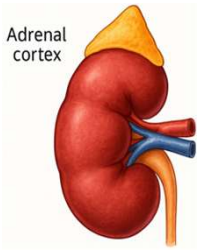
Cortisol increases gluconeogenesis in the liver

Reduces peripheral glucose uptake → insulin resistance

Stimulates protein catabolism and lipolysis

Chronic cortisol elevation → persistent hyperglycemia

- 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

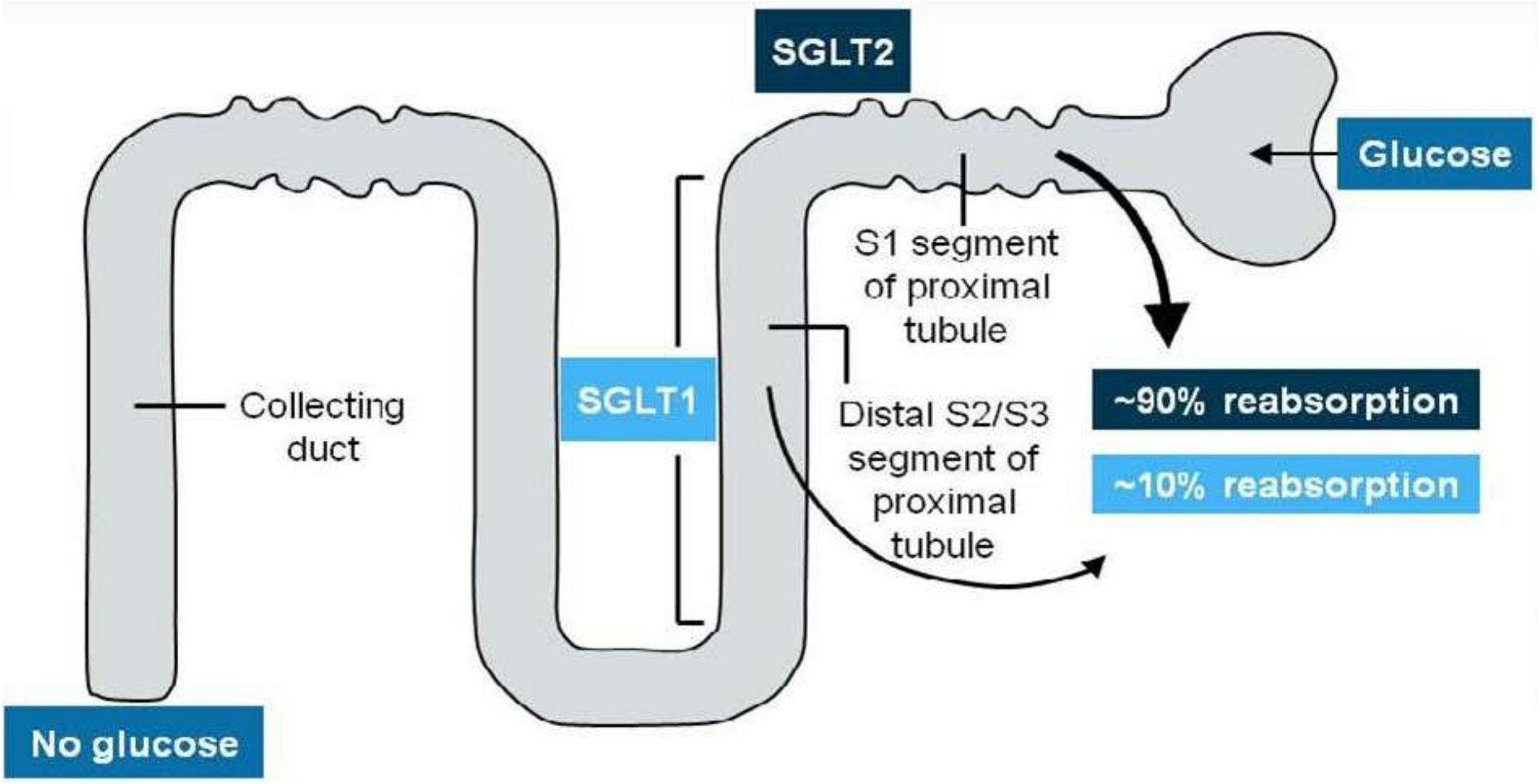
pmc.ncbi.nlm.nih.gov+3HCP

Slide 57

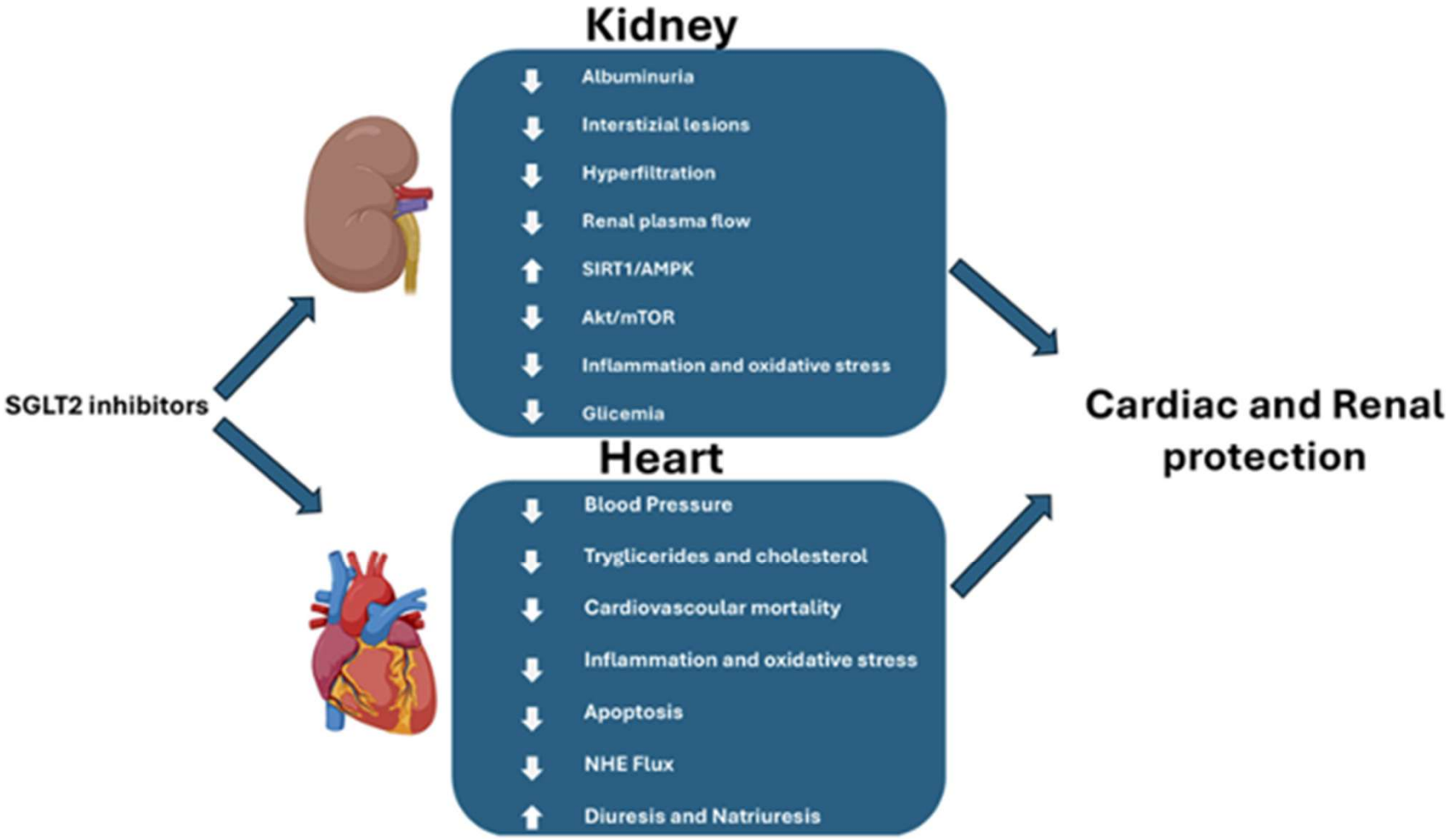
BT1 Added this slide

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

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

DI1

- 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



Slide 60

DI1 Changed question a little

Diana Isaacs, 2025-07-20T20:36:46.297

SGLT-2 Inhibitors- "Glucoretics"

- **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



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%.

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 until ESRD
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	NA	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

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

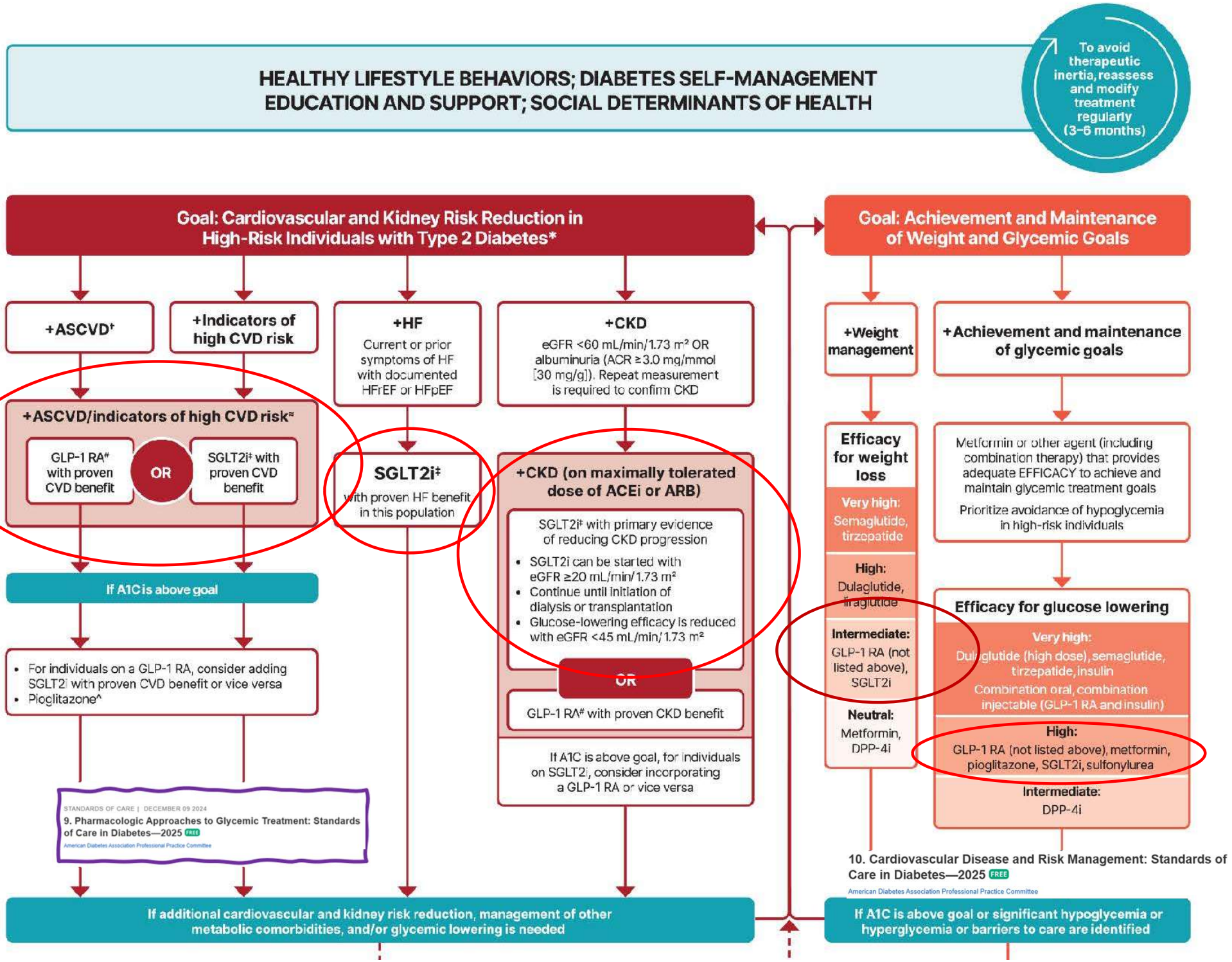
Amputation risk? (Canagliflozin), Fournier's gangrene?
Hold for 3 days prior to surgery or procedures with prolonged fasting

Managing Adverse Effects

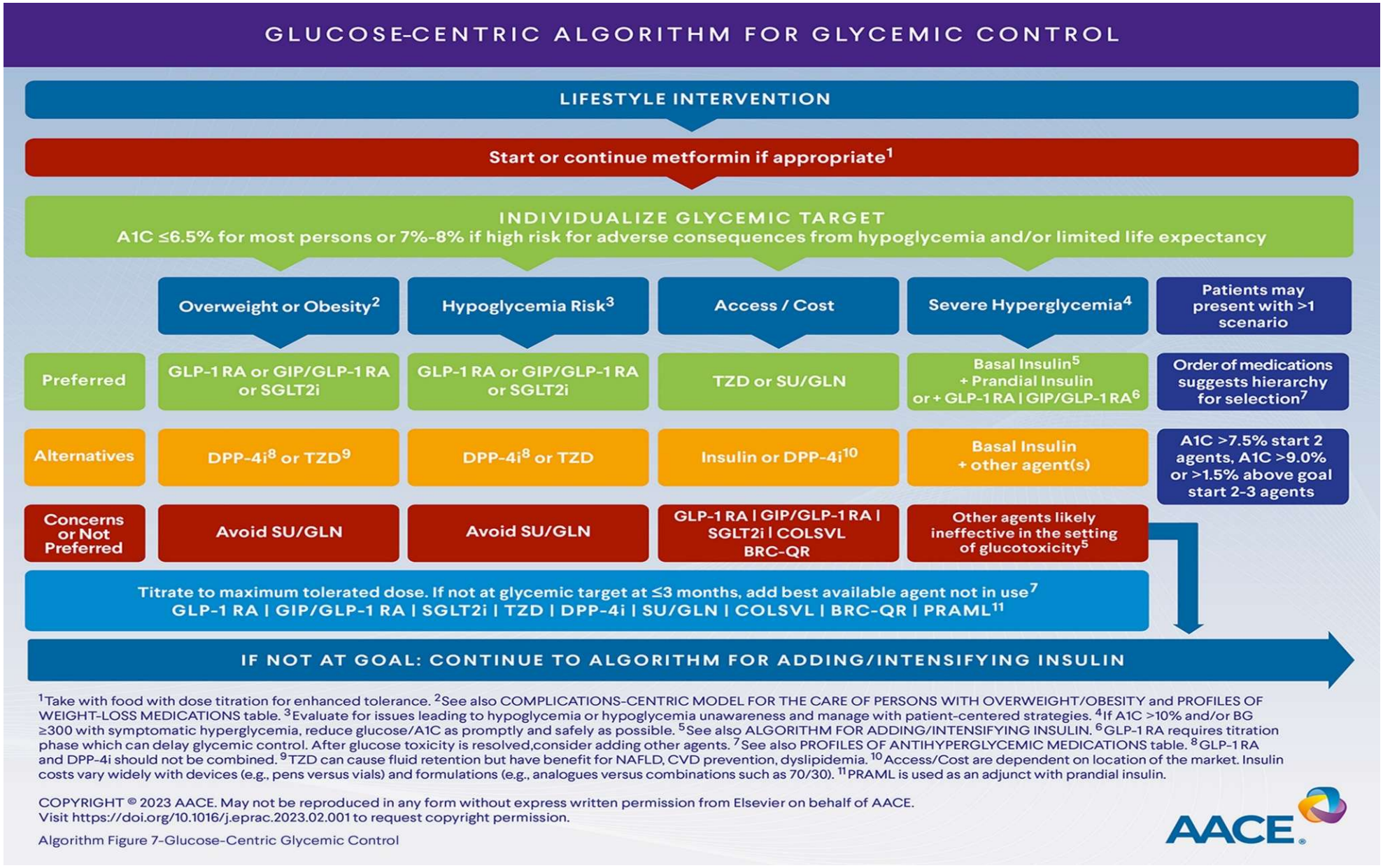
- Maintain good hygiene to reduce risk of genital mycotic infections
  - Higher risk with higher glucose
- DKA risk
  - Use caution with reducing insulin dose
- Discontinue 3 days prior to surgery or procedures that require prolonged fasting
- Monitor BP
  - May need to reduce antihypertensive meds
- UTI risk greater with hyperglycemia
- Amputations observed with canagliflozin
  - Good foot care, check feet daily
- Monitor renal function

Where do SGLT2-2 Inhibitors Fit within the Guidelines?

Use of Glucose-Lowering Medications in the Management of Type 2 Diabetes



AACE Glucose-Centric Algorithm

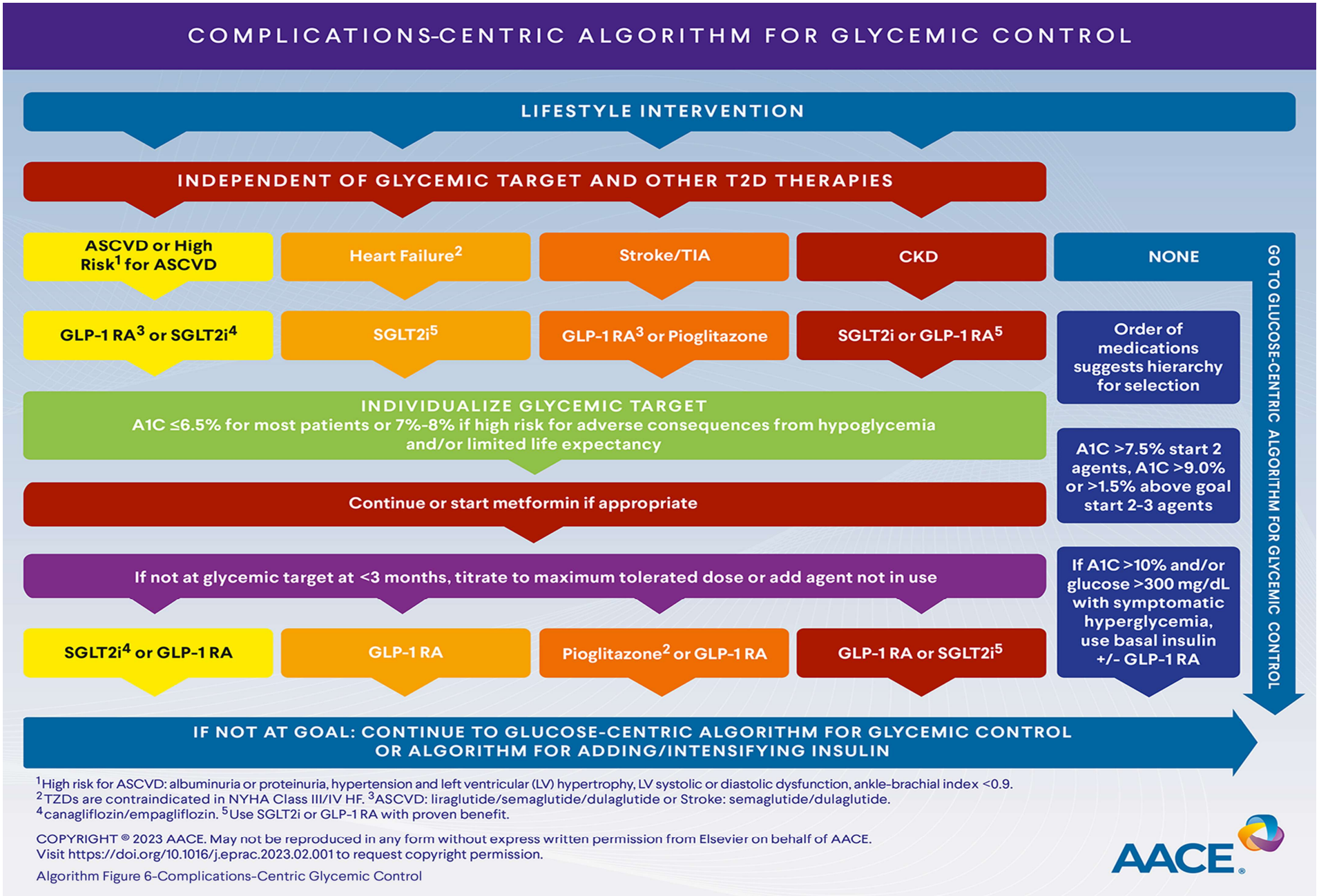


[1]Take with food with dose titration for enhanced tolerance. [2]See also COMPLICATIONS-CENTRIC MODEL FOR THE CARE OF PERSONS WITH OVERWEIGHT/OBESITY and PROFILES OF WEIGHT-LOSS MEDICATIONS table. [3]Evaluate for issues leading to hypoglycemia or hypoglycemia unawareness and manage with patient-centered strategies. [4]If A1C >10% and/or BG ≥300 with symptomatic hyperglycemia, reduce glucose/A1C as promptly and safely as possible. [5]See also ALGORITHM FOR ADDING/INTENSIFYING INSULIN. [6]GLP-1 RA requires titration phase which can delay glycemic control. After glucose toxicity is resolved,consider adding other agents. [7]See also PROFILES OF ANTIHYPERGLYCEMIC MEDICATIONS table. [8]GLP-1 RA and DPP-4i should not be combined. [9]TZD can cause fluid retention but have benefit for NAFLD, CVD prevention, dyslipidemia. [10]Access/Cost are dependent on location of the market. Insulin costs vary widely with devices (e.g., pens versus vials) and formulations (e.g., analogues versus combinations such as 70/30). [11]PRAML is used as an adjunct with prandial insulin.

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Algorithm Figure 7-Glucose-Centric Glycemic Control

AACE Complication-Centric Algorithm



[1]High risk for ASCVD: albuminuria or proteinuria, hypertension and left ventricular (LV) hypertrophy, LV systolic or diastolic dysfunction, ankle-brachial index <0.9.
[2]TZDs are contraindicated in NYHA Class III/IV HF. [3]ASCVD: liraglutide/semaglutide/dulaglutide or Stroke: semaglutide/dulaglutide.
[4]canagliflozin/empagliflozin. [5]Use SGLT2i or GLP-1 RA with proven benefit.

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Algorithm Figure 6-Complications-Centric Glycemic Control

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=7.3%.
- 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 (No Poll)

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

A. Glipizide
B. Empagliflozin
C. Pioglitazone
D. Linagliptin
E. More than 1 correct answer

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

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

Other Types of Diabetes

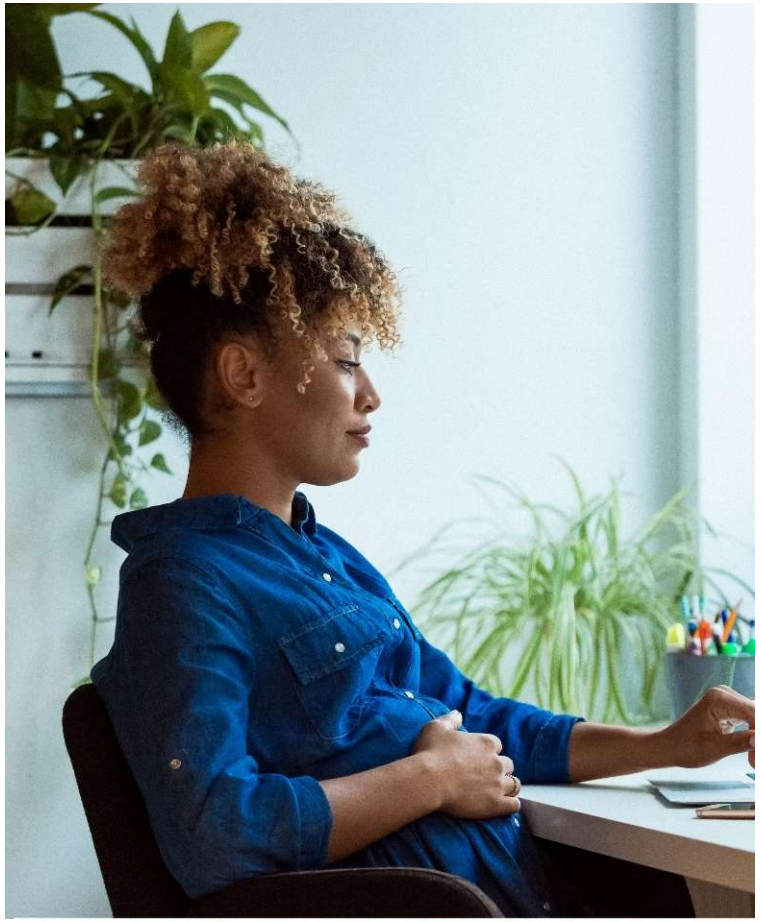
- Gestational
- Other specific types of diabetes





Screening in early Pregnancy

- Check glucose levels before 15 weeks of gestation:
  - Can find undetected diabetes or hyperglycemia
  - Prevent fetal exposure to hyperglycemia
  - Allows providers and pregnant people to take action to prevent complications
- Use standard diabetes diagnostic criteria.
  - If positive, diagnosis “Diabetes complicating pregnancy”
- If fasting BG 110+ or A1C 5.9%+
  - At higher risk of adverse outcomes and more likely to experience GDM and need insulin.



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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.



Gestational DM ~ 9% of all Pregnancies

- Detected at 24-28 weeks of pregnancy (most insulin resistant phase)
- 50% chance of getting diabetes post delivery
- Offspring at greater risk of insulin resistance and diabetes



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

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 2025 Jan; 48 (Supplement 1): S27-S49. **Compliments of Diabetes Education Services www.DiabetesEd.net**



Gestational Diabetes and Pregnancy

- Test for GDM at 24-28 weeks
- Test GDM women for post partum diabetes at 4-12 weeks, using OGTT
- People with GDM need lifelong screening for prediabetes/ diabetes at least every 3 yrs
- Women with hx of GDM, found to have prediabetes need intensive lifestyle interventions or metformin to prevent diabetes.



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15. Management of Diabetes in Pregnancy: Standards of Care in Diabetes—2025 FREE

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Other Specific Types of DM

- Medications such as: steroids, protease inhibitors and Tacrolimus
- Secondary to Agent Orange
- Liver failure
- TPN or tube feedings
- Diabetes Type 3c
  - Cystic fibrosis, pancreatitis
  - Pancreatic cancers or removal
  - Hemochromatosis



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.

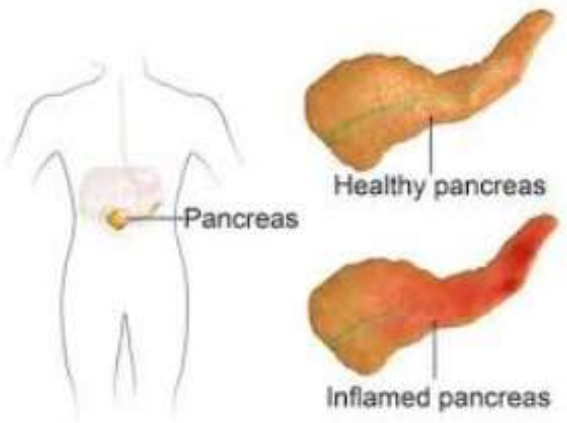
2. Diagnosis and Classification of Diabetes: Standards of Care in Diabetes—2025 FREE

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

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

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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



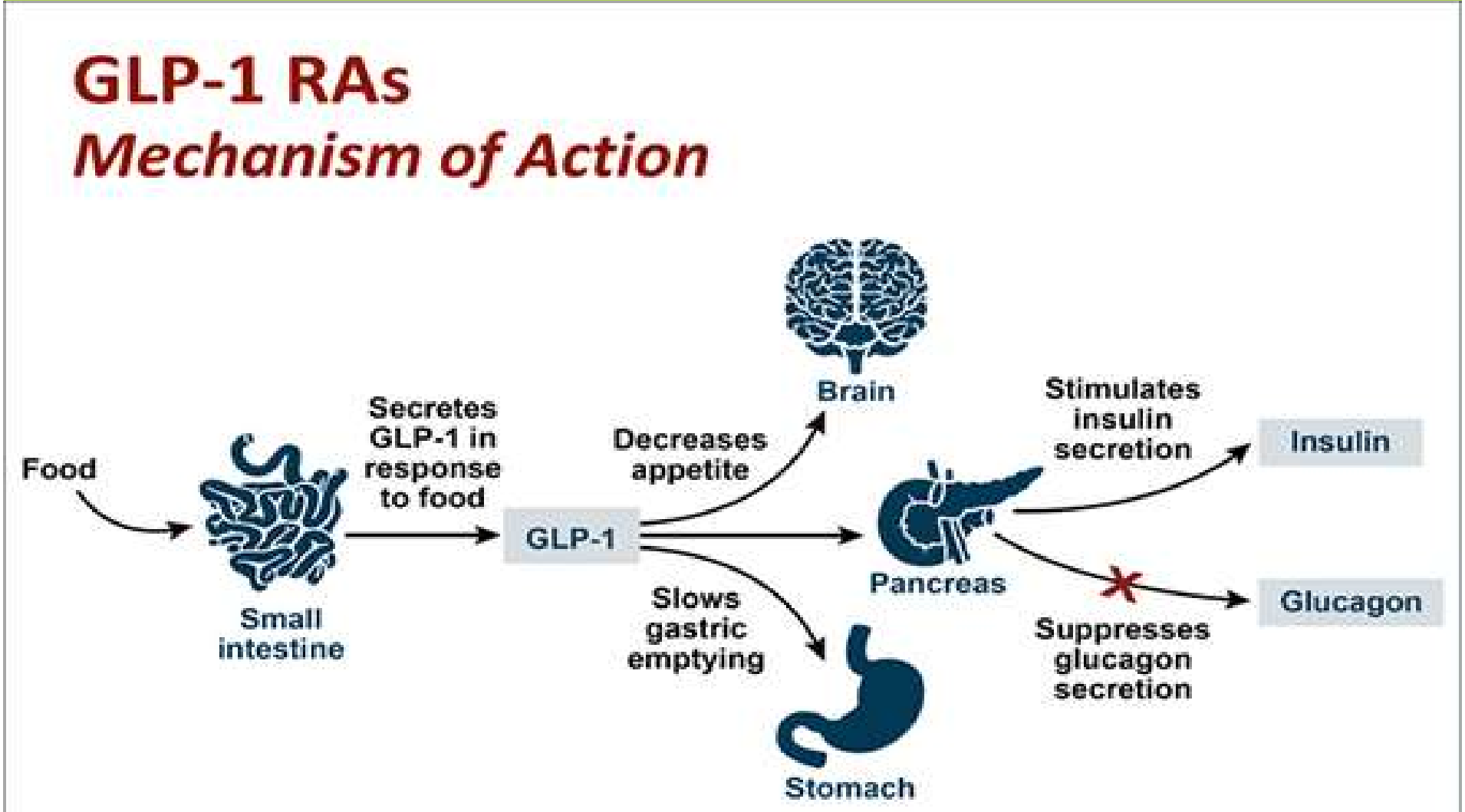
KFF Health Tracking Poll May 2024: The Public's Use and Views of GLP-1 Drugs | KFF

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

GLP-1 Receptor Agonist Mechanism



Meier JJ. *Nat Rev Endocrinol*. 2012;8:728-742.

GLP-1: Additional Effects

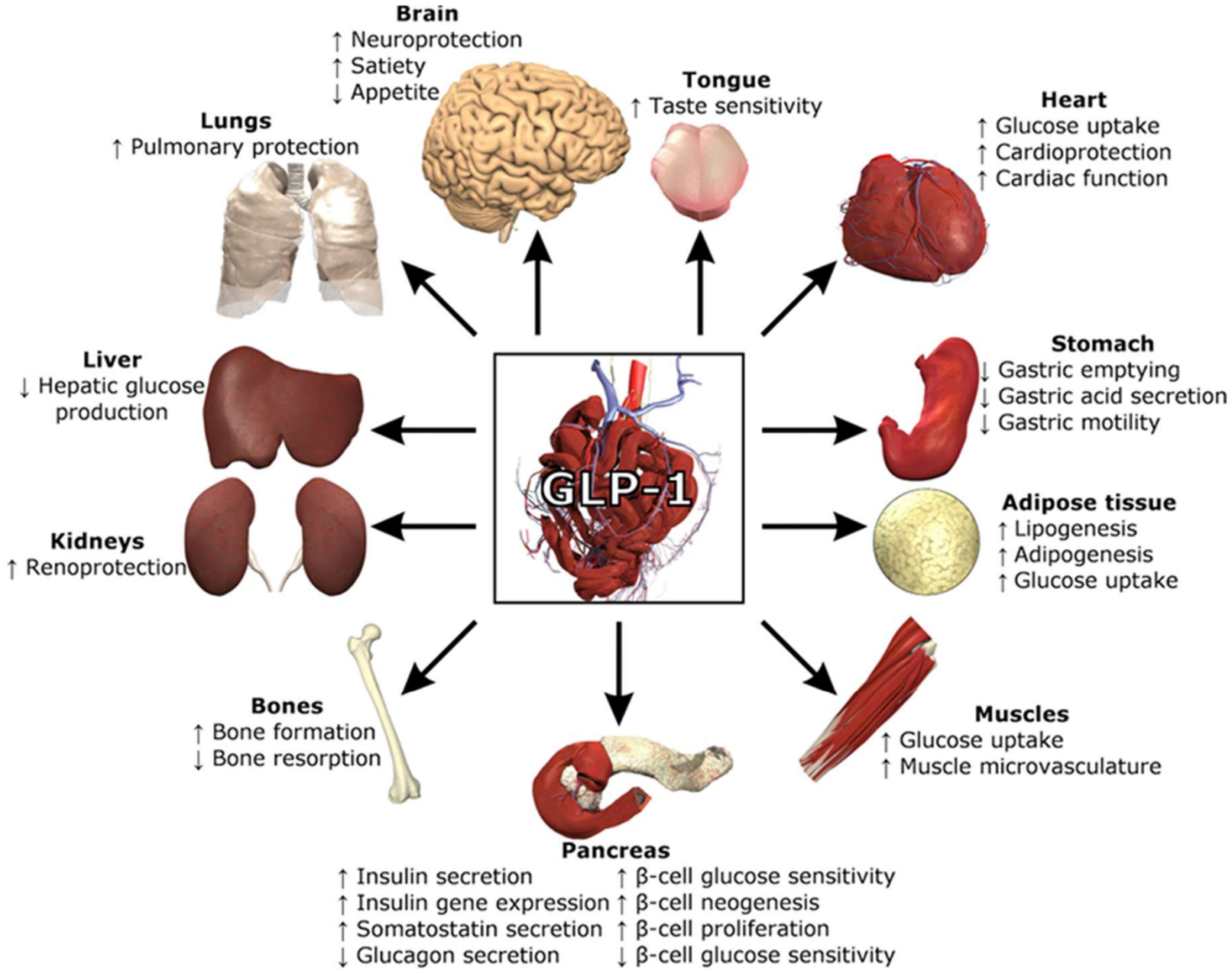


FIGURE 1 Functions of GLP-1 [By Lthoms11—Own work, CC BY-SA 4.0, https://en.wikipedia.org/w/index.php?curid=55236027].

GLP-1 vs GIP

Glucagon-like Peptide-1 Receptor Agonism

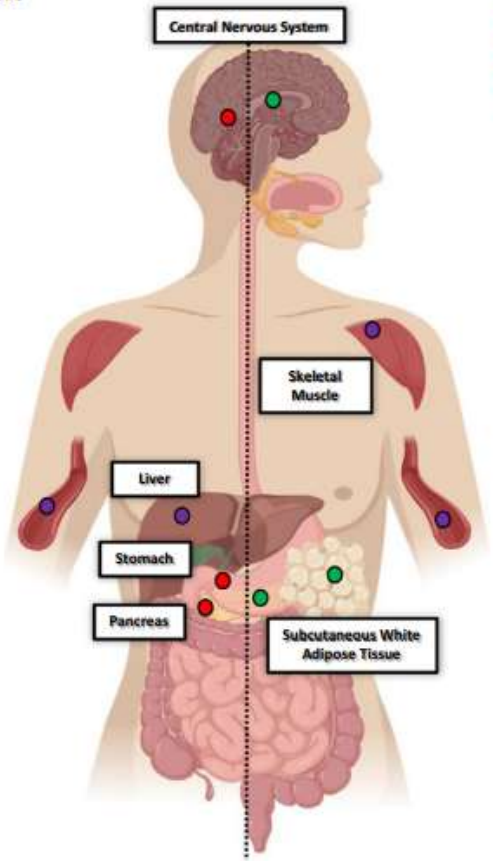
Central Nervous System
- ↑ Satiety
- ↓ Food Intake
- ↑ Nausea
- ↓ Body Weight

Pancreas
- ↑ Insulin
- ↓ Glucagon

Stomach
- ↓ Gastric Emptying

Systemic
- ↓ Hyperglycemia

Liver
- ↑ Insulin Sensitivity
- ↓ Hepatic Glucose Production
- ↓ Ectopic Lipid Accumulation



Glucose-dependent Insulinotropic Polypeptide Receptor Agonism
Glucagon-like Peptide 1 Receptor Agonism
Indirect Action

Glucose-dependent Insulinotropic Polypeptide Receptor Agonism

Central Nervous System
- ↓ Food Intake
- ↓ Nausea
- ↓ Body Weight

Pancreas
- ↑ Insulin
- ↑ Glucagon

Subcutaneous White Adipose Tissue
- ↑ Insulin Sensitivity
- ↑ Lipid Buffering Capacity
- ↑ Blood Flow
- ↑ Storage Capacity
- ↓ Proinflammatory Immune Cell Infiltration

Systemic
- ↓ Hyperglycemia
- ↓ Dietary Triglyceride

Skeletal Muscle
- ↑ Insulin Sensitivity
- ↑ Metabolic Flexibility
- ↓ Ectopic Lipid Accumulation

Samms RJ, Coghlan MP, Sloop KW. How May GIP Enhance the Therapeutic Efficacy of GLP-1? Trends Endocrinol Metab. 2020 Jun;31(6):410-421.

Pocket Card: GLP-1 & GIP RA

GLP-1 & GIP Receptor Agonists

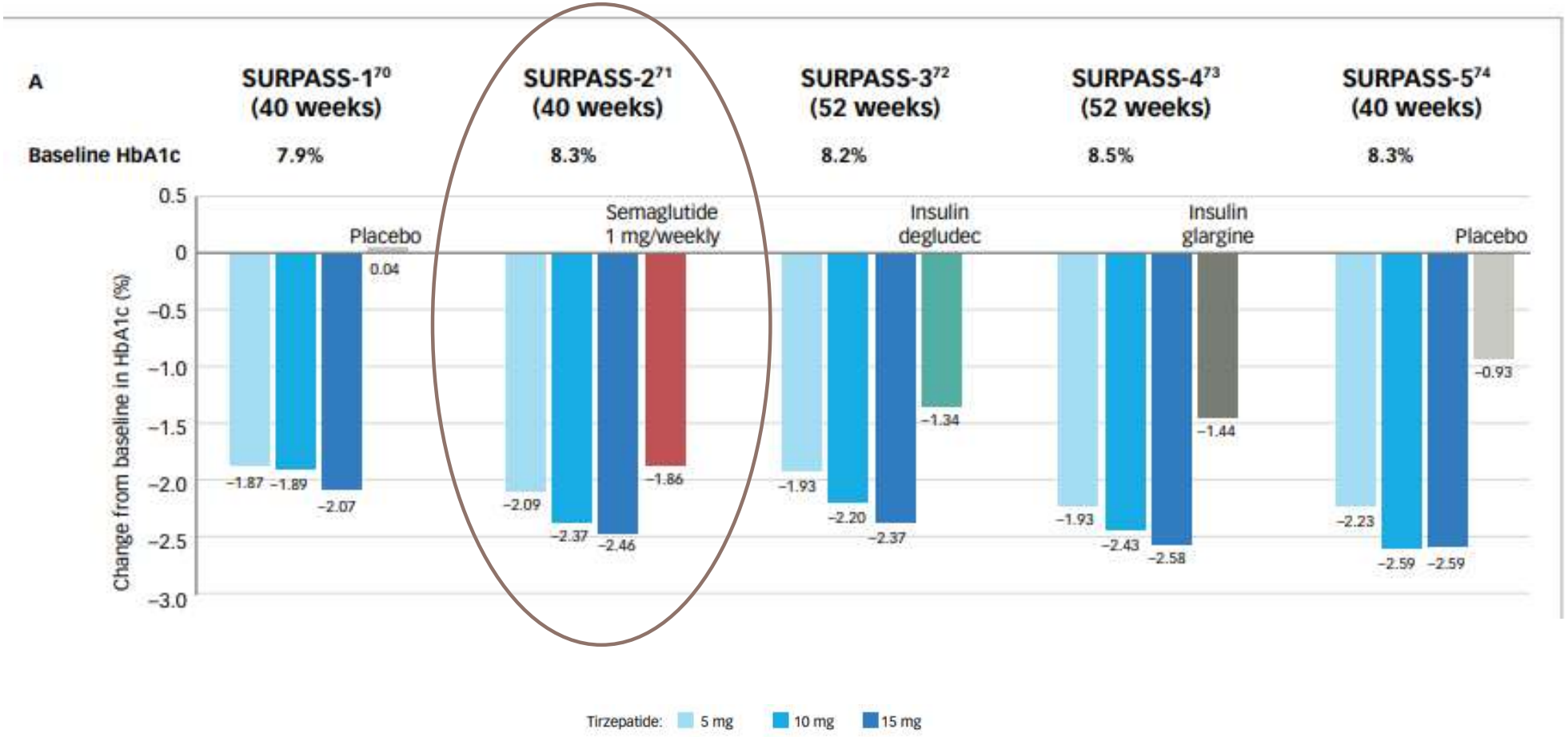
Class/Main Action	Name	Dose Range	Considerations
GLP-1 RA - Glucagon Like Peptide Receptor Agonist **"Incretin Mimetic"** • Increases insulin release with food • Slows gastric emptying • Promotes satiety • Suppresses glucagon	exenatide (Byetta)	5 and 10 mcg BID	**Side effects:** nausea, vomiting, weight loss, injection site reaction. Report signs of acute pancreatitis or intestinal blockage (ileus) and stop med. **Black box warning:** Thyroid C-cell tumor warning (avoid if family history of medullary thyroid tumor). *Significantly reduces risk of CV death, heart attack, and stroke. §Approved to reduce risk of CKD †Approved for pediatrics 10-17 yrs Lowers A1C 0.5 – 1.6% Weight loss: 4-6% body weight loss.
	exenatide XR† (Bydureon)	2 mg 1x a week Pen injector - Bydureon BCise	
	liraglutide*† (Victoza)	0.6, 1.2 and 1.8 mg daily	
	dulaglutide*† (Trulicity)	0.75, 1.5, 3.0 and 4.5 mg 1x a week pen injector	
	semaglutide*§ (Ozempic)	0.25, 0.5, 1.0 and 2.0 mg 1x a week pen injector	
	(Rybelsus) Oral tablet	3, 7, and 14 mg daily in a.m. Take on empty stomach with sip of water	
GLP-1 & GIP Receptor Agonist Activates receptors for GLP-1 (see above) & Glucose-dependent Insulinotropic Polypeptide (GIP).	Tirzepatide (Mounjaro)	2.5, 5.0, 7.5, 10, 12.5 and 15 mg 1x a week prefilled single dose pen Increase dose by 2.5 mg once monthly to reach targets.	**Side effects:** nausea, diarrhea, injection site reaction. Report pancreatitis, signs of intestinal blockage. **Black box warning:** Avoid if family history of medullary thyroid tumor. Lowers A1C ~ 1.8 - 2.4% Weight loss: 7-13% body weight loss at max dose.

DiabetesEd.net © 2025

Oral Semaglutide (Rybelsus)

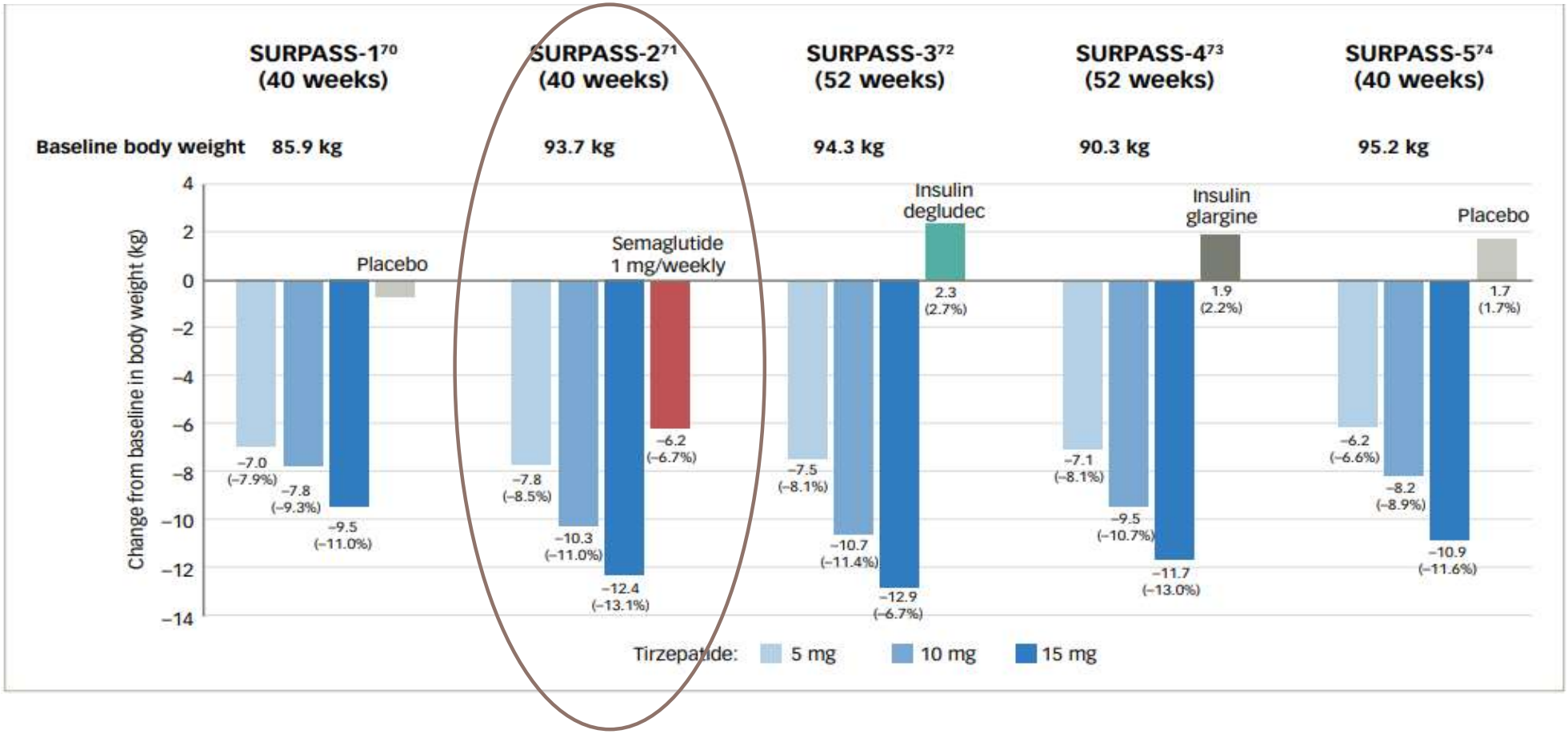
- Barriers to GLP-1 oral absorption:
  - Degradation by gastrointestinal enzymes
  - pH induced conformational changes
  - Limited protein permeability of the intestinal membrane
- Semaglutide co-formulated with sodium N-(8-[2-hydroxybenzoyl] amino) caprylate (**SNAC**), an absorption enhancer
- Absorbed 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.

DI1

Poll Question 7

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

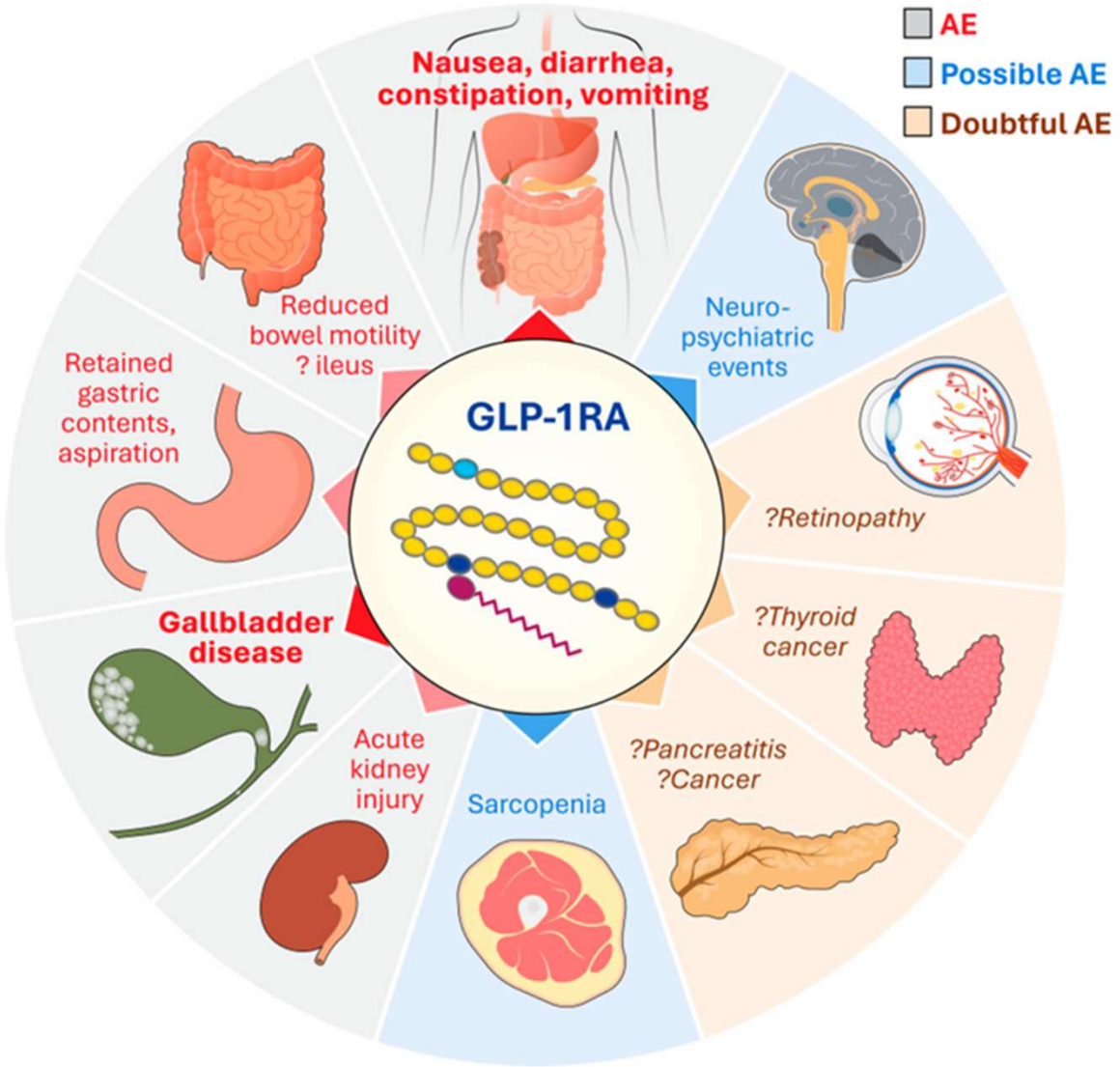
a. May experience constipation
b. May cause hypoglycemia
c. Muscle aches are common
d. Doubles risk of pancreatic cancer



Slide 96

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

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.

GLP-1 Adverse Effects

- GI side effects
  - Nausea, appetite loss, diarrhea, constipation, dyspepsia, abdominal pain
- Possible pancreatitis
- Hypoglycemia with concomitant use of insulin or secretagogues
- Acute kidney injury
- Thyroid C-Cell tumors –black box warning
- Acute gallbladder disease
- Worsening retinopathy

Package inserts.

DI1

GLP-1 FDA Warning

Nov, 2024

- 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 99

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.

DI1

Counseling Points: Incretins

- Avoid if personal or family history of medullary thyroid cancer.
- Avoid in combo with DPP-4 inhibitors
- Caution with gastroparesis
- Use of non-FDA *compounded* products not recommended
- Consider holding prior to surgery or prolonged fast
- If on tirzepitide, use back up contraception for first 4 weeks
- Ask about recent eye exam
  - Potential increase in diabetes retinopathy



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9. Pharmacologic Approaches to Glycemic Treatment: Standards of Care in Diabetes—2025 FREE

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Sudden discontinuation of semaglutide and tirzepitide results in regain of ½ to 2/3 of the weight loss within 1 year. Consider trying lowest effective dose, using intermittent therapy, or stopping medication followed by close weight monitoring.

Section 8. Diabetes Care 2025;48(Supplement_1):S167–S180

Slide 101

DI1 Slight modifications, added gastroparesis, removed pancreatitis since on last slides.
Diana Isaacs, 2025-08-24T23:47:25.289

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.

Where Do Incretins Fit within the Guidelines for Diabetes?

Click to edit Master subtitle style

GLP-1 /GIPs Approved for Weight Loss

- Liraglutide:
  - Victoza 1.8 mg (diabetes)
  - Saxenda 3 mg (wt loss)
- Semaglutide:
  - Ozempic 2mg (diabetes)
    - Wegovy 2.4mg (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 ever DI1
and for those with metabolic dysfunction-associated steatohepatitis (MASH)
Tirzepatide (Zepbound) also indicated for those with obesity & Sleep Apnea

Slide 104

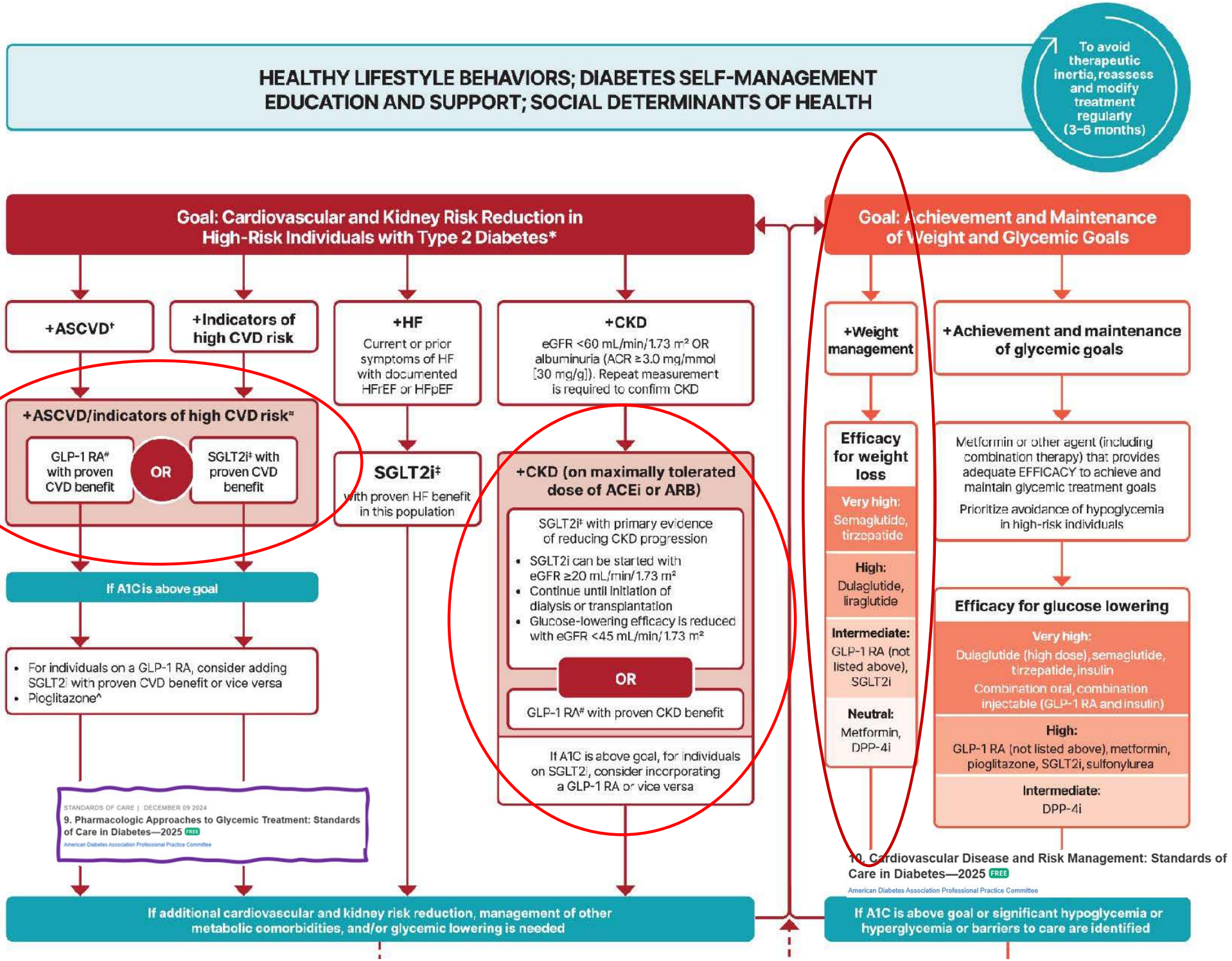
DI1 Updated indications at bottom.
Diana Isaacs, 2025-08-25T00:16:19.053

GLP-1/GIP Receptor Agonist Indications

Drug	Lower BG	Kidney Indication	CV Indication	Weight Loss Indication
Exenatide IR **(Byetta)**	Yes	No	No	No
Oral Semaglutide **(Rybelsus)**	Yes	No	CV benefit, indication pending	No
Exenatide ER **(Bydureon)**	Yes, 10 yrs and older	No	No	No
Dulaglutide **(Trulicity)**	Yes, 10 yrs and older	No	Yes	No
Semaglutide **(Ozempic, Wegovy)**	Yes	Yes	Yes, Ozempic & Wegovy	Yes Wegovy, 12 yrs and older
Liraglutide **(Victoza, Saxenda)**	Yes, 10 yrs and older	No	Yes	Yes Saxenda
Tirzepatide **(Mounjaro, Zepbound)**	Yes	No	No	Yes, Zepbound

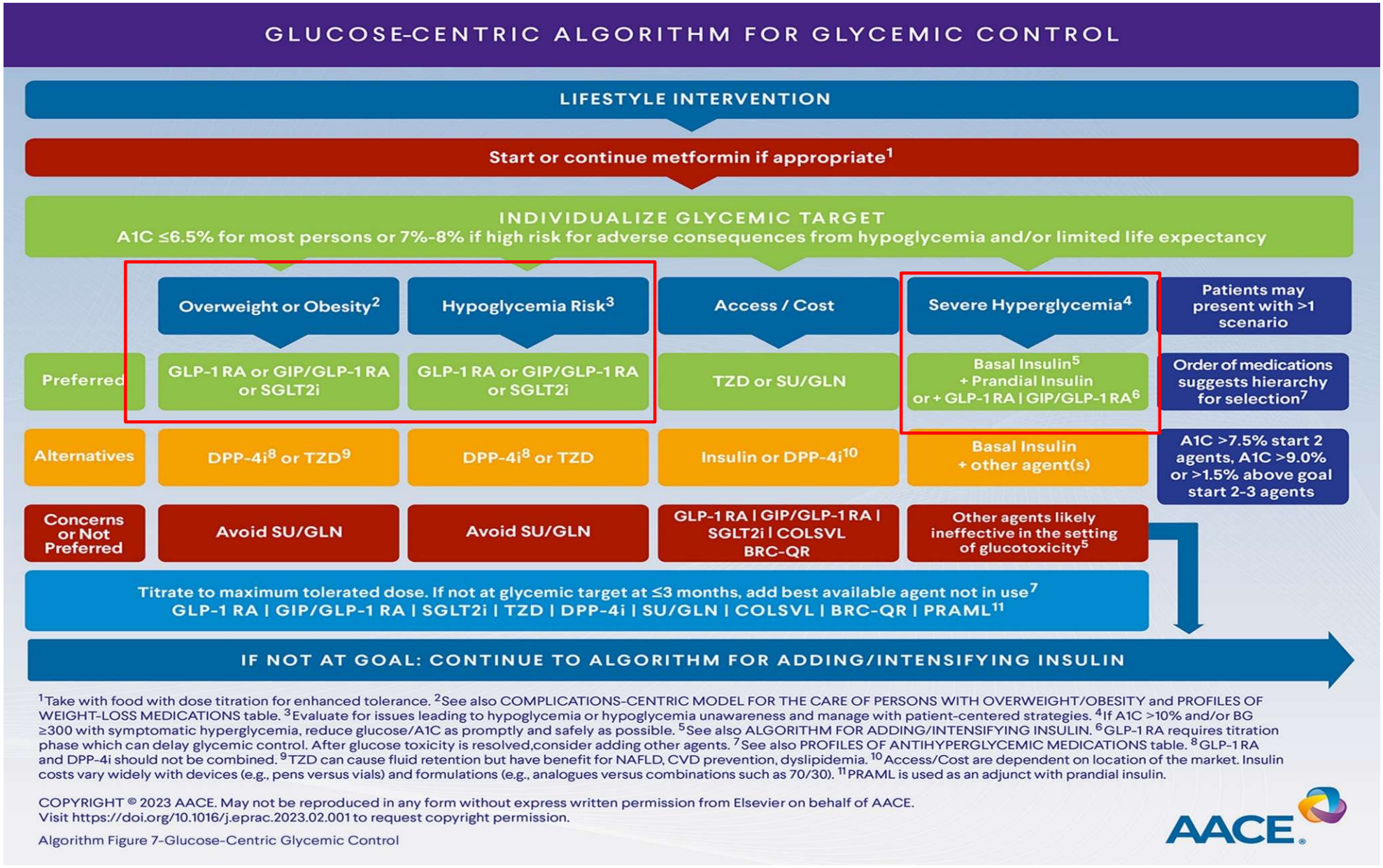
Package inserts, dailymed.nlm.nih.gov

Use of Glucose-Lowering Medications in the Management of Type 2 Diabetes



DI1

AACE Glucose-Centric Algorithm



[1]Take with food with dose titration for enhanced tolerance. [2]See also COMPLICATIONS-CENTRIC MODEL FOR THE CARE OF PERSONS WITH OVERWEIGHT/OBESITY and PROFILES OF WEIGHT-LOSS MEDICATIONS table. [3]Evaluate for issues leading to hypoglycemia or hypoglycemia unawareness and manage with patient-centered strategies. [4]If A1C >10% and/or BG ≥300 with symptomatic hyperglycemia, reduce glucose/A1C as promptly and safely as possible. [5]See also ALGORITHM FOR ADDING/INTENSIFYING INSULIN. [6]GLP-1 RA requires titration phase which can delay glycemic control. After glucose toxicity is resolved,consider adding other agents. [7]See also PROFILES OF ANTIHYPERGLYCEMIC MEDICATIONS table. [8]GLP-1 RA and DPP-4i should not be combined. [9]TZD can cause fluid retention but have benefit for NAFLD, CVD prevention, dyslipidemia. [10]Access/Cost are dependent on location of the market. Insulin costs vary widely with devices (e.g., pens versus vials) and formulations (e.g., analogues versus combinations such as 70/30). [11]PRAML is used as an adjunct with prandial insulin.

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Algorithm Figure 7-Glucose-Centric Glycemic Control

AACE

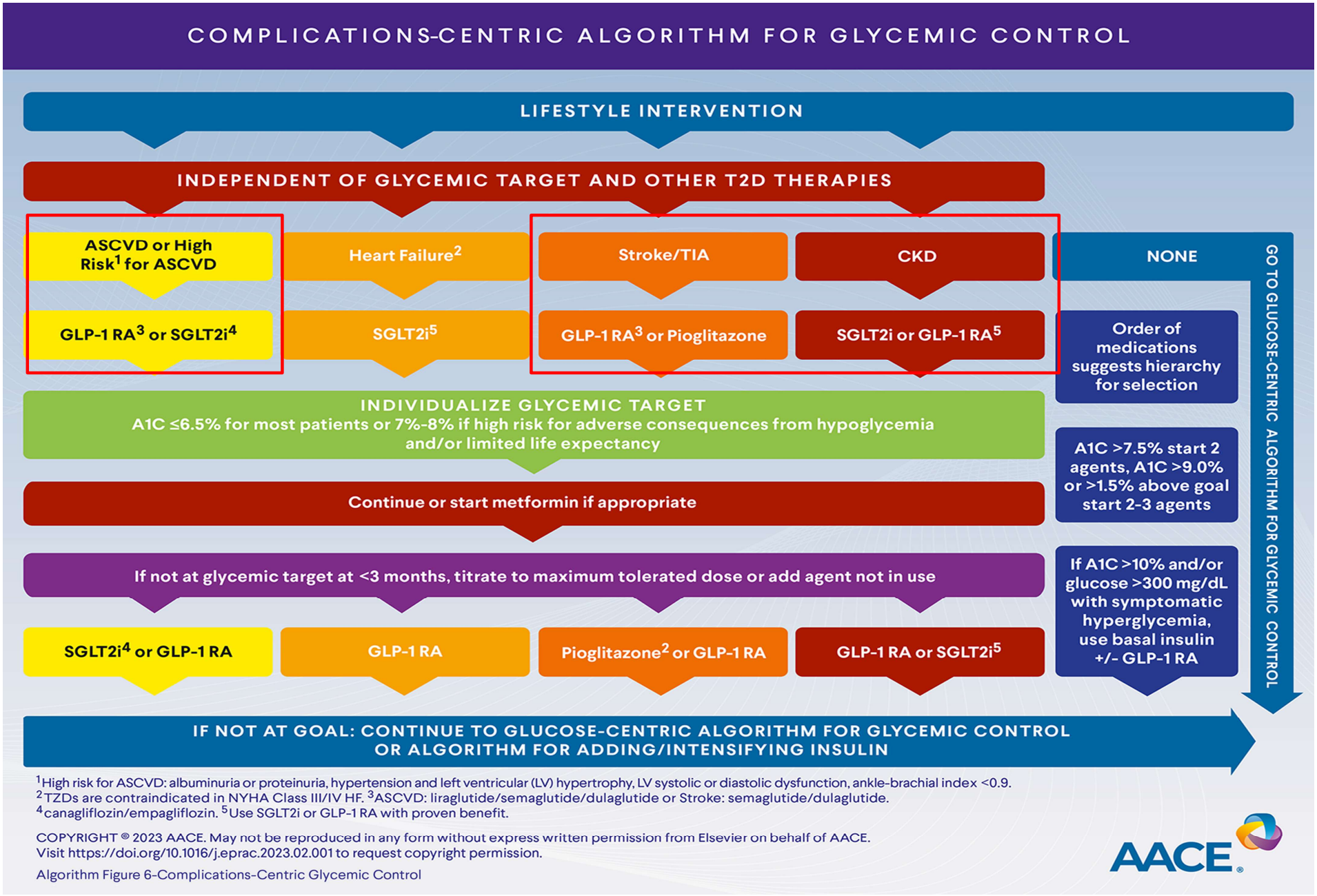
Slide 107

DI1 Added here

Diana Isaacs, 2025-08-25T00:11:42.090

DI1

AACE Complication-Centric Algorithm



[1]High risk for ASCVD: albuminuria or proteinuria, hypertension and left ventricular (LV) hypertrophy, LV systolic or diastolic dysfunction, ankle-brachial index <0.9.
[2]TZDs are contraindicated in NYHA Class III/IV HF. [3]ASCVD: liraglutide/semaglutide/dulaglutide or Stroke: semaglutide/dulaglutide.
[4]canagliflozin/empagliflozin. [5]Use SGLT2i or GLP-1 RA with proven benefit.

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Algorithm Figure 6-Complications-Centric Glycemic Control

AACE

Slide 108

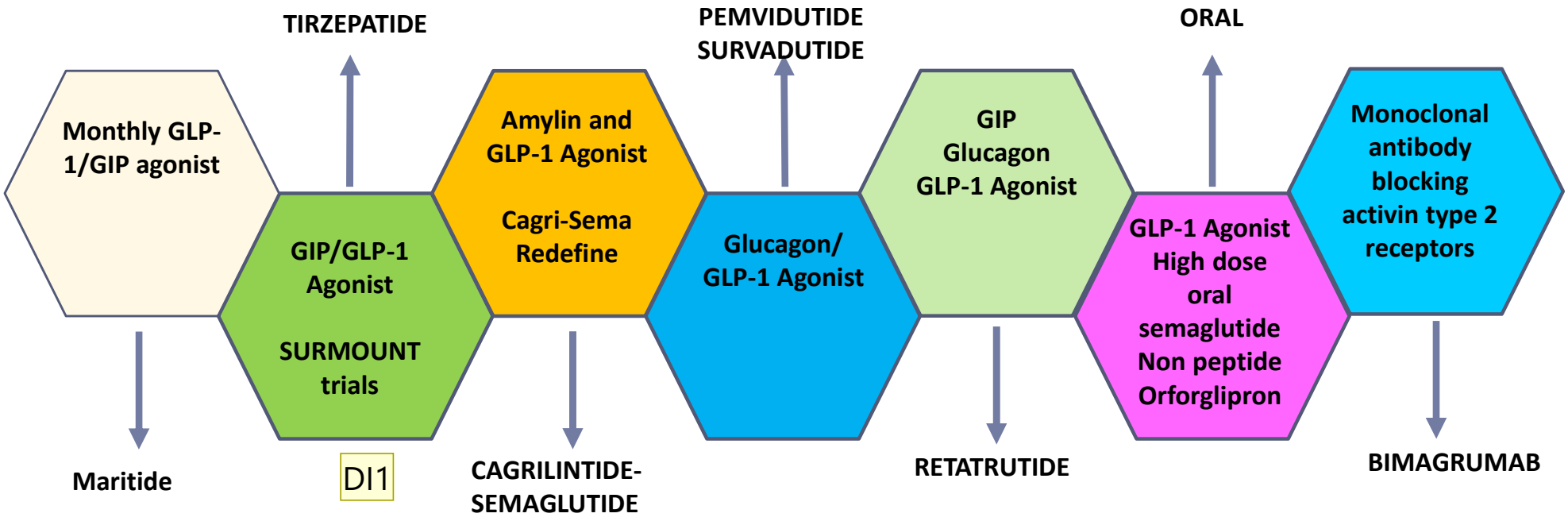
DI1 Added here

Diana Isaacs, 2025-08-25T00:11:47.744

Incretins– How Do They Rate?

Question	Answer
Cause hypoglycemia?	No
Cause weight gain?	No
Affordable?	No, $1000+/month
Lowers CV risk*?	*Liraglutide / Semaglutide/Dulaglutide/
Can most tolerate /use?	Yes/No (GI)

The Future of Incretins is Bright



Slide 110

DI1 Made some updates.
Diana Isaacs, 2025-08-24T23:54:40.690

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



ADA 2025 Summary for Exams

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



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

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.



6. Glycemic Goals and Hypoglycemia: Standards of Care in Diabetes—2025
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- Fructosamine – 2-4 wk glucose average
  - glycated albumin for those with anemia or hemoglobinopathies

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)

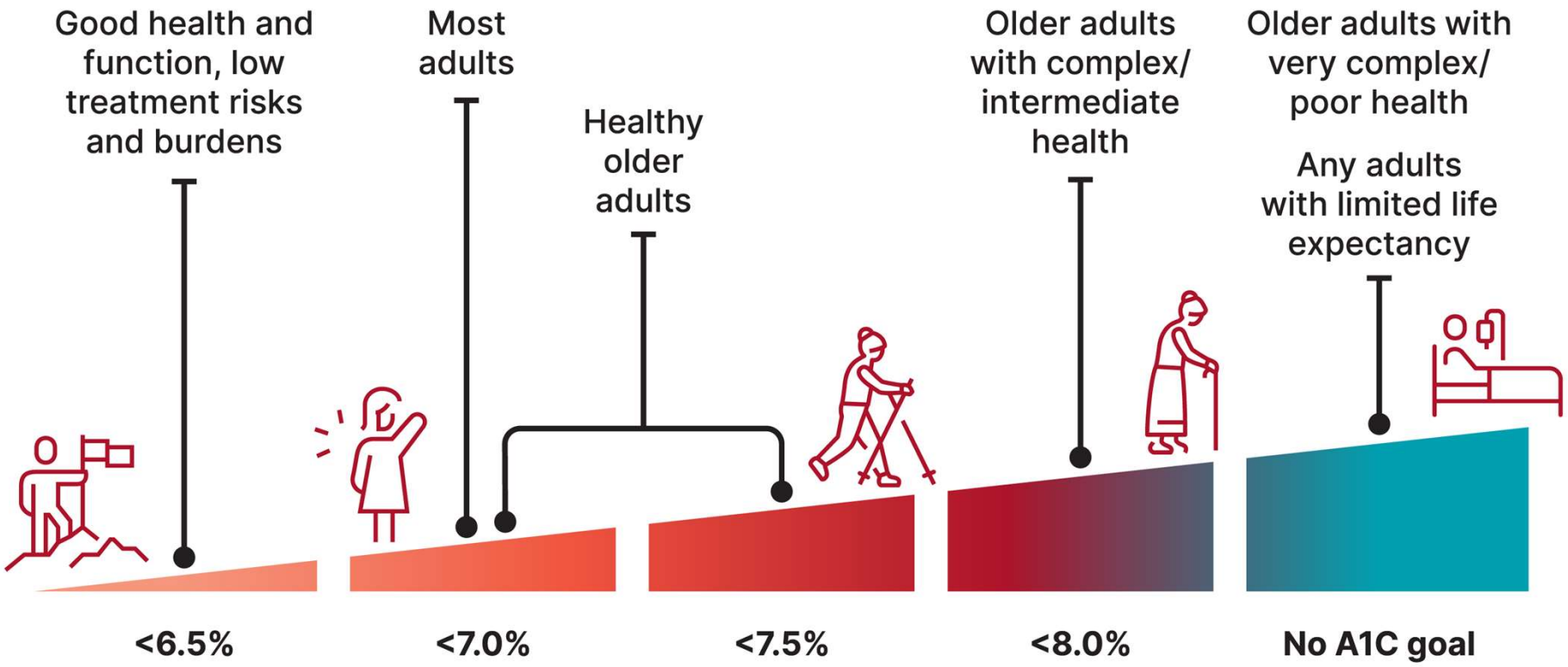


eAG = 28.7 x A1c-46.7 ~ 29 pts per 1%
Translating the A1c Assay Into eAG – ADAG Study

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6. Glycemic Goals and Hypoglycemia: Standards of Care in Diabetes—2025 FREE

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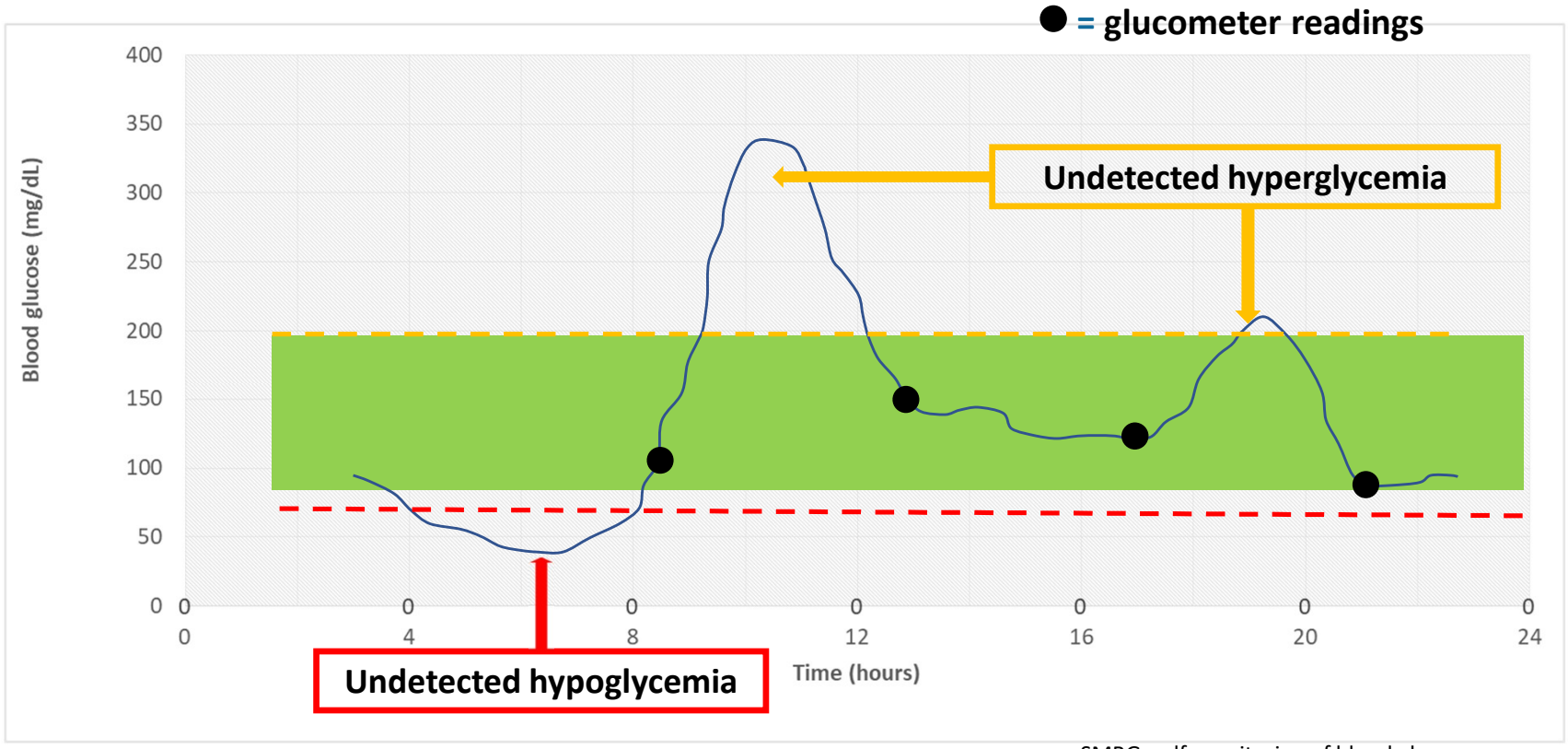
Modifying Factors

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

Table 6.2

6. Glycemic Goals and Hypoglycemia: Standards of Care in Diabetes—2025 FREE

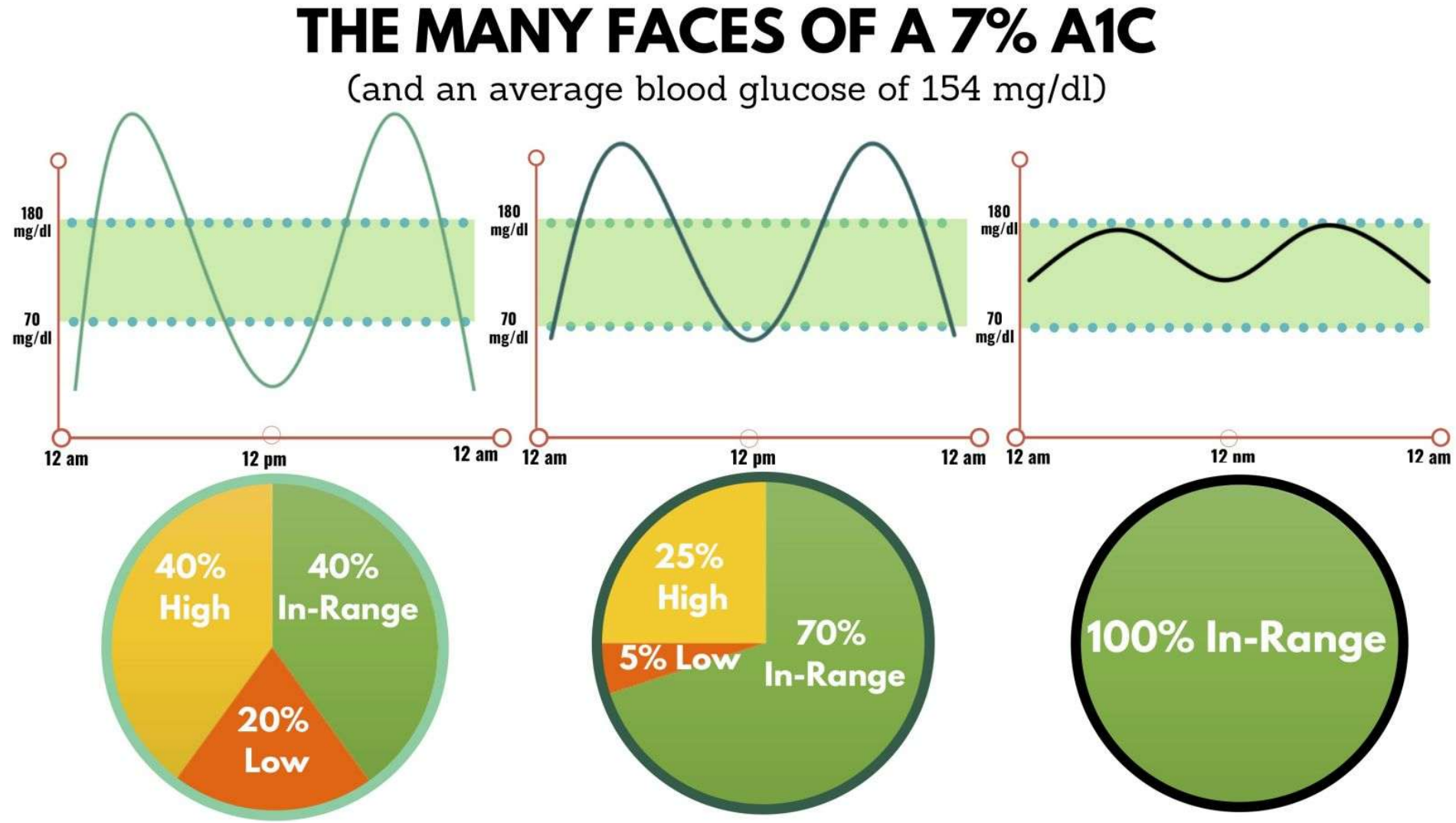
Blood Glucose Monitoring vs. Continuous Glucose Monitoring (CGM)



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

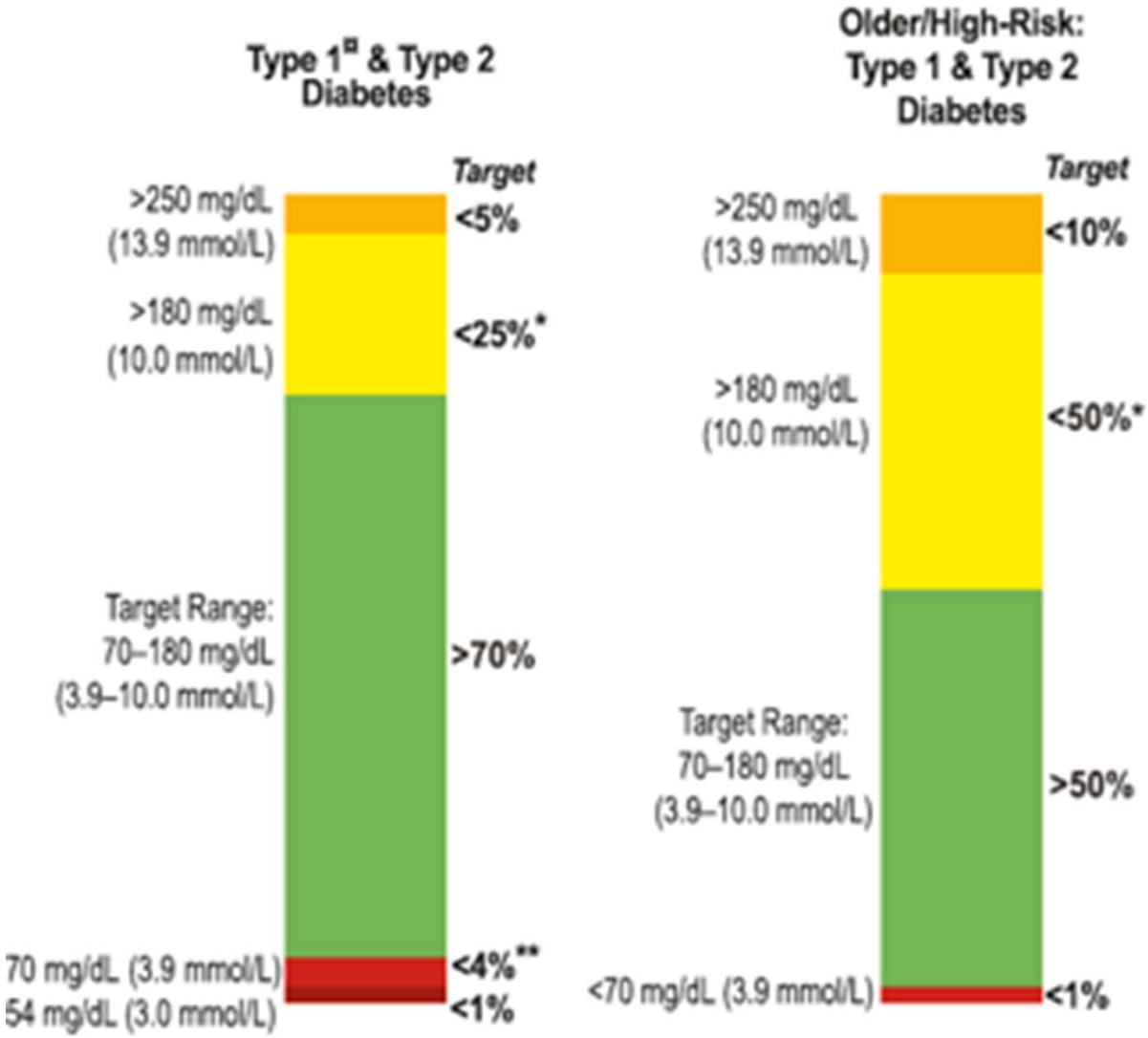


For those with frailty or at high risk of hypoglycemia recommend:

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

6. Glycemic Goals and Hypoglycemia: Standards of Care in Diabetes—2025 FREE

Time in Range



1% of the day=15 minutes

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 and Hypoglycemia: Standards of Care in Diabetes—2025

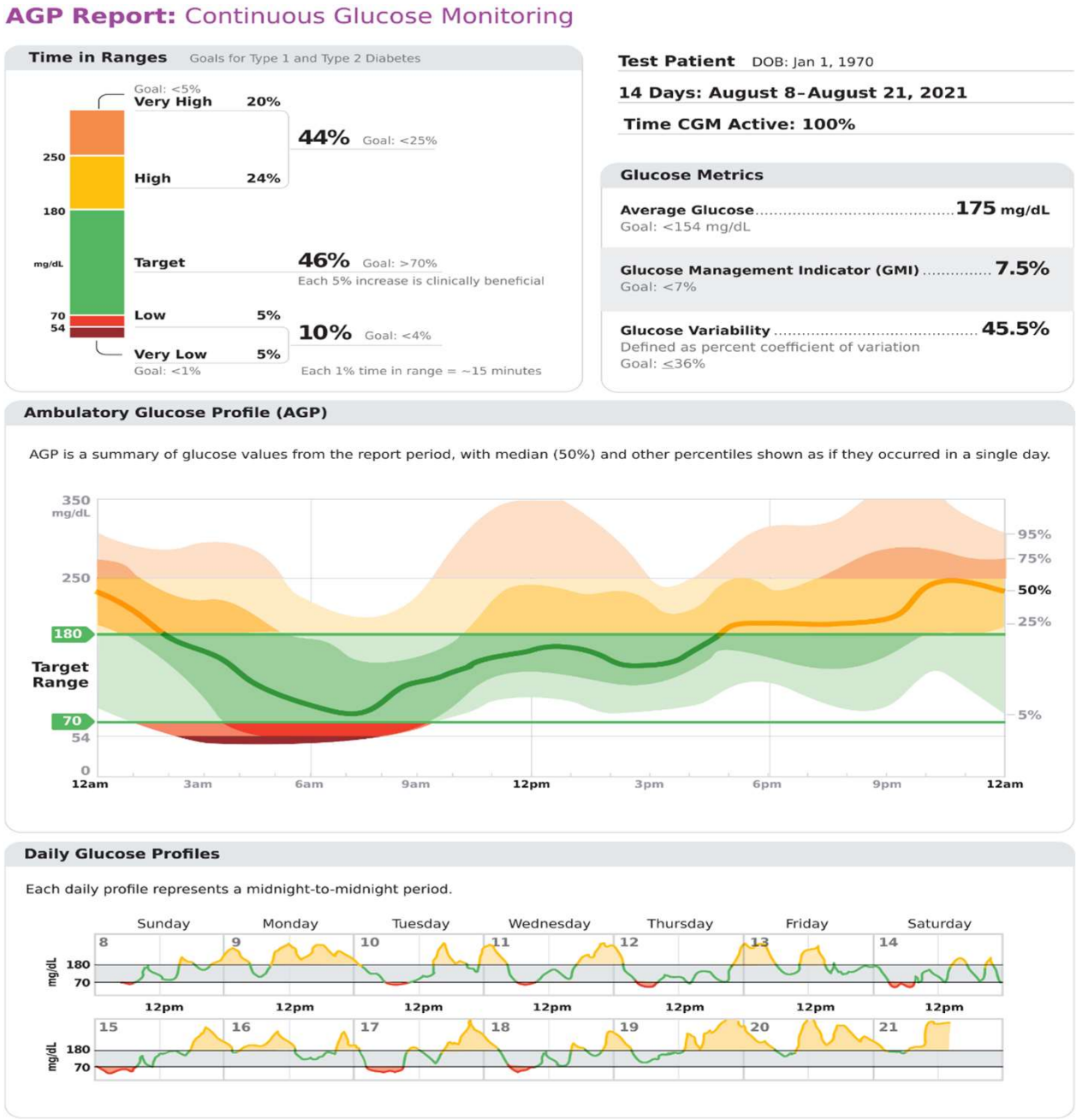
FREE

Ambulatory Glucose Profile Report

1. CGM key metrics

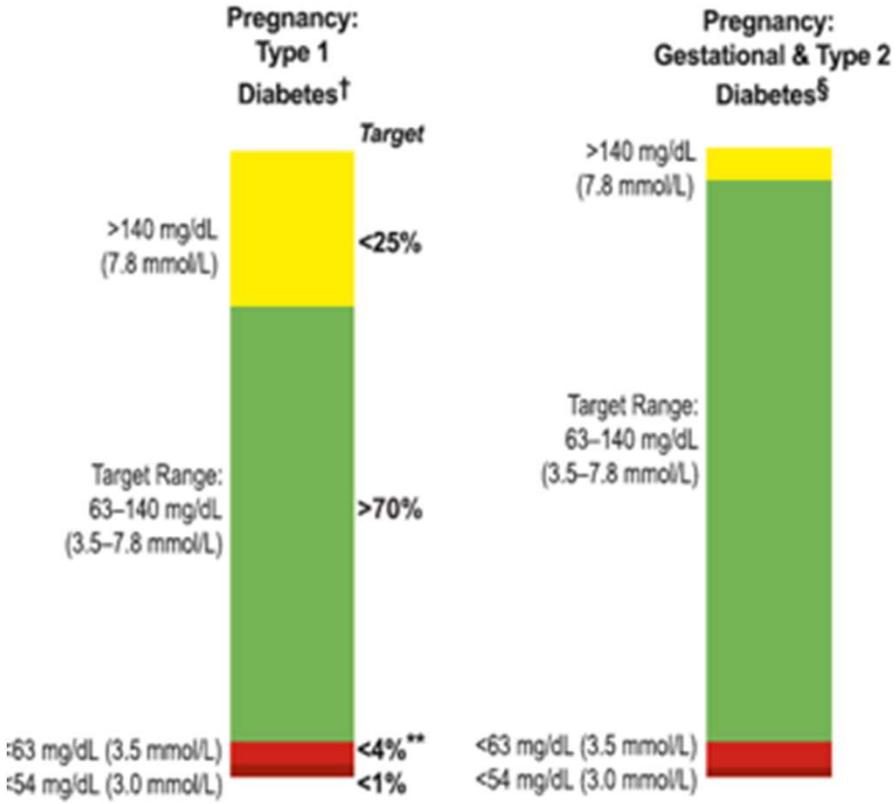
1. AGP

2. Daily tracings



15. ADA Pregnancy Targets – For those with type 1, type 2 and GDM

- A1c < 6-6.5% (closer to 6 in 2nd/3rd tri)
- Time in range: 63-140 mg/dL
- Fasting and Post Meal BG Goals
  - Fasting glucose 70–95 mg/dL and either
  - One-hour postprandial glucose 110–140 mg/dL or
  - Two-hour postprandial glucose 100–120 mg/dL



No lower glucose limit if lifestyle controlled (no insulin)

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6. Glycemic Goals and Hypoglycemia: Standards of Care in Diabetes—2025 FREE

American Diabetes Association Professional Practice Committee

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

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



Pregnancy and Hypertension

- If pregnant with diabetes and chronic 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



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: 220lbs, BMI=34kg/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

DI1

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

Slide 129

DI1 Changed the correction answer but will discuss how in the real world, metformin is most likely to be covered first.
Diana Isaacs, 2025-08-25T00:07:16.329

Metformin Dosing and Mechanism

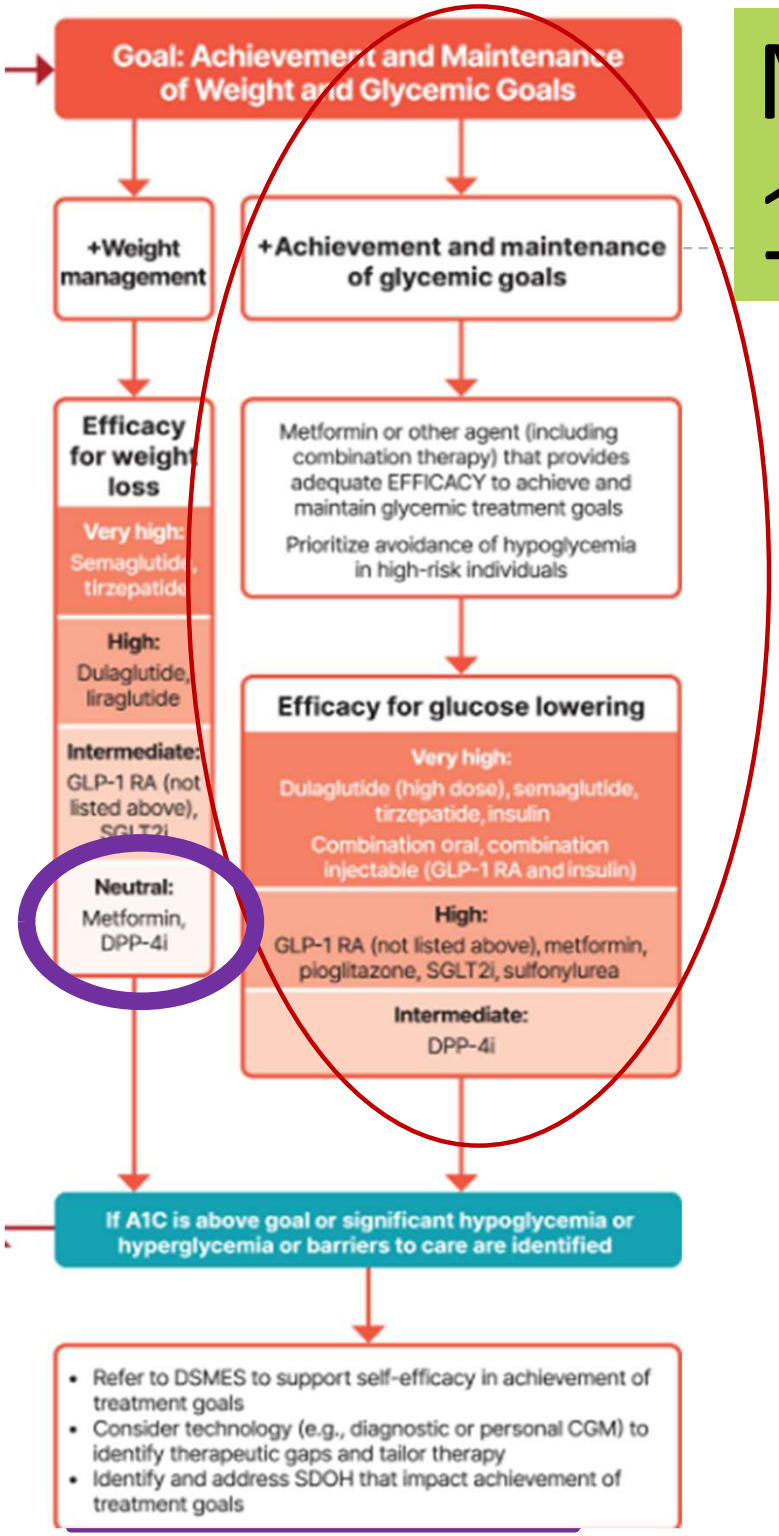
- Mechanism: decreases hepatic glucose production
  - Do not initiate when eGFR < 45
  - Data suggest metformin may be safely continued with eGFR of 30-45 mL/min/1.73m^2 with dose reductions
  - Max effective dose: 2000mg/day, max dose 2550mg/dy
- Monitor vitamin B12 levels and renal function
- GI issues: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

Common Oral Diabetes Meds

Class/Main Action	Name(s)	Daily Dose Range	Considerations
Biguanides • Decreases hepatic glucose output • First line med at diagnosis of type 2	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	

Biguanide derived from:
Goat's Rue *Galega officinalis*,
French Lilac
Does NOT harm kidneys
$10 for 3-month supply from
Walmart & other pharmacies





Metformin is "Usually" 1st Line

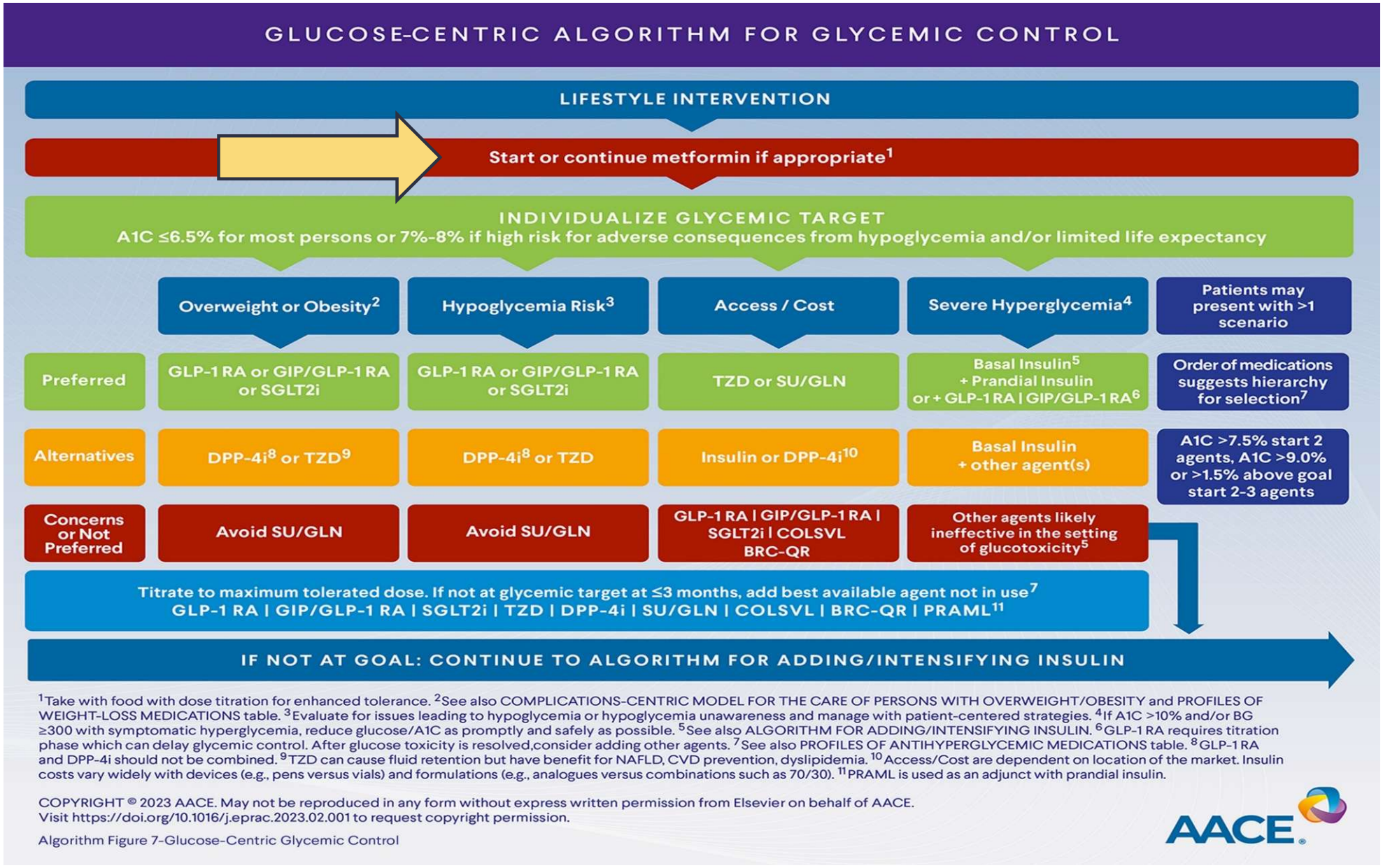
- Why metformin?
  - Longstanding evidence
  - High efficacy and safety
  - Inexpensive - 3 months for $12
  - Weight neutral
  - Check B12 levels at intervals especially if anemia or neuropathy.
- If ASCVD, HF or CKD or high ASCVD risk, use SGLT2i or GLP-1 RA +/- metformin
- If A1C ≥ 8.5%, consider combo therapy.

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9. Pharmacologic Approaches to Glycemic Treatment: Standards of Care in Diabetes—2025 FREE

American Diabetes Association Professional Practice Committee

AACE 2023 Diabetes Guideline



[1]Take with food with dose titration for enhanced tolerance. [2]See also COMPLICATIONS-CENTRIC MODEL FOR THE CARE OF PERSONS WITH OVERWEIGHT/OBESITY and PROFILES OF WEIGHT-LOSS MEDICATIONS table. [3]Evaluate for issues leading to hypoglycemia or hypoglycemia unawareness and manage with patient-centered strategies. [4]If A1C >10% and/or BG ≥300 with symptomatic hyperglycemia, reduce glucose/A1C as promptly and safely as possible. [5]See also ALGORITHM FOR ADDING/INTENSIFYING INSULIN. [6]GLP-1 RA requires titration phase which can delay glycemic control. After glucose toxicity is resolved,consider adding other agents. [7]See also PROFILES OF ANTIHYPERGLYCEMIC MEDICATIONS table. [8]GLP-1 RA and DPP-4i should not be combined. [9]TZD can cause fluid retention but have benefit for NAFLD, CVD prevention, dyslipidemia. [10]Access/Cost are dependent on location of the market. Insulin costs vary widely with devices (e.g., pens versus vials) and formulations (e.g., analogues versus combinations such as 70/30). [11]PRAML is used as an adjunct with prandial insulin.

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Algorithm Figure 7-Glucose-Centric Glycemic Control

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)

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, Latin, Asian, Pacific Islander
  - Signs of insulin resistance (acanthosis nigricans, HTN, dyslipidemia, Polycystic Ovary Syndrome – PCOS or small for gestational age birth weight



2. Diagnosis and Classification of Diabetes: Standards of Care in Diabetes—2025 FREE

American Diabetes Association Professional Practice Committee

- 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.

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**

14. Children and Adolescents: Standards of Care in Diabetes—2025 FREE

14. Children & Adolescents: Glycemic Targets

- **A1c goal 6.5 – 8.0% for Type 1**
  - Generally, goal is <7.0%
  - Individualization is encouraged.
  - A goal <6.5% may be considered for those at low risk of excessive hypoglycemia
  - A goal of 7.5 - 8.0 % may be needed
  - CGM / Insulin pump important tools.



14. Children and Adolescents: Standards of Care in Diabetes —2025 FREE

Poll Question 13

- What percent of the population over the age of 65 has type 2 diabetes?



A. 9.3%
B. 18%
C. 26%
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.



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

13. Older Adults: Standards of Care in Diabetes—2025

American Diabetes Association Professional Practice Committee

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.



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—2025

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4 M's Framework of Age Friendly Health Systems

Using the 4Ms Framework of Age-Friendly Health Systems to Address Person-Specific Issues That Can Affect Diabetes Management

MENTATION

- Self-administration of medications
- Ability to use diabetes technology
- Anxiety, depression, and diabetes distress
- Mild cognitive impairment or dementia
- Coping skills and self-care

MEDICATIONS

- Treatment burden
- Affordability or insurance coverage
- End-organ disease or complications affecting medication choice
- Polypharmacy
- History of adverse medication effects
- Social and family support
- Risk of hypoglycemia, hypoglycemia unawareness, and fear of hypoglycemia

MOBILITY

- Foot complications
- Functional ability
- Frailty and sarcopenia
- Leg weakness
- Neuropathy
- Vision and hearing impairment

WHAT MATTERS MOST

- Discussing goals and expectations
- Symptom and disease burden
- Meal and treatment preferences (e.g., injections and glucose monitoring)
- Risks, burdens, and benefits of treatment
- Loneliness, social isolation, and overall quality of life
- Life expectancy

13. Older Adults: Standards of Care in Diabetes—2025

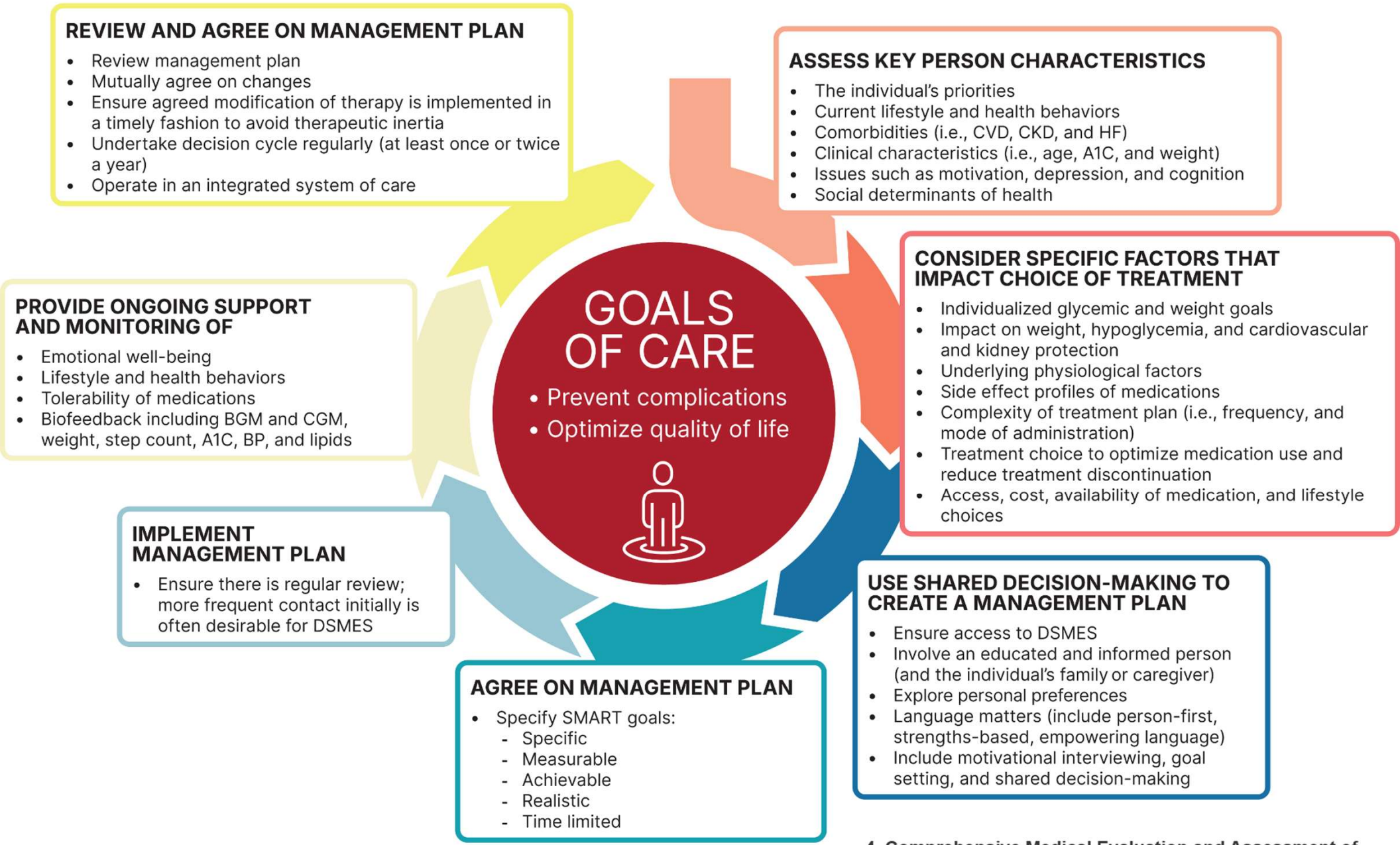
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4. ADA – Complete Medical Evaluation

- At initial visit :
  - Whole person care and psychosocial evaluation
  - Explore diabetes self-management and health status
  - Evaluate if changes in diabetes treatment would improve well being.
- Engagement in formulation of a care management plan
- Develop a plan for continuing care



Decision Cycle for Person-Centered Glycemic Management in Type 2 Diabetes



4. Comprehensive Medical Evaluation and Assessment of Comorbidities: Standards of Care in Diabetes—2025 FREE

American Diabetes Association Professional Practice Committee

ADA Assess and Treatment Plan

- **Assess risk of diabetes complications**
  - ASCVD risk factors and heart failure history
  - Stage chronic kidney disease
  - Hypoglycemia risk
  - Assess for neuropathy, retinopathy
- **Goal setting**
  - Set A1C/blood glucose targets & Time in Range
  - Address hypertension and lipids
  - Diabetes self-management goals
- **Therapeutic treatment plans**
  - Lifestyle management – referral to RD, DSME and specialists
  - Pharmacologic therapy: glucose lowering
  - Pharmacologic therapy: cardiorenal risk factors
  - Use of glucose monitoring and insulin delivery devices
  - Referral for DSME and RDN

Standard 4 – Diabetes Medical Evaluation

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

	Visit		
	Initial	Every follow-up	Annual
• Vitamin B12 if taking metformin for >5 years	✓		✓
• CBC with platelets	✓		✓
• Serum potassium levels in people with diabetes on ACE inhibitors, ARBs, or diuretics§	✓		✓
• Calcium, vitamin D, and phosphorous for appropriate people with diabetes	✓		✓
Physical examination			
• Height, weight, and BMI; growth and pubertal development in children and adolescents	✓	✓	✓
• Blood pressure determination	✓	✓	✓
• Orthostatic blood pressure measures (when indicated)	✓		✓
• Fundoscopic examination (refer to eye specialist)	✓		✓
• Thyroid palpation	✓		✓
• Skin examination (e.g., acanthosis nigricans, insulin injection or insertion sites, and lipodystrophy)	✓	✓	✓
• Comprehensive foot examination	✓		✓
• Visual inspection (e.g., skin integrity, callous formation, foot deformity or ulcer, and toenails)*	✓	✓	✓
• Check pedal pulses and screen for PAD with ABI testing if a PAD diagnosis would change management	✓		✓
• Determination of temperature, vibration or pinprick sensation, and 10-g monofilament exam	✓		✓
• Screen for depression, anxiety, diabetes distress, fear of hypoglycemia, and disordered eating	✓		✓
• Assessment for cognitive performance if indicated†	✓		✓
• Assessment for functional performance if indicated†	✓		✓
• Consider assessment for bone health (e.g., loss of height and kyphosis)	✓		✓

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: Standards of Care in Diabetes—2025 FREE

American Diabetes Association Professional Practice Committee

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—2025 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—2025 FREE

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Referrals for Initial Care Mgmt

- Eye professional – annual check
- Family planning
- RD for 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—2025 FREE

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Immunization Schedule for Diabetes 2025

Vaccine	Who by Age	Series and Frequency
Hepatitis B Vaccine	Less than 60 years ≥ 60 years, may consider	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	50+	2 dose Shingrix even if previous vaccinated
COVID-19	Starting at age 6 mo's	Initial vaccination and boosters



2025 ADA Standards, Vol.48, S66-S67

DI1

For a comprehensive list of vaccines, refer CDC & Prevention at cdc.gov/vaccines

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: Standards of Care in Diabetes—2025 FREE
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Slide 155

DI1 Slight modifications, moved PCV to next slide.
Diana Isaacs, 2025-08-25T00:53:24.417

DI1

Immunization Schedule for Diabetes 2025

Vaccine	Who by Age	Series and Frequency
Pneumonia PPSV23 (Pneumovax)	19-64 years of age, vaccinate with Pneomovax	One dose is recommended for those who previously received PCV13; if PCV15 was used, follow with PPSV23 <1 years later; PPSV23 is not indicated after PCV20; adults who received only PPSV23 may receive PCV15 or PCV20 >1 year after the last dose
	≥ 65 years	Same as above
PCV20 or PCV15	19-64 with an immunocompromising condition	One dose of PCV20 or PCV15
	Immunocompetent	One dose of PCV20 or PCV15 if no previous pneumococcal vaccines
	≥ 65 years	One dose of PCV15 or PCV20; PCSV23 may be given 8 weeks after PCV15; PPSV23 is not indicated after PCV20

2025 ADA Standards, Vol.48, S66-S67

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: Standards of Care in Diabetes—2025 FREE

American Diabetes Association Professional Practice Committee

Slide 156

DI1 New slide

Diana Isaacs, 2025-08-25T01:08:38.580

Pneomococcal Vaccine, Ages 19-49

- CDC offers **PneumoRecs VaxAdvisor** as a free app to quickly and easily provide patient-specific pneumococcal vaccine guidance

Adults 19–49 years old with chronic health conditions
Complete pneumococcal vaccine schedules

Prior vaccines	Option A	Option B
None*	PCV20 or PCV21	PCV15 → ≥1 year → PPSV23¶
PPSV23 only	≥1 year → PCV20 or PCV21	≥1 year → PCV15
PCV13† only	≥1 year → PCV20 or PCV21	NO OPTION B
PCV13† and PPSV23	**No vaccines** are recommended at this time. Review pneumococcal vaccine recommendations again when your patient turns 50 years old.	
Chronic health conditions	• Alcoholism • Chronic heart disease, including congestive heart failure and cardiomyopathies • Chronic liver disease	• Chronic lung disease, including chronic obstructive pulmonary disease, emphysema, and asthma • Cigarette smoking • Diabetes mellitus

* Also applies to people who received PCV7 at any age and no other pneumococcal vaccines
¶ If PPSV23 is not available, PCV20 or PCV21 may be used
† Adults with chronic medical conditions were previously not recommended to receive PCV13

Pneumococcal Vaccine, Ages over 50

Adults ≥50 years old
Complete pneumococcal vaccine schedules

Prior vaccines	Option A	Option B
None*	PCV20 or PCV21	PCV15 → ≥1 year† → PPSV23¶
PPSV23 only at any age	≥1 year → PCV20 or PCV21	≥1 year → PCV15
PCV13 only at any age	≥1 year → PCV20 or PCV21	NO OPTION B
PCV13 at any age & **PPSV23** at <65 yrs	≥5 years → PCV20 or PCV21	

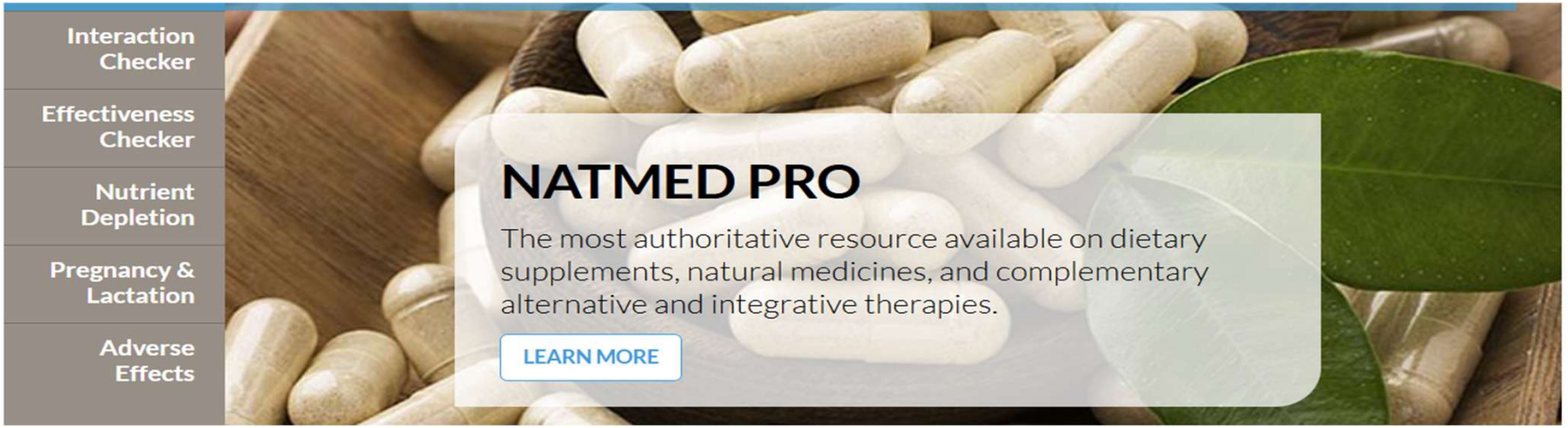
* Also applies to people who received PCV7 at any age and no other pneumococcal vaccines
¶ If PPSV23 is not available, PCV20 or PCV21 may be used
† Consider minimum interval (8 weeks) for adults with an immunocompromising condition, cochlear implant, or cerebrospinal fluid leak (CSF) leak
§ For adults with an immunocompromising condition, cochlear implant, or CSF leak, the minimum interval for PPSV23 is ≥8 weeks since last PCV13 dose and ≥5 years since last PPSV23 dose; for others, the minimum interval for PPSV23 is ≥1 year since last PCV13 dose and ≥5 years since last PPSV23 dose

Shared clinical decision-making for those who already completed the series with PCV13 and PPSV23

Prior vaccines	Shared clinical decision-making option for adults ≥65 years old
Complete series: PCV13 at any age & **PPSV23** at ≥65 yrs	≥5 years → PCV20 or PCV21 — Together, with the patient, vaccine providers **may choose** to administer PCV20 or PCV21 to adults ≥65 years old who have already received PCV13 (but not PCV15, PCV20, or PCV21) at any age and PPSV23 at or after the age of 65 years old.

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 to make needed changes. At increased hypo risk.



- **BG < 54mg/dl – Level 2**
- Indicates serious hypo. Reassess BG Goals. Consider med decrease. Predictive of Level 3 Hypo. Needs Glucagon Emergency Kit

- **Severe Hypoglycemia – Level 3**
- Altered mental, physical functioning.
- Requires external assistance – no threshold

STANDARDS OF CARE | DECEMBER 09 2024

6. Glycemic Goals and Hypoglycemia: Standards of Care in Diabetes—2025 FREE

American Diabetes Association Professional Practice Committee

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

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Hypo Marker of CV Events & Mortality



Severe hypoglycemia a potent marker of high absolute risk of 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 and Hypoglycemia: Standards of Care in Diabetes—2025

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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

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 and Hypoglycemia: Standards of Care in Diabetes—2025

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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.

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 and Hypoglycemia: Standards of Care in Diabetes—2025

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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 • Recent (within the past 3–6 months) level 2 or 3 hypoglycemia • Intensive insulin therapy* • Impaired hypoglycemia awareness • End-stage kidney disease • Cognitive impairment or dementia	Major risk factors • Food insecurity • Low-income status§ • Housing insecurity • Fasting for religious or cultural reasons • Underinsurance
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	Other risk factors • Low health literacy • Alcohol or substance use disorder

6. Glycemic Goals and Hypoglycemia: Standards of Care in Diabetes—2025
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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 to swallow, D50 IV or Glucagon
- Glucagon injection (need Rx)
  - Inform and instruct caregivers, school personnel, family, coworkers 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
- If on Insulin or level 2 or 3 hypo, (<54), get Glucagon ER Kit. 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)

Use of Glucose-Lowering Medications in the Management of Type 2 Diabetes

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 in High-Risk Individuals with Type 2 Diabetes*

+ASCVD†

+Indicators of high CVD risk

+ASCVD/indicators of high CVD risk‡

GLP-1 RA# with proven CVD benefit **OR** SGLT2i‡ with proven CVD benefit

If A1C is above goal

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

+HF

Current or prior symptoms of HF with documented HFrEF or HFpEF

SGLT2i‡

with proven HF benefit in this population

+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 with eGFR ≥20 mL/min/1.73 m²
- Continue until initiation of dialysis or transplantation
- Glucose-lowering efficacy is reduced with eGFR <45 mL/min/1.73 m²

OR

GLP-1 RA# with proven CKD benefit

If A1C is above goal, for individuals on SGLT2i, consider incorporating a GLP-1 RA or vice versa

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9. Pharmacologic Approaches to Glycemic Treatment: Standards of Care in Diabetes—2025 FREE

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

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

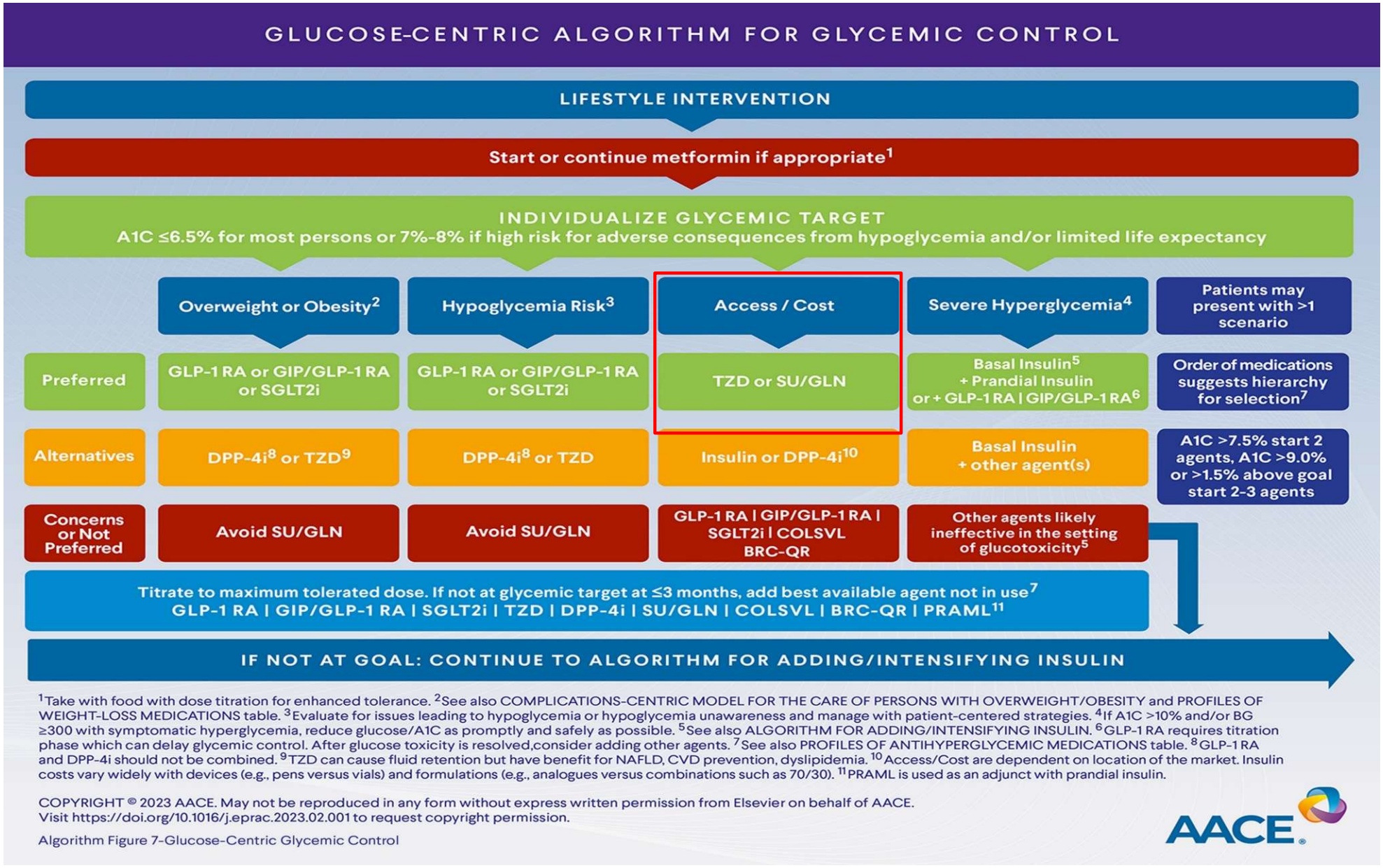
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If A1C is above goal or significant hypoglycemia or hyperglycemia or barriers to care are identified

DI1

AACE Glucose-Centric Algorithm



[1]Take with food with dose titration for enhanced tolerance. [2]See also COMPLICATIONS-CENTRIC MODEL FOR THE CARE OF PERSONS WITH OVERWEIGHT/OBESITY and PROFILES OF WEIGHT-LOSS MEDICATIONS table. [3]Evaluate for issues leading to hypoglycemia or hypoglycemia unawareness and manage with patient-centered strategies. [4]If A1C >10% and/or BG ≥300 with symptomatic hyperglycemia, reduce glucose/A1C as promptly and safely as possible. [5]See also ALGORITHM FOR ADDING/INTENSIFYING INSULIN. [6]GLP-1 RA requires titration phase which can delay glycemic control. After glucose toxicity is resolved,consider adding other agents. [7]See also PROFILES OF ANTIHYPERGLYCEMIC MEDICATIONS table. [8]GLP-1 RA and DPP-4i should not be combined. [9]TZD can cause fluid retention but have benefit for NAFLD, CVD prevention, dyslipidemia. [10]Access/Cost are dependent on location of the market. Insulin costs vary widely with devices (e.g., pens versus vials) and formulations (e.g., analogues versus combinations such as 70/30). [11]PRAML is used as an adjunct with prandial insulin.

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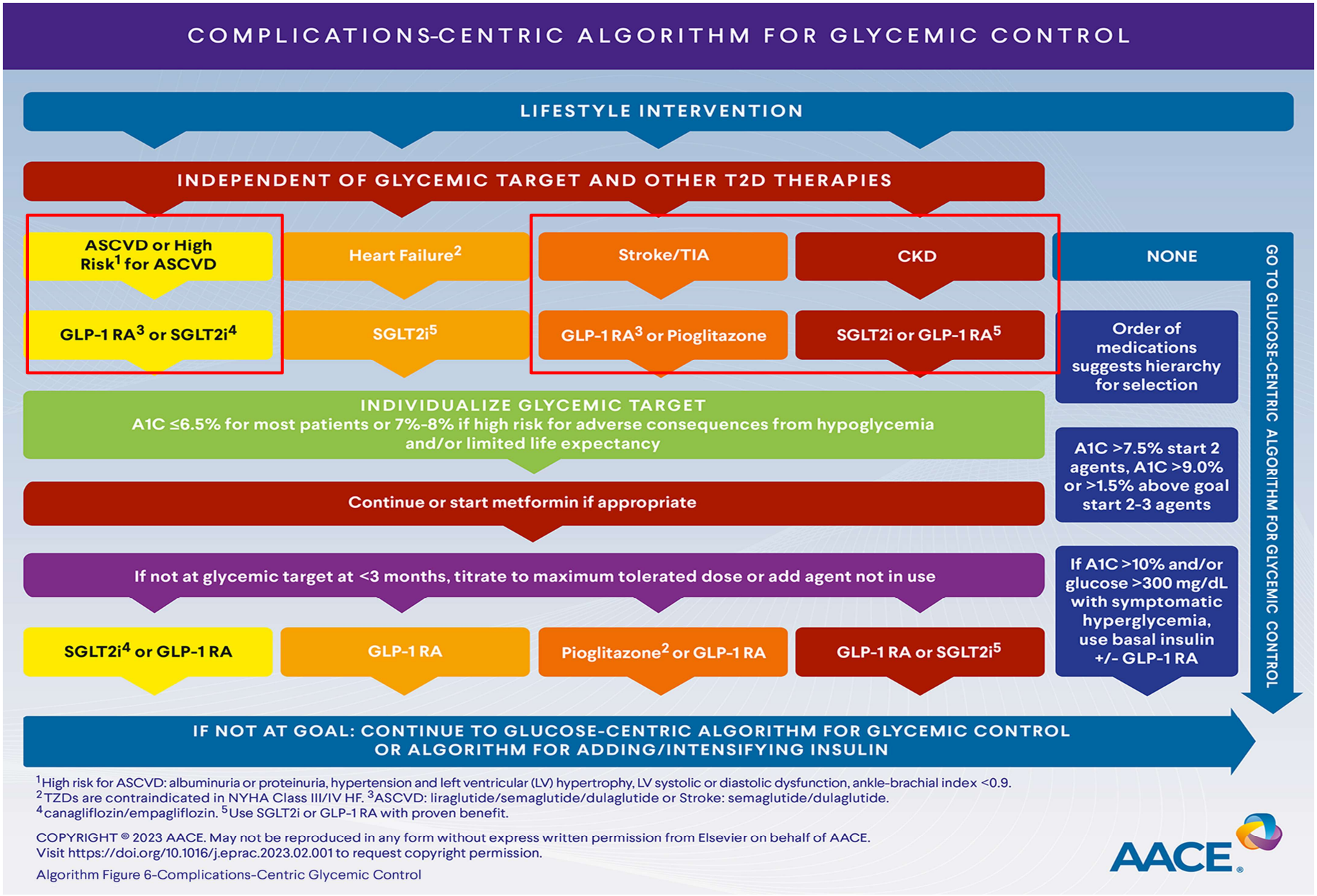
Algorithm Figure 7-Glucose-Centric Glycemic Control

AACE

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DI1

AACE Complication-Centric Algorithm



[1]High risk for ASCVD: albuminuria or proteinuria, hypertension and left ventricular (LV) hypertrophy, LV systolic or diastolic dysfunction, ankle-brachial index <0.9.
[2]TZDs are contraindicated in NYHA Class III/IV HF. [3]ASCVD: liraglutide/semaglutide/dulaglutide or Stroke: semaglutide/dulaglutide.
[4]canagliflozin/empagliflozin. [5]Use SGLT2i or GLP-1 RA with proven benefit.

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Algorithm Figure 6-Complications-Centric Glycemic Control

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DI1 Added here
Diana Isaacs, 2025-08-25T00:11:47.744

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 powder	3 mg intranasal device	3 mg	< 1 yrs: not recommended 1 yrs or older | 3mg dose	Approved Age 1+ Nasal admin Expires ~ 2 years at room temp (keep in shrink-wrapped tube).
Gvoke Injectable liquid stable glucagon solution	0.5mg or 1.0mg in -Prefilled syringe -HypoPen auto-injector -Kit with vial and syringe	1 mg	< 2yrs: not recommended 2- 12 yrs < 45kg | 0.5mg ≥ 45kg | 1mg 12 yrs or older | 1mg	Approved Age 2+ SubQ admin in arm, thigh, abdomen Expires in 2 years at room temp (keep in foil pouch).
Dasiglucagon (Zegalogue) Stable liquid glucagon analog	0.6mg/0.6mL Prefilled syringe Autoinjector	0.6mg	< 6yrs: not recommended 6 yrs or older | 0.6mg	Approved Age 6+ SubQ in abdomen, buttocks, thigh outer upper arm Expires in 1 year at room temp. (store in red protective case).

All raise BG 20+ points. Can cause nausea, vomiting. After admin, roll person on side. Seek medical help. If no response after 1st dose, give 2nd dose in 15 mins. When awake, give oral carbs ASAP when safe to swallow. Please consult package insert for detailed info.

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Quick Question 18

- JZ is excited about his A1c of 5.4%. He takes rapid acting insulin 4-6 times a day using a pen to keep his BG to target. Plus, adjusts glargine as needed if his pm BG is elevated. What is your biggest concern?



A. Does he change his needle each time?

B. Why 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

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

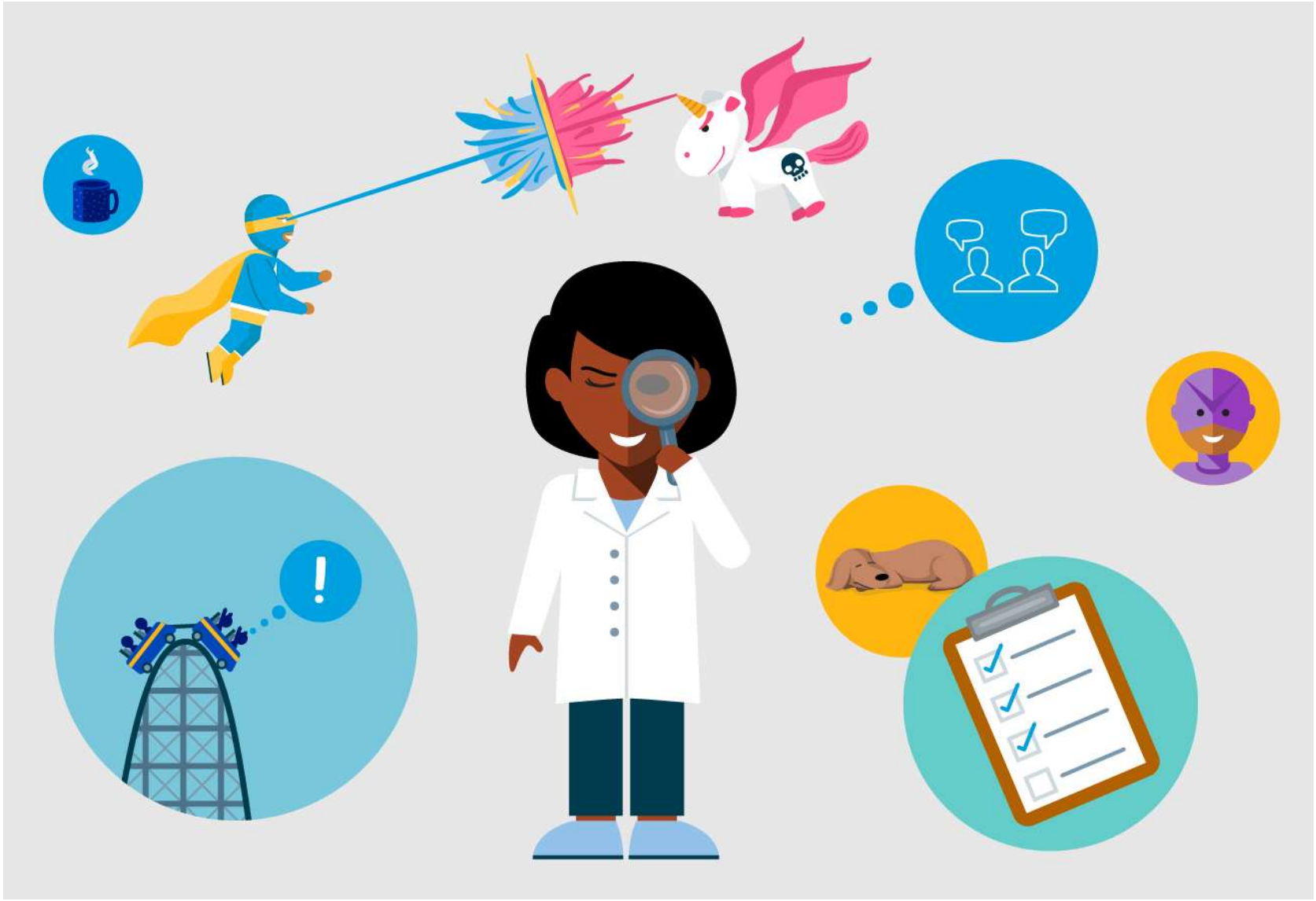
DI1

Slide 178

DI1 Added note at the top

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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

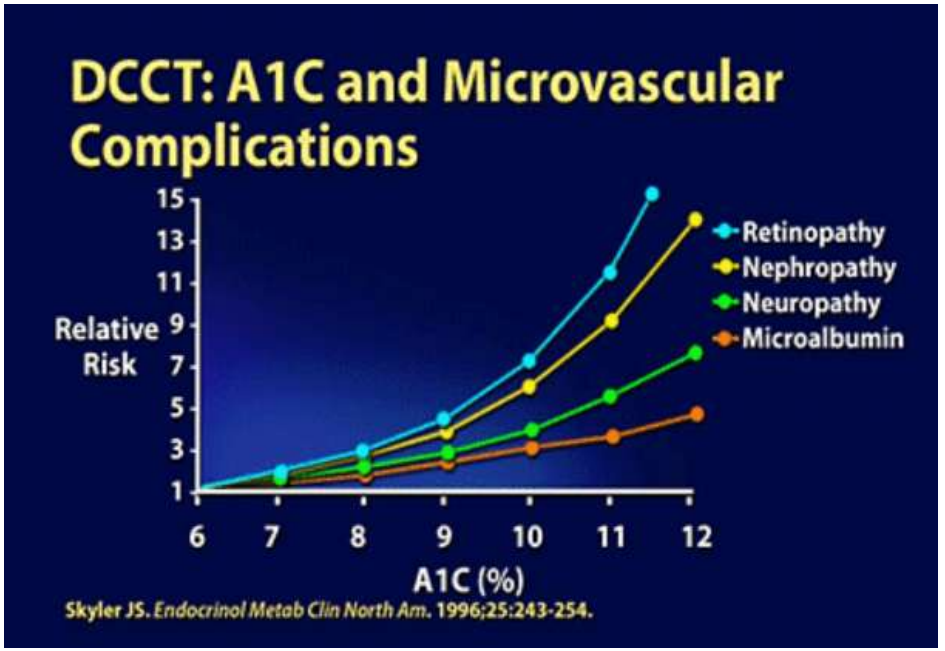
Diabetes Control and Complications Trial (DCCT) Type 1 – Does getting A1c <7% matter?

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

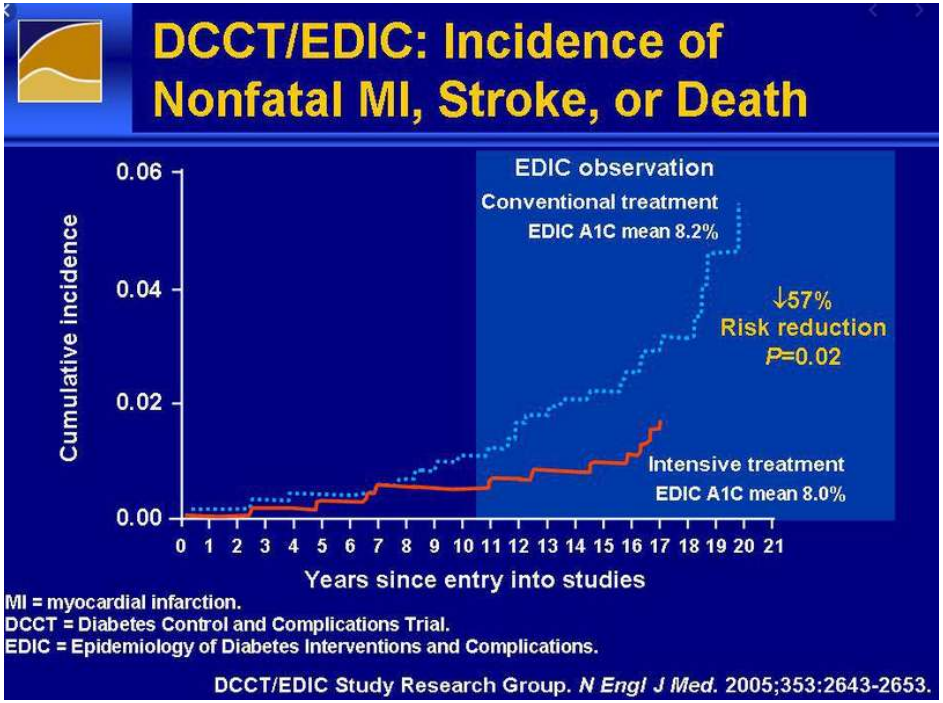
- Conducted over 20 years involving over 5,100 patients with Type 2 diabetes

- 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



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

Question and Break Time – 2:50

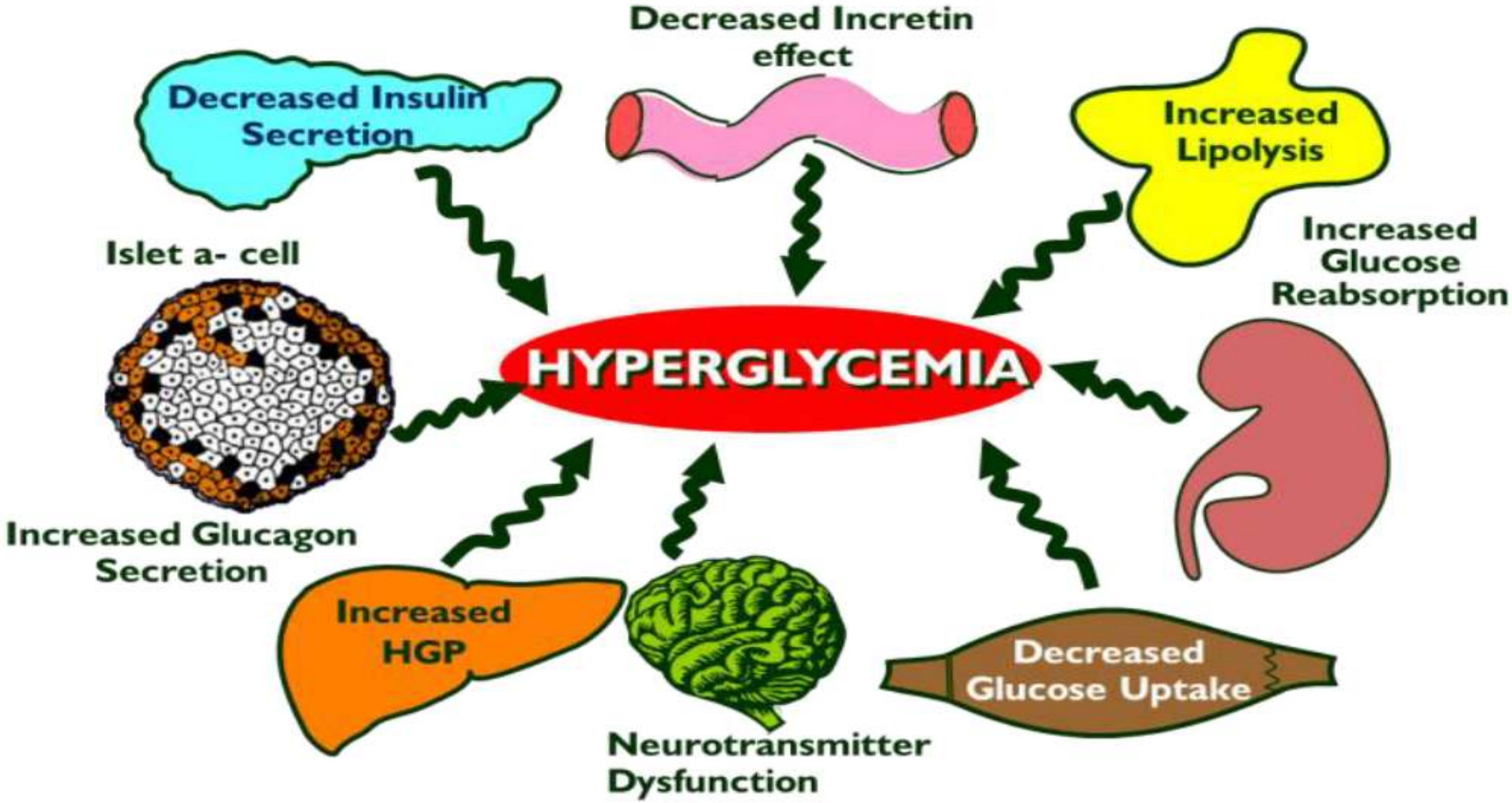
- Energizing Ideas
  - Dance
  - Walk outside
  - Enjoy a snack
  - Hydrate with spa water
  - Stretch and Breathe



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
- Amylin mimetic
- Insulin
- Glucagon

Drug Targets in Diabetes



DeFronzo et al. Diabetes Spectrum Volume 27, Number 2, 2014

Section 9- Pharmacologic Approaches to Glycemic Treatment for Type 2 Diabetes

- Person centered with focus on addressing:
  - Atherosclerotic CV Disease (ASCVD)
  - Heart failure (HF)
  - Chronic Kidney Disease (CKD)
  - Weight loss
  - MASH/MASLD
- Updated chart on cost and attributes of different meds



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Insulin Sensitizers

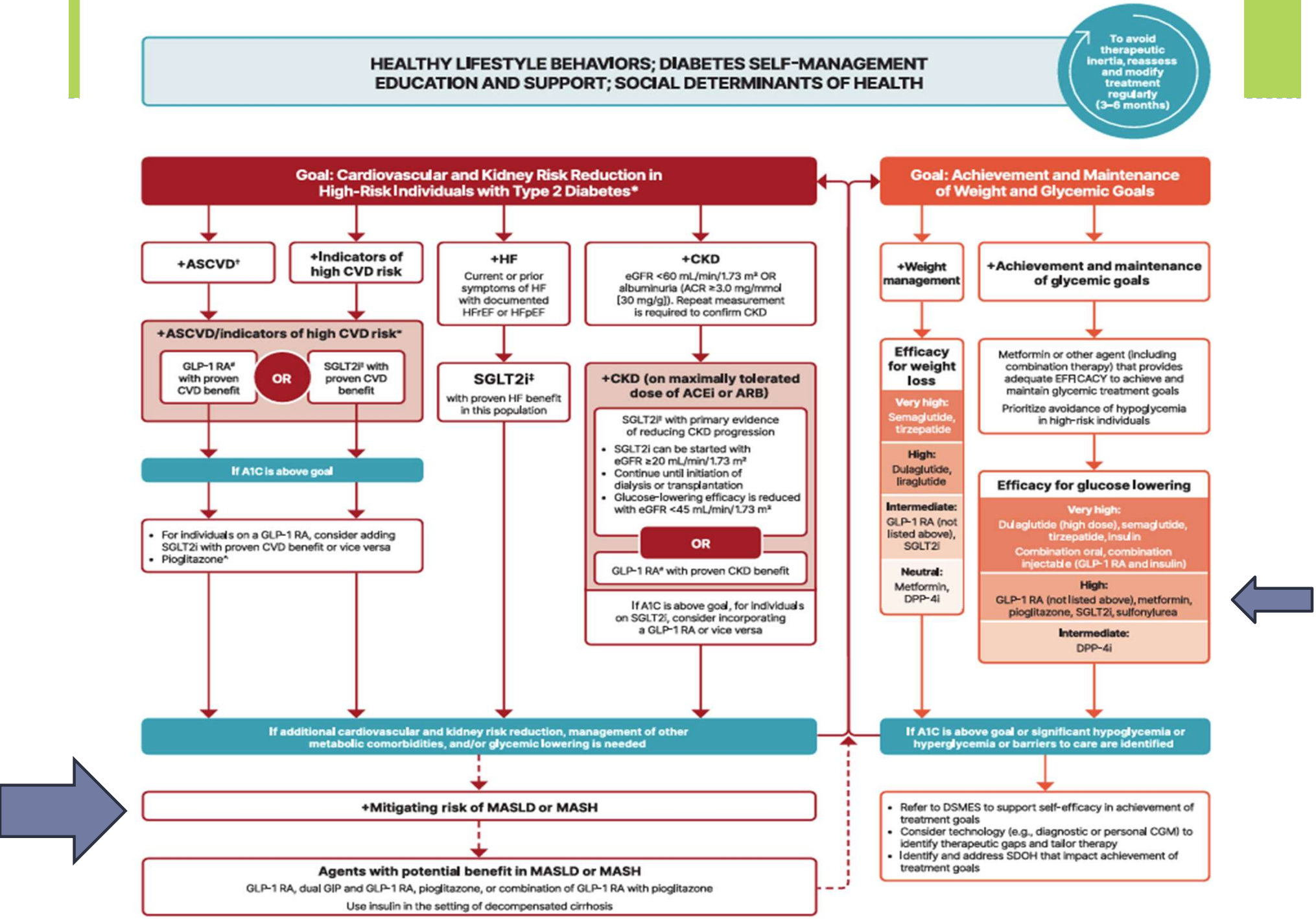
- **Action**: decrease insulin resistance by making muscle and adipose cells more sensitive to insulin; decrease free fatty acids



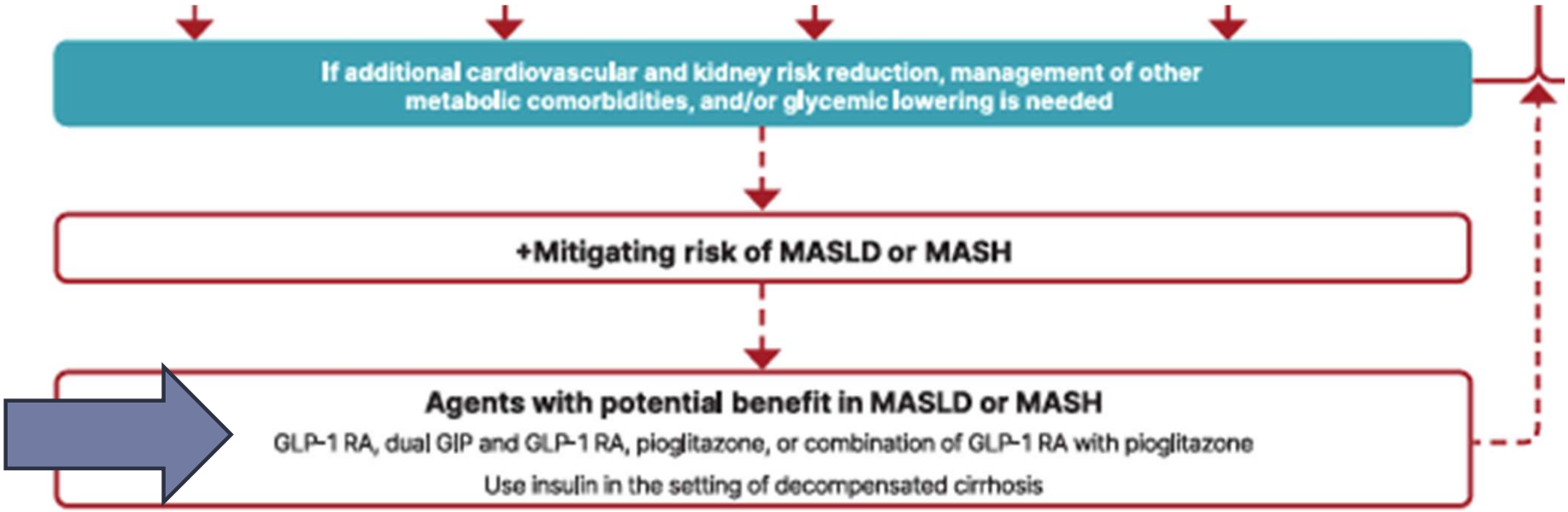
- **Names**:
  - pioglitazone (Actos) – bladder cancer warning
    - Dosing: 15-45 mg daily
    - Consider adding low dose if history of stroke or have steatosis
- **Efficacy/ Considerations**
  - Reduce A1C ~0.5-1.0%
  - 6 weeks for maximum effect
  - pioglitazone $5 a month, rosiglitazone $300 a month

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%

Use of Glucose-Lowering Medications in the Management of Type 2 Diabetes

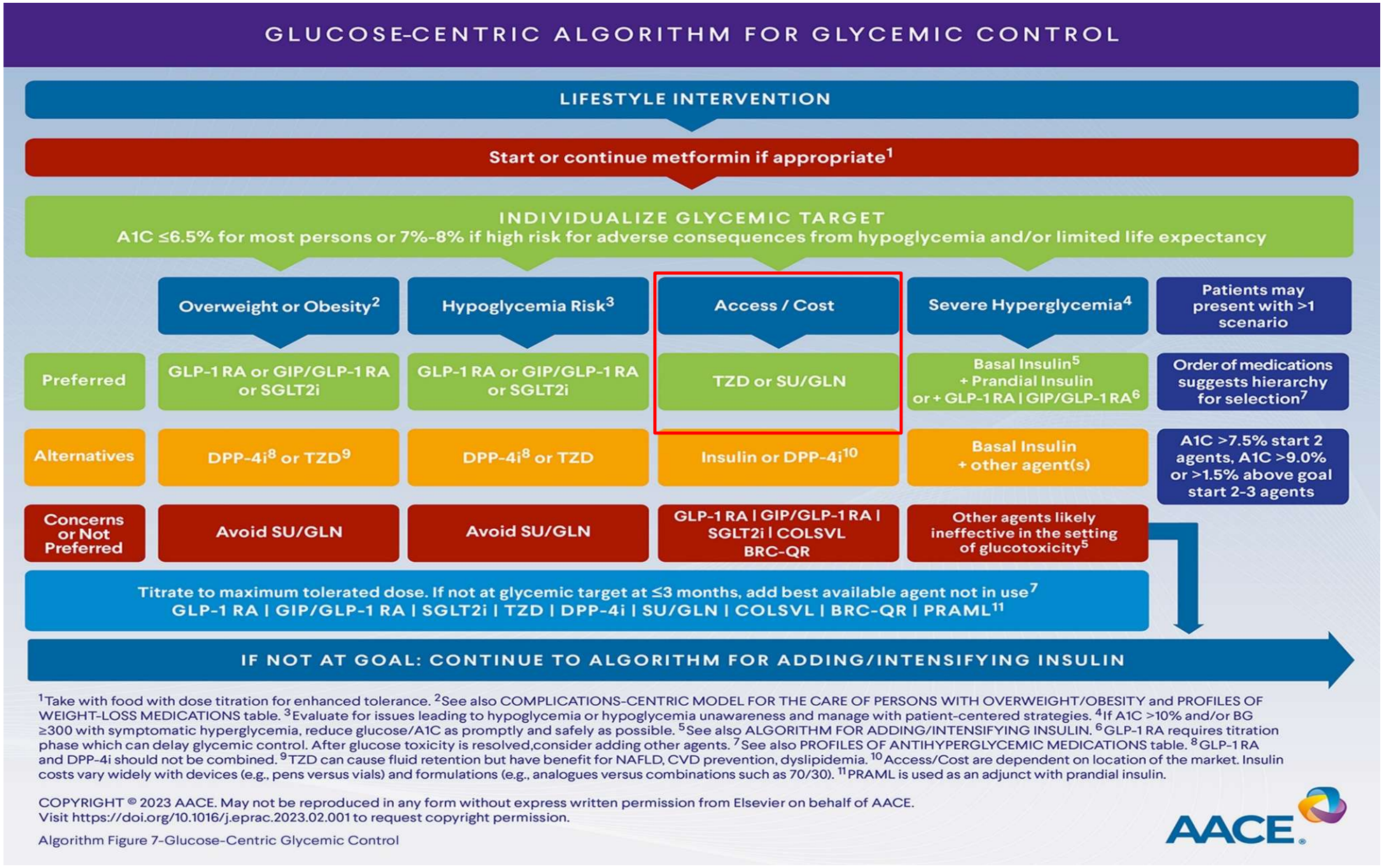


When to Use TZD's?



DI1

AACE Glucose-Centric Algorithm



[1]Take with food with dose titration for enhanced tolerance. [2]See also COMPLICATIONS-CENTRIC MODEL FOR THE CARE OF PERSONS WITH OVERWEIGHT/OBESITY and PROFILES OF WEIGHT-LOSS MEDICATIONS table. [3]Evaluate for issues leading to hypoglycemia or hypoglycemia unawareness and manage with patient-centered strategies. [4]If A1C >10% and/or BG ≥300 with symptomatic hyperglycemia, reduce glucose/A1C as promptly and safely as possible. [5]See also ALGORITHM FOR ADDING/INTENSIFYING INSULIN. [6]GLP-1 RA requires titration phase which can delay glycemic control. After glucose toxicity is resolved,consider adding other agents. [7]See also PROFILES OF ANTIHYPERGLYCEMIC MEDICATIONS table. [8]GLP-1 RA and DPP-4i should not be combined. [9]TZD can cause fluid retention but have benefit for NAFLD, CVD prevention, dyslipidemia. [10]Access/Cost are dependent on location of the market. Insulin costs vary widely with devices (e.g., pens versus vials) and formulations (e.g., analogues versus combinations such as 70/30). [11]PRAML is used as an adjunct with prandial insulin.

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Algorithm Figure 7-Glucose-Centric Glycemic Control

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Slide 193

DI1 Added here

Diana Isaacs, 2025-08-25T00:11:42.090

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?

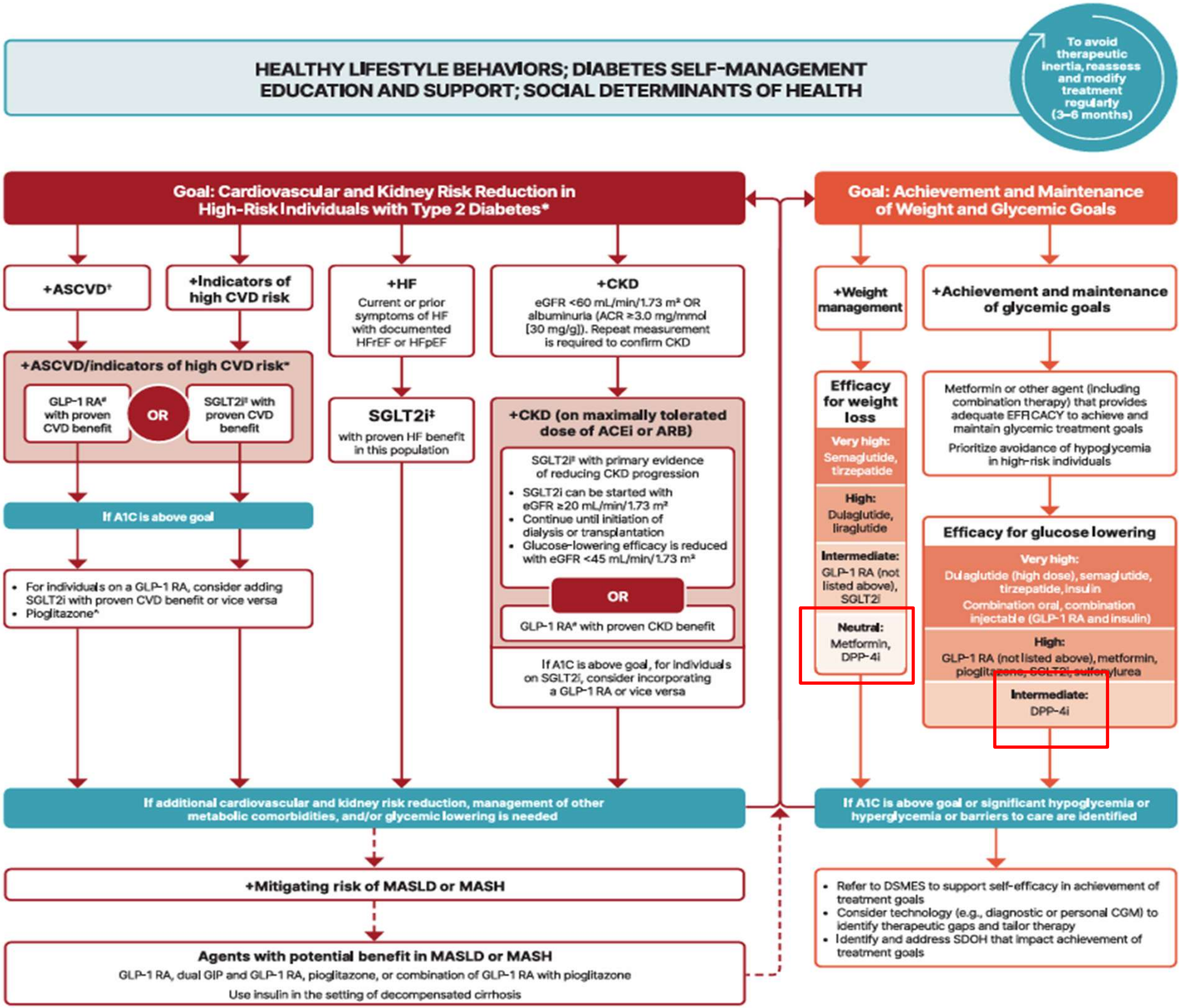
DI1

Slide 196

DI1 Modified slightly

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

Use of Glucose-Lowering Medications in the Management of Type 2 Diabetes



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

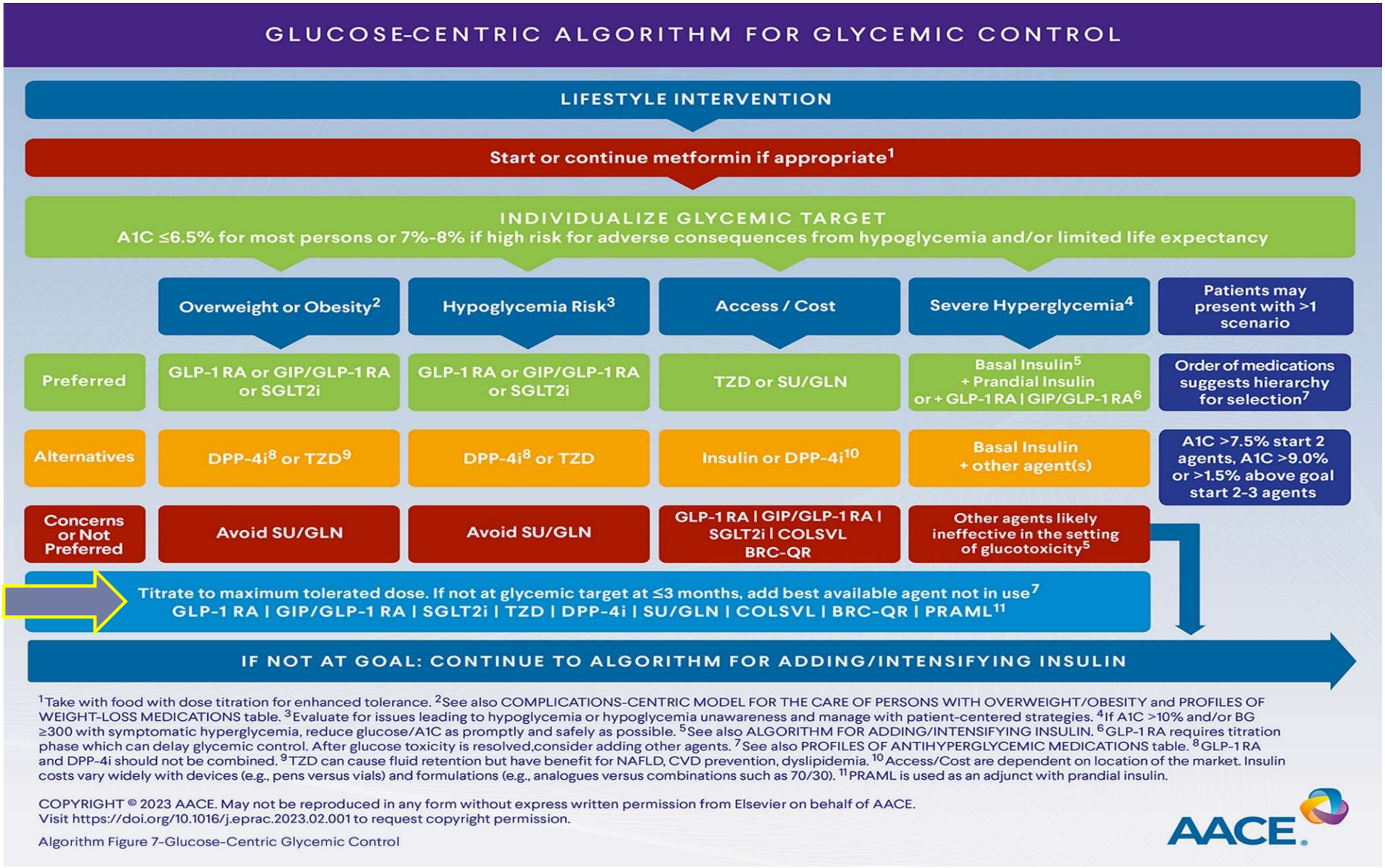
Class/Main Action	Name(s)	Daily Dose Range	Considerations
Thiazolidinediones "TZDs" • Increases insulin sensitivity	pioglitazone (Actos) rosiglitazone (Avandia)	15 – 45 mg daily 4 – 8 mg daily	Black Box Warning: TZDs may cause or worsen CHF. Monitor for edema and weight gain. Increased peripheral fracture 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%

Amylin Mimetic

- Pramlintide (Symlin)
- Indication: adjunctive treatment in patients with type 1 or type 2 diabetes who use mealtime insulin
- Modest A1C reduction: less than ~0.5%
- Boxed warning: severe hypoglycemia, other SE: N/V
- Dosing:
  - T2D: start with 60mcg before each meal, reduce meal time insulin by 50%
    - If no nausea, increase to max dose 120mcg after 3 days
  - T1D: start with 15mcg before each meal; reduce meal time insulin by 50%
    - If no nausea, increase by 15mcg every 3 days until max dose 60mcg
- Discontinued by end of 2025
- Stay tuned for weekly cagrilinitide-semaglutide

DI1

AACE Glucose-Centric Algorithm



[1]Take with food with dose titration for enhanced tolerance. [2]See also COMPLICATIONS-CENTRIC MODEL FOR THE CARE OF PERSONS WITH OVERWEIGHT/OBESITY and PROFILES OF WEIGHT-LOSS MEDICATIONS table. [3]Evaluate for issues leading to hypoglycemia or hypoglycemia unawareness and manage with patient-centered strategies. [4]If A1C >10% and/or BG ≥300 with symptomatic hyperglycemia, reduce glucose/A1C as promptly and safely as possible. [5]See also ALGORITHM FOR ADDING/INTENSIFYING INSULIN. [6]GLP-1 RA requires titration phase which can delay glycemic control. After glucose toxicity is resolved,consider adding other agents. [7]See also PROFILES OF ANTIHYPERGLYCEMIC MEDICATIONS table. [8]GLP-1 RA and DPP-4i should not be combined. [9]TZD can cause fluid retention but have benefit for NAFLD, CVD prevention, dyslipidemia. [10]Access/Cost are dependent on location of the market. Insulin costs vary widely with devices (e.g., pens versus vials) and formulations (e.g., analogues versus combinations such as 70/30). [11]PRAML is used as an adjunct with prandial insulin.

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Algorithm Figure 7-Glucose-Centric Glycemic Control

AACE

Slide 201

DI1 Added here

Diana Isaacs, 2025-08-25T00:11:42.090

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

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
  - DPP-IV's - $550-600

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

Use of Glucose-Lowering Medications in the Management of Type 2 Diabetes

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 in High-Risk Individuals with Type 2 Diabetes*

+ASCVD†

+Indicators of high CVD risk

+ASCVD/indicators of high CVD risk‖

GLP-1 RA# with proven CVD benefit **OR** SGLT2i‡ with proven CVD benefit

If A1C is above goal

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

+HF

Current or prior symptoms of HF with documented HFrEF or HFpEF

SGLT2i‡

with proven HF benefit in this population

+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 with eGFR ≥20 mL/min/1.73 m²
- Continue until initiation of dialysis or transplantation
- Glucose-lowering efficacy is reduced with eGFR <45 mL/min/1.73 m²

OR

GLP-1 RA# with proven CKD benefit

If A1C 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

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 A1C is above goal or significant hypoglycemia or hyperglycemia or barriers to care are identified

Risk of CKD Progression, CVD

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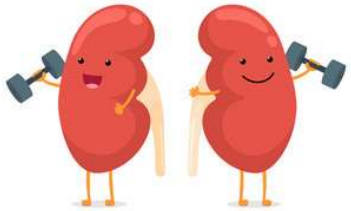
CKD is classified based on:

- **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

CKD– 2025 Update



- Optimize glucose and BP to protect kidneys
- Use SGLT-2 with demonstrated benefit to reduce CKD and CVD*
- To reduce CV risk and CKD, use a GLP-1* with demonstrated benefit.
- In people with CKD and albuminuria, a nonsteroidal MRA effective if GFR 25+
- Aim to reduce urinary albumin by ≥30% in people with CKD

Albuminuria Categories	Urinary Albumin Creatine Ratio (UACR)
Normal to mildly increased – A1	< 30 mg/g
Moderately increased – A2	30 – 299 mg/g
Severely increased – A3	300 mg/g +

Kidney Disease Stage	GFR
Stage 1 – Normal	90+
Stage 2 – Mild loss	89 - 60
Stage 3a – Mild to Mod	59 - 45
Stage 3b – Mod to Severe	44 - 30
Stage 4 – Severe loss	29 -15
Stage 5 – Kidney failure	14 - 0

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

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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.

DI1

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.

Slide 212

DI1 New slide

Diana Isaacs, 2025-08-25T01:59:02.482

Finerenone Resource

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

- In people with chronic kidney disease with UACR ≥300 mg/g
- Goal is a reduction of 30% or greater in mg/g urinary albumin to slow chronic kidney disease progression

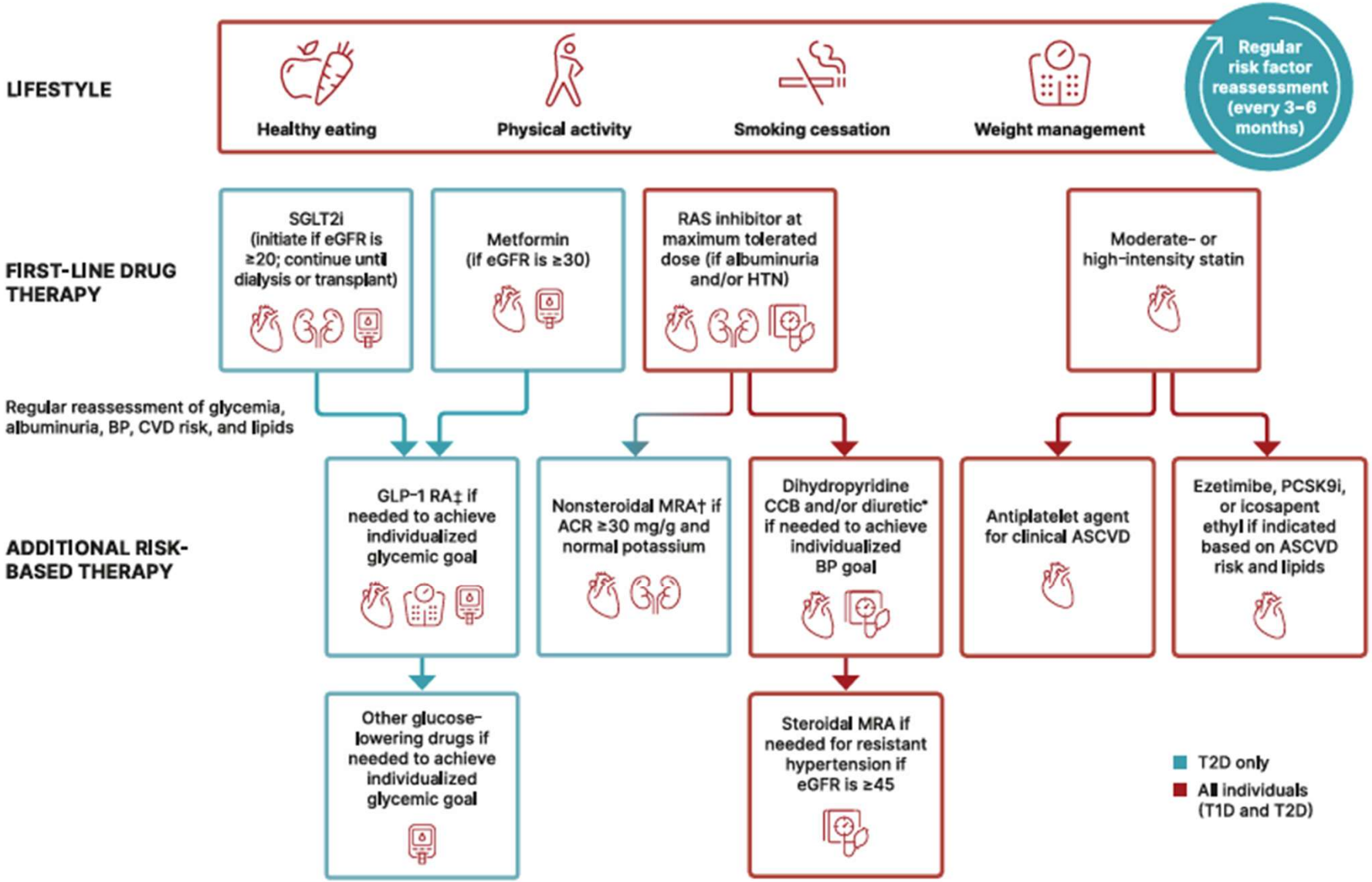


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- Nutrition Recommendations
- For people with non–dialysis-dependent stage 3 or higher chronic kidney disease
  - dietary protein intake aimed to a target level of 0.8 g/kg body weight per day.
- For those on dialysis,
  - consider protein intake of 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

Figure 11-12 Holistic Approach to Diabetes + CKD



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DI1

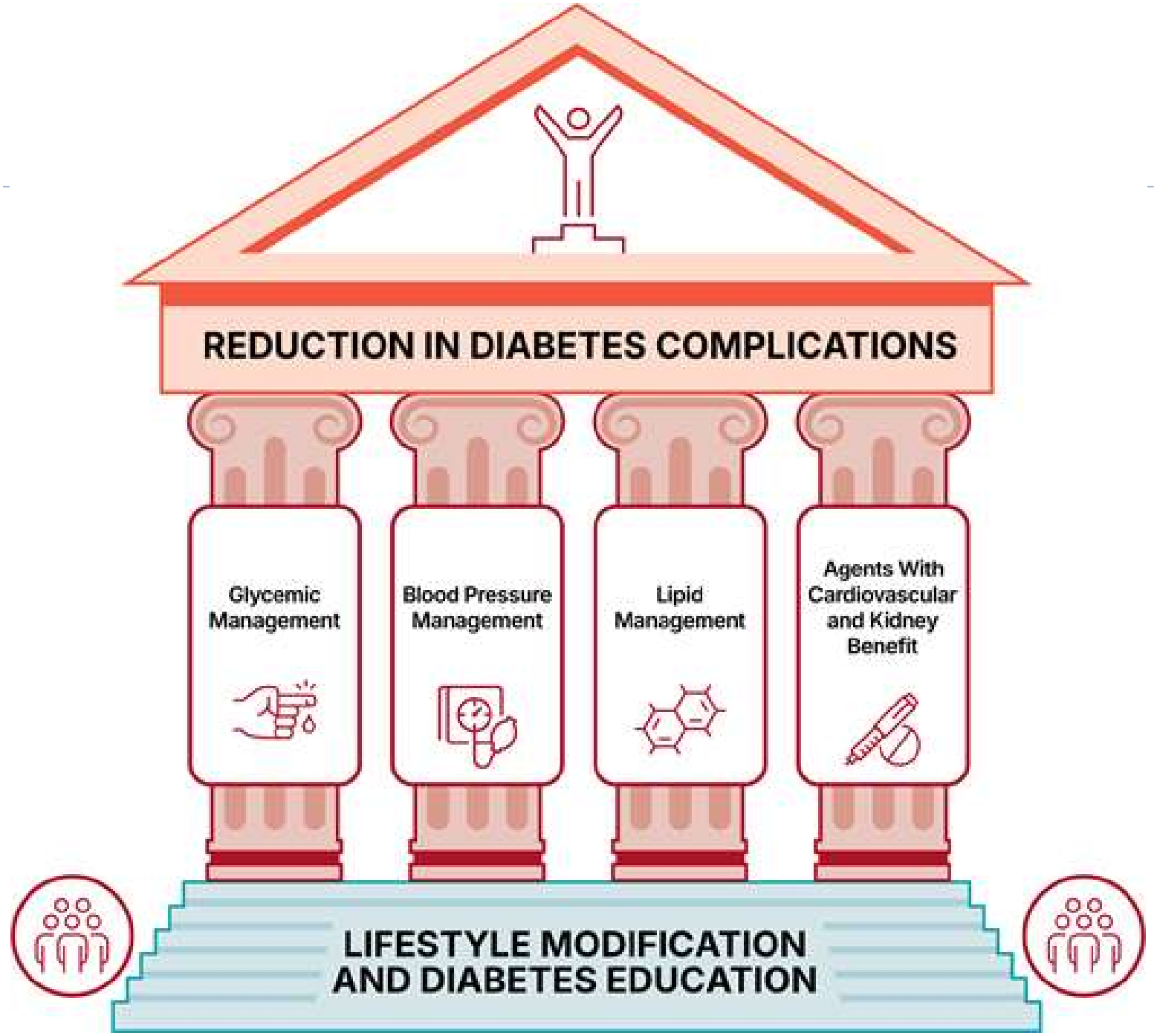
Slide 215

DI1 New slide

Diana Isaacs, 2025-08-25T02:19:23.837

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 fasting 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 SE's
- 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
- Beneficial Effects of SGLT-2 Inhibitors include:
- 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.

10. Cardiovascular Disease and Risk Management

- Higher risk of Atherosclerotic cardiovascular disease (ASCVD):
  - history of acute coronary syndrome,
  - myocardial infarction (MI),
  - stable or unstable angina,
  - coronary or other arterial revascularization,
  - stroke, transient ischemic attack,
  - or peripheral artery disease (PAD) including aortic aneurysm.
- 2x high risk of Heart Failure
- Leading cause of morbidity and mortality in people with diabetes



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

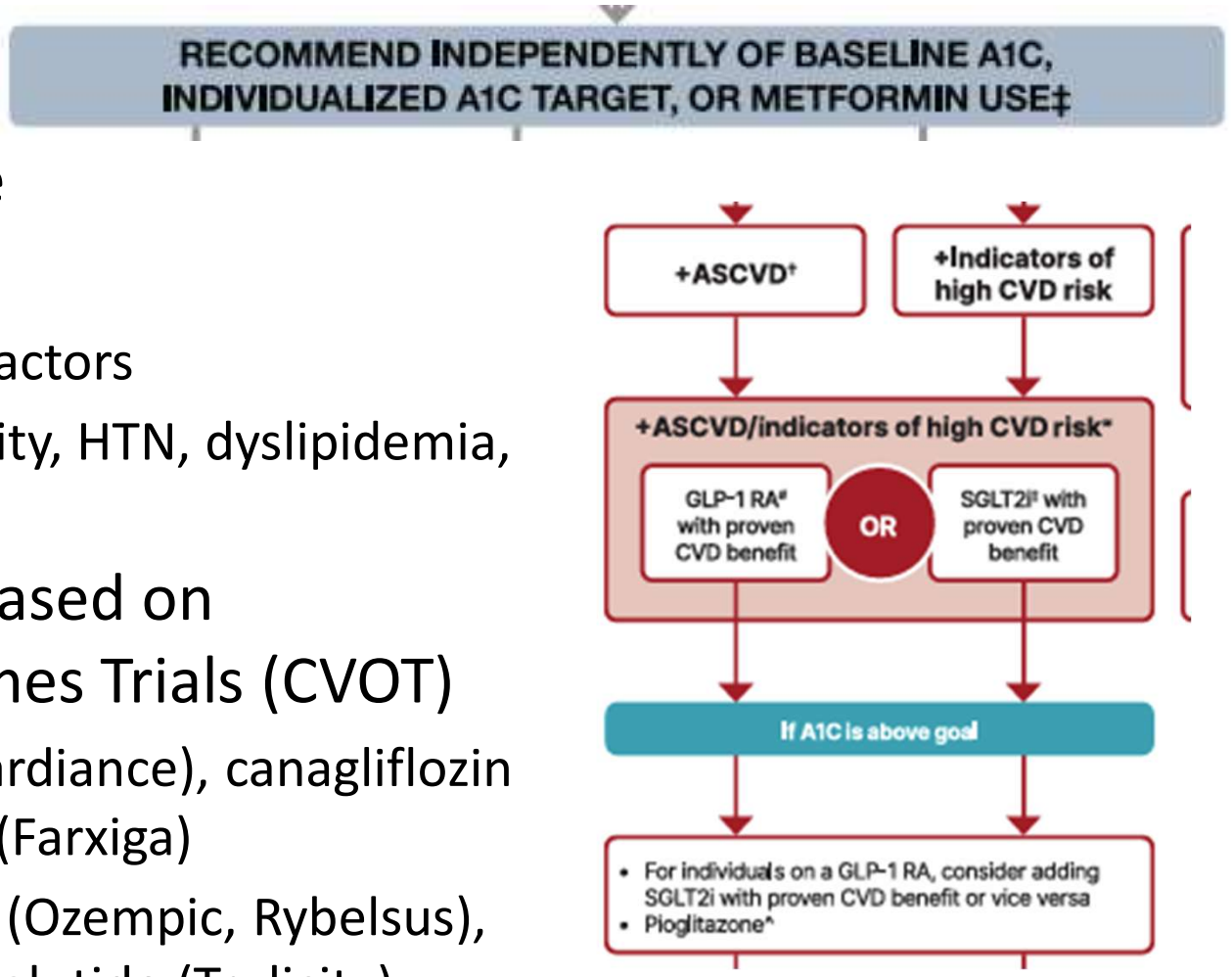
With more aggressive goals, rates of CVD have decreased.
CV Risks predicted to increase in future.

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Atherosclerotic Cardiovascular Disease

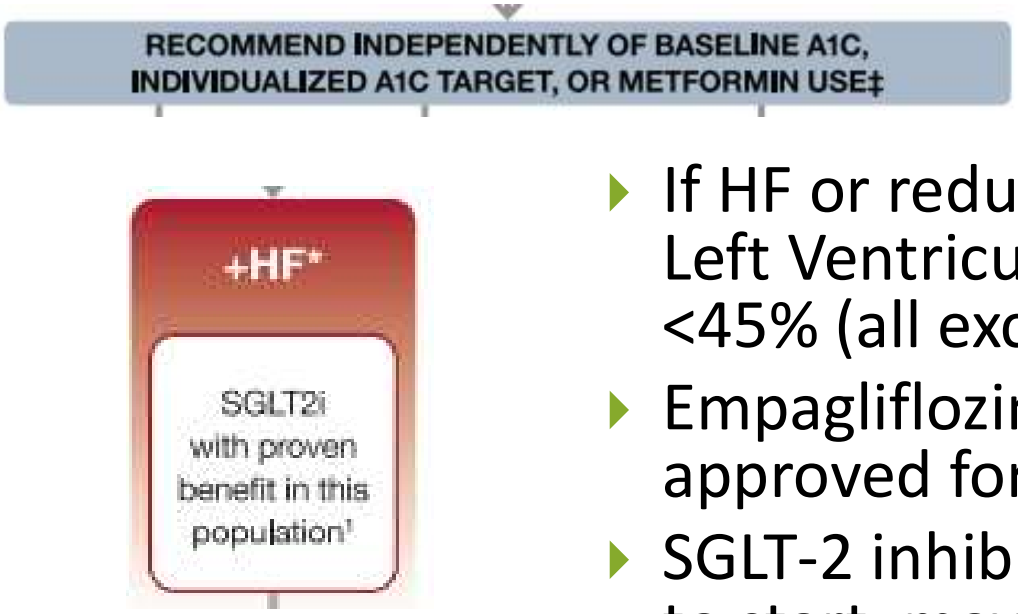
- ASCVD risk
  - Established CV disease
  - High CV Risk
    - 55+ with 2 or more risk factors
    - Risk factors include obesity, HTN, dyslipidemia, albuminuria, smoking
  - Most effective meds based on Cardiovascular Outcomes Trials (CVOT)
    - SGLT2i - Empagliflozin (Jardiance), canagliflozin (Invokana), Dapagliflozn (Farxiga)
    - GLP-1 RAs - Semaglutide (Ozempic, Rybelsus), liraglutide (Victoza), dulaglutide (Trulicity), semaglutide (Wegovy)



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Heart Failure



- If HF or reduced Ejection Fraction (rEF) and Left Ventricular Ejection Fraction (LVEF) <45% (all except bexagliflozin)
- Empagliflozin and dapagliflozin FDA approved for preserved EF
- SGLT-2 inhibitor if eGFR is adequate (>20 to start, may continue until ESRD)
- Avoid TZD
- If using a DPP4 inhibitor, avoid saxagliptin and alogliptin

- Semaglutide beneficial for people with HFpEF and overweight/obesity

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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

GLP-1 Analog CVOT Data Summary

DI1

Trial Name	GLP-1 Agent/ Comparator	Outcomes (Primary Bolded)	FDA Indication
LEADER	**Liraglutide**/placebo	81% Prior CVD**, 3 point MACE** 0.87 (0.58-0.95) N=9340, Median follow-up 3.8 years Worsening nephropathy 0.78 (0.67-0.92)	As an adjunct to diet and exercise to improve glycemic control in patients **10 years and older** with type 2 DM To reduce the risk of **major adverse CV events** in adults with type 2 DM and **established CVD**
ELIXA	**Lixesenatide**/placebo	100% Prior CVD, **4 point MACE** 1.02 (0.89-1.17) N=6068, Median follow-up 2.1 years	As an adjunct to diet and exercise to improve glycemic control in adults with type 2 DM
SUSTAIN-6	**Semaglutide inj**/ placebo	60% Prior CVD, **3 point MACE** 0.74 (0.58-0.95) N=3297, Median follow-up 2.1 years Worsening nephropathy 0.64 (0.46-0.88)	As an adjunct to diet and exercise to improve glycemic control in adults with type 2 DM To reduce the risk of **major adverse CV events** in adults with type 2 DM and **established CVD**
SOUL	**Semaglutide oral**/ placebo	56.6% Prior CVD, **3 point MACE** 0.79 (0.77-0.96) N=9650, Median follow-up 4.1 years	As an adjunct to diet and exercise to improve glycemic control in adults with type 2 DM **(future indication pending)**
EXSCEL	**Exenatide** – (weekly)/ placebo	73.1% Prior CVD, **3 point MACE** 0.86 (0.83-1.00) N=14752, Median follow-up 3.2 years	As an adjunct to diet and exercise to improve glycemic control in patients **10 years and older** with type 2 DM
REWIND	**Dulaglutide**/placebo	32% Prior CVD, **3 point MACE** 0.88 (0.79-0.99) N=9901, Median follow up 5. 4 years Worsening nephropathy 0.85 (0.77-0.93)	As an adjunct to diet and exercise to improve glycemic control in adults with type 2 DM To reduce the risk of **major adverse CV events** in adults with type 2 DM and **established CVD** or **multiple CVD risk factors**

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

Slide 225

DI1 Replaced pioneer with soul

Diana Isaacs, 2025-08-25T02:28:07.414

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

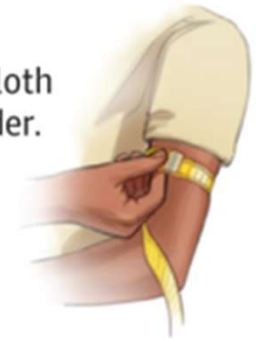
Whelton et al. 2017 High Blood Pressure Clinical Practice Guideline

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 2025

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



- 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 home and at each visit
- During pregnancy, with previous history of HTN
  - B/P Target of 110 -135/85

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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**

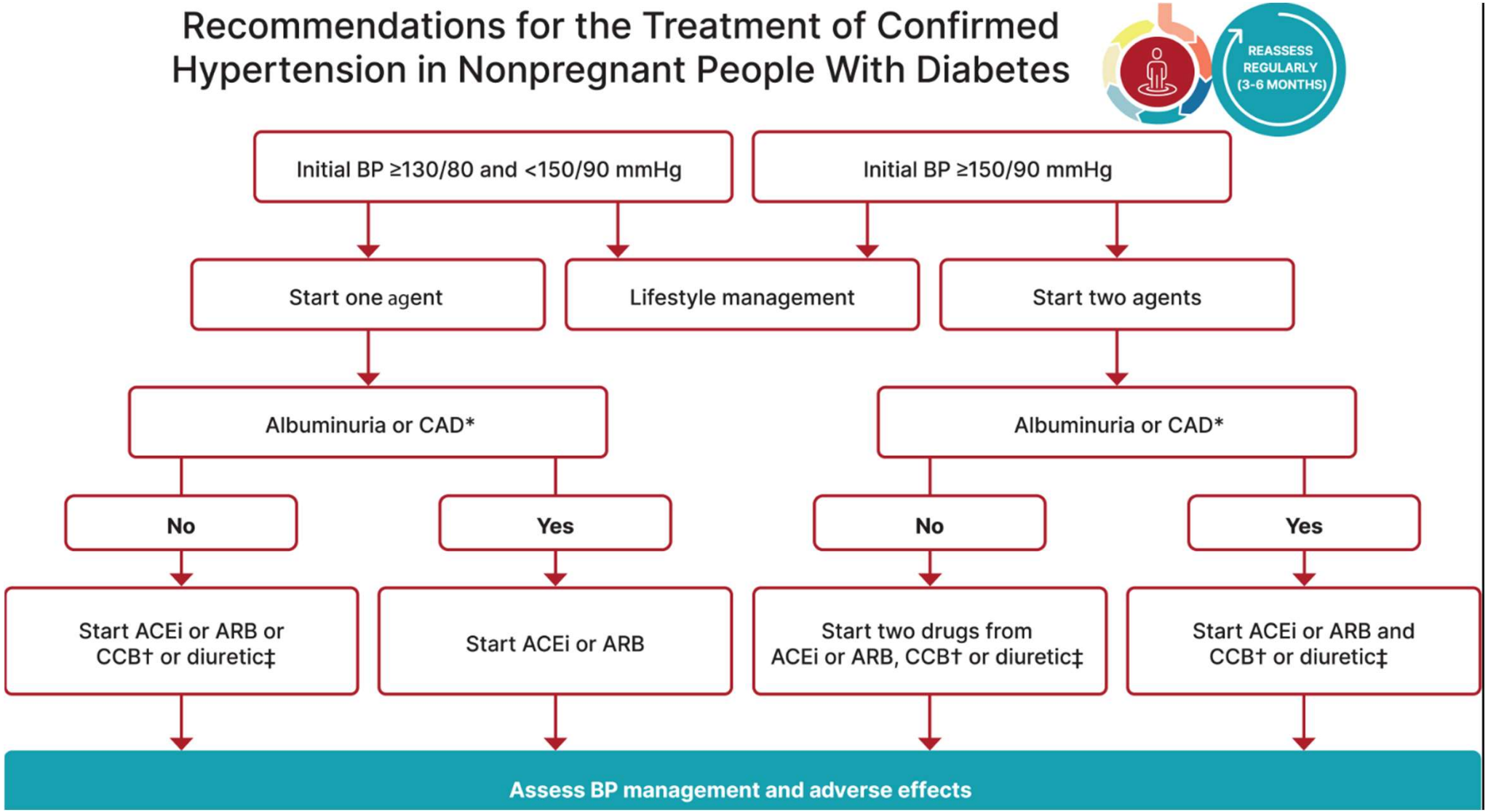


*Albuminuria = Urinary albumin creatinine ratio of 30+

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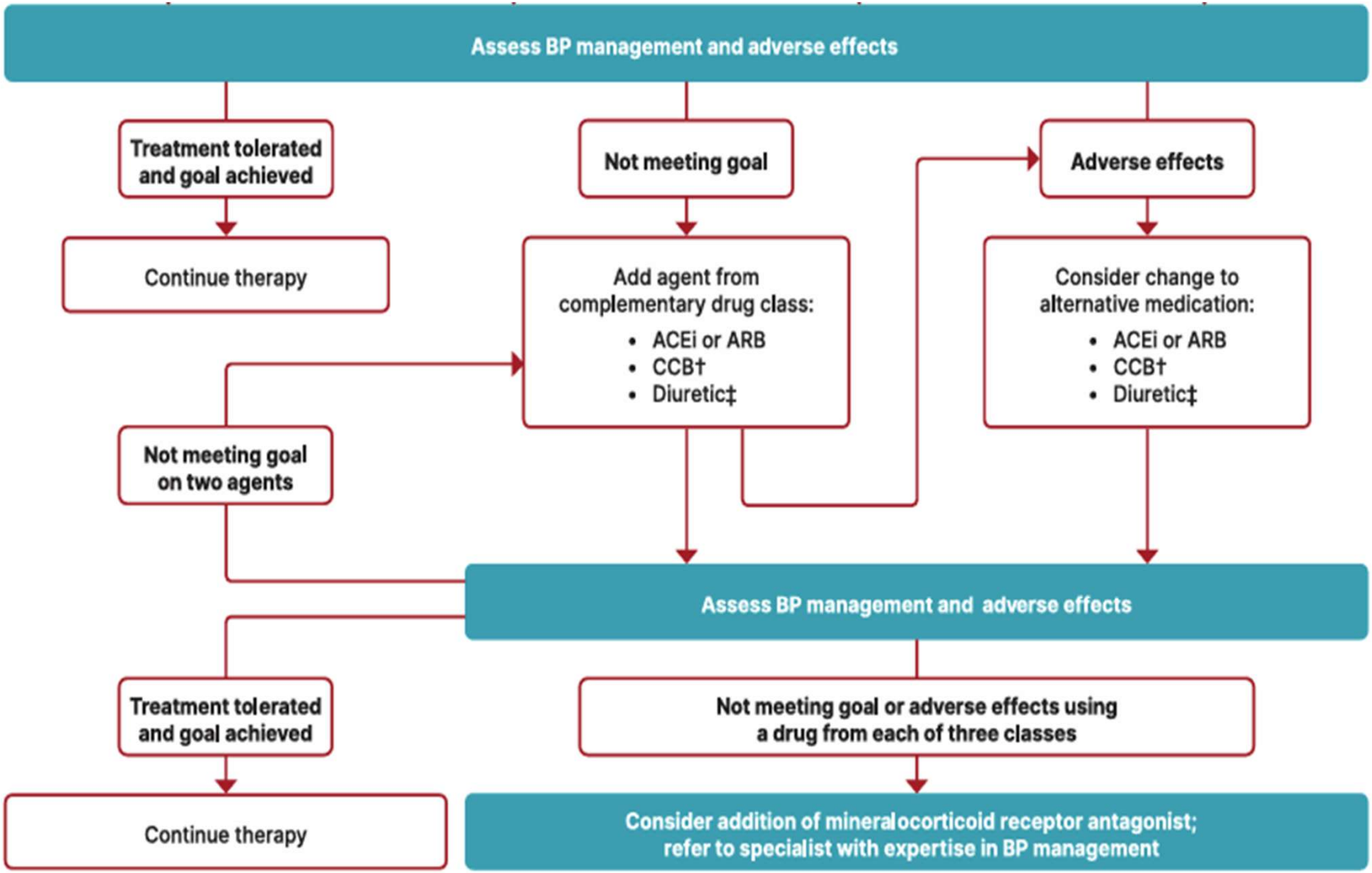
Hypertension Management



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Hypertension Management (Cont)



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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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Cardiac and Renal Disease

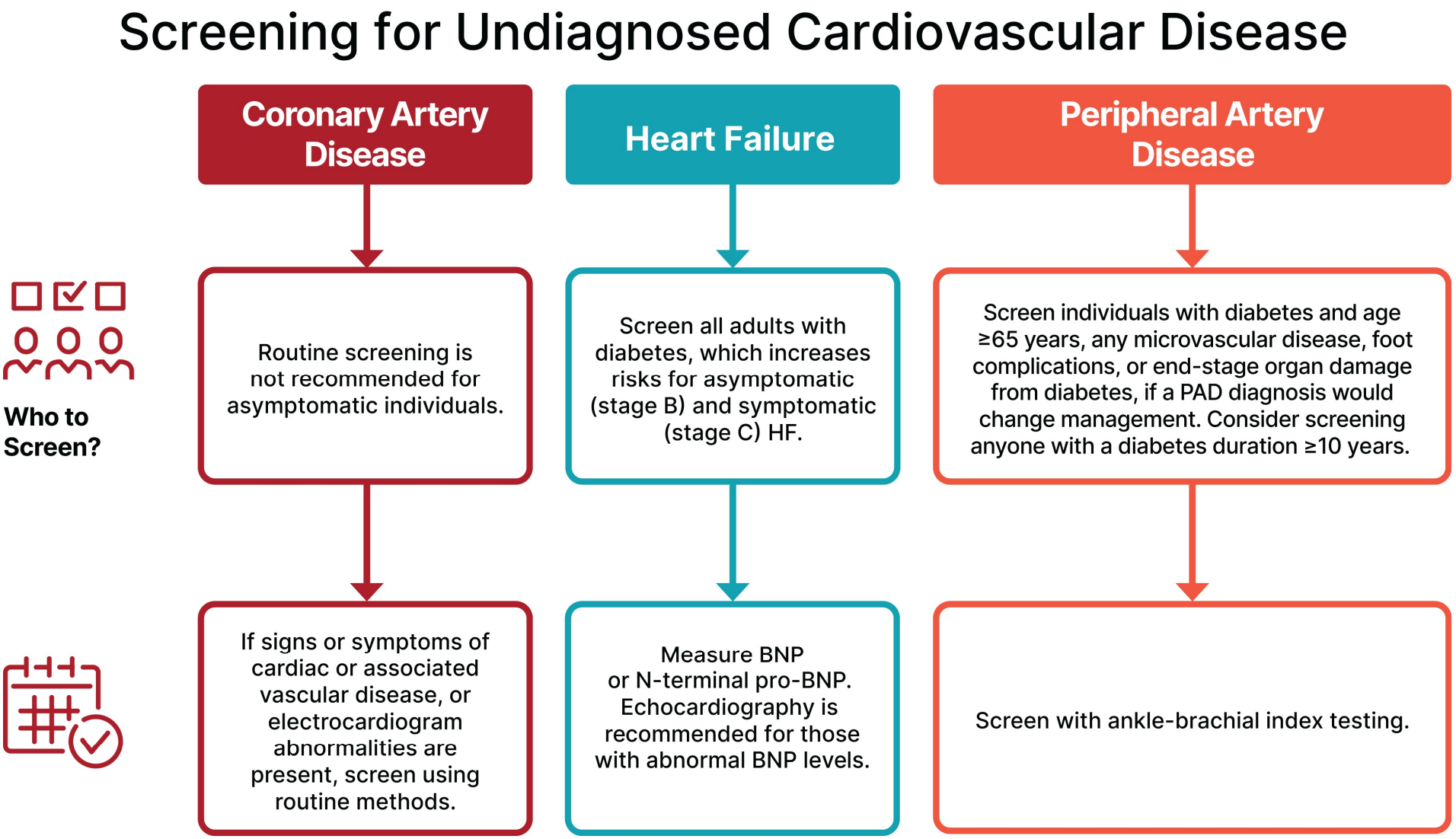
- The combination of 3 comorbidities has been termed *cardiorenal metabolic disease* or *cardiovascular-kidney-metabolic* health
  - ASCVD, heart failure, and chronic kidney disease (CKD)
- Recognized interrelationship of cardiometabolic risk factors leading to cardiovascular disease and adverse kidney 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.



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Screening for Undiagnosed CV Disease



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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.

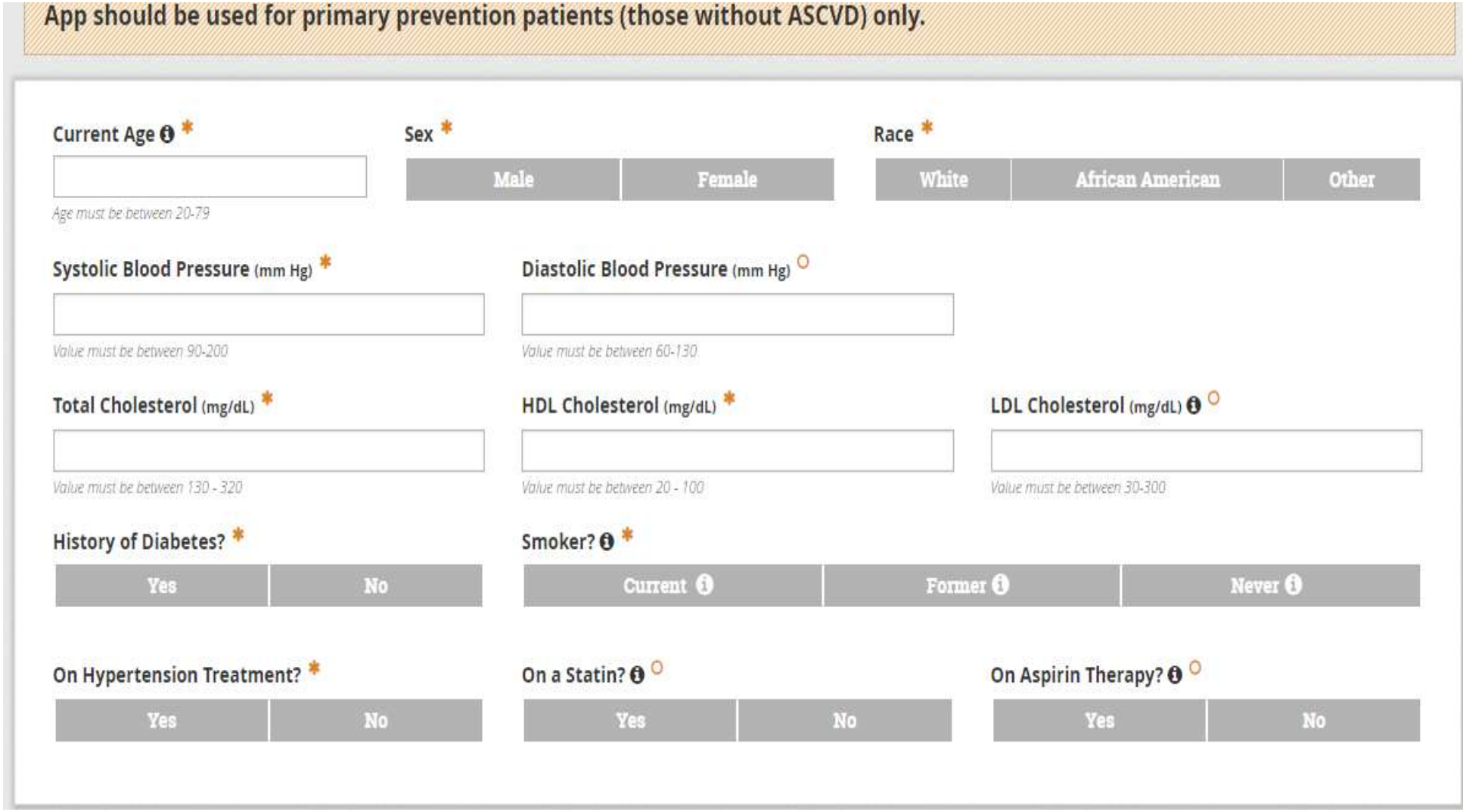
- **PMH**
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  - Escitalopram 10mg PO daily
- **PE**
  - Ht: 5'3" Wt: 185lbs , BMI:32.8kg/m^2
  - BP: 140/88mmHg
  - A1c=6.9%, K: 4.5mEq/L, Scr:0.8mg/dL, ACR 202 mg/g
  - Tchol=204mg/dL, HDL=34mg/dL, LDL=120mg/dL, TG=250mg/dL



- 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

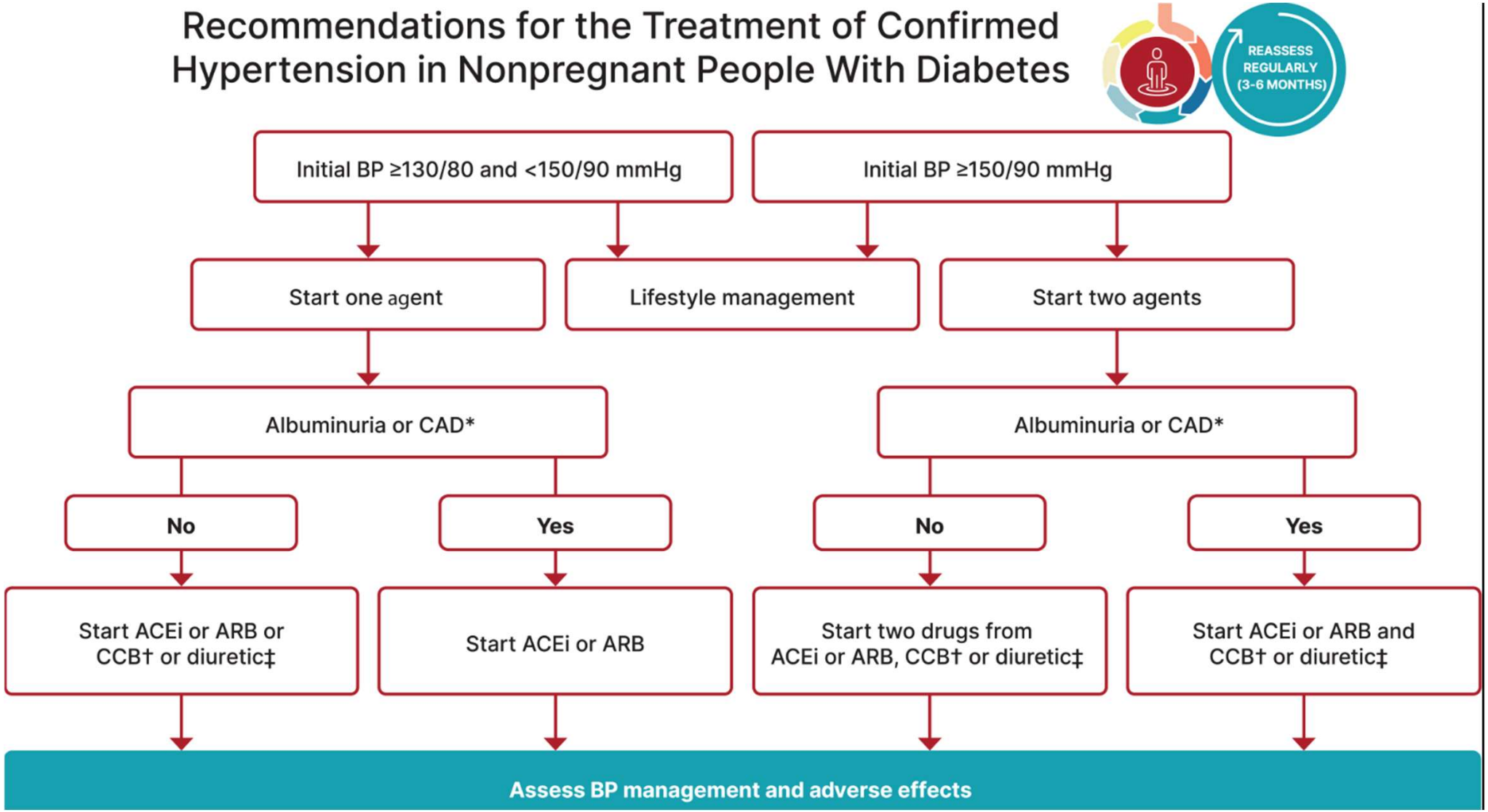
C. BP<140/80 mmHg

D. BP<140/90 mmHg





Hypertension Management



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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

DI1

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

Slide 247

DI1 Updated with new htn guidelines

Diana Isaacs, 2025-08-25T11:13:35.728

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)



DI1

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.

Slide 251

DI1 New from new htn guideline

Diana Isaacs, 2025-08-25T02:40:13.576

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 253

DI1 New from new htn guideline

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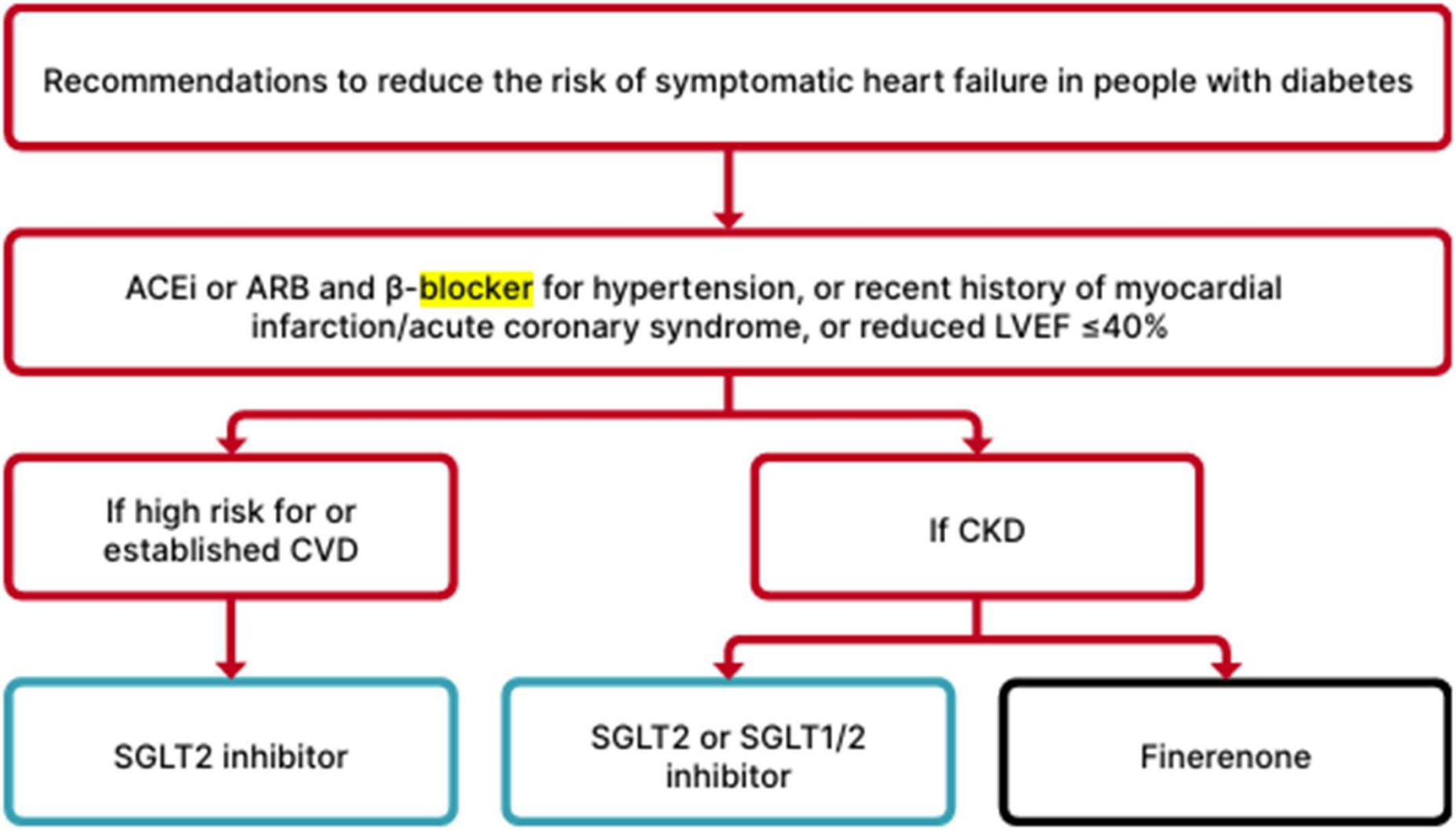
Poll 2 - What Changes are Best to Make to Alice's Hypertension Regimen?



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

Assume all choices include lifestyle modifications

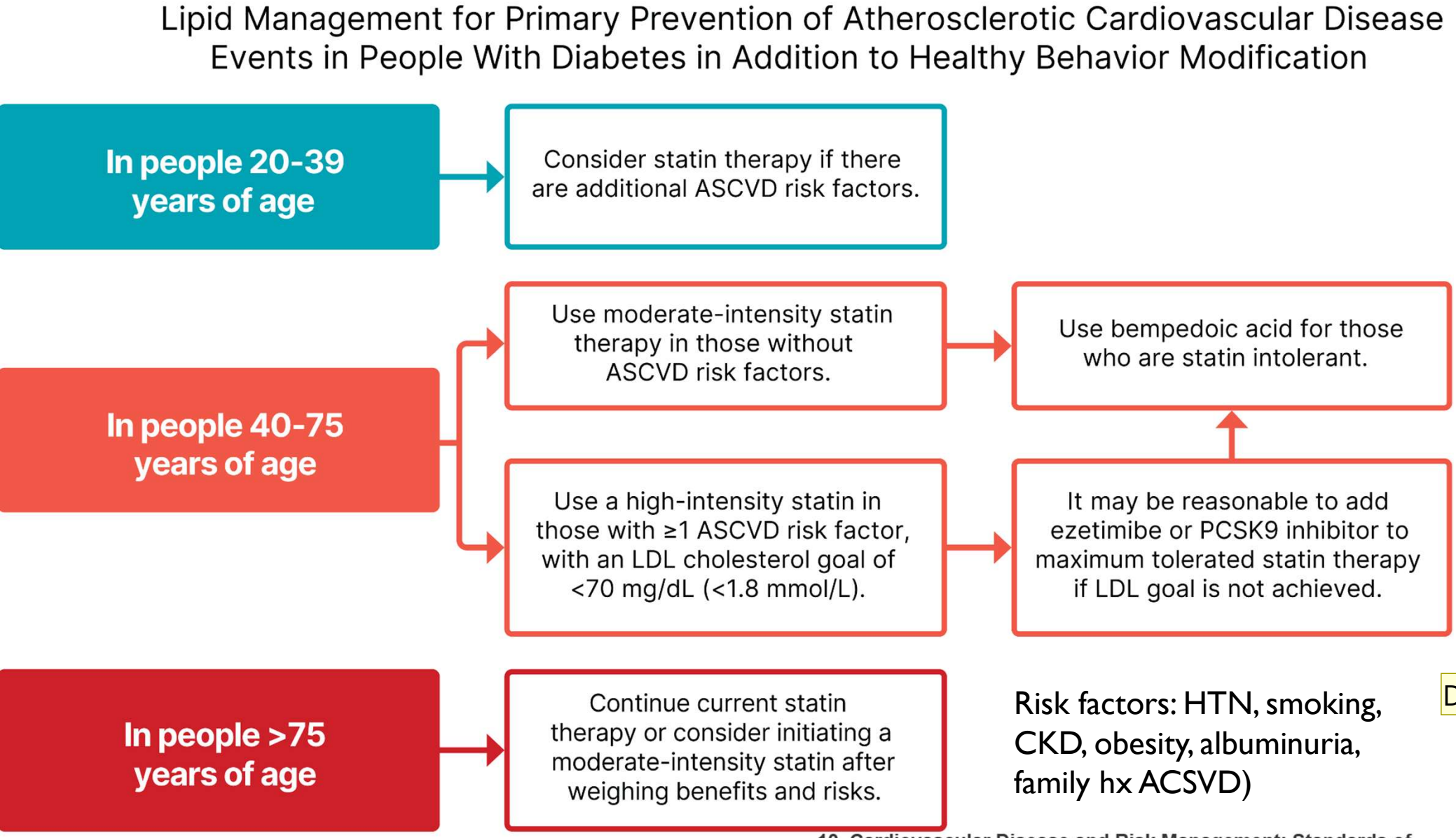
Heart Failure in People with Diabetes



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Lipid Therapy for Primary Prevention



Risk factors: HTN, smoking, CKD, obesity, albuminuria, family hx ACSVD)

DI1

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Slide 256

DI1 Added risk factors to this slide, removed duplicate slide.
Diana Isaacs, 2025-08-25T02:52:47.609

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 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 a PCSK9-directed therapy with demonstrated 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 inhibitor with monoclonal antibody treatment • Bempedoic acid • PCSK9 inhibitor with siRNA inclisiran

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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

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
	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 20 gm per day Mix w/ fluid		
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.

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

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

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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 264

DI1 New slide from AACE algorithm

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

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 ezetimibie as Nexlizet
- Once daily with or without food

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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 preventic

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Treating High TG

- Consider fibrates or fish oil when TG>500mg/dL and definitely when TG>1000mg/dL
  - High TG puts people at increased pancreatitis risk
  - Rule out secondary causes
- In adults with fasting TG >150 mg/dL or nonfasting TG >175 mg/dL treat lifestyle factors, secondary factors (diabetes, chronic liver or kidney disease and/or nephrotic syndrome, and hypothyroidism and medications that raise TG.
- In People with ASCVD on a statin with controlled LDL but elevated TG (135-499mg/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

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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)

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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.

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Algorithm Figure 4-Dyslipidemia

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.

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? No Poll

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?





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

Diabetes Care 2020;43(Suppl. 1):S111-134
ENDOCRINE PRACTICE Vol 26 No. 1 January 2020

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

ADA 2025 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



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

Thank You – Questions?



- Thanks for joining us!
- Questions?
- Info@diabetesed.net
- Call us at 530-893-8635
- www.DiabetesEd.net

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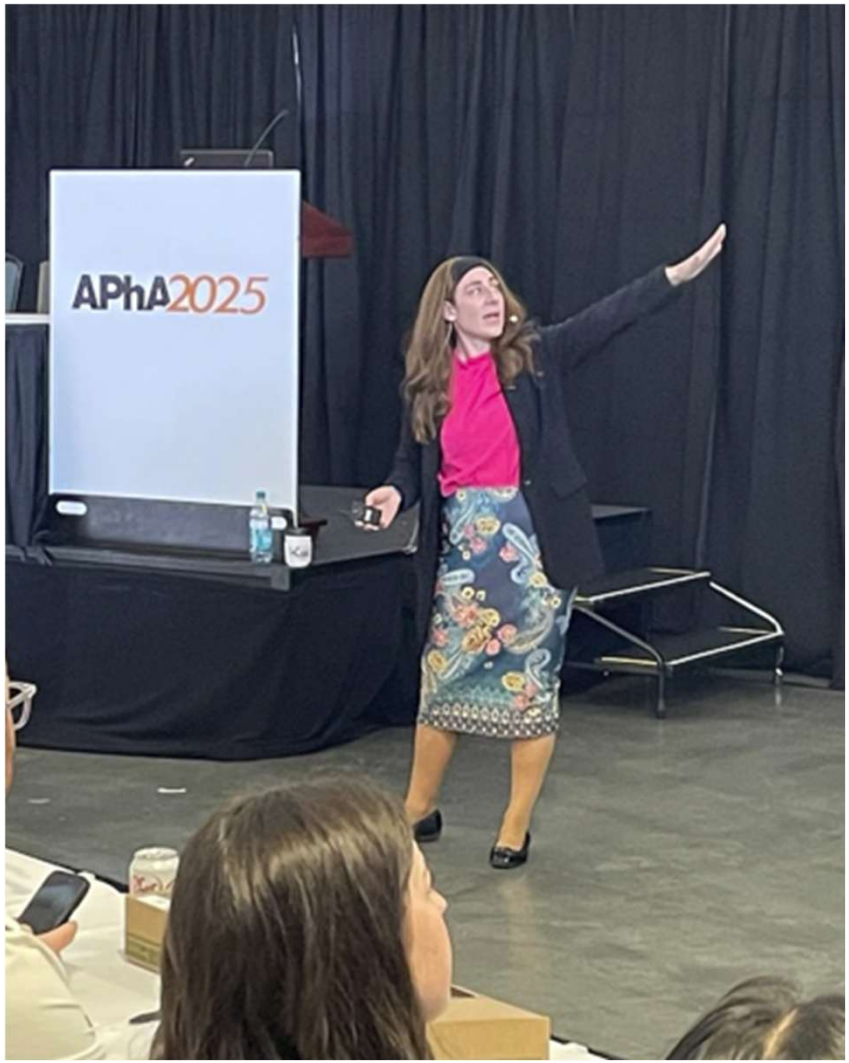
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Insulin – Ultimate Hormone Replacement Therapy



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Disclosures for Dr. Isaacs

- Diana Isaacs, PharmD, BCPS, BCACP, CDCES, BC-ADM, FADCES, FCCP declares the following disclosures:
- Speaker: Abbott, Dexcom, Novo Nordisk, Insulet, Medtronic, Lilly, Cequr, Sanofi, Corcept, Sequel

Objectives – Insulin –The Ultimate Hormone Replacement Therapy

Objectives:

- Discuss the actions of different insulins
- Describe how to use the ADA algorithm for insulin management
- Counsel a person with diabetes on safe and effective insulin use
- Discuss strategies to determine and fine-tune basal and bolus insulin settings based on glucose pattern management
- Describe how insulin settings are used to program insulin pumps and connected insulin pens

Best and Banting – U of Toronto 1921





History of insulin

- Insulin is produced by beta cells in the pancreas
- Discovered in 1921 by Frederick Banting and his assistant Charles Best from a dog's pancreas
- First used in a dog with diabetes and kept him alive for 70 days until they ran out of extract
- With the help of JB Collip and John Macleod, insulin was derived from the pancreas of cattle and in January 1922, given to a 14-year-old dying from diabetes in a Toronto hospital
- In 1923, Banting and Macleod received the Nobel Price in Medicine which they shared with Best and Collip
- Soon after, Eli Lilly started large-scale production of insulin

ADA. The history of a wonderful thing we call insulin (accessed 2020 Aug 29).

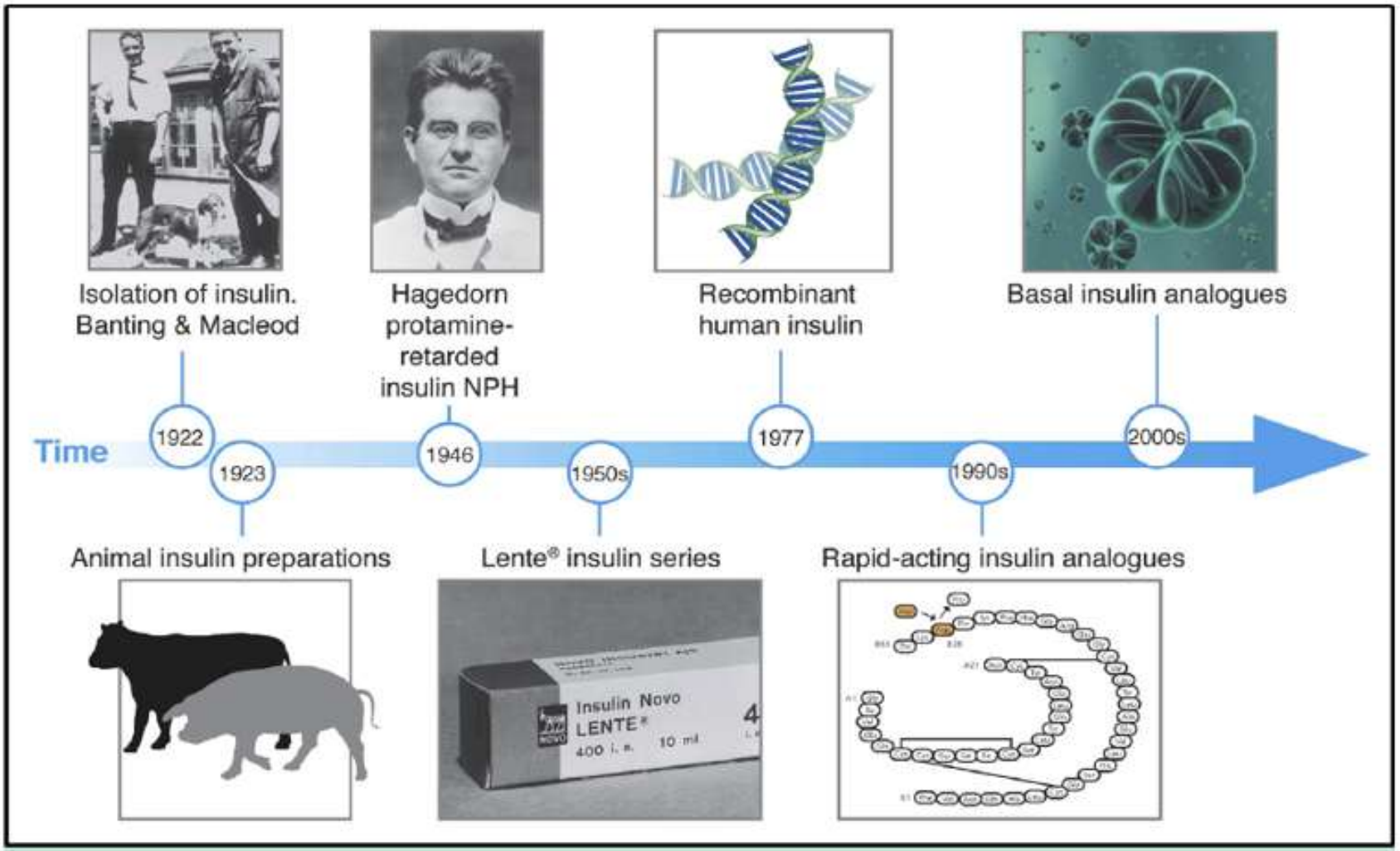
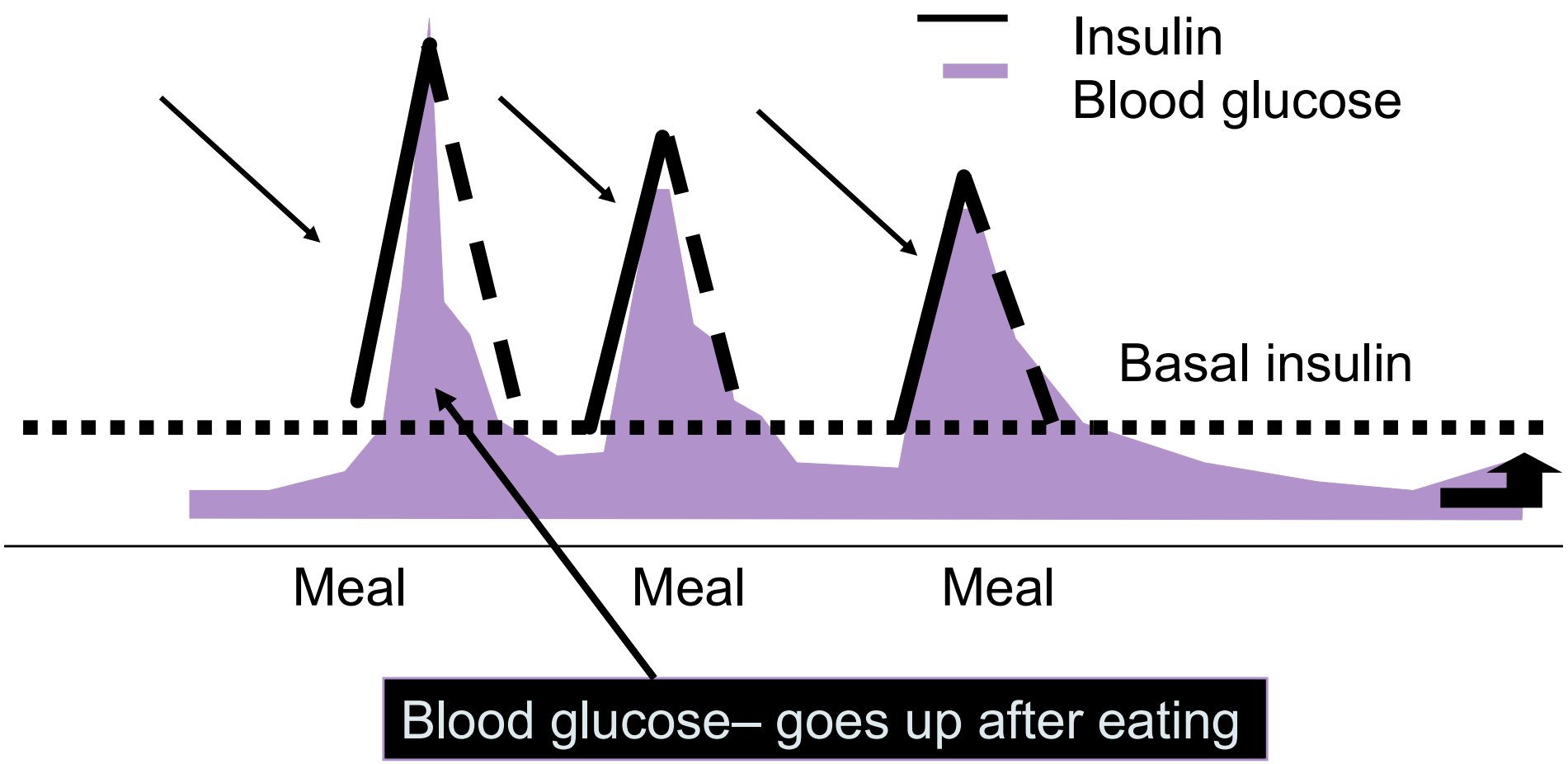


Figure 1 Milestones in the evolution of insulin therapy. NPH = neutral protamine Hagedorn.

Evolution of Insulin: From Human to Analog. Joseph M. Tibaldi, MD
American Journal of Medicine, 2014

Physiologic Insulin Release:
Individuals without diabetes



Physiologic Insulin at Meals

- **1st phase:** peak 1-2 minutes, duration 10 minutes, suppresses hepatic glucose production
- **2nd phase:** duration 1-2 hours

The perfect insulin would be fast enough to match the absorption of carbohydrates

Freeman JS. J Am Osteopath Assoc. 2009;109:26-36.

Insulin Overview

- None of the commercially available insulins are as fast as true physiologic insulin
- Almost all insulin is injected (SC or IV) with 1 inhaled option
- All people with T1D require basal + bolus insulin or insulin pump therapy
- Many people with T2D require insulin due to the progressive nature of the condition

Basal aka "Background" Insulin

- The liver plays a major role in maintaining glucose levels by regulating the process of gluconeogenesis and glycogenolysis
- Excessive hepatic glucose release leads to hyperglycemia
- In a person without diabetes, there is a low level of insulin to keep glucose homeostasis from glucose produced by the liver (**basal insulin**)
- People with T1D lack the ability to produce insulin to counteract the liver's effects
- People with T2D may not have enough insulin due to insulin resistance
- Long-acting insulins or intermediate-acting insulins serve as a basal or "background insulin"
- In an insulin pump, a regular or rapid-acting insulin can be given continuously to serve as the basal

Everyone with T1D need basal insulin and many with T2D may need it

Sharabi K et al. Mol Aspects Med. 2015; 46:21-22.

Bolus Insulin

- Glucose rises in response to carbohydrates
- A regular or rapid-acting insulin is given as a bolus to prevent the glucose from rising too much
- A regular or rapid-acting insulin can also be given to “correct” or bring down a high glucose

Everyone with T1D needs bolus insulin, some people with T2D may need it to achieve glycemic targets

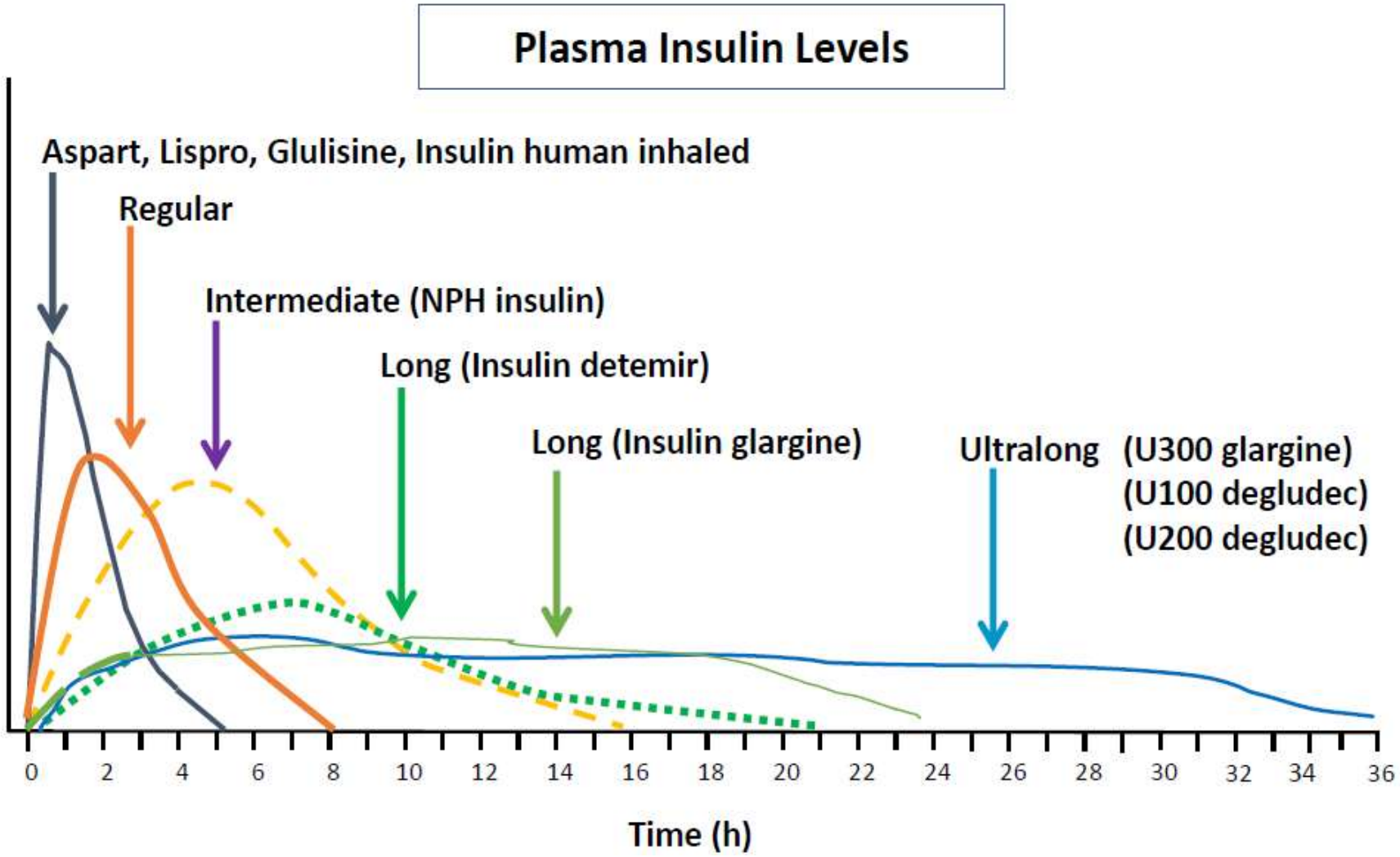
Insulin PocketCard™

Action		Insulin Name	Effective Onset	Effective Peak	Effective Duration	Considerations
Bolus	Very Rapid Acting Analogs	Aspart (Fiasp)	16 - 20 min	1 - 3 hrs	5 - 7 hrs	Bolus insulin lowers after-meal glucose. Post meal BG reflects efficacy. Basal insulin controls BG between meals and nighttime. Fasting BG reflects efficacy. Side effects: hypoglycemia, weight gain. Typical dosing range: 0.5-1.0 units/kg body wt/day. Discard most open vials after 28 days. For pen storage guidelines, see package insert.
		Lispro-aabc (Lyumjev)	15 - 17 min	2 - 3 hrs	5 - 7 hrs	
	Rapid Acting Analogs	Aspart (Novolog / Merilog)	20 - 30 min	1 - 3 hrs	3 - 7 hrs	
		Lispro (Humalog*/ Admelog)	30 min	2 - 3 hrs	5 - 7 hrs	
		Glulisine (Apidra)	15 - 30 min	1 - 3 hrs	3 - 4 hrs	
	Short Acting	Regular*	30 - 60 min	2 - 4 hrs	5 - 8 hrs	
Basal	Intermediate	NPH	2 - 4 hrs	4 - 10 hrs	10 - 16 hrs	
	Long Acting	Glargine (Lantus*/Basaglar/Semglee/Rezvoglar)	2 - 4 hrs	No Peak	20 - 24 hrs	
		Degludec (Tresiba)*	~ 1 hr		< 42 hrs	
Basal + Bolus	Intermediate + short	Combo of NPH + Reg 70/30 = 70% NPH + 30% Reg 50/50 = 50% NPH + 50% Reg	30 - 60 min	Dual peaks	10 - 16 hrs	
	Intermediate + rapid	Novolog® Mix - 70/30 Humalog® Mix - 75/25 or 50/50	5 - 15 min		24 hrs	

Concentrated insulins available - see Concentrated Insulin Card for details. Insulin action times vary; time periods are general guidelines only.

All PocketCard content is for educational purposes only. Please consult prescribing information for detailed guidelines. **© 2/2025**

Insulin Profiles



Hirsch IB. NEJM 2005;352:174-183.
Lexicomp Online, Lexi-Drugs Online, Hudson, Ohio: UpToDate, Inc; 2020; August 21, 2020.

Insulin Concentration

- Most insulin is U100: 100 units/mL
- There is also concentrated insulin
  - U500 insulin, 500 units/mL, U300, 300 units/mL, and U200, 200 units/mL
- Insulin is available in a vial, pen, or cartridge
- U100 insulin:
  - 1 vial =10mL = 1000 units
  - 1 pen =3 mL = 300 units
  - 1 cartridge = 3 mL = 300 units
  - 1 box of pens = 5 pens = 1500 units
- Inhaled insulin
  - 4, 8, 12 units cartridges



Insulin package inserts.

Concentrated and Inhaled Insulin

Concentrated & Inhaled Insulins

Name/Concentration	Insulin/Action	Considerations
Humulin Regular U-500 • 500 units insulin/mL • KwikPen or Vial	Regular Bolus / Basal	Indicated for those taking 200+ units daily. 3 mL pen holds 1,500 units. Max dose 300 units. Once opened, good for 28 days. 20 mL vial holds 10,000 units. Max dose 250 units using U-500 syringe. Once opened, good for 40 days.
Humalog KwikPen U-200 200 units insulin/mL.	Lispro (Humalog) Bolus	3 mL pen holds 600 units. Max dose 60 units. Once opened good for 28 days.
Lyumjev KwikPen U-200 200 units insulin/mL.	Lispro (Lyumjev) Bolus	3 mL pen holds 600 units. Max dose 60 units. Once opened good for 28 days.
Toujeo Solostar U-300 Pen 300 units insulin/mL.	Glargine (Lantus) Basal	1.5 mL pen holds 450 units. Max dose 80 units. 3 mL Max Solostar pen holds 900 units. Max dose 160 units. Once opened good for 56 days.
Tresiba FlexTouch U-200 Pen 200 units insulin/mL.	Degludec (Tresiba) Ultra basal	3 mL pen holds 600 units. Max dose 160 units. Once opened good for 56 days.
All concentrated insulin pens and the U-500 syringe automatically deliver correct dose (in less volume). No conversion, calculation or adjustments required. For example, if order reads 30 units, dial the concentrated pen to 30 units or draw up 30 units on the U-500 syringe. **Important – never withdraw concentrated insulin from the pen using a syringe.**		

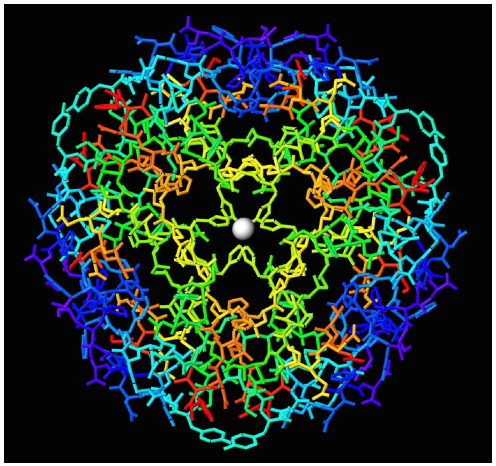
Inhaled Insulins

Action	Insulin Name	Dose Range	Onset	Peak	Duration	Considerations
Bolus – Rapid-acting	Afrezza Inhaled regular human insulin	4, 8, and 12 unit cartridges before meals	~ 12 min	35 - 45 mins	1.5 - 3 hrs	Assess lung function. Avoid in lung disease — bronchospasm risk. Side effects: hypo, cough, throat irritation.

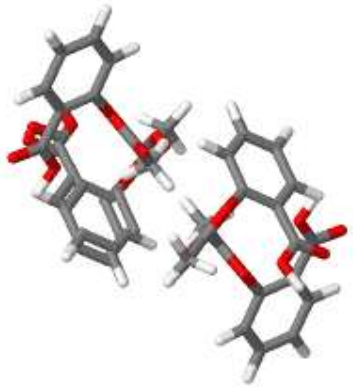
The information listed here are not guidelines. Please consult prescribing information for details. DiabetesEd.net ©2025

Follow-On Insulin & Biosimilars

- These follow-on insulin products require a separate prescription (not directly interchangeable):
  - Insulin glargine (Lantus), follow-on product (Basaglar)
  - Insulin lispro (Humalog), follow-on product (Admelog)
- However, these have demonstrated bioequivalence and are interchangeable with the reference product:
  - Insulin glargine-yfgn (Semglee) interchangeable with Lantus
  - Insulin glargine-aglr (Rezvoglar) interchangeable with Lantus
  - Insulin aspart-szjj (Merilog) interchangeable with Novolog



Insulin – Large Molecule



Aspirin – Small Molecule

Generic Insulins

- Insulin aspart
- Insulin lispro
- Insulin glargine

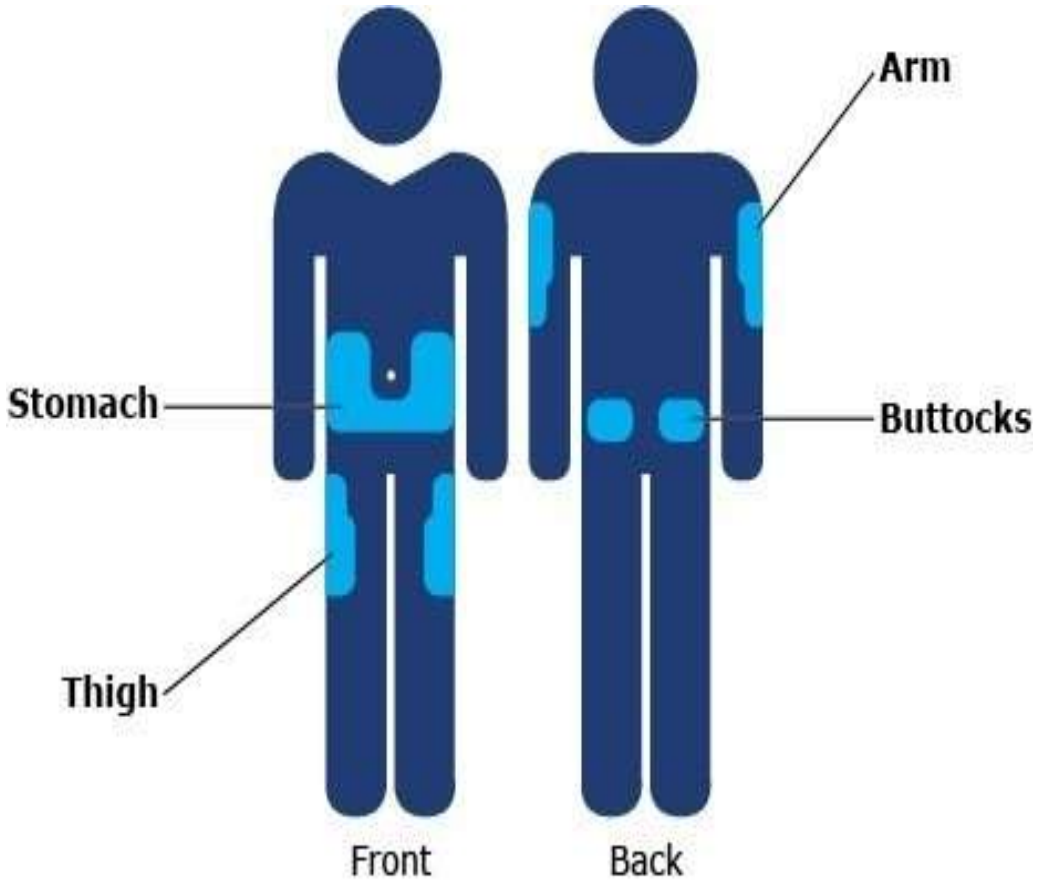


- About half the cost of the brand name
- Exact same formulation, produced by same manufacturer, interchangeable at pharmacy

Which Insulin is Interchangeable with Lantus (Insulin glargine U100)? Poll 1

A. Toujeo (Insulin glargine U300)
B. Basaglar (Insulin glargine U100)
C. Rezvoglar (Insulin glargine U100)
D. Tresiba (Insulin degludec U100)
E. All of the above

Insulin Injection Sites



Sites should be rotated

Insulin Key Counseling Points

- Do not shake insulin
- Cloudy insulin (NPH or pre-mixed) should be rolled before use so suspension is uniform
- Skin thickness is usually 2mm regardless of person's size, so shortest needles (4mm) work well for most
- Take outer and inner covering off for pen needles
- Leave the needle/syringe in the body for 5-10 seconds
- Change needle or syringe with each injection
- Dispose of needles/syringes in a sharps container or per local regulations



Dang DK. Taking medication. In: Cornell S et al, eds. The art and science of diabetes self-management education desk reference. 5th ed.

Priming insulin

- Prime pens before every use to get air bubbles out
- Hold vertically with needle at the top
- Turn dial to 2 units
- Push plunger
- Repeat until insulin comes out of the top
- May have to do multiple times for a new pen
- This will ensure all air is out and that pen needle works
- Do this every time an insulin pen injection is given



Storage Options





Insulin Storage and Expiration Cheat Sheet Available

Insulin Storage and Dispensing Info

Product Name/Type	Expiration when opened, stored at room temp up to 86 F	Pens per Box Or Vial	Units per Pen/Vial	Max Dose / Notes
Rapid Acting Insulins				
Aspart (Fiasp) -Vial -Pen -Pump	 28 Days 28 Days 6 Days	 1 Vial 5 Pens per Box	 1000 units 300 units in 3 mL	 80 Units
Aspart (Novolog) -Vial -Cartridge -Flexpen - Pump	 28 Days 28 Days 28 Days 6 Days	 1 Vial 5 cartridges 5 Pens per Box	 1000 units 300 units in 3 mL 300 units in 3 mL	 60 Units
Glulisine (Apidra) -Vial -SoloStar Pen -Pump	 28 Days 28 Days 2 Days	 1 Vial 5 Pens per Box	 1000 units 300 units in 3 mL	 80 Units
Lispro (Humalog/Admelog) -Vial -Cartridge -Pen -Pump	 28 Days 28 Days 28 days Up to 7 Days	 1 Vial 5 cartridges 5 Pens per Box	 1000 units 300 units in 3mL 300 units in 3mL	 80 Units (Admelog) 60 Units (Humalog)
Lispro -aabc (Lyumjev) - Vial -Cartridge -KwikPen	 28 Days 28 Days 28 days	 1 Vial 5 cartridges 5 Pens per box	 1000 units 300 units in 3mL 300 units in 3mL	 60 units

Side Effects of Insulin

Weight Gain

Lipodystrophy/
Lipohypertrophy

Hypoglycemia



Dang DK. Taking medication. In: Cornell S et al, eds. The art and science of diabetes self-management education desk reference. 4th ed.

Sharps Disposal: Product and Info







- Search for household hazardous waste listing for your city or county.
- Call 1-800-CLEANUP (1-800-253-2687)

Polling Question 2

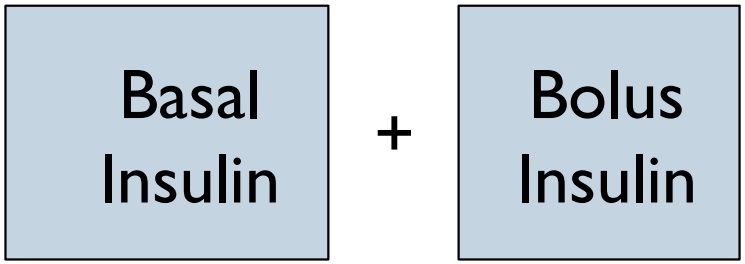
- After how many days should an open vial of insulin degludec be discarded?

A. 28 days
B. 30 days
C. 42 days
D. 56 days

How to Dose Insulin

Type 1 Diabetes (T1D)

- Absolute deficiency in endogenous insulin
- Exogenous insulin is required
- The regimen should include:

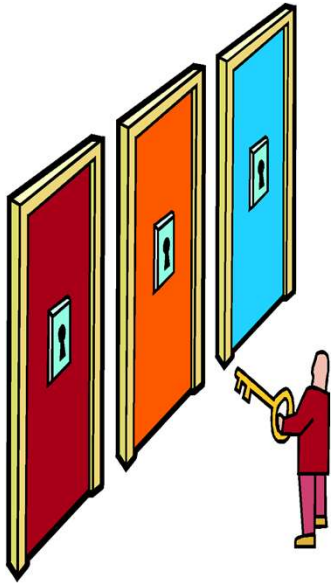


How to Dose Insulin? T1D

- Newly diagnosed T1D
  - Total insulin dose: 0.5-1.0 units/kg/day
  - 50% basal
  - 50% bolus
- Bolus can initially start with set doses or calculations can be used to determine initial carbohydrate ratio and correction factor

Pamagluapatai LG et al. In: Cornell S et al., Pharmacolotherapy for Glucose Management. The art and science of diabetes self-management education desk reference. 5th ed.

Choice of Basal Insulin



1. NPH

2. Glargine U-100

3. Delgudec U-100, Degludec U-200, Glargine U-300

Lowest cost

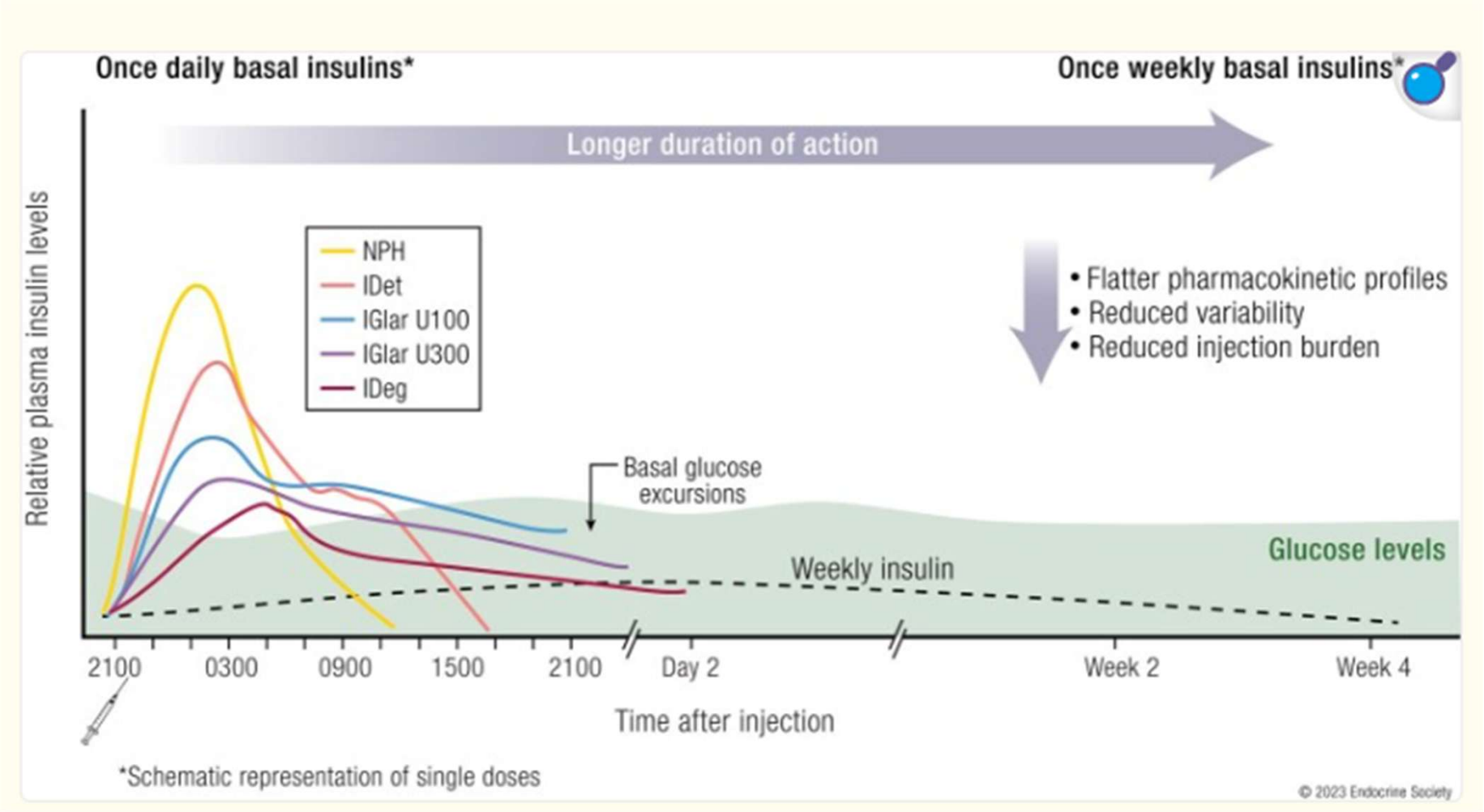
1. Shortest duration, 2. Medium duration, 3. Longest duration

Weekly Insulins

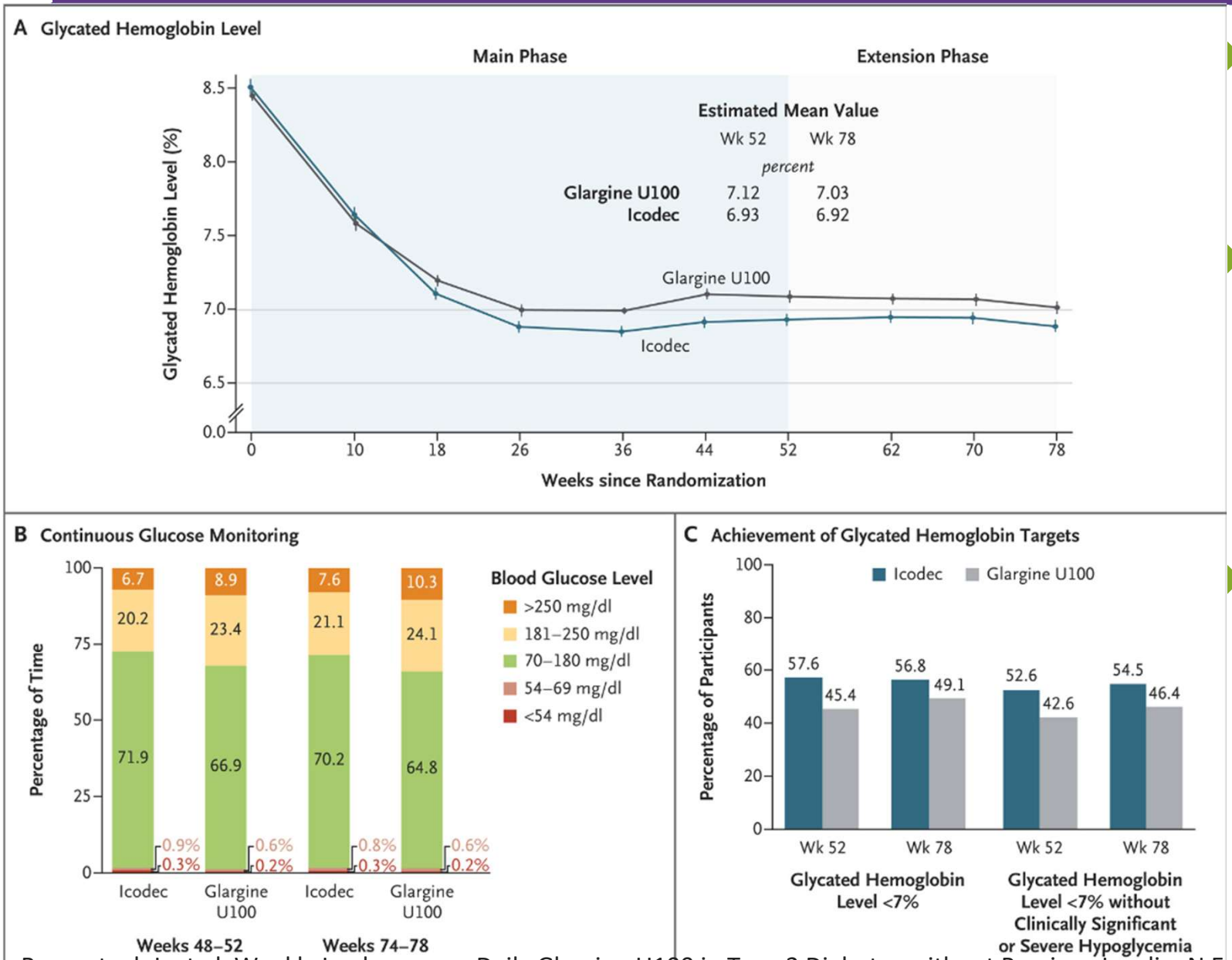
- Awiqli® (once-weekly basal insulin icodec) approved for use in the EU
- Half-life: 196 hours ~8 days
- U700 insulin, 3mL pen = 2100 units/pen
- 70 units icodec weekly = 10 units glargine daily
- Efsitora alfa is also a weekly insulin
  - 17 day half-life
- Both have flatter insulin profiles compared to daily insulin

Rosenstock J, et al. Weekly Icodec versus Daily Glargine U100 in Type 2 Diabetes without Previous Insulin. N Engl J Med. 2023 Jul 27;389(4):297-308.
In a first-of-its-kind fixed dose study, once weekly insulin efsitora alfa leads to A1C reduction similar to daily insulin | Eli Lilly and Company

Weekly Insulins vs Standard Insulins



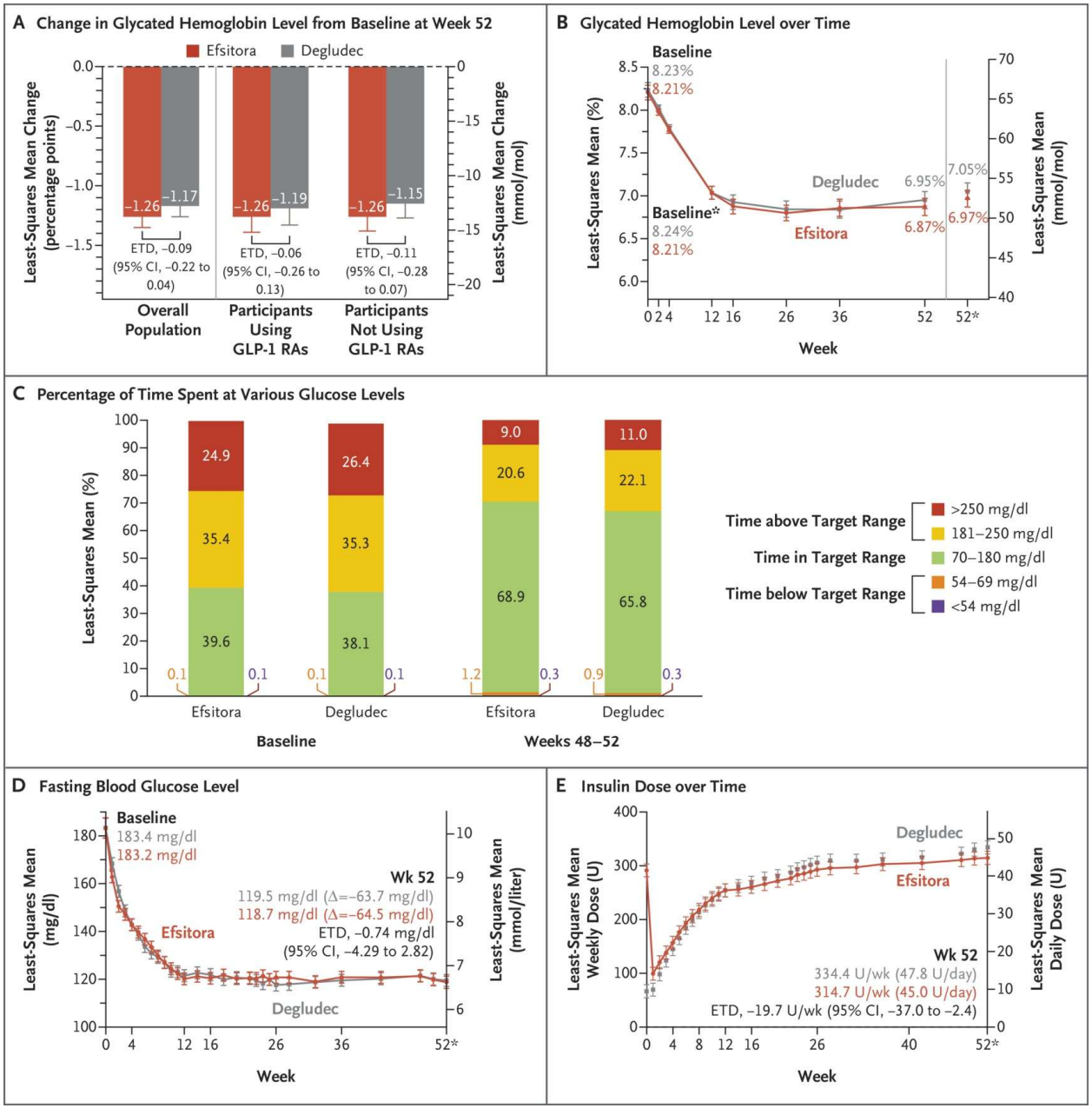
Glargine vs. Icodec in T2D



- 492 pts in each group
- Primary outcome: change in A1C
- Conclusion: glycemic control better with icodec

Rosenstock J, et al. Weekly Icodec versus Daily Glargine U100 in Type 2 Diabetes without Previous Insulin. N Engl J Med. 2023 Jul 27;389(4):297-308.

Degludec vs. Efsitora in T2D



- 928 pts
- Primary outcome: change in A1C
- Efsitora non-inferior

Choice of Bolus Insulin



1. Regular — Lowest Cost
2. Lispro (Humalog®, Admelog®); Aspart (Novolog®, Merilog)
3. Glulisine (Apidra®); Aspart (Fiasp®); Lispro (Lyumjev®)
4. Inhaled insulin (Afrezza)

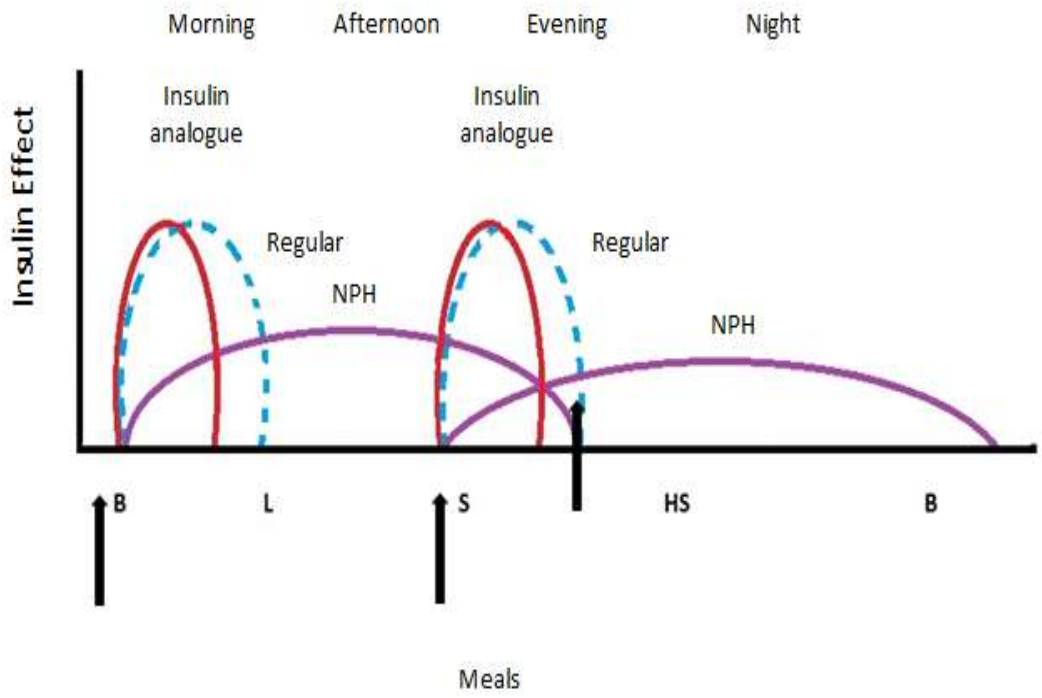
1. Slowest, 2. Medium, 3. Quicker 4. Quickest

T1D: Insulin Dosing Regimens

Time of Insulin Administration	Before breakfast	Before lunch	Before dinner	Bedtime
Method 1	Intermediate: Regular (2/3 TDD) 2:1 ratio		Intermediate: Regular (1/3 TDD) 2:1 ratio	
Method 2	Regular/ analog (1/2 TDD ÷ by 3)	Regular/ analog (1/2 TDD ÷ by 3)	Regular/ analog (1/2 TDD ÷ by 3)	Long-acting (1/2 TDD)

***These are starting regimens and are adjusted based on ability to carbohydrate count and glycemic management as determined by A1C, BGM and/or CGM

Intermediate-acting Insulin + Regular Insulin or Insulin Analog

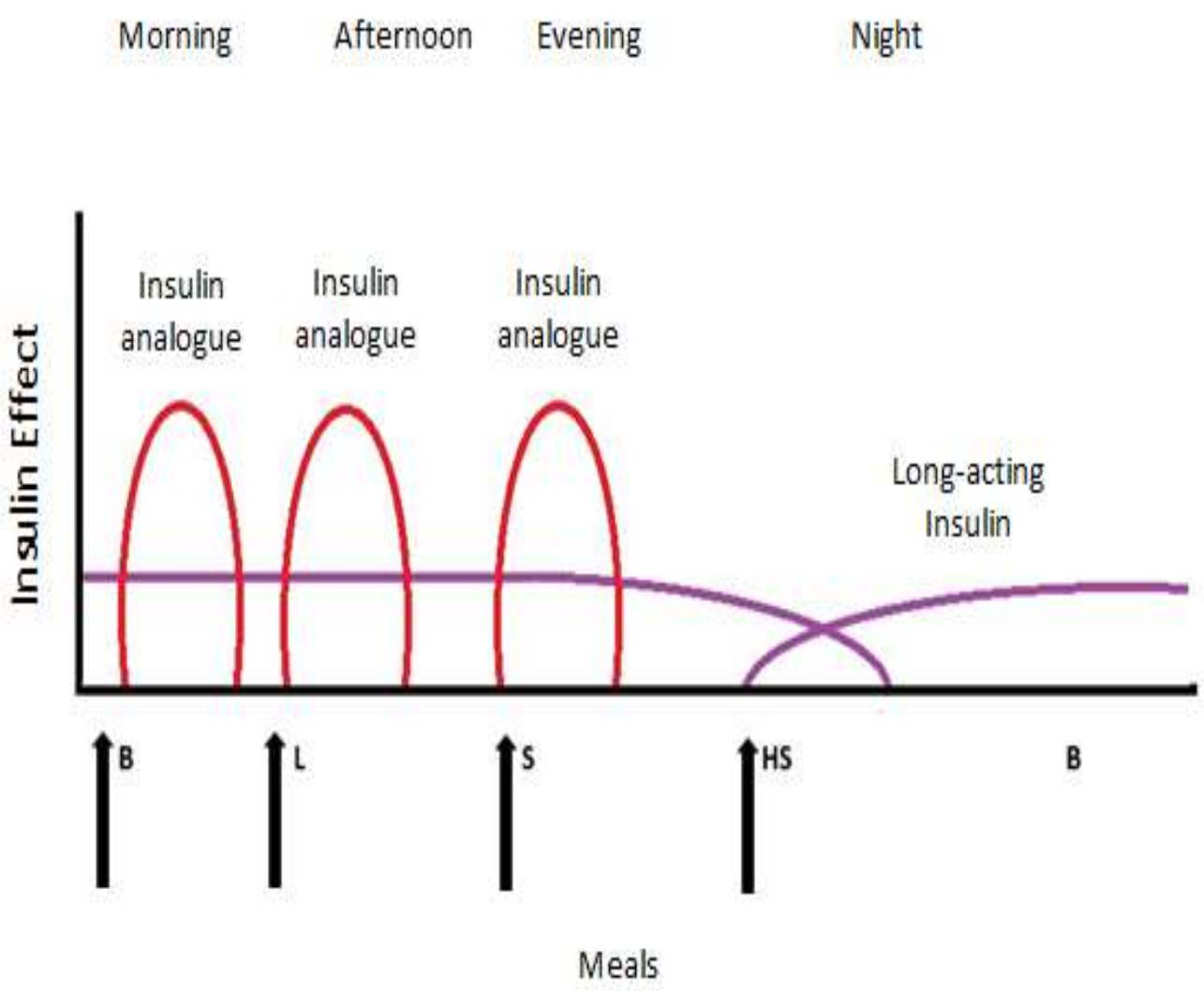


Intermediate insulin serves as basal while regular or insulin analog serves as bolus

Regular insulin: Novolin R, Humulin R
Intermediate insulin: Novolin N, Humulin N
Insulin analogue: aspart, lispro, glulisine

Dipiro JT et al, eds. Pharmacotherapy: a pathophysiologic approach. 11th ed. 2020.

Long-acting Insulin with Insulin analog



Long-acting serves as basal insulin analog serves as bolus

Carbohydrate Ratio

- Insulin to carbohydrate ratio (ICR)
  - 1 unit of insulin is expected to cover X grams of carbohydrates
- Rule of 450 or 500 can be used
  - 450/TDD = estimated carbohydrate ratio

Trujillo J et al. Diabetes mellitus. In: Dipiro JT et al., eds. Pharmacotherapy: a pathophysiologic approach. 11th ed.

Correction Factor

- Insulin correction factor (ICF)
  - Also known as insulin sensitivity factor (ISF)
  - 1 unit of insulin is expected to lower glucose by Y points
- Rule of 1700 or 1800 can be used
  - 1800/TDD = estimated ICF
- For regular insulin, the rule of 1500 is typically used

Trujillo J et al. Diabetes mellitus. In: Dipiro JT et al., eds. Pharmacotherapy: a pathophysiologic approach. 11th ed.

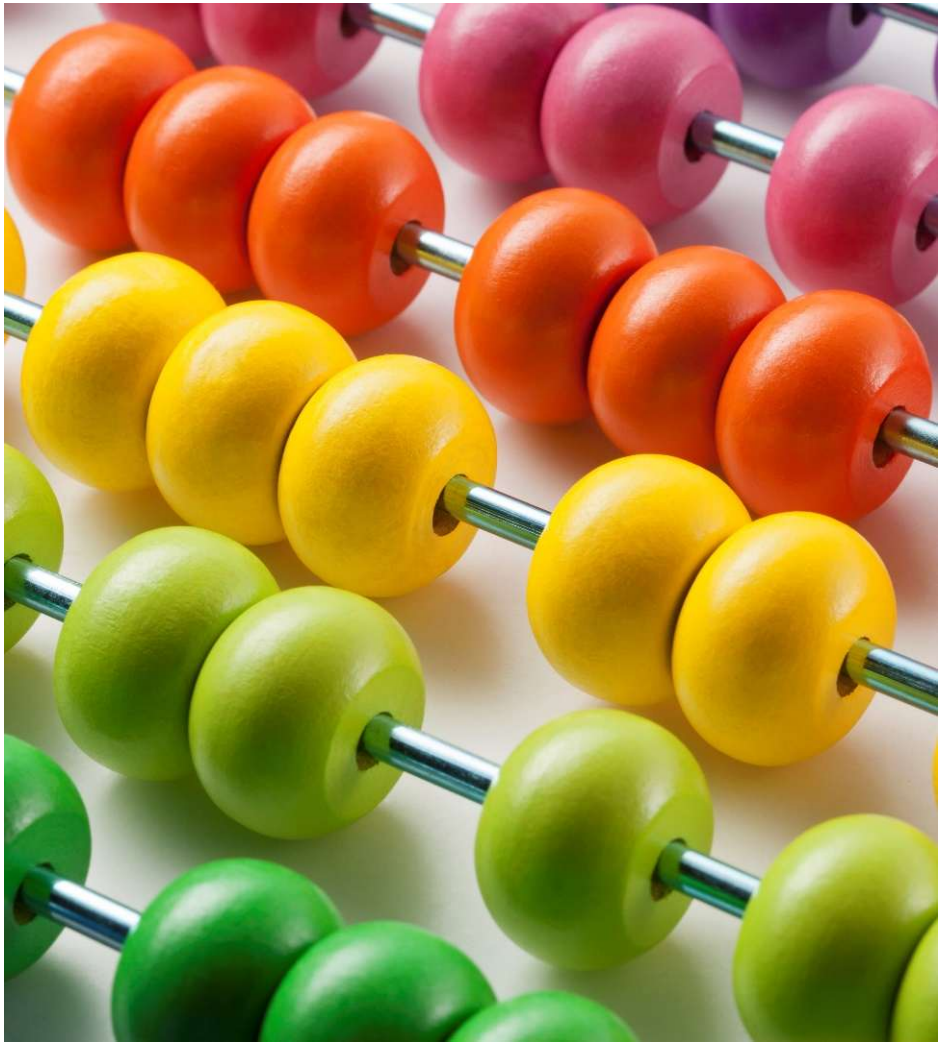
An Example: Meet Austin

- Austin is a 12-year-old newly diagnosed with T1D, he weighs 40kg
- He is started on 0.5 units/kg/day of total insulin
  - 40*0.5=20 units
  - 50% basal=10 units
  - 50% bolus=10 units
- Austin is prescribed 10 units of long-acting insulin and 3 units of rapid-acting insulin at meals
- The insulin doses will be adjusted based on glucose data

Austin Calculation cont'd

- Austin is ready for carbohydrate counting

- Based on the rule of 500 and rule of 1800, what should his ICR and ICF be?



Poll Question 3

- Based on the rule of 500 and rule of 1800, what should Austin's ICR and ICF be? (TDD=20 units/day)

A. ICR=25, ISF=90
B. ICR=20, ISF=60
C. ICR=15, ISF=50
D. ICR=30, ISF=75
E. I am not sure

Answer and Explanation

- ICR=500/20=25
  - This means that 1 unit of insulin covers 25 grams of carbohydrate
  - If Austin eats 50 grams of carbohydrate, he should inject 2 units
- ISF=1800/20=90
  - This means that 1 unit of insulin is expected to lower glucose by 90 mg/dL
  - Austin's glucose target is 100
  - If his current glucose is 190, he should take 1 extra unit of insulin

Correction Scale 1

Rapid/Fast Acting Insulin (1 unit:50 mg/dl>150)

Less than 70	Subtract 1 unit
70-150 mg/dl	0 units
151-200 mg/dl	1 unit
201-250 mg/dl	2 units
251-300 mg/dl	3 units
301-350 mg/dl	4 units
351-400 mg/dl	5 units

Correction Scale 2

Rapid/Fast Acting Insulin (2 units:50 mg/dl>150)

Less than 70	Subtract 1 unit
70-150 mg/dl	0 units
151-200 mg/dl	2 unit
201-250 mg/dl	4 units
251-300 mg/dl	6 units
301-350 mg/dl	8 units
351-400 mg/dl	10 units

DI1

Poll Question 4

- How much insulin would you start on a a child with T1D that weighs 65lbs?
  A. 10 units/day
  B. 15 units/day
  C. 30 units/day
  D. 40 units/day



DI1 Changed the question.
Diana Isaacs, 2025-08-25T18:37:23.982

DI1

Inhaled Insulin (Afrezza)



- **FDA approved for adults over 18yo**
- **Not indicated kids or during pregnancy**
- **Comes in 4, 8 and 12 units cartridges**

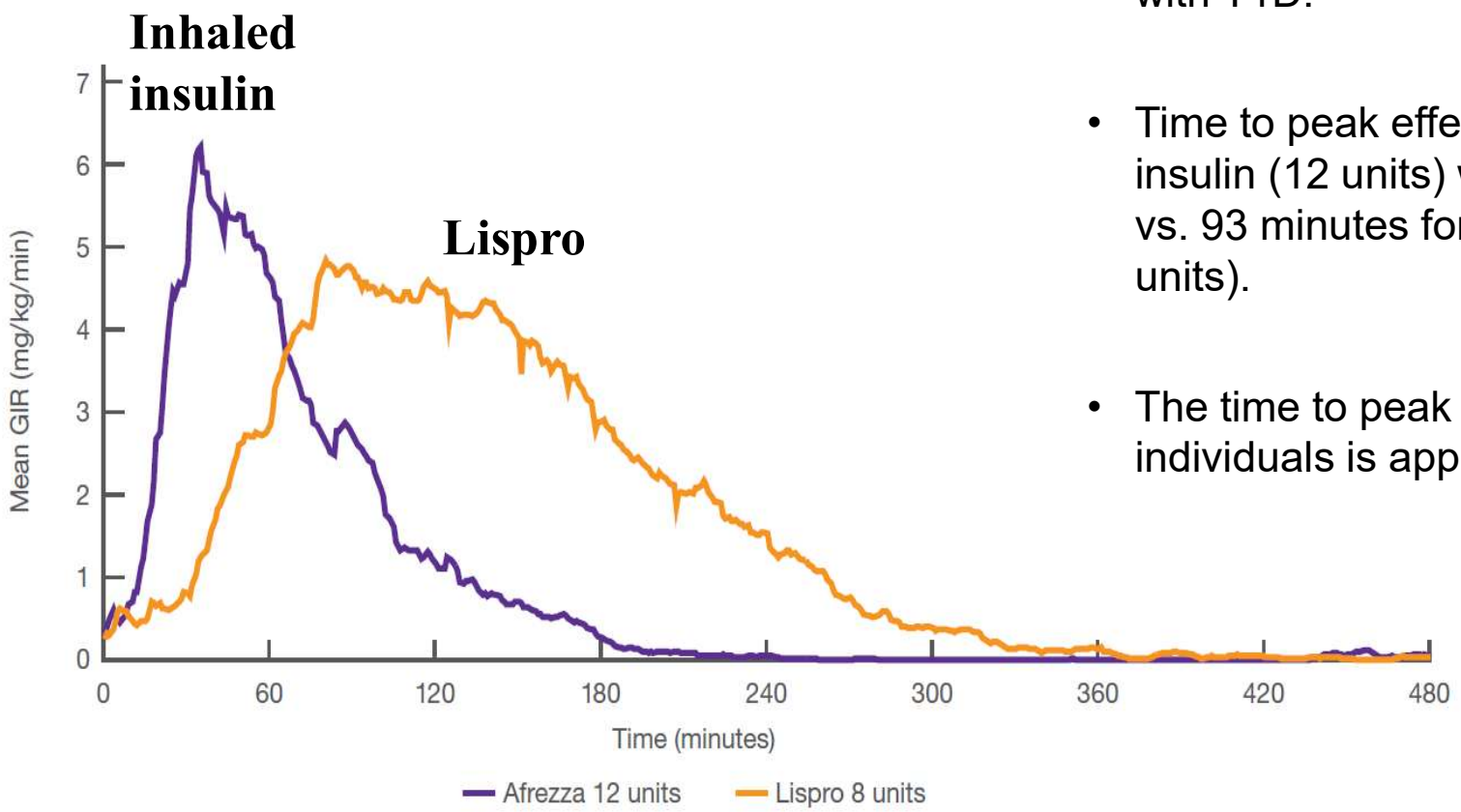
Injected Meal Time Dose	Inhaled Insulin Dose
Up to 4 units	4 units
5-8 units	8 units
9-12 units	12 units
12-16 units	16 units
17-20 units	20 units
21-24 units	24 units

Slide 49

DI1 Modified slightly.
Diana Isaacs, 2025-08-25T18:38:44.263

DI1

Inhaled Insulin Vs. Insulin lispro



- Clinical trial comparing inhaled insulin to insulin lispro in 30 people with T1D.
- Time to peak effect for inhaled insulin (12 units) was 42 minutes vs. 93 minutes for insulin lispro (8 units).
- The time to peak effect in healthy individuals is approx 45 minutes.

1. .
Grant M, Heise T, Baughman R. *Clin Pharmacokinet*. 2022;61(3):413-422.
Caumo A, Bergman RN, Cobelli C. *J Clin Endocrinol Metab.* 2000;85(11):4396-4402.
Afrezza (insulin human) Inhalation Powder Prescribing Information. MannKind Corporation.

Slide 50

DI1 New slide

Diana Isaacs, 2025-08-25T18:43:53.457

DI1

Inhaled Insulin: Time to Effect

	Insulin in Healthy Individuals	Inhaled Insulin	Injectable Insulin
Onset (minutes	10	12	17-30
Peak effect (minutes)	45	45	90-120
Back to baseline (minutes)	210	180	275-320

- Time to reach peak effect for inhaled insulin is 45 minutes versus 90-120 minutes with injectable insulin
- Time for insulin effect to return to baseline for inhaled is 180 minutes vs. 275-320 minutes for injectable insulin

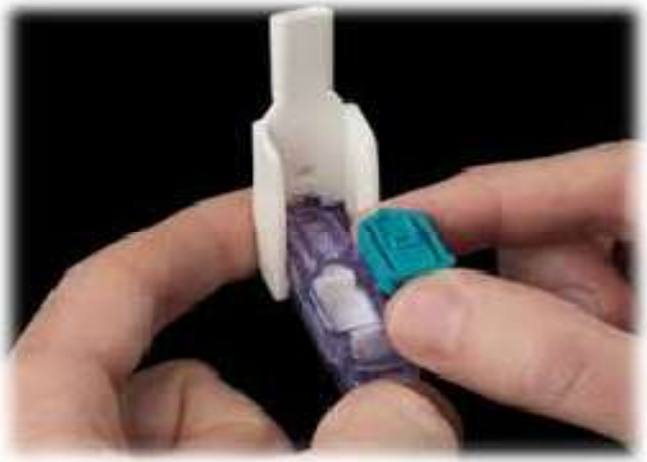
1.Afrezza (insulin human) Inhalation Powder Prescribing Information. MannKind Corporation.

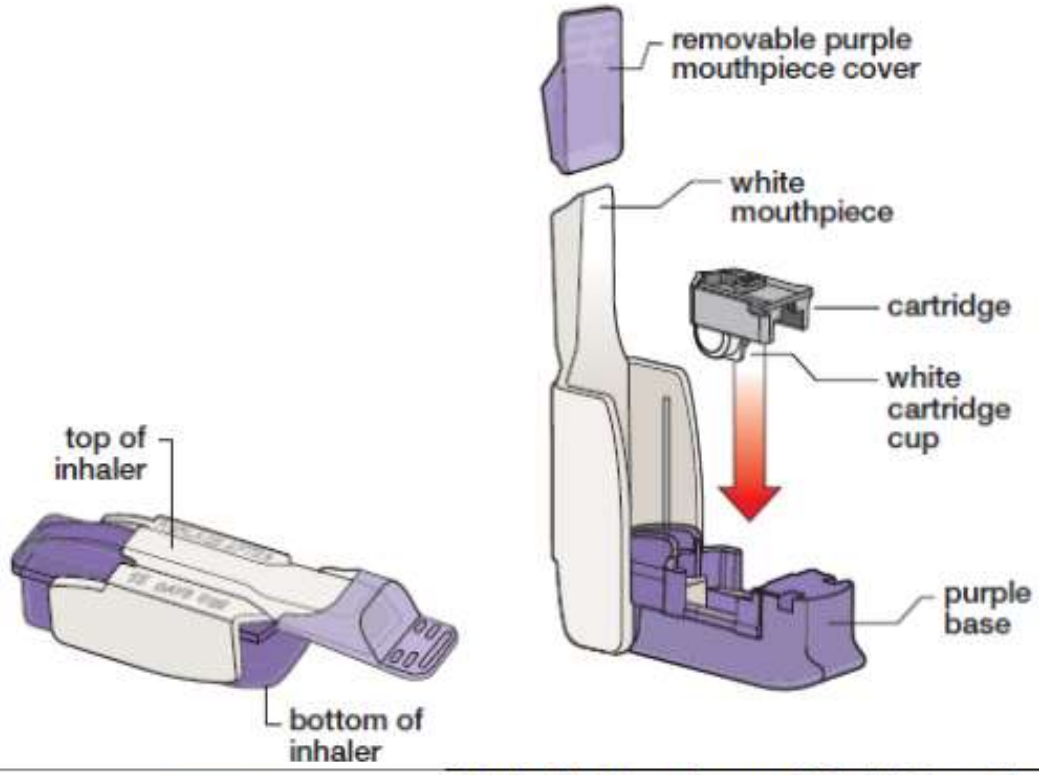
Slide 51

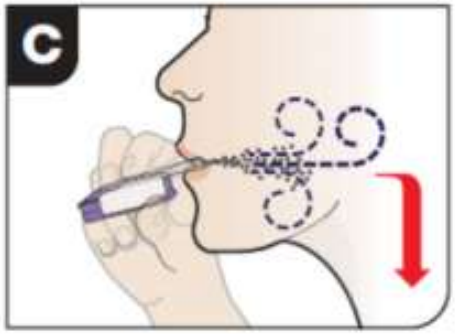
DI1 New slide

Diana Isaacs, 2025-08-25T18:45:27.161

Inhaled Insulin







Inhale Deeply and Hold Breath

With your mouth closed around the mouthpiece, **inhale deeply through the inhaler**.

Hold your breath for as long as comfortable and at the same time remove the inhaler from your mouth. After holding your breath, exhale and continue to breathe normally.

DI1

Inhaled Insulin Storage

SEALED BLISTER CARDS + STRIPS	Room Temperature
	Must be used **within 10 days**
OPENED STRIPS	Room Temperature
	Must be used **within 3 days**

- Opened inhaler: use in 15 days
- Sealed foil packages: refrigerate until expiration date on package
- Sealed blister card strips: room temp-use within 10 days, fridge-30 days
- Opened strips: room temperature, use within 3 days
- Before using, inhaler and strips should be at room temperature for at least 10 minutes

Storage-and-Handling-with-ISI-Afrezza-Assist-Update.pdf

Slide 53

DI1 Updated link

Diana Isaacs, 2025-08-25T18:48:13.130

DI1

Inhaled Insulin Dosing and Counseling

- Bolus insulin – inhaled at meals
- Usually requires 2-3x injected dose
- May inhale more 1-2 hours after a meal as needed
- Use with a basal insulin
- Lung function test before start (FEV1)
  - Not for those w/ chronic lung issues
    - Asthma, COPD, history of lung cancer, smoking within past 6 months
    - Can cause acute bronchospasm – Black box warning
- Side effects:
  - Sore throat, cough
  - Less hypoglycemia than injected insulin

Inhaled Insulin Tip Sheet - DiabetesSisters

Slide 54

DI1 updated

Diana Isaacs, 2025-08-25T18:51:37.858

Bolus Insulin Timing



- How is the effectiveness of bolus insulin determined?
  - 1-2 hours post meal
  - Before next meal blood glucose

- Glucose goals (may be modified based on pt specific factors)
  - 1-2 hours peak post meal <180 mg/dL (ADA)
  - 2 hour post meal <140 mg/dL (AACE)
  - Before next meal 80 – 130 mg/dL

Poll Question 5



- Mary takes 4 units of insulin lispro before breakfast. Which BG result reflects that the dose was the right dose?

1. Before breakfast BG of 97
2. 1 hour post lunch BG of 160
3. Before lunch BG of 94
4. 2 hour post breakfast BG of 185

U500 Insulin

More than 200 units a day?

DRUG NAME	AVAILABILITY	PEN UNITS	EXPIRATION	ONSET	PEAK EFFECT	DURATION OF ACTION	CLINICAL PEARLS
INSULIN HUMAN REGULAR (HUMULIN R U500)	Pen, Vial	5 unit	Vial: 40 days Pen: 28 days	0.25-0.5 hours	4-8 hr	13-24 hr	This insulin is 5 time as concentrated. If using a vial, use the special U500 syringe.

DailyMed: https://dailymed.nlm.nih.gov/dailymed/index.cfm

Stahnke AM et al. ADCES in Practice. March, 2020. https://doi.org/10.1177/2633559X20896414

Switching to u500 insulin

- Typically reserved for people requiring insulin >200 units/day
- U500 acts like an intermediate acting insulin but replaces both the basal and bolus doses
  - If A1C< 8%, recommend to reduce TDD by 10-20%
  - If A1C≥ 8%, consider 1:1 conversion
- Typically dosed 2-3 times daily
- Take 30 minutes prior to meals
- Often initiated as a 60/40 or 40/30/30 split

Reid TS, et al. Postgrad Med. 2017;129(5):554-562.

DI1

U500 Example: Let's Practice

- A woman with obesity, T2D, and insulin resistance takes insulin glargine 120 units BID and insulin aspart 60 units TID a.c. Her most recent A1C=9%. How would she switch to U500?
  - Will it be a 1:1 conversation or dose reduce?
  - How to split: 60/60 or 40/30/30?

- New Dose:
  - Must round to nearest 5 unit increment

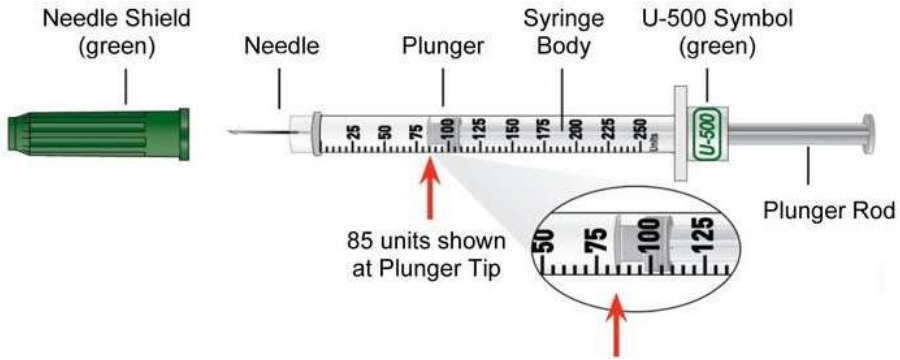
Reid TS, et al. Postgrad Med. 2017;129(5):554-562.

Slide 60

DI1 New slide for practice.
Diana Isaacs, 2025-08-25T18:59:34.076

U500 Example: Answer

- A woman with obesity, T2D, and insulin resistance takes insulin glargine 120 units BID and insulin aspart 60 units TID a.c. Her most recent A1C=9%. How would she switch to U500?
  - 1:1 conversion since A1C $\geq$ 8%
  - TDD=180+240=420 units split as 40/30/30
- New Dose:
  - U500 165 units QAM, 125 units at lunch, 125 units at dinner
  - Must round to nearest 5 unit increment
  - Inject 30 minutes before each meal
  - Use U500 syringe or U500 pen
  - Do not use U100 syringes!



Reid TS, et al. Postgrad Med. 2017;129(5):554-562.

Barriers to Insulin Use

Poll Question 6

- AJ tells you she doesn't want to start on insulin. What is your best response?



a. The needles are so small, you won’t even feel it.

b. Lots of people are afraid of insulin.

c. It sounds like you are refusing to take insulin?

d. I’m sorry, but there is a doctors' order to start insulin.

e. What concerns do you have about taking insulin?

Psychological Insulin Resistance (PIR)

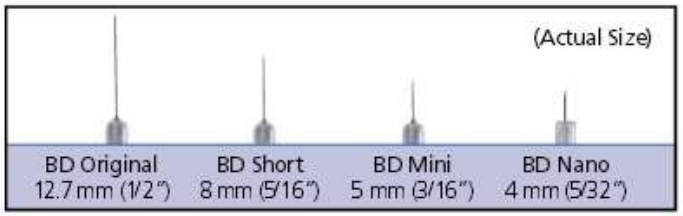
- 50% of providers in study threatened pts “with the needle”.
- Less than 50% of providers realized insulins’ positive effect on T2D
- Most pts don’t believe that insulin would “better help them manage their diabetes”.
- Solutions: Find the root of PIR and address it



Diabetes Attitudes, Wishes, Needs Study - Rubin

Needle Size often a Barrier: Size Matters

- Use shortest needles – 4 mm
- Effective for almost ALL patients
- Keeps it subq
- If thin, inject at angle



BD Nano 4mm and BD Mini 5mm only available in pen needles

- To avoid leakage, count to 10 before withdrawing needle
- For needle phobias, consider insulin pumps, patches, iport, and/or inhaled insulin

Question Time

Break for Questions



How To's of Adding Insulin in Type 2 DM

DI1

1st Injectable: GLP-1 if Possible

In adults with T2D and no evidence of insulin deficiency, a GLP-1RA, including a dual GIP and GLP-1 RA, is preferred to insulin (A)



ADA SOC 2025

STANDARDS OF CARE | DECEMBER 09 2024

9. Pharmacologic Approaches to Glycemic Treatment: Standards of Care in Diabetes—2025 FREE

American Diabetes Association Professional Practice Committee

Slide 68

DI1 New slide

Diana Isaacs, 2025-08-25T19:39:49.127

DI1

Insulin + GLP-1? YES!

- If insulin is used, combination therapy with a GLP-1RA or GIP/GLP-1RA, is recommended for greater glycemic effectiveness and beneficial effects on weight and hypoglycemia risk
- In adults with T2D who are initiating insulin therapy, continue glucose-lowering agents (unless contraindicated or not tolerated) for ongoing glycemic and metabolic benefits (i.e., weight, cardiometabolic, or kidney benefits).



STANDARDS OF CARE | DECEMBER 09 2024

9. Pharmacologic Approaches to Glycemic Treatment: Standards of Care in Diabetes—2025 FREE

American Diabetes Association Professional Practice Committee

Slide 69

DI1 New slide

Diana Isaacs, 2025-08-25T20:00:36.010

Intensifying Injectable Therapy – Type 2

- Consider GLP-1 in most individuals prior to insulin

STANDARDS OF CARE | DECEMBER 09 2024

9. Pharmacologic Approaches to Glycemic Treatment: Standards of Care in Diabetes—2025 FREE

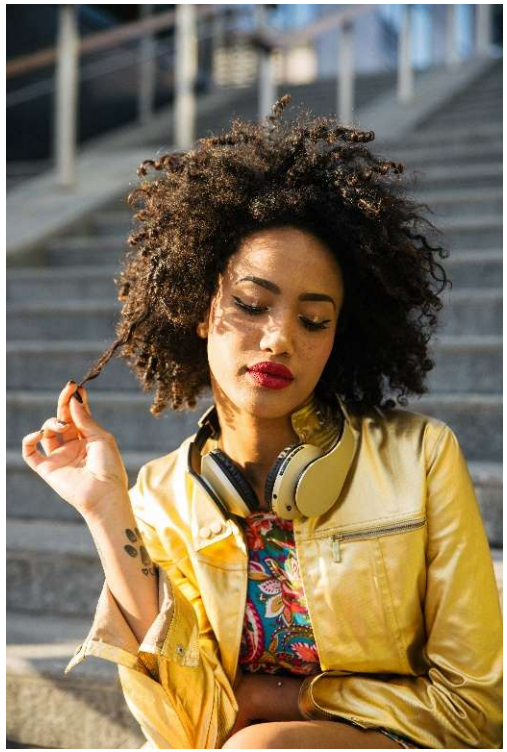
American Diabetes Association Professional Practice Committee

- Start basal insulin 10 units or 0.1 to 0.2 units/kg day
  - Titrate up 2 units every 3 days, until FBG at goal
  - If hypo, decrease basal insulin 10-20%
- Adding bolus
  - Start with 4 units or 10% basal before largest meal or meal with highest PPG
  - Consider decrease of basal by 10% or 4 units (if A1C<8%)



Overbasalization -2025 Update

- Clinical signals of overbasalization include:
  - high bedtime-to-morning or preprandial-to-postprandial glucose differential
    - (e.g., bedtime-to-morning glucose differential ≥50 mg/dL),
  - hypoglycemia (aware or unaware)
  - high glucose variability
- Evidence of overbasalization should prompt reevaluation of the glucose-lowering treatment plan to better address postprandial hyperglycemia

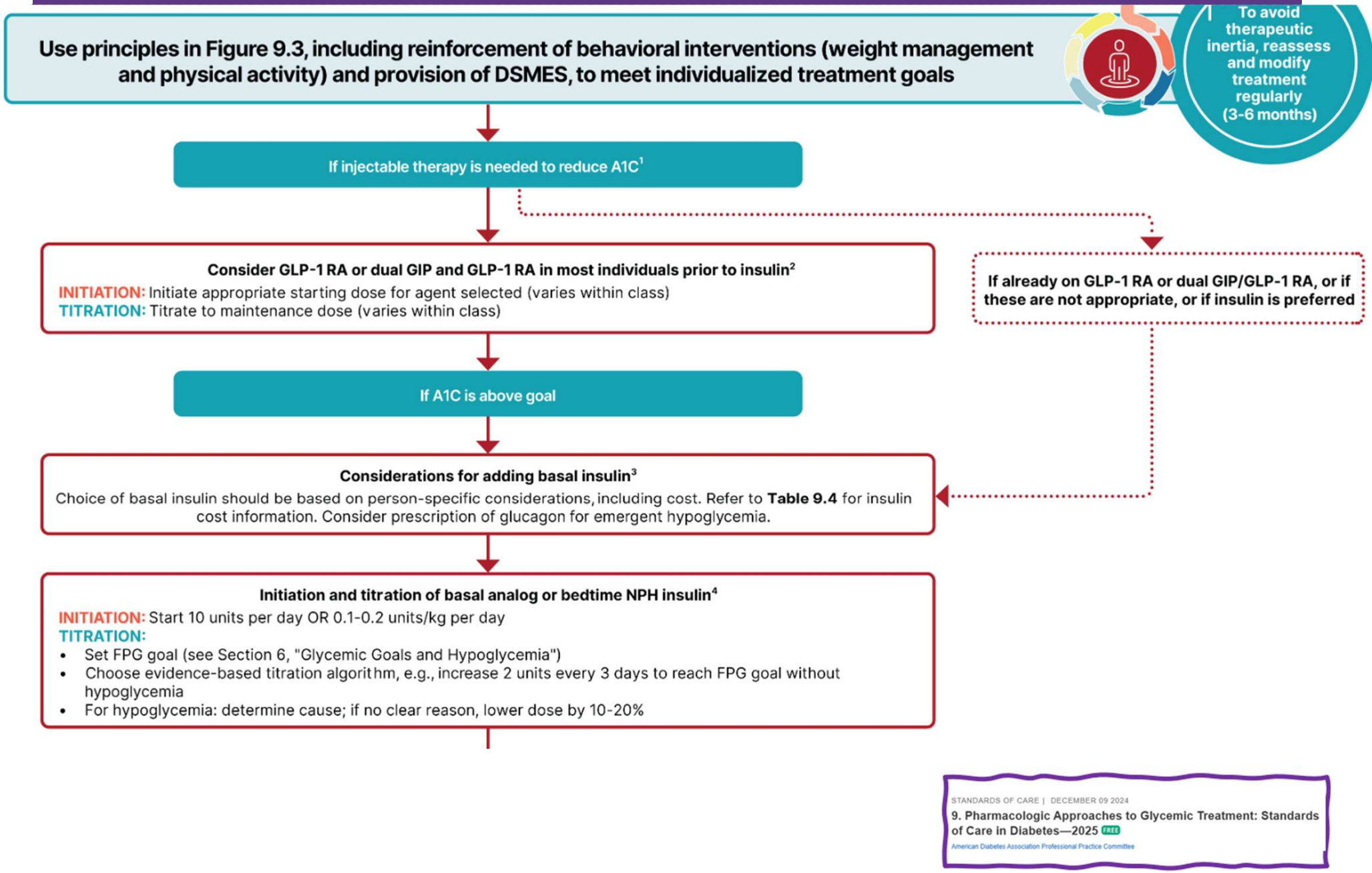


STANDARDS OF CARE | DECEMBER 09 2024

9. Pharmacologic Approaches to Glycemic Treatment: Standards of Care in Diabetes—2025 FREE

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Figure 9.4 ADA Insulin Algorithm

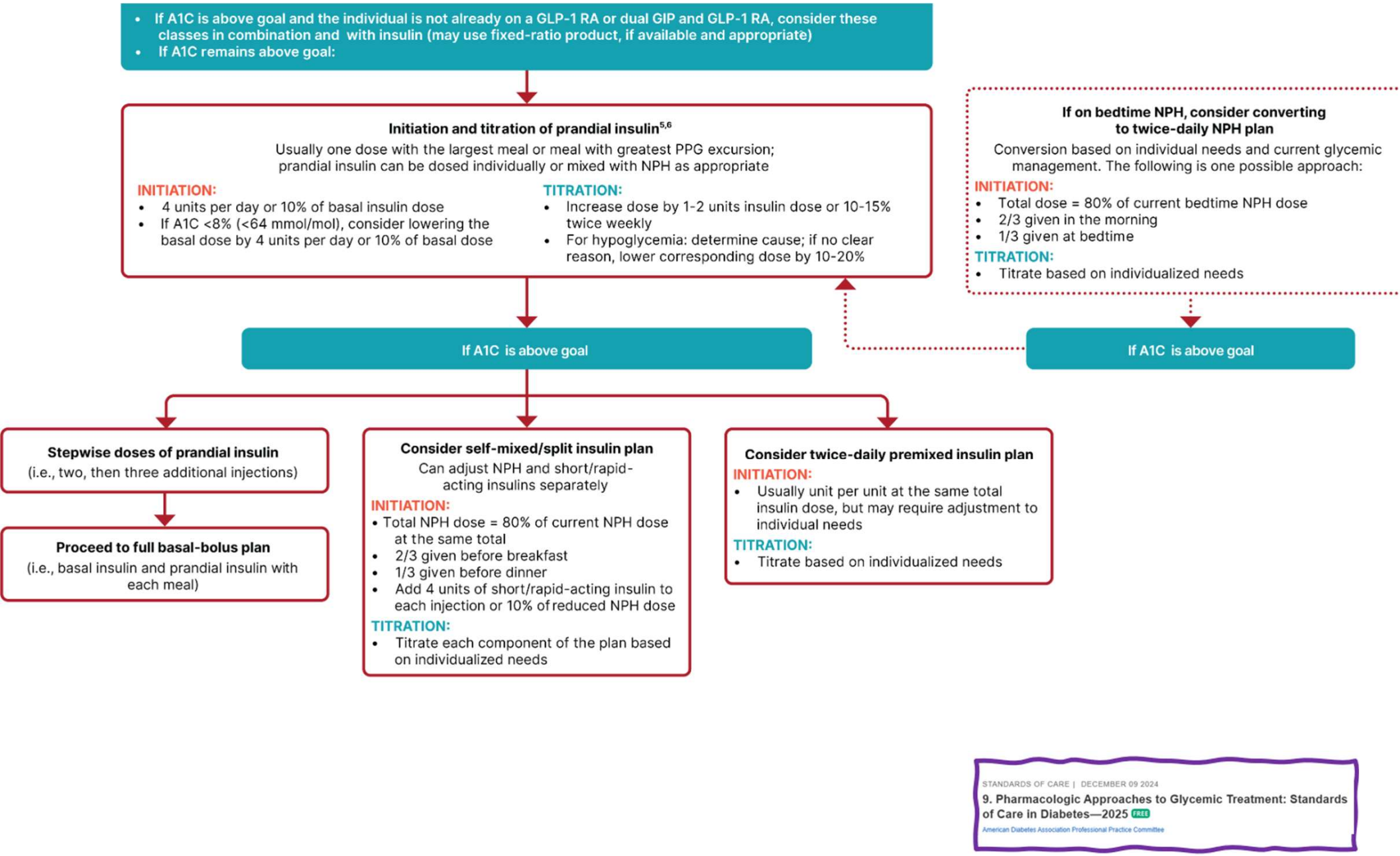


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Figure 9.4—Continued



STANDARDS OF CARE | DECEMBER 09 2024

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Intensifying Injectable Footnotes 9.4

- Consider insulin as the first injectable if evidence of ongoing catabolism A1C levels (>10%) or BG levels ≥300mg/dL or a diagnosis of T1D is a possibility.
- For those on GLP-1RA and basal insulin combination, consider using a fixed-ratio combination product (iDegLira or iGlarLixi).
- Consider switching from evening NPH to a basal analog if there is hypoglycemia and/or the individual frequently forgets to administer NPH in the evening.
  - An AM dose of a long-acting basal insulin could be a better choice.
- Consider dosing NPH in the morning for steroid-induced hyperglycemia
- If adding prandial insulin to NPH, consider initiation of a self-mixed or premixed insulin regimen to decrease number of injections.



Slide 74

DI1 Updated.
Diana Isaacs, 2025-08-25T19:50:11.959

Insulin/Injectable Combos

Name	Combines	Considerations
IDegLira* Xultophy 100/3.6	Insulin degludec (IDeg or Tresiba) Ultra long insulin + Liraglutide (Victoza) GLP-1 Receptor Agonist (GLP-1 RA)	**Xultophy 100/3.6 pre-filled pen** = 100 units IDeg / 3.6 mg liraglutide per mL Once daily injection – Dose range 10 to 50 = 10 – 50 units IDeg + 0.36 -1.8 mg liraglutide **Recommended starting dose:** • 16 IDegLira (= 16 units IDeg + 0.58 mg liraglutide) Titrate dose up or down by 2 units every 3-4 days to reach target. Supplied in package of five single-use 3mL pens. Once opened, good for 21 days.
iGlarLixi* Soliqua 100/33	Insulin glargine (Lantus) Basal Insulin + Lixisenatide (Adlyxin) GLP-1 Receptor Agonist	**Soliqua 100/33 Solostar Pen** = 100 units glargine / 33 µg lixisenatide per mL Once daily injection an hour prior to first meal of day. Dose range 15 – 60 = 15-60 units glargine + 5 – 20µg lixisenatide **Recommended starting dose:** • 15 units if not meeting glucose target on 30 units basal insulin or GLP-1 RA • 30 units if not meeting glucose target on 30-60 units basal insulin or GLP-1 RA Titrate dose up or down by 2-4 units every week to reach target. Supplied in package of five single-use 3mL pens. Once opened, good for 14 days.

***Discontinue basal insulin /GLP-1 RA therapy before starting. If dose missed, resume with next usual scheduled dose.**

Observe precautions of each component drug.

DiabetesEd.net © 2025

Case Study: Jenny

Jenny is a 50-year-old woman that takes insulin glargine 100 units daily, glipizide 10mg BID, metformin 1000mg BID, and linagliptin 5mg daily. A1C is 8.5%. She weighs 110kg. She checks glucose in the AM only and reports it's 80-110mg/dL with no symptoms of hypoglycemia. Her eGFR is 70 and BMI=34kg/m2. She previously had UTI's with empagliflozin.

DI

What concerns do you have for Jenny?

What other information would you like to have?

How could her medications be adjusted?

Slide 76

DI1 Slightly changed.
Diana Isaacs, 2025-08-25T20:04:38.513

Thinking about the choices

- Continue current meds or stop/change any?
  - Insulin glargine 100 units daily
  - Glipizide 10mg daily
  - Linagliptin 5mg daily
  - Metformin 1000mg bid
- Medication options:
  - GLP-1 or GIP/GLP-1 RA
  - Prandial insulin
  - SGLT2 inhibitor
  - Pioglitazone
  - Combination GLP1 receptor agonist /insulin injectable?



Piecing it Together

- New Regimen:
  - Insulin glargine 80 units once daily (20% reduction)
- Semaglutide 0.25mg weekly, titrated up to 2mg weekly
- Stop linagliptin (since starting GLP-1)
- Continue glipizide (for now)
- Next step could be to retry SGLT2i with counseling on how to avoid UTIs
- Or replacing glipizide with prandial insulin with largest meal
- CGM!

Switching Insulin

How to Switch Basal Insulin

- When going from twice daily NPH to long-acting insulin, reduce dose by 20%
- Switching Insulin glargine U100:
  - To glargine U300: 1:1, higher dose 10-18% may be needed
  - To degludec or NPH: 1:1 or consider 20% reduction
- Switching Insulin degludec to other basal insulins:
  - To degludec, NPH or glargine: reduce by 20%
- Switching insulin glargine U300:
  - To degludec: 1:1 or consider 20% reduction
  - To NPH or insulin glargine U100: reduce dose by 20%
- Switching NPH to other insulins:
  - If twice daily, decrease dose by 20%
  - If once daily, 1:1 or consider 20% reduction
- Need to use clinical judgement
  - For example, if A1C, FBG, and pre-meal BG are all above target, then may not be necessary to reduce basal insulin dose

Clinical Resource, How to Switch Insulin Products. Pharmacist's Letter/Pharmacy Technician's Letter/Prescriber Insights. January 2025.

DI1

Poll 7 - Making the switch: Meet Joan

Joan is taking insulin NPH 30 units twice daily. Her endo wants her to switch to degludec. Her current A1C is 6.9%. What is the best dose recommendation?



A. Insulin degludec 30 units twice daily
B. Insulin degludec 60 units once daily
C. Recommend against the switch since her A1C is at goal
D. Insulin degludec 48 units once daily

Slide 81

DI1 Slight change

Diana Isaacs, 2025-08-25T20:20:35.622

Switching Meal time Insulin

- This is a 1:1 conversion when switching between regular insulin, aspart, lispro, and glulisine including Fiasp® and Lyumjev™.
- The exception is when switching to inhaled insulin (Afrezza)-often 2-3x actually needed

Injected Meal Time Dose	Inhaled Insulin Dose
Up to 4 units	4 units
5-8 units	8 units
9-12 units	12 units
12-16 units	16 units
17-20 units	20 units
21-24 units	24 units

Clinical Resource. Pharmacist's Letter/Prescriber's Letter. August 2019.

Afrezza (package insert) 2019.

Poll 8. Patient Case: Lumy

- Lumy's insurance formulary changed from insulin lispro to insulin aspart. Her A1C is 7%.
- She was following an insulin to carbohydrate ratio of 1:12 and a correction factor of 1:50.
- How should she dose insulin aspart when she switches?
  A. Reduce all doses by 10%
  B. Increase all doses by 10%
  C. Same dosing
  D. Submit prior authorization so she doesn't change insulin

Insulin Pattern Management

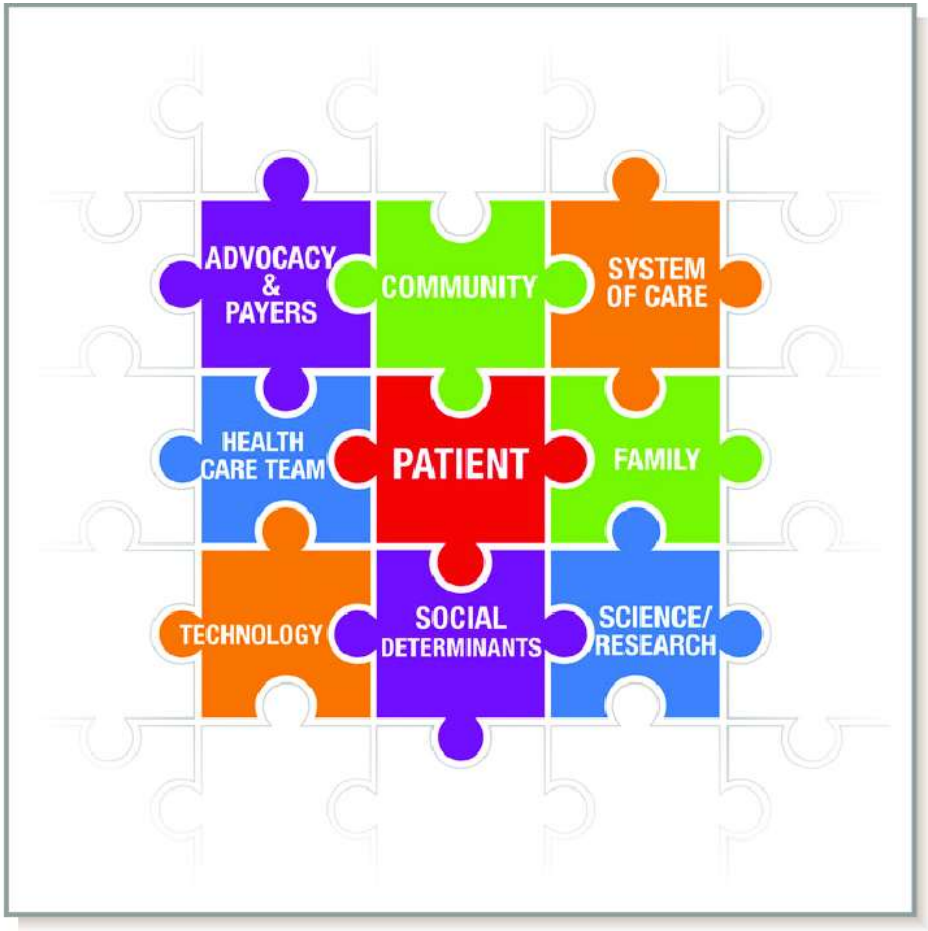
Pattern Management –AKA

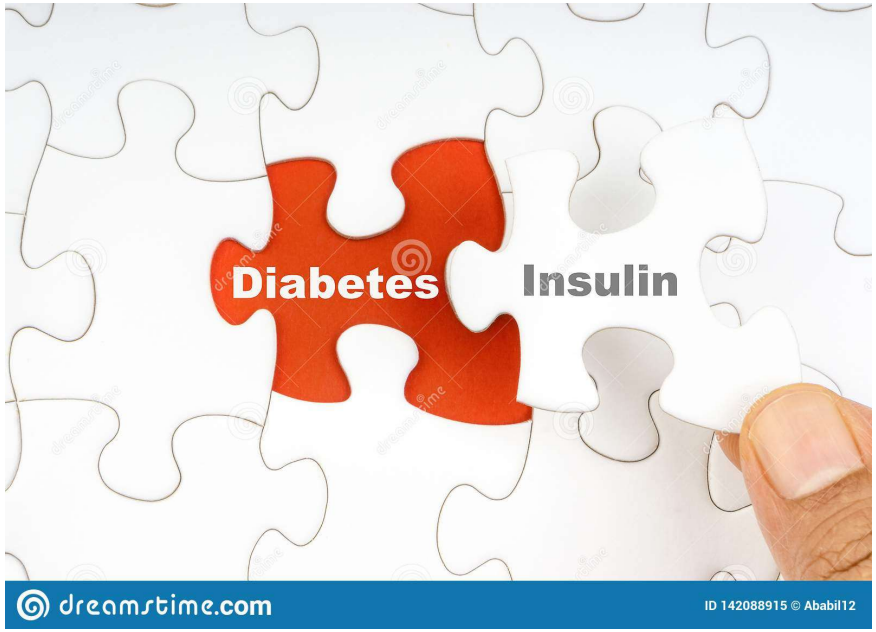
How to think like a pancreas



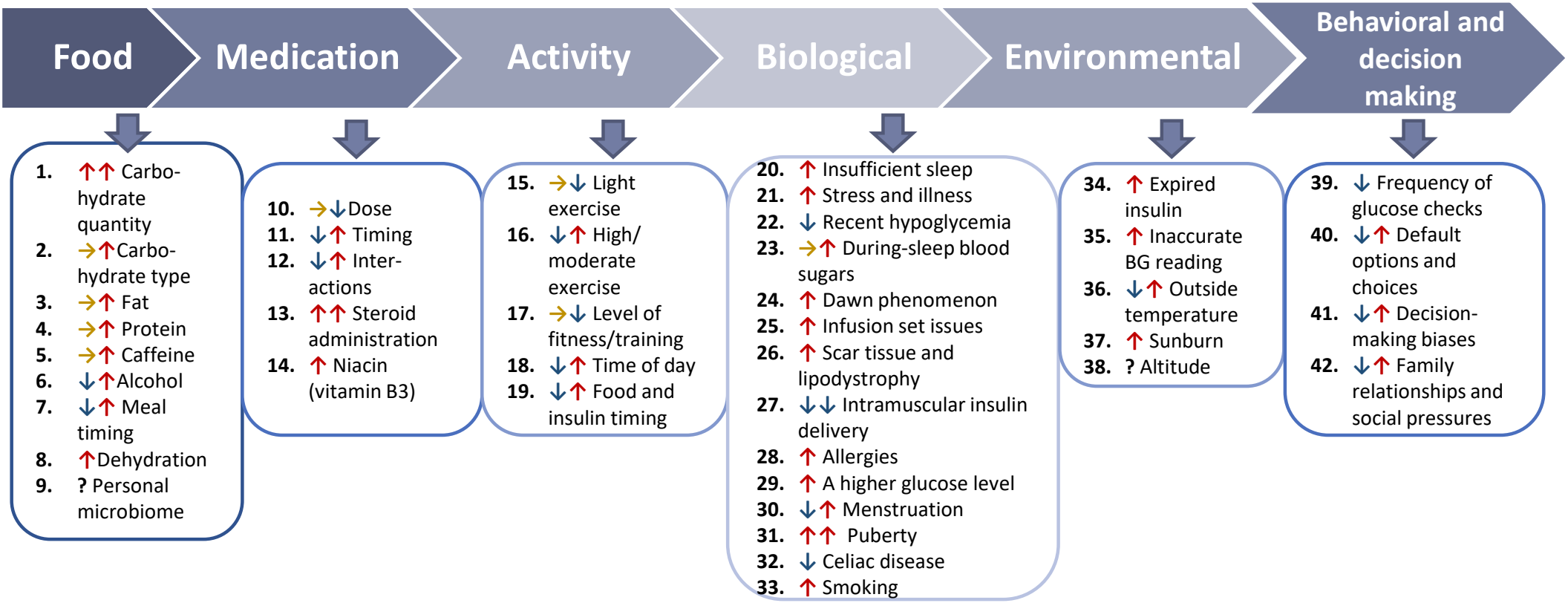
What do the numbers mean?

It’s like a BIG puzzle!





At Least 42 Factors Affect Glucose!



Adapted from Brown A. DiaTribe Learn: Making sense of diabetes...
diatribe.org/42factors

Poll Question 9

- When looking at glucose patterns, which problem do you fix first?

  a. Hyperglycemia

  b. Hypoglycemia

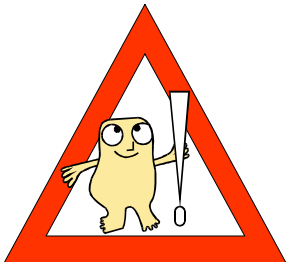
  c. Non-compliance

  d. Legible writing



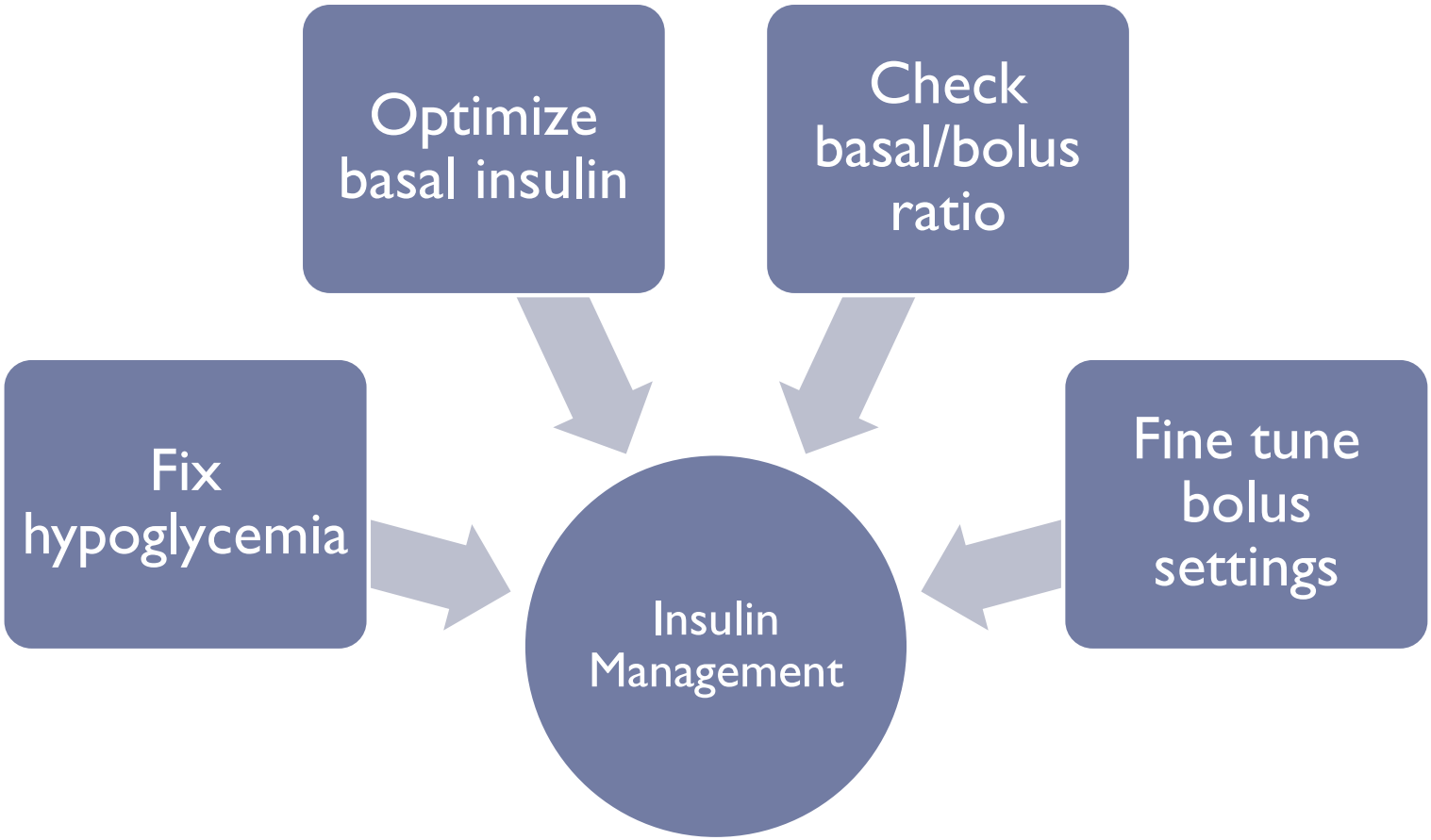
Pattern Management

- Safety 1st!! - Evaluate 3 day patterns
- **Hypo:** eval 1st and fix:
  - If possible, decrease medication dose
  - Timing of meals, exercise, medications
- **Hyperglycemia:** evaluate 2nd
  - Identify patterns
  - Before increase insulin, make sure not missing something (carbs, exercise, omission)



General Rules with Basal Bolus

- Optimize basal dose
  - Stay within 30mg/dL when not eating
  - Stay within 50mg/dL after a meal



Adjusting Insulin Doses in a Basal/Bolus regimen (T1D or T2D)

Out of Range Glucose	Insulin to Adjust
Fasting	Long acting insulin or bedtime NPH
Post-breakfast/pre-lunch	Pre-breakfast rapid/regular insulin
Post lunch/pre-dinner	Pre-lunch rapid/regular insulin or morning NPH
Post-dinner/before bedtime	Pre-dinner rapid/regular insulin

DI1

Adjusting Insulin Doses: Let's Practice

Example

Insulin degludec 20 units QAM

Insulin lispro 5 units TID before meals

Out of Range Glucose	Insulin to Adjust
Fasting	
Pre-lunch	
Post lunch	
Before bedtime	

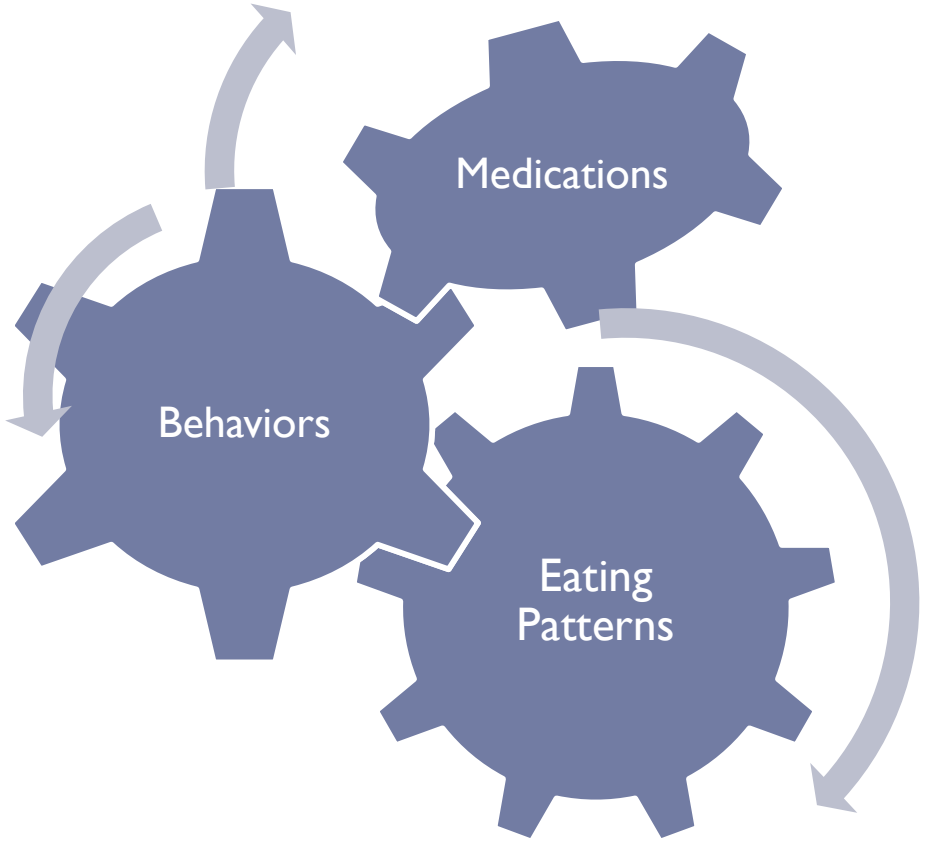
Slide 92

DI1 New slide

Diana Isaacs, 2025-08-25T22:52:37.448

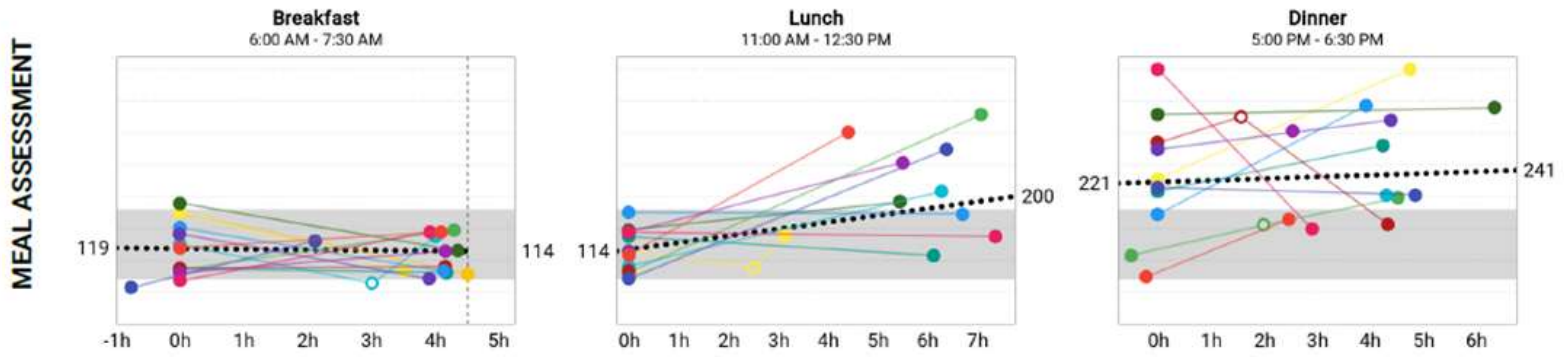
Tips for Data Interpretation

- Start by asking the person what they've experienced and noticed with their glucose patterns
- Avoid judgment
- Learn from 1 time episodes, but make changes based on patterns
- Fix lows first but some amount is expected (<1-4%) and if you remove all lows, you may end up with too many highs
- If it's not making sense, dig deeper (ex. missed doses, rationing, injection technique, food insecurity, etc)



Meal Time Data Review

- Glucose data before and after breakfast, lunch and dinner
- “Ideally”, 2 hour post-meal should not rise above 180mg/dL or 50mg/dL from the pre-meal start
  - Remember though, CGM goal <25% above 180mg/dL
- By 4-5 hours, glucose should return to pre-meal level (<130mg/dL)



DI1

Slide 94

DI1 Updated.
Diana Isaacs, 2025-08-25T22:55:11.787

Bolus Pattern Management

- Does glucose go low after a correction dose?
  - May need a higher sensitivity
  - Ex. 1:60 instead of 1:50
- Does glucose remain high after a correction dose?
  - May need a lower sensitivity
  - Ex. 1:40 instead of 1:50
- Often people are more sensitive overnight (less insulin needed)
- Does the person spike high after eating?
  - Is the person bolusing BEFORE the meal
  - Counting carbs correctly?
  - May need a more intensive carb ratio
  - Ex. 1:6 instead of 1:8
- Does the person go low after eating?
  - Counting carbs correctly?
  - May need a less intensive carb ratio
  - Ex. 1:10 instead of 1:8

Adjustments typically made 10-20% at a time

Checking the Sensitivity

- TDD=49 units

Total daily dose (per day)	49 units
Bolus amount (per day)	21U (43%)
Auto Basal / Basal amount (per day)	28U (57%)

- Rule of 1800
  - 1800/49=37

Carbohydrate Ratio (g/U)

Time	Ratio
0:00	15.0

Insulin Sensitivity (mg/dL per U)

Time	Sensitivity
0:00	40

- Current sensitivity is 40

The calculation is slightly different from the current sensitivity. Look at the glucose data to determine if the sensitivity should be decreased.

Checking the Carb Ratio

- TDD=49 units
- Rule of 450
  - 450/49=12.9
- Current carb ratio is 15

Total daily dose (per day)	49 units
Bolus amount (per day)	21U (43%)
Auto Basal / Basal amount (per day)	28U (57%)

Carbohydrate Ratio (g/U)

Time	Ratio
0:00	15.0

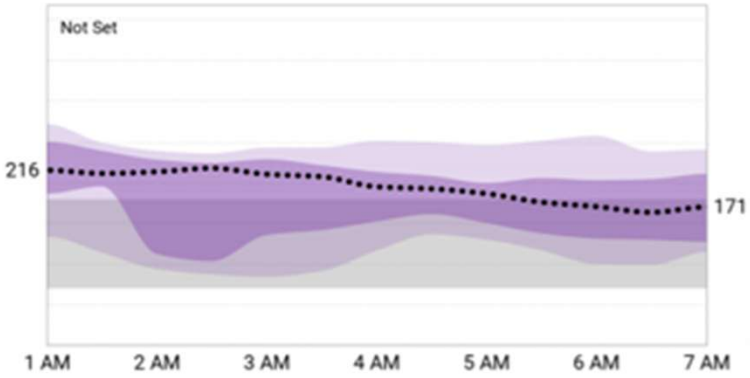
Insulin Sensitivity (mg/dL per U)

Time	Sensitivity
0:00	40

The calculation is different from the current carb ratio. Look at the glucose data to determine if the carb ratio should be decreased.

Basal Insulin Review

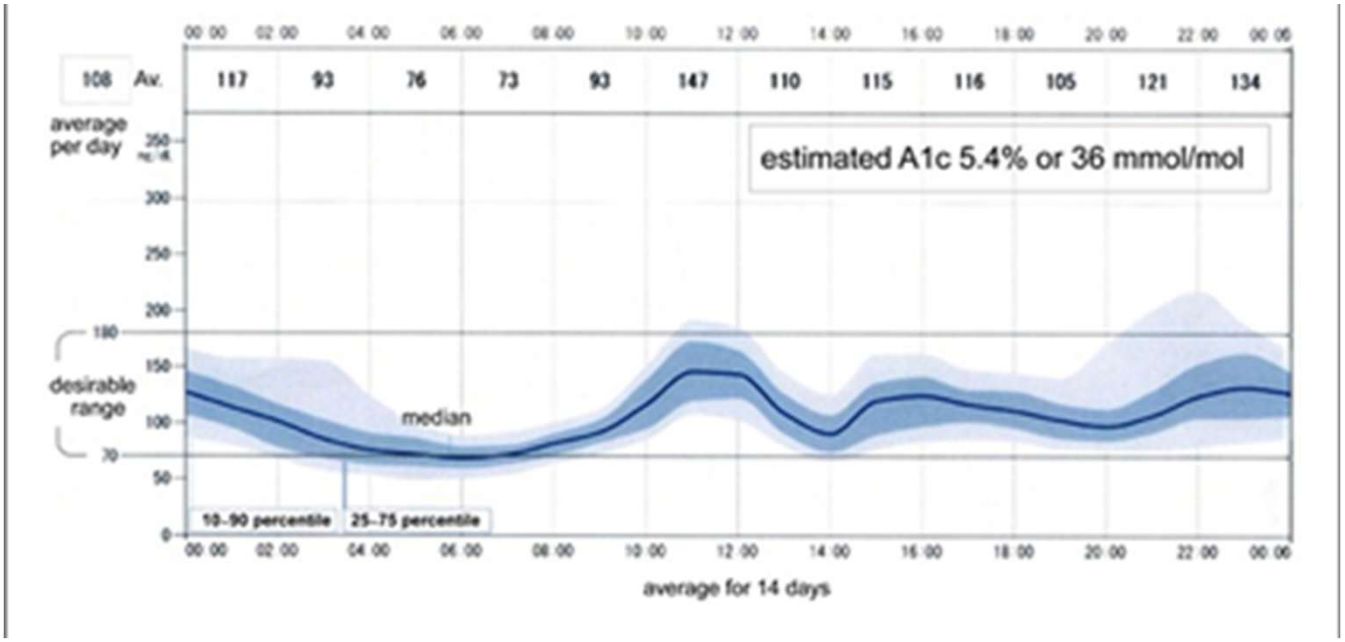
LONG-ACTING ASSESSMENT



Days Included in Assessment	11 of last 14 days
Average Daily Dose Taken	0 U
# Days with Glucose < 70 mg/dL	2 ▼
Median Bedtime to Fasting (Change)	216 to 171 (-45 mg/dL) ▼

Note: Days with overnight boluses are excluded.

▲ Rising fasting glucose of 30 mg/dL or more may indicate long-acting dose should be increased.
▼ Falling fasting glucose of 30 mg/dL or more or days with glucose < 70 mg/dL may indicate long-acting dose should be decreased.



Case Study: Larry Poll Question 12

DI1

Larry takes metformin 1000mg BID, insulin glargine 50 units once daily, empagliflozin 10mg daily. His A1C is 7.8%. His BMI is 32kg/m2. FBG averages 110 mg/dL. 2 hr PP breakfast=190mg/dL, 2 hr PP lunch=210mg/dL, and 2 hr PP dinner is 240mg/dL. What is the best recommendation for an agent to add to the regimen to achieve A1C target<7%?

A. Initiate insulin aspart 5 units at dinner, decrease insulin glargine to 45 units daily
B. Initiate insulin aspart 5 units with all meals, decrease insulin glargine to 35 units daily
C. Initiate insulin aspart 5 units at dinner, continue insulin glargine 50 units daily
D. Initiate tirzepatide 2.5mg weekly, decrease insulin glargine to 45 units daily

Slide 99

DI1 Changed slightly.
Diana Isaacs, 2025-08-25T23:05:28.930

Summary

- Many different types of insulin
- Basal + bolus needed for T1D
- Weight based dosing and rules of 1700/1800 and 500/450 can be used to calculate correction factor and carb ratio respectively
- GLP1 agonist preferred 1st injectable in T2D
- Avoid overbasalization, utilize GLP1 agonist +/- prandial insulin if large bedtime-AM glucose drop
- Counsel patients on injection site technique, administration and storage
- Fine tune insulin settings based on BGM and CGM data

DiaBingo - I

DI1

- Inhaled insulin
- Glargine, Degludec, NPH are types of
- Breakdown of glycogen into glucose
- Anabolic hormone made by pancreatic beta cells
- Insulin is released when glucose levels are low
- In which injection site is insulin most rapidly absorbed?
- Elevated post-prandial glucose indicate need for pre-meal
- Epinephrine increases insulin resistance
- Creation of glucose from amino acids and lactate
- Decreasing renal function for people on insulin can cause
- Bolus insulins
- A hormone that increases blood glucose

Slide 101

DI1 Changed detemir to degludec

Diana Isaacs, 2025-08-25T23:08:11.972

Break and Question Time

- Energizing Ideas
  - Do some jumping jacks
  - Stretch and Breathe





During interviews, outline strategies to identify previously undiscovered diabetes co-conditions, identify clinical inertia and move to best health.

Diabetes Interview – From Head to Toe & Microvascular Risk

www.DiabetesEd.net

Beverly Thomassian, RN, MPH, BC-ADM, CDCES
President, Diabetes Education Services

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: Standards of Care in Diabetes—2025 FREE

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Objectives

1. Identify common yet often under diagnosed co-conditions associated with type 1 and type 2 diabetes.
2. Describe the interrelationship between glucose, inflammation and diabetes complications.
3. List the elements of a head-to-toe assessment including lower extremity assessment.
4. Discuss barriers to sexual health and communication strategies.



4. Comprehensive Medical Evaluation and Assessment of Comorbidities



- Person centered communication, strength-based language, active listening, literacy, quality of life
- It is necessary to take into account all aspects of a person's life circumstance (SDOH)
- It is important to integrate medical eval, engagement and lifestyle changes.
- Interdisciplinary teams provide best care

Communication Goals

- The communication goal between health care professionals and people with diabetes is to:
- Establish a collaborative relationship.
- Assess and address self-management barriers *without* blaming people with diabetes for "noncompliance" or "nonadherence"
  - when the outcomes of self-management are not optimal.



4. Comprehensive Medical Evaluation and Assessment of Comorbidities: Standards of Care in Diabetes—2025 FREE

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Communication Strategies

- Empathize and use active listening techniques to help facilitate communication :
  - open-ended questions,
  - reflective statements, and
  - summarizing what the person said,
- Check in about perceptions of their:
  - Ability or self-efficacy to manage diabetes.
  - Address psychosocial factors to improve self-management and treatment outcomes.



4. Comprehensive Medical Evaluation and Assessment of Comorbidities: Standards of Care in Diabetes—2025 FREE

American Diabetes Association Professional Practice Committee

EV Arrives and Requests Help

- 58 yr old complains of 4 lb wt gain for past month. BMI 31, wt 90 kg. B/P 142/96. A1C 8.3%
- Meds include:
  - Sitagliptin, Metformin
  - Pioglitazone 15mg ac breakfast
  - glargine 58 units
  - Semaglutide 0.5mg weekly
  - Levothyroxine (ran out)
  - Lisinopril 10mg
  - Gabapentin 100 mg TID

What story do these meds tell?
Any med(s) missing?
Any med needs to be stopped?



EV Arrives and Requests Help

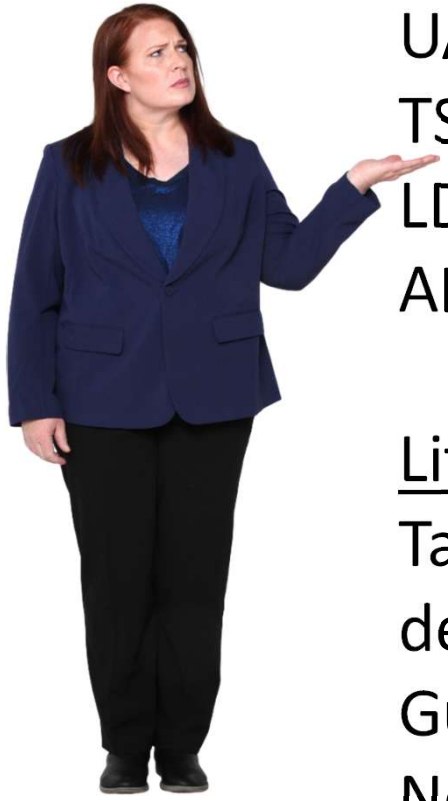
- 58 yr old complains of 4 lb wt gain for past month. BMI 31, wt 90 kg. B/P 142/96. Checks BG at hs & morning; 230 at hs, 150's in AM. A1C 8.3%.
- Meds include:
  - Sitagliptin (DPP-IV), Metformin
  - glargine 58 units (Basal)
  - Pioglitazone 15mg (TZD)
  - Semaglutide 0.5mg wk (GLP-1)
  - Levothyroxine (ran out)
  - Lisinopril 10mg (ACE)
  - Lovastatin 20mg (Statin)
  - Gabapentin 100 mg TID (leg pain)

What does this tell us about EV?

- Struggling with weight
- B/P & A1C above target
- Overbasalized? BG drops > 70pts over hs
- Why not taking thyroid med?
- Lower extremity pain contributing to distress?
- Elevated CV risk?

EV is Gaining Weight and is Tired

- 58 yr old complains of 4 lb wt gain for past month. BMI 31, wt 90 kg. B/P 142/96. Checks BG at hs & morning; 230 at hs, 150's in AM. A1C 8.3%.
- Meds include:
  - Sitagliptin, Metformin
  - Pioglitazone 15mg ac breakfast
  - glargine 58 units
  - Semaglutide 0.5mg weekly
  - Levothyroxine – ran out
  - Lisinopril 10mg
  - Gabapentin 100 mg TID



Labs

A1C – 8.3%

UACR 26 GFR >60

TSH 10.6

LDL 98 mg/dl, Trig 158

ALT 85 IU/L, AST 90 IU/L

<u>Life situation</u>

Takes care of dad with dementia

Gums inflamed

No eye doctor for year

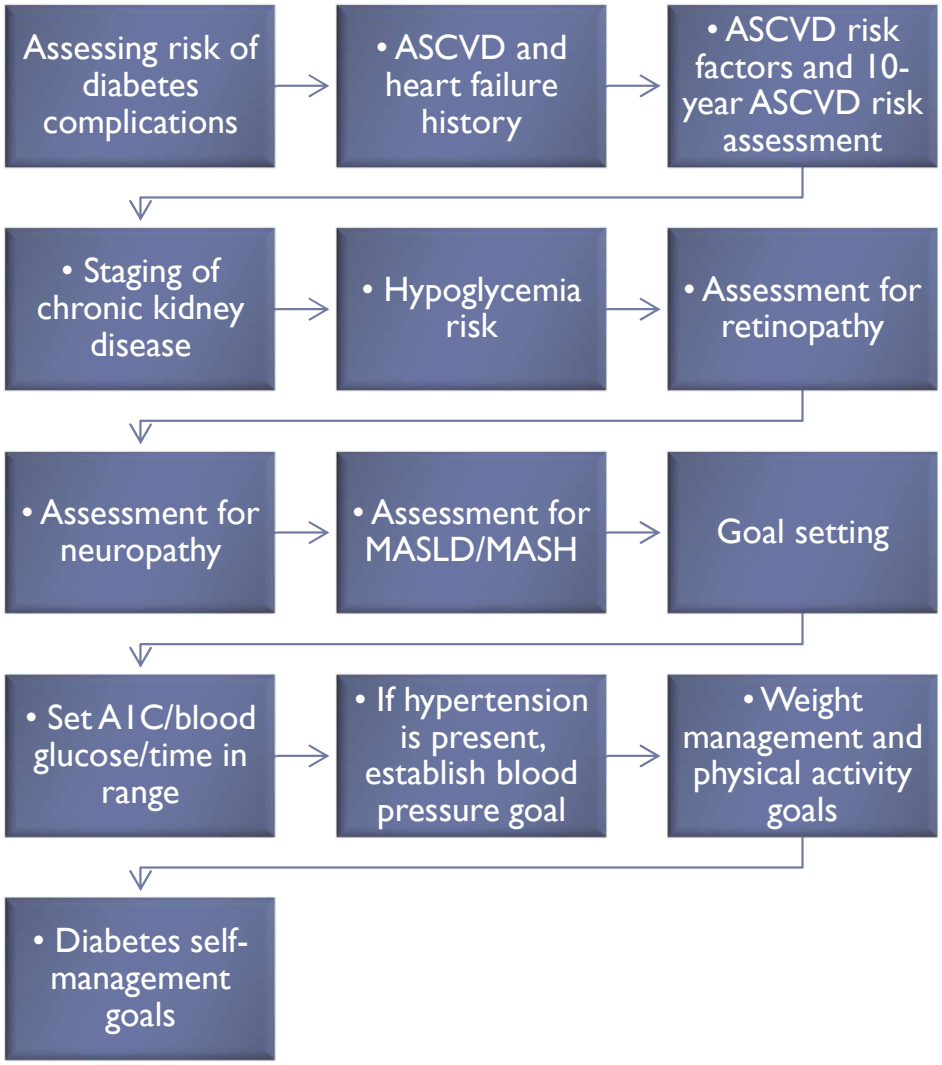
Both feet hurt at night

ABC's of Diabetes

- A1c less than 7% (individualize)
  - Pre-meal BG 80-130
  - Post meal BG <180
  - AGP - Time in Range (70-180) 70% of time
- Blood Pressure < 130/80
- Cholesterol
  - Statin therapy based on age & risk status
  - If 40+ with ASCVD Risk, decrease 50%, LDL <70
  - If 40+ with ASCVD, decrease 50%, LDL <55



Assessment and Treatment Plan



Therapeutic treatment plans

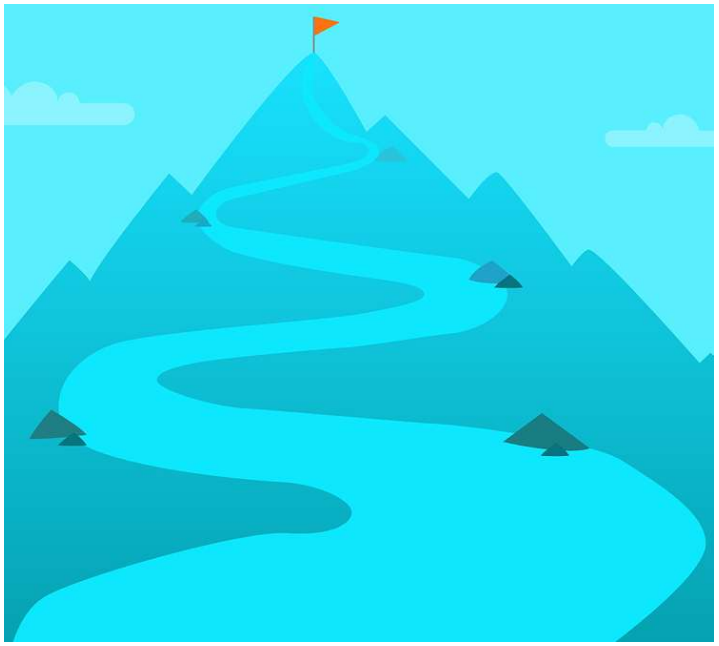
- Lifestyle management
- Pharmacologic therapy: glucose lowering
- Pharmacologic therapy: cardiovascular and kidney disease risk factors
- Weight management with pharmacotherapy or metabolic surgery, as appropriate
- Use of glucose monitoring and insulin delivery devices
- Referral to diabetes education, behavioral health, and medical specialists

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: Standards of Care in Diabetes—2025 FREE

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Advocating for Best Health for people with Diabetes

- Modifiable
  - Sleep
  - Activity
  - Smoking
  - Dietary Habits
  - Glucose
  - Blood Pressure
  - Lipids
  - Oral Care
  - Immunizations
  - Psychosocial care



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

Diabetes is a long path



Get at least 7 hours of sleep a night – Check for sleep apnea

Obstructive Sleep Apnea - OSA

- OSA affects ~25% of people with type 2
  - Up to 60% of those with type 2 have disordered sleep
- Associated with increased CVD risk
- Signs include excessive daytime sleepiness, snoring and witnessed apnea
- Treatment:
  - Lifestyle modification
  - Tirzepatide (Zepbound) BT1
  - Continuous positive oral airway pressure and devices
  - Surgery



4. Comprehensive Medical Evaluation and Assessment of Comorbidities: Standards of Care in Diabetes—2025 FREE

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BT1 Added Tirzepatide (Zepbound)

Beverly Thomassian, 2025-08-24T22:58:13.104

Where are we on this continuum?





Only about 50% of us are meeting activity goals

Benefits of Exercise and Diabetes

- Increase muscle glucose uptake 5-fold
- Glucose uptake remains elevated for 24 - 48 hours (depending on exercise duration)
- Increases insulin sensitivity in muscle, fat, liver.
- Reduce CV Risk factors (BP, cholesterol, A1c)
- Maintain wt loss
- Contribute to well being
- Muscle strength
- Better physical mobility



4. Comprehensive Medical Evaluation and Assessment of Comorbidities: Standards of Care in Diabetes—2025 FREE

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Exercise decreases:

- Sleep apnea
- Diabetic kidney disease, retinopathy
- Depression
- Sexual dysfunction
- Urinary incontinence
- Knee pain
- Need for medications
- Health care costs



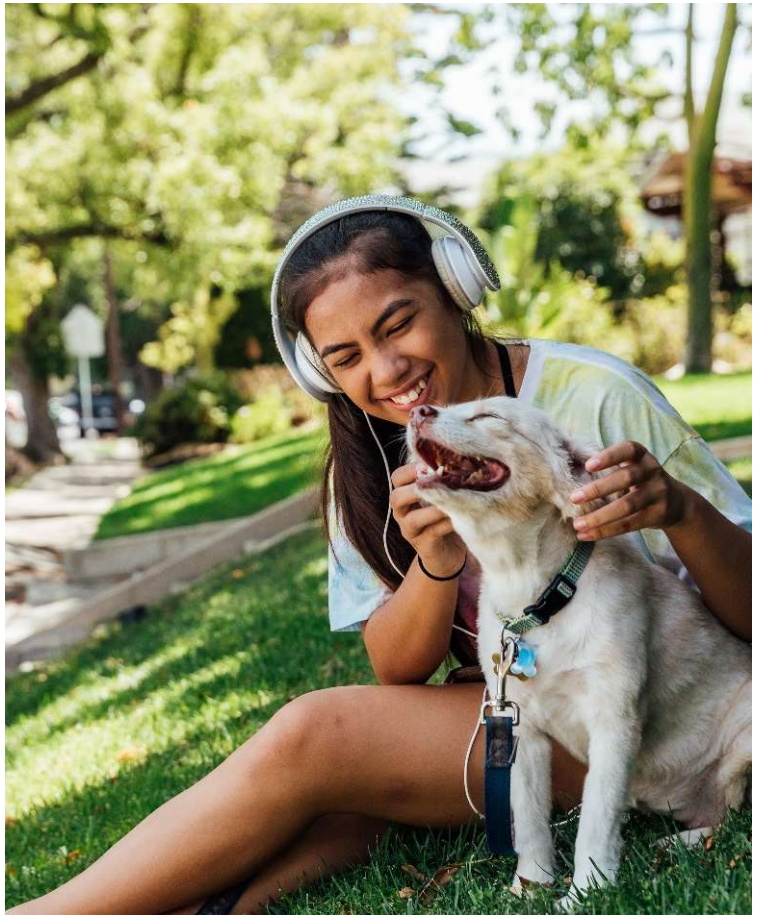
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Tobacco, Electronic Cigarettes, Alcohol, and Cannabis

Advise all youth with diabetes not to use cannabis recreationally in any form.

- 2 to 3 times higher risk of developing DKA.
- Can lead to cannabis hyperemesis syndrome

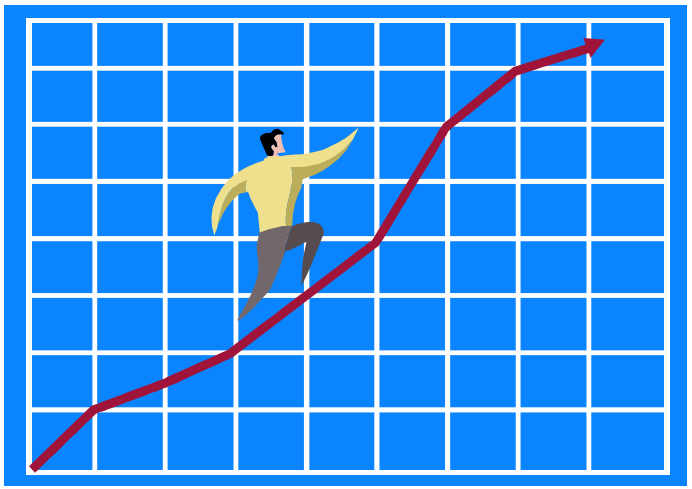


- Screen adolescents and young for tobacco or nicotine, electronic cigarettes, substance use, and alcohol use at diagnosis and regularly thereafter.

- Discourage smoking in youth who do not smoke and encourage smoking cessation in those who do smoke (including electronic cigarette use or vaping)

14. Children and Adolescents: Standards of Care in Diabetes —2025 FREE

EV asks why the weight gain?



- Fluid retention - diabetes doubles risk for Congestive Heart Failure (CHF). Check lower extremities.
- Inaccurate nutrition knowledge
- Pioglitazone can be associated with fluid wt gain.
- Blood glucose improving
- Thyroid disease under treated
- Novel Antipsychotics
- Depression / Increased intake

Poll question 9

- Which of the following is a true statement?

a. Atypical antipsychotics are contraindicated for people with diabetes and thyroid disease.

b. Hypothyroidism is more common than hyperthyroidism.

c. Hyperthyroidism can be associated with weight gain or weight loss.

d. Hypothyroidism causes LDLs to decrease.



Thyroid Disease and Diabetes

- Thyroid disorders are **2–3 times more common** in people with diabetes.
- Both conditions impact **metabolism, weight, energy, and cardiovascular health**.
- Recognizing and addressing the overlap improves outcomes.

BT1



Slide 122

BT1 Added slide

Beverly Thomassian, 2025-08-24T22:57:50.288

BT1

Prevalence: Hypothyroidism in Diabetes

- **Type 1**
  - Overt hypothyroidism **~4–10%**
  - Subclinical hypothyroidism **~10–15%**
  - Up to **30% of people with T1D** will develop autoimmune thyroid disease in their lifetime.
- **Type 2 diabetes:**
  - Overt hypothyroidism **~10–30%**
  - Higher prevalence of **subclinical hypothyroidism (~5–10%)** than the general population.
- **More Women > men.**
- **Hashimoto's thyroiditis – autoimmune thyroid**
  - most common cause of hypothyroidism w/ diabetes

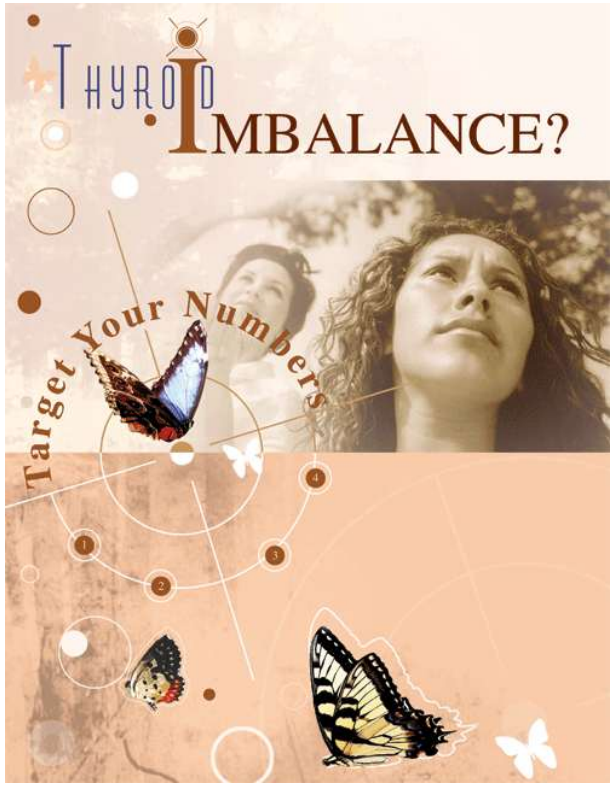
NIH https://pmc.ncbi.nlm.nih.gov/articles/PMC3647563/

Slide 123

BT1 Updated slide with new stats

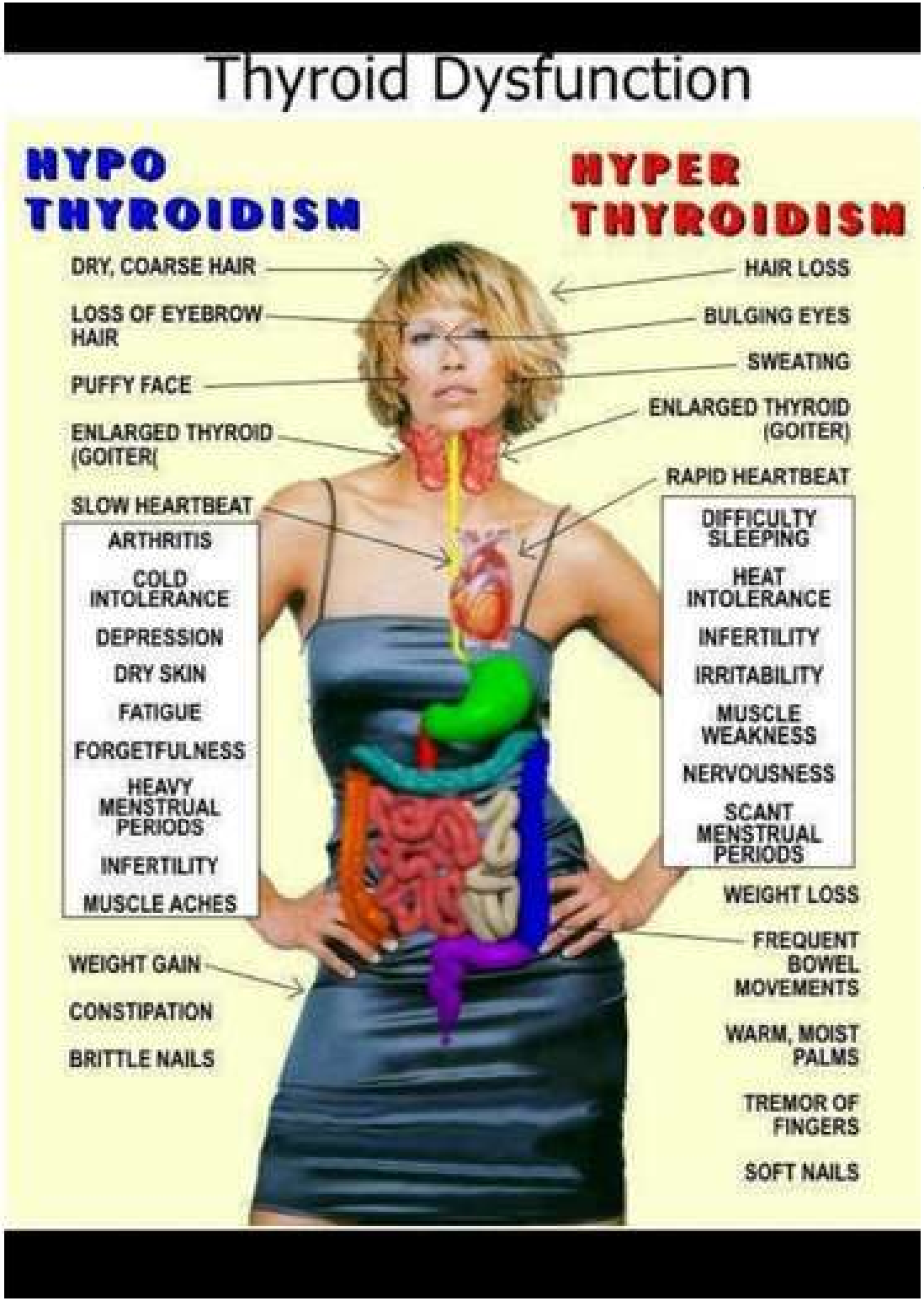
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Thyroid & TSH* Levels



AACE Guidelines

- *Thyroid Stimulating Hormone - secreted by pituitary gland
  - controls thyroid hormone thyroxine production
  - first and best test
  - TSH Norm = up to 4.5 mIU/mL
  - Treatment based on TSH plus symptoms.
    - 4.5 – 10 based on risk, s/s
    - 10 or more = treat
  - Lower = hyperthyroidism
  - Higher = hypothyroidism–



A TSH above 10 mIU/L, in combination with a subnormal free T4 characterizes overt hypothyroidism.

If TSH in range, but person is symptomatic, Check for thyroid peroxidase atb or TPO antibodies

A low TSH indicates hyperthyroidism (0.1 ish)

Collaborative Action Plan

- Increase semaglutide to 1.0mg
- Decrease glargine by 10 units
- Stop sitagliptin
- Continue pioglitazone
- Walk after lunch during work week
- Restart levothyroxine, Re-Check TSH - Re-evaluate in 4 weeks.
- Eat one serving of veggie a day and decrease meat intake to 4 nights a week.
- Meet with RD/RDN
- Check BG a few times a week before bed (in addition to am)



Labs

A1C – 8.3%

UACR 26 GFR >60

TSH 10.6

LDL 98 mg/dl,

Trig 158

ALT 85 IU/L,

AST 90 IU/L

Liver Nomenclature Update

AASLD
AMERICAN ASSOCIATION FOR THE STUDY OF LIVER DISEASES

Old Terms	New Terms
Fatty Liver Disease	Steatotic Liver Disease
Non-Alcoholic Steatohepatitis (NASH)	Metabolic Dysfunction-Associated Steatohepatitis (MASH)
Non-Alcoholic Fatty Liver Disease (NAFLD)	Metabolic Dysfunction-Associated Steatotic Liver Disease (MASLD)

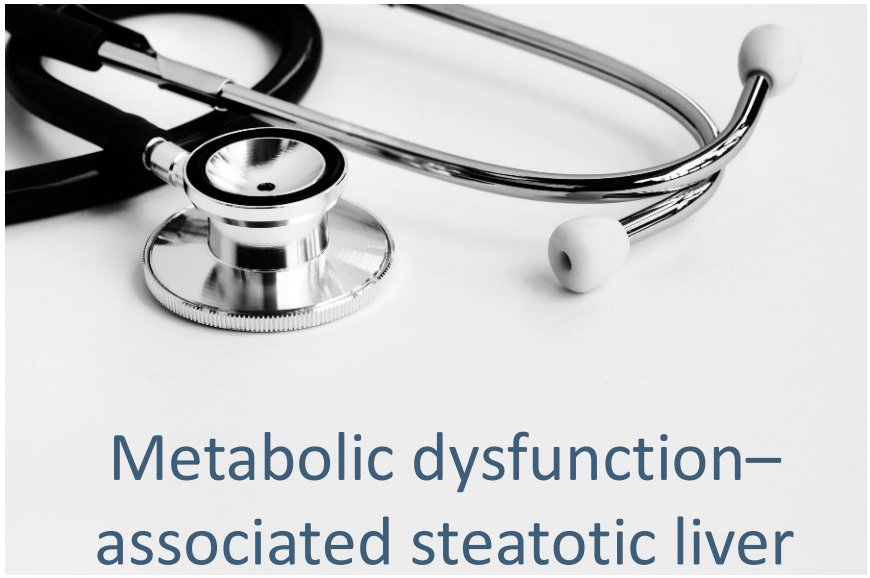
Metabolic Associated Steatohepatitis

MASH is when fat reaches 5% of the liver's weight

Without consumption of significant amounts of alcohol defined as:

- Ingestion of less than 21 standard drinks per week in men and
- Less than 14 standard drinks per week in women

over a 2-year period preceding evaluation) or the presence of other secondary causes of Steatosis disease.



Metabolic dysfunction–associated steatotic liver disease (MASLD)

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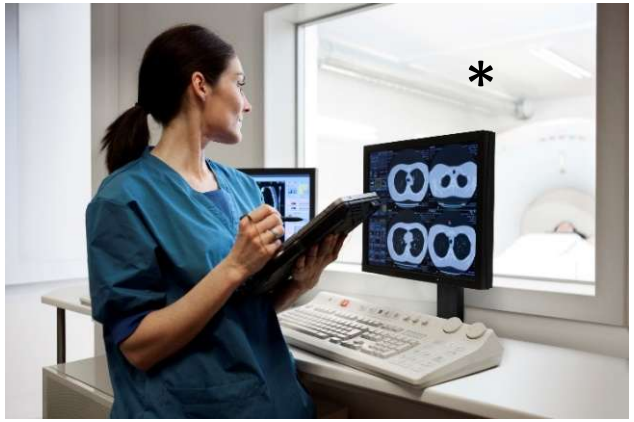
Liver Disease & Steatohepatitis

Adults with type 2 diabetes.

- >70% have MASLD
  - Of those 50% have MASH*
  - 12-20% have fibrosis
- Adults with type 1
  - 20% have MASLD

- **Associated with :**

- Increased BMI (30+)
- Cardiometabolic risk factors
- Over 50 yrs
- *ALT & AST 30 units/L +

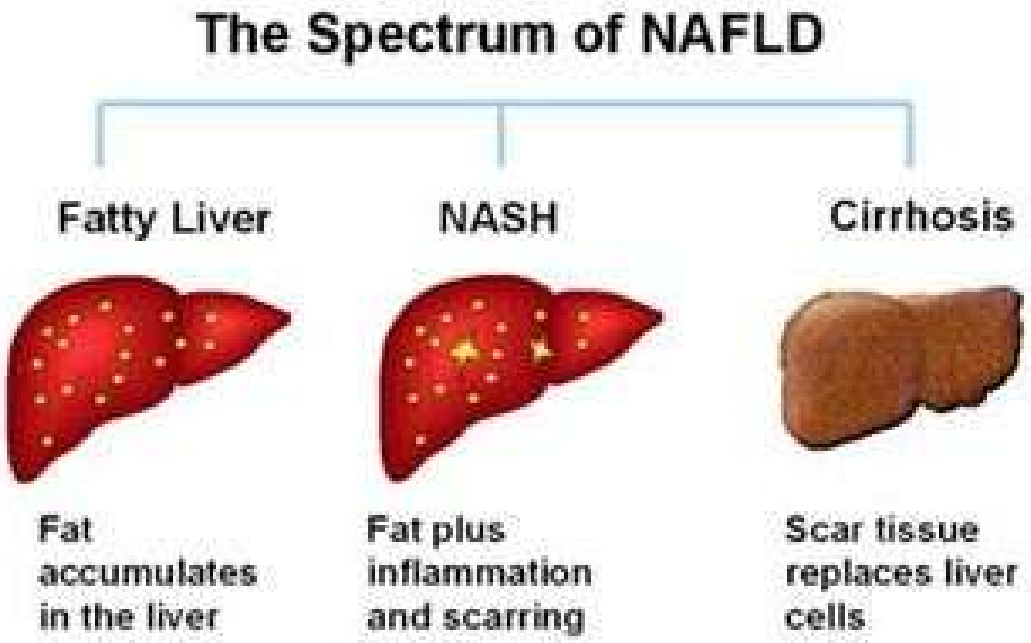


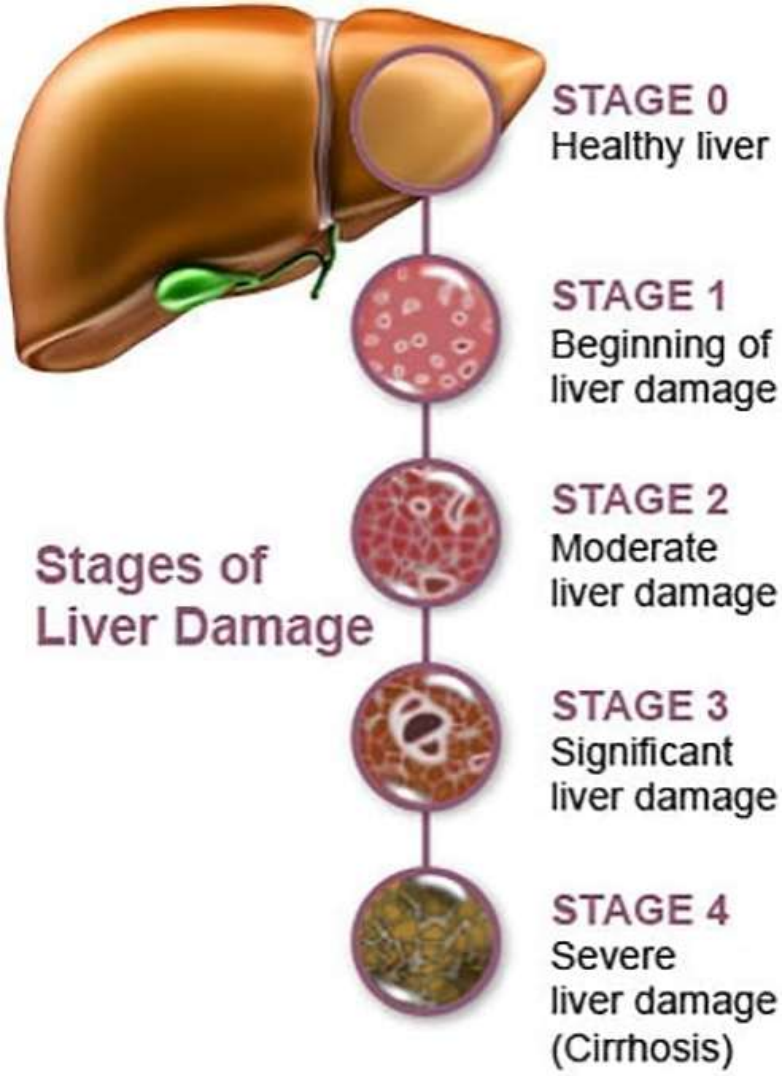
***ALT & AST**
(Eval if more if 30+ for 6 mo's - ADA)

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Natural History of NAFLD to NASH





NASH – Non-Alcoholic Steatohepatitis

MASH – Metabolic Assoc Steatohepatitis

https://liverfoundation.org/wp-content/uploads/2020/11/StagesFibrosis.jpg

Symptoms of Steatosis

If symptoms do appear, they may include:

- A feeling of fullness in the middle or upper right side of the abdomen
- Abdominal pain, nausea
- Loss of appetite or weight loss
- Weakness
- Jaundice

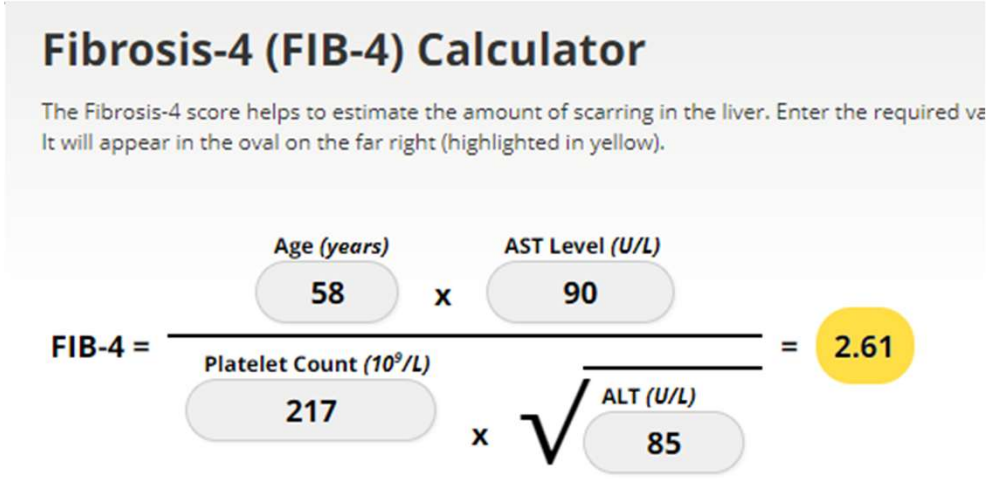


https://dermcollective.com/palmar-erythema/

- Swelling of the abdomen and legs
- Mental confusion
- Extreme fatigue or tiredness
- Signs of advanced disease include:
  - Portal hypertension, spider angiomas, reddening of palms, declining platelet counts

Mayo Clinic

Screening for NASH – FIB-4



- The American College of Gastroenterology considers Upper limit of normal ALT levels:
- 29–33 units/L for males
- 19–25 units/L for female individuals

(mdcalc.com/calc/2200/fibrosis-4-fib-4-index-liver-fibrosis).

FIB-4 estimates risk of hepatic cirrhosis (age 35+):

- Calculated by imputing:
  - Age
  - plasma aminotransferases (AST and ALT)
  - and platelet count
- FIB-4 Risk Levels
  - Lower risk is <1.3
  - Intermediate 1.3 to 2.67
  - High risk >2.67
    - considered as having a high probability of advanced fibrosis (F3–F4).

Diagnostic Algorithm for the Prevention of Cirrhosis in People With Metabolic Dysfunction-Associated Steatotic Liver Disease (MASLD)

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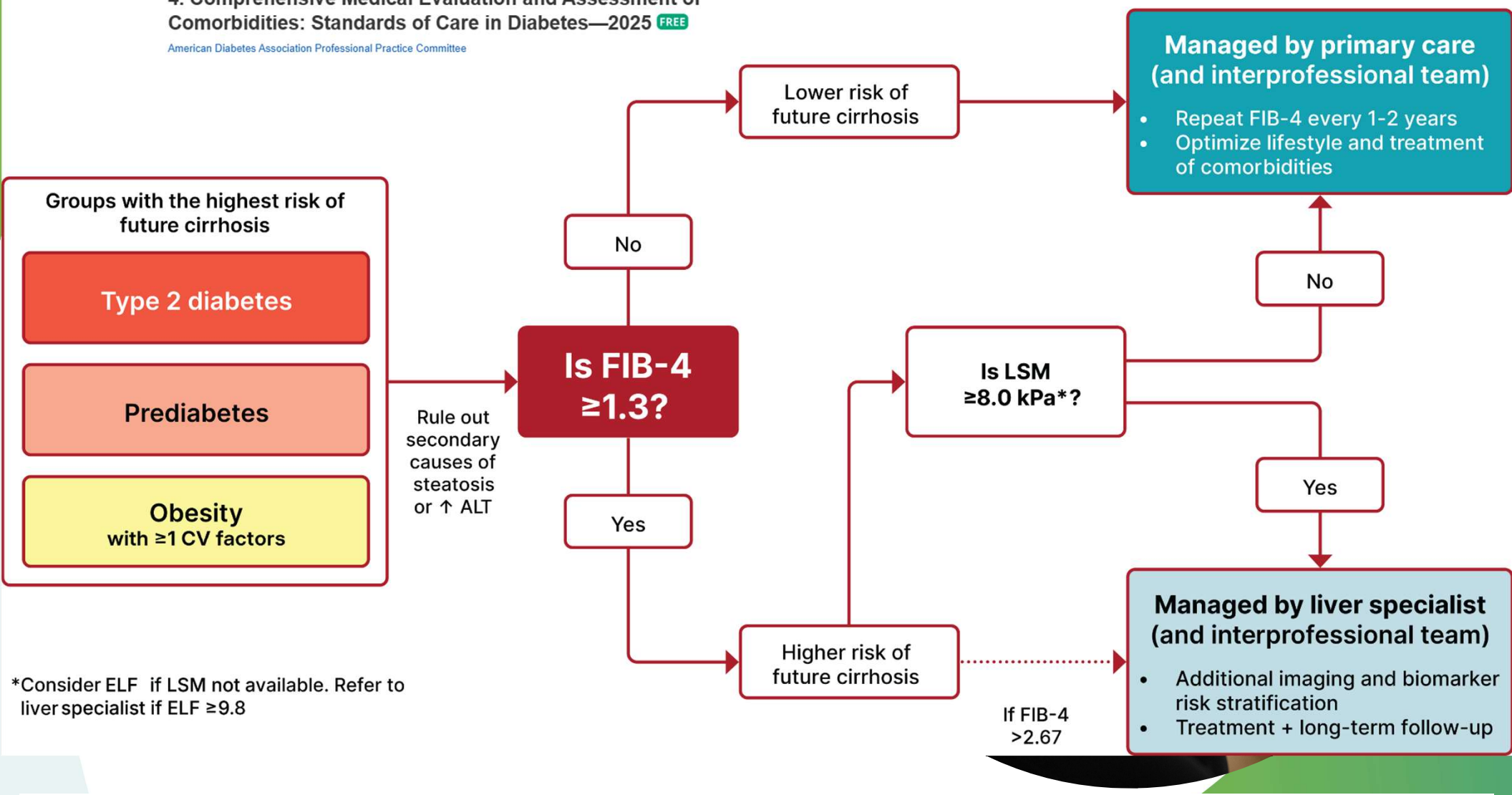


Figure 4.2—ELF, enhanced liver fibrosis test; FIB-4, fibrosis-4 index; LSM, liver stiffness measurement, as measured by vibration-controlled transient elastography. “Fibroscan” *In the absence of LSM, consider ELF a diagnostic alternative. If ELF ≥ 9.8, an individual is at high risk of MASH with advanced liver fibrosis (≥F3–F4) and should be referred to a liver specialist.

Finding Liver Disease

- Imaging procedures used to diagnose NAFLD include:
- **Abdominal ultrasound,** which is often the initial test when liver disease is suspected.
- **Transient elastography,** an enhanced form of ultrasound that measures the stiffness of liver. Liver stiffness indicates fibrosis or scarring.
- **Magnetic resonance elastography,** works by combining MRI imaging with sound waves to create a visual map (elastogram) showing the stiffness of body tissues
- **Biopsy** by liver specialist confirms definitive diagnosis



Referral to Hepatologist or GI specialist

STANDARDS OF CARE | DECEMBER 09 2024

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Other Treatments for MASLD & MASH

- Meds that lower glucose, cholesterol and weight
- Bariatric surgery
- Pioglitazone (Actos)
  - Improves lipid and glucose metabolism
  - Reverses steatohepatitis in prediabetes/diabetes
  - Causes 1-2% wt gain at 15 mg
  - 3-5% wt gain at 45 mg
- GLP-1 Receptor Agonists
  - Semaglutide (Wegovy) approved for steatosis

BT1



Support lifestyle changes

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Slide 135

BT1 Added Semaglutide) Wegovy approved for steatosis

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Actions To Decrease Steatosis

- Increase activity
  - Strength training
  - Yoga or Thai Chi
  - Walking & aerobics
- Thoughtful eating
  - More fiber
  - Less processed foods & less added sugar
  - Avoid alcohol
- Treatment
  - Actos
  - GLP-1/GIP
  - Statin
- Prevention
  - Cancer Screenings
  - Decrease inflammation

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Metabolic Dysfunction–Associated Steatotic Liver Disease (MASLD) Treatment Algorithm

Individualize care, targeting the following:

- Adoption of a healthy lifestyle
- Weight loss (if indicated)
- Optimal diabetes management
- Cardiovascular risk reduction
- Need for metabolic surgery (as recommended by guidelines)



MASLD	Obesity pharmacotherapy	Diabetes pharmacotherapy	MASH pharmacotherapy
MASLD with F0-F1	Prefer GLP-1 RA, dual GIP and GLP-1 RA	Prefer GLP-1 RA, dual GIP and GLP-1 RA, pioglitazone, SGLT2i	Not indicated
MASLD with F2-F3 ("at risk" MASH)	Prefer GLP-1 RA, dual GIP and GLP-1 RA	Prefer GLP-1 RA, dual GIP and GLP-1 RA, pioglitazone	Resmetirom
Compensated cirrhosis	As with F2-F3 with caution*	As with F2-F3 with caution*	ⓘ AVOID
Decompensated cirrhosis	ⓘ AVOID	Only use insulin	ⓘ AVOID

*Individualized care and close monitoring needed in compensated cirrhosis given limited safety data available.

F0-F1, no to minimal fibrosis; F2-F3, moderate fibrosis; F4, cirrhosis;

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Higher Fracture Risk

- Hip fractures:
  - Type 1 - 6.3 relative risk associated w/ osteoporosis
  - Type 2 – 1.7 relative risk
- Health care professionals can:
  - Assess risk fracture risk and history, esp with older clients
  - Recommend bone mineral density assessment
  - Assess if would benefit from vita d supplement
  - Home health/ Physical Therapy
  - Use TZDs and SGLT's with caution



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Assess for Fracture Risk

- People aged ≥65 years
- Postmenopausal women and men aged ≥50 years with history of adult-age fracture or with diabetes–specific risk factors:
  - Frequent hypoglycemic events
  - Diabetes duration >10 years
  - Diabetes medications: insulin, thiazolidinediones, sulfonylureas
  - A1C >8%
  - Peripheral or autonomic neuropathy, retinopathy, nephropathy
  - Frequent falls
  - Glucocorticoid use

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If at Risk for Fracture - Advise people with diabetes on their intake of calcium (1,000–1,200 mg/day) and vitamin D to ensure it meets the recommended daily allowance through their diet or supplemental means.

Sensory Impairment

- Hearing impairment 2xs as common in diabetes
  - Due to oxidative stress + hyperglycemia
  - Leads to cochlear microangiopathy and auditory neuropathy
- Risk factors
  - Low HDL cholesterol, coronary heart disease, peripheral neuropathy, and general poor health have been reported as risk factors for hearing impairment



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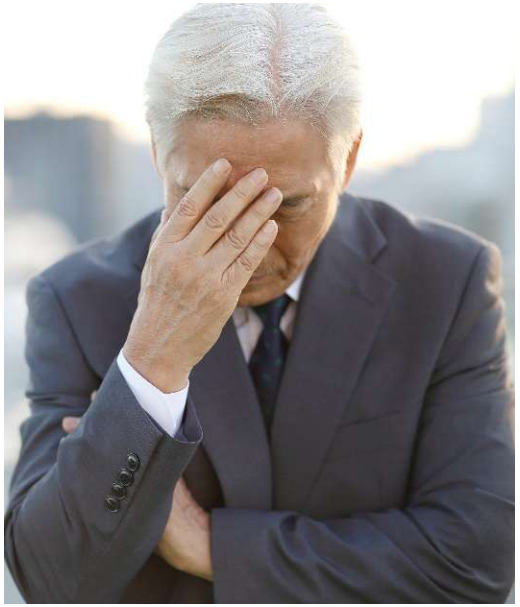
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Cognitive Impairment “Type 3”

- Meta-analysis showed individuals with diabetes had
  - 43% higher risk of all types of dementia,
  - 43% higher risk of Alzheimer dementia
  - 91% higher risk of vascular dementia
  - compared with individuals without diabetes



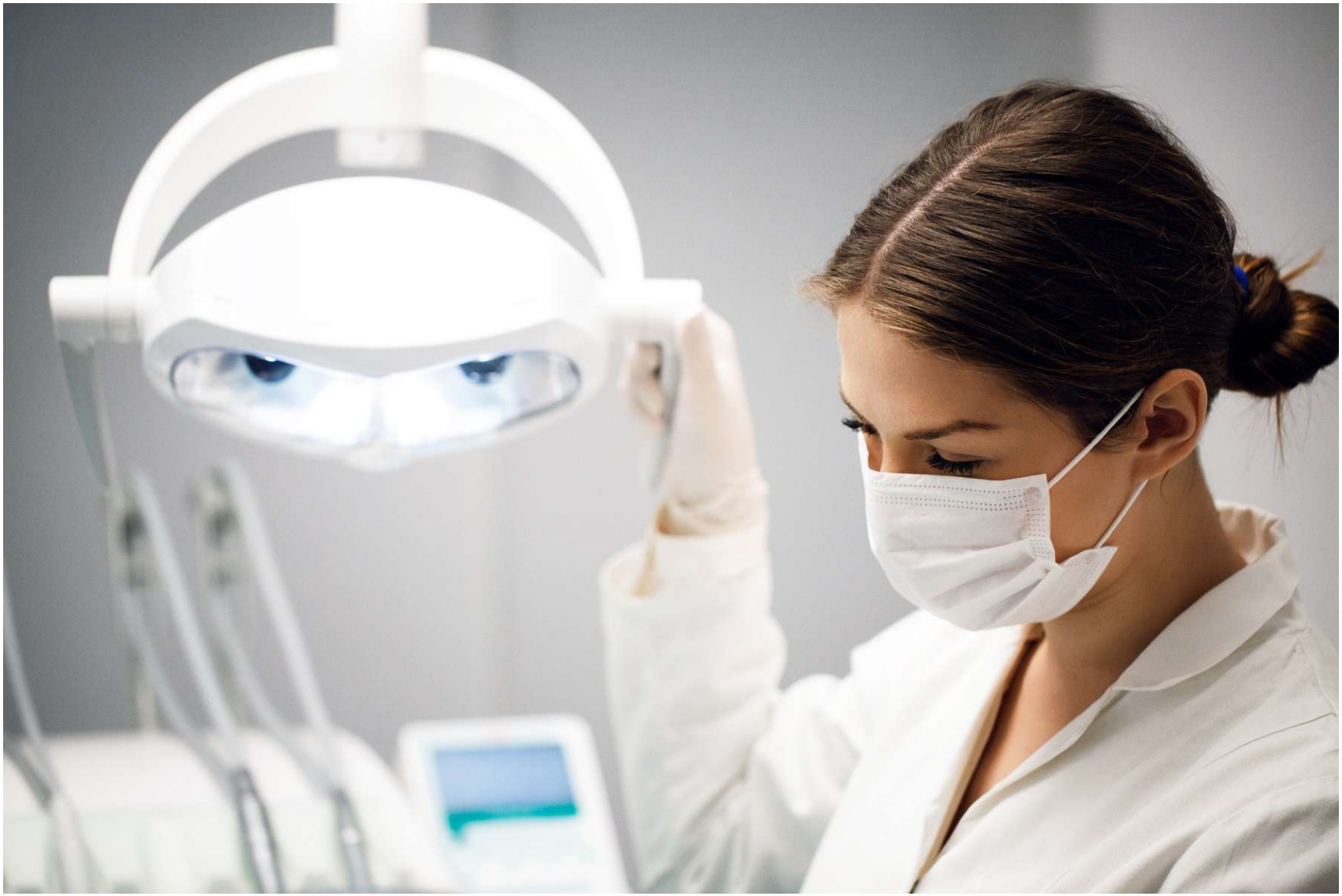
- People with Alzheimer dementia are more likely to develop diabetes than people without Alzheimer dementia.



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Dental, Eye, and Nerve Care



Poll Question 10

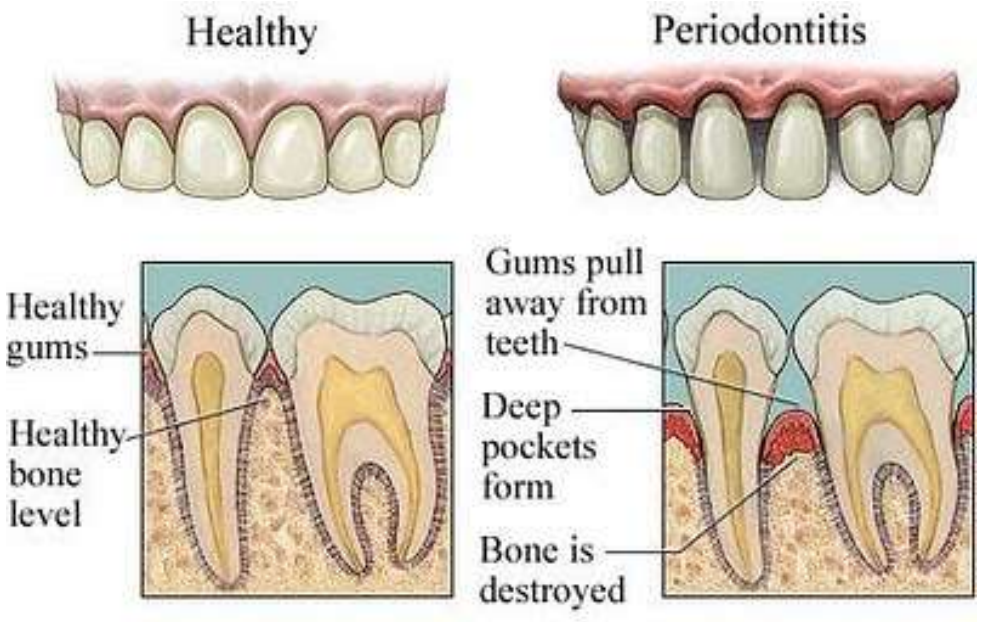
- Diabetes is associated with an increased risk of oral disease. Which of the following statements is true?

a. Diabetes is associated with decreased saliva production.
b. People with diabetes benefit from vinegar gargles to decrease bacterial load
c. People with diabetes are at greater risk for tongue cancer.
d. Diabetes is associated with increased tonsillitis.

Periodontal Disease

- More severe and prevalent with diabetes and elevated A1C levels.
  - periodontal treatment associated with better glycemic control

    (A1C 8.3% vs. 7.8%)
  - Benefits lasted for 12 mo's



- People with periodontal disease have higher rates of diabetes.
- Bidirectional

Oral Care Matters

- See dentist at least yearly
- Dental hygienist twice yearly
- Brush twice daily
- Floss daily

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Gingivitis

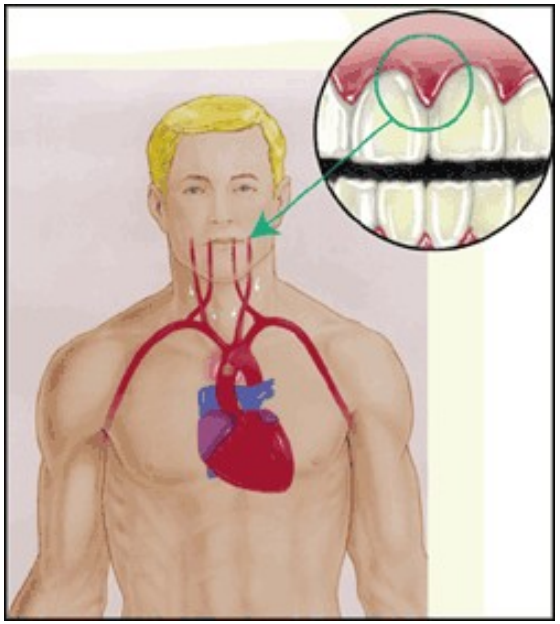


Mild to Severe Periodontitis





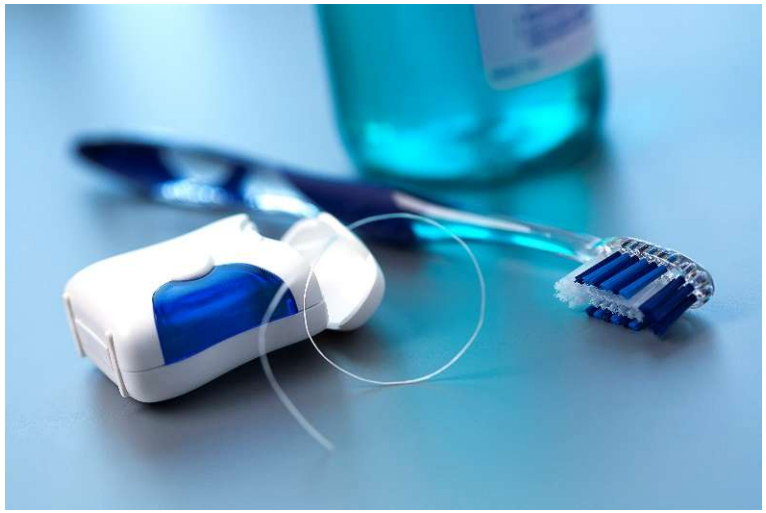
Periodontal disease and Heart Disease



- Heart disease link:
  - oral bacteria enter the blood stream, attach to fatty plaques in coronary arteries increasing clot formation
  - inflammation increases plaque build up, which may contribute to arterial inflammation
- Hyperglycemia = Gingivitis = Heart Disease

Keeping Oral Healthy

- Oral disease linked with heart disease
- Dental exams (every 6 mo's)
- Metabolic control critical
- Quit smoking
- Brush twice daily and floss daily.
- Help access affordable dental care.
- Treat infections with ATB'x, can lower A1c by 1-2%. Lowering BG shortens infection.



Best $10 investment

Retinopathy Changes How We See

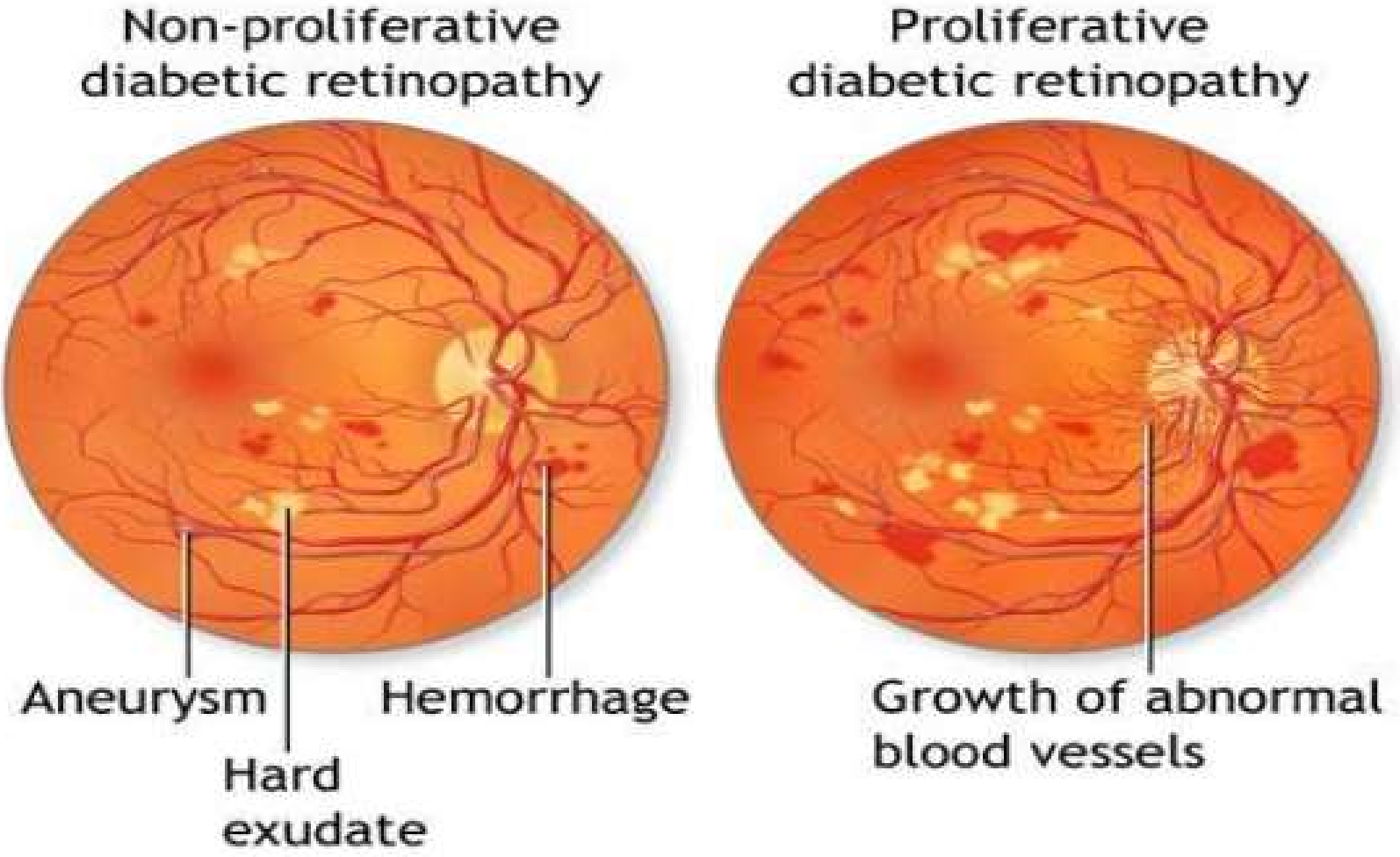


View of boys by person with normal vision



View of boys by person with diabetic retinopathy.

Non - Proliferative to Proliferative Diabetic Retinopathy



Quick Question 15

- Which of the following is correct regarding eye screening for people with diabetes?

  A. All people with diabetes must get a complete eye exam every year

  B. All people diagnosed with type 1 and 2 need an immediate eye exam.

  C. All people diagnosed with type 2 need an immediate eye exam.

  D. People with diabetes over **age** of 60 need an eye exam every 6 months.



12. Microvascular Complications - Eyes



- Optimize BG and B/P Control to protect eyes
- Screen with initial dilated and comprehensive eye exam by ophthalmologist or optometrist
  - Type 2 at diagnosis, then every year*
  - Type 1 within 5 years of dx, then every year*
  - *If **no** evidence of retinopathy **and** glycemic indicators within goal range, then screening every 1–2 years may be considered.
  - Type 1 or type 2 need eye exam before pregnancy and in the 1st trimester and may need monitoring every trimester and 1 year postpartum

- Appropriate to use retinal photography with remote reading or U.S. FDA of approved artificial intelligence algorithms to improve access to diabetes retinopathy screening.

12. Retinopathy, Neuropathy, and Foot Care: Standards of Care in Diabetes—2025 FREE

Retinopathy Prevention

- To reduce the risk or slow the progression of retinopathy
  - Optimize glycemia
  - Optimize blood pressure
  - Optimize lipids
    - retinopathy progression may be slowed by the addition of fenofibrate



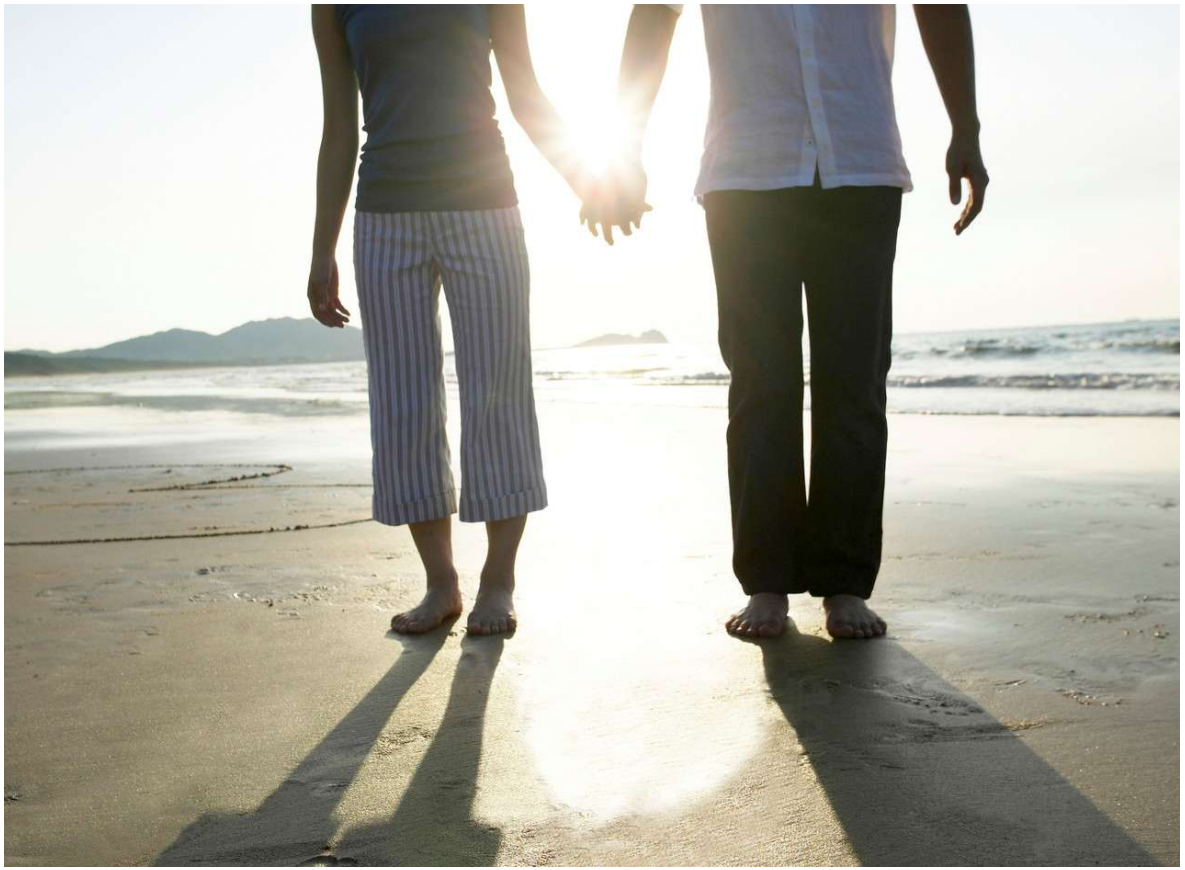
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Collaborative Action Plan and F/U

- Make appointment with dentist and eye doctor.
- Brush twice daily and floss daily.
- Need some relief from nerve pain.
- Experiencing vaginal dryness.

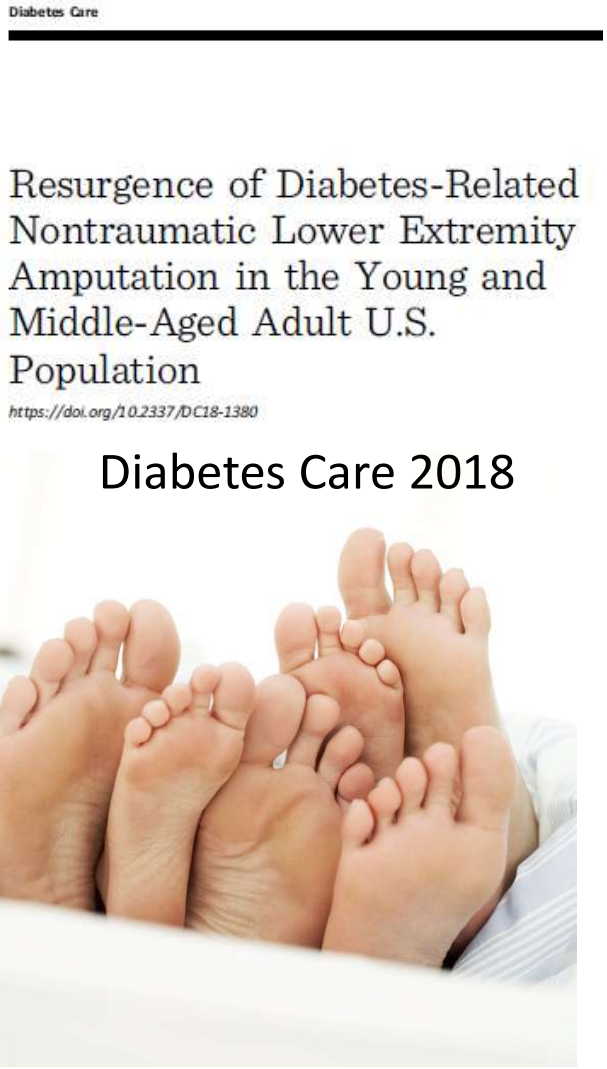


Moving on to the Lower Half



Diabetes and Amputations

- Rate declined 43% - 2000 – 2009
- Increased 50% from 2009-2015
  - 2.1 per 1000 then up to 4.2 per 1000
  - Driven by a 62% increase in minor amputations
  - Highest rates in young and middle age adults (18- 64 years).
- 50% of amputations can be avoided through self-care skill education and early intervention



Diabetes Care 2018

Poll Question 11

- Which of the following is true about diabetes and lower extremities?

a. Excess hair on the toes indicates compromised circulation.

b. People with diabetes need to inspect lower extremities weekly.

c. People over 65, with high-risk feet, qualify for a pair of custom shoes annually

d. Once a person with diabetes has an amputation, they are not likely to have another.



Lower Extremities

- Lift the Sheets and Look at the Feet



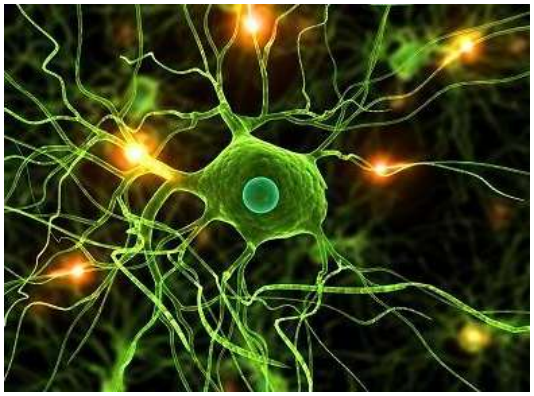




No DeFEET

12. Microvascular Complications Nerves

- Nerve Disease
  - Optimize glucose to prevent/delay.
  - Optimize wt, BP, lipids *to slow* progression.
  - Screen for nerve disease using simple tests:
    - Type 2 at diagnosis, then annually
    - Type 1 diabetes 5 years, then annually
      - 10-g Monofilament - protective sense
      - Pinprick & temperature - small nerve fiber
      - Reflexes & vibration – Large nerves
  - Assess and treat to reduce pain and symptoms to improve quality of life.



Avoid opioids for pain management

12. Retinopathy, Neuropathy, and Foot Care: Standards of Care in Diabetes—2025 FREE

Testing for Small and Large Nerve Fiber Loss

- Test for nerve fiber function and loss of protective sensation:

1. Small-fiber function: pinprick and temperature sensation.
2. Large-fiber function: vibration perception and 10-g monofilament.
3. Protective sensation: 10-g monofilament.

Up to 50% of diabetes peripheral neuropathy may be asymptomatic.



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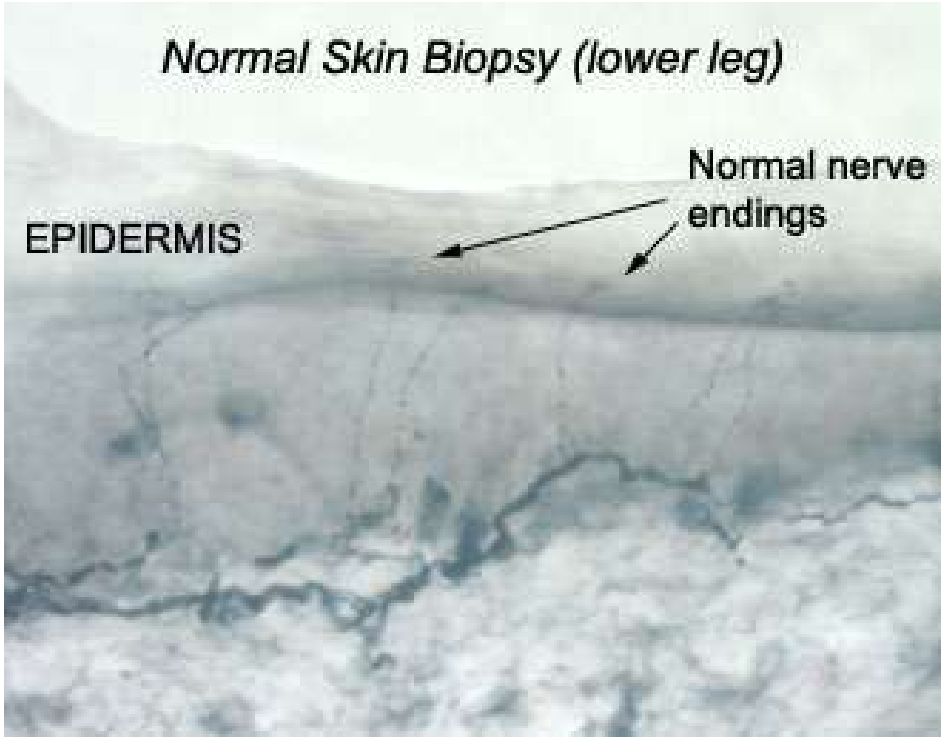
Consider Other Causes of Neuropathy

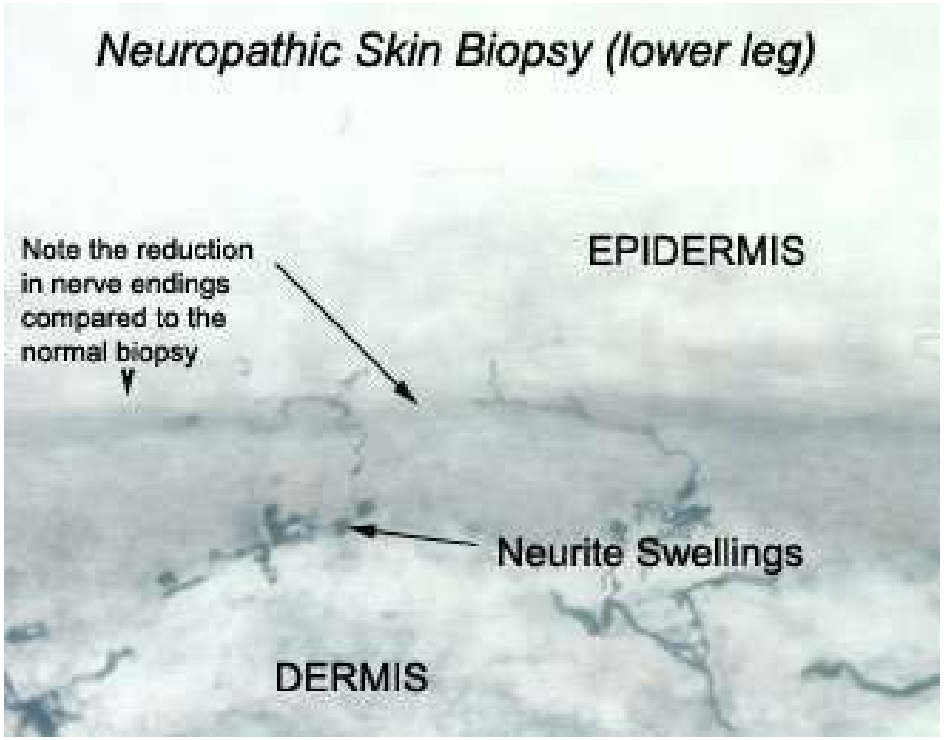
- toxins (e.g., alcohol)
- neurotoxic medications (e.g., chemotherapy)
- vitamin B12 deficiency
- hypothyroidism
- renal disease
- malignancies (e.g., multiple myeloma, bronchogenic carcinoma)
- infections (e.g., HIV)
- chronic inflammatory demyelinating neuropathy
- inherited neuropathies, and vasculitis



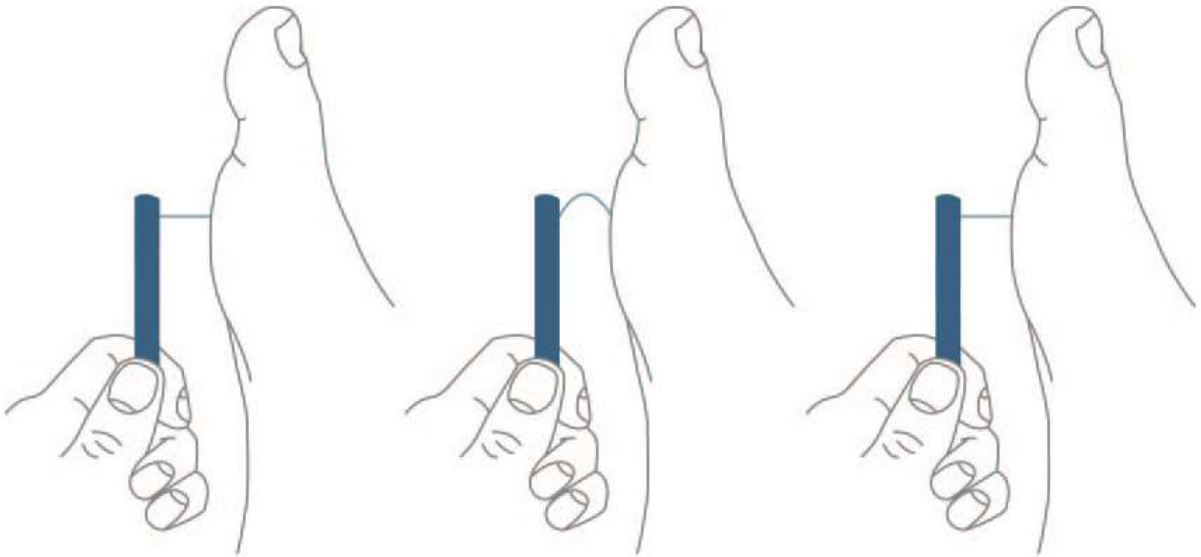
12. Retinopathy, Neuropathy, and Foot Care: Standards of Care in Diabetes—2025 FREE

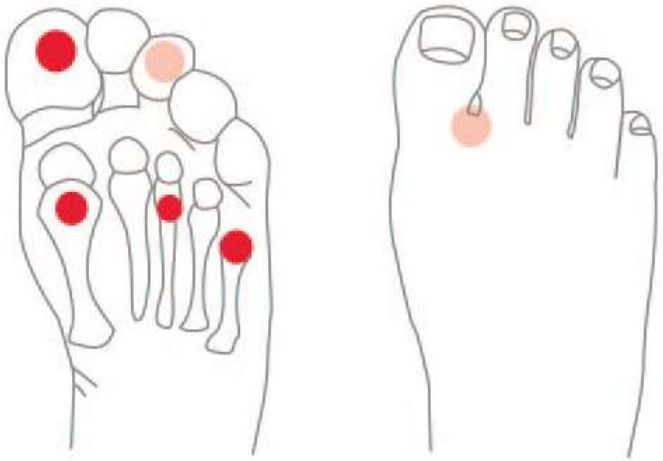
Skin Biopsy to Assess Neuropathy





5.07 monofilament delivers 10gms linear pressure





Treating Neuropathy

- Improve glycemic control
- Control pain
- Relief from depression from chronic pain
  - Massage, stretching,
  - Pain control clinic,
  - Transcutaneous Electrical Nerve Stimulation (TENS)
  - Avoid alcohol
  - Relaxation exercises....



Neuropathy Treatment for Diabetes

Behavioral Interventions: Improve glucose levels, quit smoking, alcohol reduction, exercise, massage, meditation, pain management clinic, adequate sleep, nutrition therapy, hobbies.

Pathogenetically Oriented Therapy

- Alpha lipoic acid 600 – 1,800 mg a day. Consider B12 replacement therapy.

Prescription Therapy:

1st line – Tricyclic Antidepressants (Amitriptyline, Nortriptyline, Desipramine)

- Calcium Channel Modulators (Gabapentin, Pregabalin)
- Serotonin Norepinephrine Reuptake Inhibitors (SNRI – Venlafaxine, Duloxetine)

2nd Line - Topical Capsaicin Cream for localized pain – Apply 2-4 x daily for up to 8 wks

- Opioids are no longer recommended due to addiction risk, lack of efficacy. (ADA Stds)

Common Reasons for Treatment Failure

- Dose too low or inadequate trial – requires 2-8 weeks of treatment to observe symptom reduction
- Expecting elimination of symptoms – only reduces symptoms by about 50%
- Incorrect diagnosis: If in doubt, refer to neurologist
- If there is no improvement or person has adverse effects, change medication class
- If some but inadequate relief, raise the dose and consider adding or changing meds.

References: Ziegler, D. Painful diabetic neuropathy. Diabetes Care 2009; 32 (Supp 2): S414-S419

Class	Generic / Trade Name	Usual Daily Dose Range	Comments	Side Effects/ Caution
1st Line Agents **Tricyclic Antidepressants TCA** Improves neuropathy and depression	Amitriptyline / Elavil	25 – 100 mg* Avg dose 75mg	Usually 1st choice	Take 1 hour before sleep. Side effects; dry mouth, tiredness, orthostatic hypotension. **Caution**: not for pts w/ unstable angina (<6 mo), MI, heart failure, conduction system disorder.
	Nortriptyline / Pamelor	25 - 150 mg* (for burning mouth)	Less sedating and anticholinergic	
	Desipramine / Norpramine	25 – 150 mg* *Increase by 25mg weekly till pain relieved		
Calcium Channel Modulators	Gabapentin/ Neurontin	100 - 1,200mg TID	Improves insomnia, fewer drug interactions	Sedation, dizziness, peripheral edema, wt gain **Caution**; CHF, suicide risk, seizure disorder.
	Pregabalin / Lyrica *FDA approved for neuropathy treatment	50 - 200mg TID		
Serotonin Norepinephrine Reuptake Inhibitor SNRI	Duloxetine / Cymbalta *FDA approved for neuropathy treatment	60 mg daily Start at 30 mg	Improves depression, insomnia	Nausea, sedation, HTN, constipation, dizziness, dry mouth, blurred vision. **Caution**: adjust dose for renal insufficiency, do not stop abruptly, taper dose.
	Venlafaxine/ Effexor	75 - 225 mg daily		
2nd Line Agents **Opioids** (avoid this class)	Weaker opioids Tramadol / Ultram	50 – 400 mg	Sedation, nausea, constipation **Caution: ADA Standards** no longer recommend this class due to addiction risk and lack of efficacy for painful neuropathy.	
	Stronger opioids Oxycodone	10 – 100 mg		

Meds for Neuropathy – Cheat Sheet

Also consider Capsaicin cream 8% patch or Lidocaine 5% patch

12. Retinopathy, Neuropathy, and Foot Care: Standards of Care in Diabetes—2025 FREE

Other strategies to help ease the pain

- Music
- Podcasts
- Movies
- Pet's
- Massage
- Touch
- Topical creams
- Lidocaine patches
- Mineral salts baths
- Neurostimulators



- Acetaminophen / Ibuprofen
- Earthing
- Sleep
- Hobbies
- Aromatherapy
- Time with special people
- Work / volunteering

We Can Make A Difference

- Assess
  - Nail condition, nail care, in between the toes
  - Who trims your nails
  - Have you ever cut your self?
  - Shoes – type and how often
  - Socks
  - Skin/skin care and vascular health
  - Ability to inspect
  - Loss of protective sensation
  - Nerve pain treatment

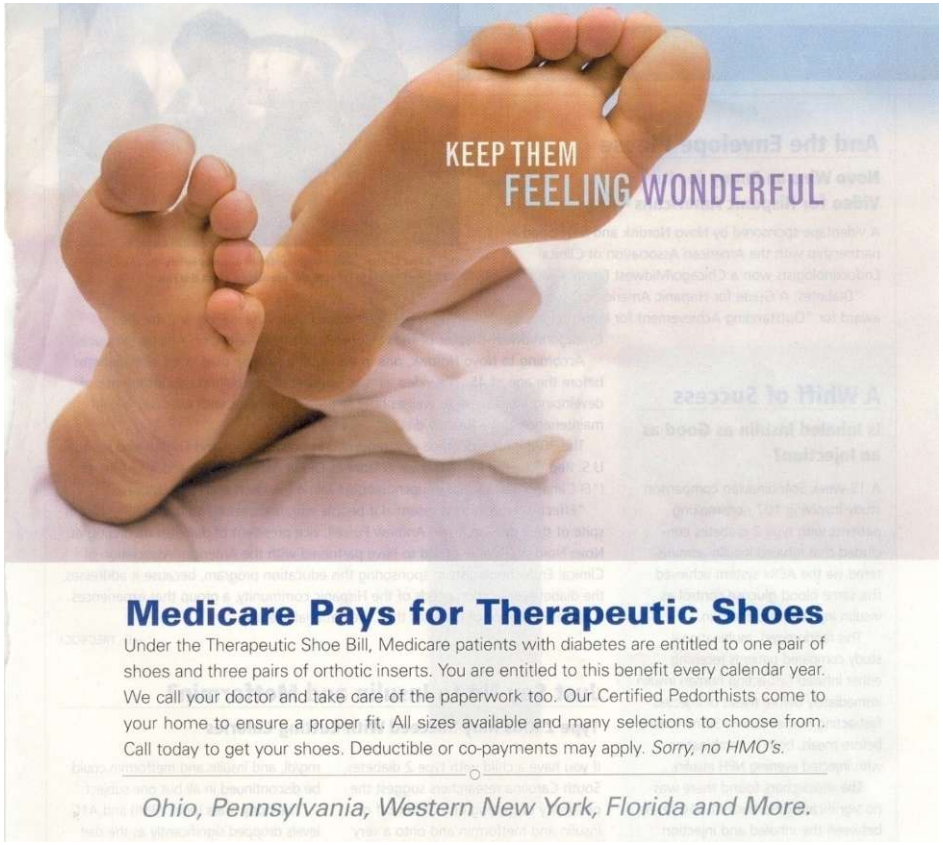


Lower Extremities

- **"Every time you see your provider, take off your shoes and socks and show your feet!"**
- For those at high risk for foot complications
  - with loss of protective sensation, foot deformities, or a history of foot ulcers
- Everyone else needs a thorough, annual inspection



Feet Deserve Special Care



- Daily inspection
- With order from MD and Loss of Protective Sensation (LOPS), Medicare Covers:
  - Annual custom shoes
  - 3 pairs of orthotic inserts

Medicare and Custom Shoes

- The doctor who treats diabetes must certify need for therapeutic shoes or inserts and be a medicare provider.
- A podiatrist or other qualified doctor must prescribe the shoes or inserts, and ind must get the shoes or inserts from one of these:

- A podiatrist
- A pedorthist
- Another qualified individual
- A prosthetist
- An orthotist

“DAN” Diabetic Autonomic Neuropathy

- 50% of ind’s with peripheral neuropathy also have DAN
- DAN associated with higher M/M Rates
  - hypoglycemia unawareness
  - resting tachycardia, orthostatic hypotension
  - gastroparesis, constipation, diarrhea, fecal incontinence
  - neurogenic bladder
  - sudomotor dysfunction with either increased or decreased sweating
  - erectile dysfunction



Sexual Functions as We Age

- 20-30 years — trice daily
- 30-40 years — tri weekly
- 40-50 years — try weekly
- 50-60 years — try weakly
- 60-70 years — try oysters
- 70-80 years — try anything
- 80-90 years — try to remember



A touch of humor from AADE-New Perspectives on Erectile Dysfunction, 1999

Erectile Dysfunction



- Affects about 50% of men with diabetes
- Loss of erections sufficient for intercourse
- Due to combo of vascular and nerve damage
- Tests: penile tumescence to eval if organic or psychogenic
- Treatment:
  - Sildenafil (Viagra), Vardenafil (Levitra), Tadalfil (Cialis)
    - Use caution if taking nitrate drugs. Check w/ MD first
  - Other meds, vacuum devices, prosthetics
  - HRT- testosterone gel, patches, injections, pills

Assess Sexual Health

- In men with diabetes or prediabetes:
  - Inquire about sexual health (e.g., low libido and erectile dysfunction [ED].
  - If symptoms and/or signs of hypogonadism are detected (e.g., low libido, ED, and depression), screen with a morning serum total testosterone level.
  - Best predictors of ED are age (>40 years), CVD, diabetes, hypertension, obesity, dyslipidemia, metabolic syndrome, hypogonadism, smoking, depression, and use of medications such as antidepressants and opioids.
  - ED is also a predicator of heart disease.
  - Assess, treat and refer

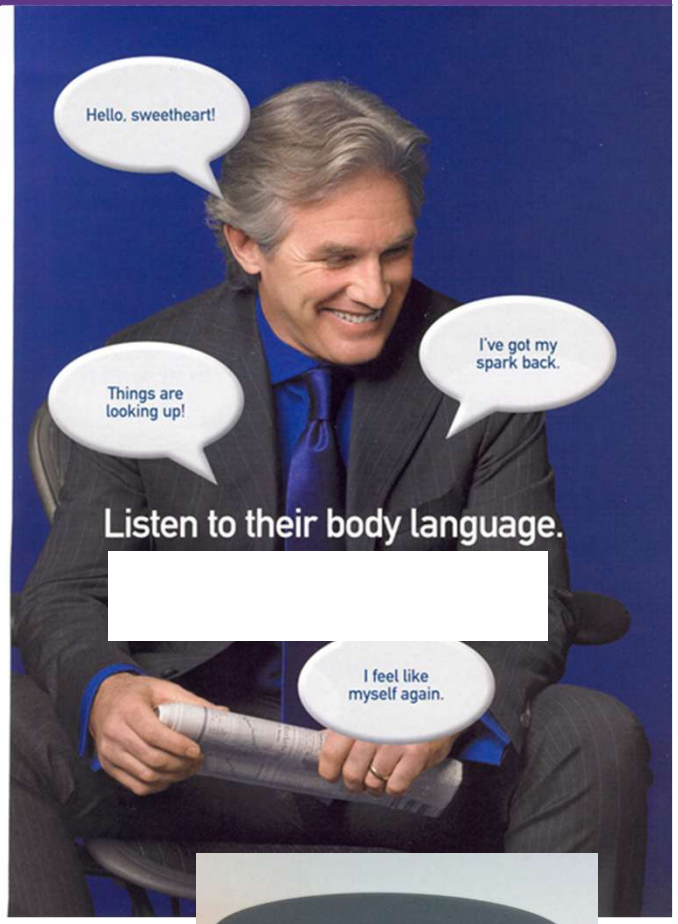


4. Comprehensive Medical Evaluation and Assessment of Comorbidities: Standards of Care in Diabetes—2025 FREE

American Diabetes Association Professional Practice Committee

Low Testosterone

- Hypogonadism: loss of sex drive or activity
- Screening: morning serum levels
- Mean testosterone levels lower in men with diabetes – also associated with elevated BMI
- Testosterone replacement therapy can improve:
  - Sexual function, strength, bone density, mood
  - Repeat am testosterone level after treatment to eval response





Asking about sexual health

- " I'm going to ask you a few questions *about your sexual health. Since sexual health is very important to overall health, I ask each person these same questions.*
- Before I begin, *do you have any questions or sexual concerns you'd like to discuss?"*
- Have you noticed any changes in your sex life over the past year?
  - Trouble with erection, lowered libido, decreased sensation, painful intercourse or something else?



Assess Sexual Health

- In women with diabetes or prediabetes, assess sexual health:
- 33% reported female sexual dysfunction (FSD)
- Screen for desire (libido), arousal, orgasm difficulties, particularly in those with depression and/or anxiety and those with recurrent urinary tract infections.
- In postmenopausal women - screen for symptoms and/or signs of genitourinary syndrome of menopause, including vaginal dryness and dyspareunia.



4. Comprehensive Medical Evaluation and Assessment of Comorbidities: Standards of Care in Diabetes—2025 FREE

American Diabetes Association Professional Practice Committee

Improving Sex Life

People with diabetes get more vaginal and bladder infections

- Difficulty achieving orgasm due to neuropathy
- Painful intercourse due to lack of vaginal lubrication

Treatment

- Lower blood glucose / blood pressure
- Treat vaginal infections and UTI's
- Water based lubricants for vaginal dryness
- Hormone replacement therapy
- Eat to prevent lows during intimacy
- Allow time, touching and romance



Many people with diabetes have issues with sexual desire, arousal, or orgasm. How about you?"

EV is feeling Empowered

- Her A1c has dropped, she feels better about herself with healthier eating and increased activity.
- She is back on her thyroid medication and has more energy.
- The pain in her feet is better and she is more hopeful overall!



The ABC's of Diabetes Management



A - A1c less than 7%, TIR 70%

B - Blood pressure < 130/80

C - Cholesterol

LDL< 70, HDL > 40, Triglycerides < 150

D - Drugs- Keep list on phone

E - Exercise and Eyes

F - Food and Feet

G – Glucose checks and goals

H- Healthy Coping - Hoorah for your hard work!

K – Kidneys – Check UACR & GFR

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
	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 20 gm per day Mix w/ fluid		
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.

Integrating Technology: CGM, Connected Pens, and Insulin Pumps DiabetesEd Training Seminar 2025 – Day 2

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

Director, Education & Training in Diabetes Technology

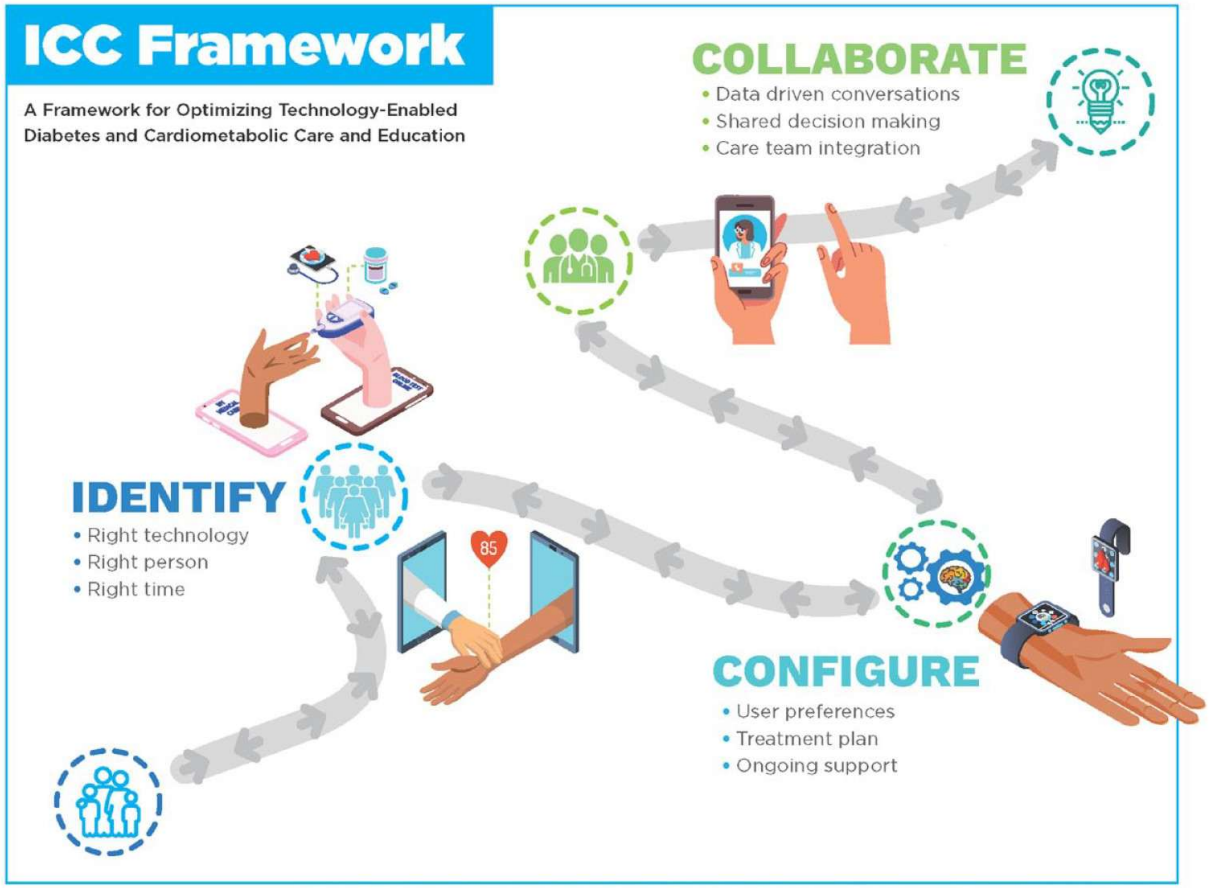
Co-Director, Endocrine Disorders in Pregnancy

Learning Objectives

- Discuss continuous glucose monitoring (CGM) and the clinical benefits for managing diabetes
- Compare and contrast different CGM, insulin pump, and connected pen devices
- Describe critical teaching content for insulin pump, connected pen and CGM use
- Describe appropriate candidates for insulin pump therapy
- List inpatient considerations for insulin pump therapy and CGMs

ICC Framework – Identify-Configure-Collaborate

A framework to overcome barriers to technology use and therapeutic inertia



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Greenwood DA, Howell F, Scher L, et al. A Framework for Optimizing Technology-Enabled Diabetes and Cardiometabolic Care and Education: The Role of the Diabetes Care and Education Specialist. The Diabetes Educator. 2020;46(4):315-322. doi:10.1177/0145721720935125

Technology is Here



CONTINUOUS GLUCOSE MONITORS (CGM)



INSULIN PUMPS

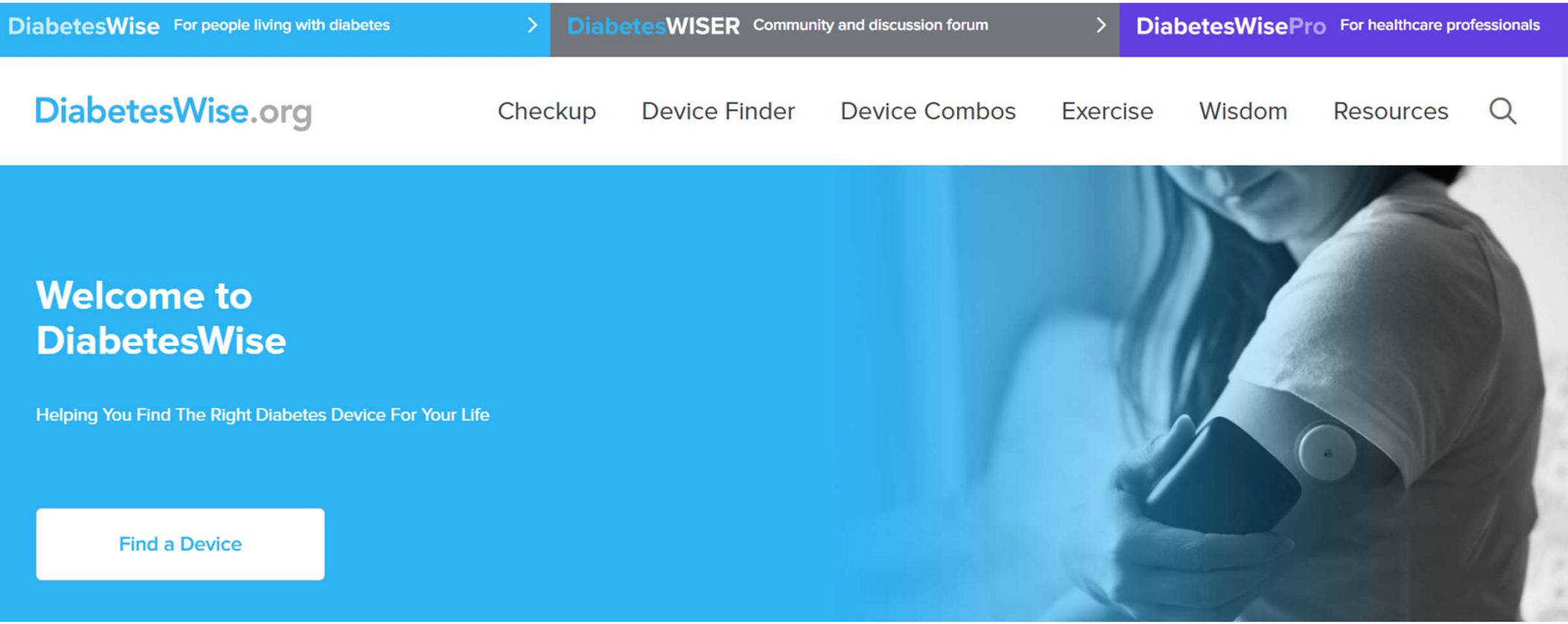


CONNECTED PENS AND CAPS



MOBILE APPS

Identify: PWD Identify the “Right” Technology



Diabeteswise.org, providers.diabeteswise.org/#/

The Importance of Education & Training

"No device used in diabetes management works optimally without education, training, and ongoing support."

ADA. Diabetes Care. 2025

Continuous Glucose Monitors



CGM: Real-Time Data





ADA Standards of Care 2025

American Diabetes Association®

- Diabetes devices should be offered to people with diabetes **(A)**
- Recommend **real-time CGM (A)** or **IS-CGM (B)** for diabetes management to youth **(C)** and adults **(B)** with diabetes on any type of insulin therapy
- Consider using **rtCGM** and **isCGM** in adults with type 2 diabetes treated with glucose-lowering medications other than insulin to achieve and maintain individualized goals **(B)**
- Use of CGM is beneficial and recommended for individuals at high risk for hypoglycemia **(A)**
- Recommend early initiation, including at diagnosis, of CGM, CSII, and AID depending on a person's or caregiver's needs and preferences **(C)**

1 American Diabetes Association. *Diabetes Care*. 2025;48(Suppl. 1):S146-S166. 2 American Diabetes Association. *Diabetes Care*. 2025;48(Suppl. 1):S128-S145.

Types of CGM

Professional	Personal
Owned by the clinic	Owned by the person with diabetes
Blinded and unblinded (real-time feedback) options	Real-time feedback
Short-term use (3-14 days)	Long-term use
Insurance coverage for most people with type 1 or type 2 diabetes	Insurance coverage for most insulin users
Not compatible with insulin pumps or connected pens	Compatible with smartphones, connected pens and insulin pumps with select devices

Wright LA, Hirsch IB. *Diabetes Technol Ther.* 2017;19(suppl 2):S16-S26; Kruger DF, et al. *Diab Educ*. 2019;45(suppl 1):S3-S20.

DI1

Types of CGM

	Professional	Personal	OTC
How to obtain	Owned by the clinic	Requires a prescription	Available without a prescription
Type	Blinded and unblinded (real-time feedback)	Real-time	Real time
Wear duration	Short-term use (10 days)	Long-term use	Short- or long-term use
Access	Insurance coverage for most people living with diabetes or prediabetes	Insurance coverage more focused on people taking insulin , although expanding	Cash pay, available to all adults
Compatibility	Smartphone app	Smartphones, reader/receiver, connected pens, mobile apps, insulin pumps	Smartphone app, mobile apps/Oura ring

Slide 11

DI1 Updated slide

Diana Isaacs, 2025-08-26T01:15:44.239

DI1

Professional CGM

Characteristics	Dexcom G6 Pro
Blinded vs unblinded	Both
Maximum wear time of sensor	10 days
Calibration	None
Downloading reports	Clarity
Care between transmitter use	Disposable-1 time use, must attached transmitter
Alarms for high/low glucose alerts	Yes
Interfering substances	Hydroxyurea
Mobile app	Dexcom G6

ADCES Practice Paper. The diabetes care and education specialist role in CGM.

Slide 12

DI1 Added mobile app

Diana Isaacs, 2025-08-26T00:54:08.570

Personal CGM Options (Rx)

Freestyle Libre 2+

Freestyle Libre 3+

Eversense 365

Dexcom G6

Dexcom G7

Guardian 4

Simplera



DI1

CGM Comparison

	Dexcom G6	Dexcom G7	Libre 2 +	Libre 3 +	Simplera	Eversense 365
Pump Integration	T:Slim X2, Omnipod 5, iLet, Mobi	T:Slim X2 , Omnipod 5, iLet, Mobi,	T:Slim X2, Omnipod 5	Twiist, iLet, Omnipod 5	780G	Twiist (soon)
Maximum wear time	10 days	10.5 days	14 days (15 days with Libre2+and 3+)		7 days	180 days
Warm-up time	2 hours	30 min	1 hour		Up to 2 hours	24 hours
Calibrations	Optional	Optional	0No		Only to enter auto mode	2/day for 14 days, then 1/week
Water depth	8 feet, 24h	8 feet, 24h	3 feet, 30 min		8 feet, 30 min	3.28 feet, 30 min
Data Platform	Dexcom Clarity		LibreView		Carelink	Eversense Data Management System

Product user guides: Dexcom G6, Dexcom G7, Libre 2, Libre 3, Simplera, Eversense

Slide 14

DI1 updated

Diana Isaacs, 2025-08-26T00:53:45.011

CGM Comparison (Continued)

	G6	G7	Libre 2+	Libre 3+	Simplera & Simplera Sync	Eversense 365
FDA approved sites	Abdomen (ages2+) Upper buttocks (a ges 2-17)	Upper arm (ages 7+) Upper buttocks (ages 2-6)	Upper arm		Upper arm, abdomen Upper buttocks (ages 2-13)	Upper arm
Approved in pregnancy	No	Yes	Yes		No	No
Transmitter	3 months	Disposable	Disposable		Disposable	Charge daily
FDA approved ages (years)	≥2	≥2	≥2		≥2 Simplera Sync ≥7 Simplera	≥18
Pregnancy Indication	No	Yes	Yes		No	No
Drug interactions	Hydroxyurea	Hydroxyurea	Vitamin C		Acetaminophen	Tetracycline antibiotics, mannitol

Product user guides: Dexcom G6, Dexcom G7, Libre 2, Libre 3, Simplera, Eversense

Poll Question 12

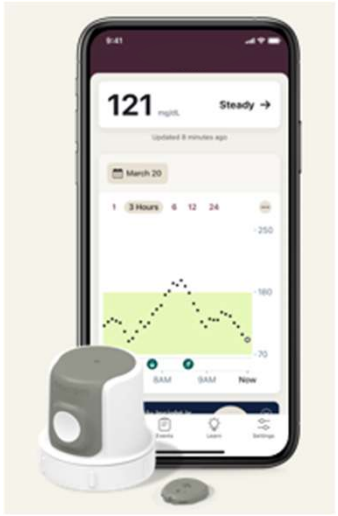
Which of the following sensors is sold over the counter without a prescription?

A. Simplera Sync
B. Dexcom G7
C. Libre 3
D. Dexcom Stelo

DI1

Over-The-Counter CGM

- Available without a prescription
- Ordered online
- Intended for adults not taking insulin
- No alerts for hypoglycemia
- Works with mobile apps that incorporate education on lifestyle and glucose goals





Zahalka SJ, et al. Endocr Pract. 2025 May 21:S1530-891X(25)00893-6

Slide 17

DI1 New slide

Diana Isaacs, 2025-08-26T01:19:25.015

DI1

OTC CGM Options

	Dexcom Stelo	Abbott Lingo
Intended audience	Adults not on insulin with T2D, prediabetes, or who are interested in tracking their glucose	Adults not on insulin interested in understanding how to improve their metabolic health
Wear time	15.5 days	14 days
Ability to share data	Dexcom Clarity	No
Glucose range	70-250mg/dL	55-200mg/dL
Real-time alerts	Spike detection	No
Special features	"Spike Alerts" – notified that your glucose is rising at a rate the app determines to be a "Spike" Daily insights	Lingo Count – points assigned for elevations in glucose throughout the day, goal is to get fewer total points, Coaching program
Frequency of glucose readings	15 minutes	1 minute
Education within App	Yes	Yes
Age	≥ 18 yr	≥ 18 yr
Cost	$99/month or $85-$89/month with subscription plans	$49-1 sensor, $89-2 sensors, $249-6 sensors, subscription plan

Information from manufacturers websites: https://www.stelo.com/en-us, Lingo - Made by Abbott: Your body has the answers (hellolingo.com)

Libre Rio FDA cleared Range: 40-400mg/dL

Slide 18

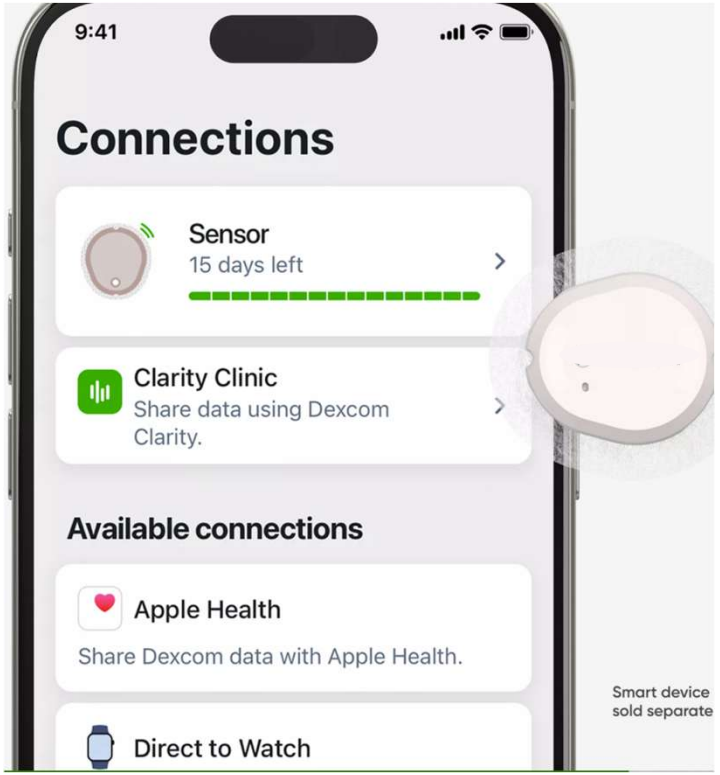
DI1 New slide

Diana Isaacs, 2025-08-26T01:19:34.950

Coming Soon



- Instinct sensor
- Dexcom G7 15 day sensor



[MiniMed Product Guide]
[Dexcom G7 15 Day Sensor User Guide]

Slide 19

DI1 New slide

Diana Isaacs, 2025-08-26T01:41:57.217

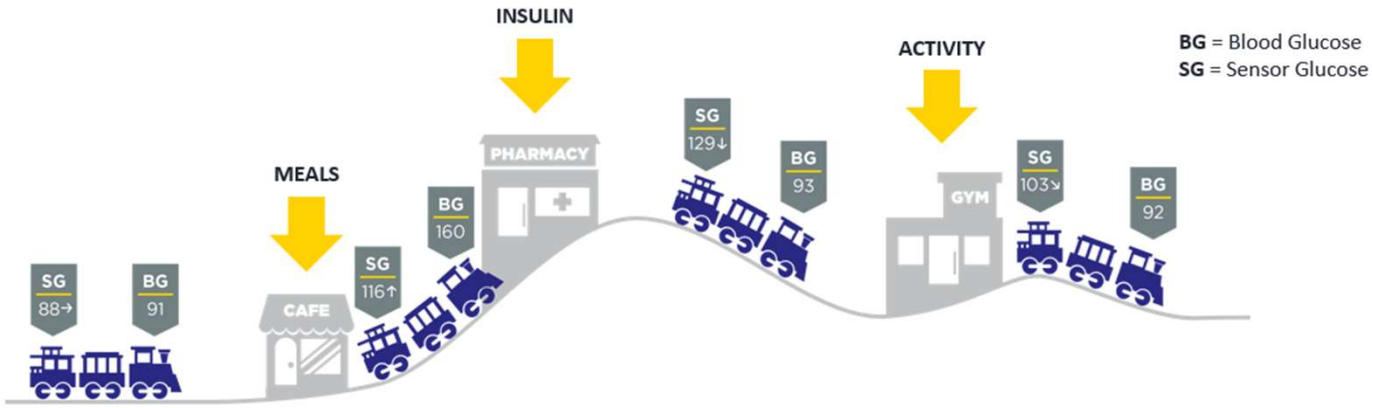
CGM Counseling Points

- Important to check glucose when indicated
  - Symptoms do not match sensor value
  - During warm-up period for treatment decisions
- Sensors are waterproof
  - Showering, bathing, swimming OK
  - Check water depth criteria for individual sensor
- Overlays and skin preps to help it stay on
- Avoid with MRI, CT, diathermy
  - Exception: Eversense implantable, transmitter should be removed
  - Libre now ok for MRI/CT
- Not FDA approved
  - Dialysis, critically ill
  - Pregnancy-Guardian,simplera eversense, G6
  - If people choose to use, it is important they know it is off-label

DI1

Lag Time

- Refers to a slight delay in CGM sensor readings compared to finger sticks
- Most apparent when glucose is changing rapidly
- Counsel pwd on the train analogy



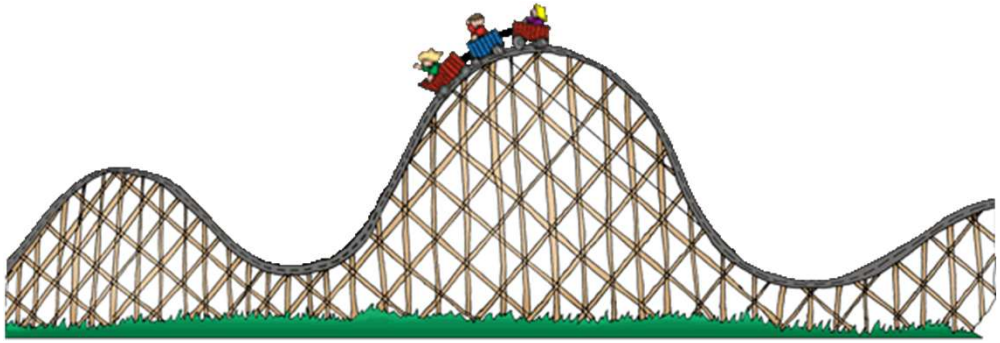
Slide 21

DI1 Updated image

Diana Isaacs, 2025-08-26T01:22:05.153

Lag Time

- Refers to a delay in CGM sensor readings compared to finger stick blood glucose readings
  - Estimated CGM sensor reading ~5 minutes behind
- Most apparent when glucose is changing rapidly
- Counsel patients on the train analogy



DI1

Causes of Falsely High or Low Readings

- Interfering substances
  - Falsely high
    - Vitamin C (Libre)
    - Acetaminophen (high dose Dexcom, Simplera)
    - Tetracycline antibiotics (Eversense)
- Compression Lows
- Dehydration
- Faulty sensor

Slide 23

DI1 updated

Diana Isaacs, 2025-08-26T01:23:47.616

When to Check BGM?

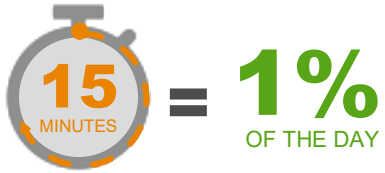


- A calibration or blood glucose symbol appears on the device
  - If making a dosing decisions
- Symptoms or expectations do not match CGM readings
- Off-label indications to ensure accuracy: dialysis, inpatient use
- Possibly after correcting a low
- If taking an interfering substance
- Counsel pwd about “lag time”

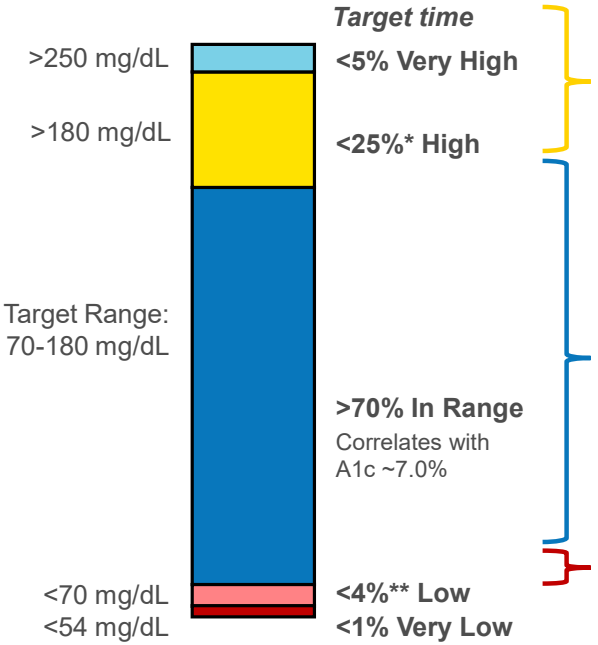
Per ADA, every person using CGM should have access to a meter and test strips

Downloading CGM Data

CGM Key Metrics



Recommended Time in Range for most people with T1D & T2D



Time above range (TAR)
< 1 hr, 12 min, > 250 mg/dL
< 6 hr, > 180 mg/dL

Time in range (TIR)
> 16 hr, 48 min

Time below range (TBR)
< 1hr < 70mg/dL
< 15 min < 54mg/dL

Number of days CGM is worn 14 days is recommended
Percentage of time CGM is active 70% of data from 14 days is recommended
Mean glucose
Glucose management indicator (GMI) Estimated A1C
Coefficient of variation (CV) This is a measure of glycemic variability. A CV >36% is considered unstable.

1. Battelino T et al. *Diabetes Care*. 2019;42(8):1593-1603. . 2. American Diabetes Association. *Diabetes Care 2021;44(Suppl. 1):S73–S84 | https://doi.org/10.2337/dc21-S006.*

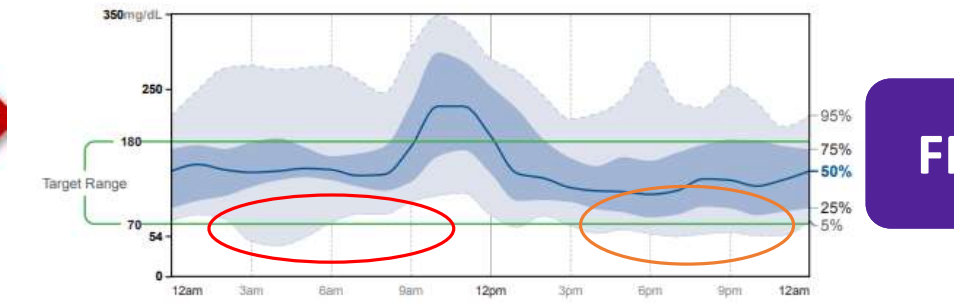
AGP report

Metrics and targets



More Green, Less Red

AGP profile (14 days)

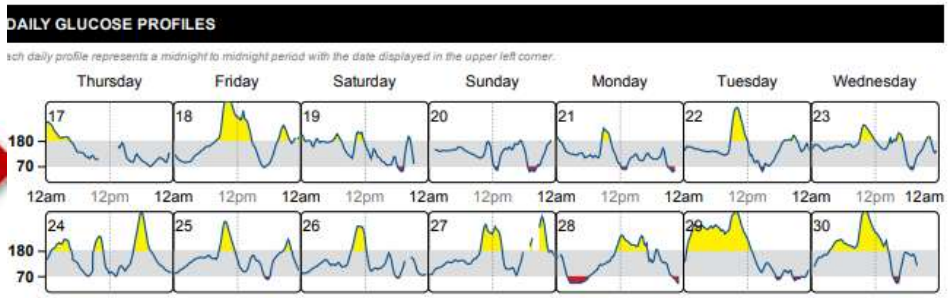


FNIR

Flat Narrow In Range

Treat Hypo 1st

Daily views



Patterns

Poll 17. What is the goal time in range for most adults with type 1 or 2 diabetes?

A. ≥50%

B. ≥70%

C. ≥80%

D. ≥90%

Target Glucose Ranges

Day

Start Time: 6:00 AM
End Time: 10:00 PM
Low Threshold: 70 mg/dL
High Threshold: 180 mg/dL

Night

Start Time: 10:00 PM
End Time: 6:00 AM
Low Threshold: 70 mg/dL
High Threshold: 180 mg/dL

Time in Range



3% Very High
22% High
73% In Range
2% Low
0% Very Low

Target Range:
70-180 mg/dL

Day

Start Time: 6:00 AM
End Time: 10:00 PM
Low Threshold: 70 mg/dL
High Threshold: 130 mg/dL

Night

Start Time: 10:00 PM
End Time: 6:00 AM
Low Threshold: 70 mg/dL
High Threshold: 130 mg/dL

Time in Range

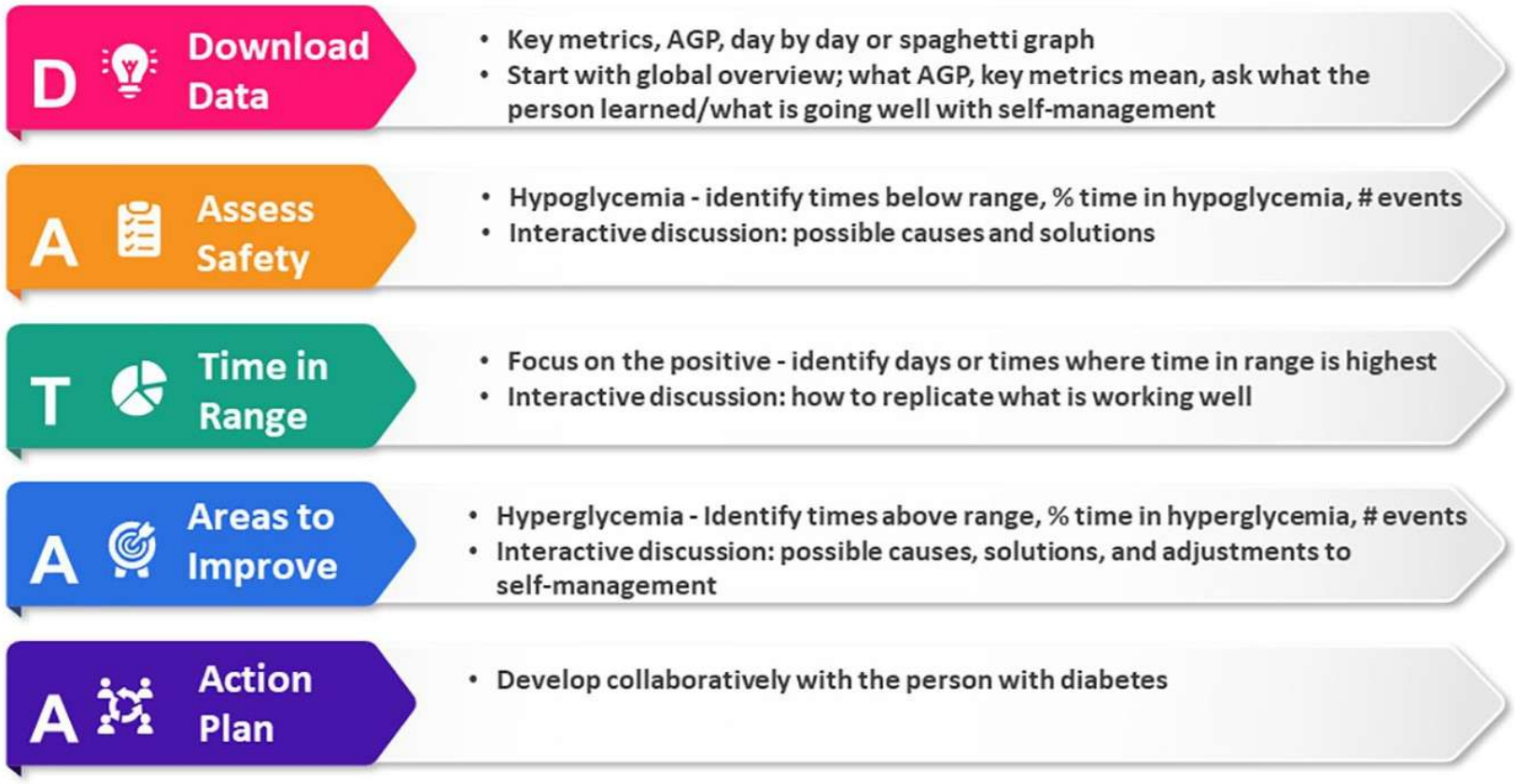


2% Very High
64% High
32% In Range
2% Low
0% Very Low

Target Range:
70-130 mg/dL

Same person, same data, look at the difference in time in range!

Review of CGM - DATAA

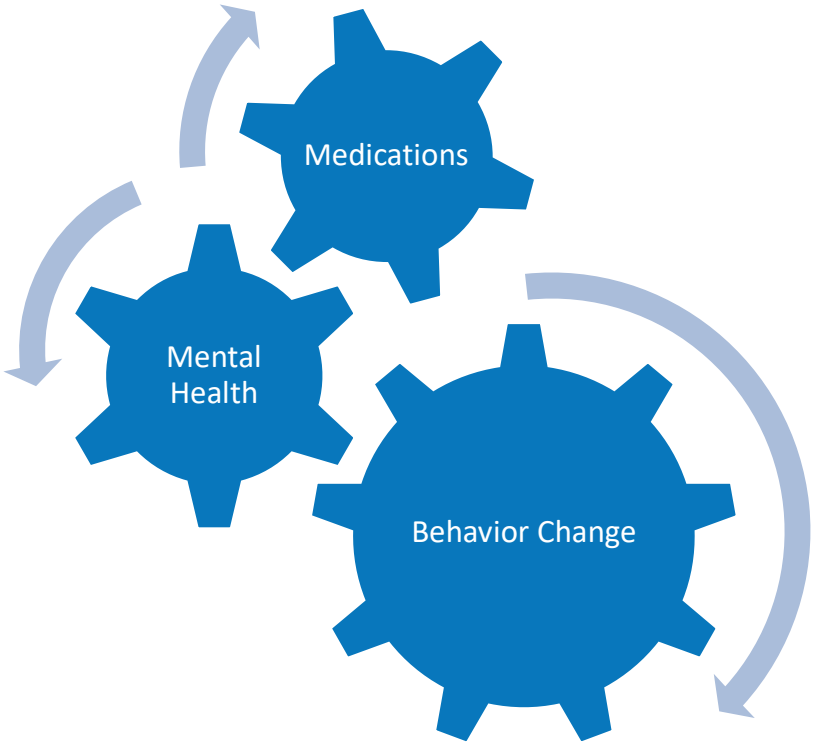


At each step, express that this is information, not good or bad

Isaacs D, Cox C, Schwab K, et al. Technology Integration: The Role of the Diabetes Care and Education Specialist in Practice. The Diabetes Educator. 2020;46(4):323-334. doi:10.1177/0145721720935123

Tips for DATA Interpretation

- Start by asking the person what they've experienced and noticed with their glucose patterns
- Avoid judgment
- Learn from 1 time episodes, but make changes based on patterns
- Fix lows first but some amount is expected (<1-4%) and if you remove all lows, you may end up with too many highs
- If it's not making sense, dig deeper (ex. missed doses, rationing, injection technique, food insecurity, etc)



Case Studies & 2 min Stretch



Case 1

Terrance is a 60-year-old man with T2D x 12 years

Current DM2 meds:

- Metformin 1000 mg twice daily
- Glimepiride 8mg daily

Other conditions

- CKD
- Hyperlipidemia
- Hypertension

Checks BGM once daily

Pertinent Labs

- SCr = 1.38 mg/dL, eGFR = 55
- A1C = 8.2%, BMI = 34 kg/m^2

- Works in project management
- Eats 3 meals/day, snacks at night, no regular exercise
- Glucose log

Day	FBG, mg/dL
1	125
2	123
3	110
4	108
5	99
6	81
7	134

Starts CGM

D Download Data

A Assess Safety

- Which CGM key metrics are at goal?
- Which are not?
- Overall patterns?

GLUCOSE STATISTICS AND TARGETS

February 26, 2021 - March 25, 2021	**28 Days**
% Time CGM is Active	**98%**

Ranges And Targets For	Type 1 or Type 2 Diabetes
Glucose Ranges	**Targets** % of Readings (Time/Day)
Target Range 70-180 mg/dL	Greater than 70% (16h 48min)
Below 70 mg/dL	Less than 4% (58min)
Below 54 mg/dL	Less than 1% (14min)
Above 180 mg/dL	Less than 25% (6h)
Above 250 mg/dL	Less than 5% (1h 12min)

Each 5% increase in time in range (70-180 mg/dL) is clinically beneficial.

Average Glucose	**185** mg/dL
Glucose Management Indicator (GMI)	**7.7%**
Glucose Variability	**29.7%**

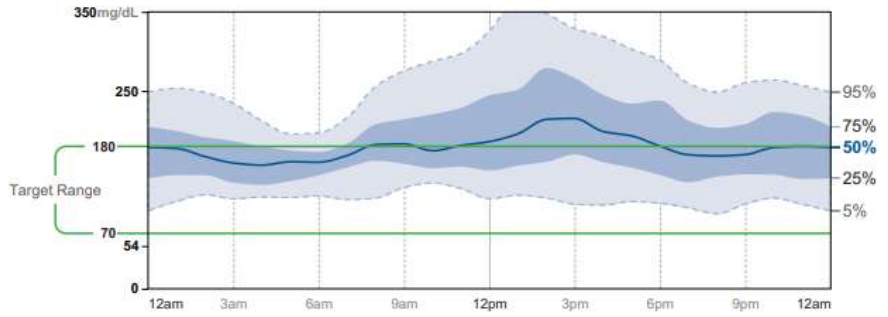
Defined as percent coefficient of variation (%CV); target ≤36%

TIME IN RANGES



AMBULATORY GLUCOSE PROFILE (AGP)

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



Poll Question 18

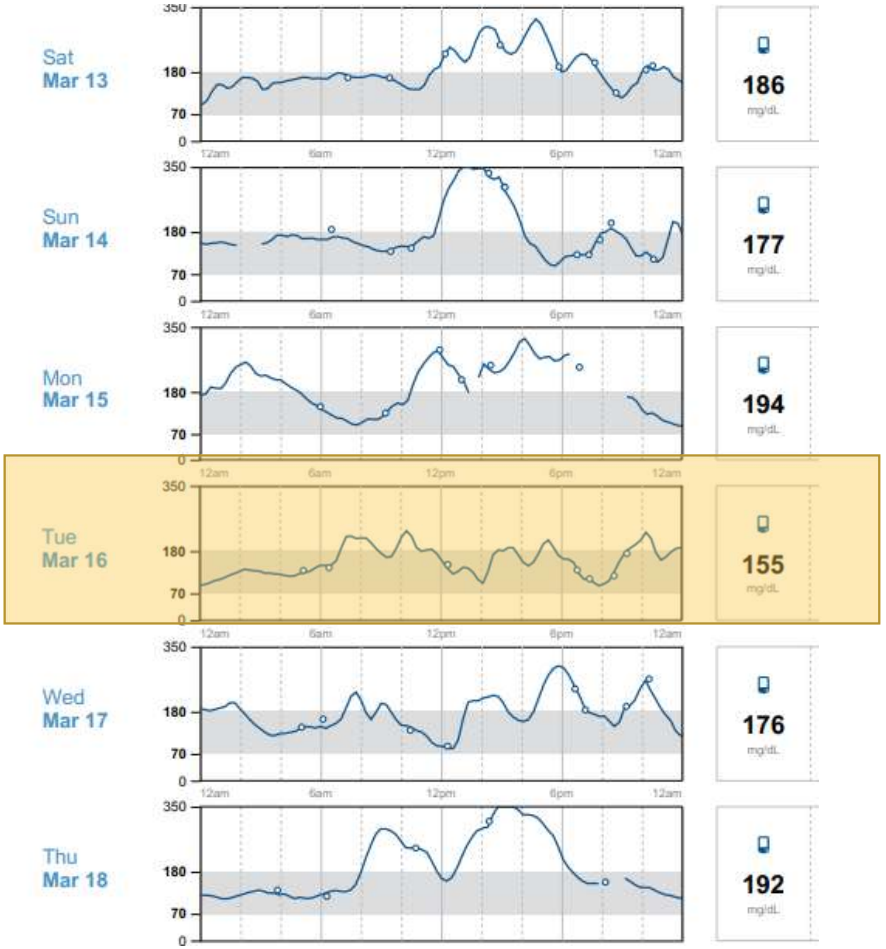
Which CGM key metrics are at goal?

A. Time in range
B. Time above range
C. Time below range
D. Glucose management indicator

Time in Range

Time in Range

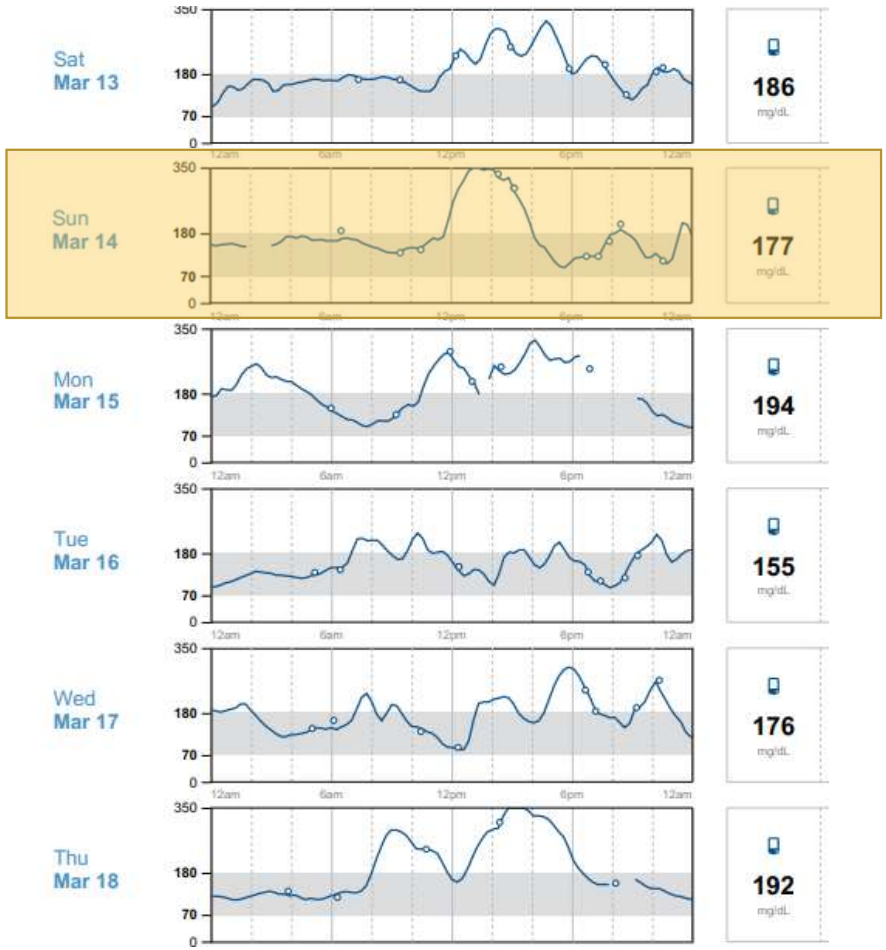
- Focus on the positive: what's worked well on Tue 3/16?
- Time in range is high this day
- Ate a granola bar for breakfast, grilled chicken salad at lunch, steak, greens, potato at dinner
- No missed medication doses
- Good night's sleep, low stress



Areas for Improvement

Areas to Improve

- Sun 3/14 glucose went high 12 pm
- Reports eating rice bowl and coke
- Silver lining
  - Walked around 3 pm (helped to lower glucose)
  - Avoided afternoon snacking
  - Ate low-carb dinner (salmon, salad, small potato)
  - Denies missed doses



DI1

Poll Question 19

What is the most appropriate medication adjustment for Terrance?

A. Add DPP4 inhibitor
B. Add GLP-1 receptor agonist
C. Add SGLT2 inhibitor
D. Lifestyle modifications only
E. More than 1 right answer

Slide 38

DI1 Updated, best answer is E.
Diana Isaacs, 2025-08-26T01:25:37.190

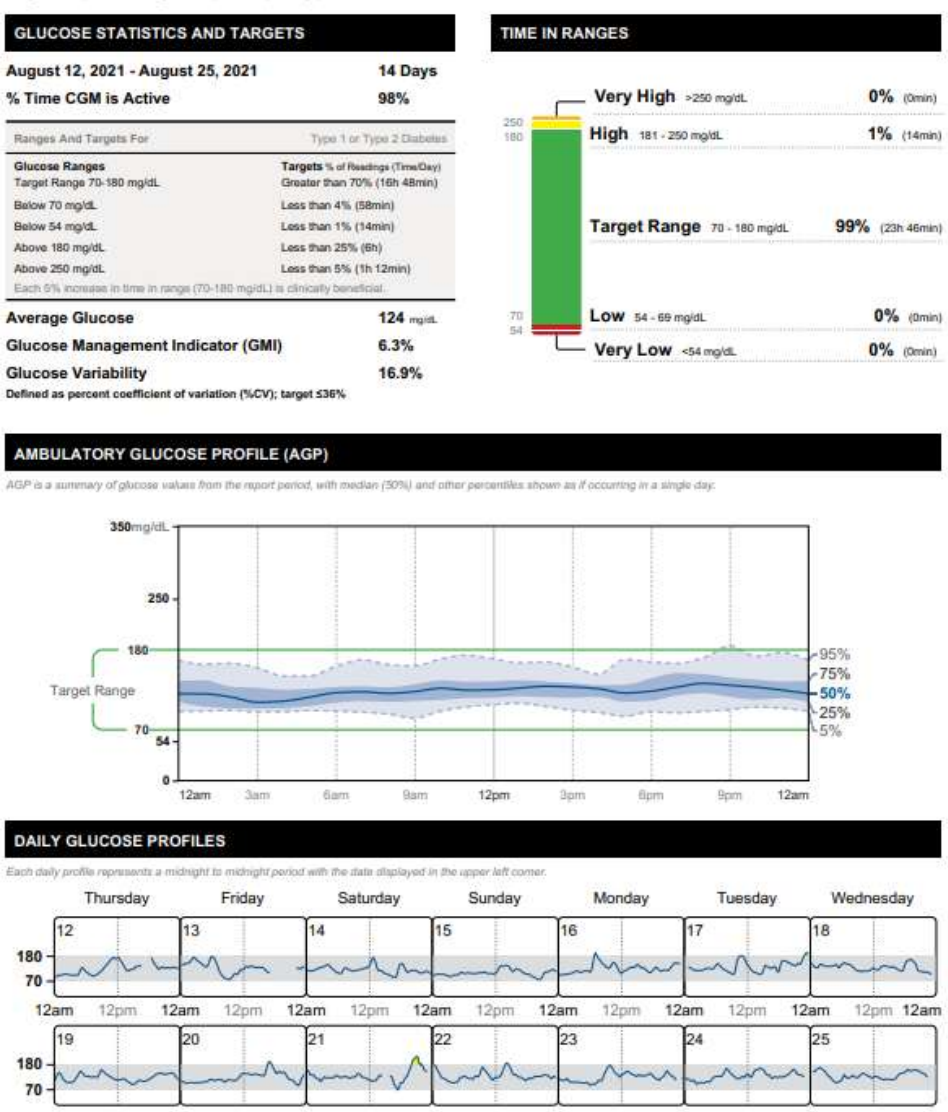
Action Plan



- In collaboration with Terrance
  - Lifestyle changes
    - Incorporate a brisk walk 3 days per week
    - Reduce high-carbohydrate foods like fries
  - CGM optimization
    - Alerts, high for 280
  - Medication adjustments
    - Add a medication to help his CKD + optimize glucose → SGLT2 inhibitor
  - Follow-up in 3-4 weeks

3 Months Later

T2D Meds:
Empagliflozin 10mg qday
Metformin 1000mg BID



GLUCOSE STATISTICS AND TARGETS

August 12, 2021 - August 25, 2021	14 Days
% Time CGM is Active	98%

Ranges And Targets For	Type 1 or Type 2 Diabetes
Glucose Ranges	**Targets** % of Readings (Time/Day)
Target Range 70-180 mg/dL	Greater than 70% (16h 48min)
Below 70 mg/dL	Less than 4% (58min)
Below 54 mg/dL	Less than 1% (14min)
Above 180 mg/dL	Less than 25% (6h)
Above 250 mg/dL	Less than 5% (1h 12min)

Each 5% increase in time in range (70-180 mg/dL) is clinically beneficial.

Average Glucose	124 mg/dL
Glucose Management Indicator (GMI)	6.3%
Glucose Variability	16.9%

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

TIME IN RANGES

Very High	>250 mg/dL	0% (0min)
High	181 - 250 mg/dL	1% (14min)
Target Range	70 - 180 mg/dL	99% (23h 46min)
Low	54 - 69 mg/dL	0% (0min)
Very Low	<54 mg/dL	0% (0min)

AMBULATORY GLUCOSE PROFILE (AGP)

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

DAILY GLUCOSE PROFILES

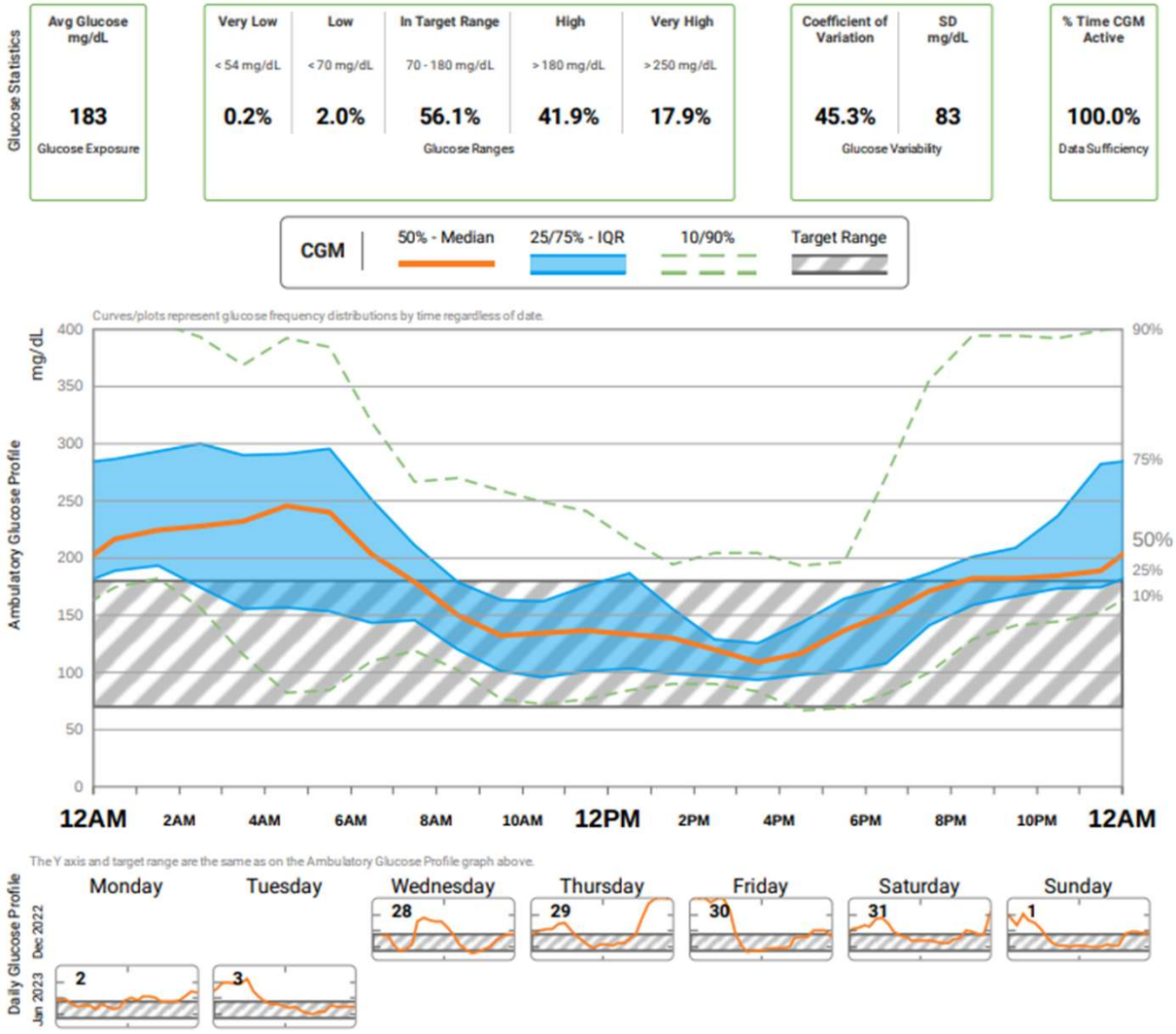
Each daily profile represents a midnight to midnight period with the date displayed in the upper left corner.

Case 2

75 yo F with 25 year h/o T2D. PMH includes HTN, hyperlipidemia, hypothyroid, obesity, ASCVD.

Current DM Meds

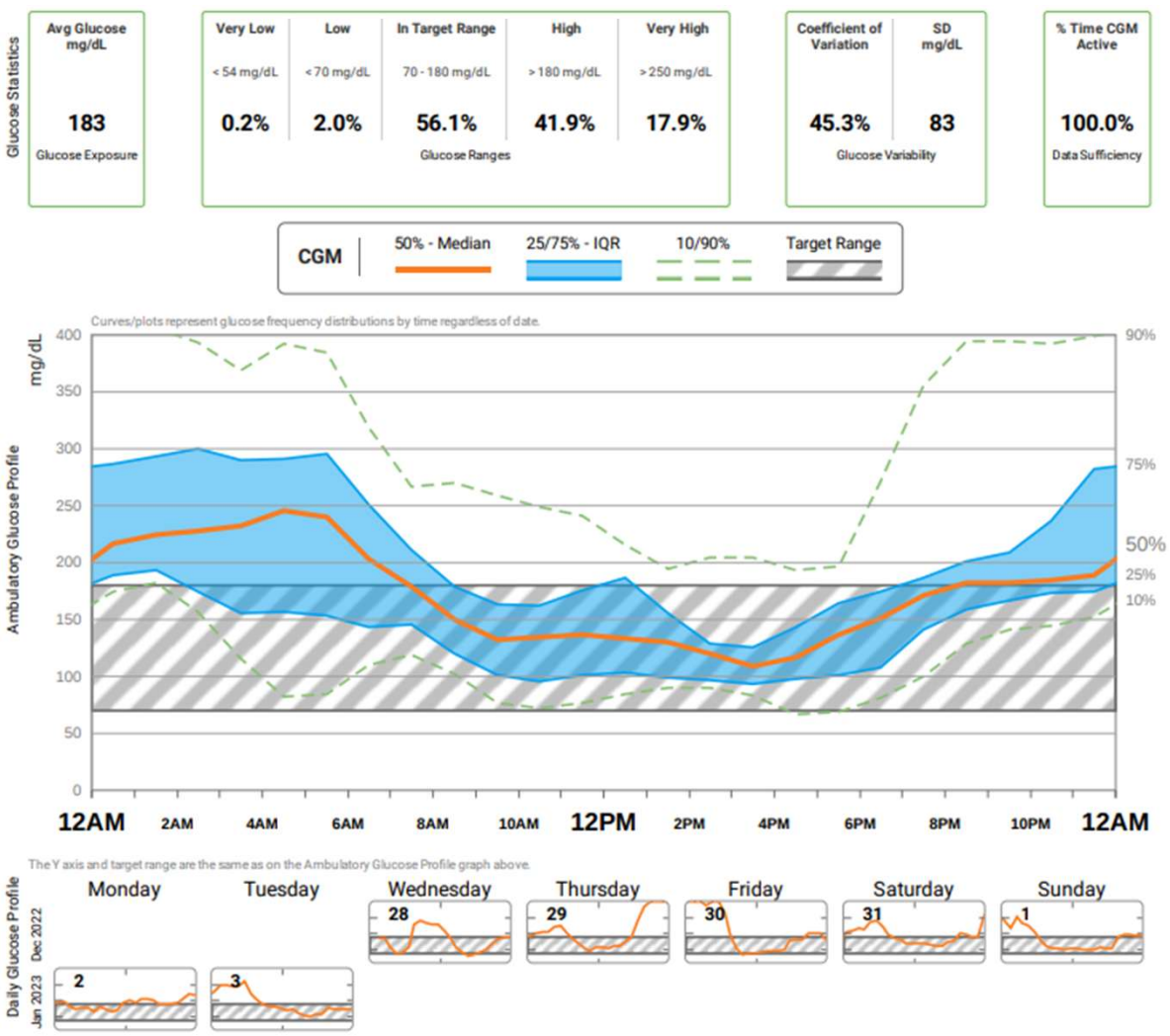
-Insulin glargine inject 50 units QAM and 40 at night
-Insulin aspart 8-10-10 units plus correction scale
-Metformin 1000 mg daily
-Semaglutide, 0.25mg weekly (2 doses so far)



Clarity report obtained from Diana Isaacs

Poll 20. Which of the following CGM key metrics is at target?

A. Time in range
B. Time above range
C. Coefficient of variation
D. Time below range



Clarity report obtained from Diana Isaacs

Using DATAA

A Assess Safety

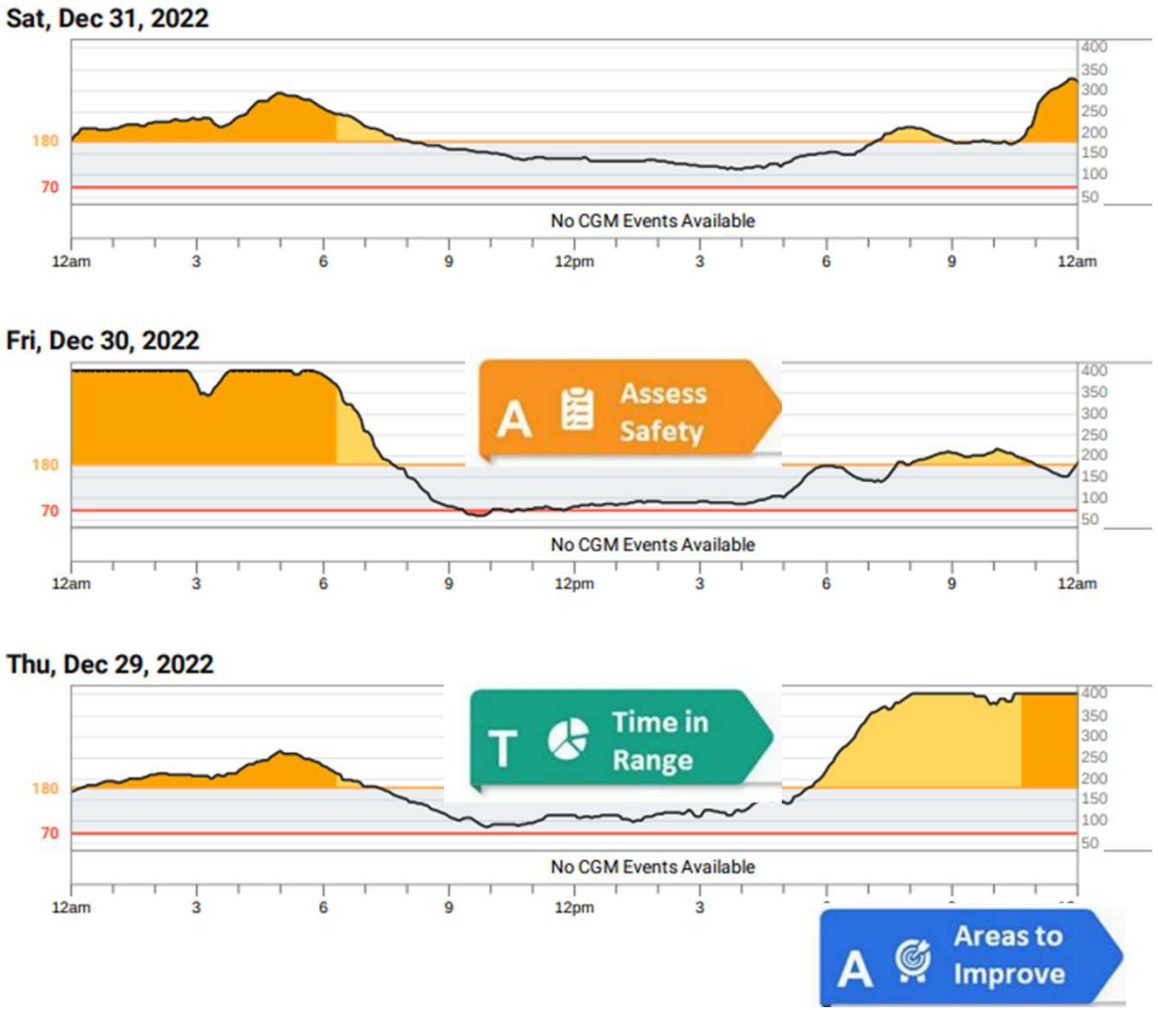
Less of an appetite since taking semaglutide, often going low during the day

T Time in Range

During the day, glucose often steady, but also having to drink juice to keep from going low

A Areas to Improve

Skipping aspart doses because running low, leading to rebound highs



Clarity report obtained from Diana Isaacs

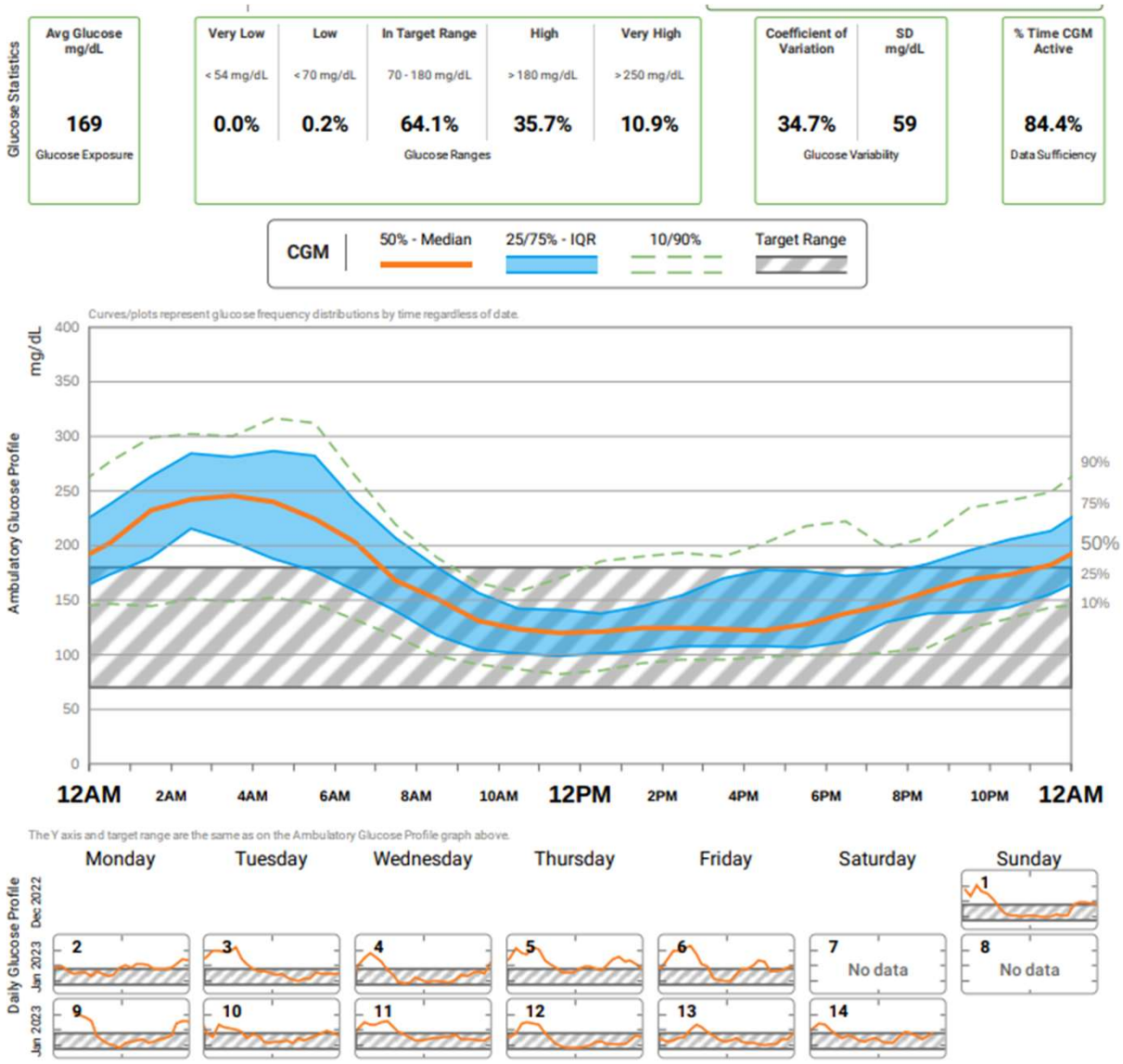
Action Plan



- Continue semaglutide 0.25mg weekly x 2 more weeks, then titrate up to 0.5mg weekly
- Decrease insulin glargine to 45 units qam and 35 units qpm
- Continue insulin aspart 8-10-10 + correction scale
- Continue metformin 1000mg daily

1 month later

- Average glucose improved
- Time in range increased
- Glucose variability improved
- Less hypoglycemia

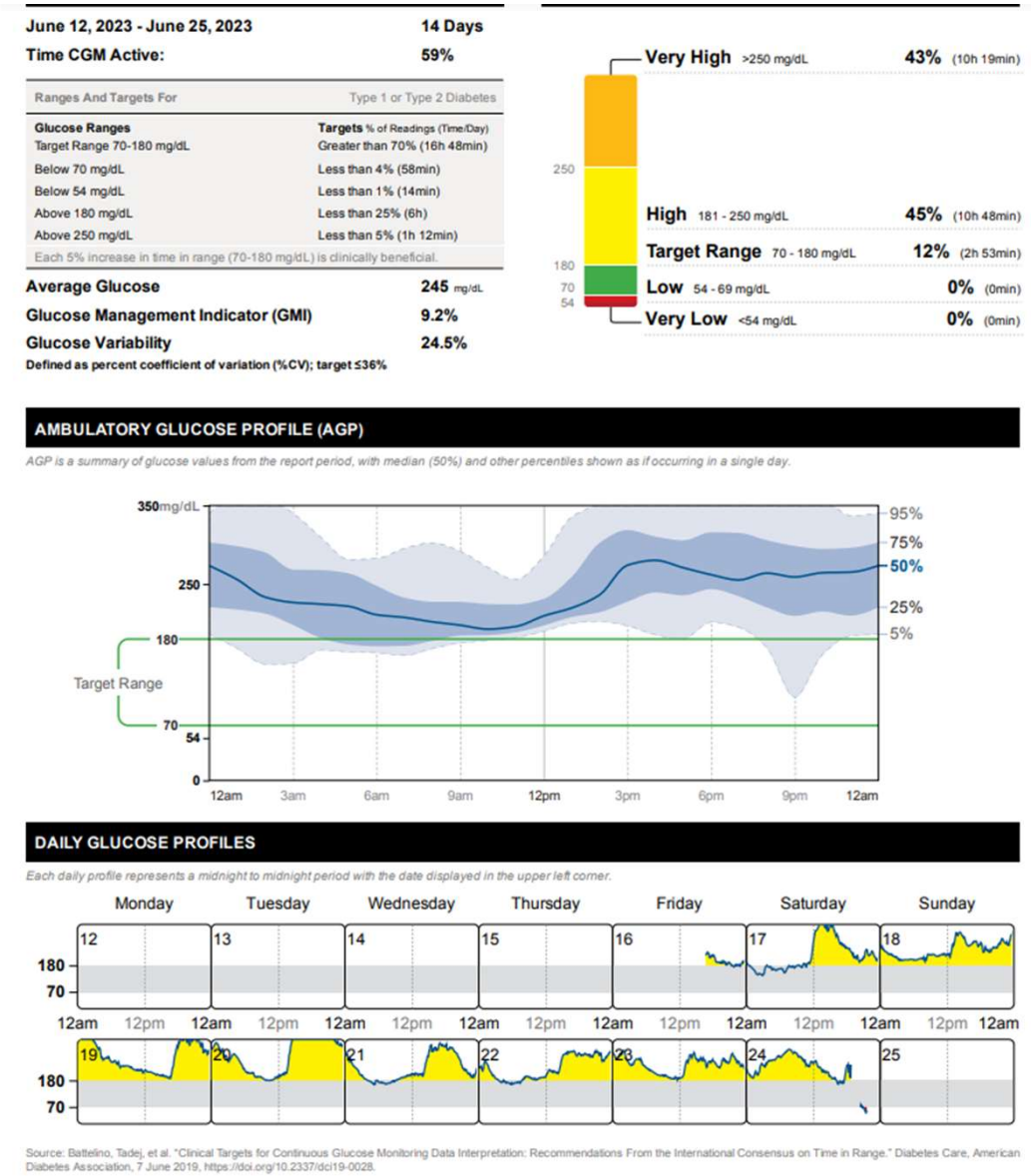


Clarity report obtained from Diana Isaacs

Case 3

- Person with T2D taking metformin 1000mg twice daily and insulin glargine 20 units daily

Is TIR at goal?
What to ask?
What changes to make?



June 12, 2023 - June 25, 2023	14 Days
Time CGM Active:	59%

Ranges And Targets For	Type 1 or Type 2 Diabetes
Glucose Ranges	**Targets** % of Readings (Time/Day)
Target Range 70-180 mg/dL	Greater than 70% (16h 48min)
Below 70 mg/dL	Less than 4% (58min)
Below 54 mg/dL	Less than 1% (14min)
Above 180 mg/dL	Less than 25% (6h)
Above 250 mg/dL	Less than 5% (1h 12min)

Each 5% increase in time in range (70-180 mg/dL) is clinically beneficial.

Average Glucose	245 mg/dL
Glucose Management Indicator (GMI)	9.2%
Glucose Variability	24.5%

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

Very High	>250 mg/dL	43%	(10h 19min)
High	181 - 250 mg/dL	45%	(10h 48min)
Target Range	70 - 180 mg/dL	12%	(2h 53min)
Low	54 - 69 mg/dL	0%	(0min)
Very Low	<54 mg/dL	0%	(0min)

250 180 70 54

AMBULATORY GLUCOSE PROFILE (AGP)

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

350mg/dL 250 180 70 54 0 Target Range

95% 75% 50% 25% 5%

12am 3am 6am 9am 12pm 3pm 6pm 9pm 12am

DAILY GLUCOSE PROFILES

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

Monday Tuesday Wednesday Thursday Friday Saturday Sunday

12 13 14 15 16 17 18

180 70

12am 12pm 12am 12pm 12am 12pm 12am 12pm 12am 12pm 12am 12pm 12am 12pm 12am

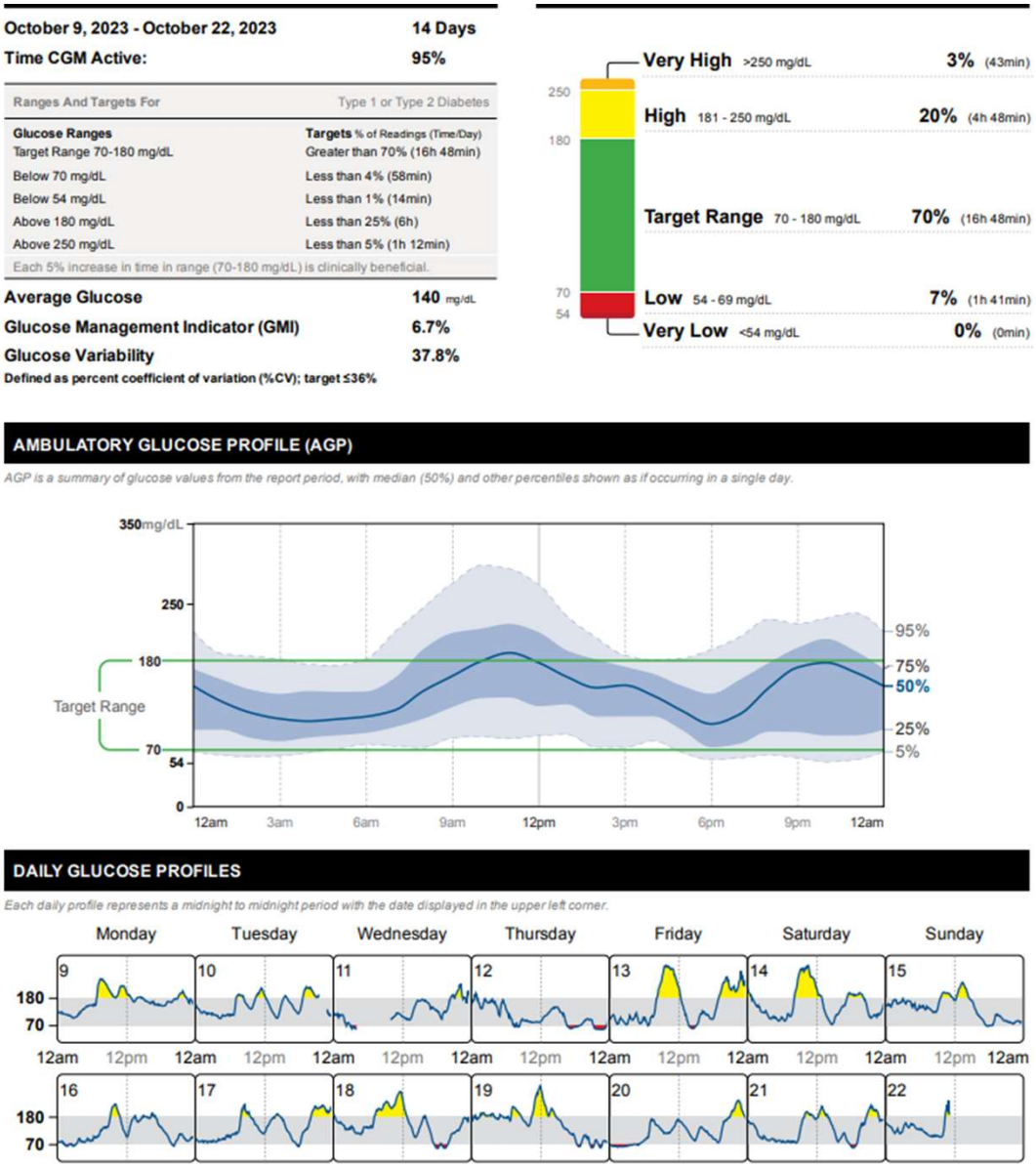
19 20 21 22 23 24 25

180 70

Source: Battelino, Tadej, et al. "Clinical Targets for Continuous Glucose Monitoring Data Interpretation: Recommendations From the International Consensus on Time in Range." Diabetes Care, American Diabetes Association, 7 June 2019, https://doi.org/10.2337/dci19-0028.

Case 4

- Person with T2D
- 56yo, BMI=33, A1C=7%
- Meds:
  - Degludec 40 units daily
  - Dulaglutide 4.5mg weekly
  - Dapagliflozin 10mg daily
  - Metformin 1000mg twice daily



October 9, 2023 - October 22, 2023	14 Days
Time CGM Active:	95%

Ranges And Targets For	Type 1 or Type 2 Diabetes
Glucose Ranges	**Targets** % of Readings (Time/Day)
Target Range 70-180 mg/dL	Greater than 70% (16h 48min)
Below 70 mg/dL	Less than 4% (58min)
Below 54 mg/dL	Less than 1% (14min)
Above 180 mg/dL	Less than 25% (6h)
Above 250 mg/dL	Less than 5% (1h 12min)

Each 5% increase in time in range (70-180 mg/dL) is clinically beneficial.

Average Glucose	**140** mg/dL
Glucose Management Indicator (GMI)	**6.7%**
Glucose Variability	**37.8%**

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

Very High	>250 mg/dL	**3%** (43min)
High	181 - 250 mg/dL	**20%** (4h 48min)
Target Range	70 - 180 mg/dL	**70%** (16h 48min)
Low	54 - 69 mg/dL	**7%** (1h 41min)
Very Low	<54 mg/dL	**0%** (0min)

250 180 70 54

AMBULATORY GLUCOSE PROFILE (AGP)

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

350mg/dL 250 180 70 54 0

Target Range

95% 75% 50% 25% 5%

12am 3am 6am 9am 12pm 3pm 6pm 9pm 12am

DAILY GLUCOSE PROFILES

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

Monday Tuesday Wednesday Thursday Friday Saturday Sunday

9 10 11 12 13 14 15

180 70

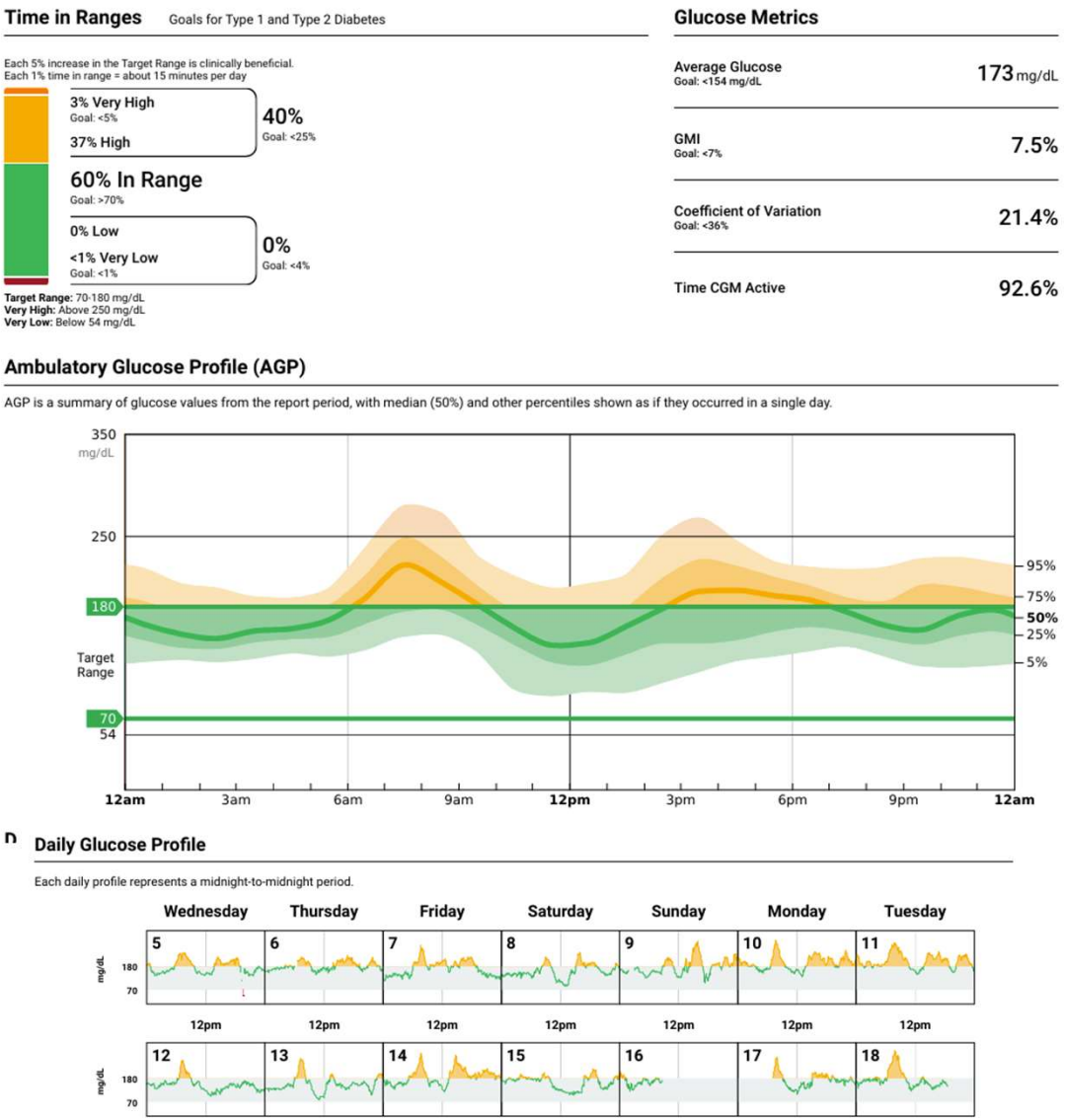
12am 12pm 12am 12pm 12am 12pm 12am 12pm 12am 12pm 12am 12pm 12am 12pm 12am

16 17 18 19 20 21 22

180 70

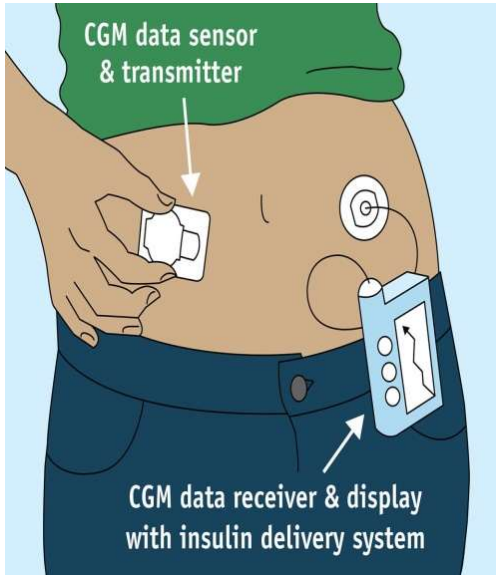
Case 4

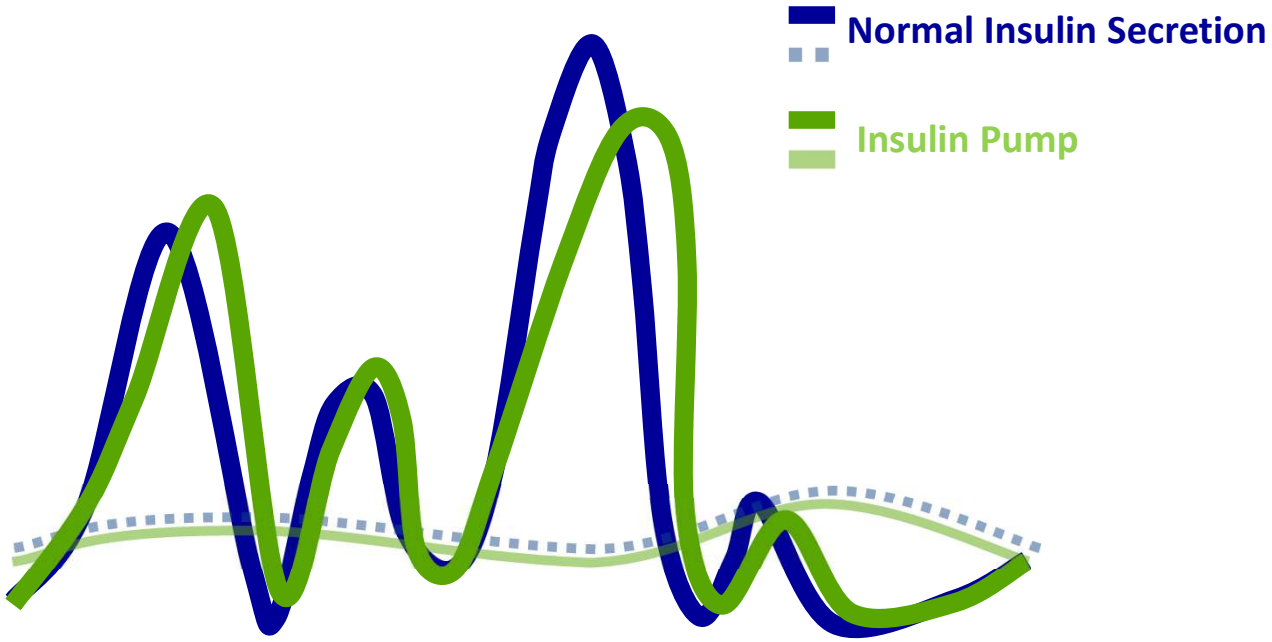
- 40yo F with T2D, lost 20lbs since starting Semaglutide 6 months ago, A1C=7.4%, also has HTN, dyslipidemia, BMI=34kg/m2
- DM Meds:
  - Metformin 1000mg twice daily
  - Empagliflozin 25mg daily
  - Semaglutide 2mg weekly
- Is data at goal?
  - TBR?
  - TIR?
  - TAR?
- Action plan?



Insulin Pumps

How a Pump Delivers Insulin

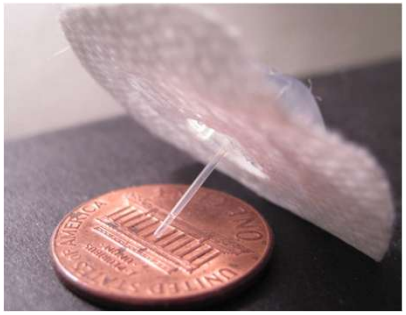


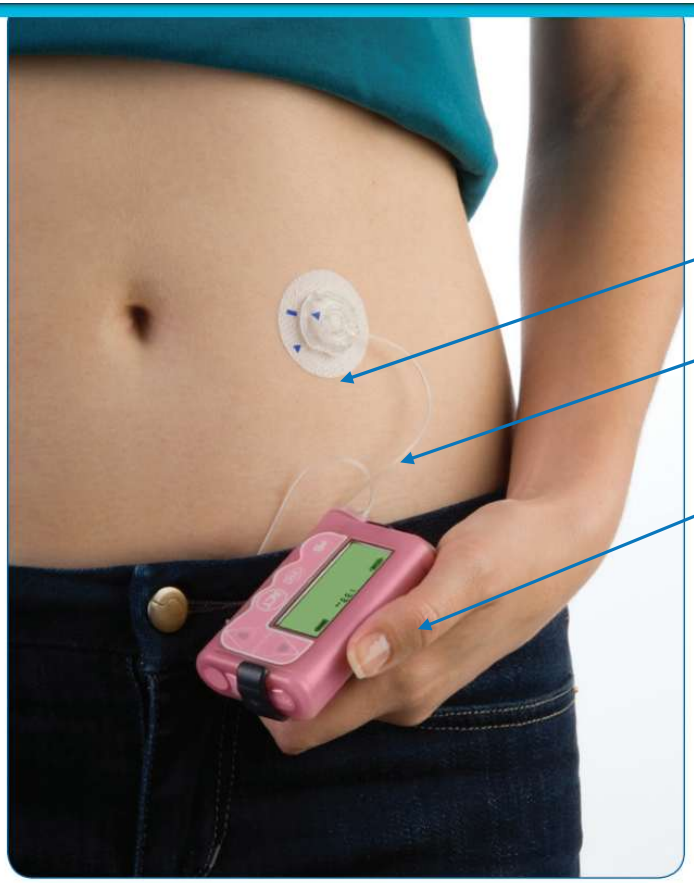


DI1

Insulin Pump Basics







Infusion Set

Tubing

Pump



Slide 51

DI1 New slide

Diana Isaacs, 2025-08-26T01:36:39.496

DI1

Insulin Pump Definitions

Basal rates	Carbohydrate ratios	Correction factors
Glucose targets	Active insulin time	Max bolus/Max basal
Extended boluses	Temp basals	Suspend on/before low

Slide 52

DI1 New slide

Diana Isaacs, 2025-08-26T01:36:44.782

DI1

Insulin Pump Basics

Uses U100 rapid-acting insulin

- Minimizes insulin variability
- Must have dexterity to fill cartridge or device

Bolus calculator incorporating settings

Active insulin to prevent stacking

Multiple basal rates or automated delivery

Small dose increments

Temporary basal rates or temporary glucose targets

Alarms and reminder features



Slide 53

DI1 New/updated slide

Diana Isaacs, 2025-08-26T01:39:31.326

Ideal Pump Candidates



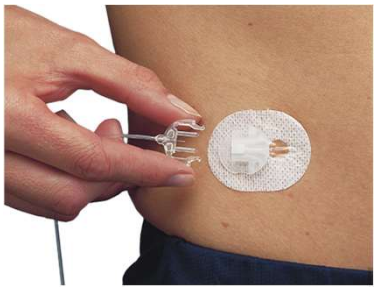
- Require meal-time insulin
- Wearing CGM or frequently checking BGM
- Carbohydrate awareness
- Willing to follow up regularly with health care team
- Can afford the pump/supplies
- Problem solving skills (eg, troubleshoot and treating high or low glucose)
- Able to use the device independently or with caregiver support

Diabetes Care. 2025;48(Supplement_1):S146-S166. doi:10.2337/dc25-S007.

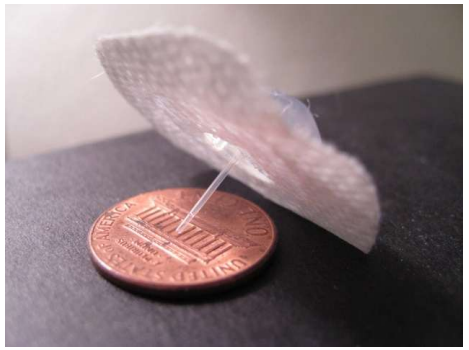
Slide 54

DI1 New slide

Diana Isaacs, 2025-08-26T01:39:19.210



Infusion Sets



- Infusion sets are usually Teflon
  - Available in different sizes (ex. 9mm vs 6mm)
  - Silhouette (angled) may be better for kids/thinner/very active people
  - Steel infusion sets a good option for people with frequent site occlusions
- Insert at least 1 inch from CGM site
  - Auto-injectors vs. manually injecting
- Site selection/rotation
- Longer tubing options
  - Good if connected on leg, arm or wearing pump further from site
- Caution with kids/babies/pets-pouches available to hide pump
- When changing out infusion set, check glucose or CGM 1-2 hours after
  - Don't change right before bed







What Happens with a Bent Cannula?



A. Hyperglycemia
B. Hypoglycemia
C. No effect

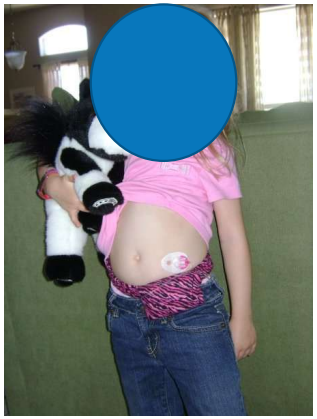
Where to Wear?











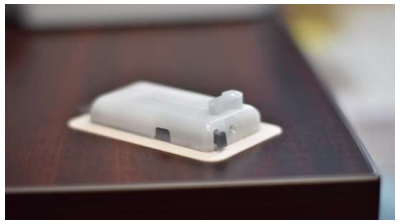








Patch Pumps



Cequr Simplicity

- Bolus pump patch only
- Approved for adults with T1DM or T2DM
- Holds up to 200 units of rapid acting insulin
- On-demand bolus doses in 2 unit increments
- Doses administered via clicks directly on the device
- Must be changed every 4 days

V-Go

- 24 hr. basal/bolus patch pump
- Approved for adults with T2DM
- Allows 20, 30, 40 unit basal rate options
- On-demand bolus doses in 2 unit increments
  - Up to 36 units/24 hrs
- Doses administered via clicks directly on the device
- Must be changed daily

Cequr Simplicity Product Guide: https://myceqursimplicity.com/wp-content/uploads/User-Guide.pdf
V-Go Product Guide: https://www.go-vgo.com/wp-content/uploads/2018/06/instructions-for-patient-use.pdf

Automated Insulin Delivery Systems

Omnipod 5
(Insulet)

T:slim X2 (Tandem)
Control IQ+

780G
(Minimed)

DI1

iLet
(Beta Bionics)

Mobi (Tandem)
Control IQ+

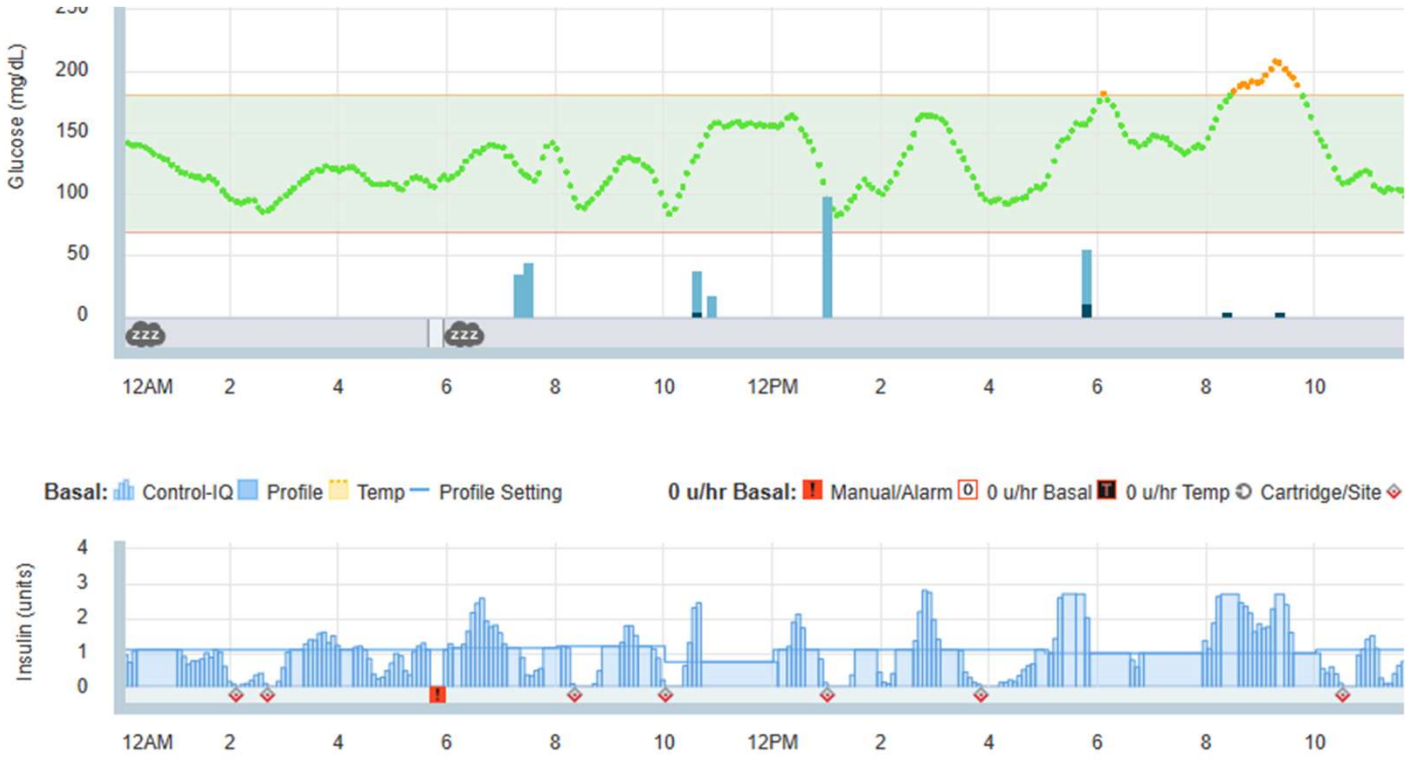
Tidepool Loop (Sequel)

Slide 59

DI1 Slight update

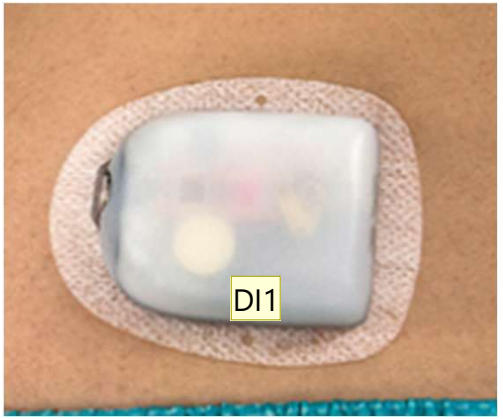
Diana Isaacs, 2025-08-26T01:40:44.900

Hybrid-Closed Loop



- Automated insulin delivery (AID)
- Auto adjust background insulin
- Some systems give auto corrections
- Maximize time 70-180mg/dL

Omnipod 5



Holds 200 units
Compatible with Dexcom G6, G7, Libre 2+
No tubing
Control system from a compatible smartphone or controller
Uses last 4-5 pods for adjustments, based on TDD
SmartBolus calculator informed by CGM value and trend
Glucose targets from 110-150 mg/dL adjustable in 10 mg/dL increments
Activity mode to protect from lows
Bluetooth connectivity with Glooko, automatic data uploads

Omnipod 5 Automated Insulin Delivery System. User Guide.

Slide 61

DI1 New slide

Diana Isaacs, 2025-08-26T01:45:50.764

Minimed 780G

- Holds 300 units
- Compatible with Guardian Sensor 3 or 4
- Meal detection (auto correction + basal)
- Adjustable target (100, 110, 120mg/dL)
- Suspend before/on low options (in manual mode)
- Bluetooth connectivity, remote software upgrades
- MiniMed and Carelink apps for data sharing/viewing
- 7 day infusion set option
- Uses AA battery

MiniMed™ 780G system - User Guides & Manuals | Medtronic

Beta Bionics iLet

- Holds 180 units of insulin
- Compatible with Dexcom G6, G7, Libre 3+
- Works with pre-filled insulin cartridges (Fiasp) -160 units
- Programmed by entering body weight and connecting to CGM
  - No other insulin pump settings
- Glucose targets (110, 120, or 130mg/dL)
- Meal estimates: no carb counting (usual, less, more)
- Provides calculated back up settings for boluses
- Requires charger
- Bluetooth connected, Bionic Circle app for up to 10 followers

DI1

[Beta Bionics User Resources]

Slide 63

DI1 updated
Diana Isaacs, 2025-08-26T01:47:09.791

DI1

Tandem T:Slim X2 with Control-IQ+

- Holds 300 units
- Compatible with Dexcom G6, G7, Libre 2+
- Algorithm adjusts insulin delivery from programed “manual” settings
- Automatic correction doses
  - Up to 1 every hour based on projected glucose >180mg/dL
  - Calculated at 60% of programmed correction factor (target of 110)
- Tandem T:Slim mobile app to bolus and for remote downloads
- Requires charging cable

User Guides for Tandem Diabetes Care Products

Slide 64

DI1 updated
Diana Isaacs, 2025-08-26T01:47:53.175

Control IQ+ Targets

		Control-IQ	Sleep Activity	Exercise Activity
Delivers	Delivers an automatic correction bolus if sensor glucose is predicted to be above ____ mg/dL	180	--	180
Increases	Increases basal insulin delivery if sensor glucose is predicted to be above ____ mg/dL	160	120	160
Maintains	Maintains active Personal Profile settings when sensor glucose is between ____ - ____ mg/dL	112.5 - 160	112.5 - 120	140 - 160
Decreases	Decreases basal insulin delivery if sensor glucose is predicted to be below ____ mg/dL	112.5	112.5	140
Stops	Stops basal insulin delivery if sensor glucose is predicted to be below ____ mg/dL	70	70	80

DI1

Tandem Mobi with Control IQ+



- Holds 200 units
- Half the size of T:Slim X2
- Dexcom G6, G7 integration
- Runs the Control IQ algorithm
- 5-Inch tubing option
- Everything controlled from mobile app except quick bolus option from pump (Tandem Mobi mobile app)
- Syringe-driven pump fill
- Wireless charging
- IP28 water resistant rating (8 feet for 2 hours)

User Guides for Tandem Diabetes Care Products

Slide 66

DI1 updated

Diana Isaacs, 2025-08-26T01:48:03.594

Sequel Twiist

- Holds 300 units of insulin
- Superior occlusion detection
- Tidepool Loop Algorithm
  - iPhone controlled
  - Bolus from Apple watch
  - 6-hour predictions, uses manual settings for automation
- Correction Range 87mg/dL-180 mg/dL
- Glucose Safety Limit: 67-110 mg/dL
- Food type for bolus speed
  - Lollipop, Taco, Pizza Bolus (up to 8 hr absorption)
  - Ability for retroactive carb entries
- Pre-meal preset option (67-130mg/dL)
- Work-out preset option (87-250mg/dL)

DI1

https://www.twiist.com/hcp-home

Slide 67

DI1 updated
Diana Isaacs, 2025-08-26T01:49:14.854

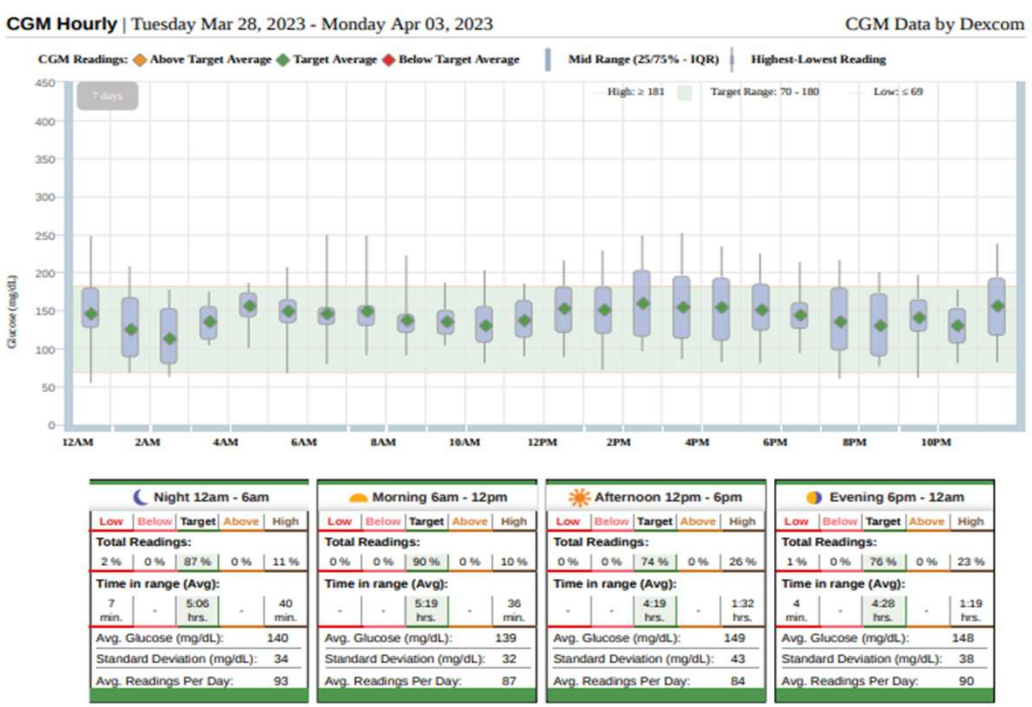
Patient Case

- 47 years old
- T2D x 20+ years
- A1C=8.1%
- BMI=39kg/m^2
- Works as a bank teller
- No diabetes complications
- Meds:
  - Insulin glargine 100 units qpm
  - Insulin aspart 45 units TID a.c.
  - Dapagliflozin 10mg daily
  - Dulaglutide 1.5 mg weekly

Is this a good candidate for an insulin pump?

Patient Case

47yo T2DM, A1C=8.1%, BMI=39kg/m²

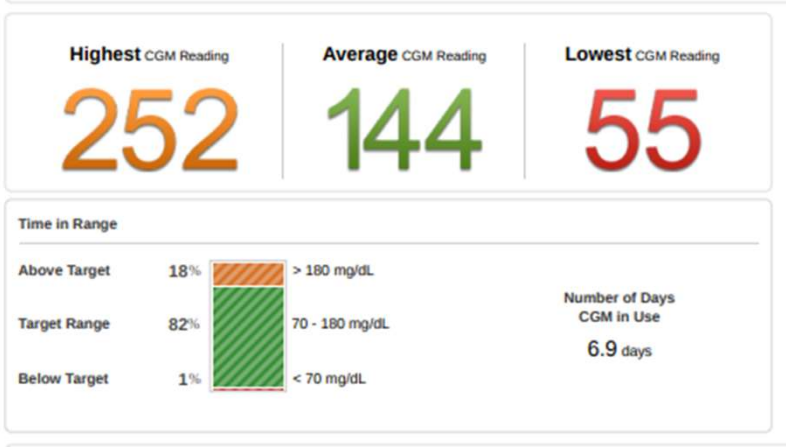


Night 12am - 6am				
Low	Below	Target	Above	High
Total Readings:				
2 %	0 %	87 %	0 %	11 %
Time in range (Avg):				
7 min.	-	5:06 hrs.	-	40 min.
Avg. Glucose (mg/dL):	140			
Standard Deviation (mg/dL):	34			
Avg. Readings Per Day:	93			

Morning 6am - 12pm				
Low	Below	Target	Above	High
Total Readings:				
0 %	0 %	90 %	0 %	10 %
Time in range (Avg):				
-	-	5:19 hrs.	-	36 min.
Avg. Glucose (mg/dL):	139			
Standard Deviation (mg/dL):	32			
Avg. Readings Per Day:	87			

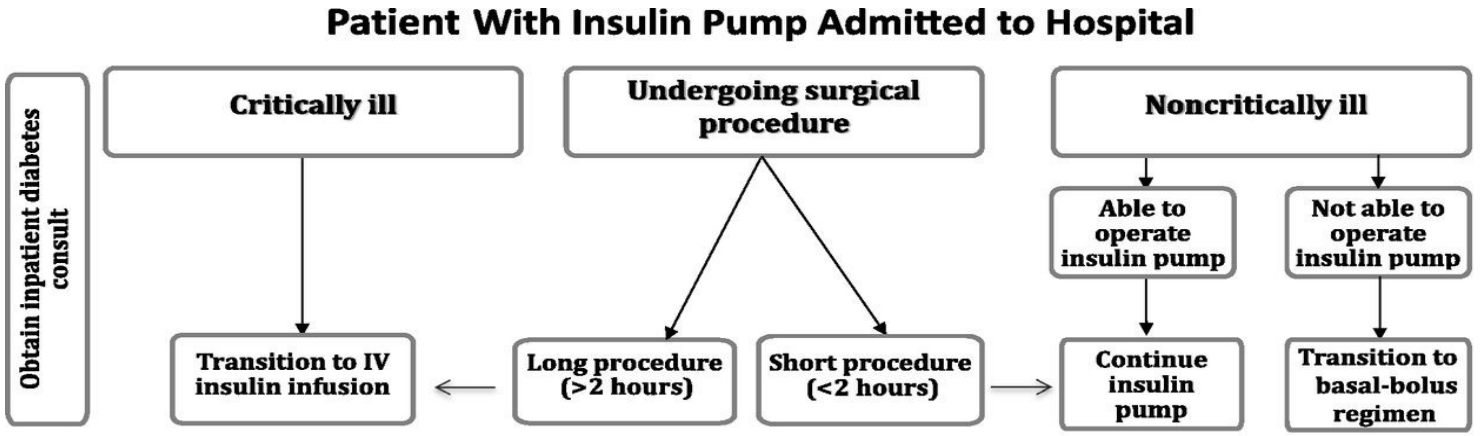
Afternoon 12pm - 6pm				
Low	Below	Target	Above	High
Total Readings:				
0 %	0 %	74 %	0 %	26 %
Time in range (Avg):				
-	-	4:19 hrs.	-	1:32 hrs.
Avg. Glucose (mg/dL):	149			
Standard Deviation (mg/dL):	43			
Avg. Readings Per Day:	84			

Evening 6pm - 12am				
Low	Below	Target	Above	High
Total Readings:				
1 %	0 %	76 %	0 %	23 %
Time in range (Avg):				
4 min.	-	4:28 hrs.	-	1:19 hrs.
Avg. Glucose (mg/dL):	148			
Standard Deviation (mg/dL):	38			
Avg. Readings Per Day:	90			



TDD decreased by 30%

Follow-Up A1C=6.7%



Changes to Pump Therapy With Imaging Studies	
X-ray/CT	Pump should be covered by lead apron
MRI	Pump and metal infusion set should be removed
Ultrasound	No need to remove pump but transducer should not be pointed directly at the pump
Cardiac catheterization	Pump should be covered by lead apron
Pacemaker/automatic implantable cardioverter defibrillator (AICD)	Pump should be covered by lead apron
Colonoscopy/EGD	Pump can remain in place
Laser surgery	Pump can remain in place

Umpierrez G et al. Diabetes Care 2018 Aug; 41(8): 1579-1589.

Contraindications to Insulin Pumps in the Hospital

Impaired level of consciousness (except during short-term anesthesia)
Patient's inability to correctly demonstrate appropriate pump settings
Critical illness requiring intensive care
Psychiatric illness that interferes with a patient's ability to self-manage diabetes
Diabetic ketoacidosis and hyperosmolar hyperglycemic state
Refusal or unwillingness to participate in self-care
Lack of pump supplies
Lack of trained health care providers, diabetes educators, or diabetes specialist
Patient at risk for suicide

Umpierrez G et al. Diabetes Care 2018 Aug; 41(8): 1579-1589.

ADA Standards of Care 2025

American Diabetes Association®

- AID systems should be the preferred insulin delivery method to improve glycemic outcomes and reduce hypoglycemia and disparities in youth and adults with T1D (A) and other forms of insulin deficient diabetes (E)
- Insulin pump therapy, preferably with CGM, should be offered for diabetes management to tough and adults on MDI with T2D (A)
- The choice of device should be made based on the individual's circumstances, preferences, and needs. (A)

*

Diabetes Care 2025;48(Suppl. 1):S146–S166

How to Share Data

System:	Associated Mobile Apps	Website to Access Portal	Data Sources
Glooko	Glooko	Glooko.com	Omnipod
Carelink	MiniMed Mobile, Carelink Mobile	https://carelink.medtronic.com/login	MiniMed pumps
Tidepool	Tidepool Mobile	Tidepool.org	Twiist
Source	T:Connect Mobile, Mobi	https://source.tandemdiabetes.com/patients	Tandem pumps
Beta Bionics User Portal	Beta bionics smartphone app	https://report.betabionics.com/	iLet

Connected Insulin Pens

DI1

Connected Insulin Pen Basics

A reusable pen or pen cap paired with a smartphone mobile app	Calculates and tracks insulin doses	Tracks active insulin time	Pairs with connected BGM and CGM
Cloud-based data access	Dose reminders	Insulin expiration	Temperature indicator

Slide 75

DI1 New slide

Diana Isaacs, 2025-08-26T01:56:49.814

DI1

ADA SOC 2025:
Who Should Use Connected Pens?



7.24 Offer connected insulin pens for people with diabetes taking multiple daily insulin injections. B



7.25 FDA-approved insulin dose calculators/decision support systems may be helpful for calculating insulin doses. B

Slide 76

DI1 New slide

Diana Isaacs, 2025-08-26T01:56:54.963

US Products

Medtronic InPen

Tempo Smart Button

DI1

InPen

- Reusable pen for up to 1 year without charging
- InPen app – Bluetooth connected
- Integrated with Simplera Sync and Dexcom G6/G7
- Works with Fiasp, Humalog, NovoLog cartridges
- Delivers boluses in 0.5 unit increments up to 30 units/dose
- Monitors insulin temperature excursions
- Dose calculator, records exact doses, priming doses

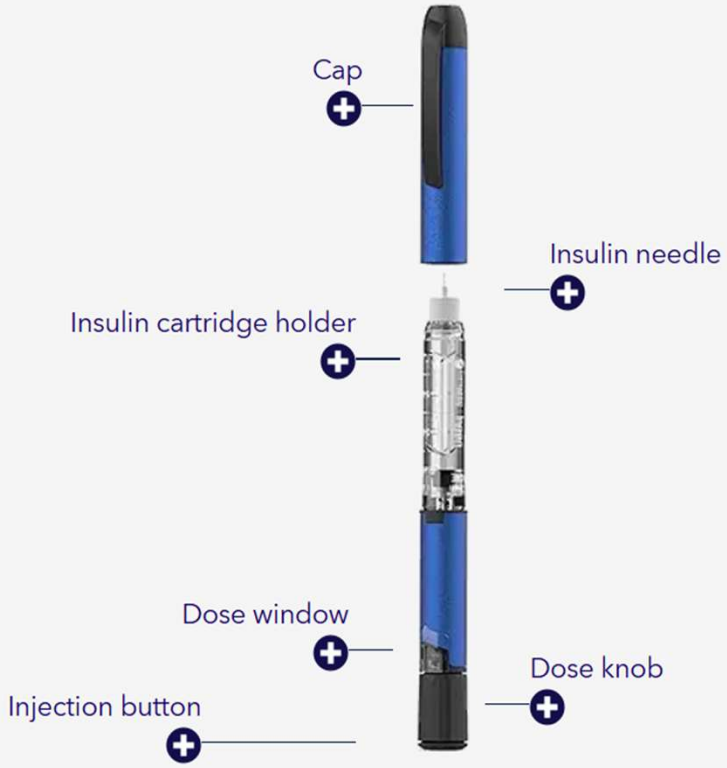
Slide 78

DI1 updated

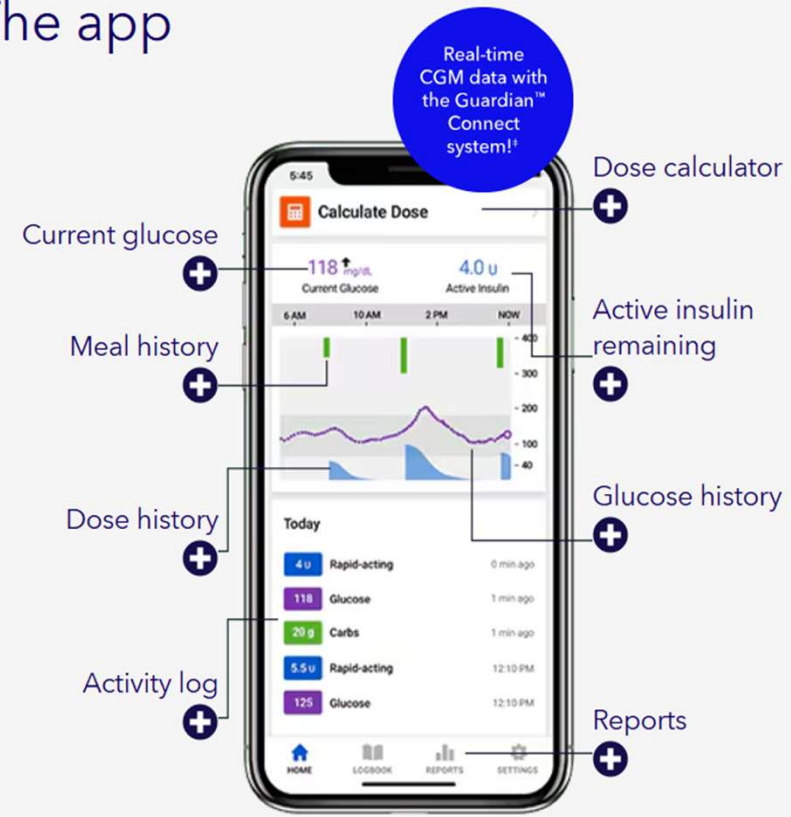
Diana Isaacs, 2025-08-26T01:57:03.767

DI1

The pen



The app



User Guide

Slide 79

DI1 New slide

Diana Isaacs, 2025-08-26T01:57:15.763

DI1

Tempo Pen

- Disposable prefilled insulin pen (Tempo)
- Tempo Smart button goes on top of this pen
- Works with the TempoSmart App
- Functionality
  - Bolus calculator
  - Basal insulin titration (only BGM)
  - Set dose reminders and notifications
- Compatible CGM:
  - Dexcom G6/G7
- Available Colors: Gray
- Compatible Insulin: Tempo Pens
  - Lyumjev (insulin lispro) 100 units/mL
  - Basaglar (insulin glargine) 100 units/mL
  - Humalog (insulin lispro) 100 units/mL

Slide 80

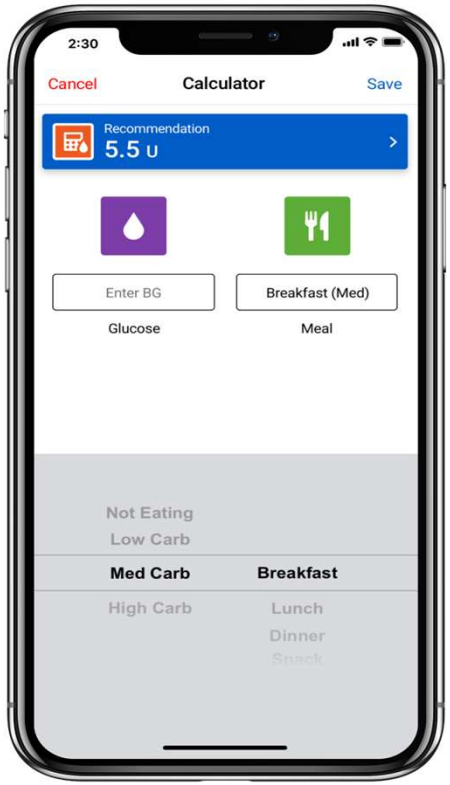
DI1 updated

Diana Isaacs, 2025-08-26T01:57:49.929

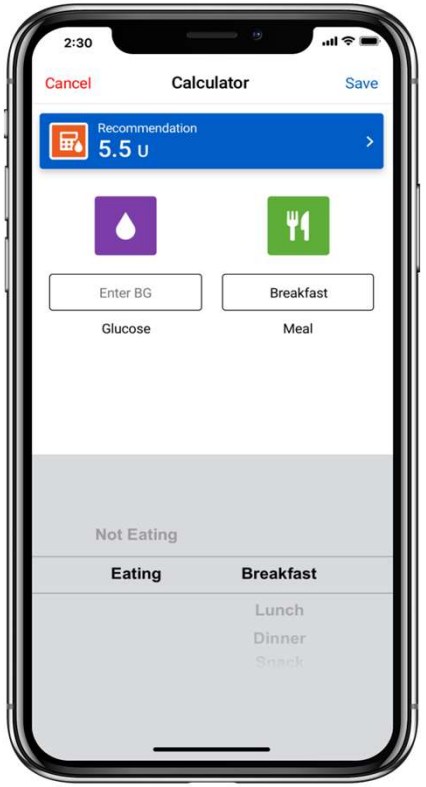
Dose Calculator



Carb Counting



Meal Estimation



Fixed Dose

Different Dose Calculators



Fixed dose

“I don’t even know what a carb is. I am just trying to reduce my portion sizes.“



Meal estimation

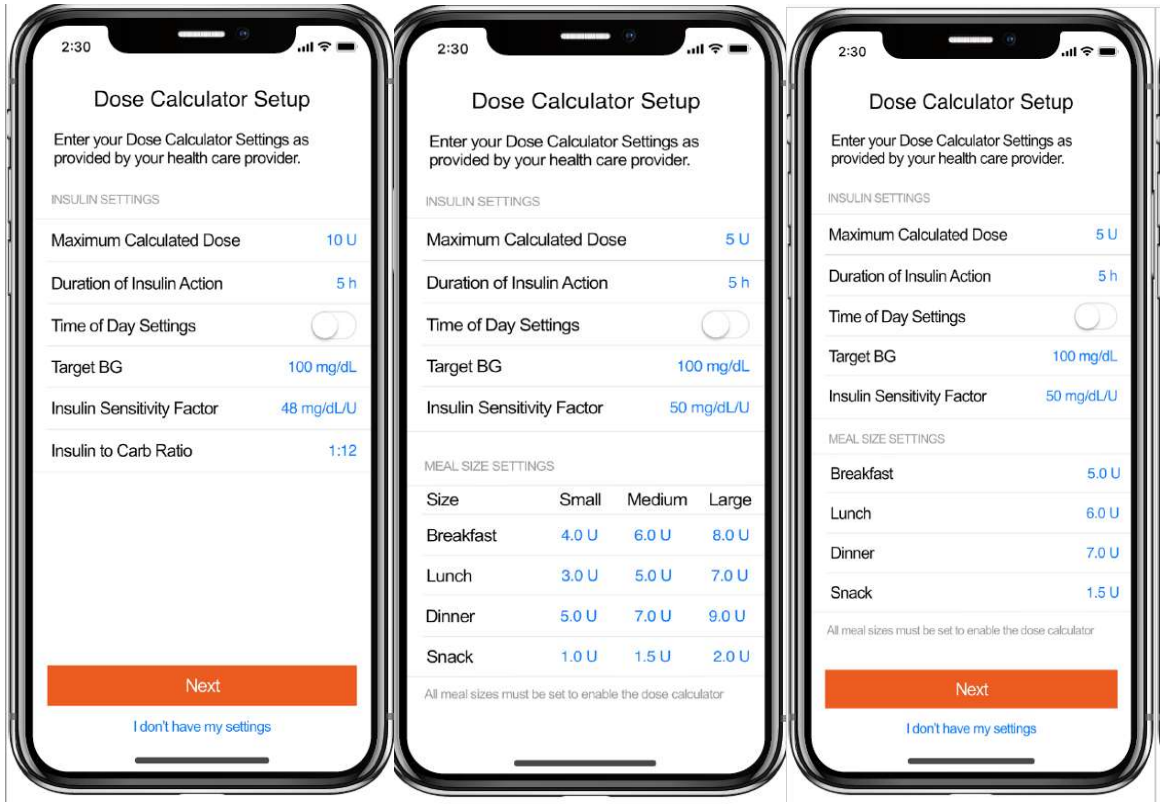
“Counting carbs is a bit overwhelming. But since I don’t always eat the same amount, I need to vary my dose!”



Carb counting

“I'm pretty good at figuring out the exact amount of carbs I eat; I use 3 different carb ratios in my dose calculator to match my insulin dose to my food.”

Therapy Settings



Time of Day Settings

Time of Day	6:00 AM	11:00 AM	5:00 PM	10:00 PM
Target Blood Glucose	100 mg/dL	90 mg/dL	90 mg/dL	110 mg/dL
Insulin Sensitivity Factor	35.0 mg/dL/U	38.0 mg/dL/U	38.0 mg/dL/U	38.0 mg/dL/U
Insulin to Carb Ratio	9.0 g/U	11.0 g/U	11.0 g/U	11.0 g/U

DI1

Connected Pen Settings

- Correction factor: rule of 1700
  - 1700/TDD
- May use existing MDI settings
  - Long acting insulin
  - Meal time doses
- Meal estimates:
  - Small: 20-25% less
  - Large: 20-25% more
- Carb ratios: rule of 450
  - 450/TDD

Slide 84

DI1 New slide

Diana Isaacs, 2025-08-26T01:58:06.338

In Summary

- There are several CGM, connected pen and insulin pump options, and the DCES can help PWD select the best device for their individual needs
- New era of hybrid closed loops
- No artificial pancreas yet, but we are getting closer to closing the loop
- Connected data can be used to discussion diabetes self-management with the person with diabetes and help to make meaningful changes-think DATAA

Resources

Collaborate: How to Share Data

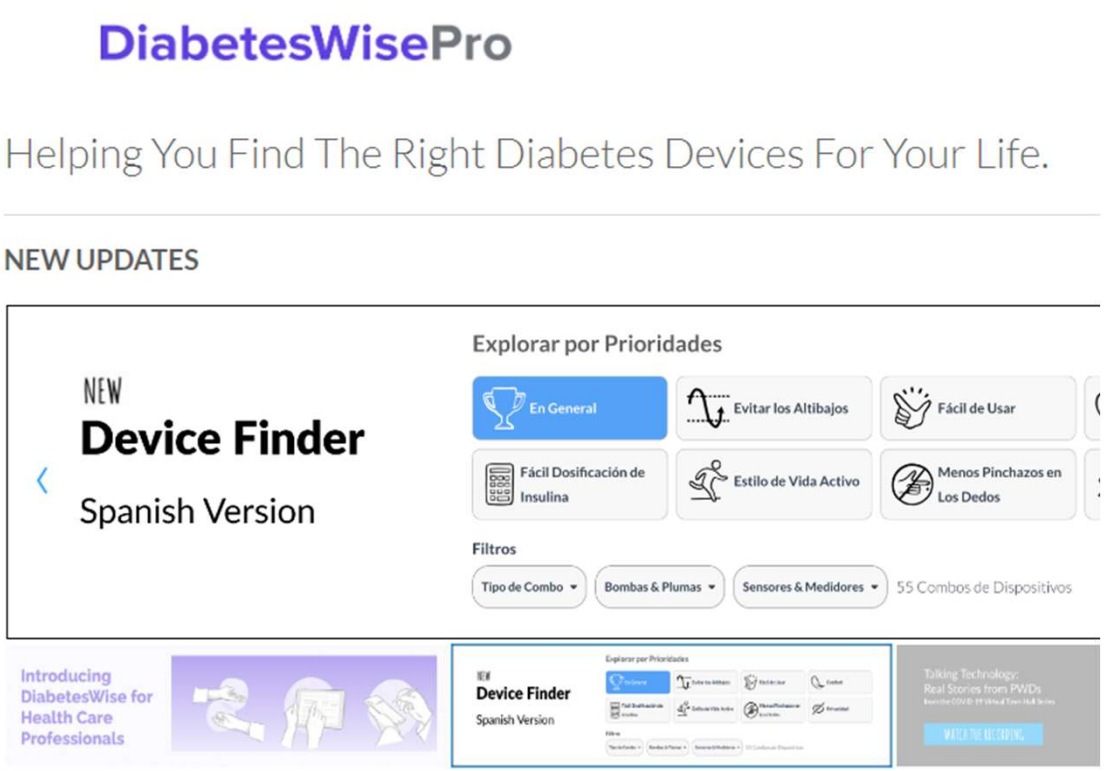
System:	Associated Mobile Apps	Data Sources
Glooko	Glooko	Omnipod 5, Dexcom, Eversense, many glucose meters, InPen, Libre
Clarity	Dexcom G6, G7, Clarity, Dexcom Follow, Undermyfork, Sugarmate	Dexcom, InPen
LibreView	LibreLink, LibreLinkUp, Libre, Libre 2, Libre 3	Libre 14 day, Libre 2+, Libre 3+
Carelink	MiniMed Connect, Carelink Connect	780G, Simplera, InPen
Tidepool	Tidepool Mobile	Twiist,, Dexcom, Libre, many glucose meters, InPen
Source	Tandem t:slim mobile app, Tandem mobi mobile app	T:Slim X2, Mobi
Eversense Data Management System	Eversense	Eversense
InPen Insights Report	InPen	InPen, Dexcom, Simplera
Tempo Platform	TempoSmart	TempoSmart Button, Dexcom

Slide 87

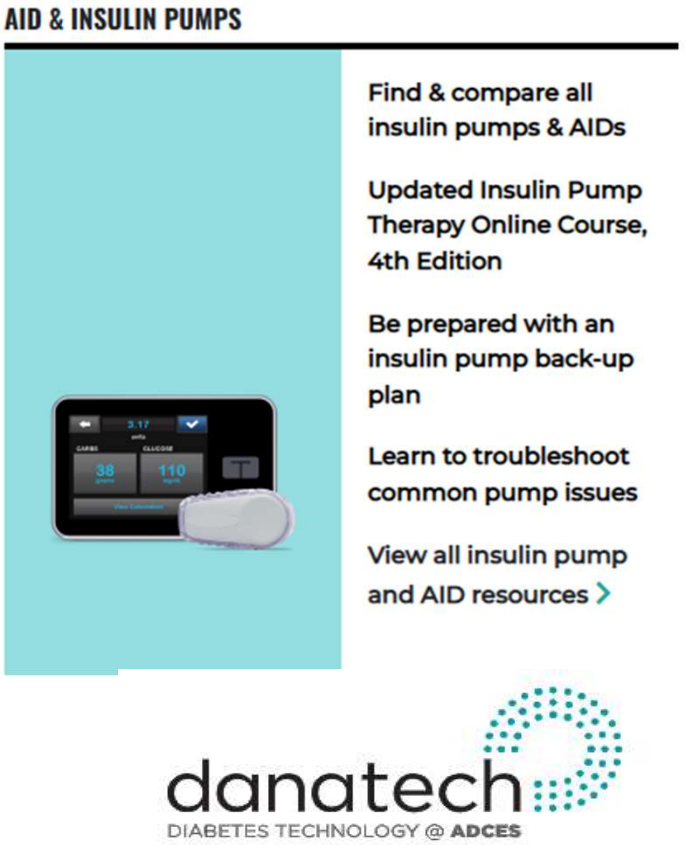
DI1 updated

Diana Isaacs, 2025-08-26T02:00:40.896

Learn All About the Tech



https://pro.diabeteswise.org/



https://www.diabeteseducator.org/danatech/home)/

Panther Tools

PANTHERTOOL™ for

CONTROL-IQ

t:slim X2 insulin pump with Control-IQ technology



OVERVIEW using C|A|R|E|S Framework

C | How it CALCULATES

- A hybrid closed-loop system that uses CGM glucose data to adjust the basal insulin delivery by increasing, decreasing or suspending programmed basal rates
- Algorithm targets glucose levels 112.5-160 mg/dL
- Automatic correction boluses up to once per hour, 60% of a calculated correction dose

A | What you can ADJUST

- Can change basal rates, I:C ratios, correction factors
- CANNOT change active insulin time (5 hours) or correction bolus target (110 mg/dL)
- "Exercise Activity" targets glucose 140-160 mg/dL (to reduce insulin delivery)
- "Sleep Activity" narrows glucose target to 112.5-120 mg/dL and prevents automated correction doses overnight.

R | When to REVERT to open-loop

The system stays in hybrid closed-loop all the time except when CGM data is not available. Users must turn off Control-IQ if they want to use temporary basal rates.

E | How to EDUCATE

See PANTHERPOINTERS below as well as EDUCATE-bullets found under STEP 3.

S | SENSOR/SHARE characteristics

- Dexcom G6 sensor and transmitter: 10 day sensor life, factory calibrated, can be used for diabetes management decisions without BG check.
- User can connect Dexcom transmitter to the Dexcom G6 app on a phone and share data with others using Dexcom Follow app.
- Sensor glucose levels auto-populate into bolus calculator

PANTHERTOOL™ for

OMNIPOD® 5

Automated Insulin Delivery System



INSTRUCTIONS FOR USE

1 Download user's device to My.Glooko.com → Set report settings to Target Range 70-180 mg/dL

2 Create reports → 2 weeks → Select: a. CGM Summary; b. Week View; and c. Devices

3 Follow this worksheet for step-by-step guidance on clinical assessment, user education and insulin dose adjustments.

STEP 1 **BIG PICTURE** (PATTERNS)
→ STEP 2 **SMALL PICTURE** (REASONS)
→ STEP 3 **PLAN** (SOLUTIONS)

OVERVIEW using C|A|R|E|S Framework

C | How it CALCULATES

- Automated basal insulin delivery calculated from total daily insulin, which is updated with each Pod change (adaptive basal rate).
- Calculates dose of insulin every 5 min based on glucose levels predicted 60 minutes into future.

A | What you can ADJUST

- Can adjust the algorithm's Target Glucose (110, 120, 130, 140, 150 mg/dL) for adaptive basal rate.
- Can adjust I:C ratios, correction factors, active insulin time for bolus settings.
- Cannot change basal rates (programmed basal rates are not used in Automated Mode).

R | When to REVERT to open-loop

- System may revert to Automated Mode: Limited (static basal rate determined by system; not based on CGM value/trend) for 2 reasons:
  1. If CGM stops communicating with Pod for 20 min. Will resume full automation when CGM returns.
  2. If an Automated Delivery Restriction alarm occurs (insulin delivery suspended or at max delivery too long). Alarm must be cleared by user and enter Manual Mode for 5 min. Can turn Automated Mode back on after 5 minutes.

E | How to EDUCATE

- Bolus before eating, ideally 10-15 minutes prior.
- Tap Use CGM in bolus calculator to add glucose value and trend into bolus calculator.
- Treat mild hypoglycemia with 5-10g carb to avoid rebound hyperglycemia and WAIT 15 min before re-treating to give glucose time to rise.

S | SENSOR/SHARE characteristics

- Dexcom G6 which requires no calibrations.
- Must use G6 mobile app on smartphone to start CGM sensor (cannot use Dexcom receiver or Omnipod 5 Controller).
- Can use Dexcom Share for remote monitoring of CGM data.

PANTHERPOINTERS™ FOR CLINICIANS

1. Focus on behavior: Wearing the CGM consistently, giving all boluses, etc.
2. When adjusting insulin pump settings, focus primarily on Target Glucose and I:C ratios.
3. To make system more aggressive: Lower the Target Glucose, encourage user to give more boluses and intensify bolus settings (e.g. I:C ratio) to increase total daily insulin (which drives the automation calculation).
4. Avoid overthinking the automated basal delivery. Focus on the overall Time in Range (TIR), and optimizing system use, bolus behaviors and bolus doses.

PANTHER Diabetes Technology. | danatech

Panther Tools

Download / Print PDF

	iLet Bionic Pancreas	MiniMed™ 780G	t:slim X2™ Control-IQ™	Omnipod® 5
				
CALCULATE	**iLet**	**780G**	**Control-IQ**	**Omnipod 5**
What is automation called?	iLet Bionic Pancreas	SmartGuard™	Control-IQ™	Automated Mode
Basal automation?	Insulin Automation is initialized by entering user's weight. Basal insulin delivery adjusts every 5 minutes based on CGM glucose trends and adapts over time based on the iLet's analysis of the user's daily glucose patterns.	"Auto Basal" calculated from total daily insulin, which is updated each day at midnight. Auto Basal is adjusted every 5 min based on recent CGM glucose trends, aiming for the target glucose value.	Increases or decreases the programmed basal rates based on a 30 min prediction of CGM glucose, aiming for the target glucose range.	"Adaptive Basal" calculated from total daily insulin, which is updated at each Pod change. Adaptive Basal is adjusted every 5 min based on a 60 min prediction of CGM glucose, aiming for the target glucose value.
Bolus automation?	All meal bolus doses and correction bolus doses are automated.	Auto correction boluses (max. every 5 min) if glucose is >120 mg/dL. Auto corrections can be turned on or off.	Auto correction boluses (max once/hr) if glucose is predicted to be >180 mg/dL in 30 min.	No automated boluses
Algorithm target glucose / target range?	3 target options: "Usual", "Lower", "Higher"	3 target options: 100, 110, 120 mg/dL	Target range: 112.5-160 mg/dL	5 target options: 110, 120, 130, 140, 150 mg/dL
Which insulin does the user give?	User completes a meal "announcement" to prompt the iLet to deliver a meal bolus, which involves indicating the carbohydrate amount for each meal ("Usual for Me"/"More" than usual/"Less" than usual).	User gives boluses for meals by entering total grams of carbs in the bolus menu / bolus calculator. User can deliver correction boluses as needed in the bolus menu / bolus calculator.		

Cleveland Clinic

Every life deserves world class care.

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Instagram/Twitter: dianamisaacs
Podcast: https://www.hcplive.com/podcasts/diabetes-dialogue

DIABETES DIALOGUE
Technology, Therapeutics, and Real-World Perspectives

Diabetes Education Services™

LIVE SEMINAR

www.DiabetesEd.net

ABCs of Assessing & Supporting Well-Being: Healing Through Connection

Beverly Thomassian, RN, MPH, CDCES, BC-ADM

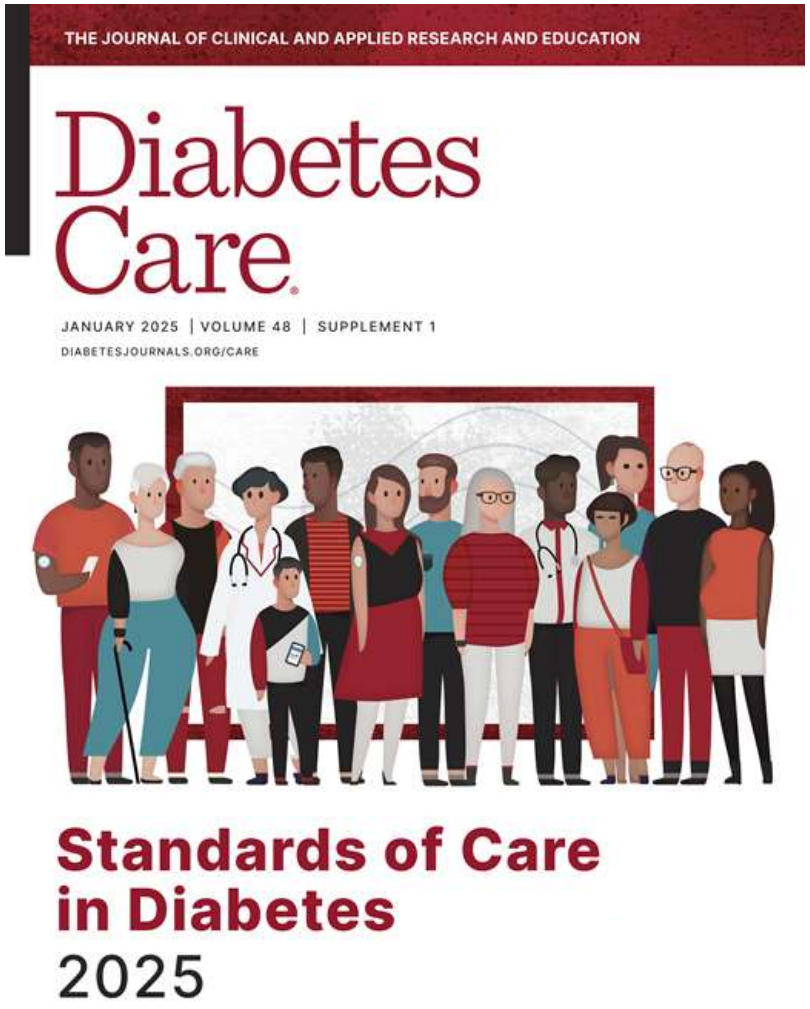
Pronouns: She, her, hers

ABCs of Assessing & Supporting Well-Being: Healing Through Connection

- State strategies to assess and address social determinants of health
- Discuss health care delivery systems using a person-centered approach
- List tools that can help detect distress, and mental health issues.
- Describe psycho-social and emotional barriers to diabetes self-management
- Discuss communication tools that healthcare professionals can use to address distress and support well-being.



Improving Care and Well Being



1. Improving Care and Promoting Health in Populations: Standards of Care in Diabetes—2025 FREE

American Diabetes Association Professional Practice Committee

American Diabetes Association Professional Practice Committee; 1. Improving Care and Promoting Health in Populations: Standards of Care in Diabetes—2025. *Diabetes Care* 1 January 2025; 48 (Supplement_1): S14–S26. https://doi.org/10.2337/dc25-S001

5. Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes: Standards of Care in Diabetes—2025 FREE

American Diabetes Association Professional Practice Committee

American Diabetes Association Professional Practice Committee; 5. Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes: Standards of Care in Diabetes—2025. *Diabetes Care* 1 January 2025; 48 (Supplement_1): S86–S127. https://doi.org/10.2337/dc25-S005

Facilitating Positive Health Behaviors and Well Being to Improve Health Outcomes – Standard 5

- Building positive health behaviors and maintaining psychological well-being are foundational for achieving diabetes management goals and maximizing quality of life
- Engage in person-centered collaborative care and shared decision making



5. Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes: Standards of Care in Diabetes—2025 FREE

American Diabetes Association Professional Practice Committee

Well-Being Key Goal of Care

- Timely treatment based on evidence and SDOH in collaboration with individual
- Integrate long term treatment approaches w/ person centered care team.
- Facilitate in person & virtual team-based care along with community involvement



We want to help people move from
Dis – Ease to
Well- Being

1. Improving Care and Promoting Health in Populations: Standards of Care in Diabetes—2025 FREE

American Diabetes Association Professional Practice Committee

Diabetes Care and Education Specialist (CDCES) Definition

"A compassionate teacher and expert who, as an integral member of the care team, provides collaborative, comprehensive, and person-centered care and education for people with diabetes"



2022 National Standards for Diabetes Self-Management Education and Support

Diabetes Care 2022;45:484–494 | https://doi.org/10.2337/dc21-2396

When I get lost or discouraged, I remember my why.

Diabetes Self-Management Education

- DSMES facilitates the knowledge, decision-making, and skills mastery necessary for optimal diabetes self-care and incorporate the needs, goals, and life experiences of the person with diabetes.



- Consider the burden of treatment and the person's level of confidence and self-efficacy for management behaviors as well as the level of social and family support.
- Use positive, strength-based words and phrases putting people first

Barriers to DSMES

- **Only about 50% of eligible individuals receive DSMES**
- Barriers include health system, payor, clinic, HCP, and individual.
- Due to lack of administrative leadership support to ineffective DSMES referral processes, transportation challenges etc.
- Low participation can be due to lack of referrals, logistical issues (e.g., accessibility, timing, and costs), and lack of a perceived benefit

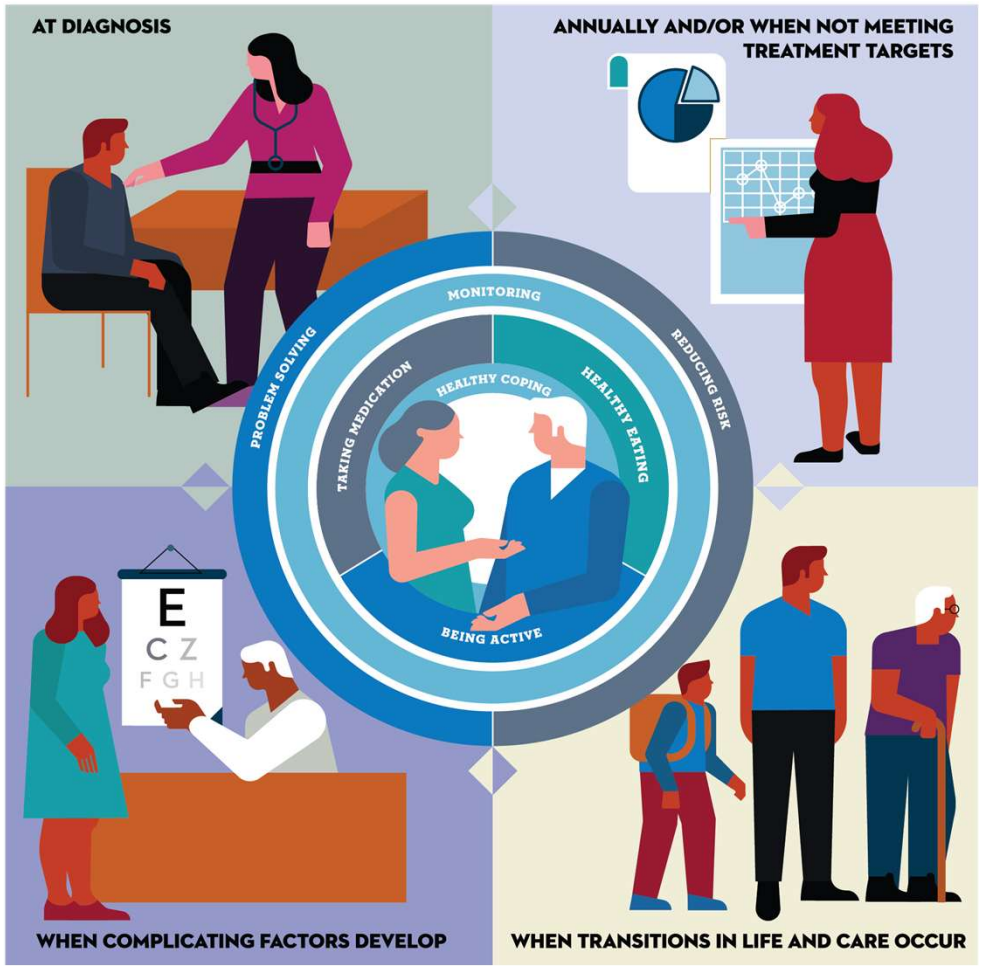


Efforts to identify and address potential barriers at all levels need to be made.

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Critical times to provide and modify DSMES



- At Diagnosis
- Annually and/or when not meeting treatment goals
- When complicating factors develop (medical, physical, psychosocial) develop
- When transitions in life and care occur.

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Powers MA, Bardsley JK, et al. DSMES Consensus Report, The Diabetes Educator, 2020
ADCES. AADE7 Self-Care Behaviors, The Diabetes Educator, 2020

Diabetes Self Management Ed Benefits

- Improved knowledge
- Lower weight
- Improved quality of life
- Reduced mortality
- Positive coping
- Reduced cost



- Increased primary care, preventive services
- Better outcomes
- Less frequent use of acute care
- More likely to follow best practice recommendations

Elevator Pitch: *I help people with diabetes get to their best health through collaboration and education.*

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Individual & Population Health

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

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- Integrated person-centered care:
  - ensures individual's values guide all clinical decisions
  - is respectful of and responsive to individual preferences, needs, and values;
  - considers comorbidities and prognoses

Chronic Care Model – 6 Core Elements

Delivery system design (moving from a *reactive* to a *proactive* care delivery system where planned visits are coordinated through a team-based approach)

Self-management support

Decision support (basing care on evidence-based, effective care guidelines)



Clinical information systems (using registries that can provide patient-specific and population-based support to the care team)

Community resources and policies (identifying or developing resources to support healthy lifestyles)

Health systems (to create a quality-oriented culture)

Studies show using chronic care delivery model decreases death & disease and improves outcomes.

Lived Experiences & Advocacy



Diabetes Admit for Hyperglycemia

- John is admitted for hyperglycemia because he stopped taking his diabetes meds.
- HCP says, “Don’t you realize you are going to get complications, like kidney disease or amputation if you don’t take your medications?”
- Door Closed – No Connection made

How Does John Feel?

- Embarrassed
- Ashamed
- Defeated
- Angry
- Unheard



How does HCP feel?

- Frustrated
- Defeated
- Worried

Diabetes Visit – Let's Go *through*

A small adjustment can make a BIG Difference

- HCP says, "John, I am worried about you and your elevated blood glucose. Can you share what is going on in your life?"
- Door Open – Connection made

How Does John Feel?

- Heard & Seen
- Recognized
- Connected
- Engaged

How does the HCP feel?

- Connected
- Concerned
- Collaborative

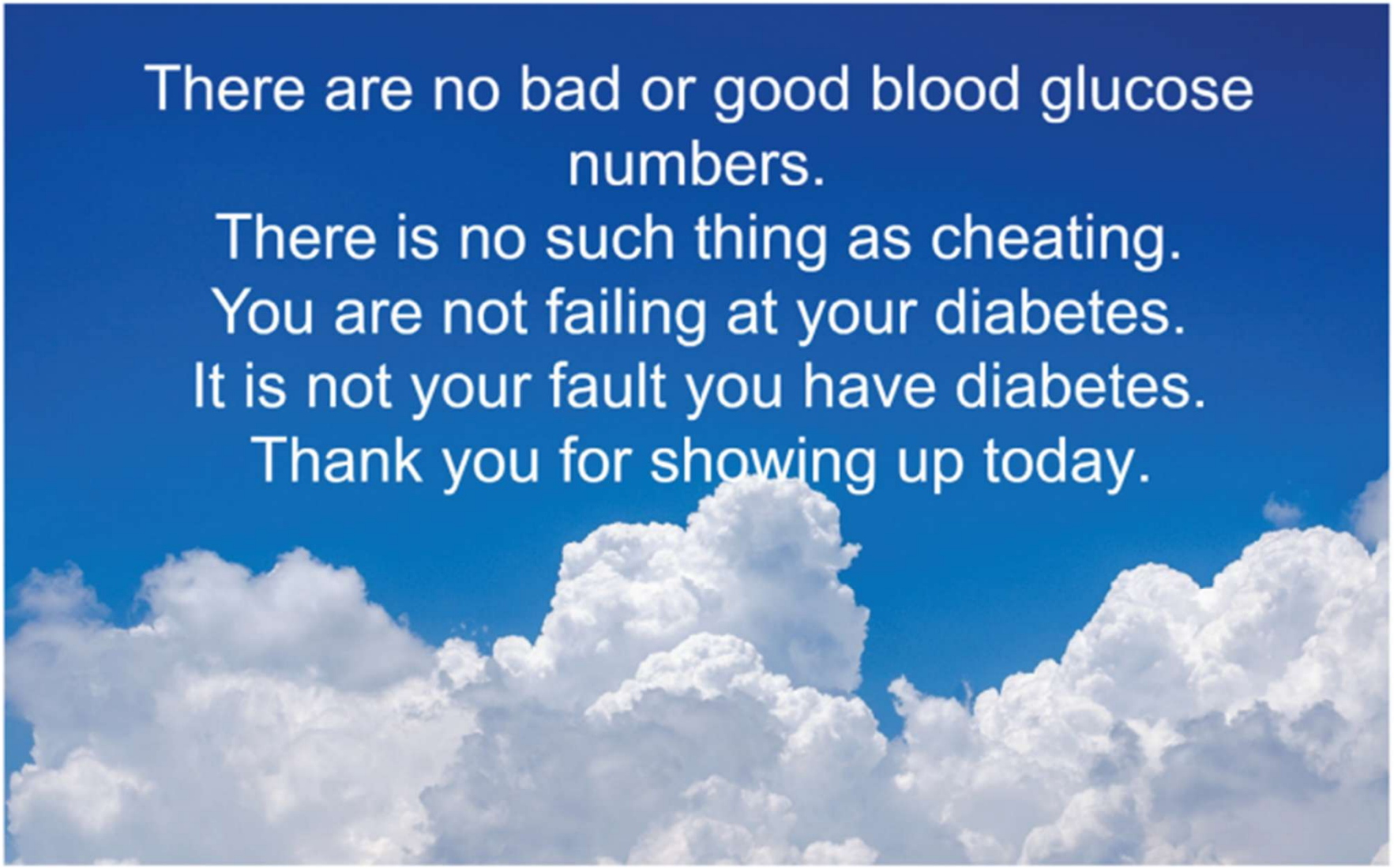


Healing to HCP

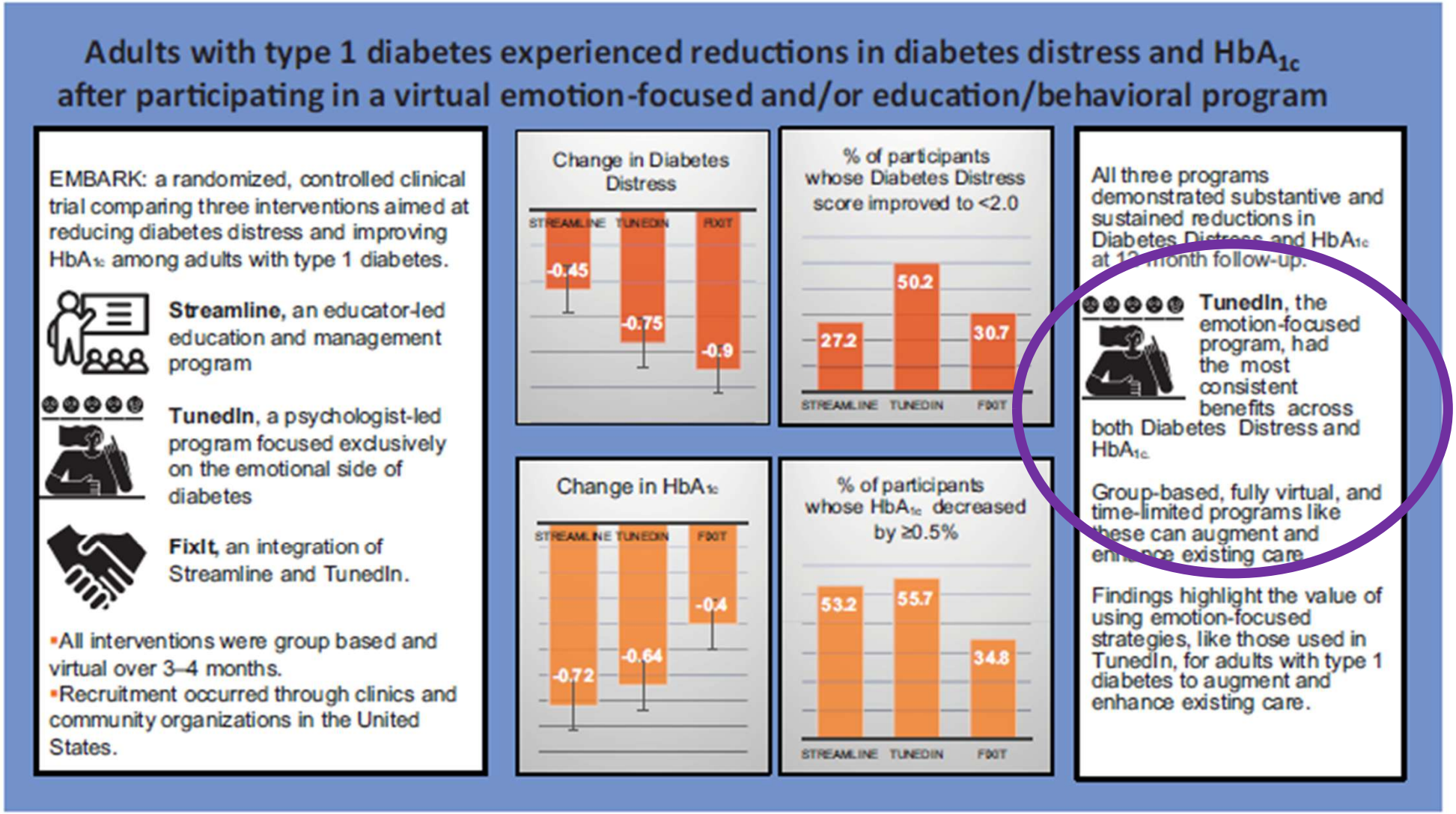
Bidirectional Healing

Healing to Person

Create a Judgement Free Zone – Roll out the Carpet of Acceptance



EMBARK Trial

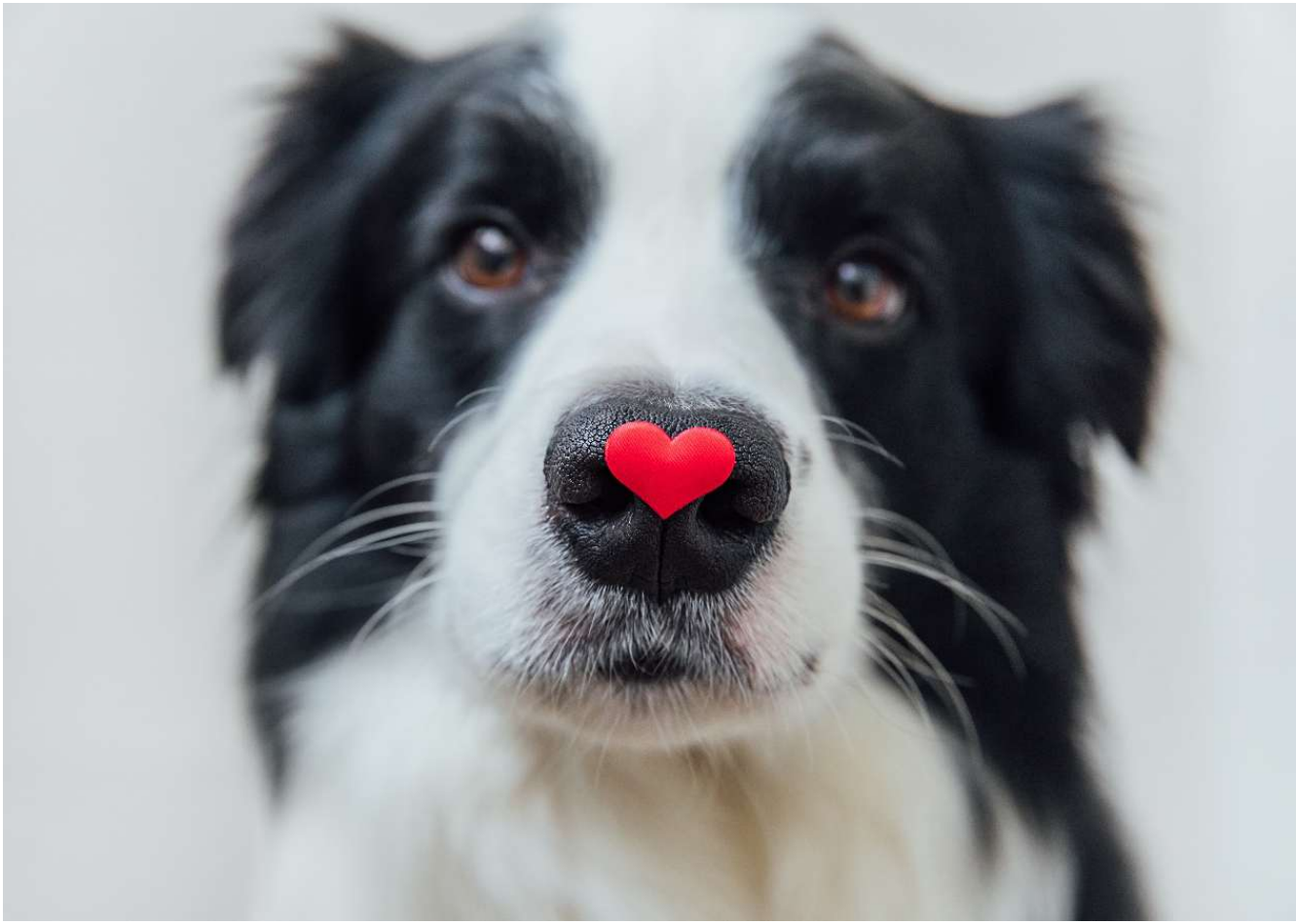


EMBARK: A Randomized, Controlled Trial Comparing Three Approaches to Reducing Diabetes Distress and Improving HbA_{1c} in Adults With Type 1 Diabetes. *Diabetes Care* 2024; dc232452. https://doi.org/10.2337/dc23-2452

Embark Trial – Emotions as Priority

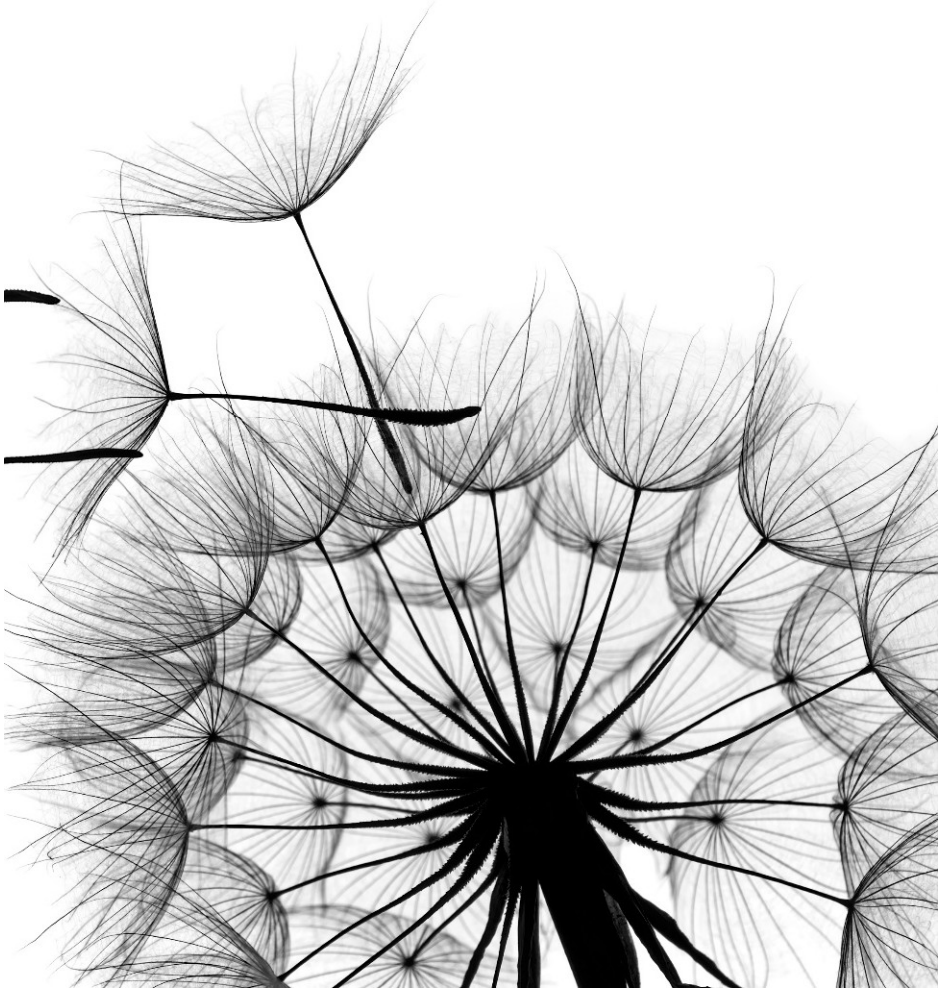
I have finally given myself permission to make addressing the emotional aspects of diabetes a priority.

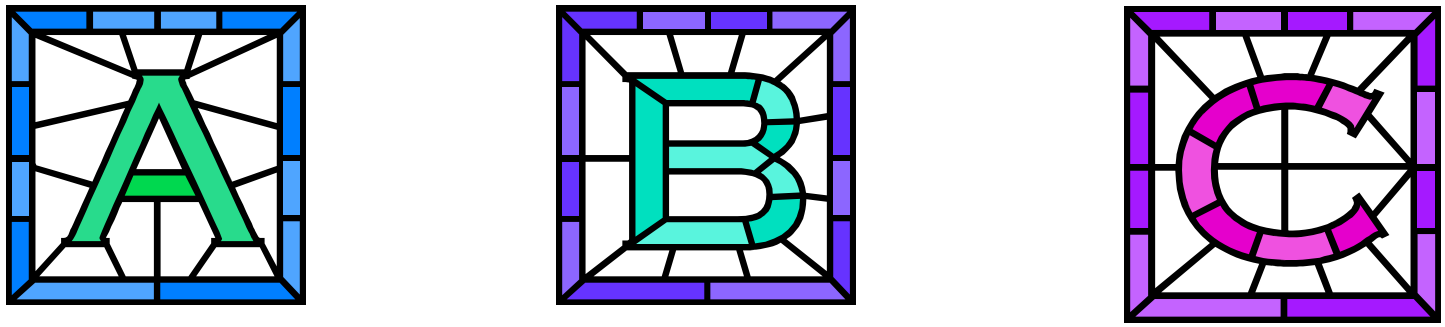
~Coach Beverly



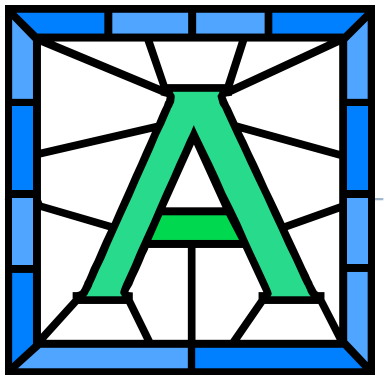
Releasing the Brake

- This strategy recognizes that diabetes distress acts as a brake on the application of existing diabetes knowledge and skills.
- By releasing the diabetes distress brake through emotion-focused intervention, the negative cycle can be efficiently ended.





of Healing Through Connection



- Ask about their life (SDOH)
- Assess current self-management behaviors
- Assess your feelings
- Accept without judgement
- Acknowledge one thing they are doing right
- Advocate for needed resources

Case Study



- 34-year-old transgender female, with type 2 diabetes, ends up in urgent care with an abscess due to elevated blood glucose – A1C 9.4%.
  Living with roommates.
  On glipizide and metformin, but not taking because can't afford strips to check glucose.
  Afraid of glucose going too low.
- History of diabetes distress and anxiety.



Inclusive Care for LGBTQ People with Diabetes

Members of the lesbian, gay, bisexual, transgender and queer (LGBTQ) community have unique health disparities and worse health outcomes than their heterosexual counterparts, which has clinical relevance in the delivery of diabetes care and education.[1] Diabetes care and education specialists are in a pivotal position to help this medically-underserved and vulnerable population get the best possible care.

Definitions[2]

Gender Identity: One's internal sense of being male or female, neither of these, both, or another – female/woman/girl, male/man/boy, other gender(s) (e.g. 58 gender options for Facebook users).

Gender Expression: The physical expression of one's gender identity through clothing, hairstyle, voice, body shape, etc. - feminine, masculine, other.

Sex Assigned at Birth: The assignment and classification of people as male, female, intersex or another sex based on a combination of anatomy, hormones and chromosomes – female, male, other/intersex.

Sexual Orientation: Sexually attracted to men, women, other gender(s).

Romantic/Emotional Orientation: Romantically attracted to men, women, other gender(s)

Transgender: An umbrella term for people whose gender identity and/or gender expression differs from what is typically associated with the sex they were assigned at birth.

Cisgender: A term used to describe people who are not transgender, i.e., who identify with the gender assigned at birth. "Cis-" is a Latin prefix meaning "on the same side as," and is therefore an antonym of "trans-."



Content provided by Theresa Garnero, APRN, BC-ADM, MSN, CDE
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Social Determinants of Health

To improve health, support overall well-being, and eliminate disparities, it is crucial to address these determinants.

Individuals from racial and ethnic minority communities, underserved geographic areas (rural or urban), and those facing socioeconomic barriers to care and health at higher risk.

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Care Quality Gaps



Growing gaps in diabetes care quality and outcomes due to high & risings costs of care.



Increased disparities experienced by individuals from racial and ethnic minoritized backgrounds and those facing socioeconomic barriers to care.



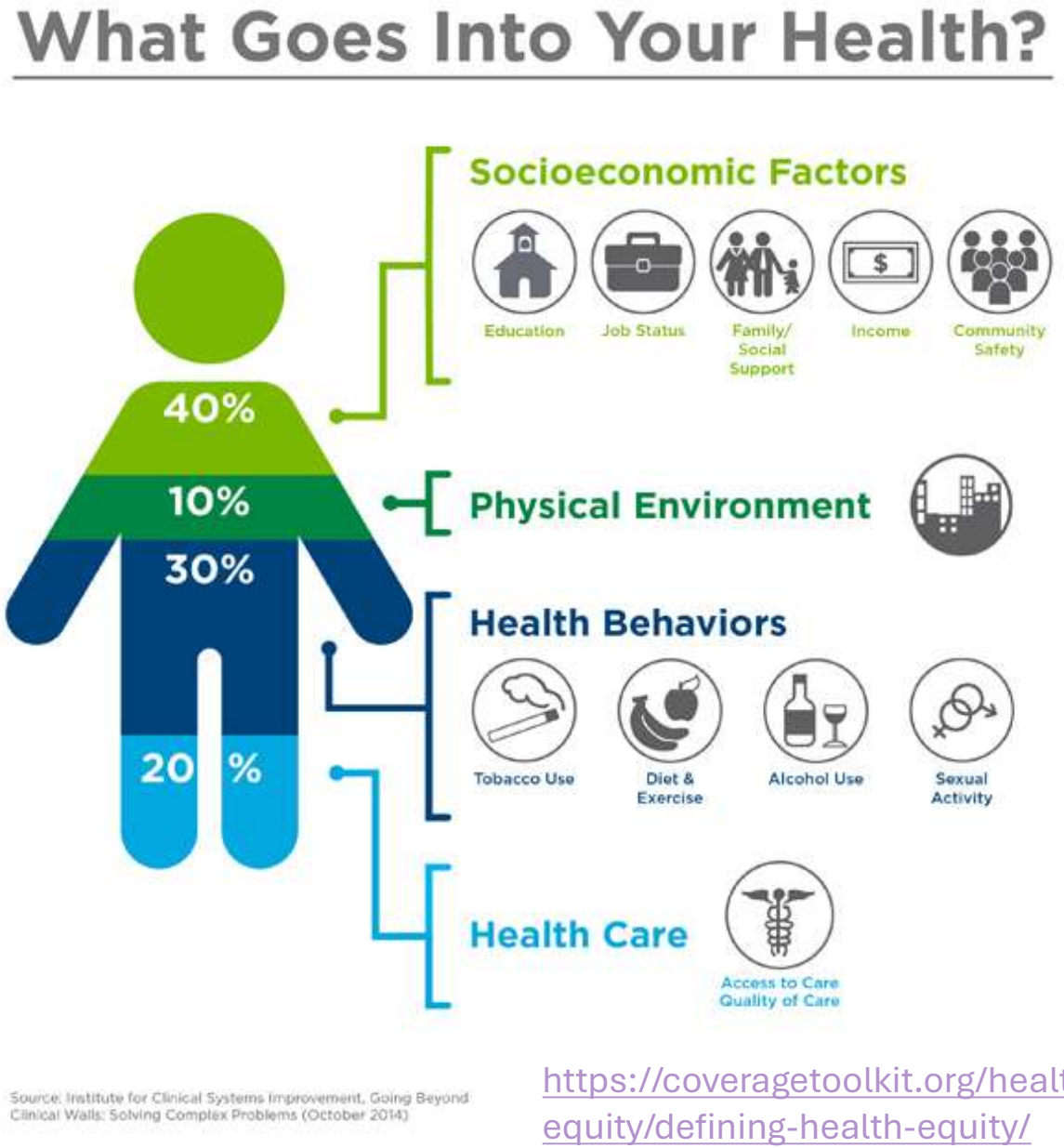
Calls for urgent, substantial, and multisectoral system-level improvements to care delivery

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Assess 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 determinants of health** in the target population when designing care.

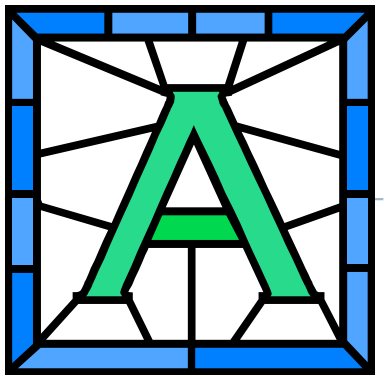


https://coveragetoolkit.org/health-equity/defining-health-equity/

Case Study



- 34-year-old transgender female, with type 2 diabetes, ends up in urgent care with an abscess due to elevated blood glucose – A1C 9.4%.
  Living with roommates.
  On glipizide and metformin, but not taking because can't afford strips to check glucose.
  Afraid of glucose going too low.
- History of diabetes distress and anxiety.



- Ask about their life (SDOH)
- Assess current self-management behaviors
- Assess your feelings
- Accept without judgement
- Acknowledge one thing they are doing right
- Advocate for needed resources

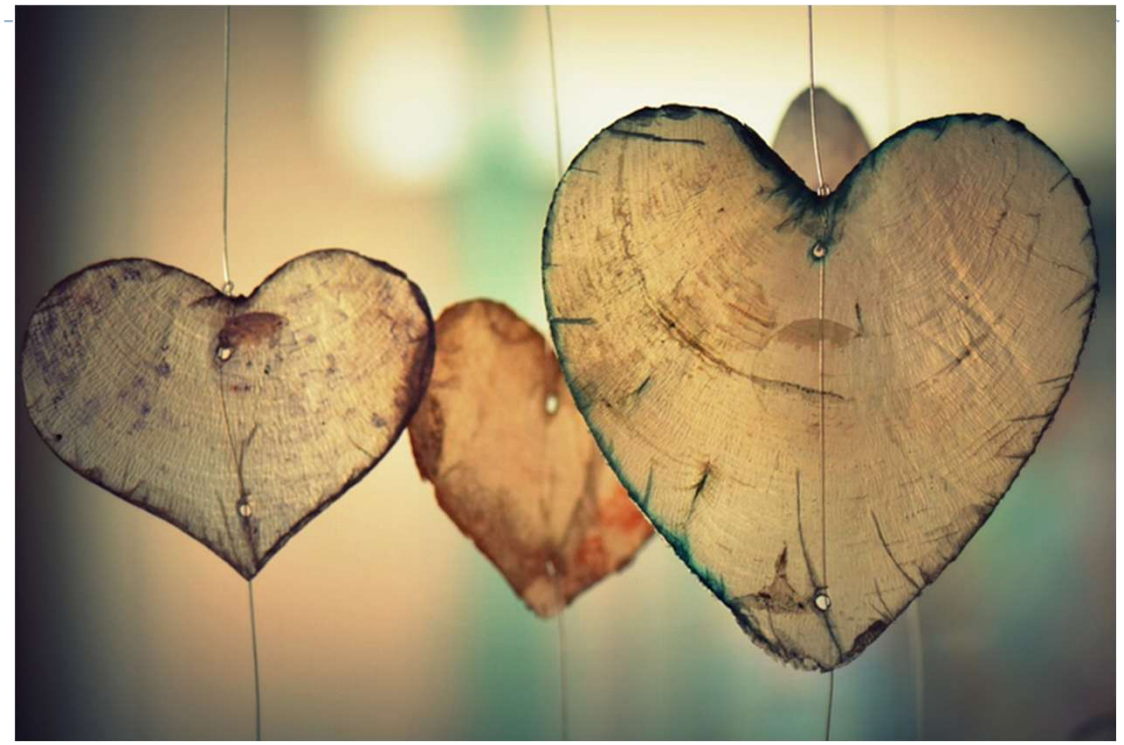
From Judgement to Curiosity

When you meet with people and release Judgment, this is what feelings of CURIOSITY could sound like.

Judgement Statement	Curiosity Statement
They still aren't taking their medications every day.	I wonder why they aren't able to take their medications every day.
I can't believe they keep gaining weight.	Let me explore how they are feeling about their body health.
How come they can't even exercise at least once a week.	Something seems to be blocking their goal to get more active. Let's find out.
Why are they still eating tortillas with each meal?	How do they think tortillas affect their blood glucose levels?
Can't they check their blood glucose more often?	I wonder how often they think they need to check their blood glucose?
Don't they understand they are going to get complications if they don't lower their blood glucose?	It seems like we need to explore what is happening in their lives, preventing them from engaging in their diabetes self-management.

Psychosocial Care

- Provide psychosocial care to all people with diabetes to optimize health-related quality of life and outcomes.
- Integrate such care with routine medical care using a collaborative, person-centered, culturally informed approach.
- Implement screening protocols for psychosocial concerns.



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What to Assess?

- Using standardized/validated tools
  - Diabetes Distress
  - Depression
  - Anxiety
  - Disordered Eating
  - Cognitive Capacity
  - Adverse Childhood Experiences
  - Suicidality if appropriate



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Poll Question 1

JT, a nine-year-old with type 1 diabetes, is struggling. Which of the following statements reflects that they may dealing with diabetes distress?

A. I sometimes just guess my carbs.
B. I just don't want to get out of bed in the morning.
C. I just can't keep up with all this diabetes self-care stuff.
D. I don't want to wear a diabetes bracelet or necklace.

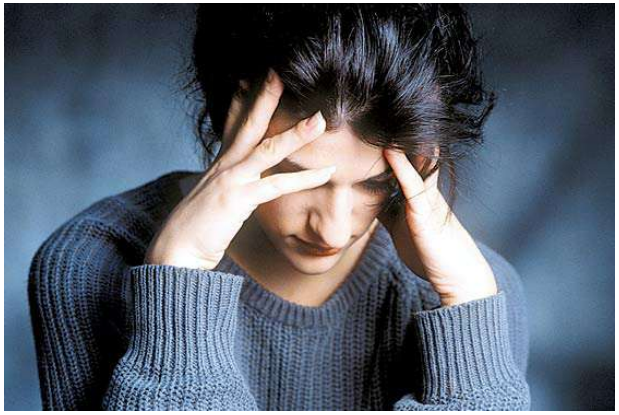


Diabetes Distress=DD

- Diabetes distress refers to significant negative psychological reactions related to emotional burdens and worries specific to an individual's experience in having to manage a demanding chronic condition such as diabetes.
- Can impact A1C, cognition and mental health
  - Type 2 - Affects ~ 60%
  - Type 1 – Affects 22-42%

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DDS 17: Diabetes Distress Scale

- Yields a total Diabetes Distress Scale score plus 4 sub scores:
  - Emotional burden
  - Physician related Distress
  - Regimen related Distress
  - Interpersonal Distress



Begin a conversation with any item rated 3 or more – See Distress Scale in your resources page

- 44.5% of individuals reported diabetes distress
- Only 24% of providers asked pts how diabetes affected their life (DAWN Study)

Diabetes Distress Scale cont.

Feeling that diabetes is taking up too much of my mental and physical energy every day.

Feeling that my doctor doesn't know enough about diabetes and diabetes care/ doesn't give me clear enough directions .

Feeling angry, scared, and/or depressed … think about living with diabetes

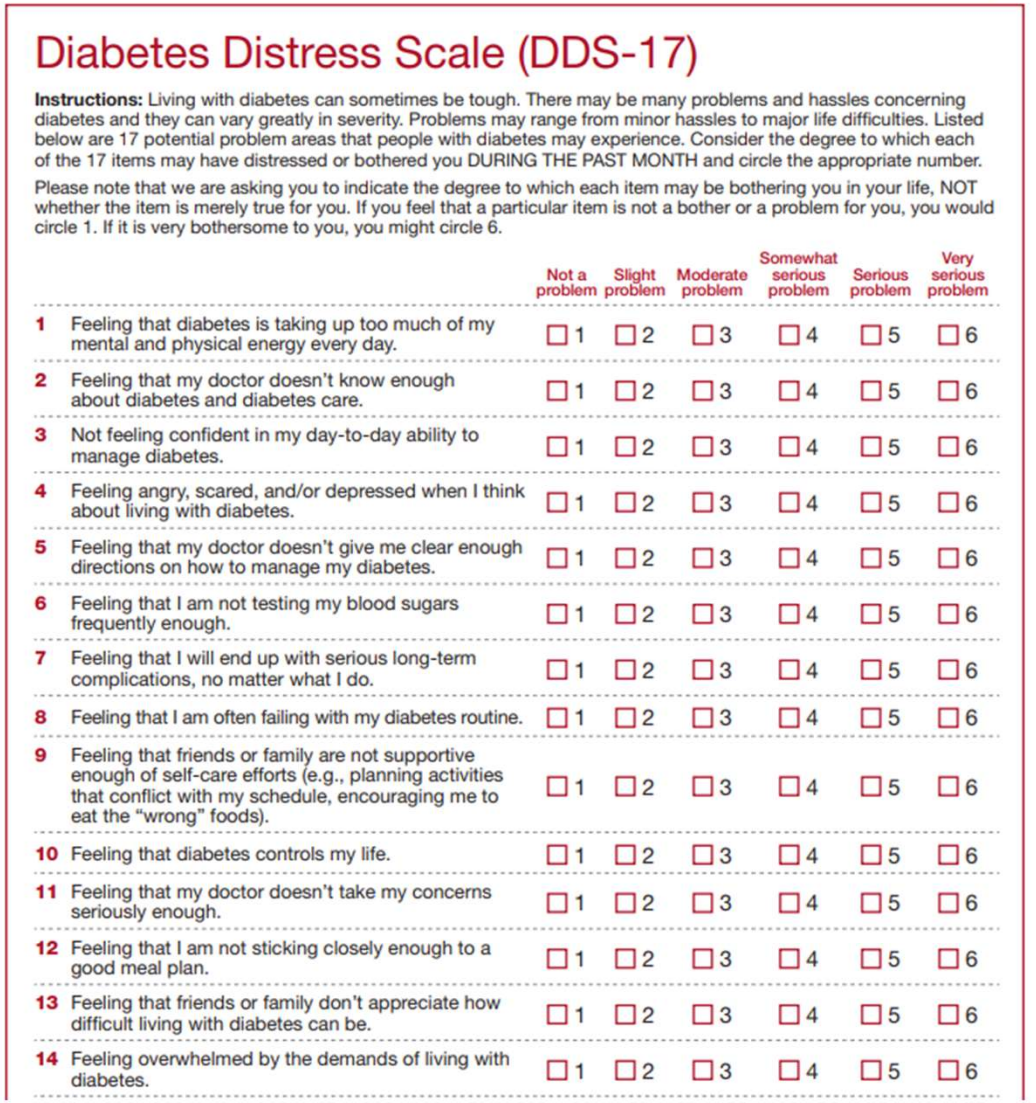
Feeling that I am not testing my blood sugars frequently enough.

Feeling that I am often failing with my diabetes routine.

Feeling that friends or family are not supportive enough of self-care efforts (planning activities that …, encourage me to eat the "wrong" foods).

Feeling that diabetes controls my life.

Not feeling motivated to keep up my diabetes self management. DDS (17) Scoring



Diabetes Distress Scale (DDS-17)

Instructions: Living with diabetes can sometimes be tough. There may be many problems and hassles concerning diabetes and they can vary greatly in severity. Problems may range from minor hassles to major life difficulties. Listed below are 17 potential problem areas that people with diabetes may experience. Consider the degree to which each of the 17 items may have distressed or bothered you DURING THE PAST MONTH and circle the appropriate number.

Please note that we are asking you to indicate the degree to which each item may be bothering you in your life, NOT whether the item is merely true for you. If you feel that a particular item is not a bother or a problem for you, you would circle 1. If it is very bothersome to you, you might circle 6.

		Not a problem	Slight problem	Moderate problem	Somewhat serious problem	Serious problem	Very serious problem
1	Feeling that diabetes is taking up too much of my mental and physical energy every day.	☐1	☐2	☐3	☐4	☐5	☐6
2	Feeling that my doctor doesn't know enough about diabetes and diabetes care.	☐1	☐2	☐3	☐4	☐5	☐6
3	Not feeling confident in my day-to-day ability to manage diabetes.	☐1	☐2	☐3	☐4	☐5	☐6
4	Feeling angry, scared, and/or depressed when I think about living with diabetes.	☐1	☐2	☐3	☐4	☐5	☐6
5	Feeling that my doctor doesn't give me clear enough directions on how to manage my diabetes.	☐1	☐2	☐3	☐4	☐5	☐6
6	Feeling that I am not testing my blood sugars frequently enough.	☐1	☐2	☐3	☐4	☐5	☐6
7	Feeling that I will end up with serious long-term complications, no matter what I do.	☐1	☐2	☐3	☐4	☐5	☐6
8	Feeling that I am often failing with my diabetes routine.	☐1	☐2	☐3	☐4	☐5	☐6
9	Feeling that friends or family are not supportive enough of self-care efforts (e.g., planning activities that conflict with my schedule, encouraging me to eat the "wrong" foods).	☐1	☐2	☐3	☐4	☐5	☐6
10	Feeling that diabetes controls my life.	☐1	☐2	☐3	☐4	☐5	☐6
11	Feeling that my doctor doesn't take my concerns seriously enough.	☐1	☐2	☐3	☐4	☐5	☐6
12	Feeling that I am not sticking closely enough to a good meal plan.	☐1	☐2	☐3	☐4	☐5	☐6
13	Feeling that friends or family don't appreciate how difficult living with diabetes can be.	☐1	☐2	☐3	☐4	☐5	☐6
14	Feeling overwhelmed by the demands of living with diabetes.	☐1	☐2	☐3	☐4	☐5	☐6

https://professional.diabetes.org/sites/default/files/media/ada_mental_health_toolkit_questionnaires.pdf.

Diabetes Distress – *Assess Annually

- High levels of diabetes distress significantly impact medication-taking behaviors and are linked to higher A1C, lower self-efficacy, and poorer dietary and exercise behaviors
- Can also contribute to higher stress hormone levels

- Address Distress
- Mindful Self-Compassion is important
- Counseling and DSME can help



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Trusting our Intuition

- As healthcare professionals, we tend to focus on problem-solving around lifestyle, medications, and glucose levels.
- The results of the Embark study confirm our intuition to prioritize addressing emotions to support individuals living with diabetes.
- **Let's reprioritize our checklist by assessing and addressing distress and move into the heart of providing effective diabetes care.**



Anxiety Symptoms Common in Diabetes

- 19.5% lifetime prevalence of generalized anxiety disorder in type 1 or type 2 diabetes*
- People with diabetes have higher rates of:
  - generalized anxiety disorder,
  - body dysmorphic disorder,
  - obsessive compulsive disorder,
  - specific phobias,
  - Posttraumatic stress disorder.

*Behavioral Risk Factor Surveillance System estimates

- Common Anxieties
  - Fear of Hypoglycemia
  - Not meeting glycemic goals
  - Insulin injection/infusion
  - Onset of complications



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Consider Referral to Mental Health Provider for Eval and Treatment

- Low engagement in diabetes self-management
- Screens positive for depression, anxiety, FoH*
- Disordered eating or disrupted eating patterns
- Not taking insulin/meds to lose weight
- Serious mental illness is suspected
- Youth with repeated hospitalizations, distress
- Cognitive impairment or impairment of DSME
- Before bariatric/metabolic surgery

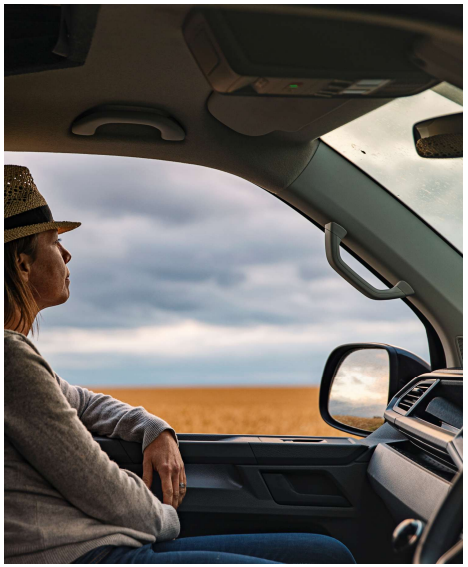
*Fear of hypoglycemia

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Care Study

- Acknowledge – That makes sense you are not taking your meds due to fear of hypo.
- What about just taking metformin?
- If we can get strips for your meter, would you be interested in checking your BG?



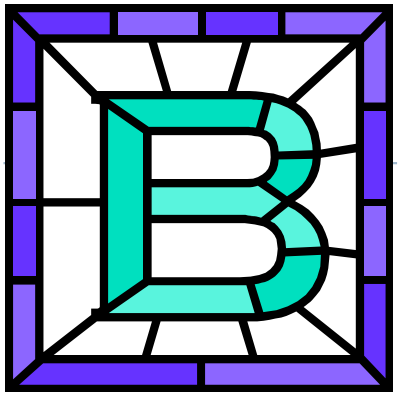
curiosity

- 34-year-old transgender female, with type 2 diabetes, ends up in urgent care with an abscess due to elevated blood glucose – A1C 9.4%. Living with roommates.
  On glipizide and metformin, but not taking because can't afford strips to check glucose. Afraid of glucose going too low.
- History of diabetes distress and anxiety.

Empowering and Promoting Health for Individuals and Populations



Our Actions Make a Difference



- Beliefs about health and diabetes
- Barriers can be confused with non-compliance
- Burnout lookout. On extended diabetes vacation due to diabetes distress?
- Bouncing back – leaning into resilience

When Treatment Goals aren't met

- Invoke Curiosity
- Reassess treatment regimen and barriers
  - Social determinants of Health
  - Health & Numeral Literacy
  - Language barriers
  - Diabetes related distress or depression
  - Competing demands
  - Medication costs

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Action Steps

- Provide Diabetes Self-Management Education
- Therapeutic connection
- Refer to RD/RDN
- Social Services
- Community Health Worker
- Support Group
- Other

Individualized Care Strategies

- Consider individualized care and create environmental structures to support people with:
  - Food insecurity
  - Living situation & Housing
  - Refugee, Migrant farm laborers
  - Language barriers

- Health disparities related to:
  - Ethnicity, racism, culture, sex, socioeconomic status, LGBTQ



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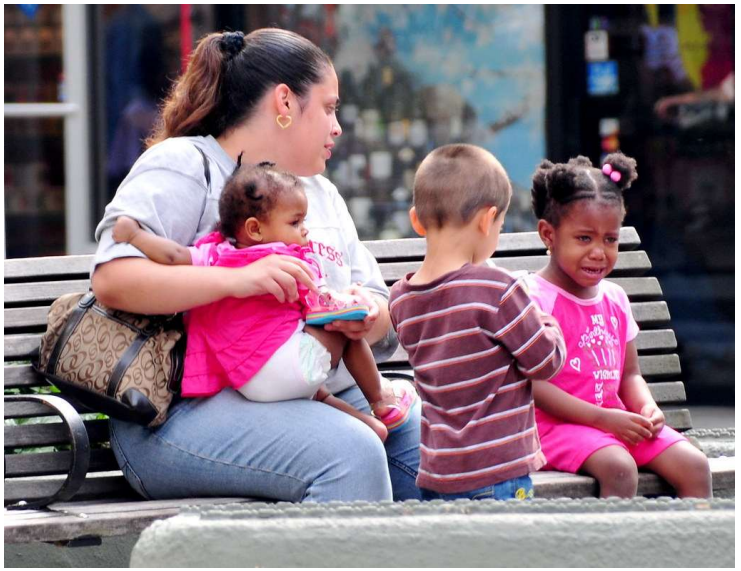
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Food Insecurity

- *Food insecurity is the unreliable availability of nutritious food and the inability to consistently obtain food without resorting to socially unacceptable practices*

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- Up to 20% in diabetes
  - Higher in African American, Latinos, low income, single moms
- Type 2 diabetes risk doubled in those with food insecurity



Living Situation impacts self-care

- The prevalence of diabetes in the unhoused population is estimated to be around 8%
- Need secure places to keep supplies and meds
- Help connect with social resources



Housing insecurity has been shown to be directly associated with a person's ability to maintain their diabetes self-management

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Refugee, Migrant & Seasonal Workers

- Higher risk of having diabetes, CV Disease
- Poverty associated with chronic stress, food insecurity and higher risk of diabetes
- link to certain pesticides and the incidence of diabetes

Health care professionals need to attune to individual's working and living conditions

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- Many barriers to care:
  - Migration
  - Culture and language
  - Lack of funds for transportation
  - Other barriers



Look Beyond – What impacts DSM

- Improving diabetes treatment outcomes requires looking at multiple factors:
  - Living situation
  - Childhood trauma
  - Adequacy of medical management
  - Cost-related barriers to medication use
  - Duration of diabetes
  - Other health related problems
  - Social structural factors
  - Access to Care



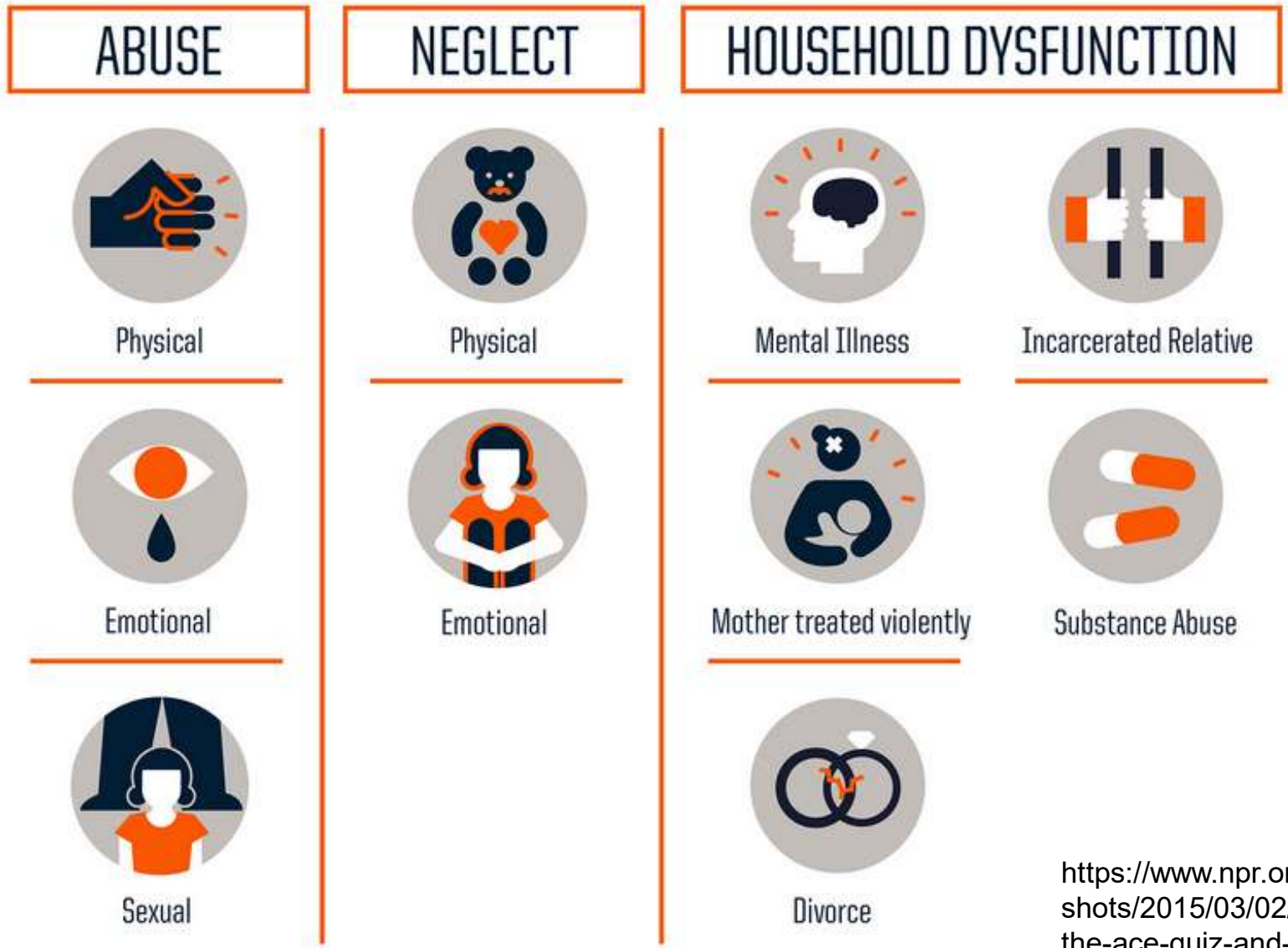
Question - What is ACE?

- ACE =
  - Adverse
  - Childhood
  - Experiences
    - (before 18 yrs)

- What is the relationship between childhood trauma and health?



10 Assessment Areas for ACE – Use 10 Question Screening Tool to Assess



https://www.npr.org/sections/health-shots/2015/03/02/387007941/take-the-ace-quiz-and-learn-what-it-does-and-doesnt-mean

ACE increases risk for 9 out of 10 leading causes of death in US

Leading Cause of Death	Odds Ratio with ≥ 4 ACEs
Heart Disease	2.1
Stroke	2.0
Diabetes	1.4
Kidney Disease	1.7
Cancer	2.3
Alzheimer's	4.2
Suicide(attempts)	37.5

https://www.cdc.gov/vitalsigns/aces/index.html

Supportive Relationships & Resilience



The clinical response to identification of toxic stress should include:

1. Applying principles of trauma-informed care, including establishing trust, safety, and collaborative decision-making.

2. Supplementing usual care for ACE-Associated Health Conditions with patient education on toxic stress and discussing strategies that can help regulate the stress response, including:

- Supportive relationships, including with caregivers (for children), other family members, and peers
- High-quality, sufficient sleep
- Balanced nutrition
- Regular physical activity
- Mindfulness and meditation
- Experiencing nature
- Mental health care, including psychotherapy or psychiatric care, and substance use disorder treatment, when indicated



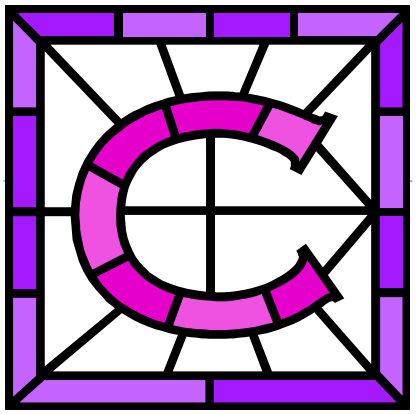
3. Validating existing strengths and protective factors.

4. Referrals to patient resources or interventions, such as educational materials, social workers, school agencies, care coordination or patient navigation, and community health workers.

Awareness >> to Healing

https://www.acesaware.org





- Having the Conversation
- Coaching that highlights *their* knowledge and resilience.
- Carrots – problem solve together and dig for solutions that are meaningful in everyday life.
- Compassion for the people in our care and ourselves.

Example of A More Helpful Expectation: From Perfectionism to "Healthy Good Enough"

Perfectionistic thinking: has 2 speeds, perfect or failure, not achievable for very long, exhausting, contributes to burnout

Healthy Good Enough

- Personalized
- Ambitious and realistic
- Allows for normal fluctuations, mistakes and experiments
- Sees small steps as valuable
- Focus is on efforts made, not numbers
- Forward looking: What now?

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Poll question 2

- LR is a 16-year-old on an insulin pump and Continuous Glucose Monitor and is feeling very distressed because their glucose keeps going above target range. What is an appropriate intervention?
- A. Encourage them to ask their provider about starting medications for anxiety.
- B. Help them set a SMART goal to improve carb to insulin ratios.
- C. Explore their feelings.
- D. Remind them that alcohol can actually lower blood glucose.

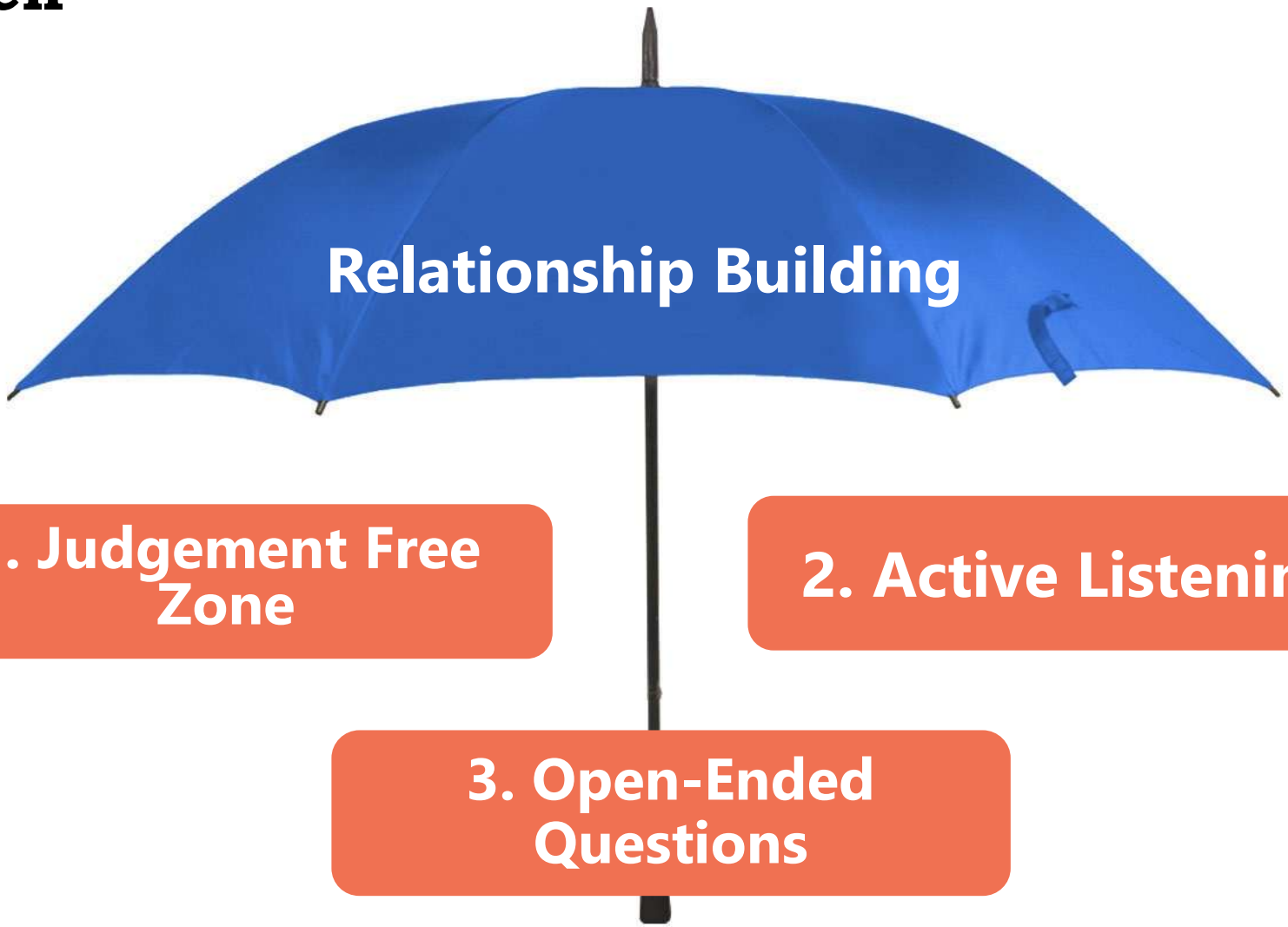


Time In Range – Person Centered

- “Hyperglance-emia”
- Healthy Good Enough – not perfection
- Each 1% is 15 minutes
- There is 24 hours in a day.
  - 17 hours in range
  - 7 hours outside of range.
- You are not defined by your blood glucose.
- What range feels safe for you?
- Try and step back and take in the whole picture.
- Sometimes you need shaved ice!



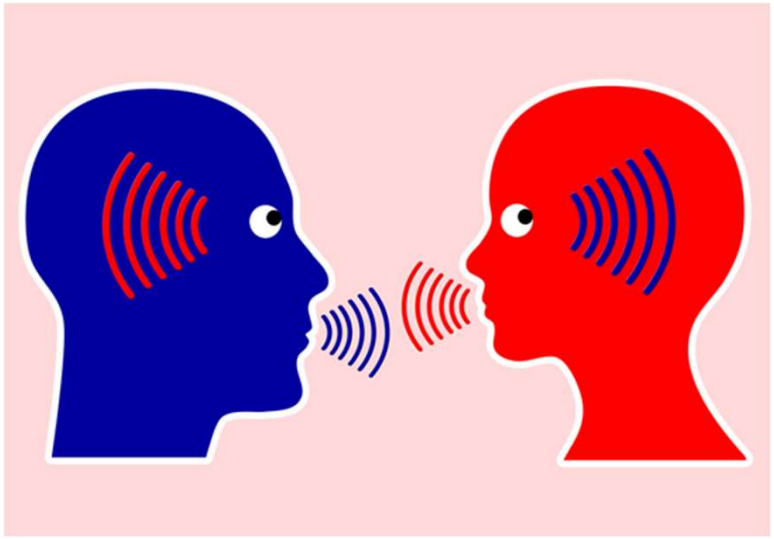
Relationship Building | Three Tools To Make It Happen



Conversational Tools You Can Use To Address Diabetes Distress

The goal is to help people label, verbalize, share, consider, and evaluate these frequently unaddressed and often hidden feelings and thoughts about diabetes.

Building the relationship with conversational skills is the intervention!



Start with Open Ended Questions

Used with permission from ReVive 5 Program; Larry Fisher, PhD & Susan Guzman, PhD

Clinical Engagement Tools: Label & Address Feelings

Common feeling words:

- Sad
- Frustrated
- Scared/fearful
- Disappointed
- Angry
- Hopeless
- Defeated
- Ashamed/embarrassed
- Burned out



Used with permission from ReVive 5 Program; Larry Fisher, PhD & Susan Guzman, PhD

Having the Conversation

Review and summarize the story you hear:

"Do I have this right?"

"Is there anything missing?"

Then ask:

"How does all of this strike you?"

"Does any of this surprise you?"

Used with permission from ReVive 5 Program; Larry Fisher, PhD & Susan Guzman, PhD

RT Loves Eating Out

- RT loves to eat dinner out with their friends 2-3 times a week.
- However, blood sugars always seem to go above target on those evenings.
- Want to have improved time in range to feel better, worry less and enjoy time with friends.
- States - I am such a failure, my blood sugars are always going too high. Makes me not even want to try.

Having the Conversation

- Elicit diabetes story
- Listening for the major diabetes distress themes
- Communication Approaches
  - Open ended questions (O) -What, How, Why
  - Reflect feelings words (R) – Sad, upset, worried, hopeful, angry, happy, scared etc.
  - Summarize (S) – So what your saying is… Did I get that right?
  - Normalize (N) – A lot of people with diabetes feel that same way.
  - Active listening with empathy (E) – I hear you. That sounds really tough

Used with permission from ReVive 5 Program; Larry Fisher, PhD & Susan Guzman, PhD

Our response to RT

You Say / Ask

- It sounds like you feel like you are a failure if your blood sugars go above a certain level? Did I get that right?
- I am also hearing that going out with your friends for dinner is important for you?
- A lot of people living with diabetes say the same thing.
- I hear you. This sounds really tough.
- What do you envision are some next steps?

RT Sets up Experiment/ Takes Action

Steps

- Make a small change
- Realize, that the story and tough feelings can be major barrier to change.
- Discover an unexpected issue.

RT Changes

- Be present with her fear of failure
- Look up carbs on app/website.
- Ask her friends for support
- Asking for help is hard, but I think it will help.
- See how drinking wine with dinner affects BG

Checking in with RT 2 weeks later

You Say / Ask

- Thank you for keeping logs on your eating out days.
- What kind of feelings showed up for you?
- Were you able to try any of your new approaches?
- Did you discover anything new?

RT Responds

- We went to the same restaurant 2 times in the same week. My friends helped me figure out the carbs in my favorite dish, but the first night, it still went high. I noticed the DD story of feeling like a failure.
- A few nights later, I tolerated my DD, ordered the same dish, and increased my bolus by 2 units. My blood sugar was right on track!

Checking in with RT 2 weeks later

You Say / Ask

- I know you also mentioned you wanted to see how wine affected your blood sugars.
- Did you discover anything new?

RT Responds

- I didn't have a chance to check that out yet. But next time, I am going to eat the same dish, take the same amount of insulin and add have a glass of wine to see what happens.
- I see that I need to keep challenging myself to not give in to feeling like a failure and keep making new choices.

Support Self-Confidence

- Support positive expectations for change…
  - emphasize personal responsibility,
  - instill confidence and hope,
  - increase sense of ability to cope.

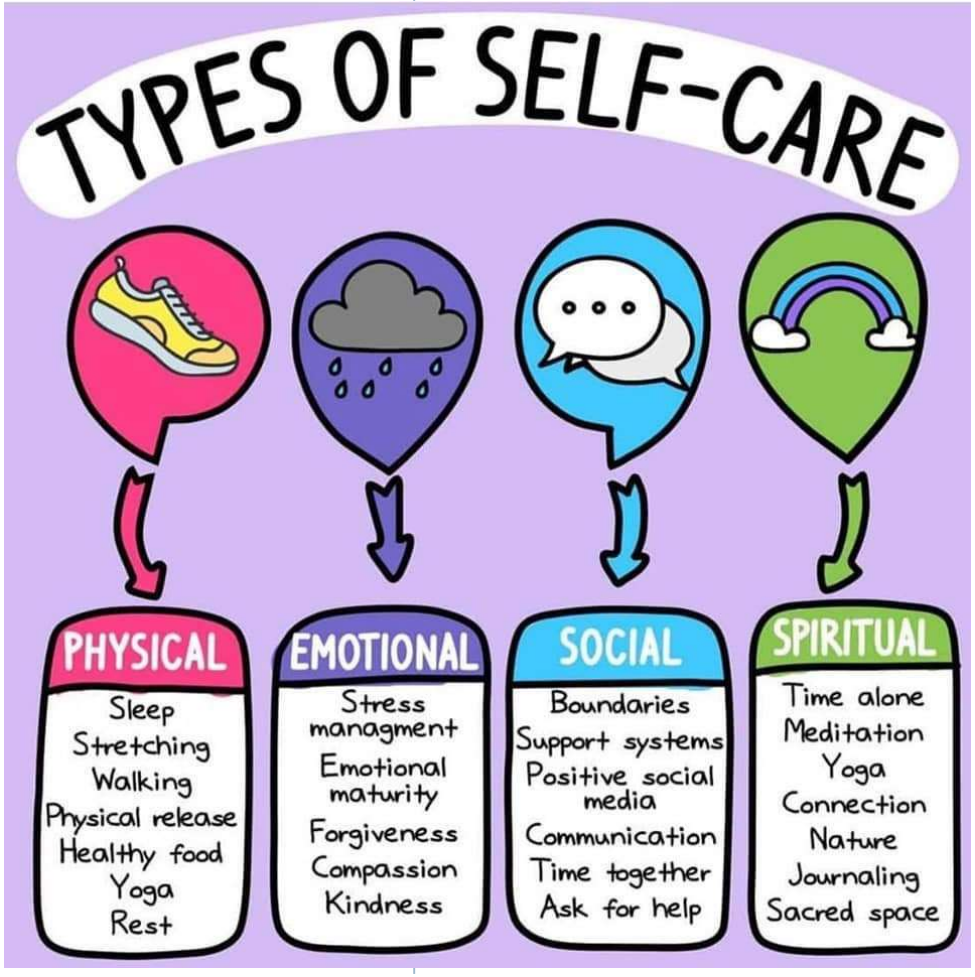


"From what you've told me about your past successes…it really seems like you can do this!"

Step 8

Compassion for Yourself

- Get enough sleep
- Keep active
- Remind yourself that you are not responsible for the decisions of others. Love and release.
- Connect with friends and family
- Investigate unhealthy behaviors
- Nourish your body
- Consider a hobby



Celebrate and Recognize

In conclusion: Celebrate and Recognize Each Person's Efforts.

- Making behavior changes, like losing weight or adjusting lifelong eating habits, can be extremely difficult.

- **Find a way to recognize and affirm their efforts even if there is no or little change in clinical measures.**



Our belief in people makes a difference!

Thank You –



- Thanks for joining us!
- Questions?
- Info@diabetesed.net
- Call us at 530-893-8635
- www.DiabetesEd.net

Cheat Sheet Appendix

RECOMMENDATIONS FOR DIAGNOSIS AND CLASSIFICATION OF DIABETES – 2025

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 or second degree relative with diabetes • High risk ethnicity or ancestry • Other conditions associated with insulin resistance (PCOS, Acanthosis Nigricans, Steatosis) • 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** (before taking 2nd generation antipsychotics, steroids, thiazide diuretics, statins, HIV meds *and* after initiating therapy) with history of pancreatitis, or periodontal disease.

TESTS TO DIAGNOSE DIABETES - TABLE 2

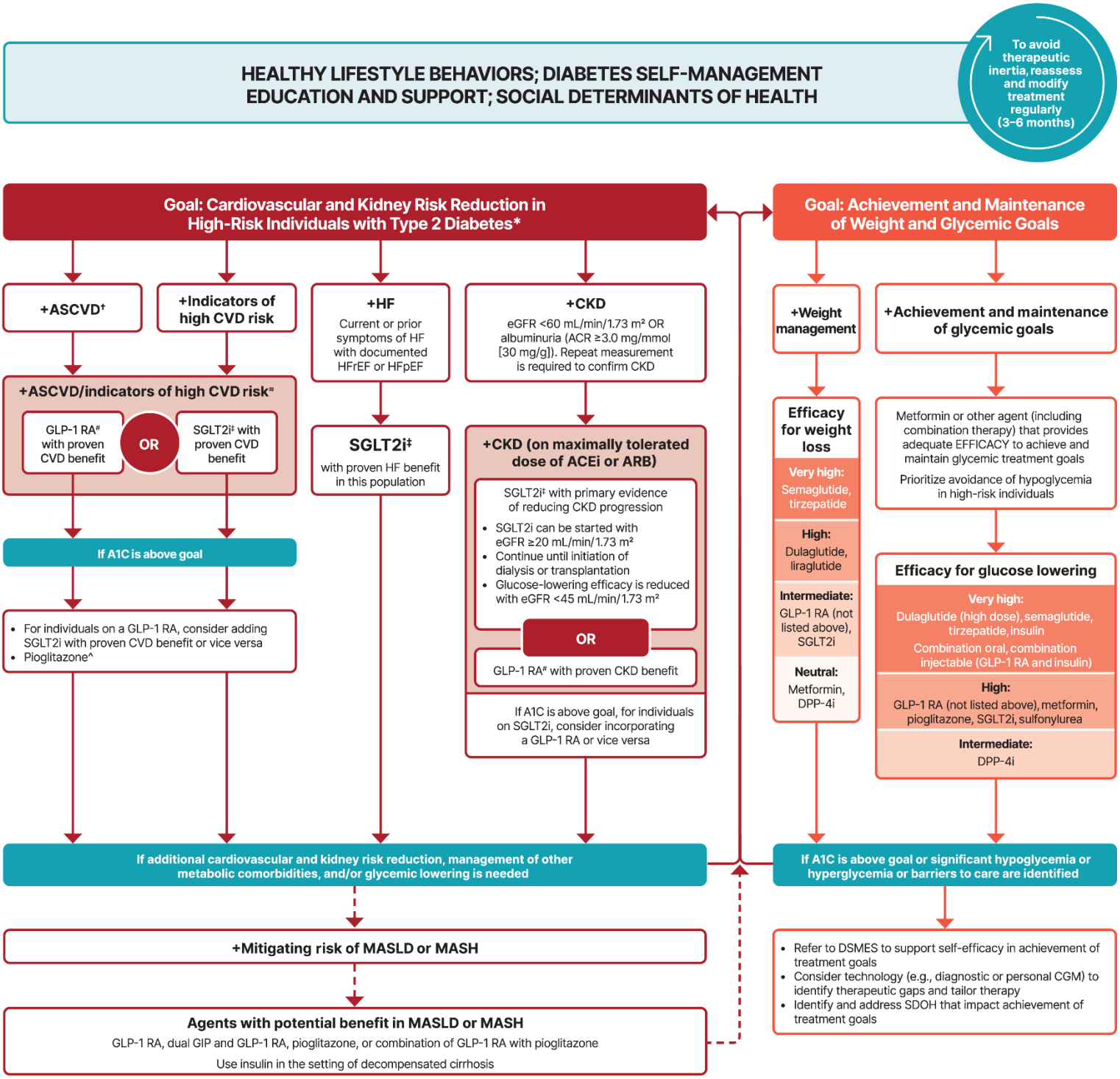
STAGE	For all the below tests, in the absence of unequivocal hyperglycemia, Confirm results by repeat testing.			
	A1C *NGSP certified & standardized assay*	**Fasting* Plasma Glucose (FPG)** **No intake 8 hrs.*	**Random Plasma Glucose**	**Oral Glucose Tolerance Test (OGTT) 75-g** (Carb intake of ≥ 150 g/day for 3 days prior to test.)
Diabetes	A1C ≥ 6.5%	FPG ≥ 126 mg/dl	Random plasma glucose ≥ 200 mg/dl plus symptoms[1] [1]Random = any time-of-day w/out regard to time since last meal; symptoms include usual polyuria, polydipsia, and unexplained wt. loss.	Two-hour plasma glucose (2hPG) ≥ 200 mg/dl
Prediabetes	A1C 5.7 – 6.4%	Impaired Fasting BG (IFG) = FPG 100-125 mg/dl		Impaired Glucose Tolerance (IGT) = 2hPG 140 -199 mg/dl
Normal	A1C < 5.7%	FPG < 100 mg/dl		2hPG < 140 mg/dl

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.	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)	**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
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.*	**"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 >**	**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 2025 Jan; 48 (Supplement 1): S27-S49. **Compliments of Diabetes Education Services www.DiabetesEd.net**

Use of Glucose-Lowering Medications in the Management of Type 2 Diabetes



* In people with HF, CKD, established CVD, or multiple risk factors for CVD, the decision to use a GLP-1 RA or SGLT2i with proven benefit should be made irrespective of background use of metformin or A1C.

† ASCVD: Defined differently across CVOTs but all included individuals with established CVD (e.g., MI, stroke, and arterial revascularization procedure) and variably included conditions such as transient ischemic attack, unstable angina, amputation, and symptomatic or asymptomatic coronary artery disease. Indicators of high risk: While definitions vary, most comprise ≥55 years of age with two or more additional risk factors (including obesity, hypertension, smoking, dyslipidemia, or albuminuria).

≈ A strong recommendation is warranted for people with CVD and a weaker recommendation for those with indicators of high-risk CVD. Moreover, a higher absolute risk reduction and thus lower numbers needed to treat are seen at higher levels of baseline risk and should be factored into the shared decision-making process. See text for details.

For GLP-1 RAs, CVOTs demonstrate their efficacy in reducing composite MACE, CV death, all-cause mortality, MI, stroke, and kidney end points in individuals with T2D with established or high risk of CVD. One kidney outcome trial demonstrated benefit in reducing persistent eGFR reduction and CV death for a GLP-1 RA in individuals with CKD and T2D.

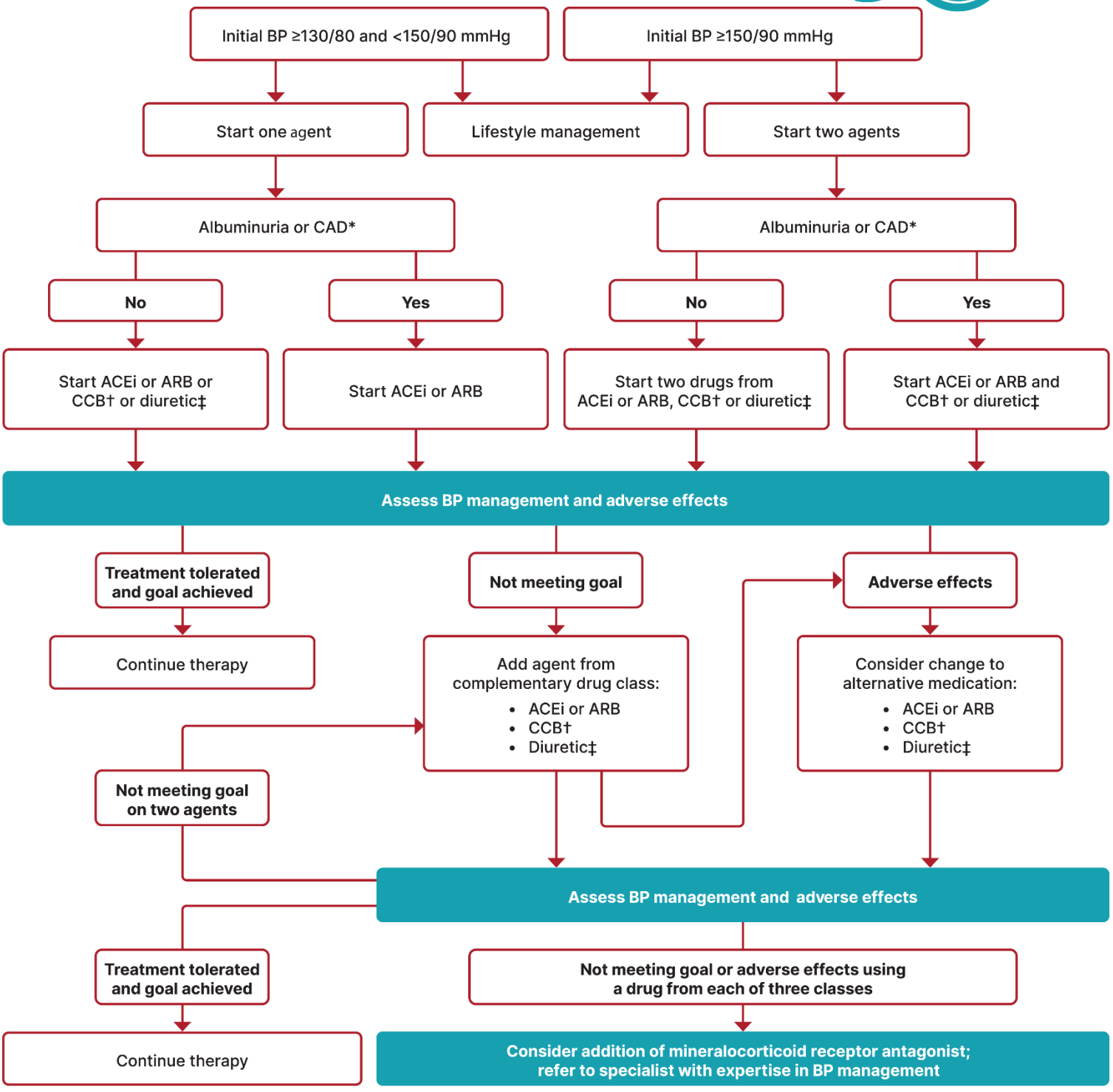
‡ For SGLT2is, CV and kidney outcomes trials demonstrate their efficacy in reducing the risks of composite MACE, CV death, all-cause mortality, MI, HHF, and kidney outcomes in individuals with T2D and established or high risk of CVD.

^ Low-dose pioglitazone may be better tolerated and similarly effective as higher doses.

9. Pharmacologic Approaches to Glycemic Treatment: Standards of Care in Diabetes—2025 FREE

American Diabetes Association Professional Practice Committee

Recommendations for the Treatment of Confirmed Hypertension in Nonpregnant People With Diabetes



ADA 2025 Standards of Diabetes Care
Figure 10.2 Vol.48, S207–S238

INTENSIFYING INJECTABLE THERAPY IN TYPE 2 – ADA STANDARDS Figure 9.4 2025

Including reinforcement of behavioral interventions (weight management and physical activity) and and provision of DSMES to meet individualized treatment goals.

To Avoid Therapeutic Inertia - Reassess and modify treatment regularly (3-6 months)

If injectable therapy is needed to reduce A1C[1]

Consider GLP-1 RA or GIP/GLP-1 RA in most individuals prior to insulin[2]

INITIATION: Initiate appropriate starting dose for agent selected (varies within class)

TITRATION: Titration to maintenance dose (varies within class)

If already on **GLP-1 RA or GIP/GLP-1 RA** or if these are not appropriate OR if insulin is preferred:

If above A1C target

Add basal insulin[3]

Choice of basal insulin should be based on person-specific considerations, including cost. Refer to **Table 9.4** for insulin cost information. Consider Rx for glucagon ER med.

Add basal analog or bedtime NPH insulin

INITIATION: Start 10 units a day **OR** 0.1-0.2 units/kg a day

TITRATION:

- Set FPG target (see Section 6: Glycemic Targets)
- Choose evidenced-based titration algorithm, e.g., increase 2 units every 3 days to reach FPG target without hypoglycemia
- For hypoglycemia determine cause. If no clear reason lower dose by 10-20%

Assess adequacy of basal insulin dose at every visit

Consider clinical signals to evaluate for overbasalization and need for adjunctive therapies (e.g., elevated bedtime-morning and/or post-preprandial differential, hypoglycemia [aware or unaware], high variability)

If above A1C target and not on GLP-1/GIP, consider adding to treatment plan. If A1C still elevated:

Initiation and titration of prandial insulin[5]

Usually, one dose with the largest meal or meal with the greatest PPG excursion; prandial insulin can be dosed individually or mixed with NPH as appropriate

INITIATION:

- 4 units a day or 10% of basal insulin
- If A1C <8% (64 mmol/mol) consider lowering basal dose by 4 units a day or 10% of basal dose.

TITRATION:

- Increase dose by 1-2 units or 10-15% twice
- For hypoglycemia determine cause. If no clear reason lower corresponding dose by 10-20%

If on bedtime NPH, consider converting to twice-daily NPH regimen

Conversion based on individual needs, glycemic control. The following is one possible approach:

INITIATION:

- Total dose= 80% of current NPH dose
- 2/3 given in the morning
- 1/3 given at bedtime

TITRATION: Titrate based on individualized needs

If above A1C target

Stepwise additional injections of prandial insulin

(i.e., two then three additional injections)

Proceed to full basal-bolus regimen

(i.e., basal insulin and prandial insulin with each)

Consider self-mixed/split insulin regimen

Can adjust NPH and short/rapid-acting insulins separately

INITIATION:

- Total NPH dose = 80% of current NPH dose
- 2/3 given before breakfast
- 1/3 given before dinner
- Add 4 units of short/rapid-acting insulin to eachinjection or 10% of reduced NPH dose

TITRATION:

- Titrate each component of the regimen based on individualized needs

Consider twice daily premix insulin regimen

INITIATION:

- Usually unit per unit at the same total insulin dose, but may require adjustment to individual needs

TITRATION:

- Titrate based on individualized needs

1. Consider insulin as the first injectable if evidence of ongoing catabolism, symptoms of hyperglycemia are present, when A1C levels (>10% [86mmol/mol]) or blood glucose levels (≥300mg/dL [16.7mmol/L]) are very high, or a diagnosis of type 1 diabetes is a possibility.
2. When selecting GLP-1 RA, consider: individual preference, A1C lowering, weight-lowering effect, or frequency of injection. If CVD, consider GLP-1 RA with proven CVD benefit. Oral or injectable GLP-1 RA are appropriate.
3. For those on GLP-1 RA and basal insulin combination, consider using a fixed-ratio combination product (iDegLira or iGlarLixi).
4. Consider switching from evening NPH to a basal analog if there is hypoglycemia and/or the individual frequently forgets to administer NPH in the evening and would be better with an AM dose of long-acting basal insulin
5. If adding prandial insulin to NPH, consider initiation of a self-mixed or premixed insulin regimen to decrease the number of injections required.

ADA Standards of Care 2025 Figure 9.4 – Intensifying to injectable therapies. DSMES, diabetes self-management education and support; FPG, fasting plasma glucose; FRC, fixed-ratio combination; GLP-1RA, glucagon-like peptide 1 receptor agonist; max, maximum; PPG, postprandial glucose. Adapted from Davies et al. 151).

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