DiabetesEd Training Conference Syllabus

October 9th-11th, 2024

Presented By:

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

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

Jessica Jones, MS, RDN, CDCES

DiabetesEd Training Conference – San Diego
October 9th-11th, 2024

Welcome

We are proud to welcome you to our 25th Annual DiabetesEd Training Conference. Your attendance demonstrates a commitment to advocating for 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 prediabetes and diabetes using a person-centered, evidenced-based, compassionate approach coupled with curiosity. Thank you for your participation, and we invite you to enjoy the program.

Faculty Biographies

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

As president of Diabetes Education Services, Beverly Thomassian, RN, MPH, CDCES, BC-ADM, believes that we can improve diabetes care through education, advocacy and curiosity. As a diabetes coach, she promotes excellence in care through her live courses and webinar presentations. As a Diabetes Nurse Specialist who is Board Certified in Advanced Diabetes Management, Beverly has a twenty-year history of being an innovator, leader and mentor.

In addition to running her company, she is an Associate Clinical Professor at the University of California, San Francisco, (UCSF) and a visiting professor at California State University, Chico (CSU Chico). As a Diabetes Nurse Specialist at a local Indian Health Services Health Center, she keeps her clinical skills fresh through one-on-one consultation, provider collaboration and quality improvement initiatives.

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

Diana Isaacs was 2020 ADCES Diabetes Educator of the Year for her educational platform promoting the use of CGM for people with diabetes and other innovations. Dr. Isaacs was awarded the Ohio Pharmacists Association Under 40 Award in 2019. She serves in leadership roles for several pharmacies and diabetes organizations. She has numerous diabetes publications and research projects with a focus on medications, CGM and diabetes technology. Dr. Isaacs is a contributing author for the 2023 ADA Standards of Care.

For the past three years, Dr. Isaacs has served as a contributing author for the ADA Standards of Care. As the Program Coordinator and clinical pharmacist specialist in the Cleveland Clinic Diabetes Center, Dr. Isaacs brings a wealth of clinical knowledge combined with extensive research and speaking experience to this program.

Jessica Jones, MS, RDN, CDCES

Jessica is a nationally recognized Registered Dietitian Nutritionist and Certified Diabetes Care & Education Specialist committed to making nutrition education accessible to everyone. As the CEO and co-founder of Diabetes Digital, Jessica has been pivotal in developing an innovative telehealth platform that provides tailored nutrition counseling for individuals with diabetes and prediabetes. Additionally, she co-hosts the Diabetes Digital Podcast, engaging listeners with thoughtful conversations on managing diabetes. With over a decade of clinical experience, Jessica has contributed significantly to the field through her co-authorship of the "28-Day Plant-Powered Health Reboot" cookbook and "A Diabetes Guide to Enjoying the Foods of the World." She also wrote the Diabetes Chapter for the Food and Nutrition Care Manual Textbook and regularly shares her insights as a columnist for SELF magazine.

As a co-founder of Food Heaven, an online platform and podcast with more than 5 million downloads, she offers essential resources on cooking, intuitive eating, and embracing body respect. Jessica's contributions have been celebrated in prominent publications, including Oprah Magazine, Women's Health, The Food Network Magazine, SELF Magazine, the Huffington Post, and Bon Appetit.

Staff Biographies and Accreditation

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 inspire.

Tiffany Bergeron – Onsite Customer Advocate
Tiffany brings a wealth of experience and a strong commitment to supporting the customer experience at Diabetes Education Services. Her background includes managing CRM and website content, event coordination, and administrative duties. She excels in ensuring seamless communication with customers. Her ability to respond effectively to customer service calls and guide customer inquiries demonstrates her dedication to providing exceptional support.

Accreditation Info
Diabetes Education Services is an approved provider by the California Board of Registered Nursing, Provider 12640, and our CPEU courses have received Prior Approval* from the Commission of Dietetic Registration (CDR), Provider DI002. Need hours for your CDCES? We have great news. This program is accredited by the CDR so all hours of instruction can be used to renew your CDCES regardless of your profession.

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
DiabetesEd.Net

DiabetesEd Training Conference |San Diego *

Day One | October 9, 2024 (Pacific Time)

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

Time	Topic	Speakers
7:30 – 8:00am	**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
10:00 – 10:15	**Break**	Diana Isaacs, PharmD, BCPS, BCACP, CDCES, BC-ADM, FADCES, FCCP
10:15 – 12:00	**Medical Evaluation, Risk Identification** **Diabetes Prevention** **Glycemic targets across the Lifespan**	
12:00 – 1:00	**Lunch Break**	
1:00 – 2:30	**Hypoglycemia prevention & treatment** **Landmark Studies** **Medications for Type 2**	
2:30 – 2:45	**Break**	
2:45– 3:15	**Pharmacology Algorithms - AACE and ADA**	
3:30 – 4:30	**Cardiovascular Monitoring and Management**	
4:30 – 4:45	**Delivering Extraordinary Diabetes Care**	

**Topics, Timing and Speakers Subject to Change*

Diabetes Education Services Presents:

DiabetesEd Specialist Training Conference – Day 1

October 9th – 11th, 2024

Diabetes Education Services and Team

www.DiabetesEd.net

Thank you to our Speakers

Coach Beverly Thomassian

Dr. Diana Isaacs

Jessica Jones

www.DiabetesEd.net

Diabetes Education SERVICES 25 years

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

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
- Consultant: Sanofi, Undermyfork
- ADCES Board Member

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 occupational drivers
- In work settings
- In Correctional Institutions

FREE

Global Epidemic

537 million adults are living with diabetes

3 in 4 adults with diabetes live in low- and middle-income countries

Diabetes around the world in 2021

www. DiabetesAtlas.org

- World Diabetes Day is November 14

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

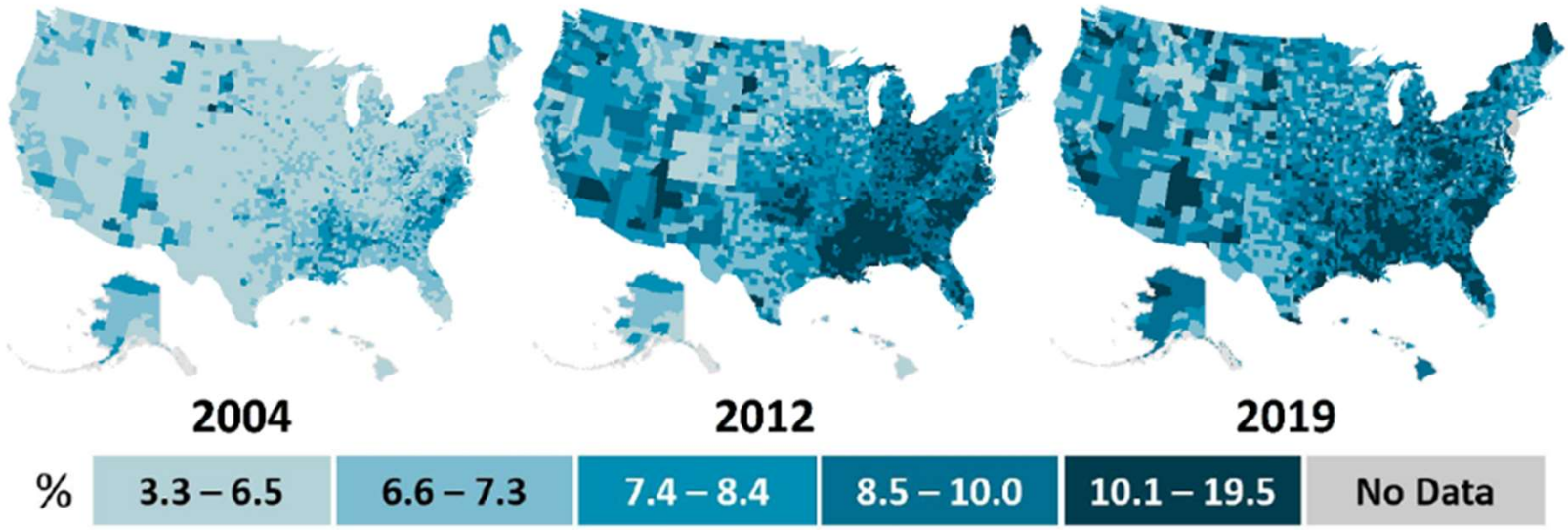
- According to the CDC, what best describes the current prevalence of prediabetes and diabetes in the U.S.?

a. 30% of people above the age of 20 have type 2 diabetes.
b. The rate of type 1 and type 2 diabetes have tripled since 2010.
c. A total of 50% of people have prediabetes or diabetes.
d. 1 out of 2 persons above age 20 have prediabetes.

Type 2 Diabetes in America 2024

- 11.3% with Diabetes - 37 million adults
  - 23% don't know they have it
- 38% with Prediabetes – 96 million adults

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



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

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

1. Improving Care and Promoting Health in Populations

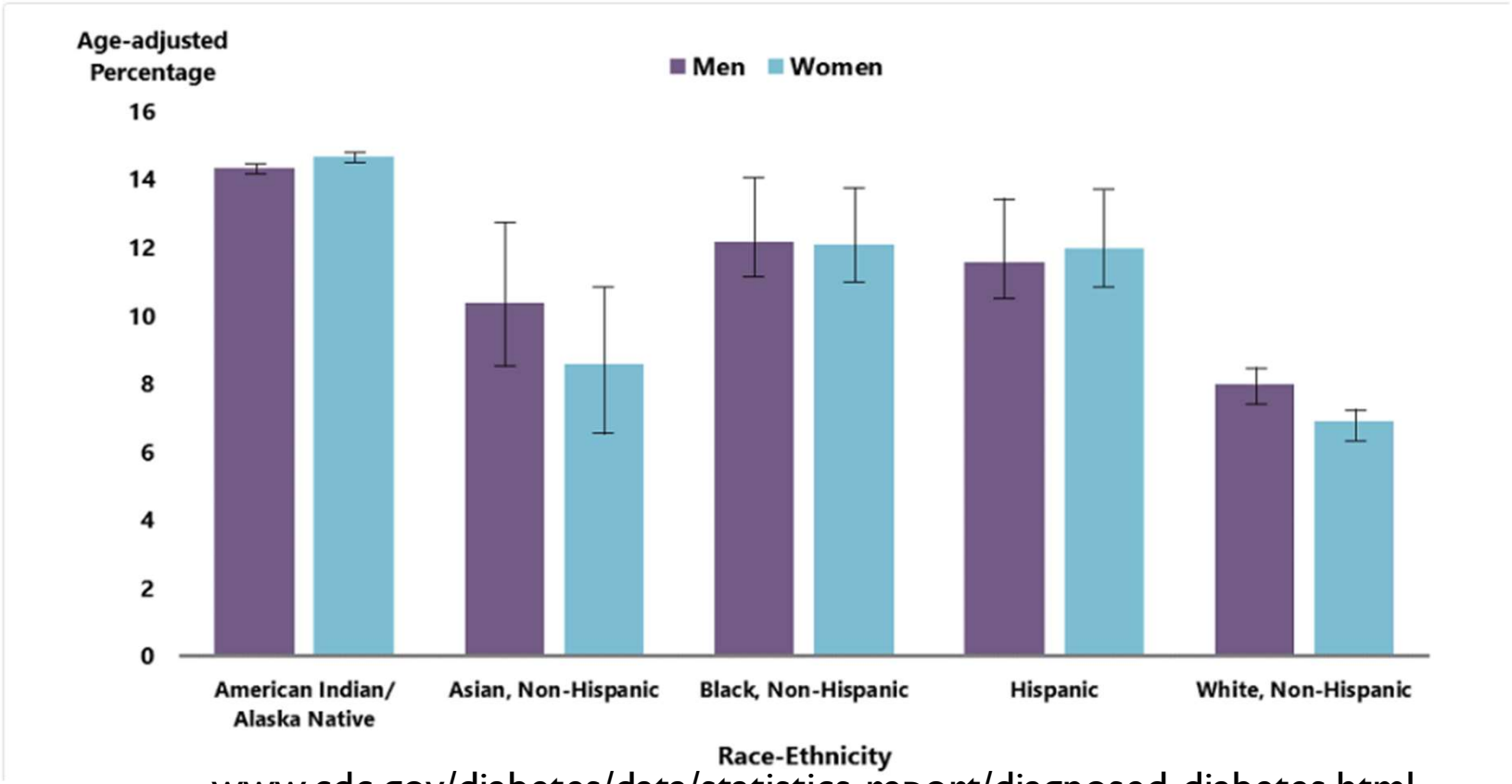
- "Health outcomes of a group of individuals -
  - including the distribution of health outcomes within the group"
- These outcomes can be measured in terms of health:
  - mortality, morbidity, health, and functional status
  - disease burden
    - (incidence and prevalence)
  - behavioral and metabolic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

ADA Standards 2024

Diabetes Prevalence by Ethnic Group

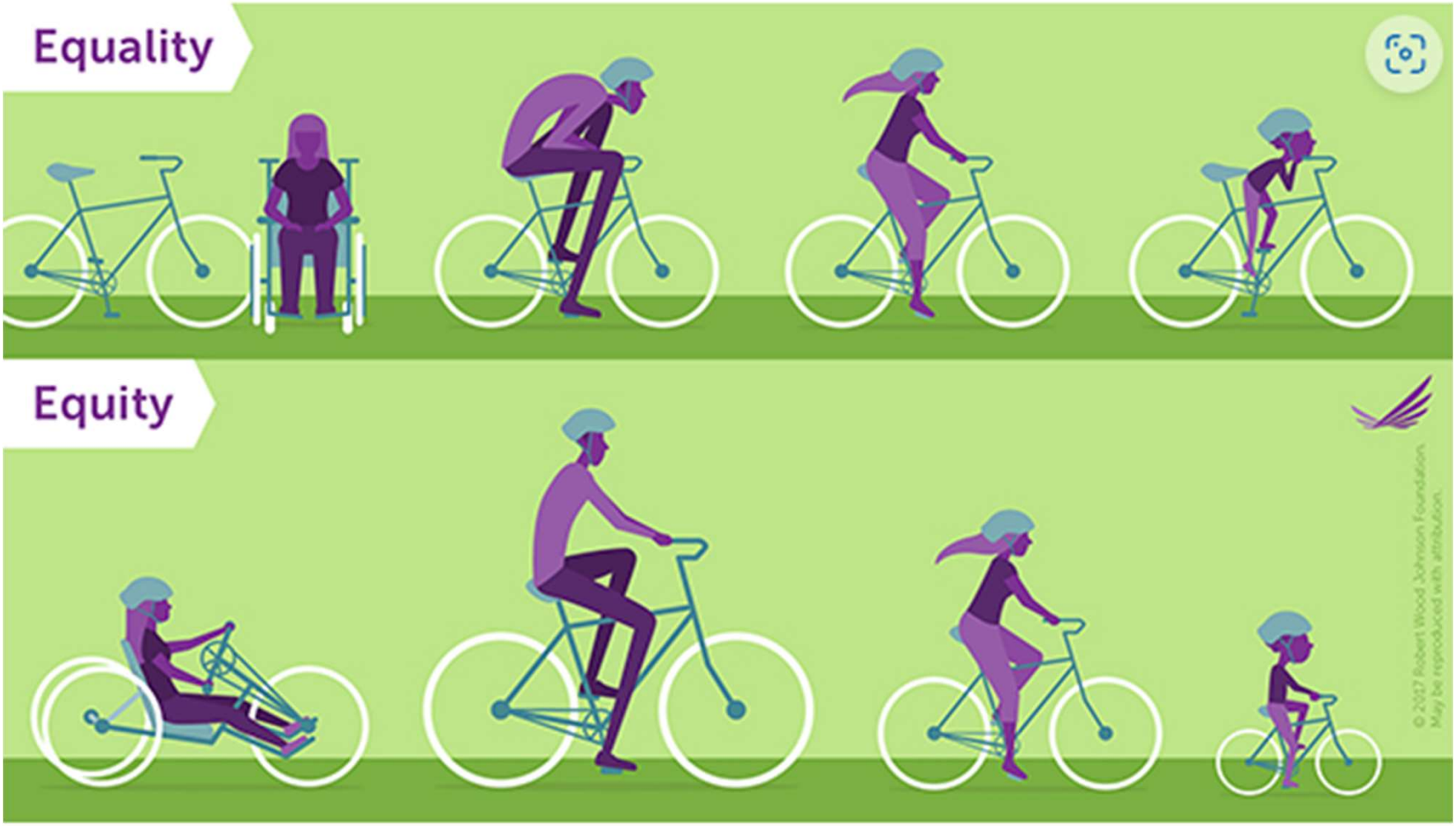
- For adults, diabetes prevalence highest among:
  - American Indians and Alaska Natives (14.5%),
  - Non-Hispanic Blacks (12.1%),
  - People of Hispanic origin (11.8%),
  - Non-Hispanic Asians (9.5%)

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



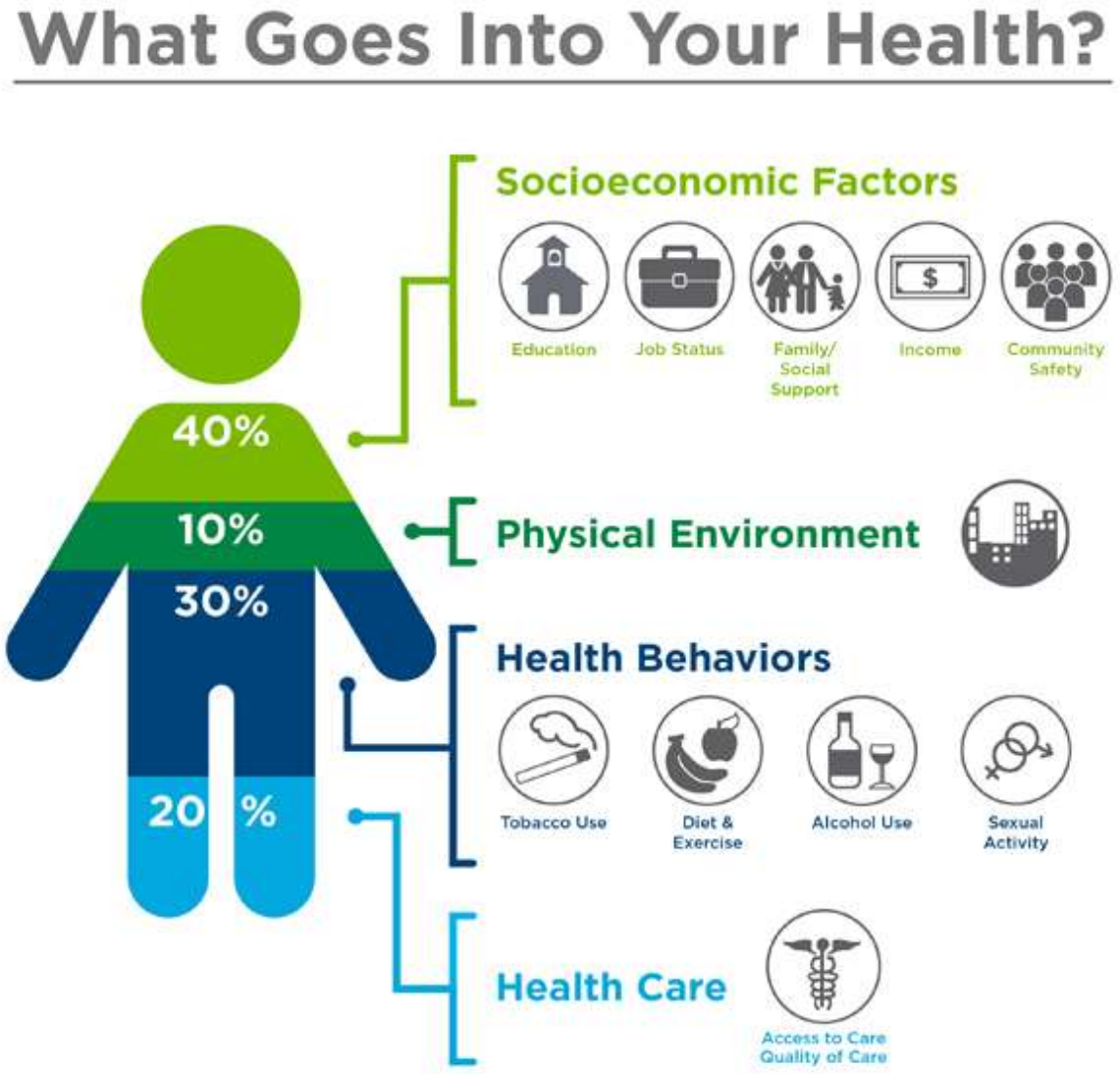
© 2017 Robert Wood Johnson Foundation

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—2024* FREE

American Diabetes Association Professional Practice Committee

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.

1. Improving Care and Promoting Health in Populations: *Standards of Care in Diabetes—2024* FREE

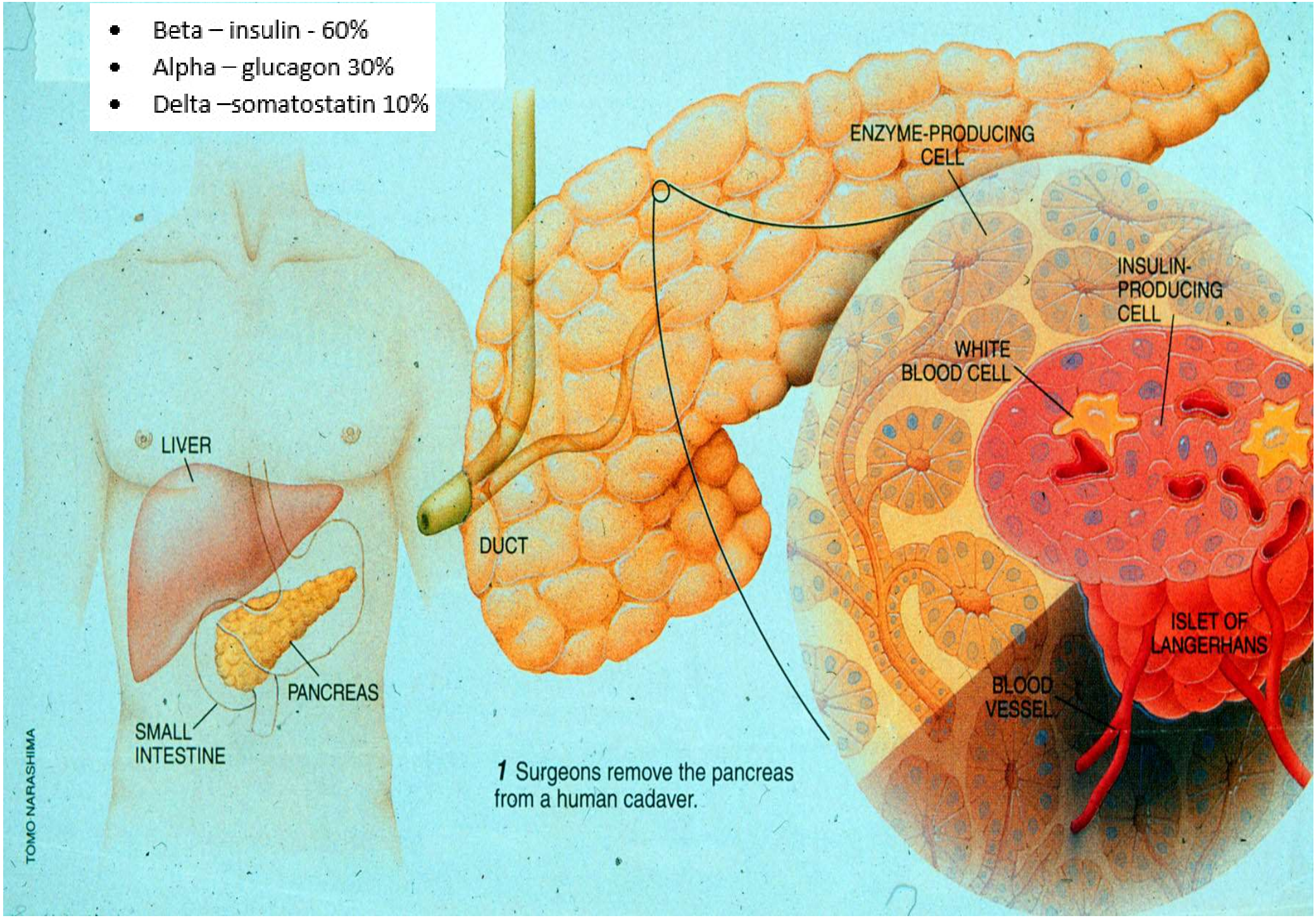
American Diabetes Association Professional Practice Committee

Abstracts | View article | PDF

Topics: chronic care, chronic disease, food insecurity, guidelines, health personnel

Diabetes Care December 2023, Vol.47, S11-S19. doi:https://doi.org/10.2337/dc24-S001

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



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 intestinal mucosa, beta cell has receptors)	↓

Pre Diabetes & Type 2- Screening Guidelines (ADA 2024 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
- *PreDiabetes
- History of heart disease
- *Taking high risk meds; antiretrovirals, 2nd generation antipsychotics or steroids
- History of pancreatitis

2. Diagnosis and Classification of Diabetes: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

Second-Generation Antipsychotic Meds and Diabetes Risk

- People taking these meds require frequent monitoring due to increased risk of hyperglycemia and other metabolic effects.
- There is a range of effects across second-generation antipsychotic medications;
  - Olanzapine, haloperidol, clozapine, quetiapine, and risperidone tend to have *more* metabolic effects.
  - Aripiprazole and ziprasidone tend to have *fewer* metabolic effects.
  - It taking these agents, screen for prediabetes or diabetes at baseline, rescreen at 12–16 weeks after medication initiation, and screen annually thereafter ADA 2024

2. Diagnosis and Classification of Diabetes: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

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—2024* FREE

American Diabetes Association Professional Practice Committee

RECOMMENDATIONS FOR DIAGNOSIS AND CLASSIFICATION OF DIABETES – 2024

CRITERIA FOR TESTING FOR DIABETES AND PREDIABETES IN ASYMPTOMATIC ADULTS – TABLE 1

DIABETES TYPE	RISK FACTORS and FREQUENCY OF SCREENING and TESTING FOR DIABETES
Type 1	Screen for presymptomatic type 1 diabetes, by testing autoantibodies to insulin, GAD, islet antigen 2, or ZnT8 is recommended. Also test antibodies for those with type 1 phenotypic risk (younger age, 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 with 1 or more risk factors: • History of cardiovascular disease • First or second degree relative with diabetes • HDL ≤ 35 mg/dl or triglyceride ≥ 250 mg/dl • If taking antipsychotic, antiretroviral meds* • Other conditions associated with insulin resistance (PCOS, Acanthosis Nigricans) • High risk ethnicity (African American, Latino, Native American, Asian American, Pacific Islanders) • Physical inactivity • History of GDM (repeat test at least every 3 years) • Hypertension ≥ 130/80 or on therapy for HTN • A1c ≥ 5.7% or Impaired Fasting Glucose (test yearly) 3. If results normal, repeat test at a minimum of 3-year intervals or more frequently based on risk status. 4. *Screen people with HIV, exposure to high-risk medicines, history of pancreatitis and re-check annually.

DiabetesEd.net Cheat Sheets – See appendix in back of syllabus

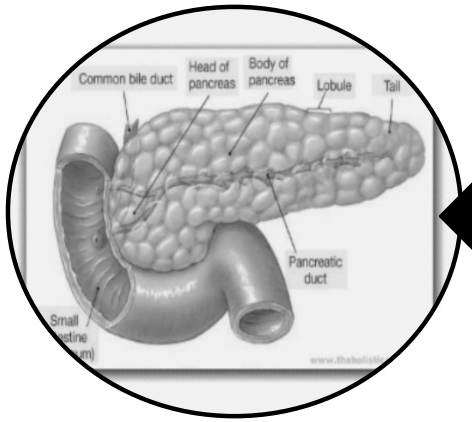
TESTS TO DIAGNOSE DIABETES - TABLE 2

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

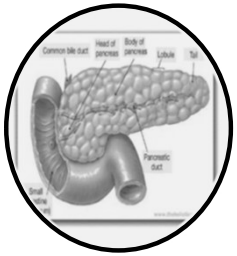
Poll Question 2

- 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

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?

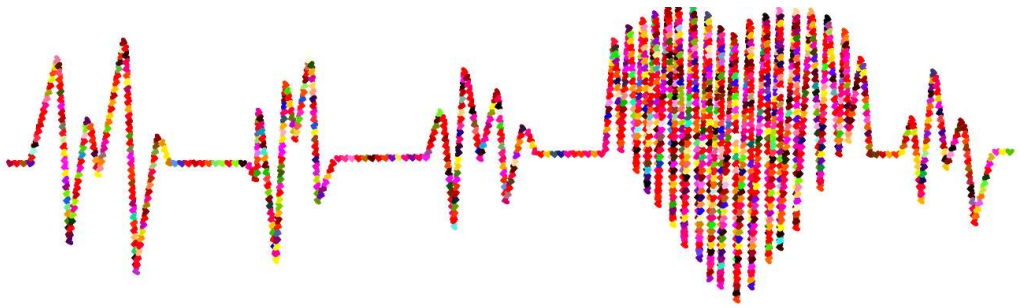
3. Prevention or Delay of Diabetes and Associated Comorbidities: *Standards of Care in Diabetes—2024*

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

3. Detecting PreDiabetes Matters

- Given the cost-effectiveness of lifestyle behavior modification programs for diabetes prevention:
  - Offer diabetes prevention programs to adults at high risk of type 2 diabetes
  - Should be covered by third-party payers,
  - Address inconsistencies in access
- Screening guidelines for people with Type 1



3. Prevention or Delay of Diabetes and Associated Comorbidities: *Standards of Care in Diabetes—2024*

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—2024*

3. Prediabetes Pharmacologic Intervention

- No FDA approved med for prevention (off label)
- Consider Metformin Therapy for Prediabetes
- Especially for ages 25-59
  - BMI of 35+
  - If A1c is ~6.0 or FPG is 110mg/dL
  - Women with history of GDM
- Monitor B12 level (esp with neuropathy or anemia)

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

3. Prevention or Delay of Diabetes and Associated Comorbidities: *Standards of Care in Diabetes—2024*

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"

The ADA recognizes this relationship and is taking action.

1. Improving Care and Promoting Health in Populations: *Standards of Care in Diabetes—2023* FREE

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

Person Centered Care

- Emphasize that a collaboratively developed plan improves well-being and outcomes.
- Provides care that is respectful and responsive to the individuals preferences, needs and values.
- Ensuring that the person's values guide all clinical decisions

Recognizes the expert within. Goal is to improve outcomes and encourage self-management for the long run.

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.

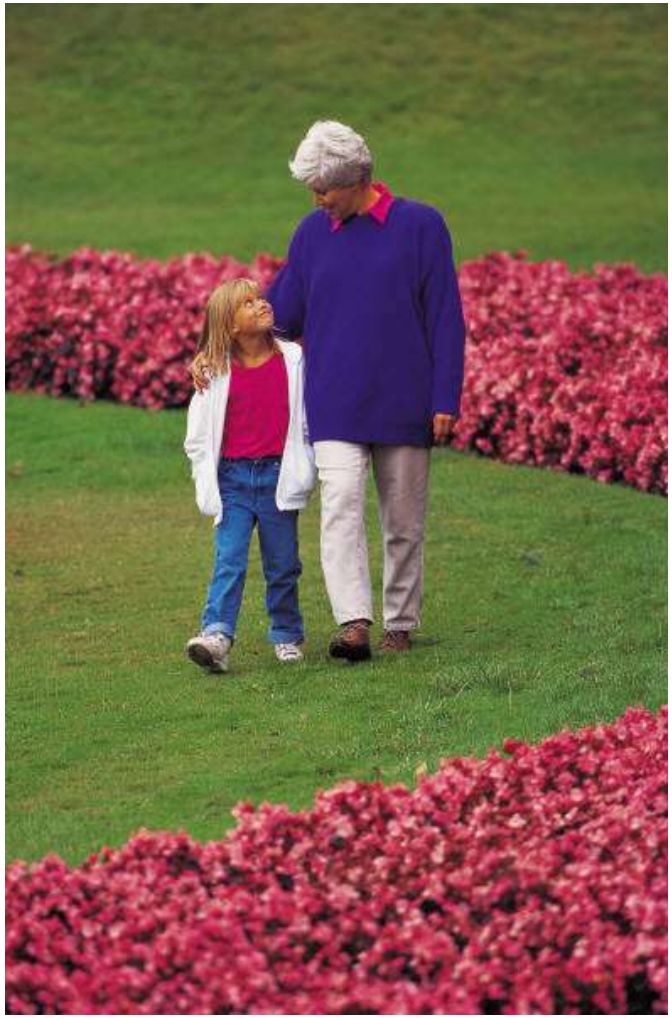
Poll Question 4

JR's mom has type 1 diabetes and JR's dad has type 2 diabetes. JR is 28 years old and in the emergency room with a glucose of 482 mg/dl. Besides checking glucose, ketones and A1C levels, which of the following lab test can be used to determine if someone has autoimmune diabetes?

1. Endogenous insulin titer
2. Glutamic Acid Decarboxylase
3. Beta cells auto antibodies
4. Langerhan's antibody

How do we know someone has Type 1 vs Type 2?

- Type 1 - Positive antibodies
  - GAD - glutamic acid decarboxylase (primary)
  - IA2 - islet antigen 2, or
  - ZnT8 - zinc transporter 8
- Can also check C-peptide levels to determine endogenous insulin production
- Younger people develop quickly
- Older people take longer to develop
- "misdiagnosis is common and can occur in ~40% of adults with new type 1 diabetes"



2. Diagnosis and Classification of Diabetes: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

Determine if Type 1 - Use AABBCC Approach

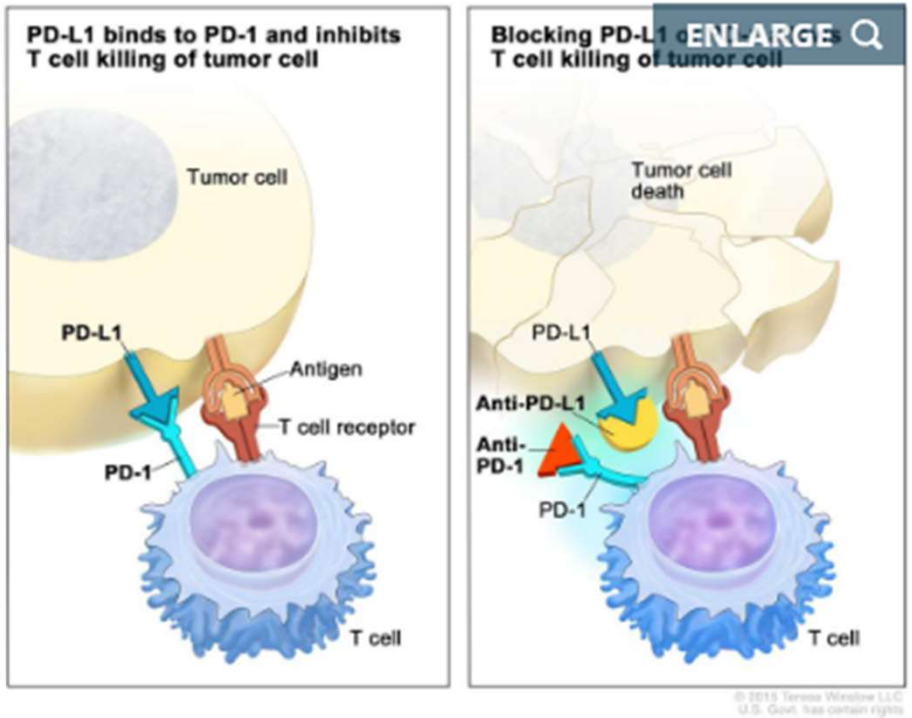
- **A**ge
  - e.g., for individuals <35 years old, consider type 1 diabetes
- **A**utoimmunity
  - e.g., personal or family history of autoimmune disease or polyglandular autoimmune syndromes
- **B**ody habitus
  - e.g., BMI <25 kg/m2
- **B**ackground
  - e.g., family history of type 1 diabetes
- **C**ontrol
  - 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

2. Diagnosis and Classification of Diabetes: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

Diabetes Care, June 2023

Immune Checkpoint Inhibitors



Checkpoint proteins, such as PD-L1 on tumor cells and PD-1 on T cells, help keep immune responses in check. The binding of PD-L1 to PD-1 keeps T cells from killing tumor cells in the body (left panel). Blocking the binding of PD-L1 to PD-1 with an immune checkpoint inhibitor (anti-PD-L1 or anti-PD-1) allows the T cells to kill tumor cells (right panel).

Credit: © Terese Winslow

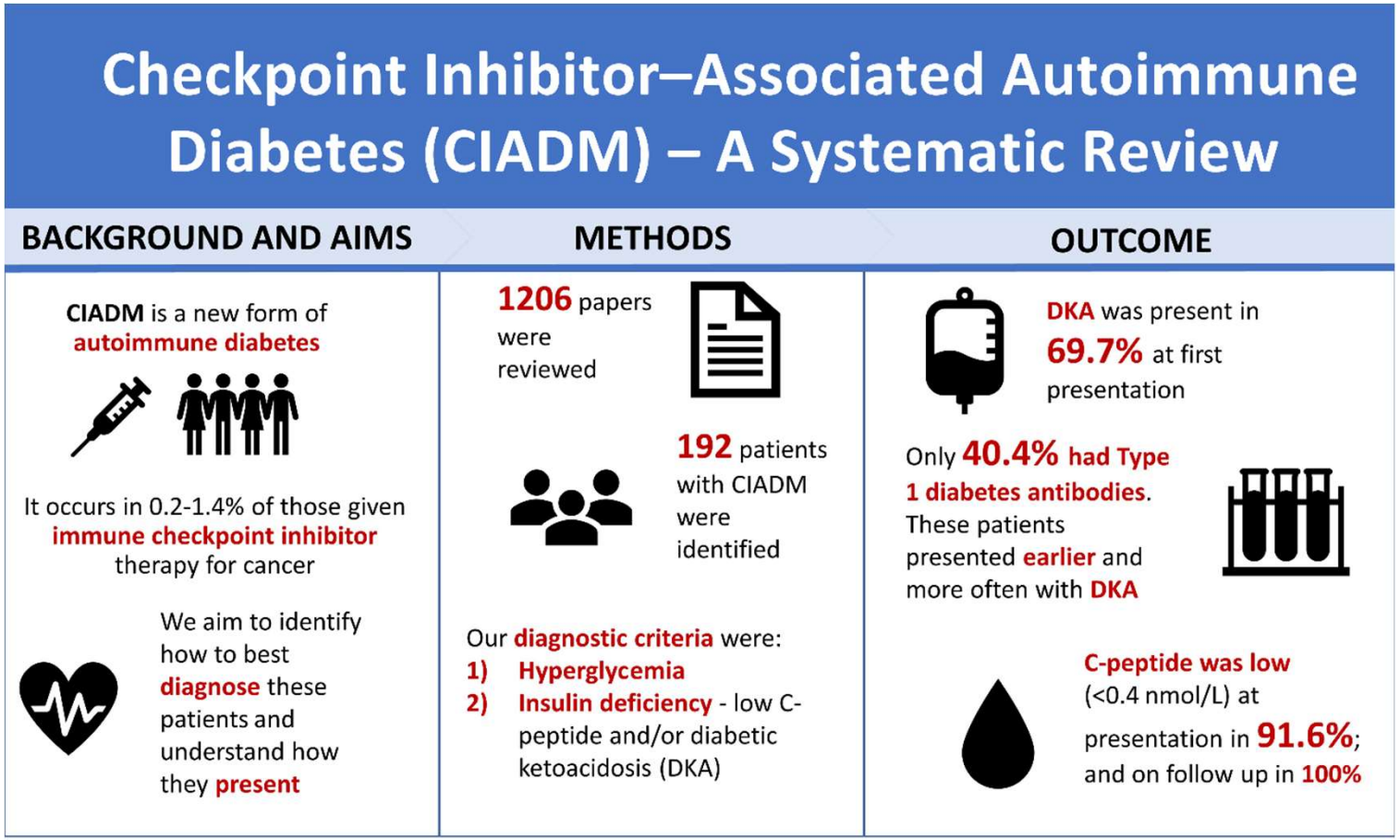
Approved to treat cancer types, including:

- breast cancer
- bladder cancer
- cervical cancer
- colon cancer
- head and neck cancer
- Hodgkin lymphoma
- liver cancer
- lung cancer
- renal cell cancer (a type of kidney cancer)
- skin cancer, including melanoma
- stomach cancer
- rectal cancer
- any solid tumor that is not able to repair errors in its DNA that occur when the DNA is copied

https://www.cancer.gov/about-cancer/treatment/types/immunotherapy/checkpoint-inhibitors

Checkpoint Inhibitors cause immune meditated diabetes

"treatment with immune checkpoint inhibitors for cancer can cause acute autoimmune type 1 diabetes or presence of other autoimmune conditions."



2. Diagnosis and Classification of Diabetes: *Standards of Care in Diabetes—2024* FREE
American Diabetes Association Professional Practice Committee

Linda Wu, Venessa Tsang, Alexander M. Menzies, Sarah C. Sasson, Matteo S. Carlino, David A. Brown, Roderick Clifton-Bligh, Jenny E. Gunton; Risk Factors and Characteristics of Checkpoint Inhibitor–Associated Autoimmune Diabetes Mellitus (CIADM): A Systematic Review and Delineation From Type 1 Diabetes. Diabetes Care 1 June 2023; 46 (6): 1292–1299. https://doi.org/10.2337/dc22-2202

Type 1 Diabetes Features?

- 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.

CONSENSUS REPORT | OCTOBER 18 2021

The Management of Type 1 Diabetes in Adults. A Consensus Report by the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD) FREE

3. Prevention or Delay of Diabetes and Associated Comorbidities: *Standards of Care in Diabetes—2024*

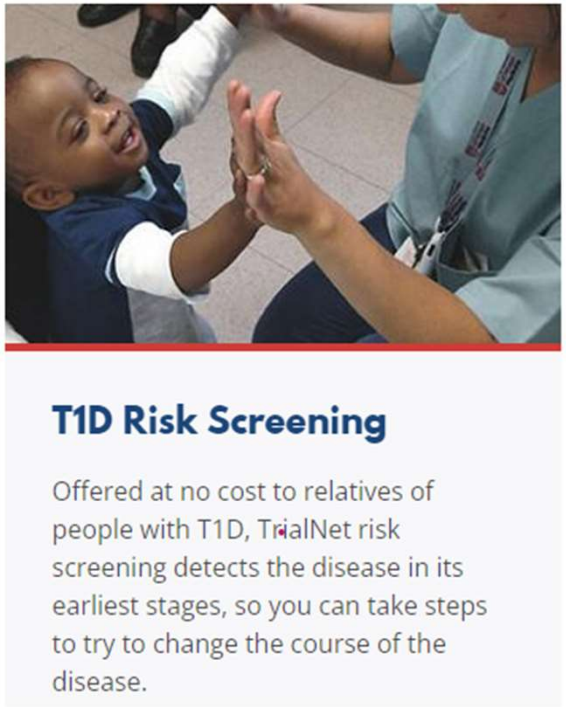
Type 1 Diabetes Progression

	Stage 1	Stage 2	Stage 3
Characteristics	• Autoimmunity	• Autoimmunity	• Autoimmunity
	• Normoglycemia	• Dysglycemia	• Overt hyperglycemia
	• Presymptomatic	• Presymptomatic	• Symptomatic
Diagnostic criteria	• Multiple islet autoantibodies - GAD, glutamic acid decarboxylase - islet antigen 2 - Zinc transporter 8 (ZnT8) - Islet cell autoantibody (ICA)	• 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

2. Diagnosis and Classification of Diabetes: *Standards of Care in Diabetes—2024* FREE
American Diabetes Association Professional Practice Committee

3. Prevention or Delay of Diabetes and Associated Comorbidities (for Preclinical Type 1 Diabetes)

- Positive Antibodies with Prediabetes:
  - A1c 5.7 – 6.4% or fasting BG 100 -125mg/dl
- Action:
  - Screen A1C every 6 months
  - 75- OGTT every year
  - Modify screening based on antibodies and glycemic metrics.
  - May benefit from CGM to monitor progression



Trialnet.org

3. Prevention or Delay of Diabetes and Associated Comorbidities: *Standards of Care in Diabetes—2024*

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

3. Prevention or Delay of Diabetes and Associated Comorbidities: *Standards of Care in Diabetes—2024*

Pharmacologic Intervention to Delay Symptomatic Type 1 (in Stage 2)

- Teplizumab-Tzield (CD3-monoclonal antibody)
- 14-day infusion can delay the onset of symptomatic type 1 diabetes (stage 3)
- An option in selected individuals aged ≥8 years with stage 2 type 1 diabetes.
- In a single trial, 44 individuals received 14-day course of teplizumab vs 32 placebo.
- The median time to stage 3 diagnosis of type 1
  - 48.4 months in tep group
  - 24.4 months placebo
- Cost: $193,000
- Sanofi has financial assist programs.

126. Herold KC, Bundy BN, Long SA, 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;381:603–613

Type 1 (stage 2) Delayed with Teplizumab by 2 years TrialNet

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

Quick Question

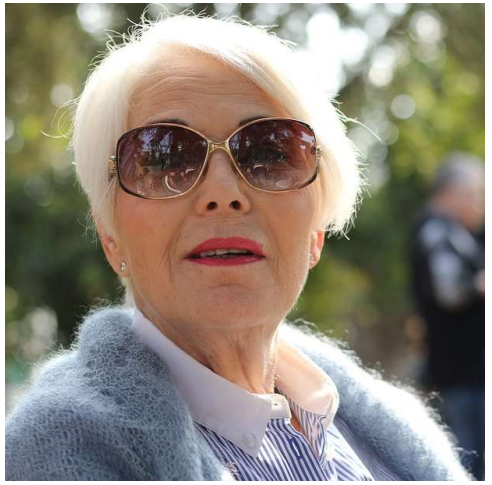
- **Question:** LT has just been diagnosed with stage 2, type 1 diabetes. They have 2 positive antibodies and their blood sugars are slightly elevated. They ask you if they are a candidate for "that therapy" that can protect their beta cells and slow progression of type 1 diabetes. **What is the most accurate response?**
  - Unfortunately, you are not a candidate, since you already have 2 positive antibodies.
  - Let's talk to your provider about the possibility of starting Teplizumab therapy.
  - With your blood sugar elevation, the best early intervention is insulin therapy.
  - Since you are already in stage 2, the monoclonal antibody therapy won't be effective.

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
  - Humalog 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

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

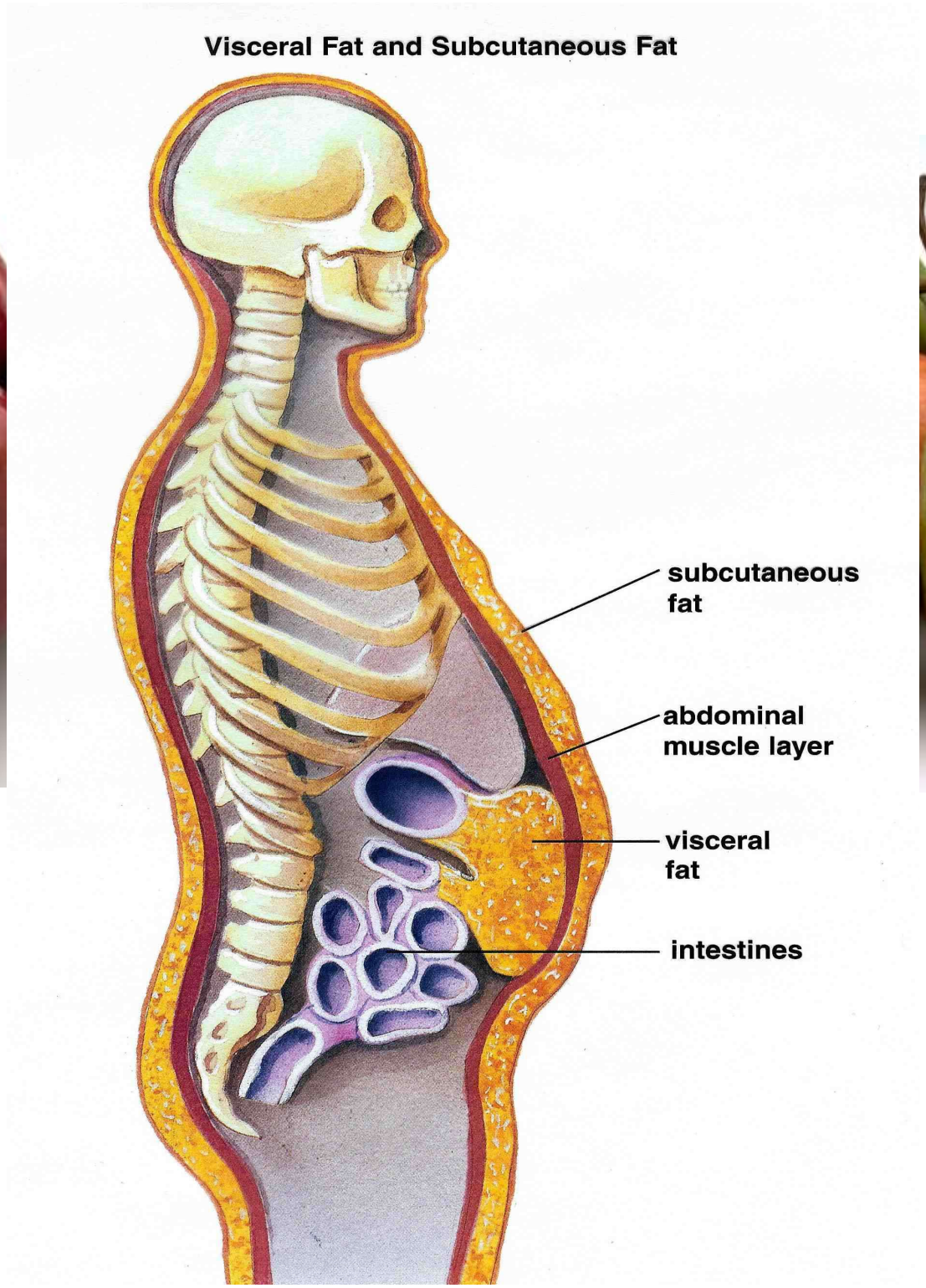
Last Update: June 21, 2022.

Practical Diabetology March 08, Unger MD

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
subcutaneous fat
abdominal muscle layer
visceral fat
intestines

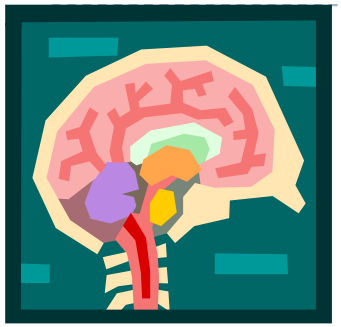
What is Type 2 Diabetes?

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

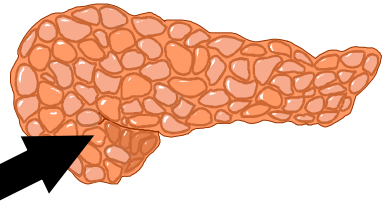
with social, behavioral and environmental risk factors unmasking the effects of genetic susceptibility.

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

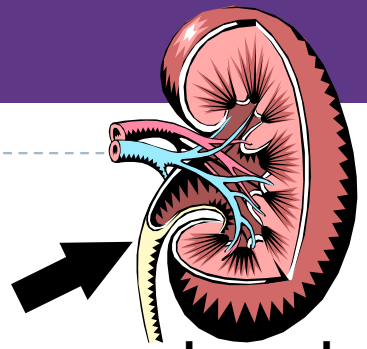
Ominous Octet



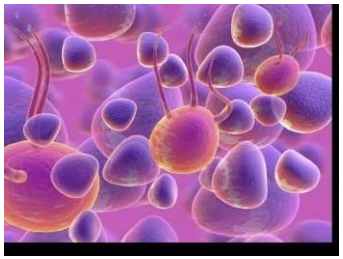
Decreased satiation neuro-transmission



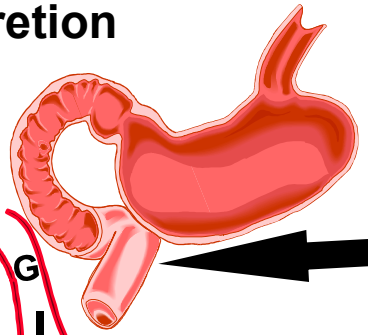
Decreased amylin, β-cell secretion
80% loss at dx



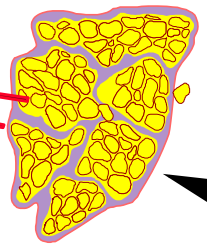
Increased renal glucose reabsorption



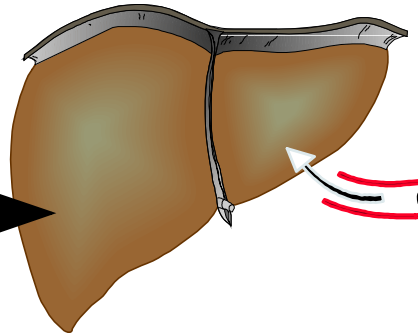
Increased glucagon secretion



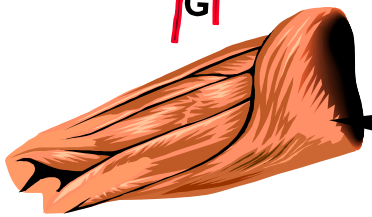
Decreased Gut hormones



Increased lipolysis

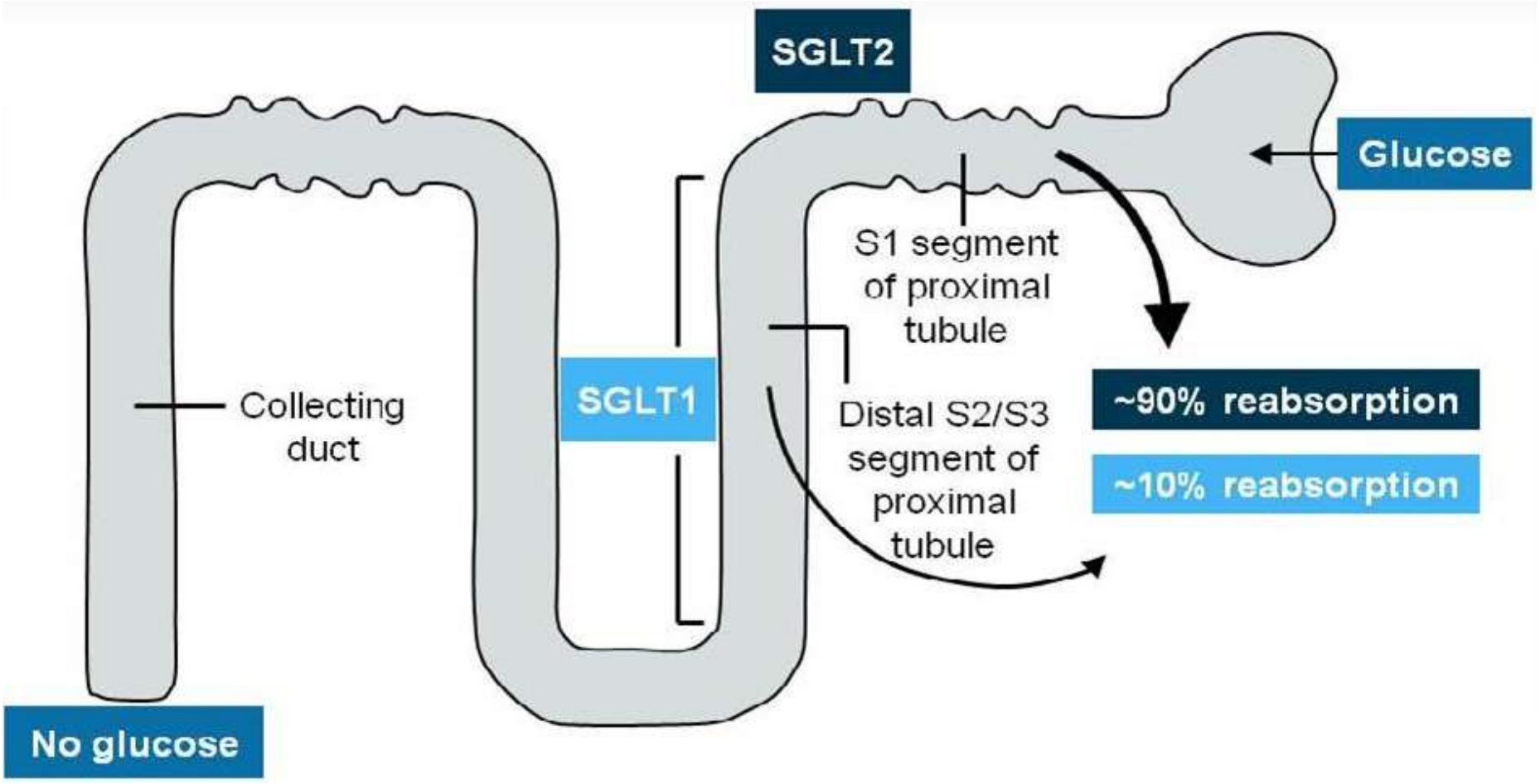


Increase glucose production



Decreased glucose uptake

SGLT and the Kidney



Poll Question 7

- A potential side effect of SGLT-2 Inhibitors is:

a. Urinary tract infections
b. Hypertension
c. Kidney tenderness
d. Increased uric acid

SGLT2 Inhibitors- "Glucoretics"

- **Action**: decreases renal reabsorption of glucose 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:** See Package Insert (PI) for GFR cut-offs, dosing. Limited BG lowering effect if GFR < 45, still benefits kidneys & heart at lower GFR. If CKD & GFR ≥20, use SGLT-2 to reduce CVD, HF, preserve renal function. (ADA/EASD) **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-2i Indications Summary

Drug	Lowers BG	Reduces CV Risk?	Used to treat Heart Failure?	Slows renal disease?
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	Yes	Yes w/ Diabetes	Yes w/ Diabetes
Ertugliflozin (Steglatro)	Yes	No	Yes w/ Diabetes	No
Bexagliflozin (Brenzavvy)	Yes	NA	NA	NA

Benefits of SGLT-2 Inhibitors

A1C lowering

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? Fournier's gangrene?

SGLT2i: 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
- 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/potassium
- Discontinue 3 days prior to surgery or procedures that require prolonged fasting

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. Dapagliflozin (Farxiga)
C. Pioglitazone (Actos)
D. Linagliptin (Tradjenta)
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

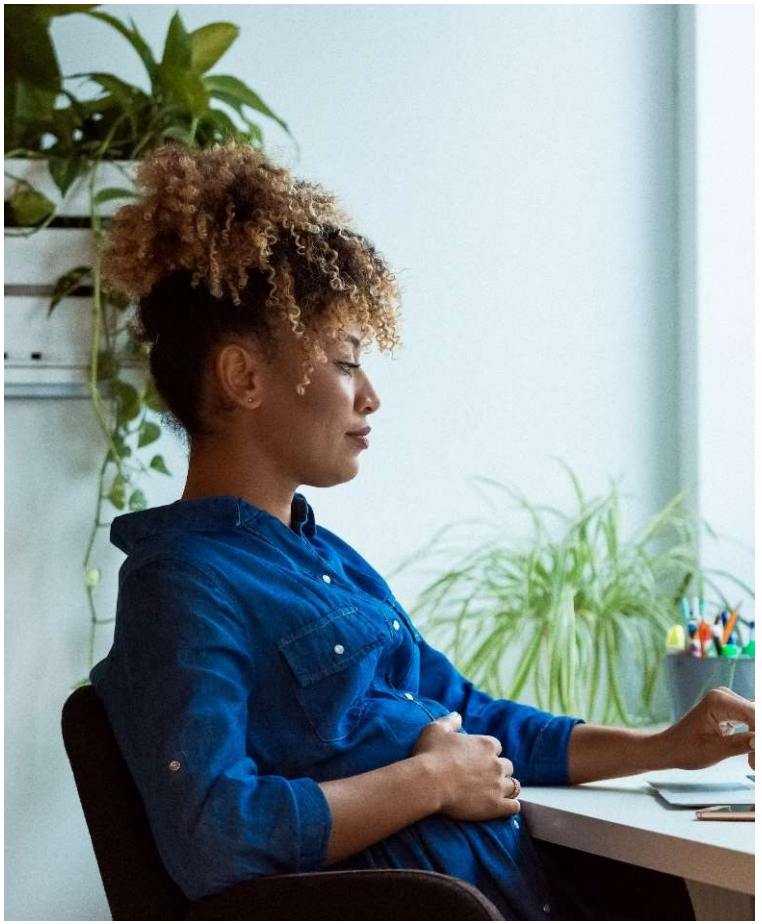
	Type I	Type 2	LADA
Excess weight	x	xxx	x
Insulin dependence	xxx	30%	6mos
Respond to oral agents	0	xxx	x
Ketosis	xxx	x	x
Antibodies present	xxx	0	xx
Typical Age of onset	teens	adult	adult
Insulin Resistance	0	xxx	x

Other Types of Diabetes

- Gestational
- Other specific types of diabetes

Screening in early Pregnancy

- Checking 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.



15. Management of Diabetes in Pregnancy: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

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 2024 Jan; 47 (Supplement 1): S20-S42. **Compliments of Diabetes Education Services www.DiabetesEd.net**

See appendix in back of syllabus

15. Management of Diabetes in Pregnancy: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

Gestational Diabetes and Pregnancy

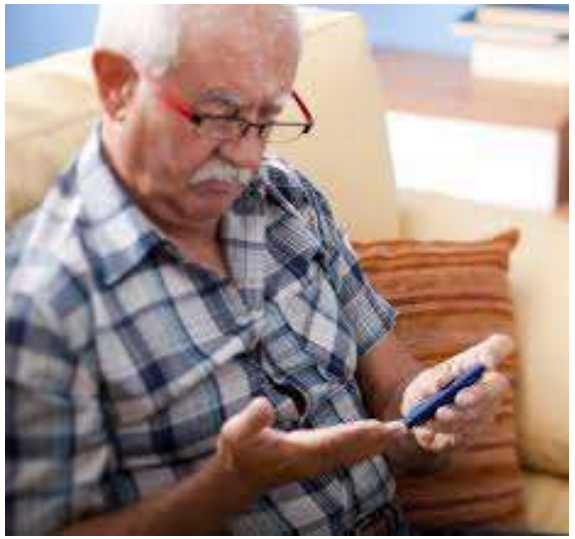
- Test for GDM at 24-28 weeks
- Test GDM women for post partum diabetes at 4-12 weeks, using OGTT
- Women with GDM need lifelong screening for prediabetes/diabetes at least every 3 yrs
- Women with hx of GDM, found to have prediabetes need intensive lifestyle interventions or metformin to prevent diabetes.

15. Management of Diabetes in Pregnancy: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

Other Specific Types of DM

- Medications such as: steroids, protease inhibitors and Prograf®
- Secondary to Agent Orange
- Liver failure
- TPN or tube feedings
- Pancreatic cancers or removal
- Cystic fibrosis, pancreatitis
- Other



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

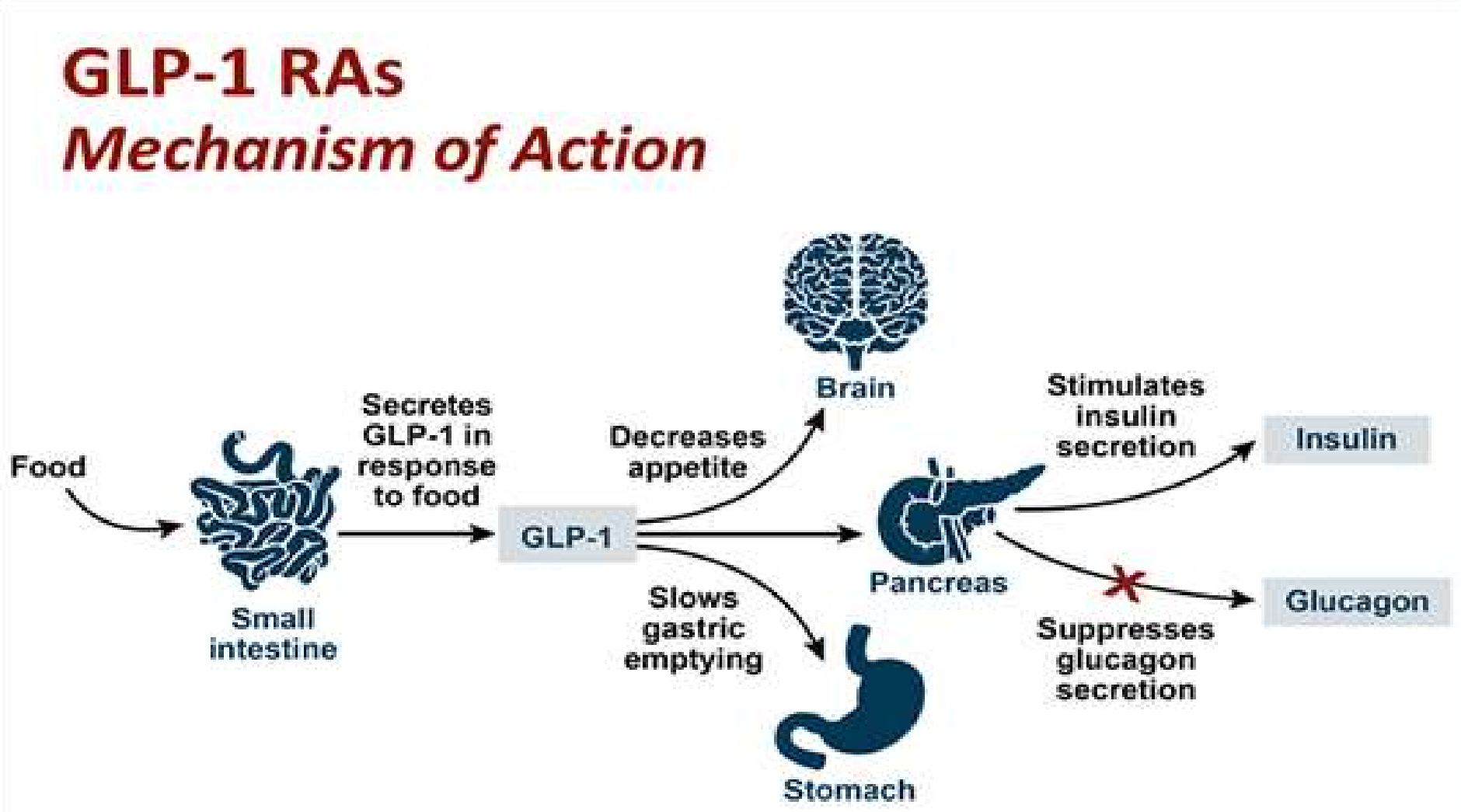
B At dx of type 2, about __% of the beta cell function is lost

B Diabetes – random glucose ____ or greater

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

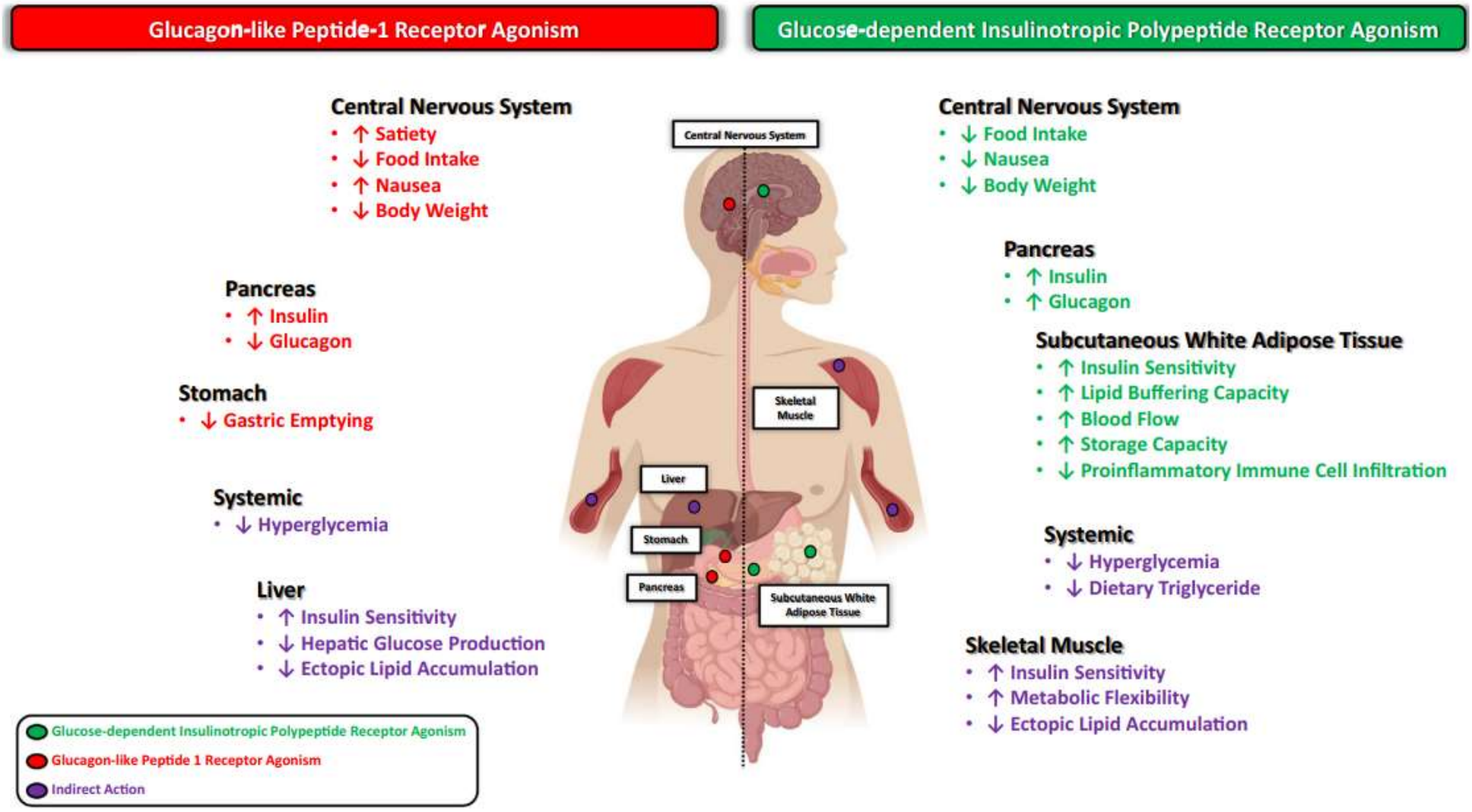
GLP-1: glucagon like peptide 1
GIP: glucose-dependent insulinotropic polypeptide

GLP-1 Receptor Agonist Mechanism



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

Action of GLP-1 and GIP



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. Increase dose monthly to achieve targets. **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 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 © 2024

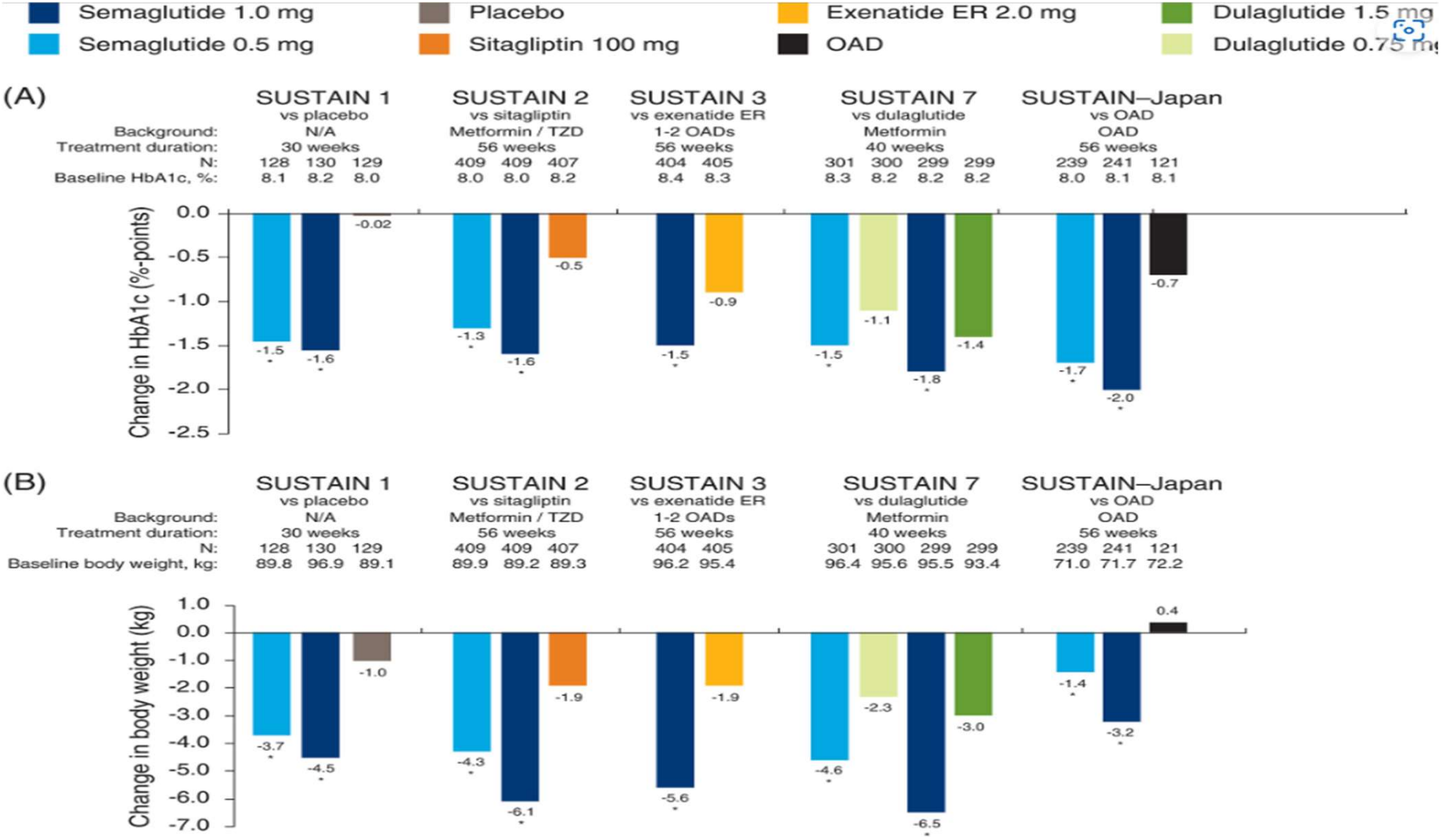
Oral Semaglutide (Rybelsus)

- 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)

Incretin Summary

	Drug	Approval date (US, EMA)	Phase III clinical trial program	Base	Homology to native GLP-1 (%)	Dose and frequency	Route	T_{max}	Half-life
Short-acting	Exenatide (Byetta®)	28 April 2005, 20 November 2006	AMIGO	Exendin-4	53	5–10 mcg twice daily	SC	2.1 h	2.4 h
	Lixisenatide (Adlyxin®, Lyxumia®)	28 July 2016, 1 February 2013	GetGoal	Exendin-4	50	10–20 mcg once daily	SC	1–3.5 h	3 h
Long-acting	Liraglutide (Victoza®)	25 January 2010, 30 June 2009	LEAD	Human GLP-1	97	0.6–1.8 mg once daily	SC	8–12 h	13 h
	Exenatide (Bydureon®)	26 January 2012, 17 June 2011	DURATION	Exendin-4	53	2 mg once weekly	SC	2.1–5.1 h	NR
	Dulaglutide (Trulicity®)	18 September 2014, 21 November 2014	AWARD	Human GLP-1	90	0.75–1.5 mg once weekly	SC	24–72 h	5 days
	Semaglutide (Ozempic®)	5 December 2017, 8 February 2018	SUSTAIN	Human GLP-1	94	0.25–1 mg once weekly	SC	1–3 days	1 week
	Oral Semaglutide (Rybelsus®)	20 September 2019, 3 April 2020	PIONEER	Human GLP-1	94	3–14 mg once daily	PO	1 h	1 week

SUSTAIN (semaglutide)clinical program



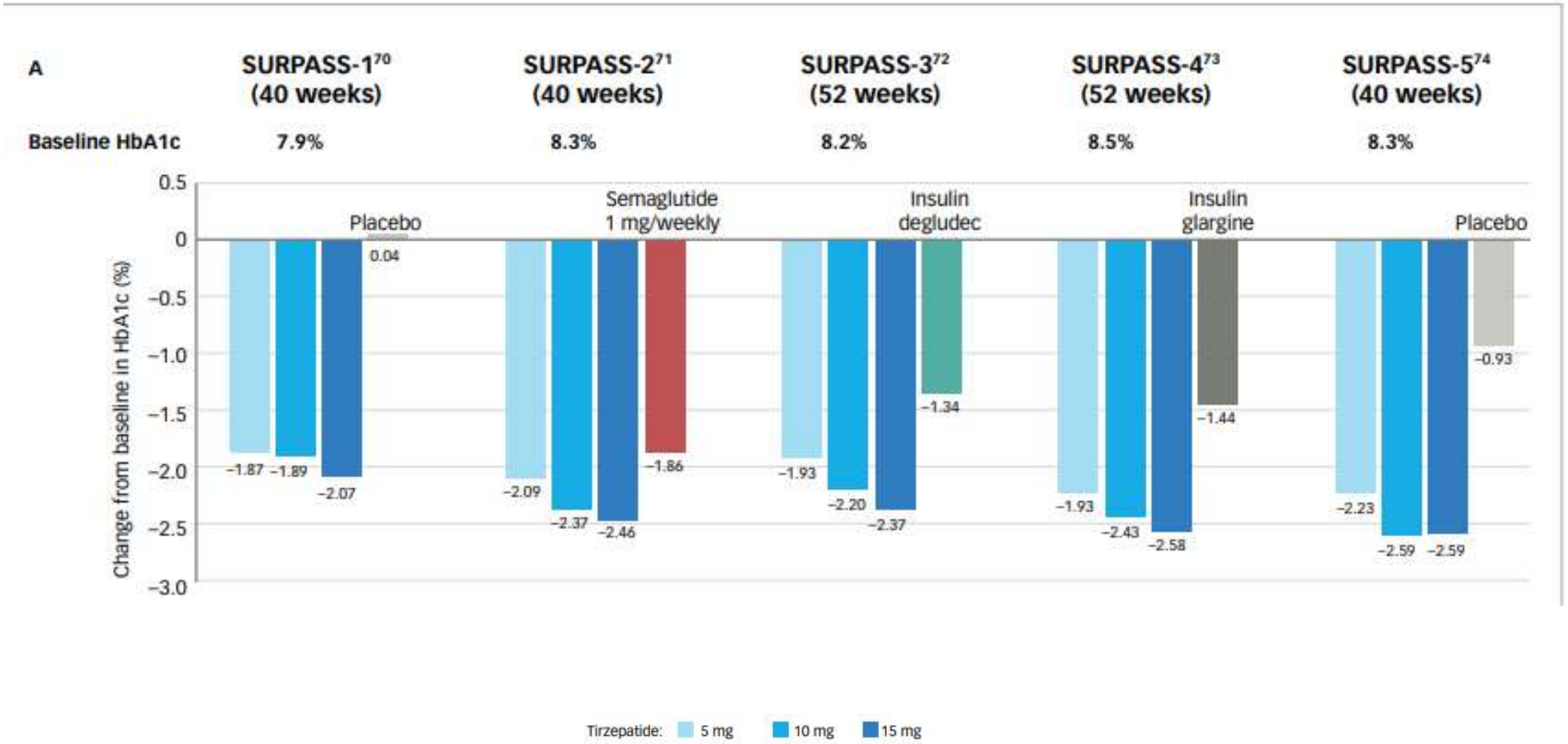
Chudleigh RA, Platts J, Bain SC. Comparative Effectiveness of Long-Acting GLP-1 Receptor Agonists in Type 2 Diabetes: A Short Review on the Emerging Data. Diabetes Metab Syndr Obes. 2020 Feb 18;13:433-438.

Poll Question 9

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

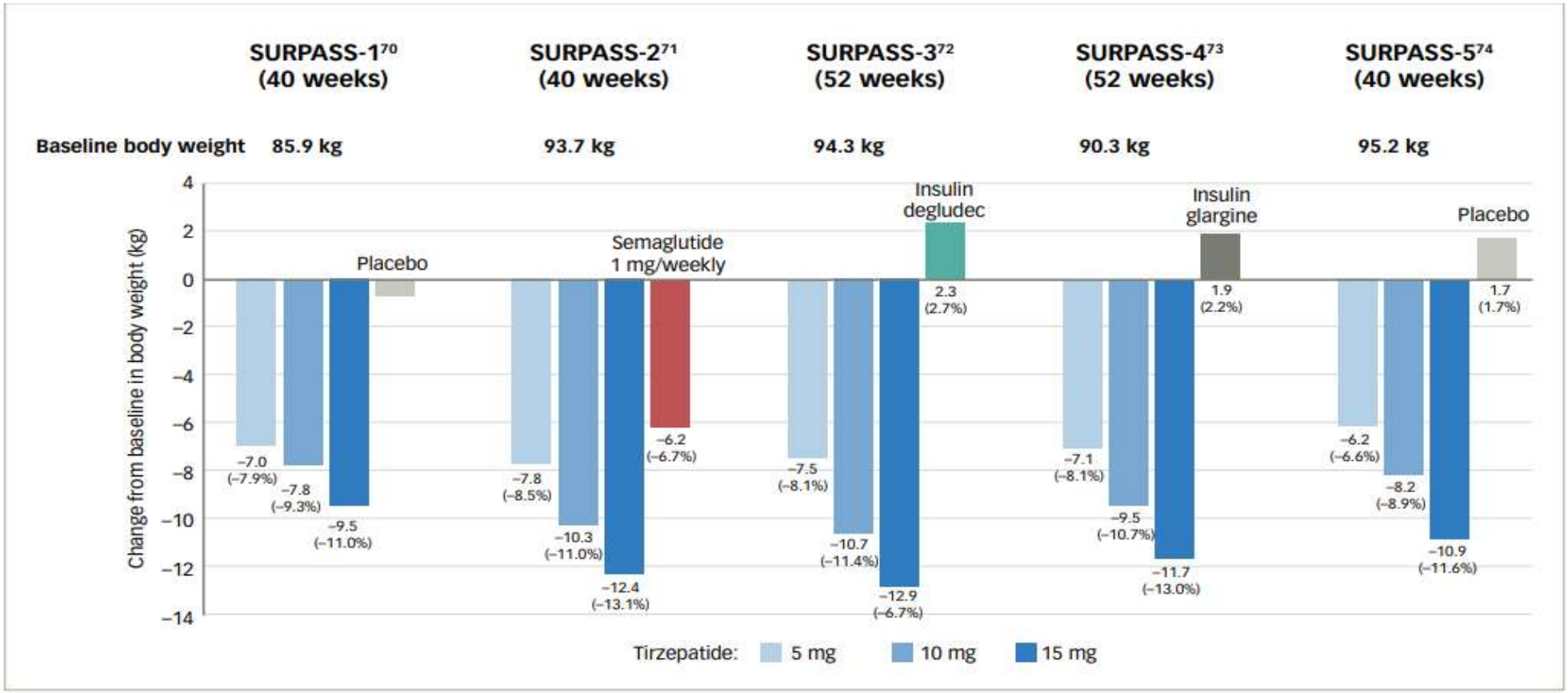
a. May experience nausea
b. May cause hypoglycemia
c. Muscle aches are common
d. Doubles risk of pancreatic cancer

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): Change in Body Weight



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.

Tirzepatide & GLP-1 RA Safety Profile

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

Package inserts.

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

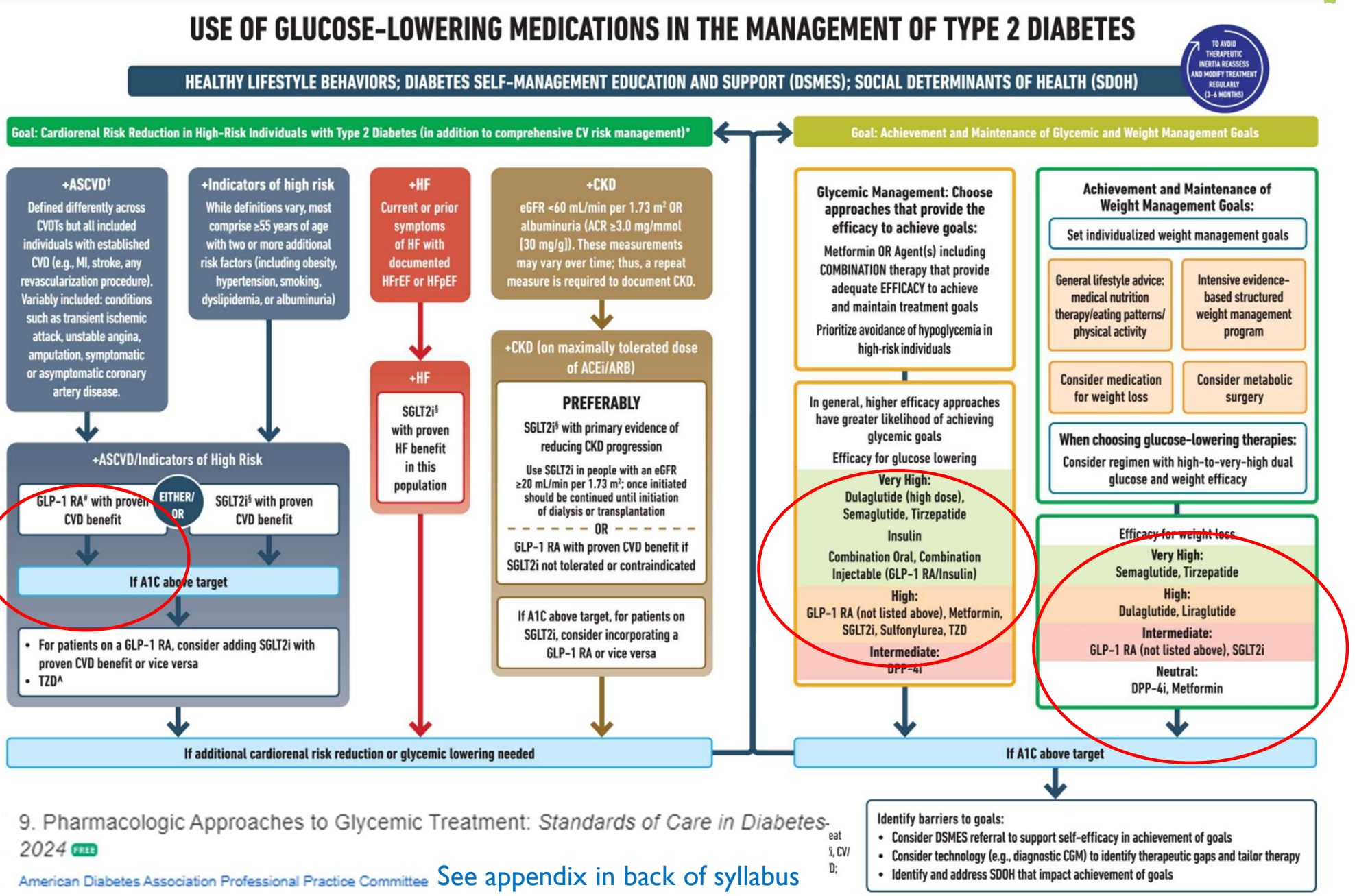
- Avoid if personal or family history of medullary thyroid cancer
- Start at lower dose and titrate
- Eat smaller *nourishing* meals to reduce nausea
- Avoid high fat meals -
- Reconsider nausea as feeling full
- Store extra pens in fridge
- Avoid in combo with DPP-4 inhibitors
- Report any sudden abdominal pain or pancreatitis symptoms
- Ask about recent eye exam
  - Potential increase in diabetes retinopathy

Poll Question 10

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.

ADA Algorithm: Where do GLP-1 Fit?

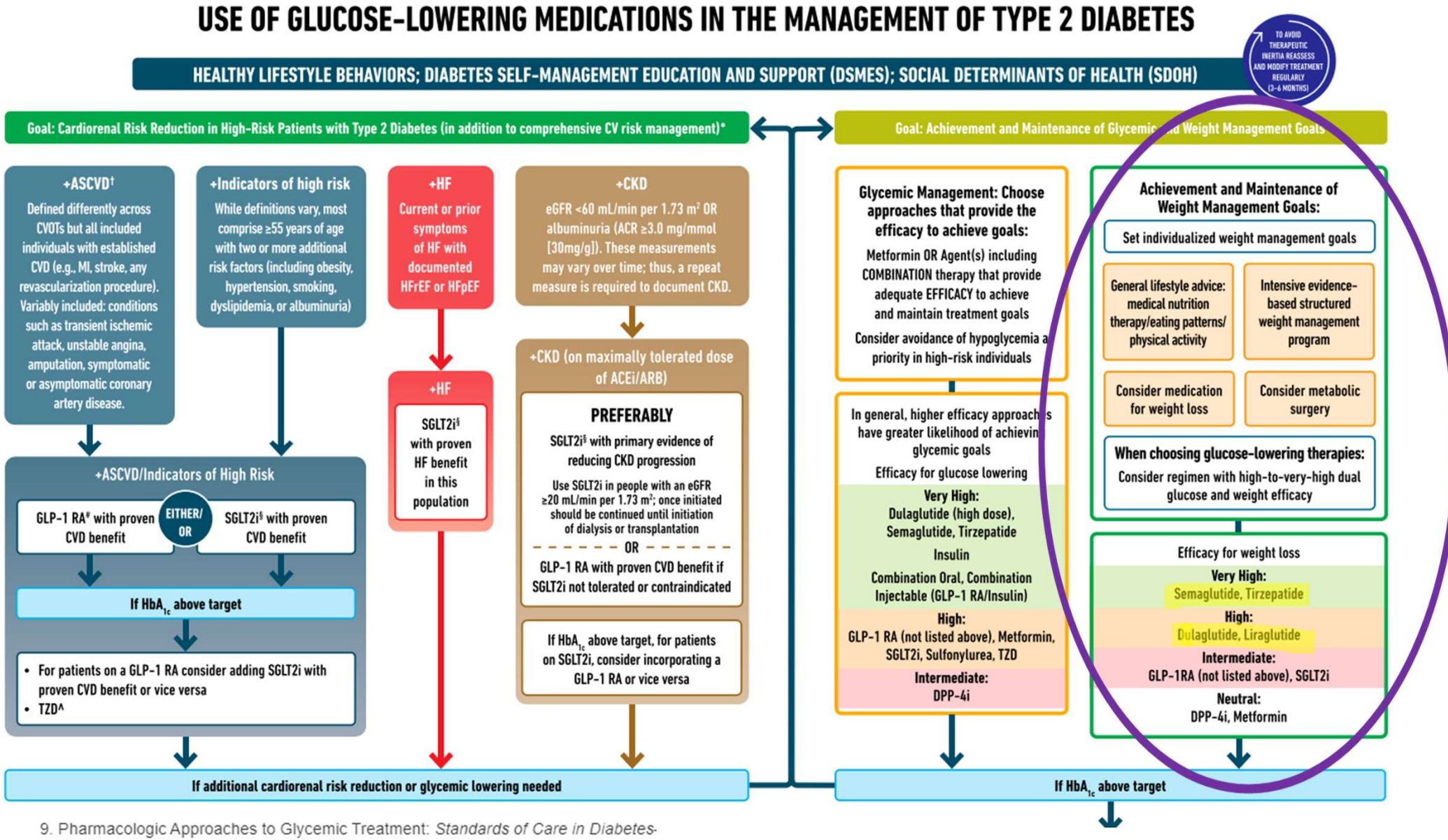


9. Pharmacologic Approaches to Glycemic Treatment: *Standards of Care in Diabetes-2024* FREE

American Diabetes Association Professional Practice Committee

See appendix in back of syllabus

ADA Meds Algorithm



9. Pharmacologic Approaches to Glycemic Treatment: *Standards of Care in Diabetes-2024* FREE

American Diabetes Association Professional Practice Committee

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)

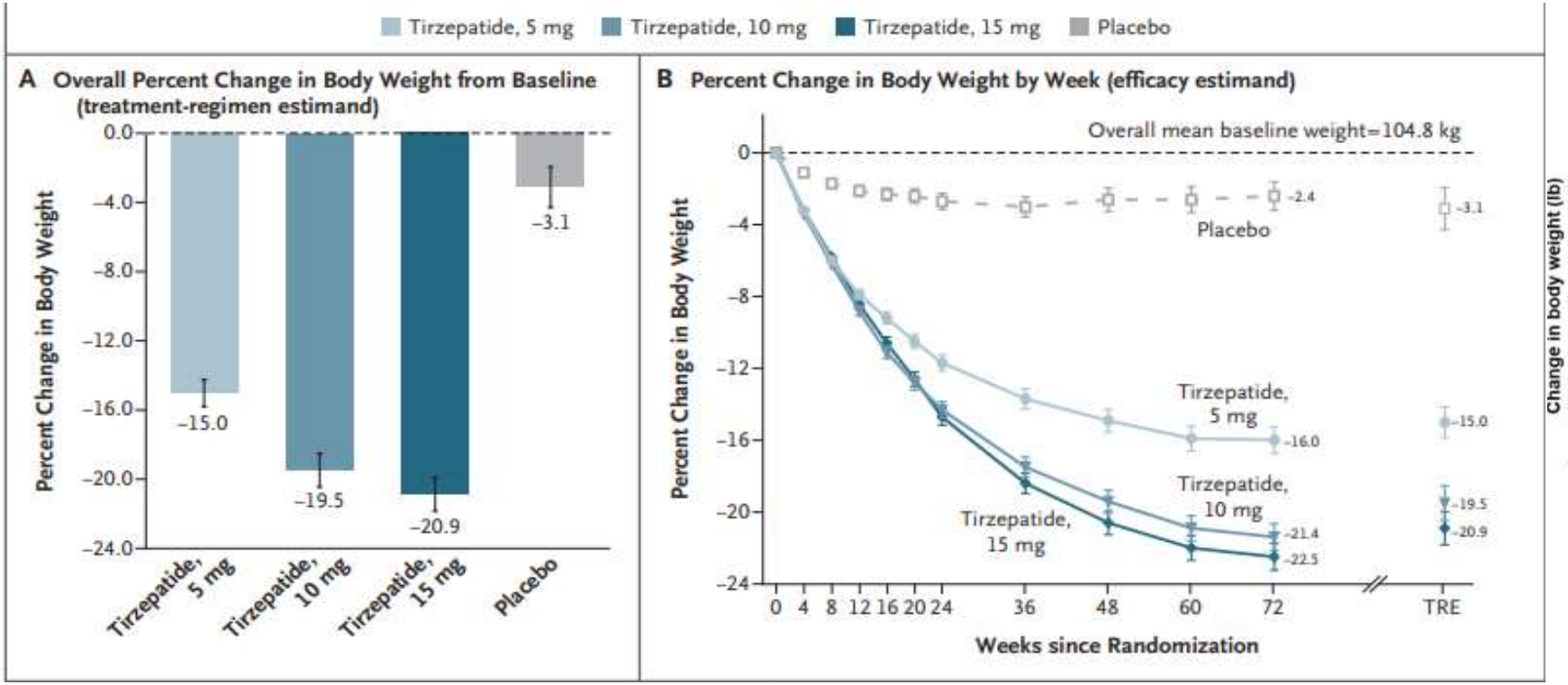
All 3 Approved for use in adults with a:

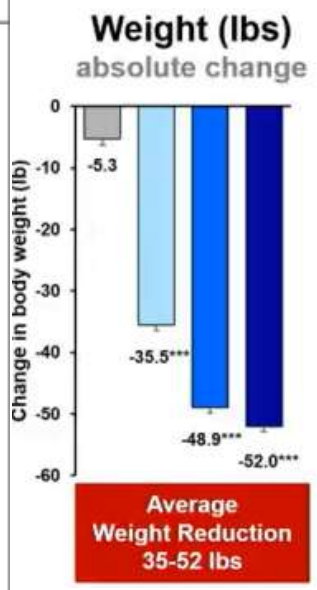
- BMI of ≥ 30 or
- BMI of ≥ 27 or greater who have hypertension, type 2 diabetes, or dyslipidemia.

Wegovy also indicated for those overweight/obesity ASCVD to reduce CVD events

Tirzepatide for Weight Loss: SURMOUNT-1

- 20.9% weight loss with 15mg dose and 35-52lbs lost!





Jastreboff AM, et al., on behalf of the SURMOUNT-1 Investigators. Tirzepatide Once Weekly for the Treatment of Obesity. *N Engl J Med* 2022;387:205-16.

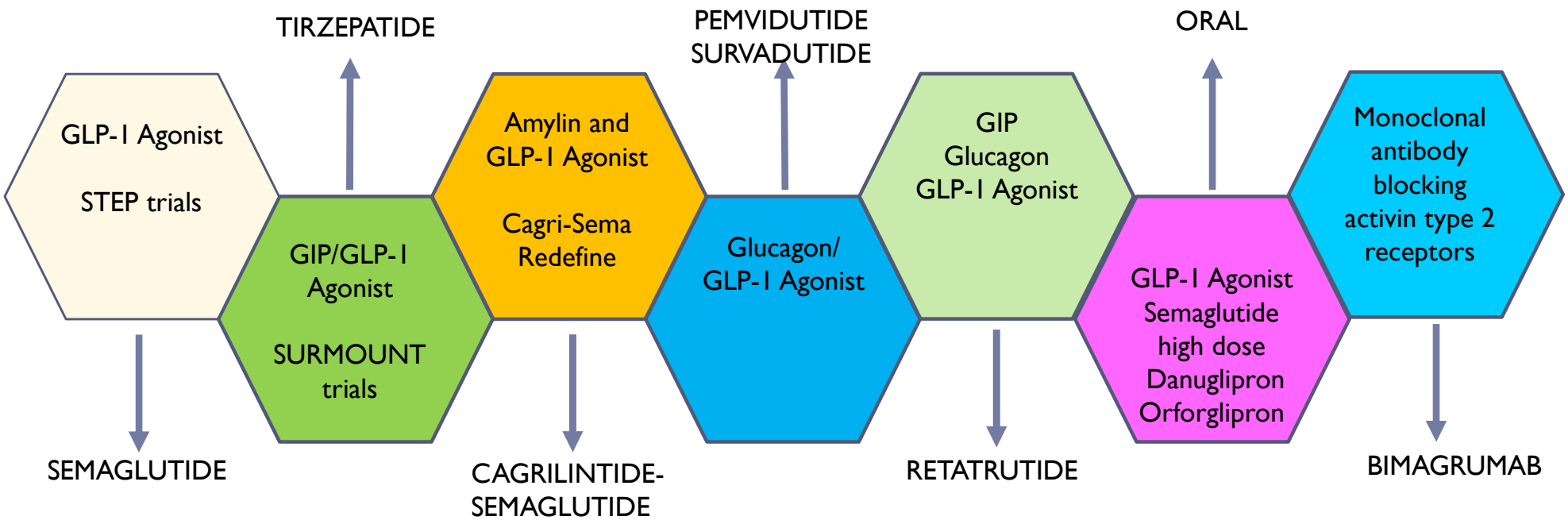
GLP-1/GIP Receptor Agonist Indications

Drug	Lower BG	Reduce CV Risk?	Wt loss approved?
Exenatide IR **(Byetta)** Lixisenatide **(Adlyxin)** Semaglutide **(Rybelsus)**	Yes	No	No
Exenatide ER **(Bydureon)**	Yes for 10 yrs and older	No	No
Dulaglutide **(Trulicity)**	Yes for 10 yrs and older	Yes	No
Semaglutide **(Ozempic)**	Yes	Yes	Yes Wegovy 2.4mg
Liraglutide **(Victoza)**	Yes for 10 yrs and older	Yes	Yes Saxenda 3mg
Tirzepatide **(Mounjaro)**	Yes	?	Yes, Zepbound 15 mg

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



Medication Taking Behaviors

- Adequate medication taking is defined as 80%
- 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.

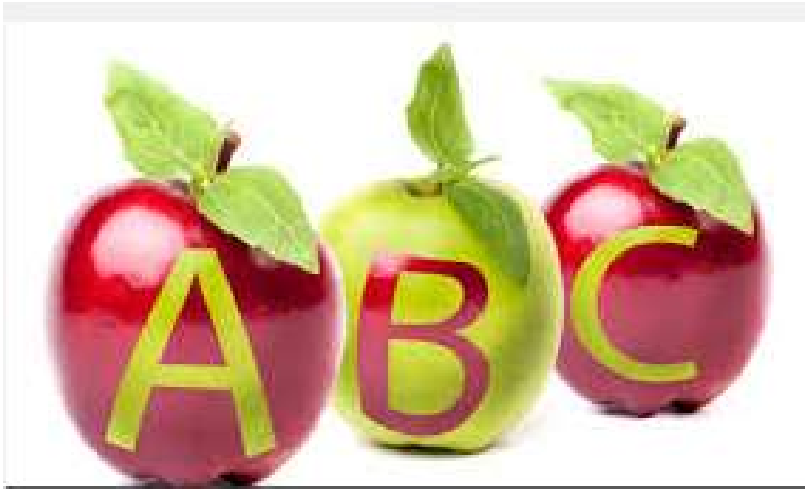
Work on targeted approach for specific barrier

6. Glycemic Goals & Hypo

A1C

Blood Pressure

Cardiovascular risk reduction



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

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

6. Glycemic Goals and Hypoglycemia: *Standards of Care in Diabetes—2024*

BGM vs CGM

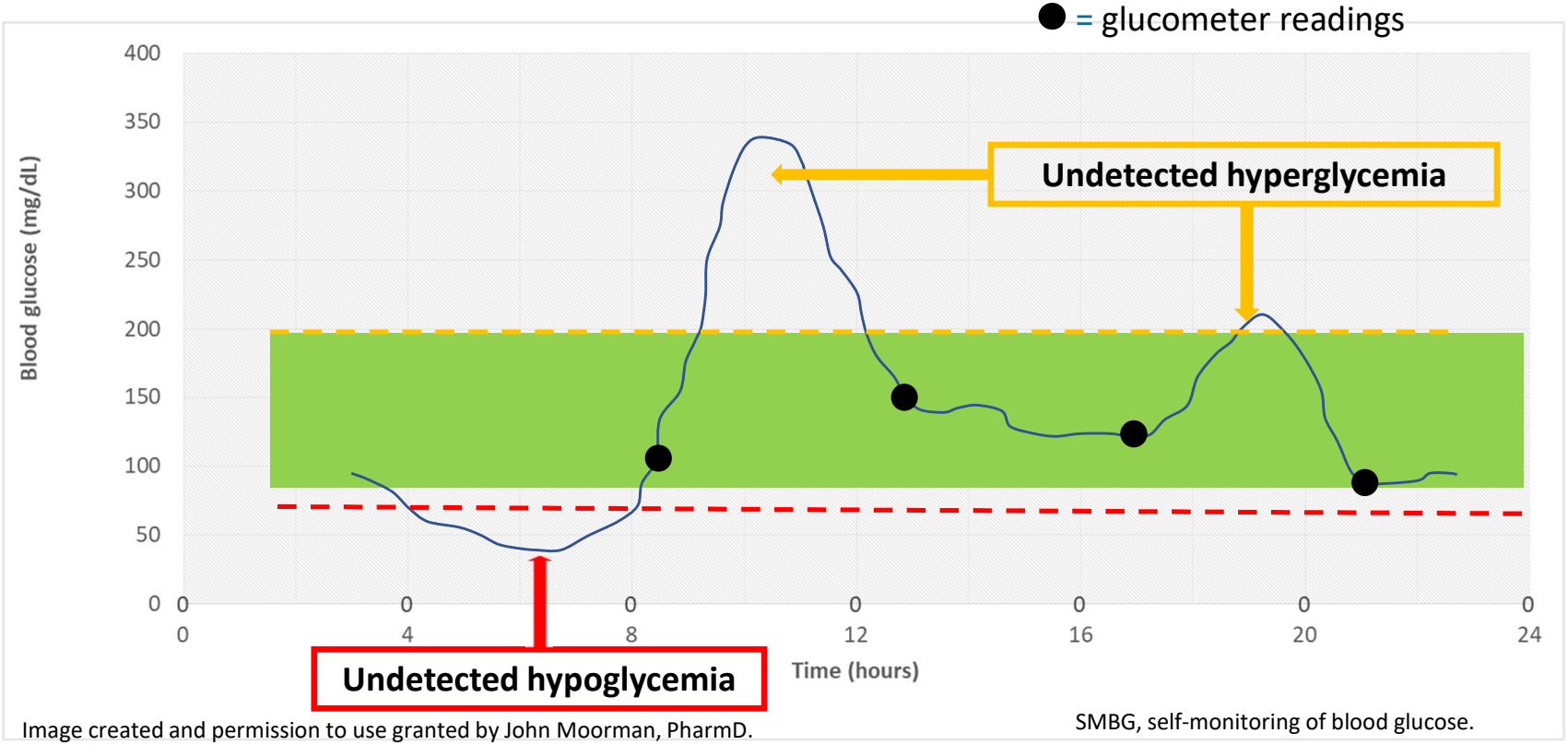
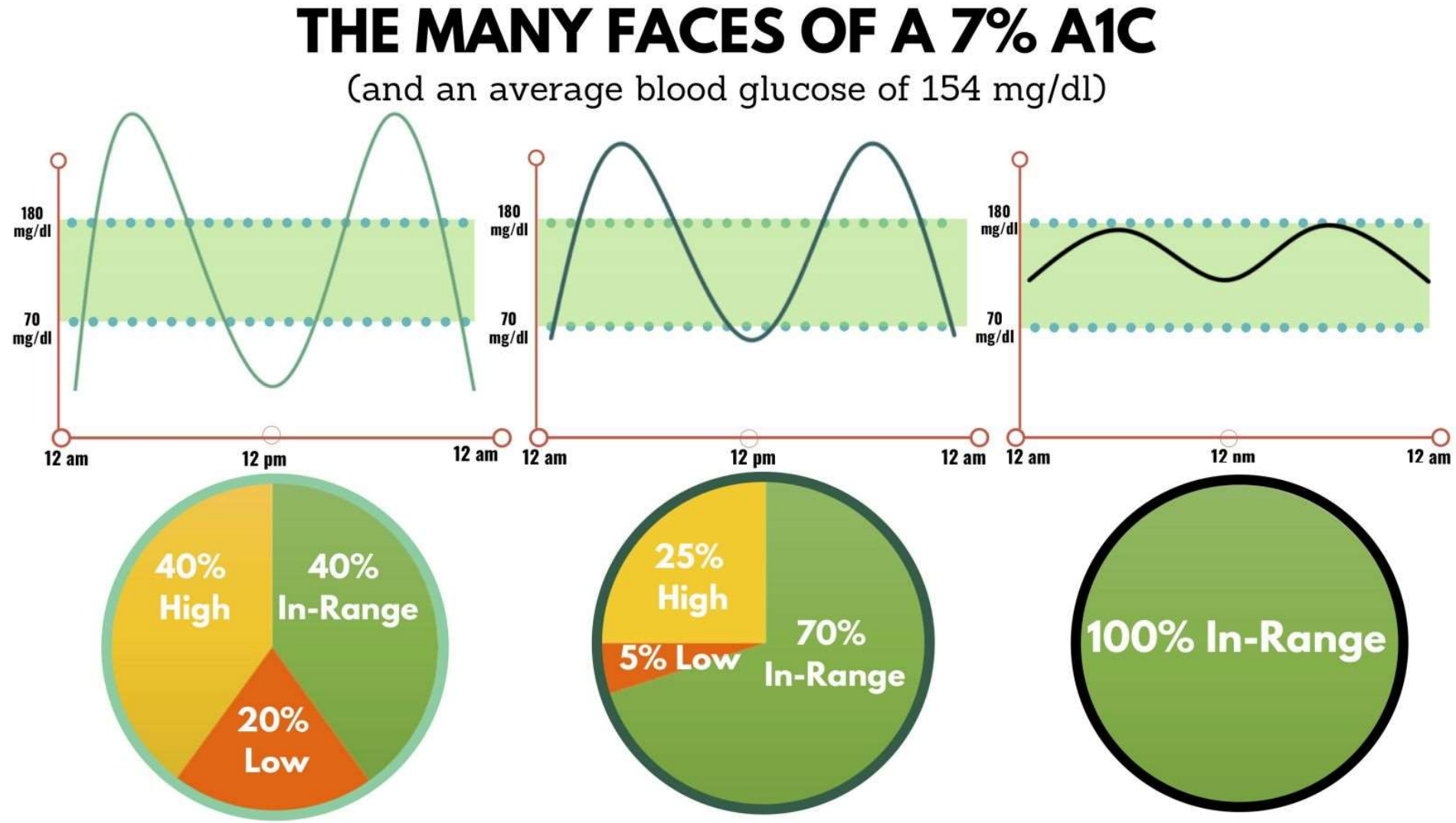


Image created and permission to use granted by John Moorman, PharmD.

SMBG, self-monitoring of blood glucose.

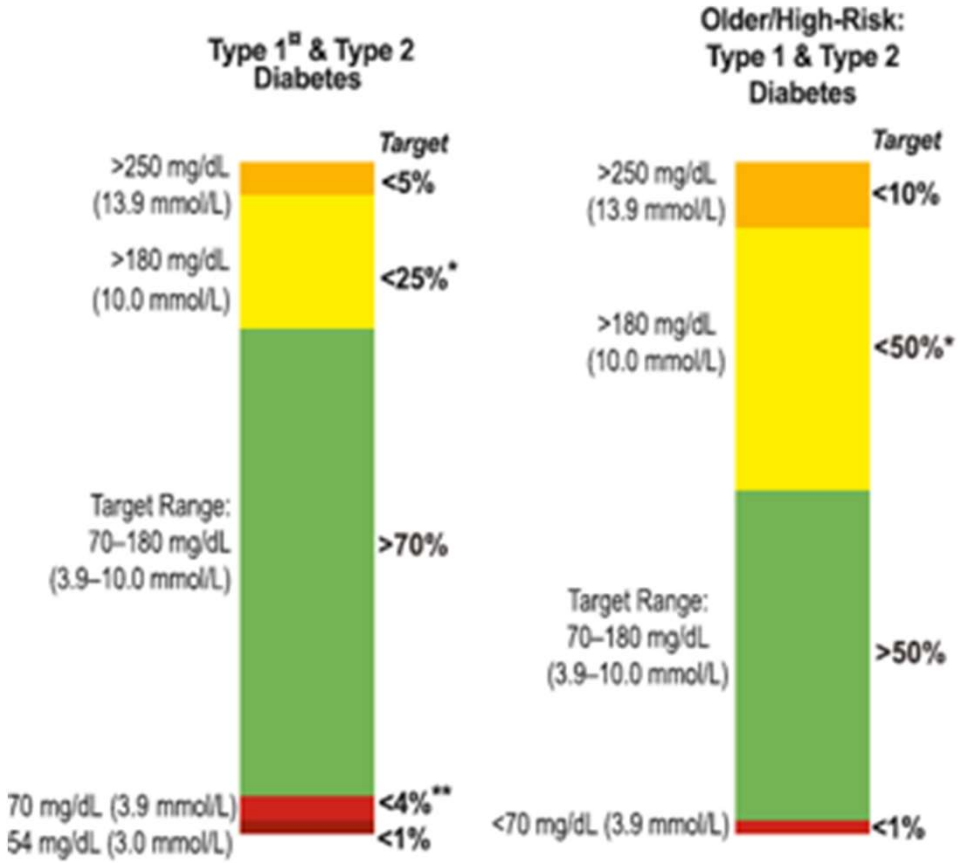
A1C Alone is Just Not Enough



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

Time in Range

- Evaluate Time in Range (TIR)
  - Target 70-180 mg/dl
  - Target time *below* goal
    - Less than 70
    - Less than 54
  - Target time *above* goal
    - Above 180
    - Above 250



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

6. Glycemic Goals and Hypoglycemia: *Standards of Care in Diabetes—2024*

Estimation of A1c for a Given TIR

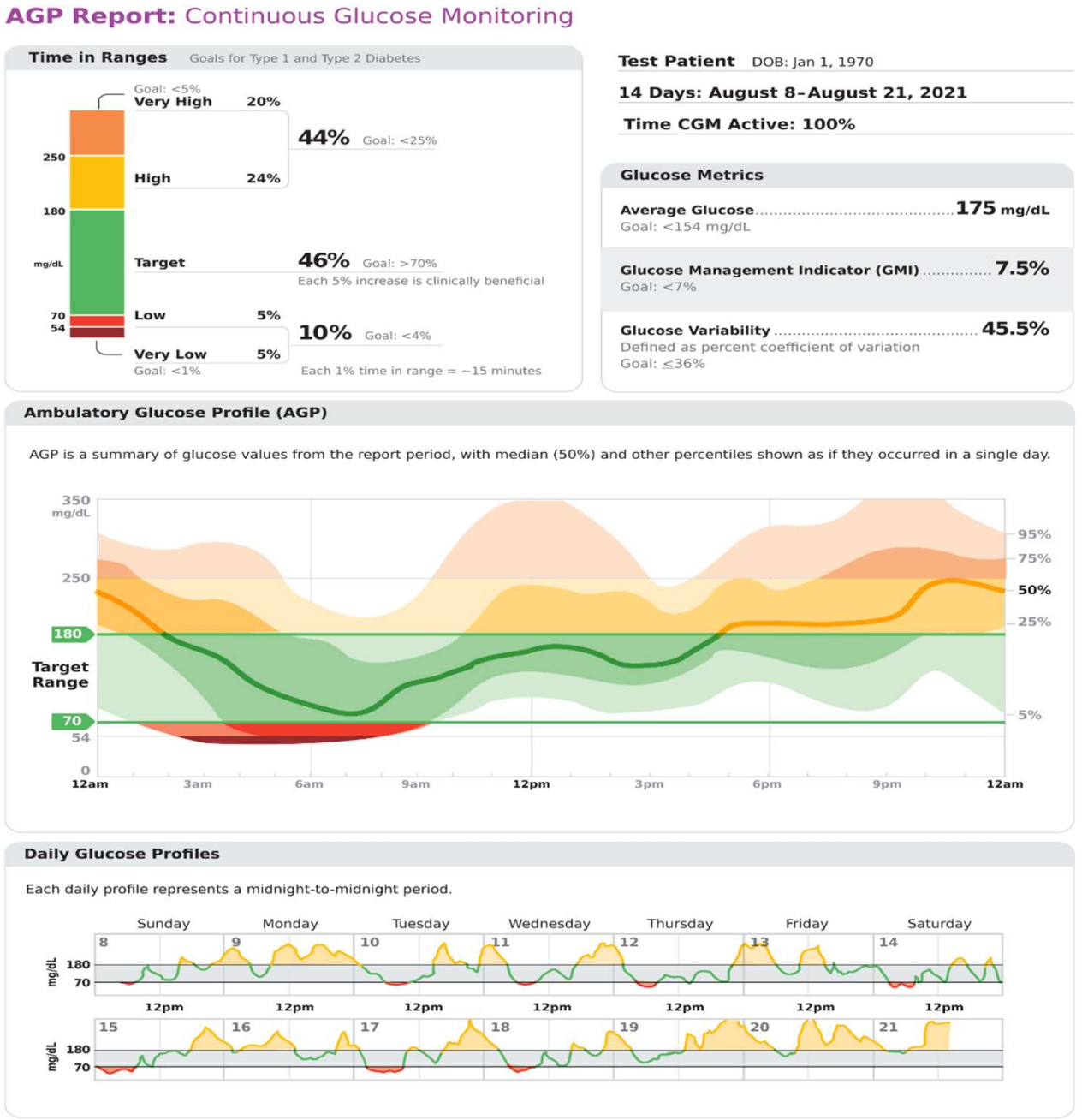
TIR$^{70\text{-}180}$ (%)	Estimated HbA1c (%)	95% CI for the predicted value
20	9.4	(8.0, 10.7)
30	8.9	(7.7, 10.2)
40	8.4	(7.1, 9.7)
50	**7.9**	**(6.6, 9.2)**
60	7.4	(6.1, 8.8)
70	**7.0**	**(5.6, 8.3)**
80	6.5	(5.2, 7.8)
90	6.0	(4.7, 7.3)

10% ΔTIR ≈ 0.5% ΔHbA1c

Beck RW, et al. J Diabetes Sci Technol. 2019;13:614-626.

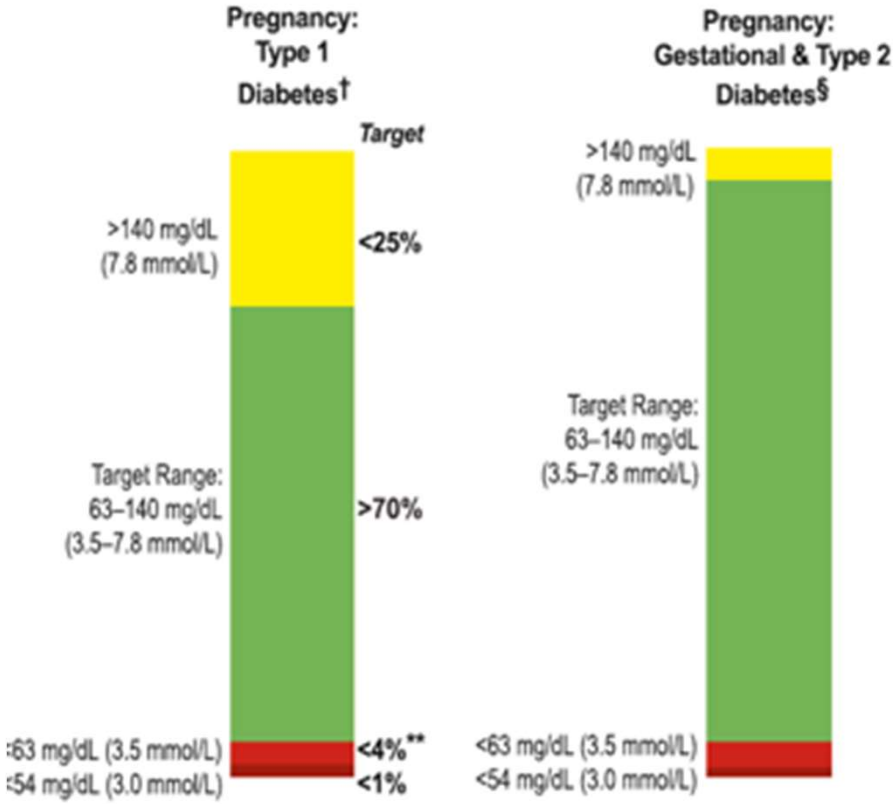
Ambulatory Glucose Profile Report

- CGM key metrics
- AGP
- 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)
- 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
- Time in range: 63-140 mg/dL



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

6. Glycemic Goals and Hypoglycemia: *Standards of Care in Diabetes—2024*

Pharmacologic Treatment during Pregnancy

- Insulin is preferred therapy for GDM, type 1 and 2
  - 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
  - Passes through placenta
  - If using for PCOS, stop by end of first trimester
- Refer to specialized center

15. Management of Diabetes in Pregnancy: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

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
    - Stop these meds at conception
    - Preferred meds: labetolol, nifedipine

15. Management of Diabetes in Pregnancy: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

Case Study - Ricki

Ricki 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

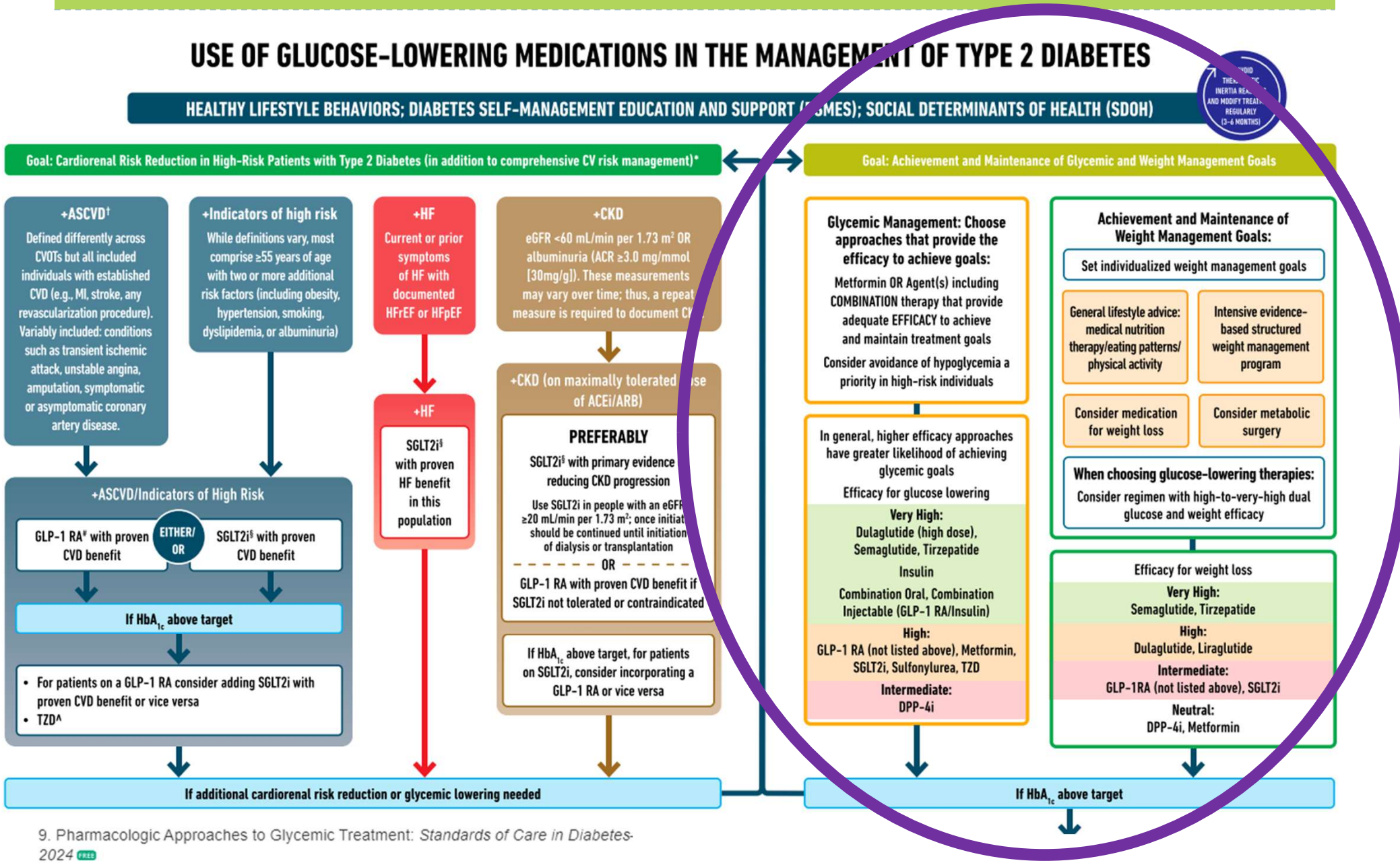
Social history

- 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

Poll 11. What Treatment Should Ricki Be Started On?

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

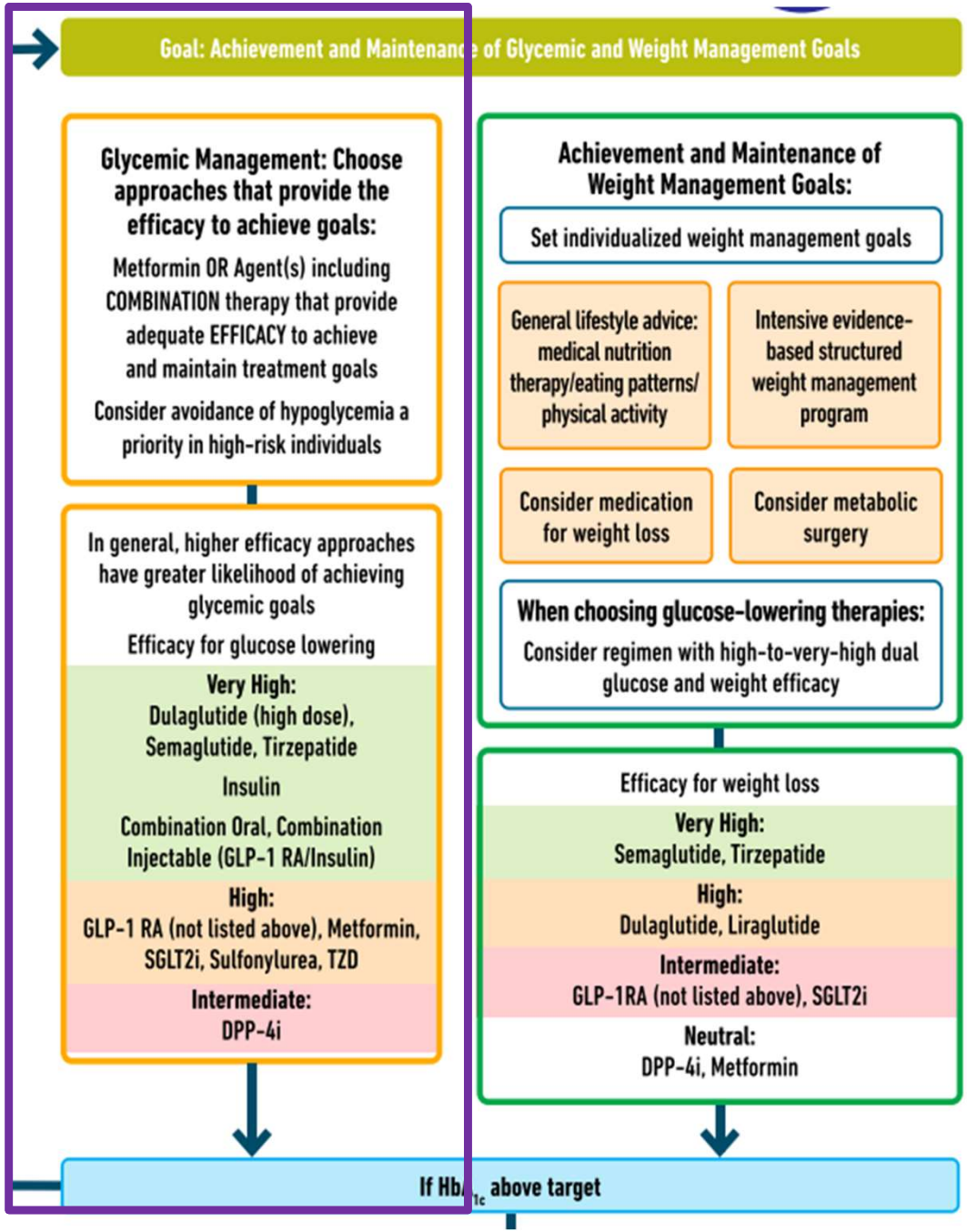
ADA Meds Management



9. Pharmacologic Approaches to Glycemic Treatment: *Standards of Care in Diabetes-2024* FREE

American Diabetes Association Professional Practice Committee

Metformin is "Usually" 1st Line



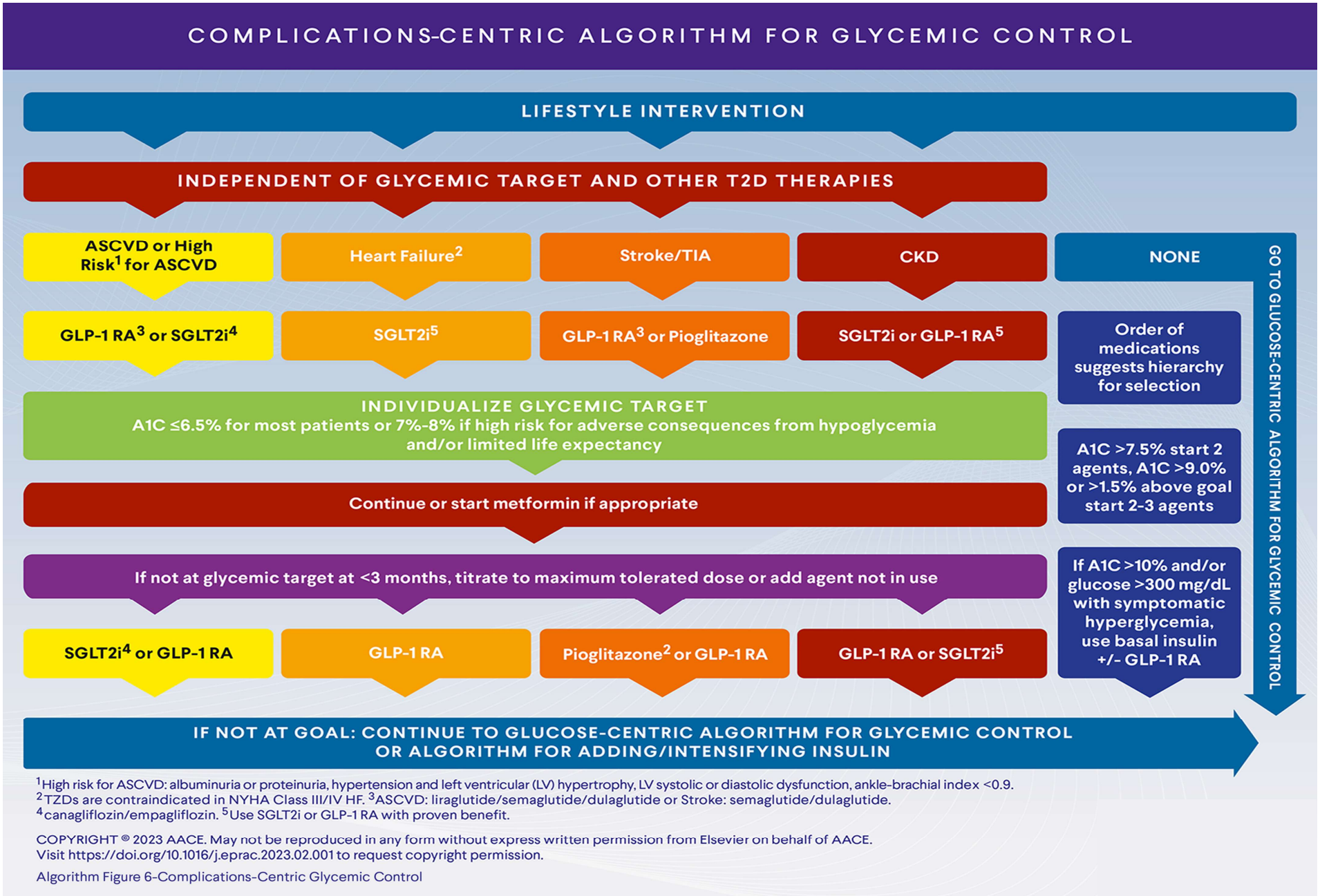
- Why metformin?
  - Longstanding evidence
  - High efficacy and safety
  - Inexpensive - 3 months for $12
  - Weight neutral

- If ASCVD, HF or CKD or high ASCVD risk, use SGLT2i or GLP-1 RA +/- metformin
- If A1C ≥ 8.5%, consider combo therapy.

9. Pharmacologic Approaches to Glycemic Treatment: *Standards of Care in Diabetes-2024* FREE

American Diabetes Association Professional Practice Committee

AACE 2023 Diabetes Guideline



[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.

COPYRIGHT ® 2023 AACE. May not be reproduced in any form without express written permission from Elsevier on behalf of AACE.
Visit https://doi.org/10.1016/j.eprac.2023.02.001 to request copyright permission.

Algorithm Figure 6-Complications-Centric Glycemic Control

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

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. If you forget to take metformin before the meal, hold the dose
c. Metformin may cause loose stools
d. Avoid Metformin if eGFR is less than 60

Metformin Dosing and Mechanism

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

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, creat)

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—2024* 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.

14. 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 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—2024* FREE

14. Pediatric 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 <8.0 may be needed
  - CGM / Insulin pump important tools.

14. Children and Adolescents: *Standards of Care in Diabetes—2024* 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.

Healthy & Good Functional Status

- Set more intensive goals if:
  - Good cognitive and physical function
  - Expected to live long enough to reap benefits of intensive management,
- Ongoing follow-up to eval safety and hypoglycemia frequency

- **Goals:**
  - Reasonable A1c goal <7.0 - 7.5%
  - Fasting BG 80 – 130
  - Bedtime Glucose 80-180
  - Blood Pressure < 130/80
  - Statin unless contraindicated or not tolerated

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 Lantus 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%
  - Fasting BG 90 – 150
  - Bedtime BG 100-180
  - Blood Pressure < 130/80
  - Statin unless contraindicated or not tolerated

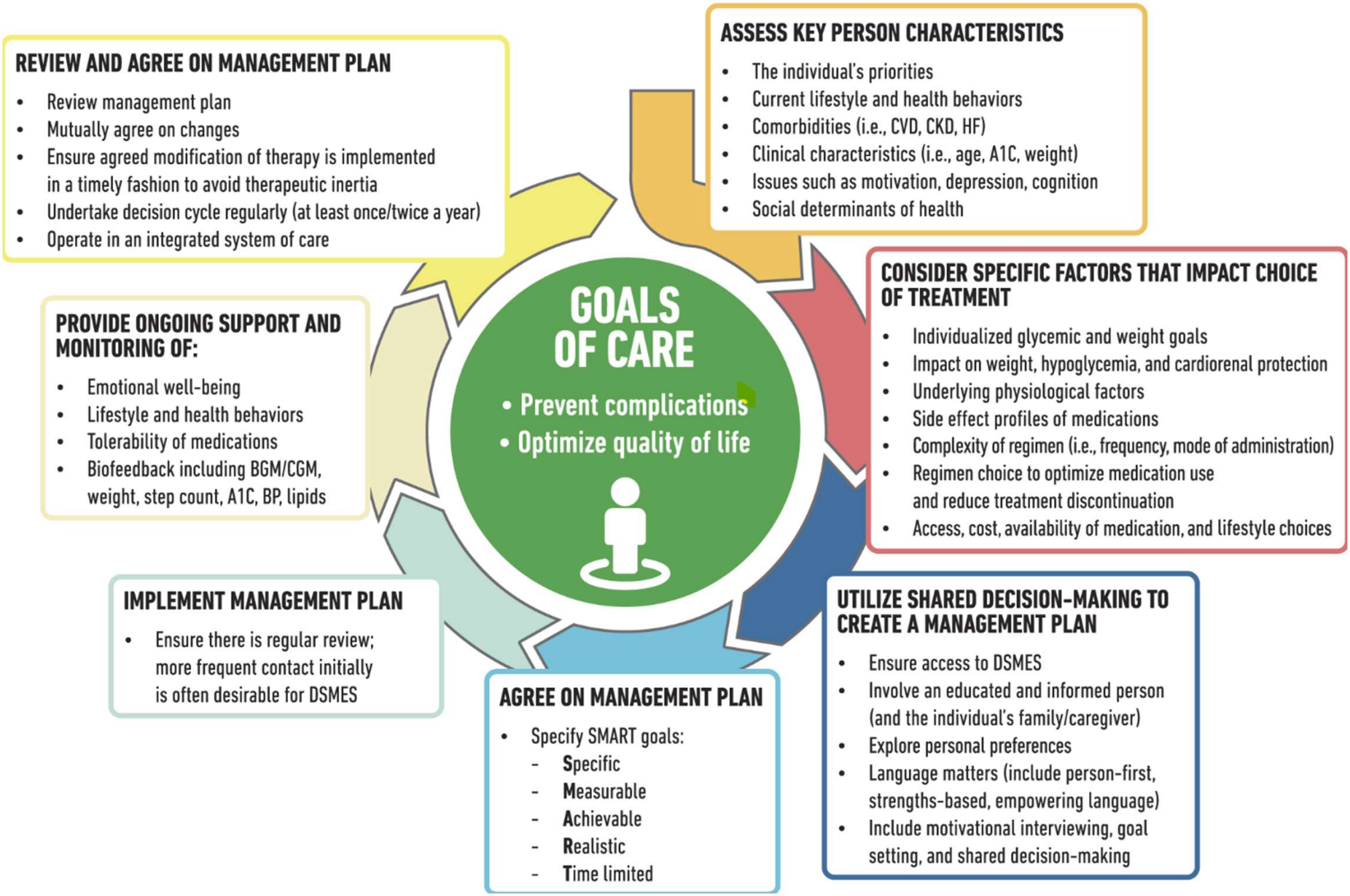
Older Adults (≥65 years) with diabetes

- Annual screening for early detection of mild cognitive impairment or dementia
- High priority population for depression screening and treatment
- Avoid hypoglycemia in this high risk group
  - Prevent hypo by adjusting glycemic targets and adjusting pharmacologic interventions

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—2024*

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

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 (type 1)
  - B12 if on metformin
  - 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—2024*

American Diabetes Association Professional Practice Committee

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—2024* FREE

ADA – Follow-up Visit to include:

- **Interval medical history**
  - Psychosocial Status
  - Assess med taking behavior
- **Physical exam**
  - Skin appearance
  - Ambulation and gate
  - Lower extremities, feet
  - Activity levels strengthening and cardiovascular workout
- **Health**
  - Dental health, Bone health
  - Eye check
  - Mammogram
  - Vaccinations
  - RDN, CDCES, Diabetes Ed Program
- **Nutritional status and relationship with food**
  - GI health (constipation, diarrhea, gastroparesis, fatty liver)
  - GU health – continence, creat, GFR, creat /alb ratio
  - Menstruation and contraception
  - Thyroid – Symptoms + TSH
  - Heart – blood pressure, chest pain, heart rate, cholesterol

Immunization Schedule for Diabetes 2024

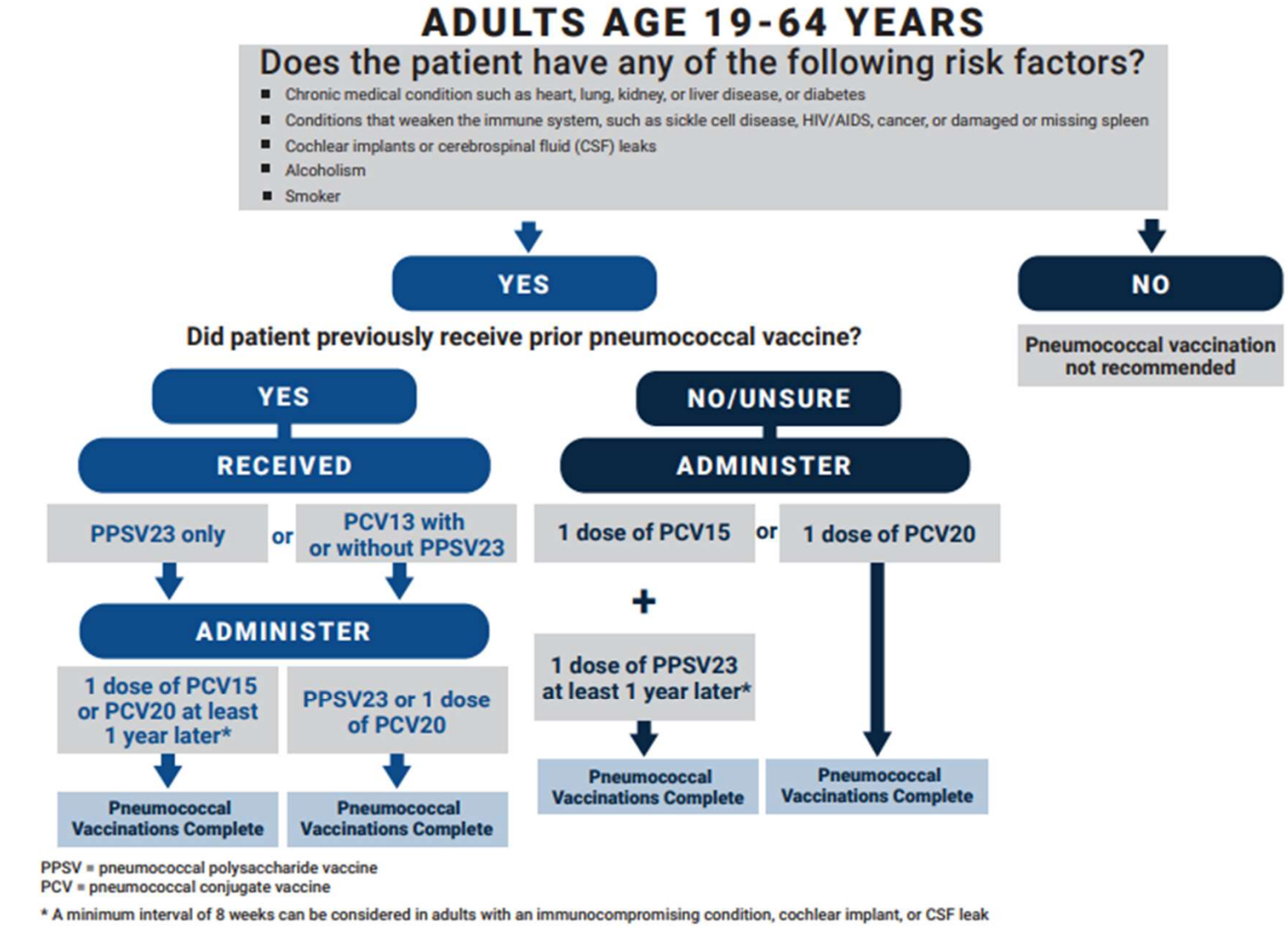
Vaccine	Who by Age	Series and Frequency
Hepatitis B Vaccine	Less than 60 years*	2-3 dose series
RSV	Adults ≥ 60 years	Single dose
Influenza (avoid live attenuated vaccine)	All	Annually
Tetanus, diphtheria, pertussis (TDAP)	All adults; extra dose during pregnancy	Booster every 10 years.
Zoster	50+	2 dose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

2024 ADA Standards, Vol.47, S52-S76.

*See ADA Standards, Table 4.4 for detailed info/considerations.

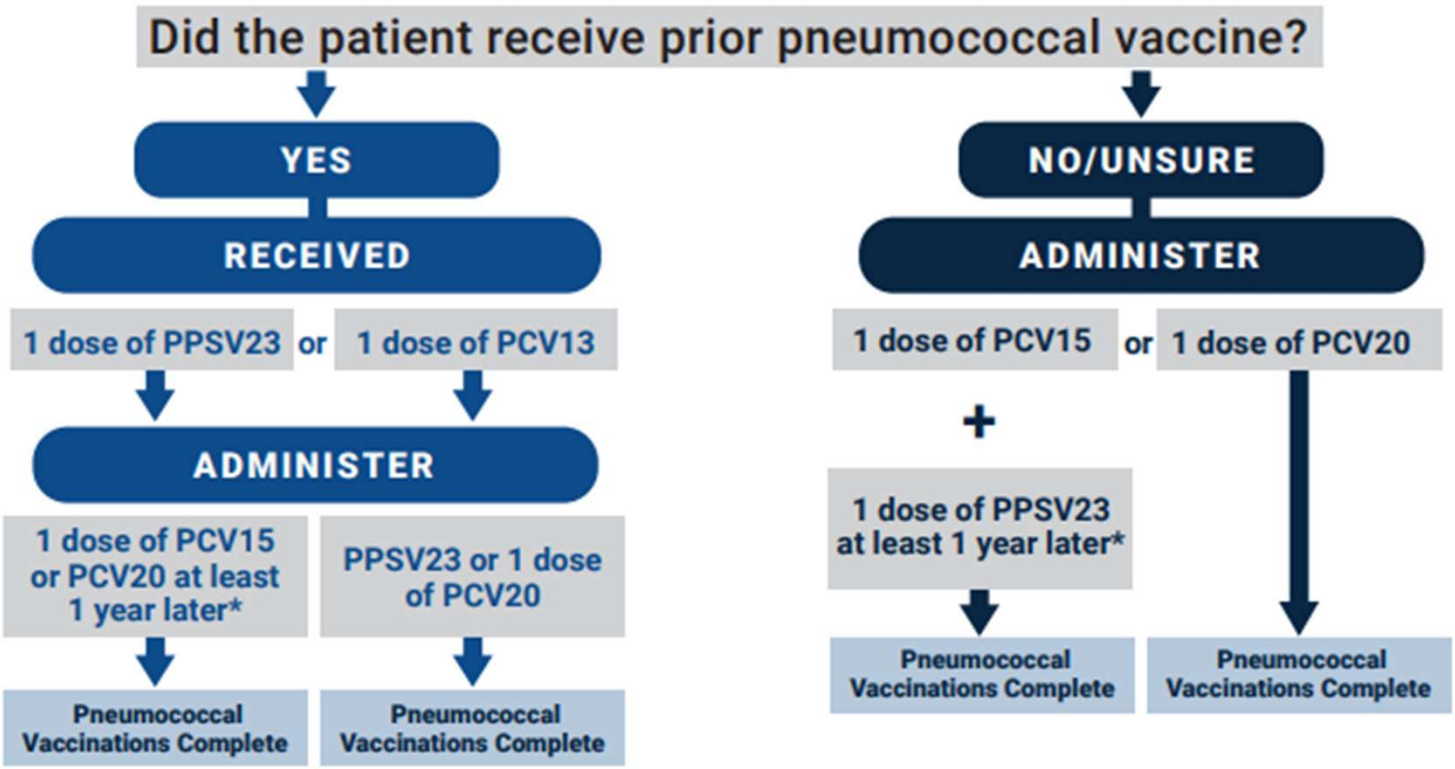
For educational purposes only. www.DiabetesEd.net

Pneumococcal Vaccine for US Adults



PNEUMOCOCCAL VACCINE FOR US ADULTS

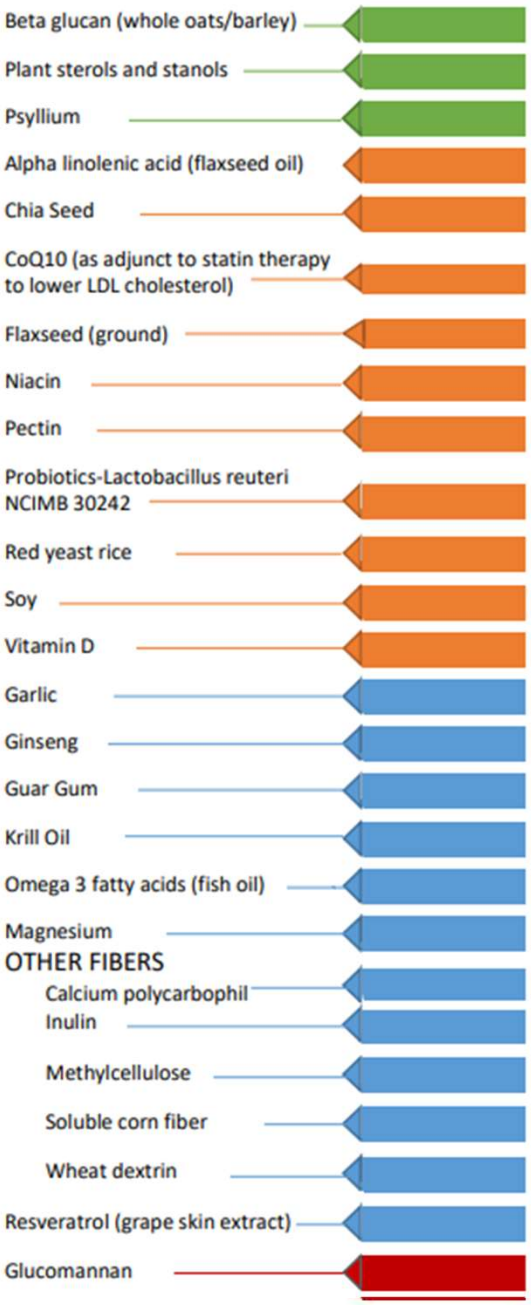
ADULTS AGE 65 YEARS AND OLDER



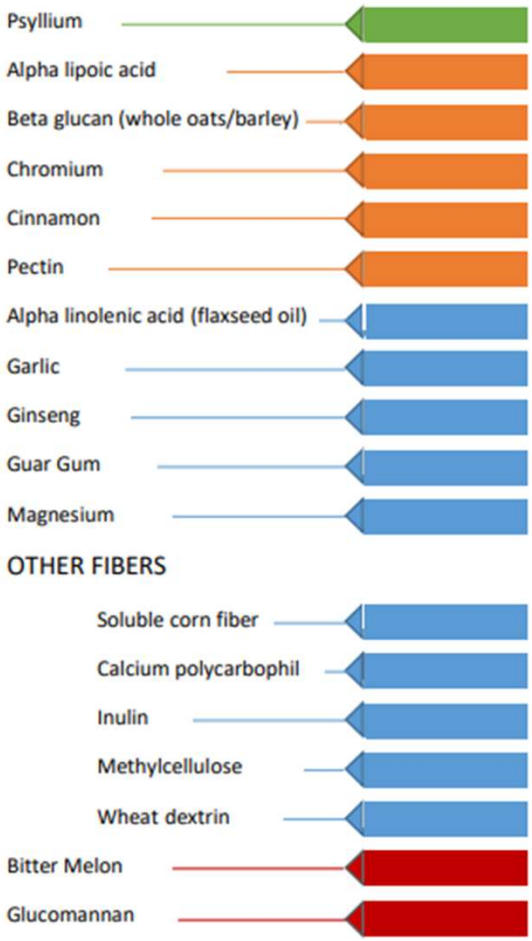
PPSV = pneumococcal polysaccharide vaccine
PCV = pneumococcal conjugate vaccine

* A minimum interval of 8 weeks can be considered in adults with an immunocompromising condition, cochlear implant, or CSF leak

Supplements to Help Manage Total Cholesterol, LDL, and HDL



Supplements to Help Lower Blood Sugar



This downloadable version is compliments of

www.DiabetesEd.net

Supplement Safety Ratings from Cleveland Clinic

Safety Rating Color Key

Recommended: Several well-designed studies in humans have shown positive benefit. Our team is confident about its therapeutic potential.

Recommended with Caution: Preliminary studies suggest some benefit. Future trials are needed before we can make a stronger recommendation.

Not Recommended-Evidence: Our team does not recommend this product because clinical trials to date suggest little to no benefit.

Not Recommended-High Risk: Our team recommends against using this product because clinical trials suggest substantial risk is greater than the benefit

This content was adapted from The Cleveland Clinic Wellness flyer. For more detailed information, access full supplement review at www.clevelandclinicwellness.com/supp review

2024

QuickHitCard.pdf (clevelandclinicwellness.com)

See appendix in back of syllabus

Diabetes Toolkit - Individualize

Meter

- Strips that aren't expired?

List of Meds

Plan for Lows

Emergency Plan

Power back-up

- BG Checks and logging results
- Diabetes ID
  - Phone, medic alert, on person
- Carbohydrate source
  - Granola bar, glucose tabs, GU, gummy bears
- Rescue Meds

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

6. Glycemic Goals and Hypoglycemia: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

Hypoglycemia: Clinical Risk Factors

Table 6.5

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

Clinical/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§ • Homelessness • Fasting for religious or cultural reasons
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	Other risk factors • Low health literacy • Alcohol or substance use disorder

6. Glycemic Goals and Hypoglycemia: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

Components of hypoglycemia prevention for high-risk individuals at initial, follow-up, and annual visits

Hypoglycemia prevention action 6. Glycemic Goals and Hypoglycemia: *Standards of Care in Diabetes—2024* FREE American Diabetes Association Professional Practice Committee	**Initial visit**	**Follow-up visit**	**Annual visit**
Hypoglycemia history assessment	✓	✓	✓
Hypoglycemia awareness assessment	✓		✓
Cognitive function and other hypoglycemia risk factor assessment	✓		✓
Structured education for hypoglycemia prevention and treatment	✓	✓*	✓*
Consideration of continuous glucose monitoring needs	✓	✓	✓
Reevaluation of diabetes treatment plan with deintensification, simplification, or agent modification as appropriate	✓	✓†	✓†
Glucagon prescription and training for close contacts for insulin-treated individuals or those at high hypoglycemic risk	✓		✓
Training to reestablish awareness of hypoglycemia	✓		✓

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.

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

PocketCard content is for educational purposes only.
© 2024

Poll Question 1

- JL is 78 and drinks a “few cocktails” every night. Lives with partner and takes basal insulin at night and bolus insulin as needed. Checks BG a few times a week. Most recent A1c was 5.9%. What is the BG target for JL?

- A. A1c less than 6.5%
- B. Fasting BG 100 +
- C. Ask JL to determine their A1c target.
- D. A1c less than 7% based on the Legacy Trial results.

If on insulin or sulfonylurea – special precautions required

- Carb source on person, car, by bed at all times
- Identification
  - Phone (ICE)
  - Wallet Card
  - Bracelet
- If pattern of lows, med adjustment required
- Pre-meal target
  - 100-130?
- Post meal
  - Less than 180
- Bedtime
  - 110 - 180

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 1.0-2.0

Case Study Ken – Poll 2

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 (Januvia)

C. Glimepiride (Amaryl)

D. Pioglitazone (Actos)

Reducing Hypoglycemia

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

- ❑ Insulin
- ❑ Secretagogues (sulfonylureas, glitinides)

6. Glycemic Goals and Hypoglycemia: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

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	< 4 yrs: not recommended 4 yrs or older | 3mg dose	Approved Age 4+ 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.

All PocketCard content is for educational purposes only. Please consult prescribing information for detailed guidelines.

DiabetesEd.net Copyright Diabetes Education Services 2024 © 2024

Quick Question 3

- 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

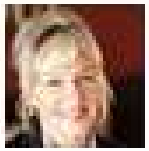
Nocturnal Lows

- 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

"The highest form of wisdom is kindness."
The Talmud



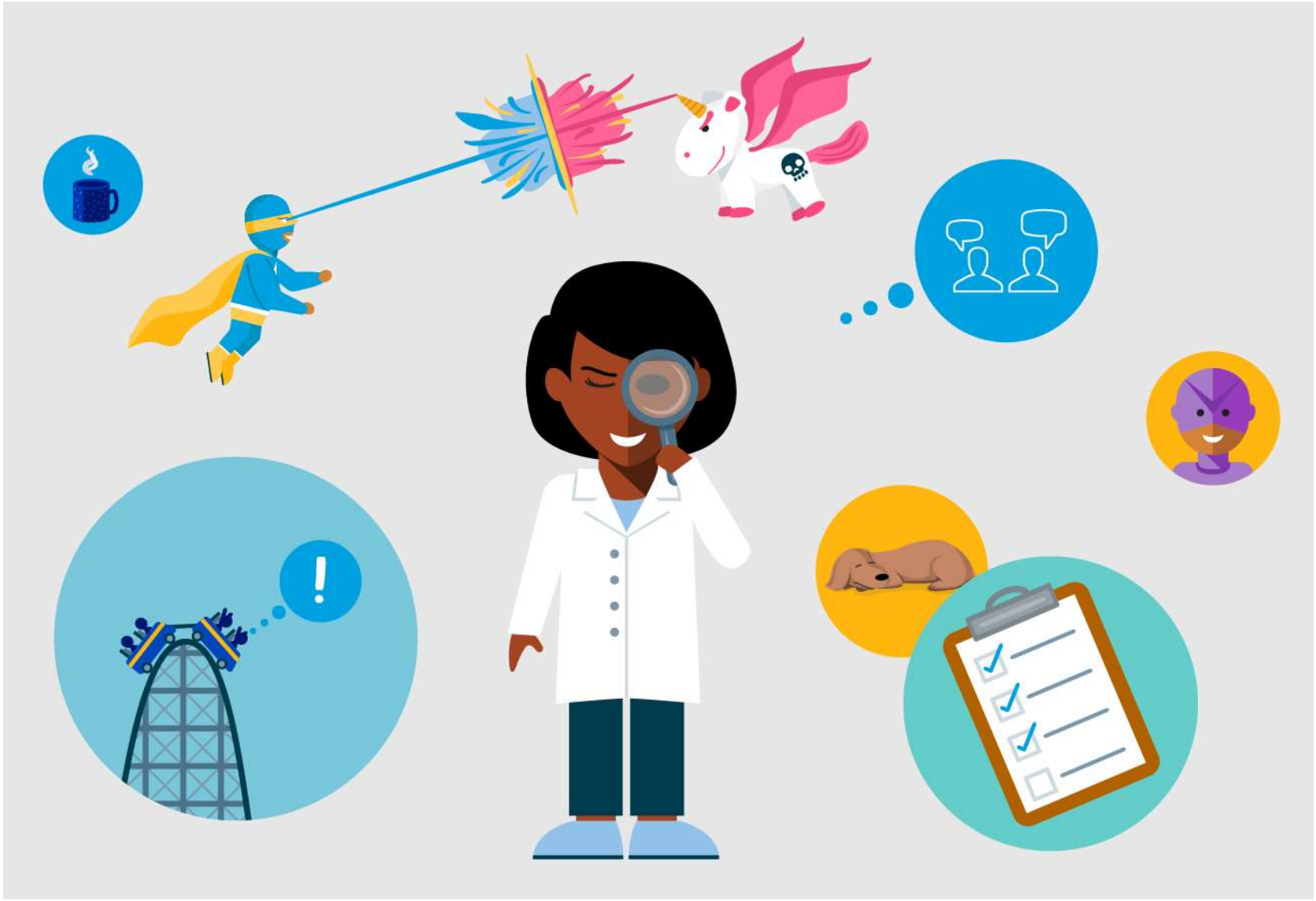
Kindness matters!
Learning to be less harsh or judgmental and more compassionate to oneself may help people with diabetes manage their disease and stave off depression, a recent study suggests.

Self-compassion may help people with diabetes achieve better glucose control and less depression

By Reyna Gobel(Reuters Health) – Learning to be less harsh or judgmental and more...

REUTERS.COM | BY REYNA GOBEL

Landmark Trials



Quick Question 3A

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

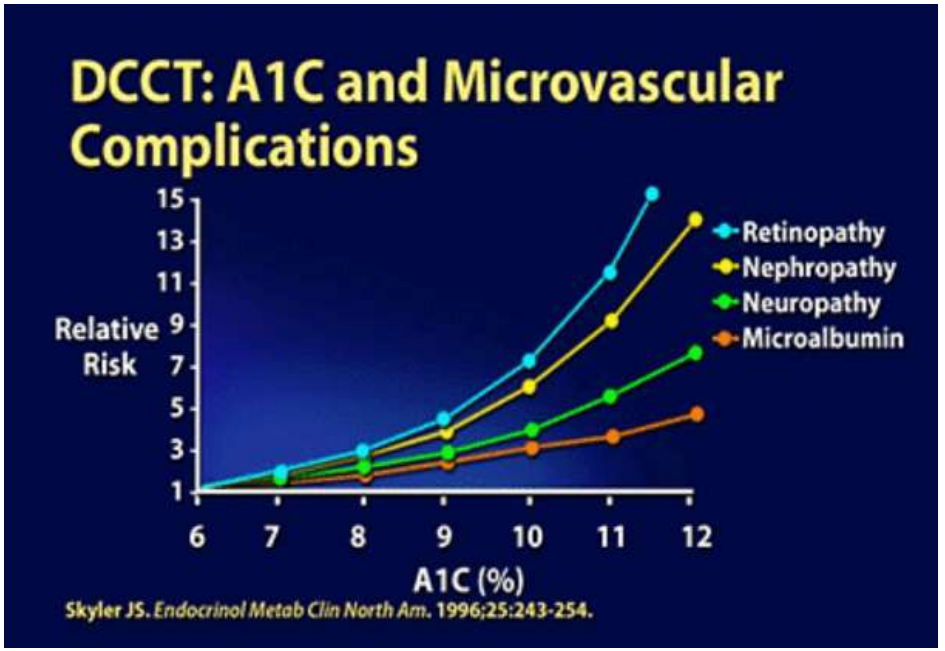
Diabetes Control and Complications Trial (DCCT) Type 1 – Does getting A1c <7% matter?

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

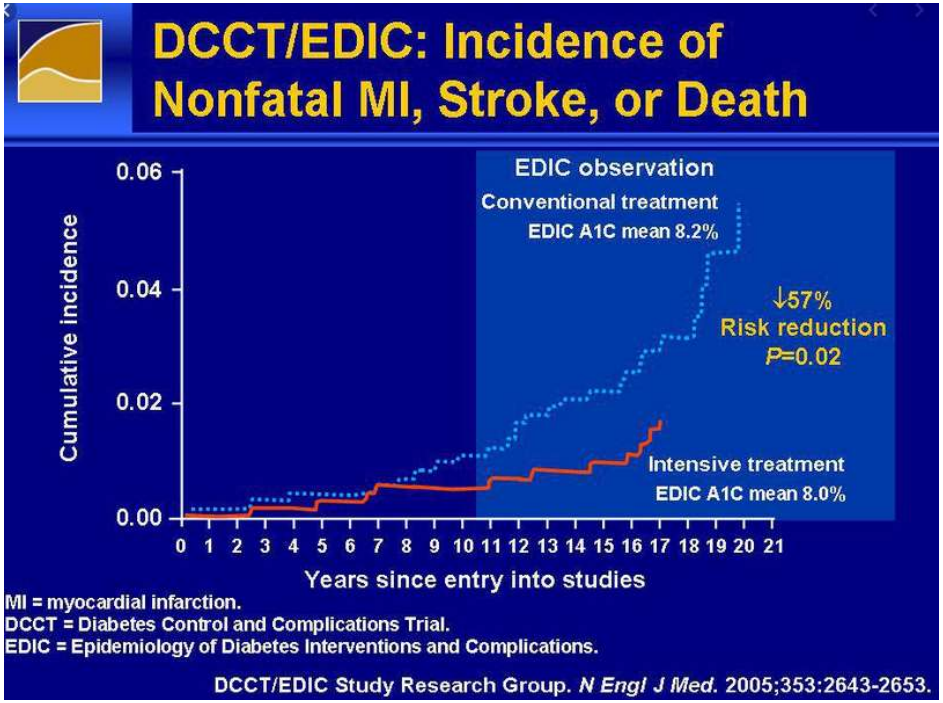
- Conducted over 20 years involving over 5,100 patients with Type 2 diabetes

- 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 (ophthalmologist) at least

G The goal for triglyceride level is less than

G Goal for my HDL cholesterol is more than

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

G People with DM should get this shot every year

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

G Periodontal disease indicates increased risk for heart disease

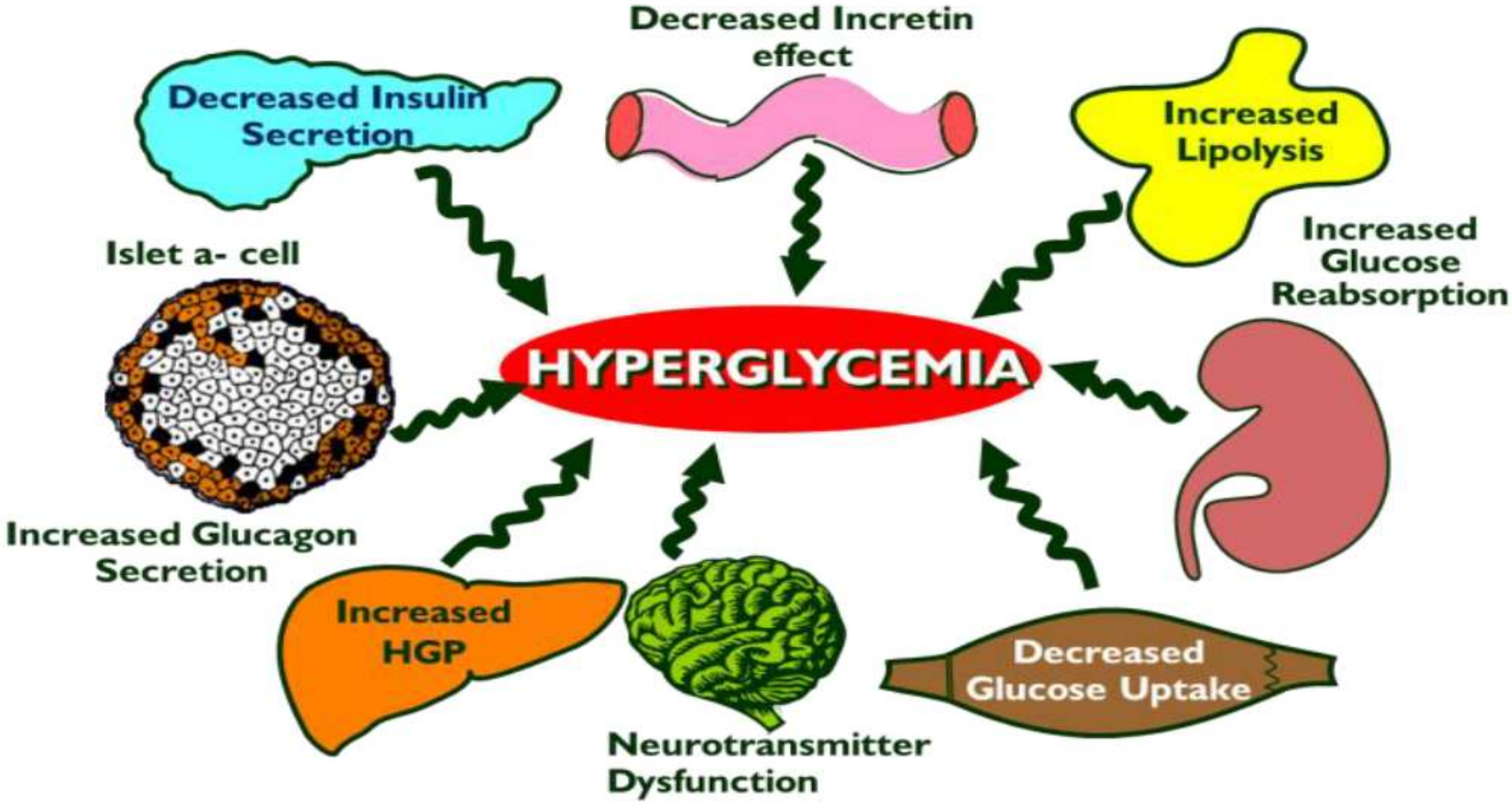
G The goal for blood sugar levels before meals is:

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

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

Drug Targets in Diabetes



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

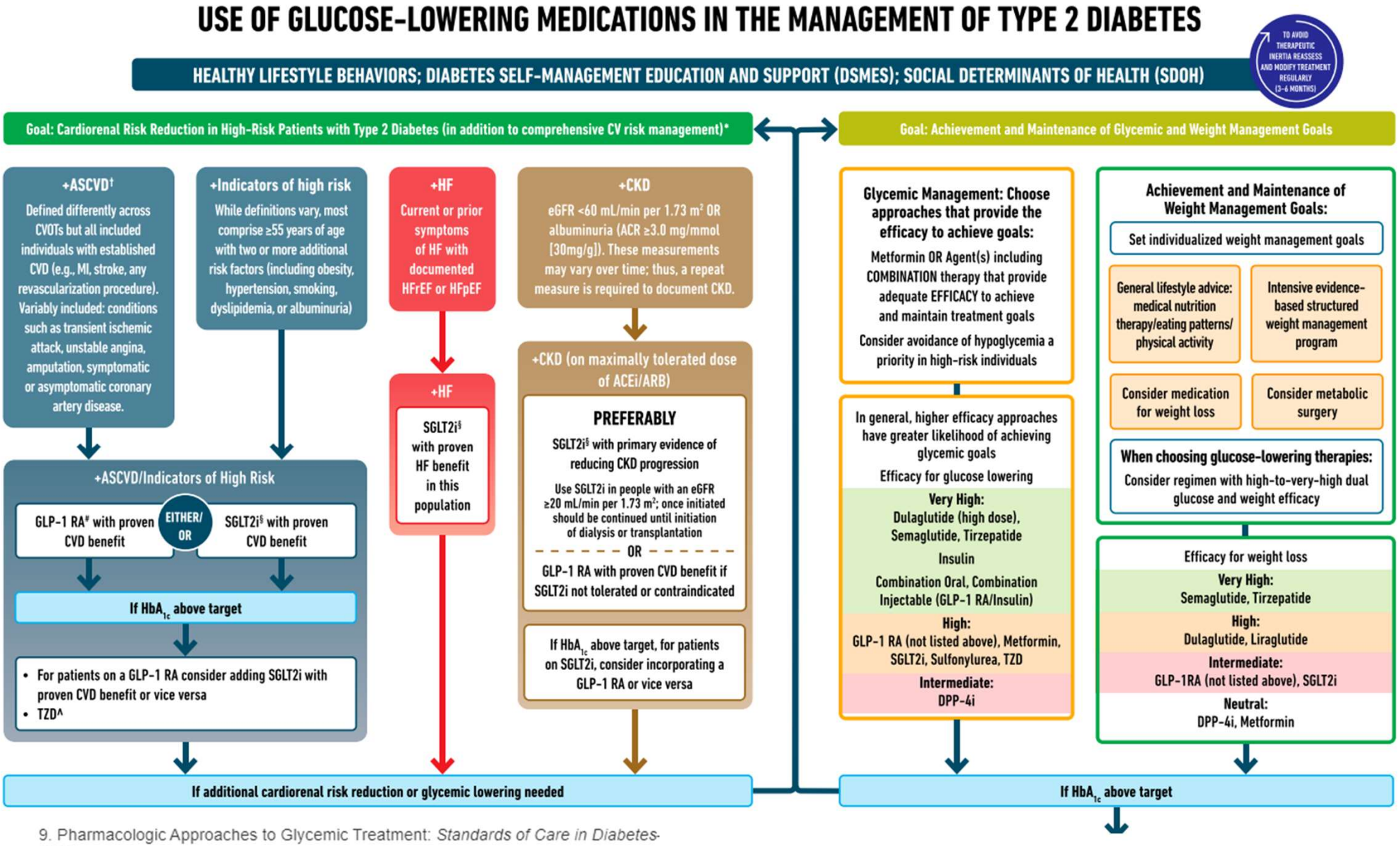
Section 9- Pharmacologic Approaches to Glycemic Treatment for Type 2 Diabetes

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

9. Pharmacologic Approaches to Glycemic Treatment: *Standards of Care in Diabetes-2024* FREE

American Diabetes Association Professional Practice Committee

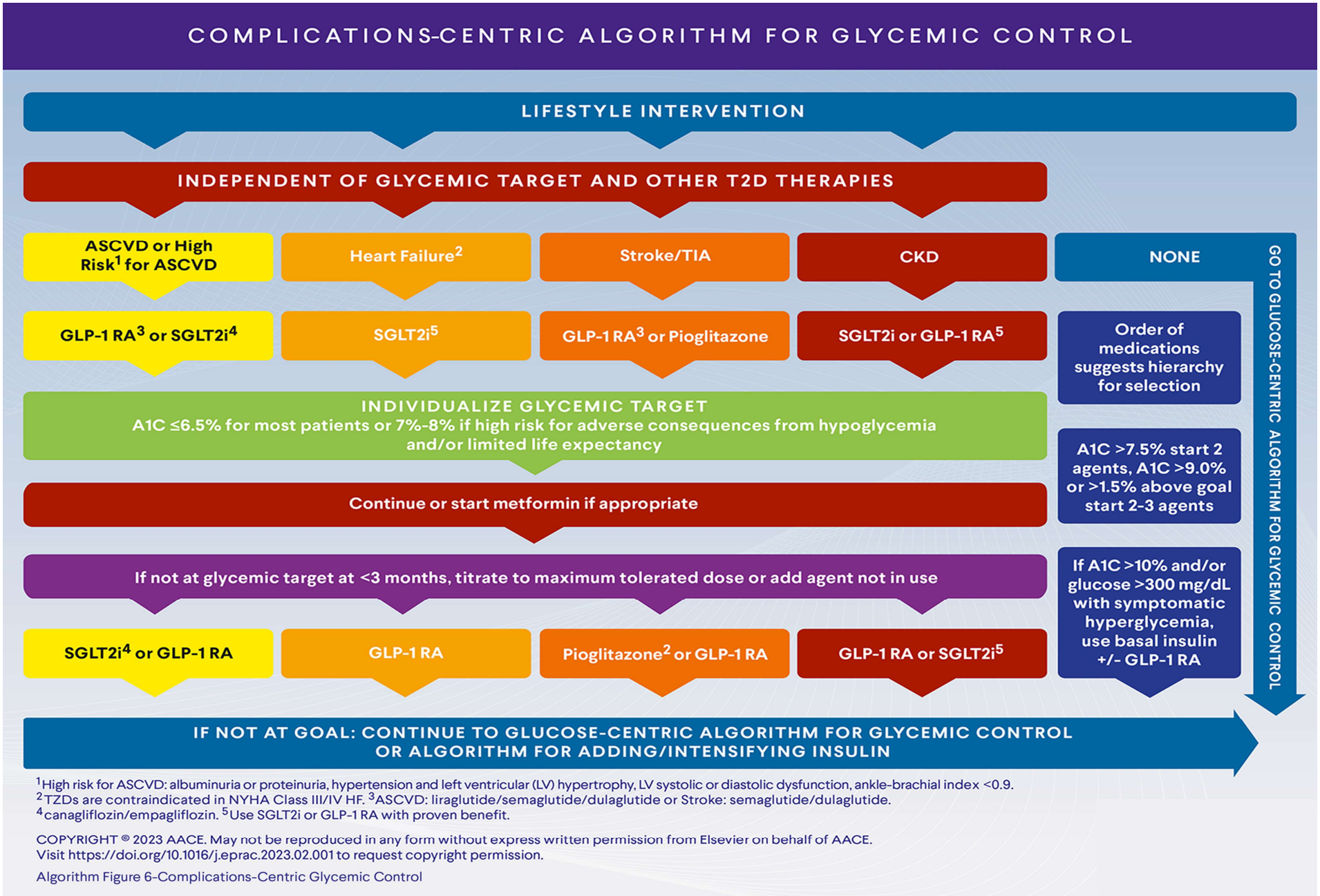
ADA Meds Management for Type 2



9. Pharmacologic Approaches to Glycemic Treatment: *Standards of Care in Diabetes-2024* FREE

American Diabetes Association Professional Practice Committee

AACE 2023 Diabetes Guideline



[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.

COPYRIGHT ® 2023 AACE. May not be reproduced in any form without express written permission from Elsevier on behalf of AACE.
Visit https://doi.org/10.1016/j.eprac.2023.02.001 to request copyright permission.

Algorithm Figure 6-Complications-Centric Glycemic Control

Indications for Insulin Sensitizers

Rosiglitazone (Avandia), Pioglitazone (Actos)

- **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
  - rosiglitazone (Avandia)
    - Dosing: 4-8 mg daily

- **Efficacy/ Considerations**
  - Reduce A1C ~0.5-1.0%
  - 6 weeks for maximum effect
  - Actos $5 a month, Avandia $300 a month
  - Can cause fluid retention, not indicated w/ CHF

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%

TZDs – How Do They Rate?

Question	Answer
Cause hypoglycemia?	No
Cause weight gain?	Yes
Affordable?	Generic
Lowers CV risk?	??
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 efficacious 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

DPP – 4 Inhibitors "Incretin Enhancers" • Prolongs action of gut hormones • Increases insulin secretion • Delays gastric emptying	sitagliptin (Januvia)	25 - 100 mg daily – eliminated via kidney*	*If creat elevated, see med insert for dosing. **Side effects:** headache and flu-like symptoms. **Can cause severe, disabling joint pain.** Contact MD, stop med. Report signs of pancreatitis. †Alogliptin can increase risk of heart failure. Notify MD for shortness of breath, edema, weakness, etc. No wt gain or hypoglycemia. Lowers A1c 0.6%-0.8%.
	linagliptin (Tradjenta)	5 mg daily – eliminated via feces	
	alogliptin (Nesina)†	6.25 - 25 mg daily – eliminated via kidney*	

- DPP-IV Dosing and Diabetes Med PocketCards

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 Med Classes

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) nateglinide (Starlix)	0.5 – 4 mg w/meals (metabolized in liver) 60 – 120 mg w/meals (eliminated via kidney)	Take before meals. Side effects may include hypoglycemia and weight gain. Lowers A1c 1.0% – 2.0%.
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%

DiabetesEd.net ©2024

Drug Comparison

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

Check Your Knowledge – No Poll

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

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

Medication Cost Considerations

- Lowest cost medications - AWP for a month
  - Metformin - $3
  - Sulfonylureas $3
  - TZD – Pioglitazone $3
  - Lower cost insulin
  - Brenzavvy-$48, costplus
  - Insulin-$35
- 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.

DiabetesEd.net ©2024

ADA 2024 Standard 11 - Chronic Kidney Disease and Risk Management

- Optimize glucose and BP to protect kidneys
- Screen Urine Albumin Creatinine ratio (UACR) & GFR
  - Type 2 at dx then yearly
  - Type 1 with diabetes for 5 years, then yearly
  - If urinary albumin ≥300 and GFR 30–60 monitor 1-4 times a year to guide therapy.
- Treat hypertension with ACEI or ARB and for elevated albumin-to-creatinine ratio of 30 -299.
- Monitor serum creat and K+
  - if on ACE, ARB or diuretics

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

11. Chronic Kidney Disease and Risk Management: *Standards of Care in Diabetes—2024*
FREE

Poll Question 5

- Evaluating kidney function is important to determine most beneficial treatment interventions. Which of the following measurements would indicate that JR has healthy kidney function?

A. Urinary albumin creatinine ratio of 30-299 mg/g with GFR of 45.
B. GFR of 60 or greater and urinary albumin creatinine ratio of 12 mg/g.
C. Urinary albumin creatinine ratio less than 30 mg/g and GFR of 30-45.

- Creatinine of 1.5 and urinary albumin creatinine ratio of 300 mg/g or greater.

11. Chronic Kidney Disease and Risk Management: *Standards of Care in Diabetes—2024*

FREE

				Albuminuria categories Description and range		
				A1	**A2**	**A3**
CKD is classified based on: **• Cause (C)** **• GFR (G)** **• Albuminuria (A)**				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
GFR categories (mL/min/1.73 m²) Description and range	**G1**	Normal or high	≥90	Screen 1	Treat 1	Treat and refer 3
	G2	Mildly decreased	60–89	Screen 1	Treat 1	Treat and refer 3
	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

Diabetes + CKD – Increases CVD Risk

- Chronic kidney disease (CKD) is a frequent complication in diabetes
  - Type 1 diabetes ~30%
  - Type 2 diabetes ~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

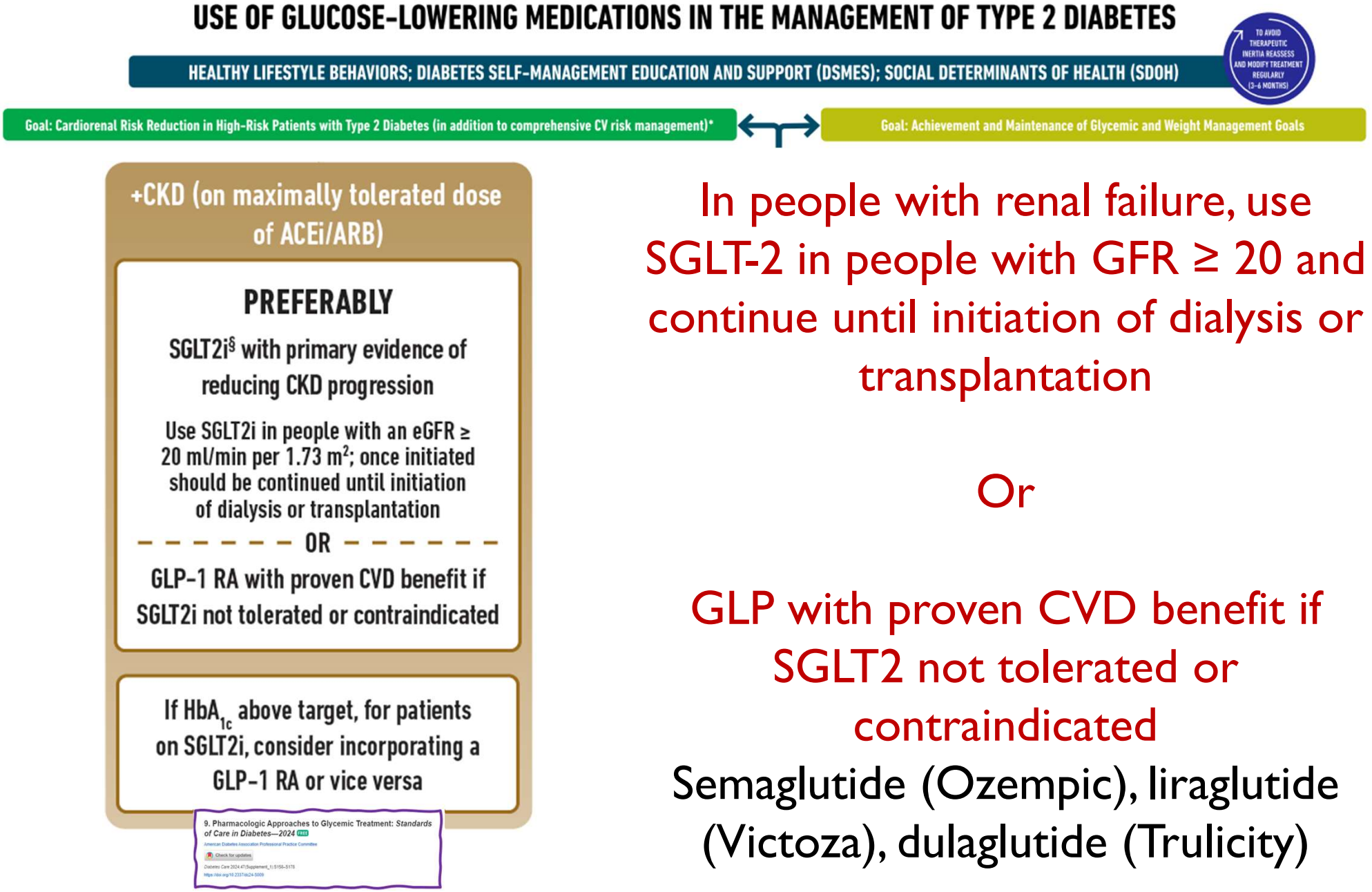
Standard 11 – Protect Kidneys

- Diabetes with a
  - GFR ≥20 and
  - UACR ≥200 mg/g
- Start SGLT2 to reduce chronic kidney disease progression and cardiovascular events.

- If type 2 diabetes and established Chronic Kidney Disease (CKD)
  - Start nonsteroidal mineralocorticoid receptor antagonist (finerenone) and/or GLP-1 RA recommended for cardiovascular risk reduction.

11. Chronic Kidney Disease and Risk Management: *Standards of Care in Diabetes—2024*
FREE

Choosing glucose-lowering medication in people with Chronic Kidney Disease



In people with renal failure, use SGLT-2 in people with GFR ≥ 20 and continue until initiation of dialysis or transplantation

Or

GLP with proven CVD benefit if SGLT2 not tolerated or contraindicated

Semaglutide (Ozempic), liraglutide (Victoza), dulaglutide (Trulicity)

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 create or death from renal or CV cause** (primary): 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**): 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**): 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.

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	20mg daily	As an adjunct to diet and exercise to improve glycemic control in adults with T2DM

Finereone's Place in Therapy

- In people with CKD and albuminuria who are at increased risk for CV events or CKD progression
  - a nonsteroidal mineralocorticoid receptor antagonist (finerenone) is recommended to reduce CKD progression and CV events.
- First optimize ACEI or ARB

11. Chronic Kidney Disease and Risk Management: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

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

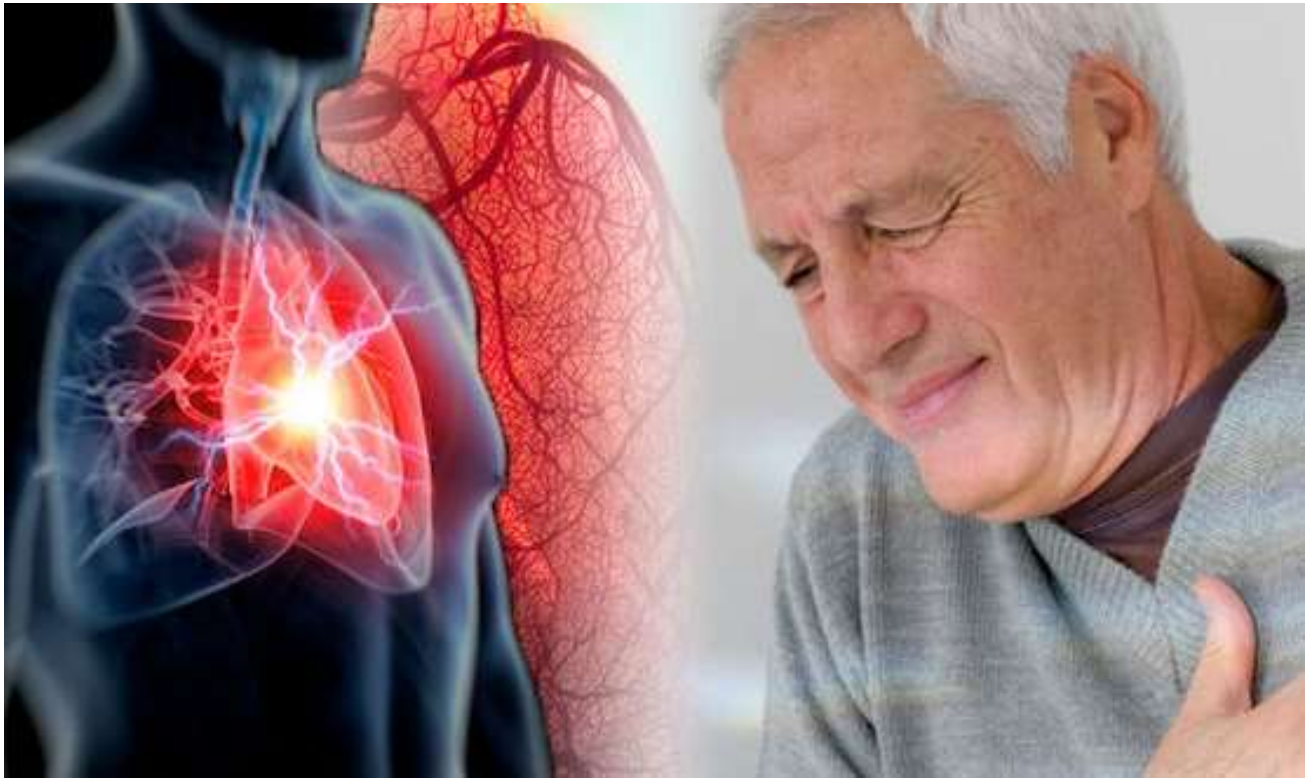
- **Nutrition Recommendations**
- For people with non–dialysis-dependent stage 3 or higher chronic kidney disease
  - dietary protein intake aimed to a target level of 0.8 g/kg body weight per day.
- For those on dialysis,
  - consider higher levels of dietary protein intake since protein energy wasting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

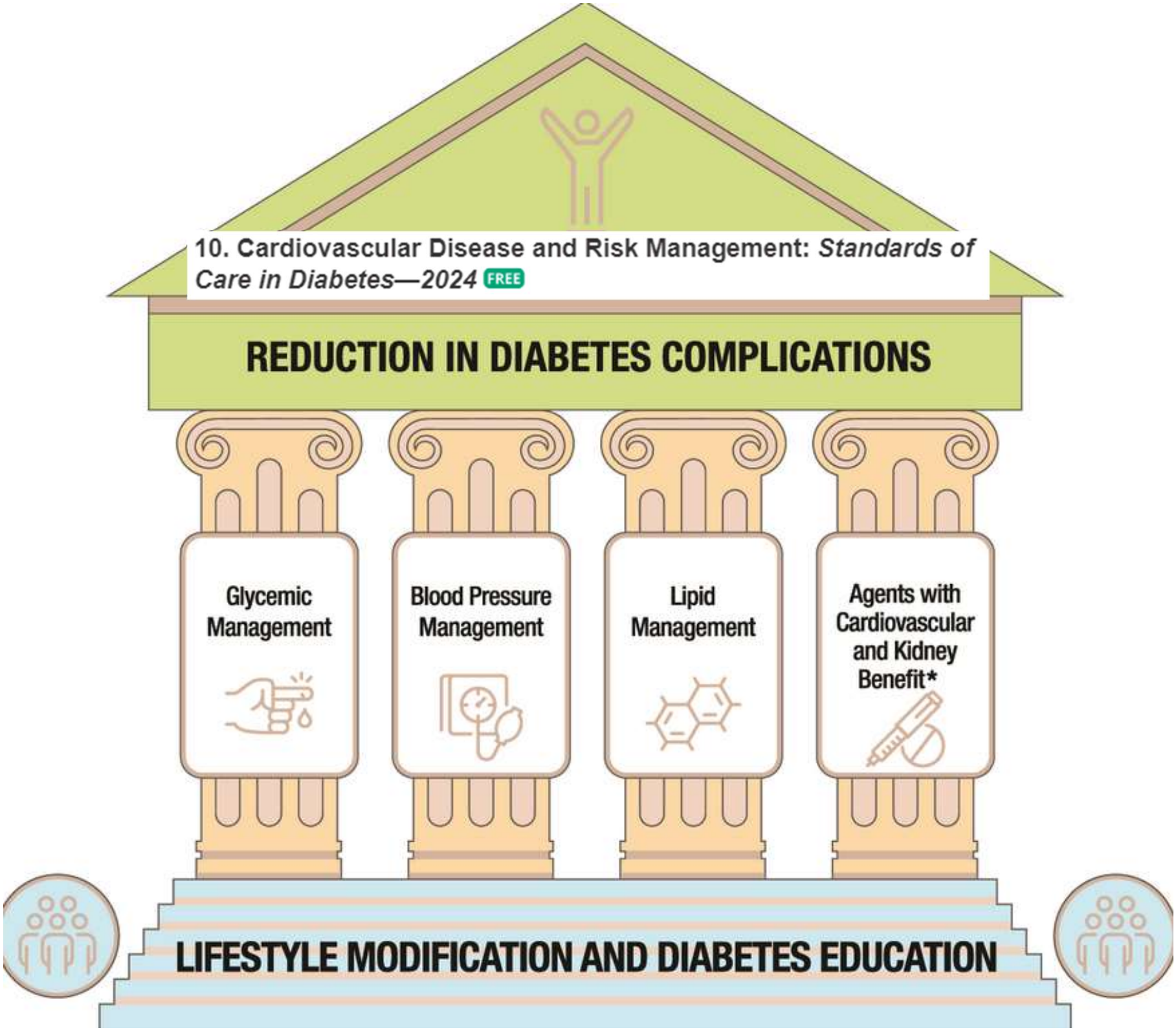
11. Chronic Kidney Disease and Risk Management: *Standards of Care in Diabetes—2023* FREE

DiaBingo - O

- SGLT-2 Inhibitors main action
- Januvia(sitagliptin) belongs to which class?
- These classes of diabetes pills increase insulin release
- Which treatments help lower elevated fasting BG
- 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
- Side effects of Canagliflozin (Invokana) include
- If GI side effects on Metformin try ____

Cardiovascular Disease is the Leading Cause of Death in Diabetes




10. Cardiovascular Disease and Risk Management: *Standards of Care in Diabetes—2024* FREE
REDUCTION IN DIABETES COMPLICATIONS
Glycemic Management
Blood Pressure Management
Lipid Management
Agents with Cardiovascular and Kidney Benefit*
LIFESTYLE MODIFICATION AND DIABETES EDUCATION

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

- Atherosclerotic cardiovascular disease (ASCVD) and Heart Failure are leadings causes of morbidity and mortality in diabetes.
- ASCVD includes:
  - coronary heart disease (CHD),
  - cerebrovascular disease, or
  - peripheral arterial disease
- $39.4 billion in cardiovascular-related spending per year

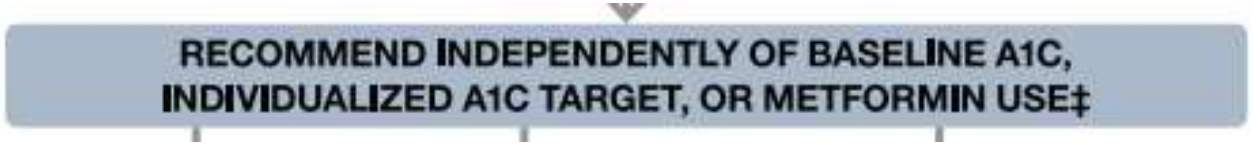
Large benefits are seen when multiple CV risk factors are addressed simultaneously

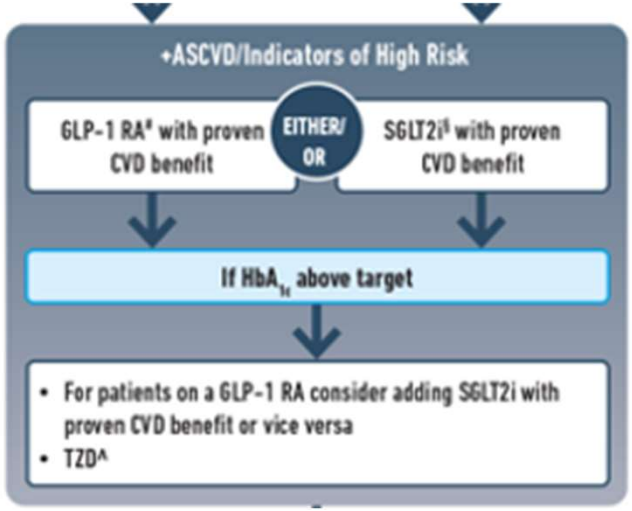
With more aggressive goals, rates of CVD have decreased over past decade

10. Cardiovascular Disease and Risk Management: *Standards of Care in Diabetes—2024* FREE

Atherosclerotic Cardiovascular Disease

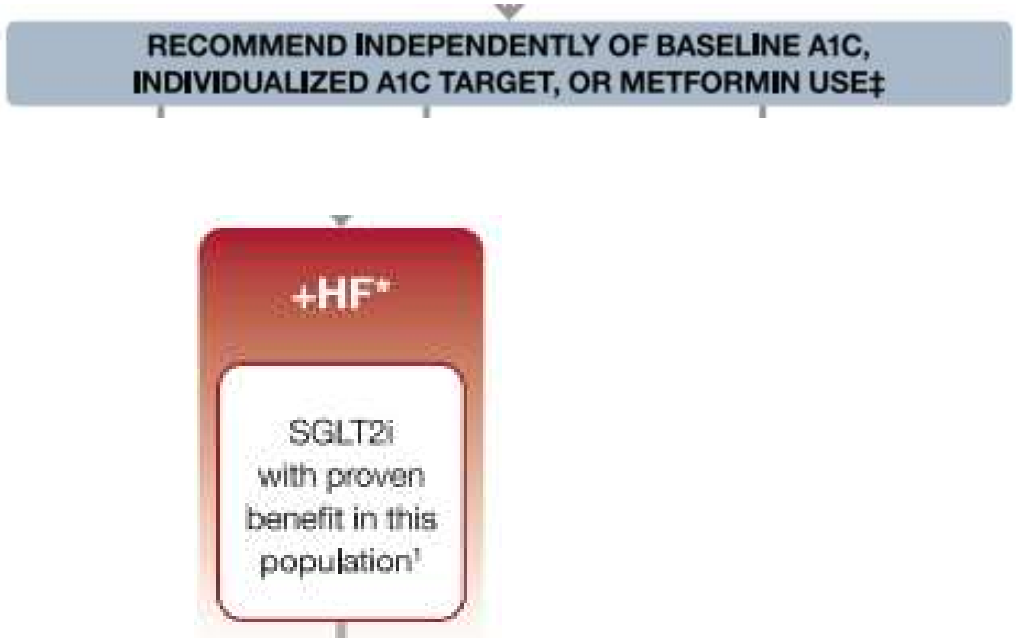
- ASCVD risk
  - Established CV disease
  - High CV Risk
    - 55+ with 2 or more risk factors
    - Risk factors include obesity, HTN, dyslipidemia, albuminuria, smoking
  - Most effective meds based on Cardiovascular Outcomes Trials (CVOT)
    - SGLT2i - Empagliflozin (Jardiance), canagliflozin (Invokana),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





Diabetes Care 2023;46(Suppl. 1):S125-S143.

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

Proven benefit: All

9. Pharmacologic Approaches to Glycemic Treatment: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

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)

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

GLP-1 Analog CVOT Data Summary

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**
PIONEER-6	**Semaglutide oral**/ placebo	84.7% Prior CVD, **3 point MACE** 0.79 (0.57-1.11) N=3183, Median follow-up 1.3 years	As an adjunct to diet and exercise to improve glycemic control in adults with type 2 DM
EXSCEL	**Exenatide** – (weekly)/ placebo	73.1% Prior CVD, **3 point MACE** 0.91 (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

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

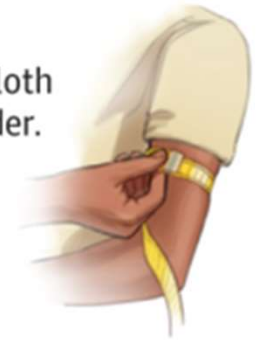
Individuals with SBP and DBP in 2 categories should be designated to the higher BP category

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 2024

- **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 ind 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

10. Cardiovascular Disease and Risk Management: *Standards of Care in Diabetes—2024* FREE

BP Treatment in addition to Lifestyle

- **First Line B/P Drugs if 130/80 +**
  - With albuminuria* or ASCVD
    - 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+ 7-14 days after start/annually
  - Avoid ACE and ARB at same time
  - Multiple Drug Therapy often required
- **If B/P ≥ 150 /90 start 2 drug combo**

*Albuminuria = Urinary albumin creatinine ratio of 30+

10. Cardiovascular Disease and Risk Management: *Standards of Care in Diabetes—2024* FREE

Recommendations for the Treatment of Confirmed Hypertension in Nonpregnant People With Diabetes

Initial BP ≥130/80 and <150/90 mmHg

Start one agent

Albuminuria or CAD*

No

Start one drug:
- ACEi or ARB
- CCB†
- Diuretic‡

Yes

Start:
- ACEi or ARB

Lifestyle management

Initial BP ≥150/90 mmHg

Start two agents

Albuminuria or CAD*

No

Start drug from 2 of 3 options:
- ACEi or ARB
- CCB†
- Diuretic‡

Yes

Start:
- ACEi or ARB

and

- CCB† or Diuretic‡

Assess BP Control and Adverse Effects

See Cheat Sheets & appendix in back of syllabus

10. Cardiovascular Disease and Risk Management: *Standards of Care in Diabetes—2024* FREE

Cost vs Benefit of Treating HTN

- Consider potential adverse effects of BP medications
  - Hypotension, syncope, falls, acute kidney injury, and electrolyte abnormalities
  - Older people, those with chronic kidney disease, 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 B/P targets to enhance quality of life.

10. Cardiovascular Disease and Risk Management: *Standards of Care in Diabetes—2024* FREE

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

10. Cardiovascular Disease and Risk Management: *Standards of Care in Diabetes—2024* FREE

Back to Alice

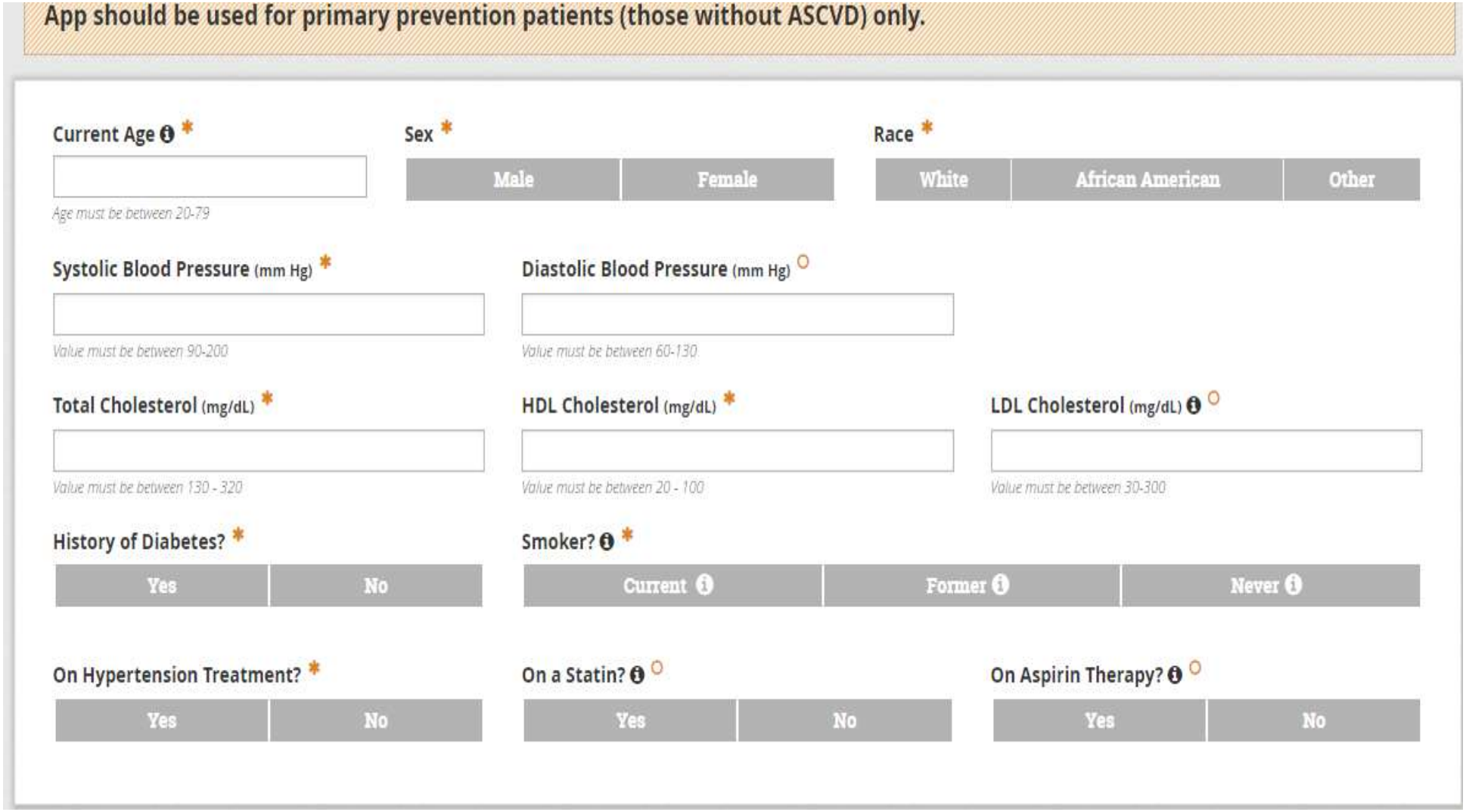
Alice is a 56yo AAF presenting for follow-up for type 2 diabetes. Alice reports that her blood pressure has been higher lately. Denies s/sx of hypoglycemia.

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

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

Calculating ASCVD Risk

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



What Is Alice's ASCVD risk?

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

Poll 6 - 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

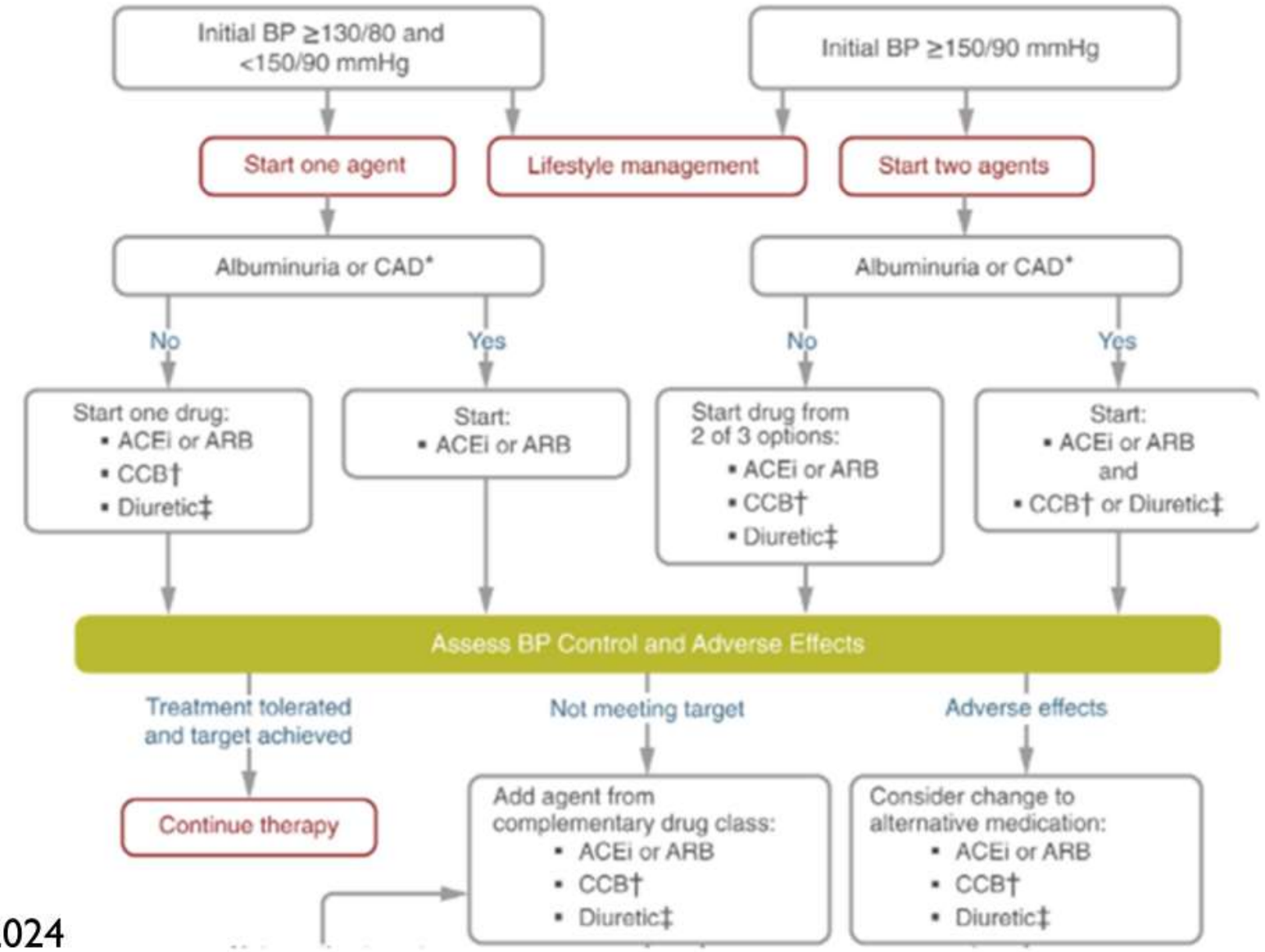
Does Alice have albuminuria?

Albumin to Creatinine ratio (ACR)= 202 mg/g

YES

Recommendations for the Treatment of Confirmed Hypertension in Nonpregnant People With Diabetes

ADA 2024 Standards of Diabetes Care
Figure 10.2 Vol.47, S179-218



ADASOC 2024

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 same time each day. Effects seen w/in 1 hr of admin, max effects in 6 hrs. **Side effects**: Can cause cough (due to increased bradykinin) – can try different med in same class. Also can cause fatigue, dizziness, hypotension. †These meds are also available as a combo w/ low dose HCTZ (hydrochlorothiazide). ‡These meds are also available as a combo w/ CCB (calcium channel blocker) usually amlodipine
	captopril /Capoten*†	12.5 - 100 mg	2-3 x a day	
	Enalopril/ Vasotec*†	2.5 - 40 mg	1-2 x a day	
	Fosinopil / Monopril†	10- 40 mg	1 x a day	
	Lisinopril *† Prinivil Zestril	 10 – 40 mg 10 - 40 mg		
	Ramipril / Altace*†	2.5 – 10 mg		
	Moexipril / Univasc†	3.75 - 15 mg		
	Perindopril/Aceon‡ Perindopril/ Indapamide combo (Coversyl)	2-16 mg 2 - 8 mg 0.625 - 2.5 mg		
	Quinapril /Accupril†	5 – 40 mg		
	Trandolapril/ Mavik Trandolapril/ Verapamil combo (TARKA)	1.0 – 4 mg 1-4 mg 180 to 240 mg		

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 same time each day **Side effects**- Can cause dizziness, drowsiness, diarrhea, hyperkalemia, hypotension. †These meds are also available as a combo w/ low dose HCTZ (hydrochlorothiazide). ‡These meds are also available as a combo w/ CCB (calcium channel blocker) usually amlodipine
	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 (triple combo)	80 – 320 mg		
	Valsartan/ Nebivolol combo (Byvalson)	80 mg 5 mg		

Initial dose adjustment may be needed for renal dysfunction or elderly

See Med Cheat Sheets

ACEI/ARB Adverse Effects

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

- Contraindications
  - Pregnancy
  - Bilateral renal artery stenosis

Thiazide diuretics

Class / Action	Generic / Trade Name	Usual Daily Dose Range	Considerations
Thiazide Diuretics **Action:** cause diuresis and decrease vascular resistance. (Many meds combined with this class)	Hydrochlorathiazide (HCTZ)* HydroDIURIL Microzide	12.5 – 25 mg Most frequently prescribed	1 x daily in am with or w/out food **Side effects**: lyte imbalances; hypokalemia, hypomagnesemia, hyperuricemia, hyperglycemia, hyperlipidemia and hyper/hypocalcemia. S/S include muscle cramps, fatigue, dizziness and cardiac arrhythmias .
	Chlorthalidone / Clorpres*	12.5 – 25 mg	
	Metolazone / Zaroxolyn*	2.5 – 20 mg	
	Indapamide / Lozol*	1.2 – 2.5 mg	

See Med Cheat Sheets

Calcium Channel Blockers

Calcium Channel Blockers are usually second or third line BP med for diabetes, since they have less impact on CVD. They may also be used for those who can't tolerate ACE or ARB Therapy.

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***	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 extended release*			
	Cardizem CD	120 – 480 mg	1 x day	
	Tiazac	120 – 540 mg	1 x day	
	Dilacor, Diltia	180 – 540 mg	1 x day	
	Verapamil immediate release* Calan	80 -320 mg	3 x day	
	Verapamil sustained release* Calan SR, Veralan	120 mg – 480 mg	1 -2 x day	
	Verapamil extended release*			
	Covera-HS	120 – 480 mg	1 x day	
	Verelan PM	100 – 400 mg		
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
- Consider 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
- Side effects: depression, sexual dysfunction, exercise intolerance, sedation, dizziness
- Monitor BP, lipids, heart rate, glucose
- When stopping, taper dose gradually
- Can elevate glucose and mask adrenergic symptoms of hypoglycemia (ex. tachycardia)
  - Sweating will still occur (cholinergic mediated)

Beta Blockers are commonly prescribed as an add-on to other B/P meds for people with DM. Beta Blockers are beneficial for persons w/ concurrent cardiac problems and prevention of recurrent MI and heart failure. Caution in DM since Beta Blockers can cause hyperglycemia and mask hypoglycemia induced tachycardia (but do not block hypoglycemia related dizziness and sweating). Monitor B/P, heart rate, lipids and glucose.

Beta Blockers *β1- Selective* **Action:** Blockade β1 receptors & reduce cardiac output & kidney renin activation.g	Acebutolol / Sectral*	200 – 800 mg	2 x daily	Side Effects: Usually CNS related including sedation, dizziness, lightheaded . Watch for bradycardia, hypotension, depression and sexual dysfunction. Check heart rate each visit, adjust dose if HR <50. Can cause heart block – review package insert for drug-drug interactions. Watch for exercise intolerance. When stopping beta blockers, taper dose gradually. Use cautiously at lowest dose. †These meds are also available as a combo w/ low dose HCTZ (hydrochlorothiazide).
	Atenolol / Tenormin*	25 – 100 mg	1 x daily	
	Atenolol with Chlorthalidone/ Tenoretic	50 -100 mg 25 mg	1 x daily 1 x daily	
	Betaxolol / Kerlone	5 – 10 mg	2 x daily	
	Bisoprolol/ Zebeta†	2.5 – 10 mg		
	Metoprolol tartate/Lopressor*†	25 – 100 mg	1 x daily	
	Metoprolol succinate / Toprol XL	25 - 100 mg		
	Nebivolol/Bystolic	5 to 40 mg		
	Nebivolol with Valsartan/ Byvalson	5 mg 80 mg		
Beta Blockers *Non Selective* **Action**: Blockades β1 & β2	Nadolol / Corgard* Nadolol with Bendroflumethiazide	40 - 120 mg 40-80 mg 5 mg	1 x daily	
	Penbutolol / Levatol	10 - 40 mg	1 x daily	
	Pindolol / Visken	10 – 40 mg	2 x daily	
	Propanolol / Inderal* Inderal LA (extended)	40 – 160 mg 60 – 180 mg	2 x daily 1 x daily	
	Timolol / Blocadren*	10 – 60 mg	2 x daily	
Combined α- and β- Blockers	Corvedilol / Coreg Coreg CR	6.25 – 50 mg 20 – 80 mg	2 x daily 1 x daily	Same precautions as beta blockers.
	Labetalol / Normodyne*	100 – 2400 mg	2 x daily	

Other Hypertension Meds

- Direct renin inhibitors (Alsikiren-Tekturna®)
  - Similar side effects to ACEI/ARB, rarely used in clinical practice
- Combined alpha and beta blockers (ex. Carvedilol)
  - Similar precautions as beta blockers, additional MOA
- 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

Other hypertension meds (cont)

- Alpha 1 blockers (Doxazosin, Prazosin, Terazosin)
  - Vasodilator, risk of orthostatic hypotension
  - Often used for people with DM + benign prostatic hypertrophy (BPH)
- Alpha 2 agonists (Clonidine, Methyldopa)
  - Centrally acting
  - Administer with a diuretic
  - Side effects: sedation, dry mouth, orthostatic hypotension, impotence
  - Avoid abrupt discontinuation

α1 – Receptor Blockers - Often used for pts with DM & benign prostatic hypertrophy (BPH).				
α1 – Receptor Blockers Vasodilation	Doxazoxin/Cardura*	1 – 8 mg	1 x day	Take at hs and low dose to reduce risk of postural hypotension/syncope.
	Prazosin / Minipress*	2 – 20 mg	2 - 3 day	
	Terazosin/ Hytrin*	1 – 10 mg	1 – 2 day	
α2 agonists- Not usually first line due to side effects. Effective in pts w/ renal disease, since does not compromise renal function.				
α2 agonists – Centrally act to block influence of norepinephrine on the heart and lower B/P	Clonidine / Catapres*	0.1 to 0.8 mg	2 x day	Administer w/ diuretic. Side effects: sedation, dry mouth, bradycardia orthostatic hypotension, impotence. Do not stop abruptly, can cause hypertensive crisis.
	Methyldopa / Aldomet*	250 – 1000 mg	2-3 x day	

Poll 7 - 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

Cholesterol Management in People with Diabetes

- 1 minute stretch and Questions?

Poll Question 8

RZ is 47 years old with type 2 diabetes and hypertension. RZ takes metformin 1000 mg BID, plus lisinopril 20mg daily. RZs LDL is 130 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. Lower LDL by 30%.

C. LDL target of 65 mg/dL or less.

D. Determine LDL target based on ASCVD risk.

Lipid Goals – Primary Prevention

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

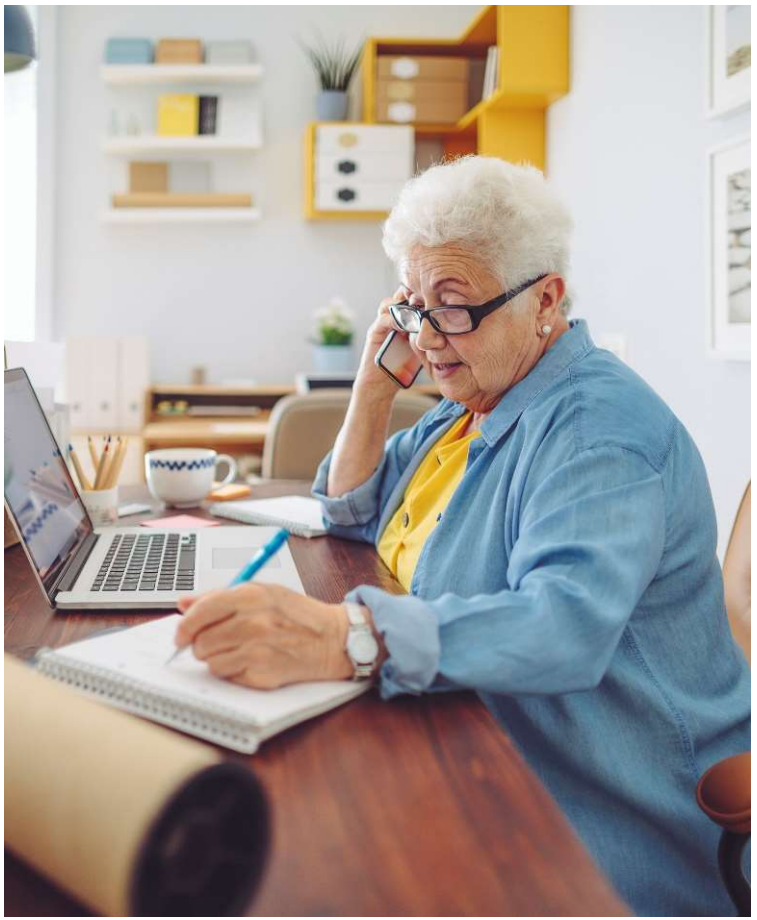
    AND
  - **Target LDL cholesterol <70 mg/dL.**

- **If LDL cholesterol 70 +**
  - it may be reasonable to add ezetimibe or a PCSK9 inhibitor to maximum tolerated statin therapy.

10. Cardiovascular Disease and Risk Management: *Standards of Care in Diabetes—2024* FREE

Lipid Goals for People *with* ASCVD

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



10. Cardiovascular Disease and Risk Management: *Standards of Care in Diabetes—2024* FREE

Lipid Therapy in Diabetes by Age

- All ages 20+ *with* ASCVD, add high-intensity statin
- 20–39 and additional ASCVD risk factors
  - may be reasonable to initiate statin therapy
  - 40-75 without ASCVD and low CV risk
    - Moderate intensity statin
  - 40-75 without ASCVD with 1 or more CV risk factor, reduce LDL by 50%, use high-intensity statin, LDL goal <70
- 75 years or older and already on statin
  - it is reasonable to continue statin treatment.
- 75 years or older
  - it may be reasonable to initiate moderate-intensity statin therapy after discussion of potential benefits and risks.

10. Cardiovascular Disease and Risk Management: *Standards of Care in Diabetes—2024* FREE

Statin Dosing

High Intensity:
Lowers LDL ≥50%

- Lipitor (atorvastatin)
  - 40-80mg
- Crestor (rosuvastatin)
  - 20-40mg

Moderate Intensity:
Lower LDL 30-<50%

- Lipitor (atorvastatin)
  - 10-20mg
- Crestor (rosuvastatin)
  - 5-10mg
- Zocor (Simvastatin)
  - 20-40mg
- Pravachol (pravastatin)
  - 40 – 80mg
- Mevacor (lovastatin) 40 mg
- Lescol (fluvastatin) XL 80mg
- Livalo (pitavastatin) 2-4mg

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

See Med Cheat Sheets

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
  - Triglycerides <150
  - LDL target based on risk

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

On statin
Monitor lipids at diagnosis and yearly.
Monitor lipids 4-12 weeks after statin dose adjustment.

- 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 helps lower triglycerides and increase HDL

10. Cardiovascular Disease and Risk Management: *Standards of Care in Diabetes—2024* FREE

Statin Intolerant

- Primary Prevention
  - In people with diabetes intolerant to statin therapy, treatment with bempedoic acid is recommended to reduce cardiovascular event rates as an alternative cholesterol-lowering plan. (A)

- Secondary Prevention
  - For people with diabetes and ASCVD intolerant to statin ther apy, PCSK9 inhibitor therapy with monoclonal antibody treatment, (A), bempedoic acid (A) or PCSK9 inhibitor therapy with inclisiran siRNA (E) should be considered as an alternative cholesterol-lowering therapy.

10. Cardiovascular Disease and Risk Management: *Standards of Care in Diabetes—2024* FREE

Additional Agents to Lower LDL

- Bempedoic acid (Nexltetol), lowers LDL by ~23% when added to statin
  - Reduced CVD events by 13% in people with CVD or high risk and intolerant to statin
  - Mechanism: adenosine triphosphate-citrate lyase (ACL) inhibitor that lowers LDL by inhibition of cholesterol synthesis in the liver.
  - ACL is an enzyme upstream of 3-hydroxy-3-methyl-glutaryl-coenzyme A (HMG-CoA) reductase in the cholesterol biosynthesis pathway.
  - Dose: 180mg orally once daily

Additional Agents to Lower LDL

- Iclisiran (Leqvio), lowers LDL by ~50% when added to statin
  - Studied in ORION-10 and ORION-11 trials
  - CV events reduced, being studied in a longer CVD outcome trial
  - Mechanism: double-stranded small interfering ribonucleic acid (siRNA), conjugated on the sense strand with triantennary N-Acetylgalactosamine (GalNAc) to facilitate uptake by hepatocytes.
  - In hepatocytes, inclisiran utilizes the RNA interference mechanism and directs catalytic breakdown of mRNA for PCSK9.
  - This increases LDL-C receptor recycling and expression on the hepatocyte cell surface, which increases LDL-C uptake and lowers LDL-C levels in the circulation.
  - SC injection, day 1, 90 days, then every 6 months

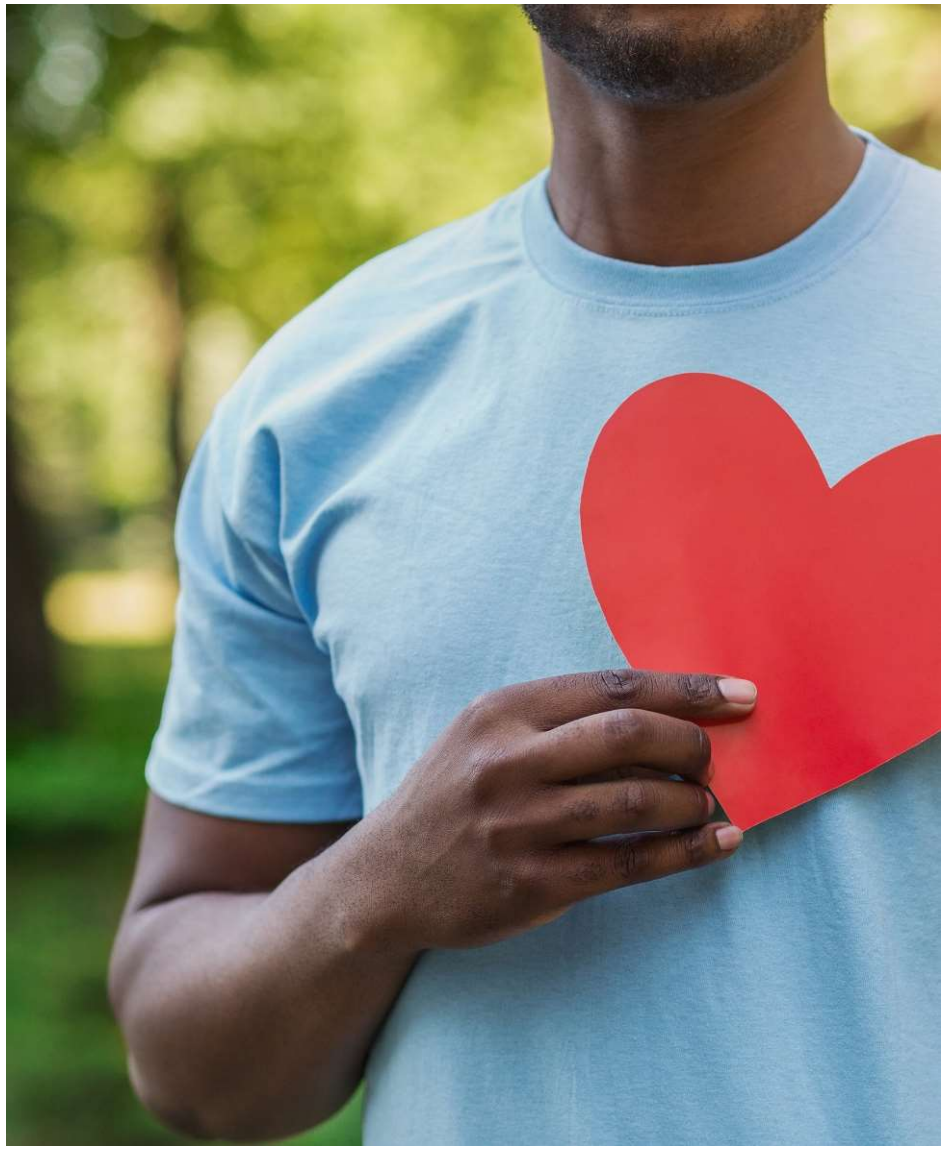
Treating High TG

- 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 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, Vascepa demonstrated a 25% risk reduction in 3 point MACE

Diabetes Meds Lower CV Risk

- If diabetes plus ASCVD risk factors
  - SGLT-2s* and GLP-1s* reduce risk of major adverse CV events
  - Plus ACE or ARB
  - Post MI, continue beta blockers for 3 years.
- If type 2 diabetes and heart failure
  - SGLT-2s reduce risk of heart failure and hospitalization.
  - Also consider beta blocker



10. Cardiovascular Disease and Risk Management: *Standards of Care in Diabetes—2024* FREE

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 8 - 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

ADA 2024 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

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

10. Cardiovascular Disease and Risk Management: *Standards of Care in Diabetes—2024* FREE

Should Alice start aspirin?

A. Yes

B. No

Individualized discussed with shared decision making

Would you change Alice's Diabetes Regimen?

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

Which of the Following Changes Would you Make to Alice's regimen? Poll 10

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

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 11- What Lifestyle Modifications are Recommended for Alice?

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

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

Select all that apply

Thank You – Questions?

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

DiabetesEd Training Conference |San Diego *

Day Two | October 10, 2024 (Pacific Time)

Insulin Pattern Management, Physical Assessment & Diabetes Techn

Time	Topic	Speakers
7:30am – 8:00am	**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 Beverly Dyck Thomassian, RN, BC-ADM, MPH, CDCES
10:45– 12:00	**Diabetes Interview – From Head to Toe** **Microvascular Risk Reduction**	
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**	
3:15 – 4:30	**Integrating Mental Health with Body Health.** **Assessment Tools and Coping**	

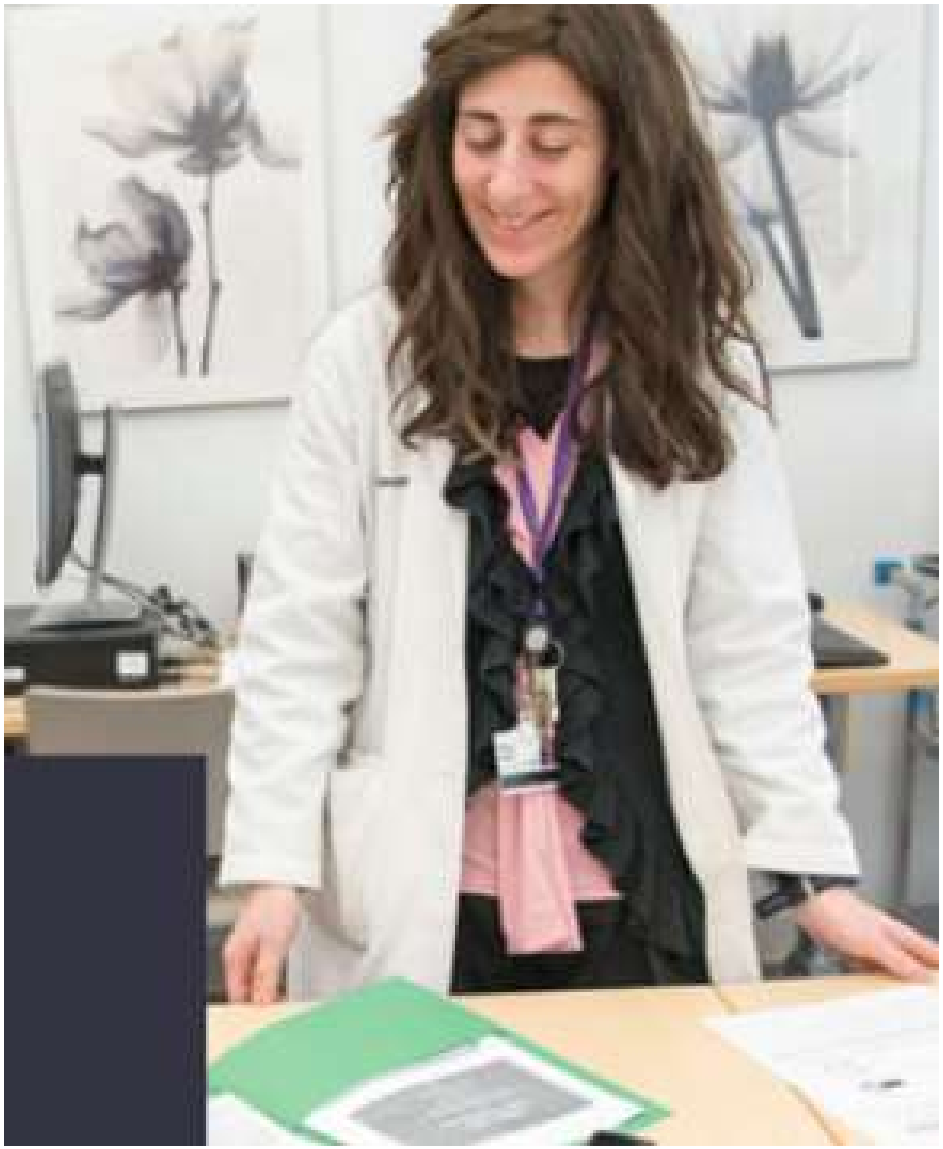
Diabetes Education Services Presents:

DiabetesEd Training Conference 2024 – Day 2

Beverly Thomassian, RN, MPH, BC-ADM, CDCES
Diana Isaacs, PharmD, BCPS, BC-ADM, BCACP CDCES, FADCES, FCCP

www.DiabetesEd.net

Insulin – Ultimate Hormone Replacement Therapy



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

Endocrine Clinical Pharmacy Specialist

Co-Director Endocrine Disorders in Pregnancy

Cleveland Clinic Diabetes Center

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
- Consultant: Undermyfork, Sequel
- ADCES Board Member

Objectives – Insulin –The Ultimate Hormone Replacement Therapy

Objectives:

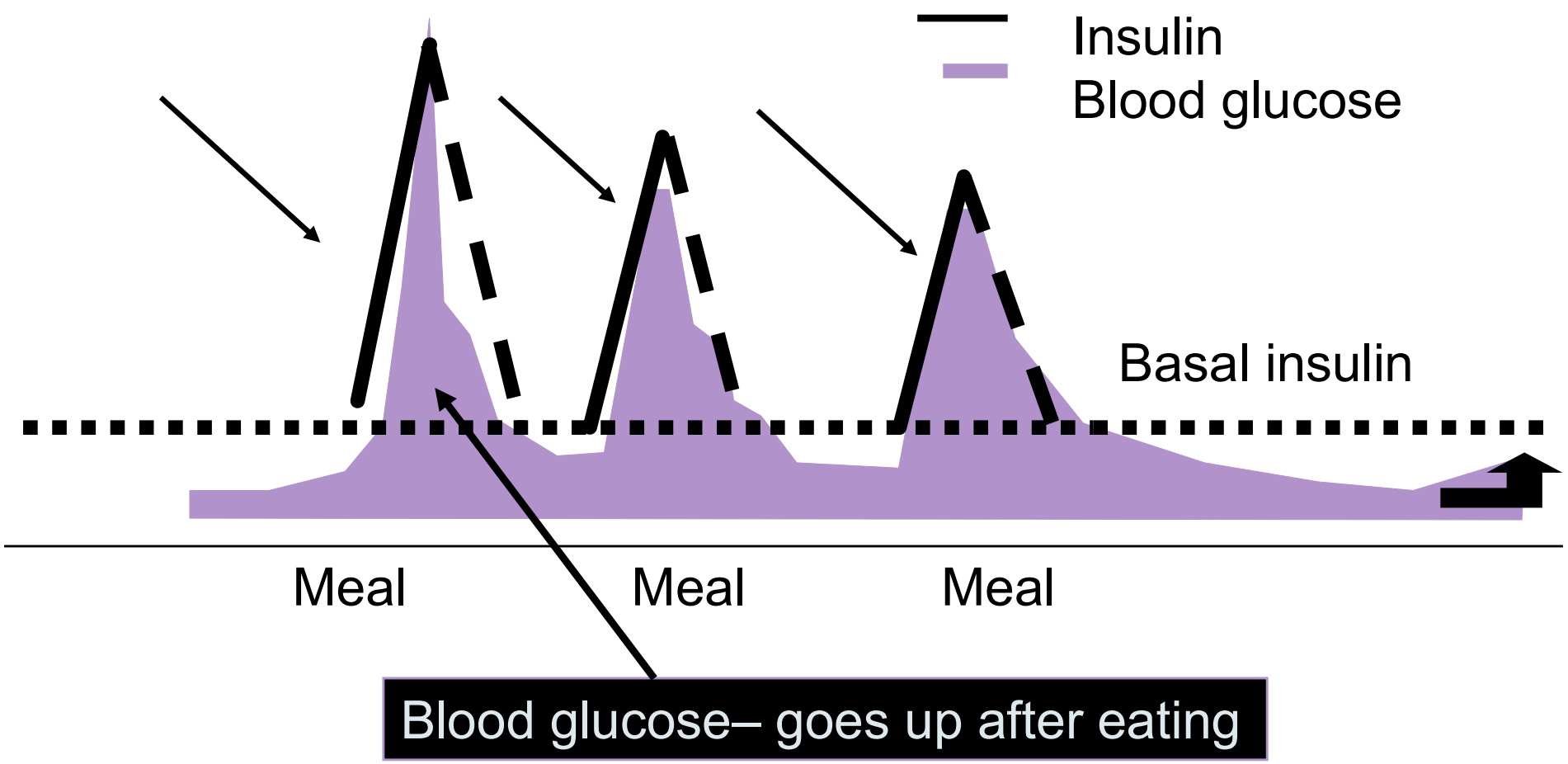
- Discuss the actions of different insulins
- Describe how to use the ADA algorithm for insulin management
- Counsel a person with diabetes on safe and effective insulin use
- Discuss strategies to determine and fine-tune basal and bolus insulin settings based on glucose pattern management
- Describe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

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).

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 type 1 diabetes lack the ability to produce insulin to counteract the liver's effects
- In people with type 2 diabetes, there may not be 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

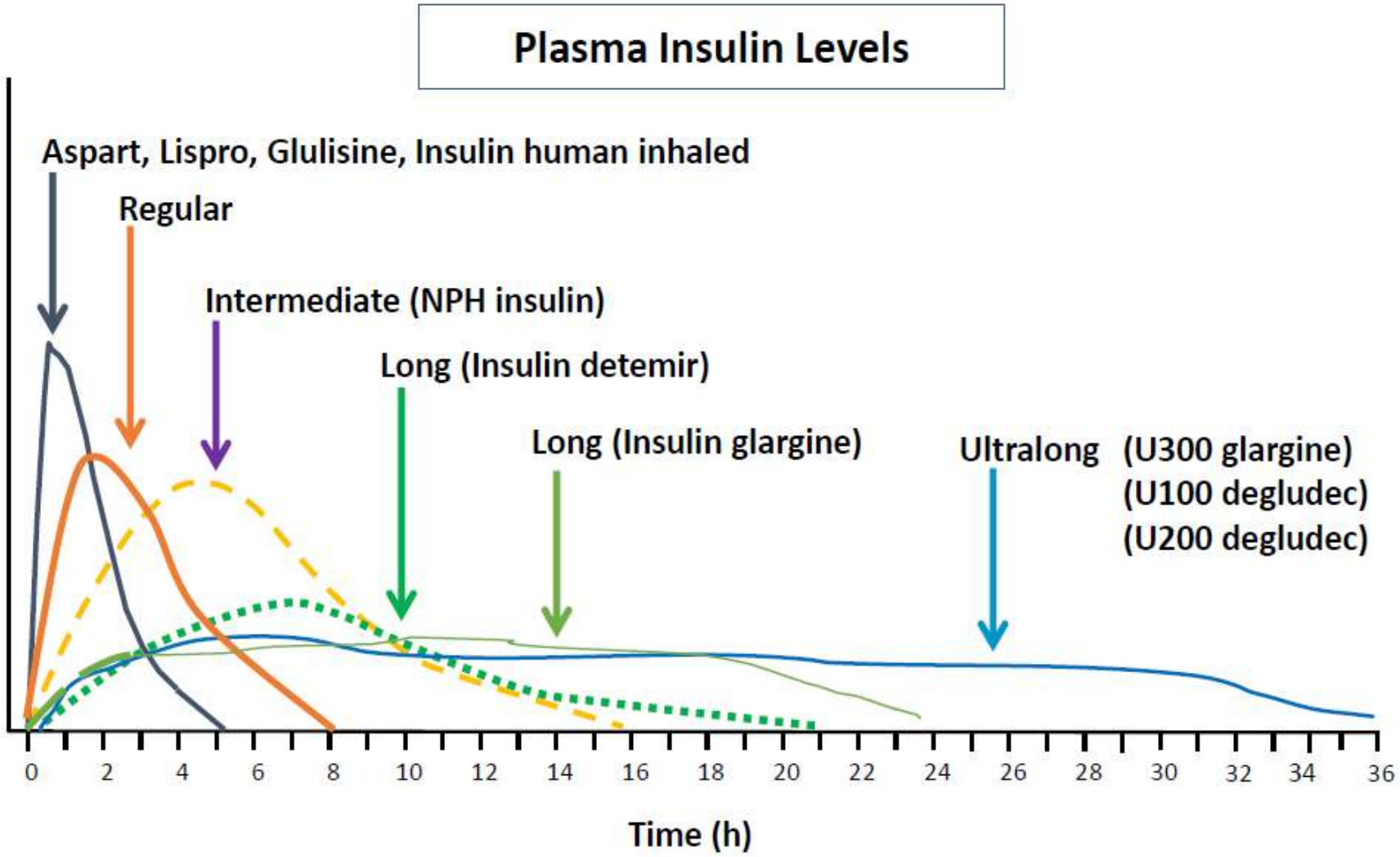
Insulin PocketCard™

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)	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. © 2024

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

Afrezza, Novolog, Humalog, Lantus, Levmir (package inserts) 2022

Image: :Blausen.com staff (2014). Medical gallery of Blausen Medical 2014. WikiJournal of Medicine 1 (2).

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

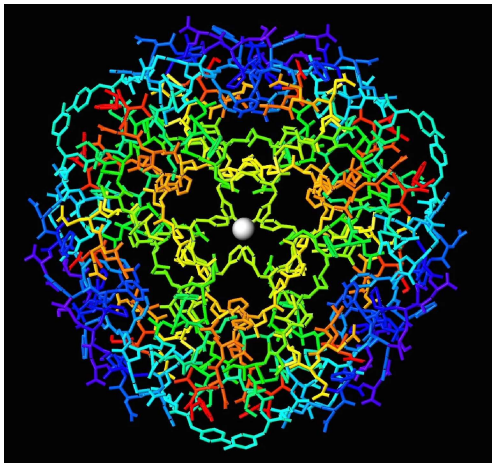
Action	Insulin Name	Dose Range	Onset	Peak	Duration	Considerations
Bolus – Rapid-acting	Afrezza Inhaled regular human insulin	4, 8, and 12 unit cartridges before meals	~ 12 min	35 - 45 mins	1.5 - 3 hrs	Assess lung function. Avoid in lung disease — bronchospasm risk. Side effects: hypo, cough, throat irritation.

The information listed here are not guidelines. Please consult prescribing information for details.

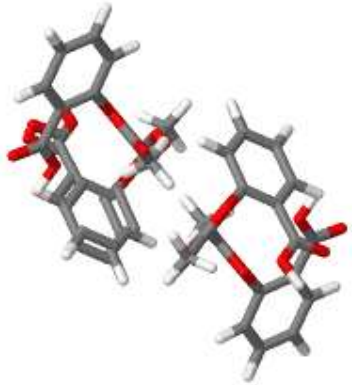
DiabetesEd.net © 2024

Follow-On Insulin

- Follow-on insulin products requires a separate prescription (not directly interchangeable)
  - Examples:
    - Insulin glargine (Lantus), follow-on product (Basaglar)
    - Insulin lispro (Humalog), follow-on product (Ademlog)
- Semglee and Rezvoglar can be interchangeable with Lantus (insulin glargine)



Insulin – Large Molecule



Aspirin – Small Molecule

Generic Insulins

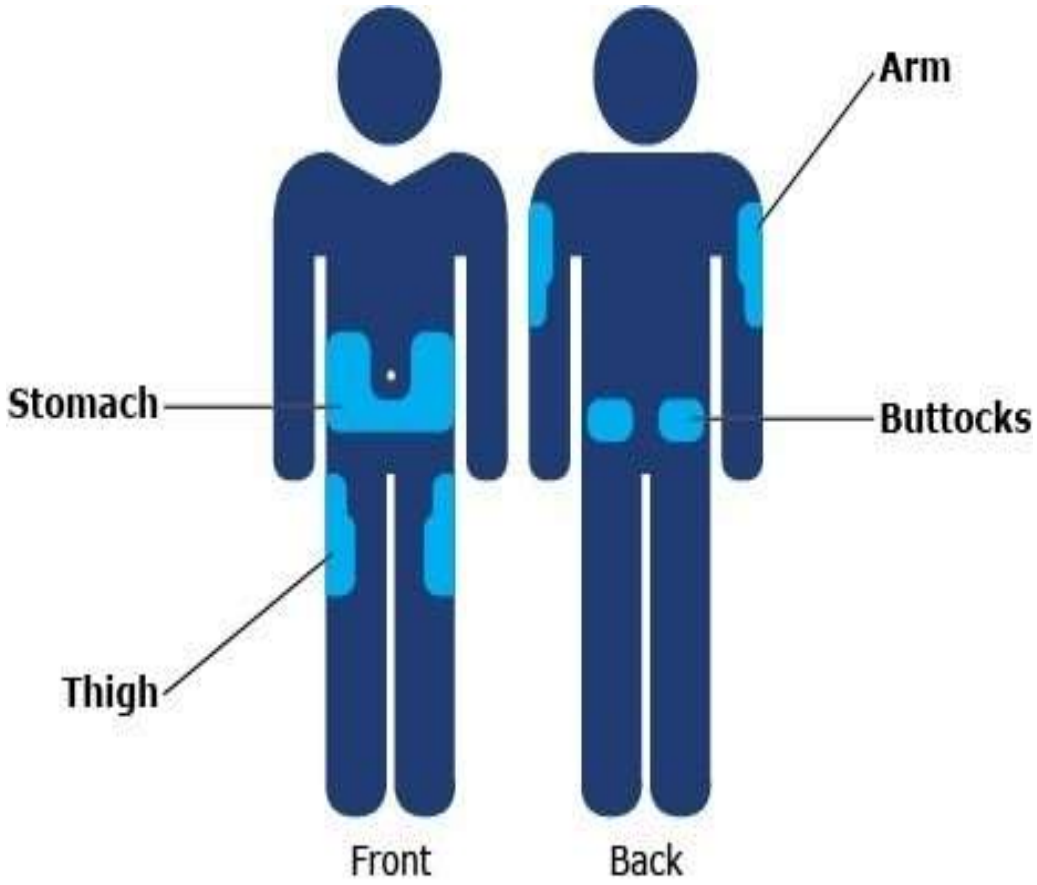
- Insulin aspart
- Insulin lispro
- Insulin glargine

- 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)?

A. Toujeo (Insulin glargine U300)
B. Basaglar (Insulin glargine U100)
C. Semglee (Insulin glargine U100)
D. 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)

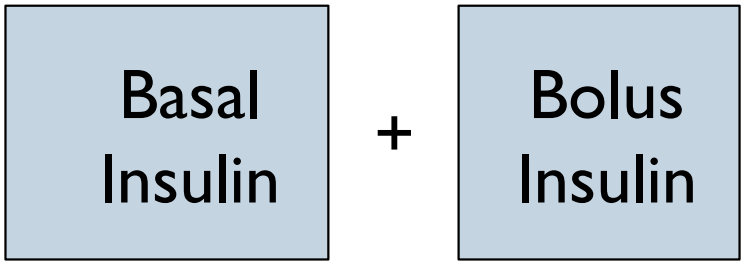
Polling Question 1

- 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

Type 1 Diabetes (T1D)

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

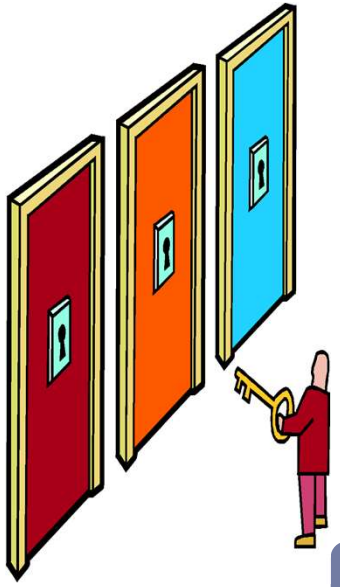


How to Dose Insulin? T1D

- 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 — Lowest Cost
2. Detemir
   - 3. Glargine U-300
   - 3. Delgudec U-100
- Glargine
  - Degludec U-200

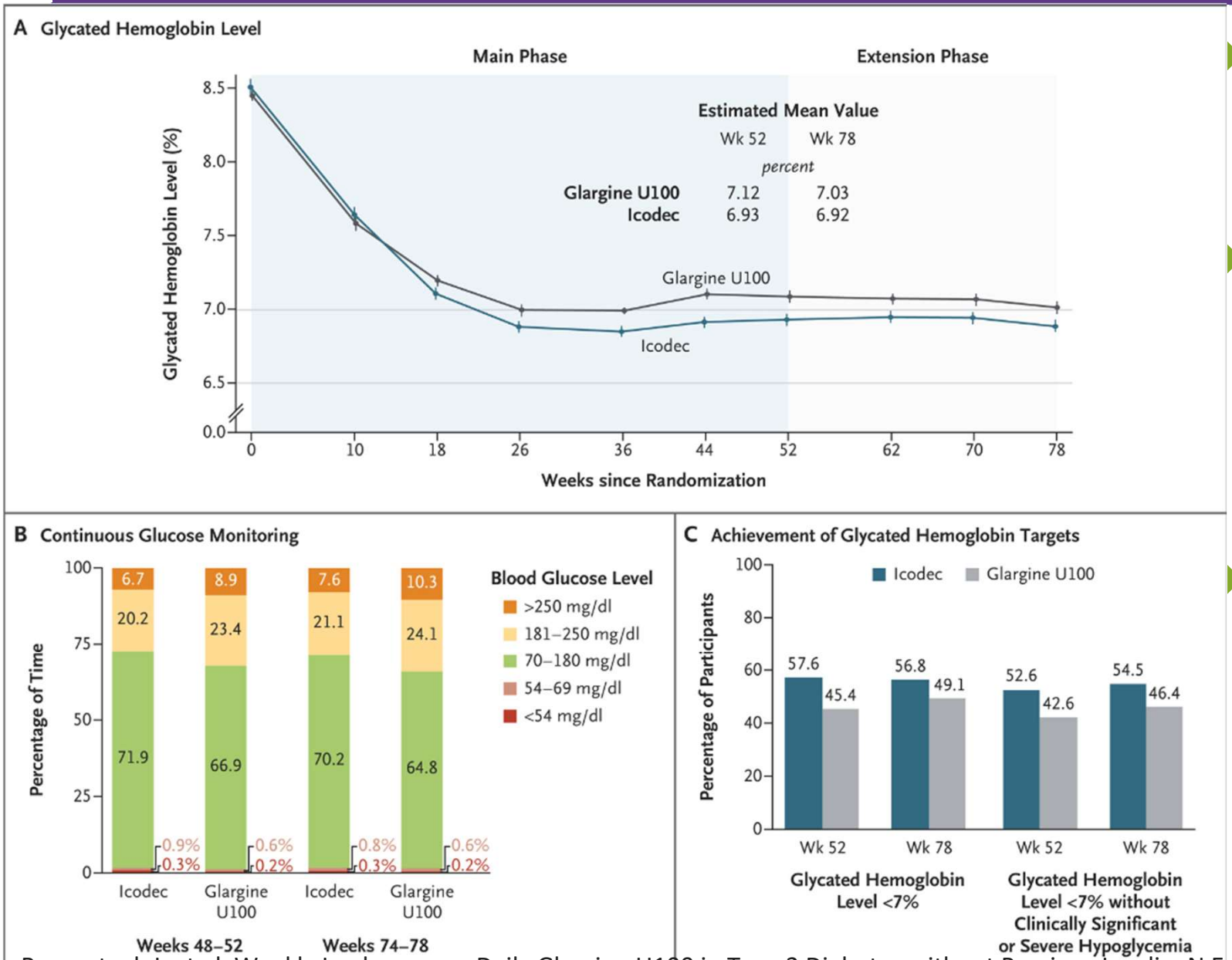
1. Shortest duration, 2. Medium duration, 3. Longest duration

Weekly Insulin

- Awiqli® (once-weekly basal insulin icodec) approved for use in the EU
- Anticipated US approval in the near future
- 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
  - Announced positive topline results in adults with T2D, (QWINT program)

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

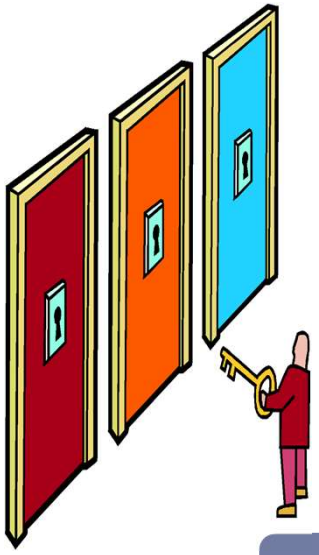
Glargine vs. Icodec in T2D



- 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.

Choice of Bolus Insulin



1. Regular

Lowest Cost

2. Lispro (Humalog®, Admelog®)

Aspart (Novolog®)

3. Glulisine (Apidra®)

Aspart (Fiasp®)

Lispro (Lyumjev®)

Inhaled (Afrezza®)

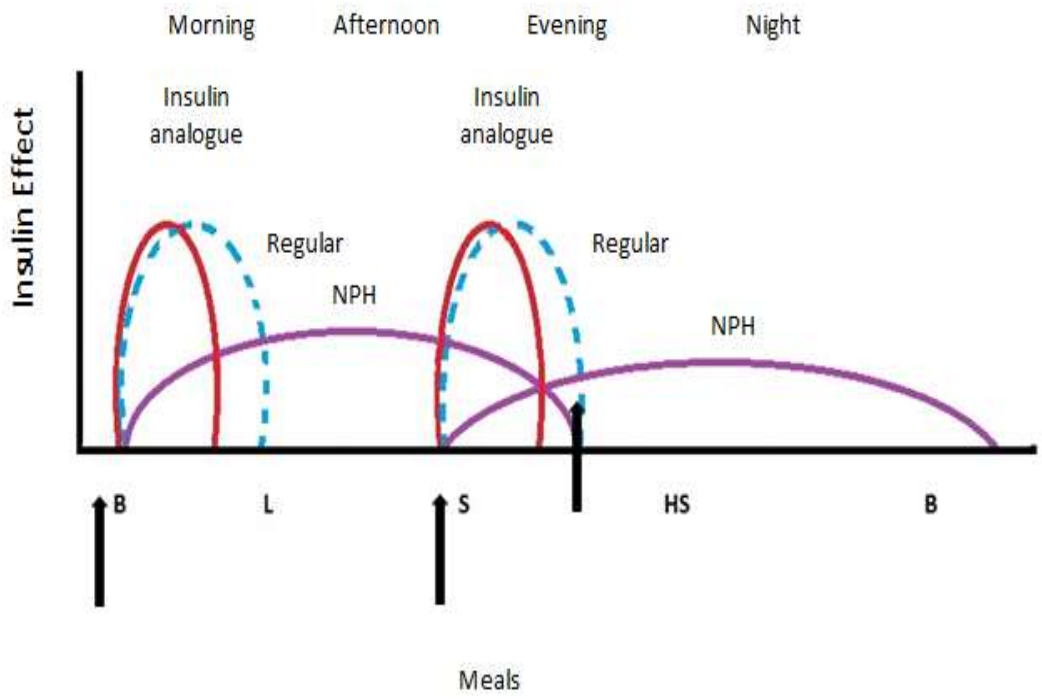
1. Slowest, 2. Medium, 3. Quickest

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

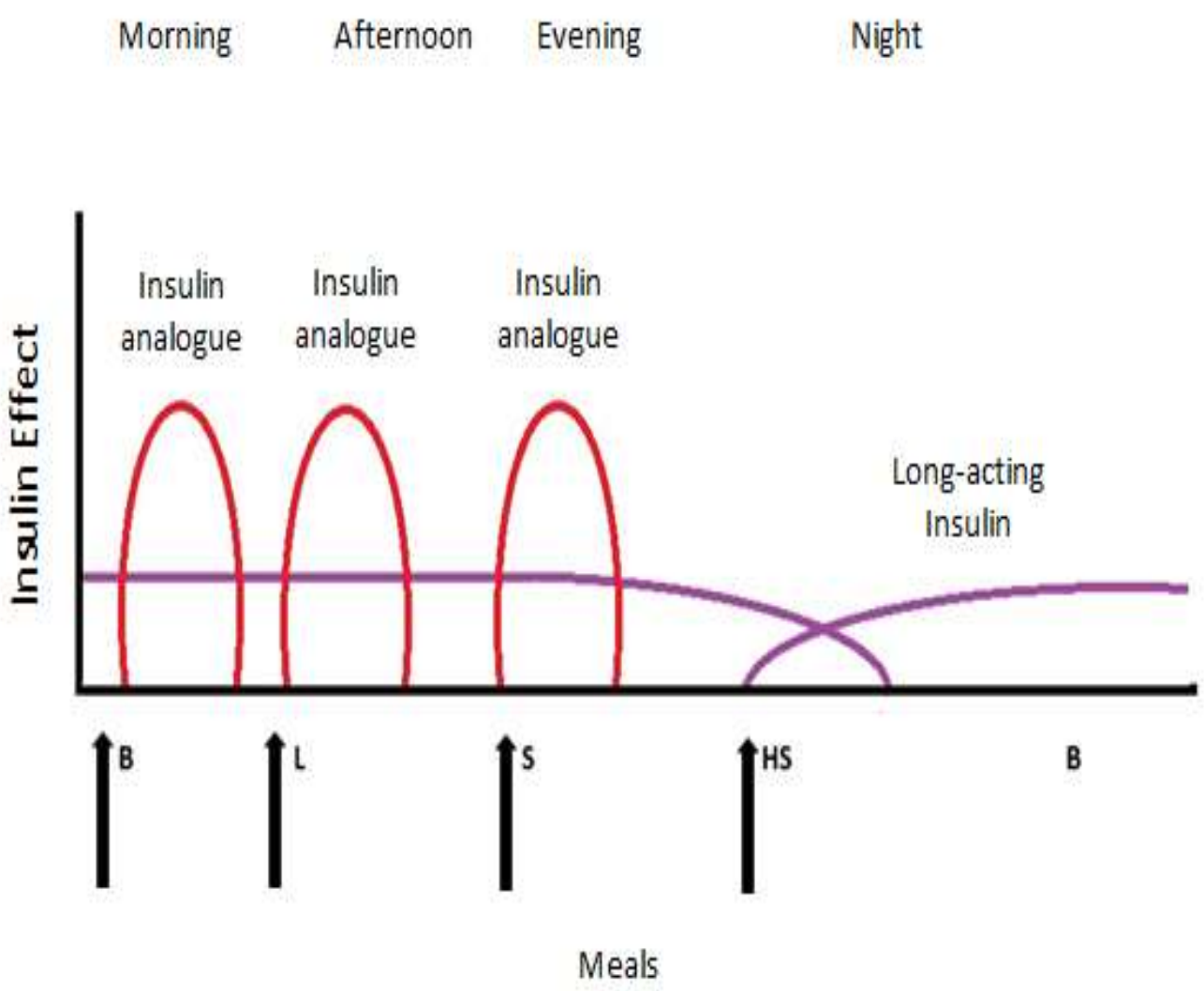


Intermediate insulin serves as basal while regular or insulin analog serves as bolus

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
  - 500/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)
  - Often returned to as insulin sensitivity
  - 1 unit of insulin is expected to lower glucose by Y points
- Rule of 1700 or 1800 can be used
  - 1700/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.

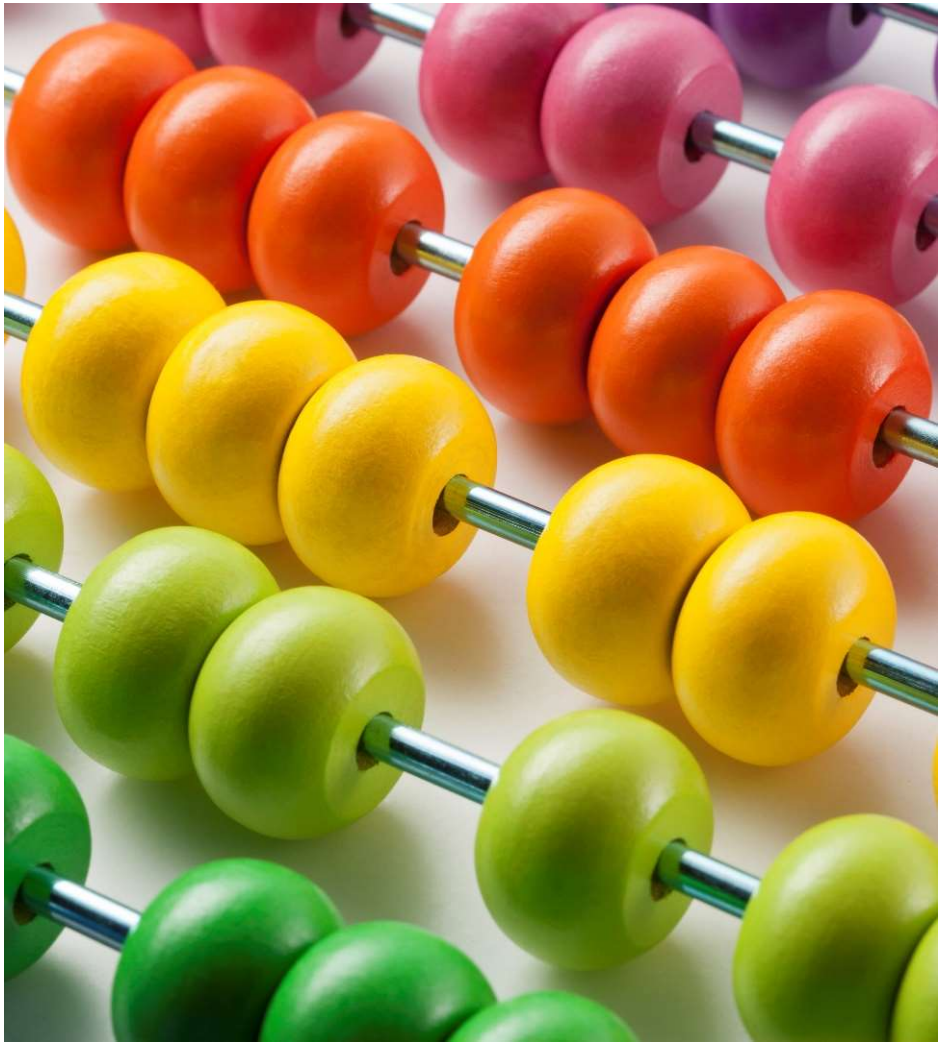
An Example: Meet Austin

- 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 1700, what should his ICR and ICF be?



Poll Question 2

- Based on the rule of 500 and rule of 1700, what should Austin's ICR and ICF be? (TDD=20 units/day)

A. ICR=25, ISF=85
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=1700/20=85
  - This means that 1 unit of insulin is expected to lower glucose by 85 mg/dL
  - Austin's glucose target is 100
  - If his current glucose is 185, 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

Poll Question 3

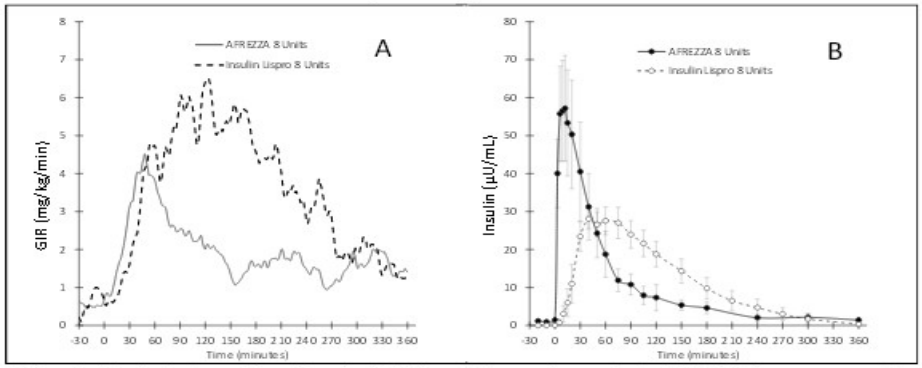
- How much insulin does a person with type 1 diabetes need a day?
  a. 1 to 2 units/kg per day
  b. No more than 0.5 units/kg per day
  c. 5 to 10 units/kg per day
  d. 0.5 to 1 units/kg per day

Inhaled Insulin

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

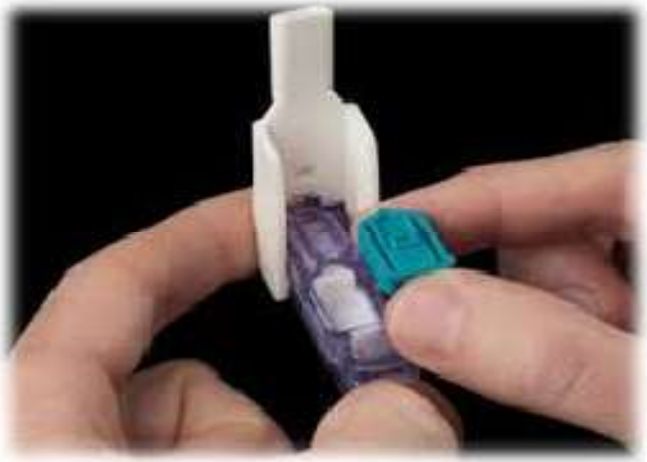
- **FDA approved for adults over 18yo**
- **Not indicated for pregnancy, while breastfeeding**

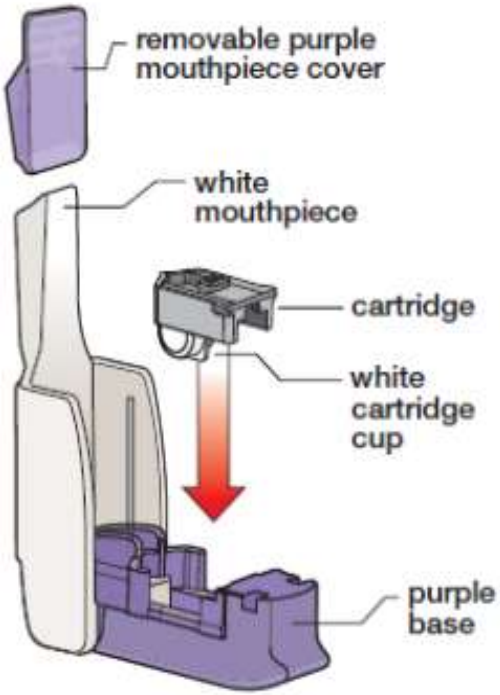
Figure 3. Baseline-Corrected Glucose Infusion Rate (A) and Baseline-Corrected Serum Insulin Concentrations (B) after Administration of AFREZZA or Subcutaneous Insulin Lispro in Type 1 Diabetes Patients*

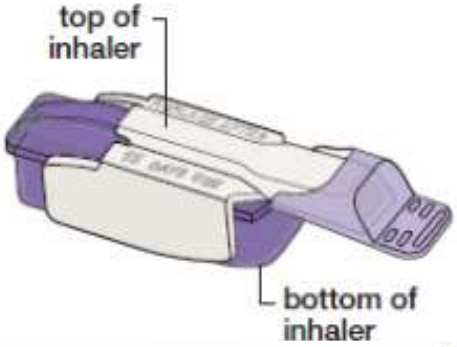


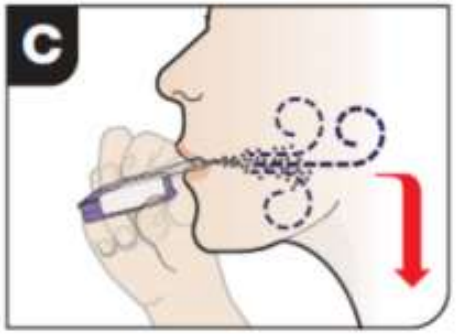
* Despite the faster absorption of insulin (PK) from Afrezza, the onset of activity (PD) was comparable to insulin lispro.

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.

Inhaled Insulin Storage

- 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

https://afrezza.com/wp-content/uploads/2020/01/Afrezza-Storage-and-Handling-Guide.pdf

Inhaled Insulin Dosing and Counseling

- Bolus insulin – inhaled before meals
- Dosing: 4, 8 and 12 unit cartridges
- Lung function test before start (FEV1)
  - Not for pts 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

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 by HCP/pt
  - 1-2 hours peak post meal <180 (ADA)
  - 2 hour post meal <140 (AACE)
  - Before next meal 80 - 130

Poll Question 5

- Mary takes 4 units of insulin lispro (Humalog) 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 87
4. 2 hour post breakfast BG of 185

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

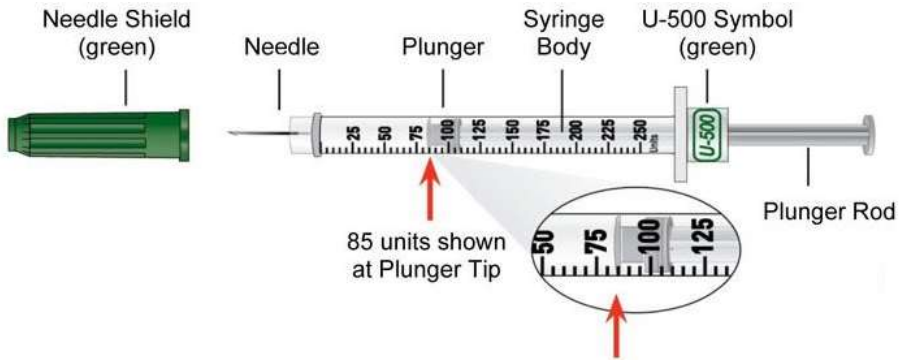
Switching to u500 insulin

- 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
- It should be taken 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.

U500 example

- 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.

BD

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.

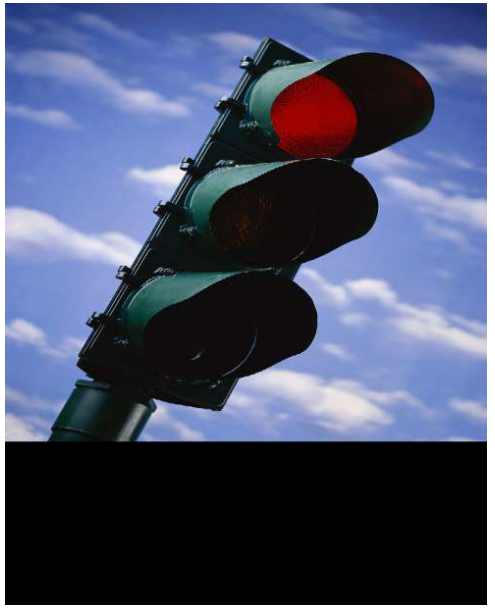
c. It sounds like you are refusing to take insulin?

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)

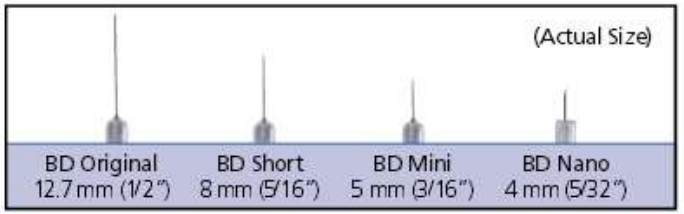
- 50% of providers in study threatened pts “with the needle”.
- Less than 50% of providers realized insulins’ positive effect on type 2 DM
- Most pts don’t believe that insulin would “better help them manage their diabetes”.
- Solutions: Find the root of PIR and address it



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



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

How To's of Adding Insulin in Type 2 DM

Diana Isaacs, PharmD, BCPS, BC-ADM, BCACP CDCES, FADCES, FCCP
Director, Education & Training in Diabetes Technology

Injectable Therapy for Type 2 Diabetes

- Use GLP-1 RA as first injectable when possible
- Start basal insulin 10 units or 0.1 to 0.2 units/kg day
- Titrate up 2 units every 3-4 days, until FBG at goal
- If hypo, decrease insulin 20% or 4 units
- If basal insulin is >0.5 unit/kg day, add bolus insulin (avoid overbasalization)
- Adding bolus
  - Start with 4 units bolus at largest meal or
  - Start 1-2 injections with 10% of basal or
  - Switch to 70/30 twice or three times daily.

Intensifying Injectable Footnotes 9.2

- Consider insulin as the first injectable if evidence of ongoing catabolism A1C levels (>10%) or BG levels ≥300mg/dL or a diagnosis of type 1 diabetes 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. In this case, an AM dose of a long-acting basal insulin could be a better choice.
- If adding prandial insulin to NPH, consider initiation of a self-mixed or premixed insulin regimen to decrease number of injections.

Insulin/Injectable Combos

PocketCards are updated twice yearly.
Scan QR code to download or
order the latest version.

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.

©2024

INTENSIFYING INJECTABLE THERAPY IN TYPE 2 – ADA STANARDS Figure 9.4

Including reinforcement of behavioral interventions (weightmanagement and physical activity) 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.

Add basal analog or bedtime NPH insulin

INITIATION: Start 10 IU a day **OR** 0.1-0.2 IU/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%

INTENSIFYING INJECTABLE THERAPY IN TYPE 2 – ADA STANARDS Figure 9.4

Including reinforcement of behavioral interventions (weightmanagement and physical activity) and provision of DSMES to meet individualized treatment goals.

Assess adequacy of basal insulin dose

Consider clinical signals to evaluate for overbasalization and need to consider adjunctive therapies (e.g., basal dose >0.5 IU/kg, 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:

Add 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 IU a day or 10% of basal insulin dose
- If A1C <8% (64 mmol/mol) consider lowering the basal dose by 4 IU a day

TITRATION:

- Increase dose by 1-2 IU or 10-15% twice weekly
- For hypoglycemia determine cause, if no clear reason lower corresponding dose by 10-20%

INTENSIFYING INJECTABLE THERAPY IN TYPE 2 – ADA STANARDS Figure 9.4
Including reinforcement of behavioral interventions (weightmanagement and physical activity) and provision of DSMES to meet individualized treatment goals.

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 IU of short/rapid-acting insulin to each injection 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

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 9.3%. She weighs 110kg. She checks glucose in the AM only and reports it's 90-130mg/dL. Her eGFR is 70. She previously had UTI's with empagliflozin.

What is the best recommendation to adjust this regimen?

Thinking about the choices

- Continue glargine?
- Continue glipizide?
- Continue linagliptin?
- Add GLP-1 agonist?
- Switch to combination GLP1 receptor agonist /insulin injectable?
- Add prandial insulin?
- Add SGLT-2 inhibitor?

Piecing it Together

- New Regimen:
  - Insulin glargine 80 units once daily (20% reduction)
- Semaglutide 0.25mg weekly, titrated up to 2mg weekly
- Stop linagliptin
- 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!

How to Switch Basal Insulin

- When going from twice daily basal insulin to once daily, reduce dose by 20%
  - Examples:
    - Insulin NPH BID to insulin glargine daily
    - Insulin detemir BID to insulin degludec daily
- When switching between once daily, a unit per unit conversion is okay
- Long-acting to glargine U300 often requires higher doses (10 to 18%) but start with a unit to unit conversion
- When switching from glargine U300 to another long-acting insulin, reduce dose by 20%
- 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. Pharmacist's Letter/Prescriber's Letter. August 2019.

Poll 7 - Making the switch: Meet Joan

Joan is taking insulin glargine 30 units twice daily. Her insurance formulary wants her to switch to insulin 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. Do not switch since her A1C is well-controlled and get a prior authorization to continue with insulin glargine
D. Insulin degludec 48 units once daily

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 Afrezza

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.

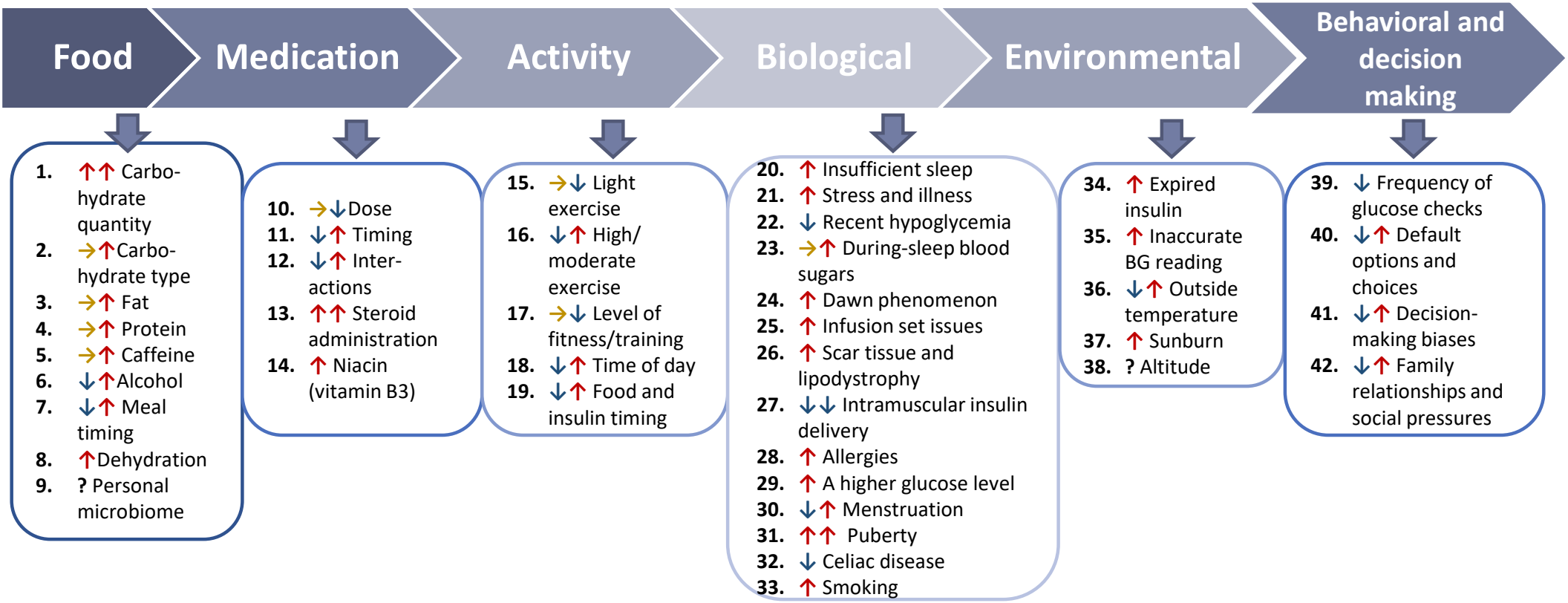
Poll 8. Patient Case: Lumy

- Lumy's insurance formulary changed from insulin lispro to insulin aspart.
- 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

Diana Isaacs, PharmD, BCPS, BC-ADM, BCACP CDCES, FADCES, FCCP
Director, Education & Training in Diabetes Technology

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

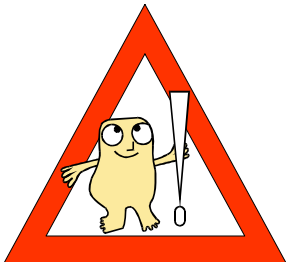
  b. Hypoglycemia

  c. Non-compliance

  d. Legible writing

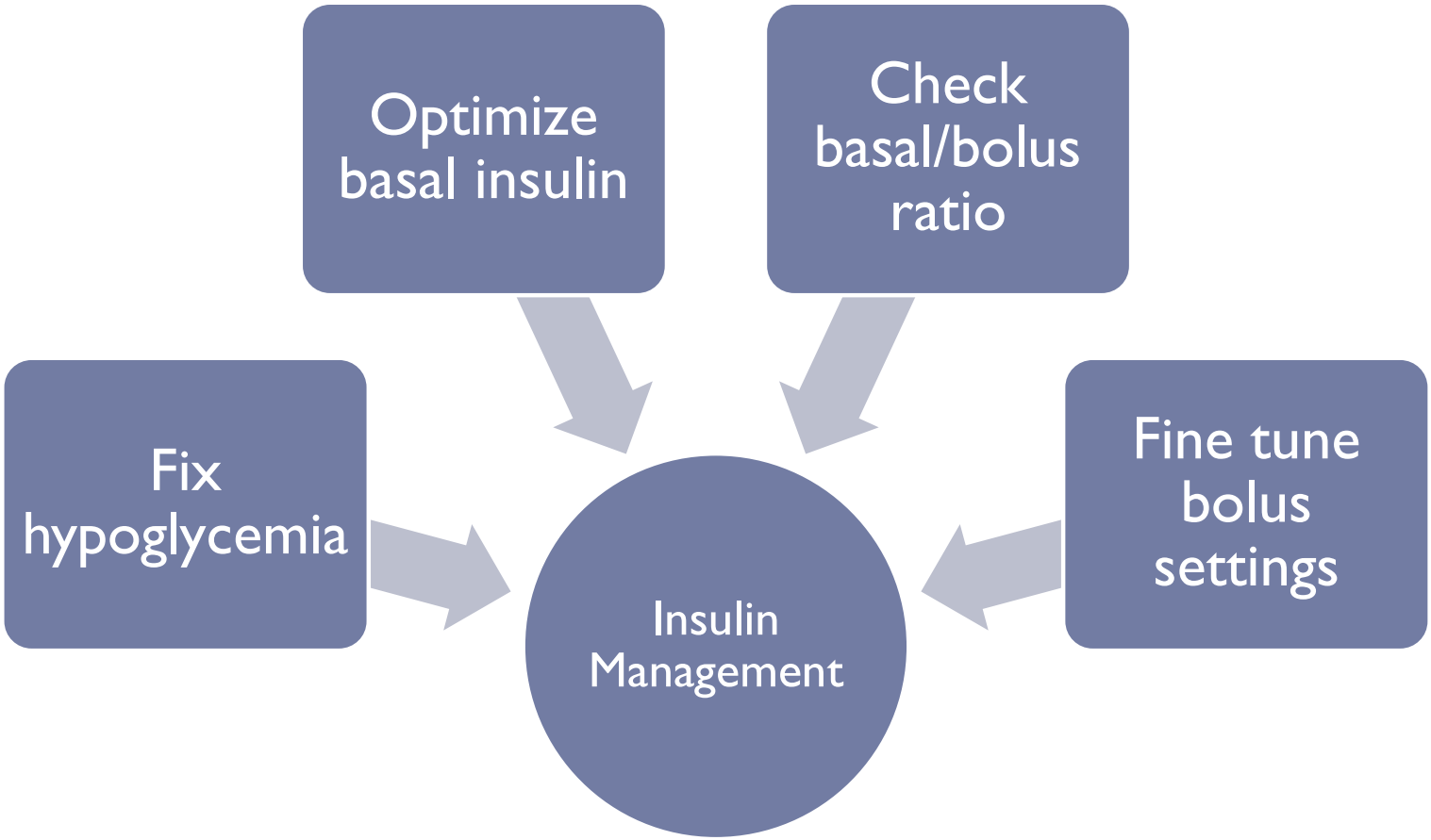
Pattern Management

- 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

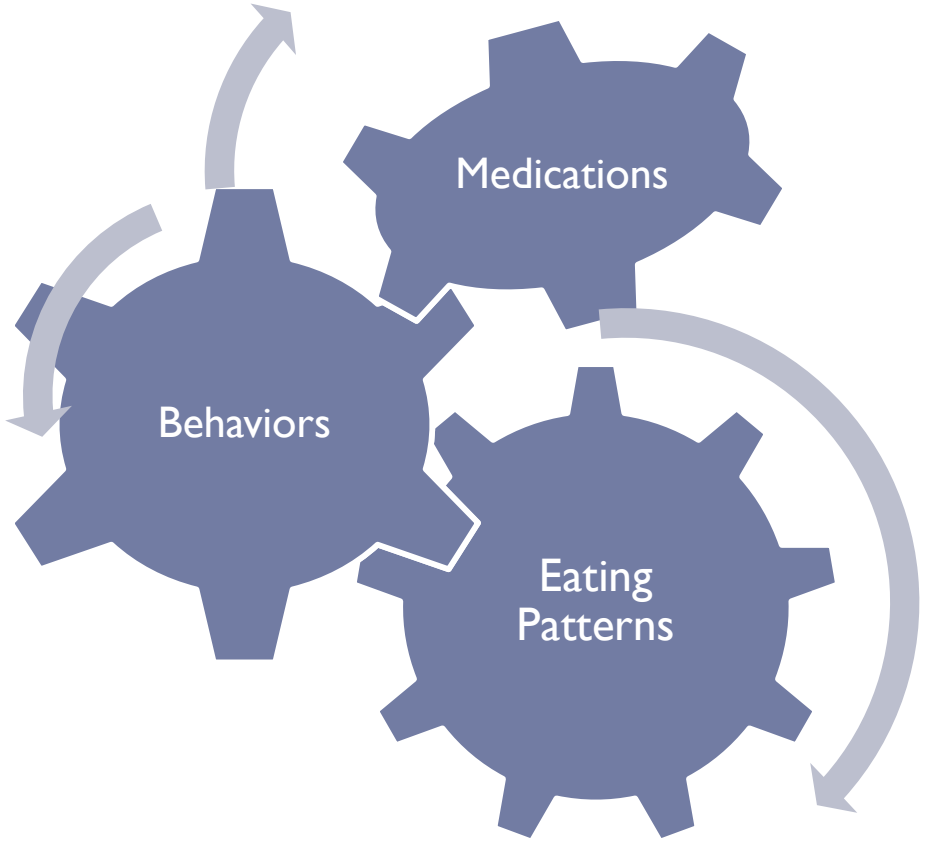


Adjusting Insulin doses in a Basal/Bolus regimen (T1DM & T2DM)

Out of Range Glucose	Insulin to Adjust
Fasting	Long acting insulin or evening 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

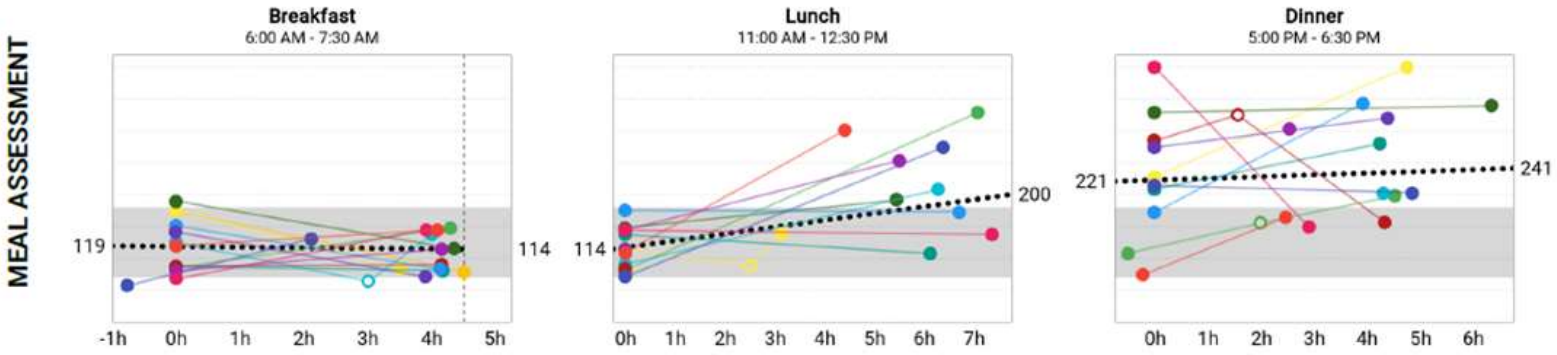
Tips for Data Interpretation

- 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
- By 4-5 hours, glucose should return to pre-meal level



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 1700
  - 1700/49=35

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

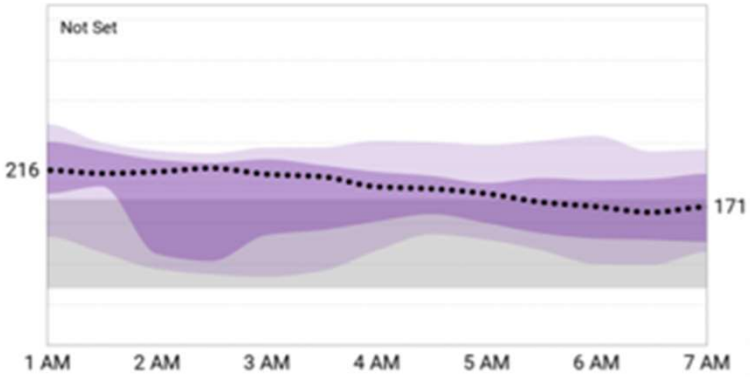
Insulin Sensitivity (mg/dL per U)

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

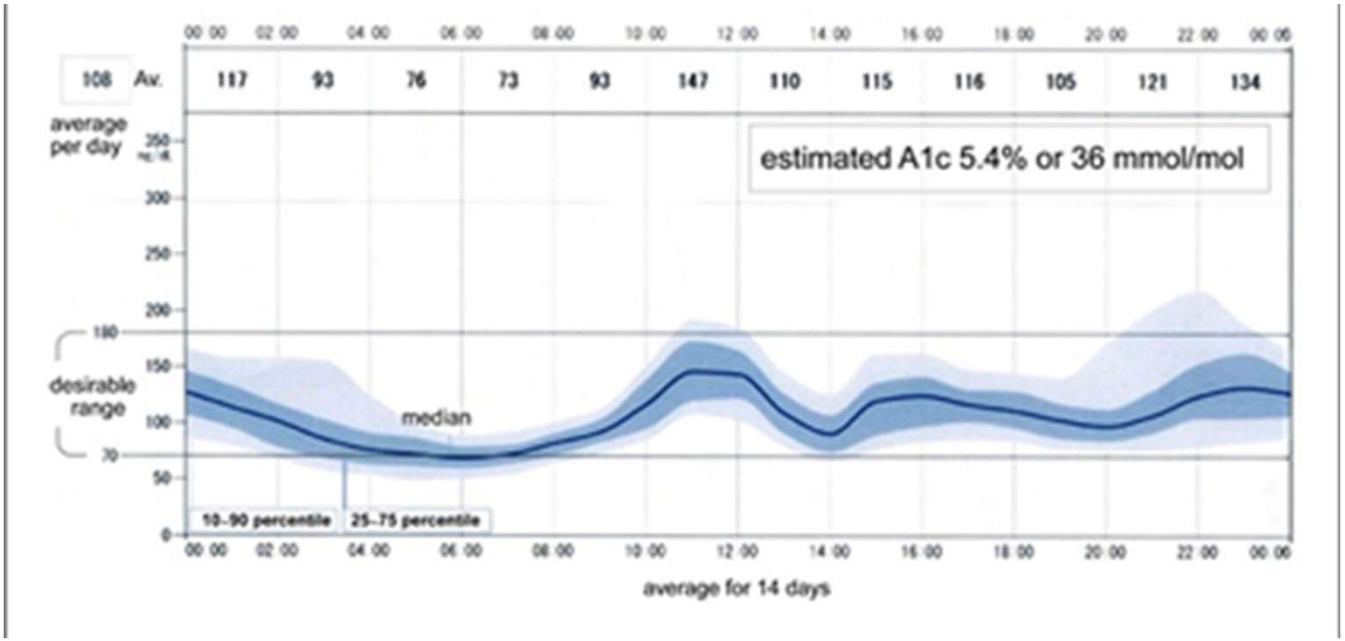
LONG-ACTING ASSESSMENT



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

Larry takes metformin 1000mg BID, insulin glargine 50 units once daily, empagliflozin 10mg daily. His A1C is 7.8%. He weighs 90kg. FBG averages 100mg/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?

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

Summary

- Many different types of insulin
- Basal + bolus needed for T1DM
- Weight based dosing and rules of 1700/1800 and 500/450 can be used to calculate correction factor and carb ratio
- GLP1 agonist preferred 1st injectable in T2DM
- Avoid overbasalization, if taking more than 0.5unit/kg/day, think about GLP1 agonist +/- prandial insulin
- Counsel patients on injection site technique, administration and storage
- Fine tune insulin settings based on BGM and CGM data

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

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

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
- It is important to integrate medical eval, engagement and lifestyle changes.
- Interdisciplinary teams provide best care

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
  - Actos 15mg ac breakfast
  - Basaglar 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 in morning; 150ish. A1C 8.3%
- Meds include:
  - Sitagliptin (DPP-IV), Metformin
  - Basaglar 58 units (Basal)
  - Actos 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 (max dose 0.5 units/kg a day
- 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 in morning; 150ish. A1C 8.3%
- Meds include:
  - Sitagliptin, Metformin
  - Actos 15mg ac breakfast
  - Basaglar 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

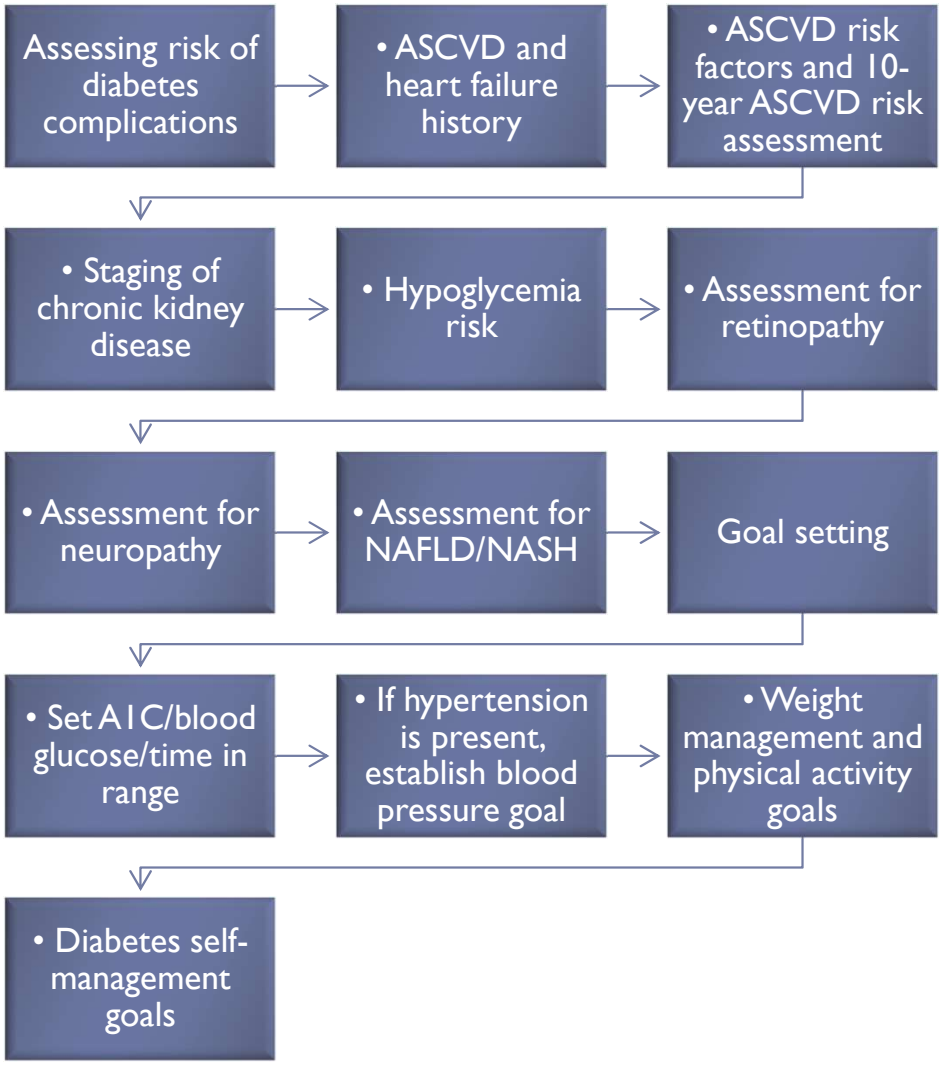
No eye doctor for year

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



4. Comprehensive Medical Evaluation and Assessment of Comorbidities: *Standards of Care in Diabetes—2024* FREE

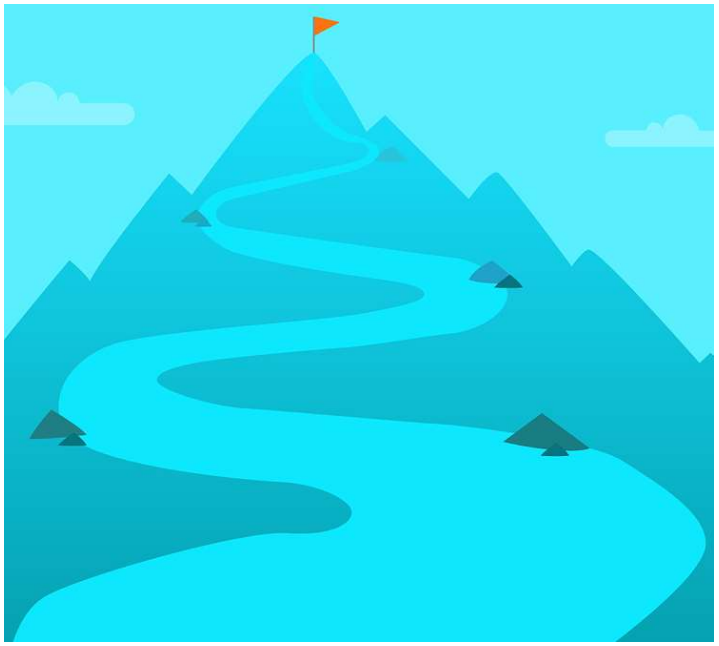
American Diabetes Association Professional Practice Committee

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

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
  - Continuous positive oral airway pressure and devices
  - Surgery

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

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

5. Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

Exercise decreases:

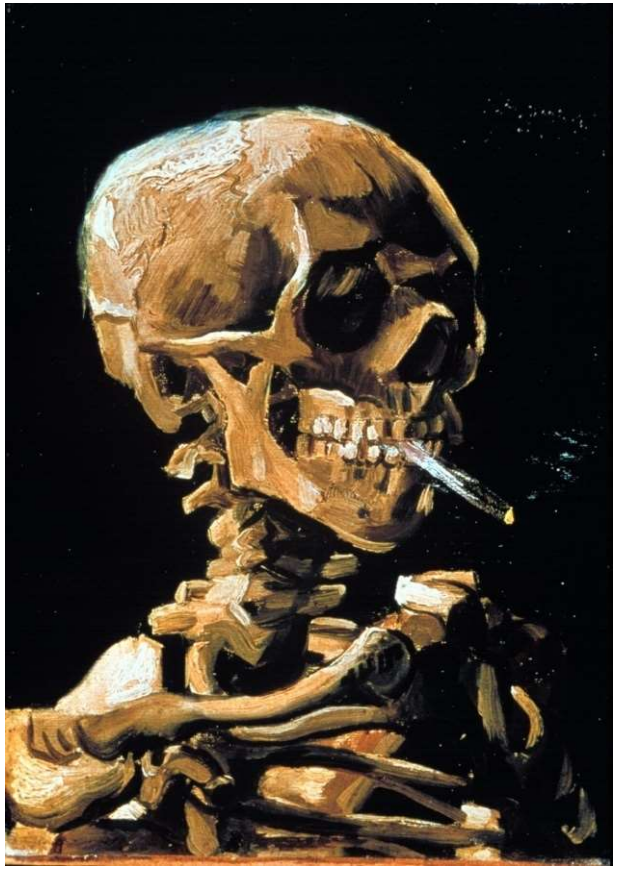
- Sleep apnea
- Diabetic kidney disease, retinopathy
- Depression
- Sexual dysfunction
- Urinary incontinence
- Knee pain
- Need for medications
- Health care costs

5. Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

Smoking and Diabetes

Smoking increases risk of diabetes 30%



- Ask at every visit
- Assess
- Advise
- Assist with stop smoking
- Arrange for referrals
- Organize your clinic

Goals of Medical Nutrition Therapy – ADA

Promote and support *Individualized* healthful eating patterns

1. Support healthful eating patterns

- Emphasize eating a variety of nutrient dense foods in appropriate portions to:
  - Attain individualized BP, glycemic and lipid goals
  - Attain and maintain body wt goals
  - Delay and/or prevent complications

2. Individualize nutrition care based on:

- Personal and cultural preferences
- Health literacy and numeracy
- Access to healthful foods
- Willingness and ability to make behavioral changes
- Barriers to Change

3. Maintain pleasure of eating.

Provide positive, nonjudgmental messages about food

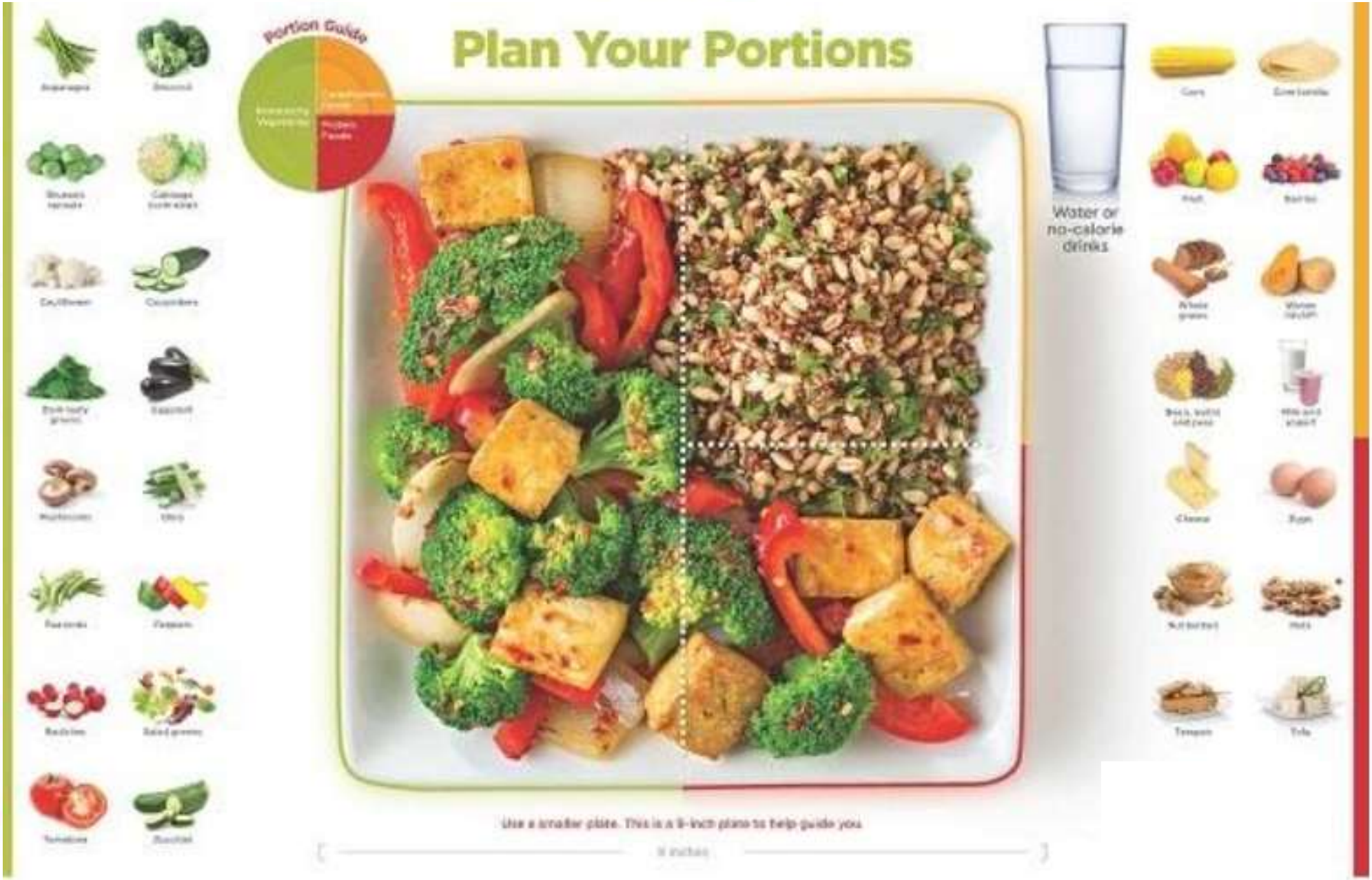
- Limit food choices only when backed by science

4. Provide practical tools for day-to-day healthy meal planning

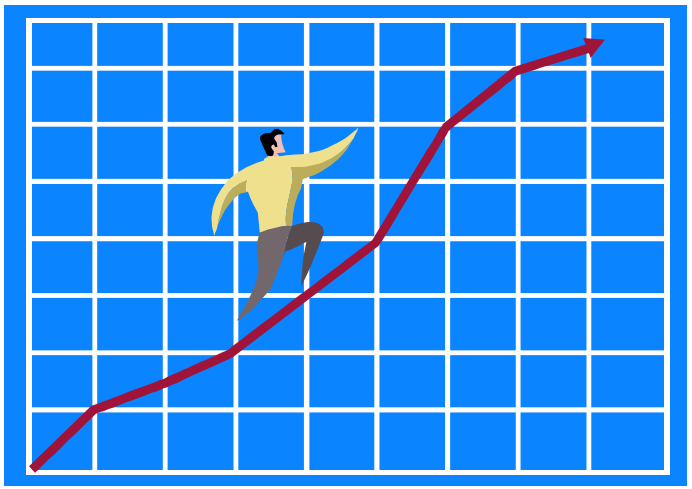
5. Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

Plan Your Portions



EV asks why the weight gain?



- Fluid retention - diabetes doubles risk for Congestive Heart Failure (CHF). Check lower extremities.
- Inaccurate nutrition knowledge
- Actos and Avandia, (TZD's) associated with edema
- Blood sugars improving
- Thyroid disease under treated
- Novel Antipsychotics
- Depression / Increased intake

Poll question 13

- Which of the following is a true statement?

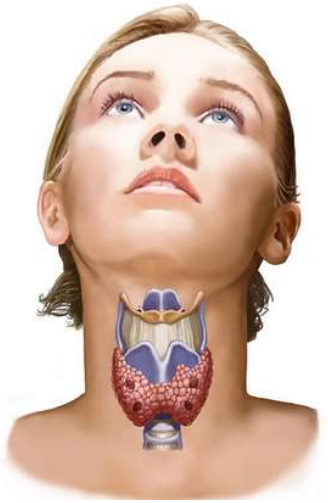
a. Atypical antipsychotics are contraindicated for people with diabetes and thyroid disease.

b. Hypothyroidism is more common than hyperthyroidism.

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

d. Hypothyroidism causes LDLs to decrease.

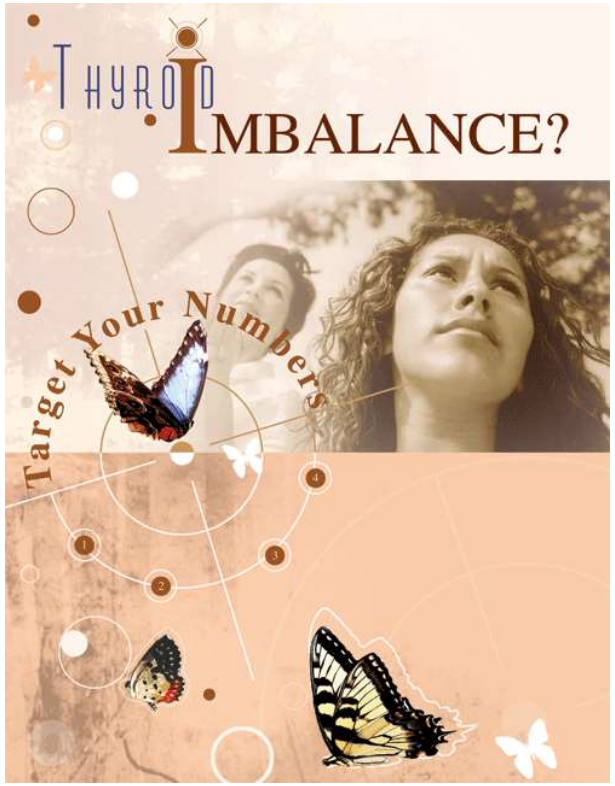
Thyroid Disease and Diabetes



- 15 to 30% of people w/ diabetes & their siblings or parents are likely to develop thyroid disease
- Up to 60 percent of those with thyroid disease are unaware of their condition.
- Women are 5-8x's more likely than men to have thyroid problems.
- Check TSH on Type 1 & 2 annually or if indicated.
- Hashimoto's thyroiditis – autoimmune thyroid
  - most common cause of hypothyroidism w/ dm
  - Associated with:
    - Elevated cholesterol levels
    - Increased risk of CV disease
    - Weight gain

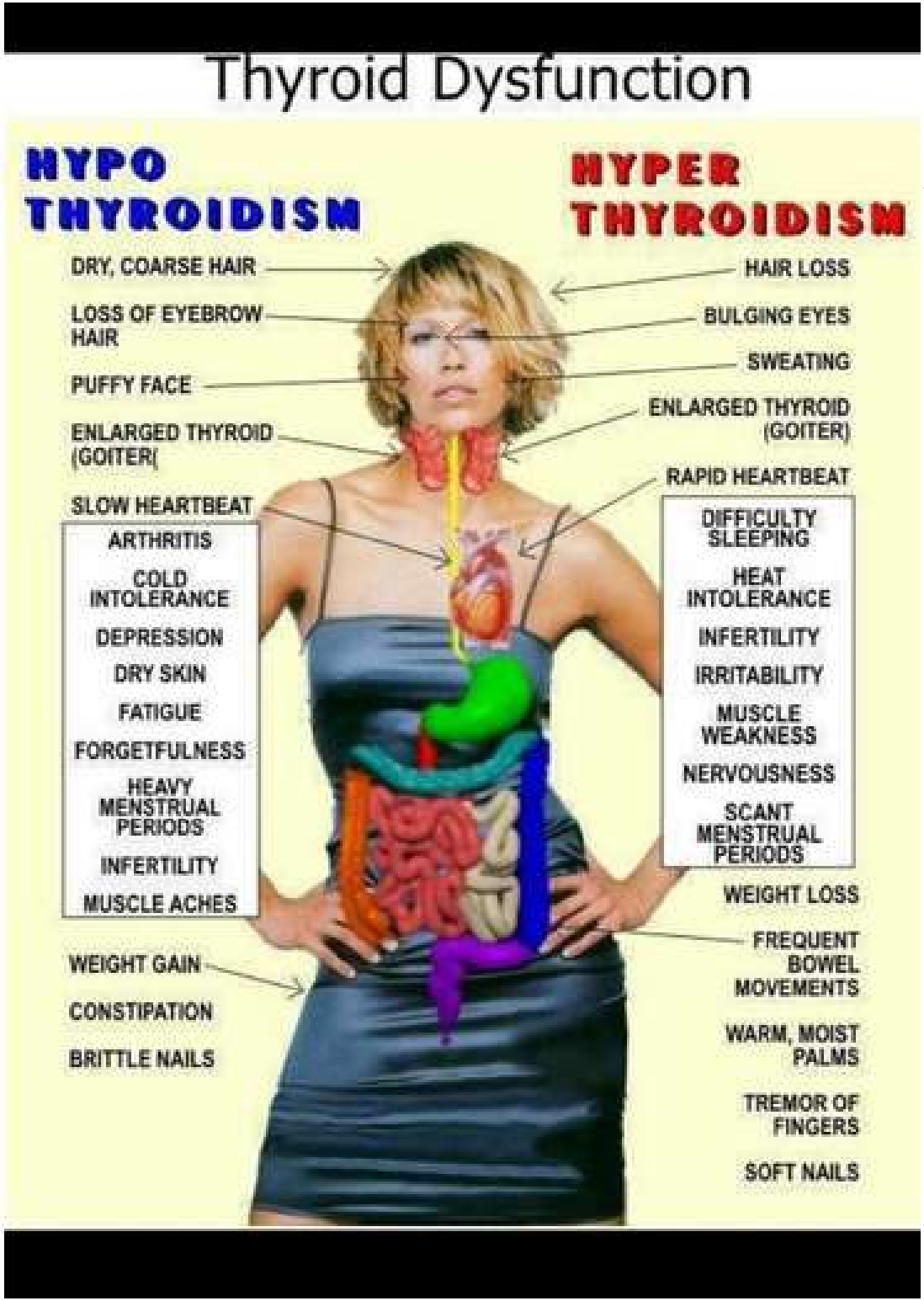
AACE Website

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 basaglar by 10 units
- Stop sitagliptin
- Continue pioglitazone (Actos)
- 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

Non-Alcoholic Steatosis Disease

NAFLD 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.

Non-Alcoholic Fatty Liver Disease (NAFLD)

Metabolic dysfunction–associated steatotic liver disease (MAFLD)

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

Liver Nomenclature Update

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)

Fatty Liver Disease & Steatohepatitis

Adults with type 2 diabetes.

- NAFLD is prevalent in >70%
  - Of those 50% have NASH*
  - 12-20% have fibrosis

*Non-Alcoholic Steatohepatitis (NASH)

- **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)

Gastroenterologist norm

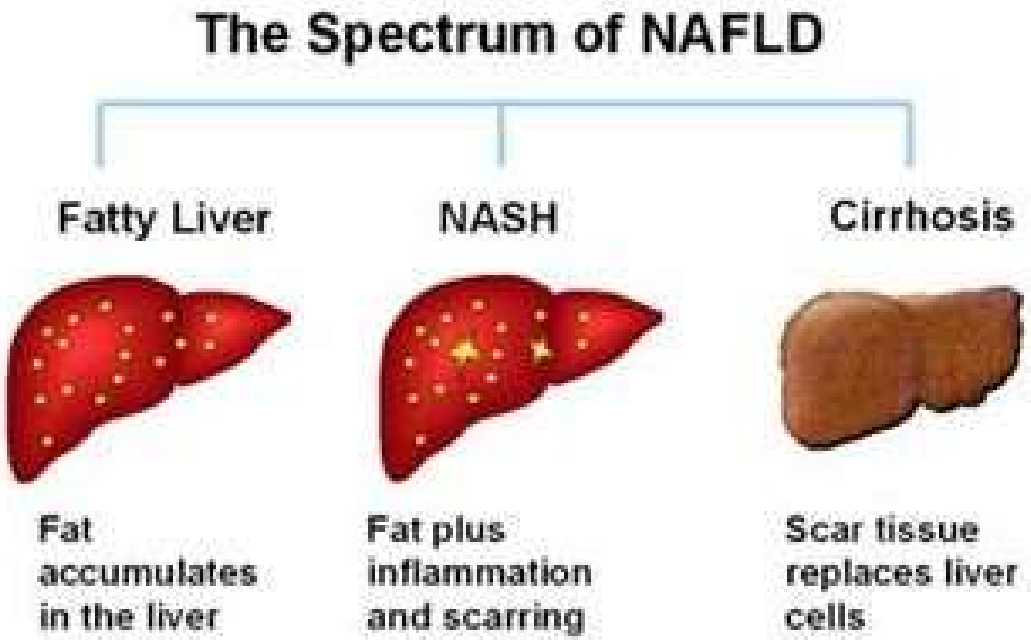
ALT 29-33 men

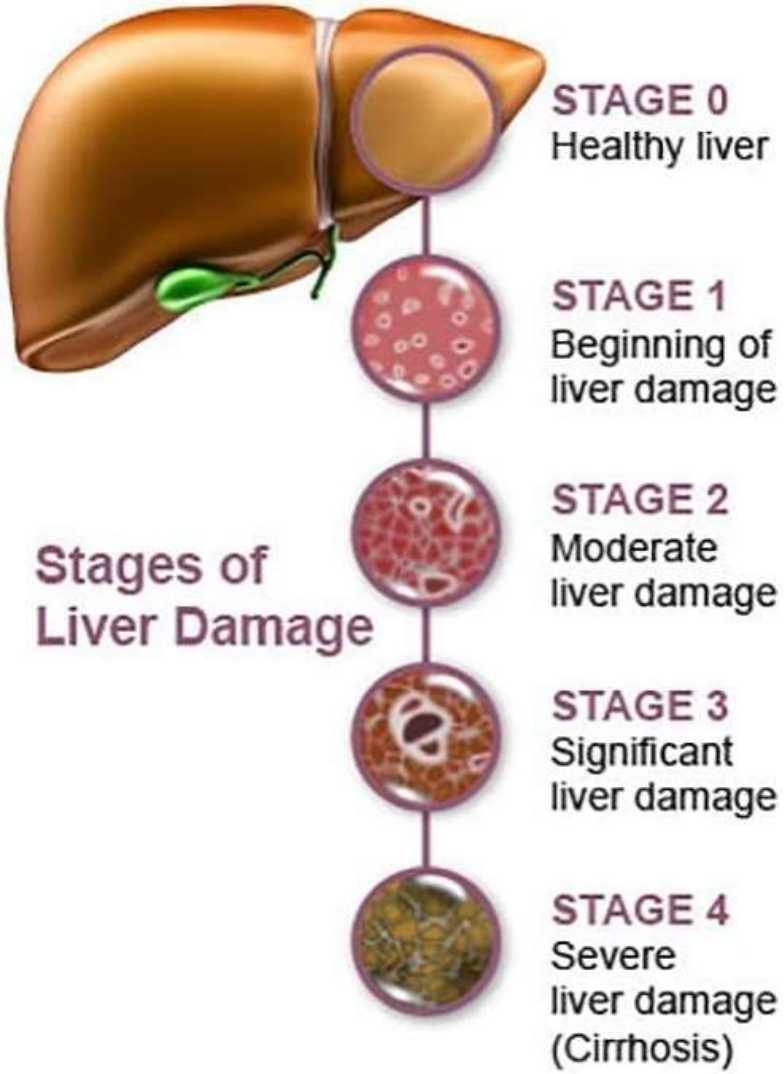
ALT 19-25 women

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

Natural History of NAFLD to NASH





NASH – Non-Alcoholic Steatohepatitis

MASH – Metabolic Assoc Steatohepatitis

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

Stages of Liver Failure

- NAFLD – nonalcoholic fatty liver disease
  - NAFL – simple fatty liver, doesn't usually progress to cause liver damage
  - NASH or MASH nonalcoholic / metabolic steatohepatitis
    - Liver inflammation and cell damage.
    - Can cause fibrosis, scarring
    - Leading cause of hepatocellular carcinoma and liver transplants (ADA)
- Cirrhosis – degeneration of cells, inflammation, fibrous thickening
- End-stage liver disease & Liver Cancer

https://liverfoundation.org/for-patients/about-the-liver/the-progression-of-liver-disease/#fibrosis-scarring

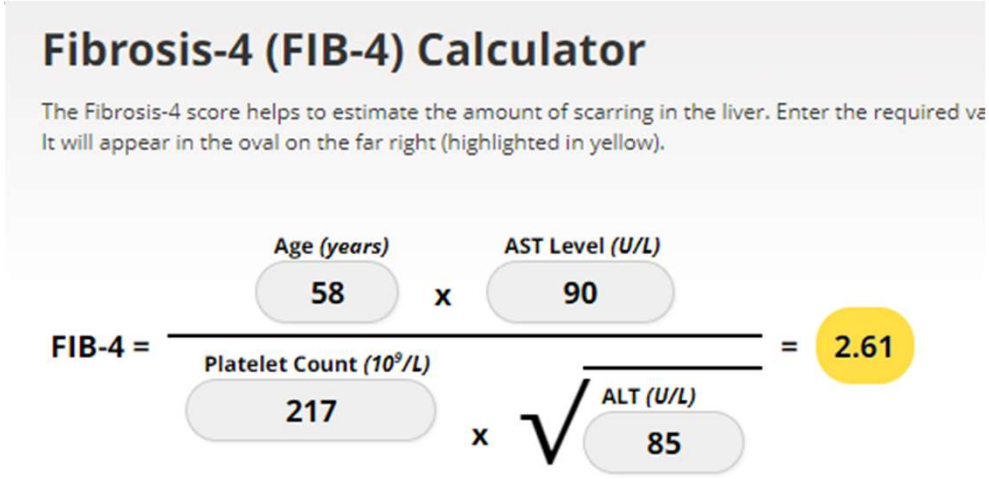
Nonalcoholic Fatty Liver Disease and Nonalcoholic Steatohepatitis Screening

- Screen adults with type 2 diabetes or prediabetes
  - particularly those with BMI 30 +
  - cardiometabolic risk factors or established CV disease
  - even if normal liver enzymes.
- Screen and provide risk stratification for clinically significant liver fibrosis using
- Calculated fibrosis-4 index (FIB-4) (derived from age, ALT, AST, and platelets

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

Screening for NASH – FIB-4



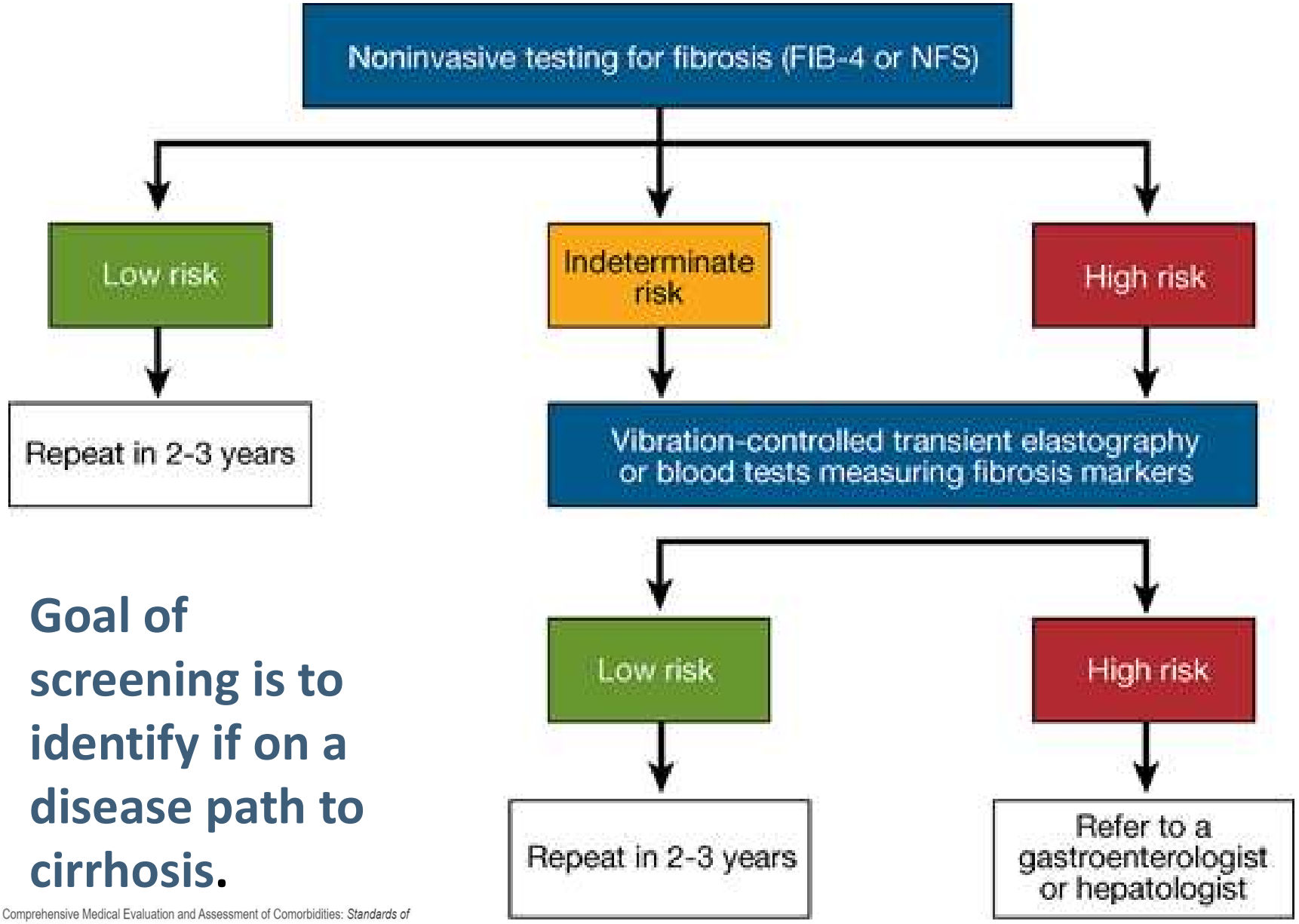
- The American College of Gastroenterology considers Upper limit of normal ALT levels:
- 29–33 units/L for males
- 19–25 units/L for female individuals

(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).

Screening for Fibrosis Risk



Goal of screening is to identify if on a disease path to cirrhosis.

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: *Standards of Care in Diabetes—2024*

American Diabetes Association Professional Practice Committee

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/

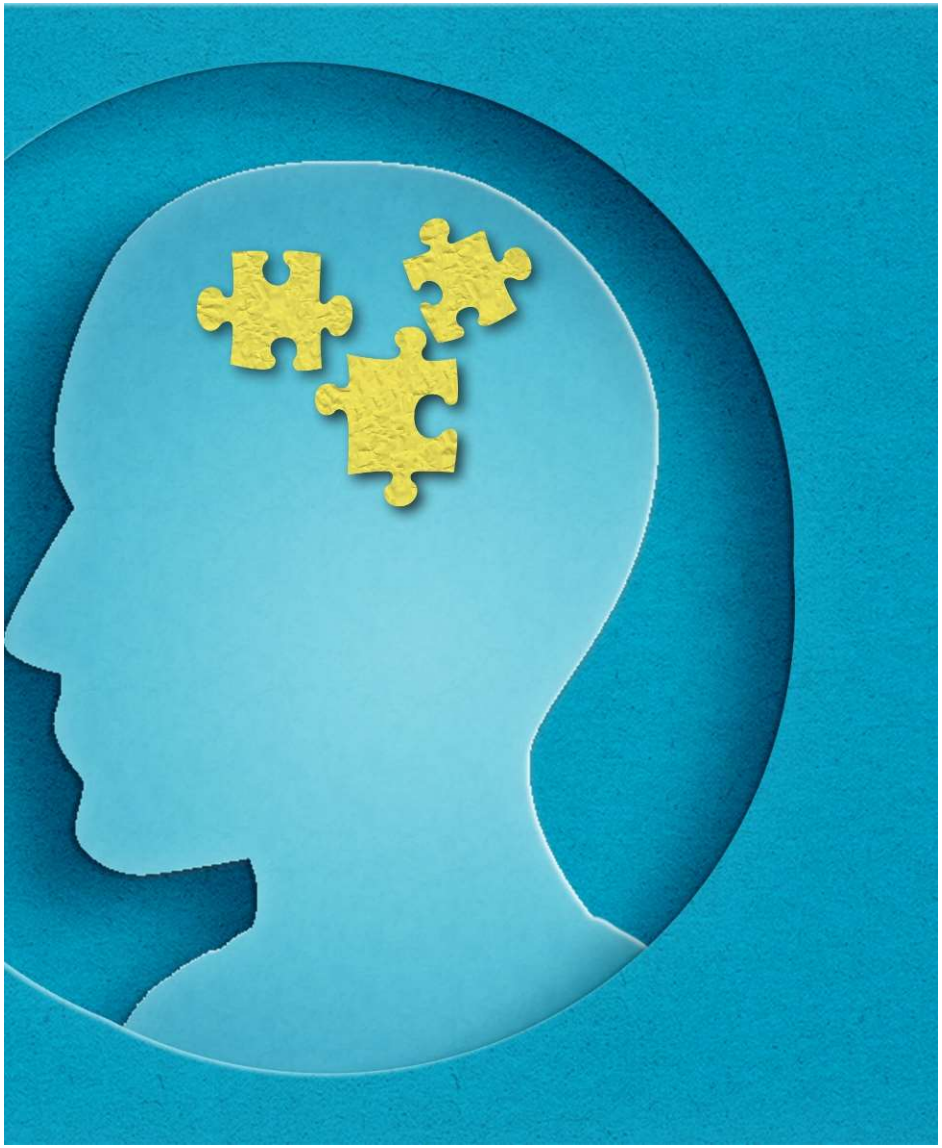
- Swelling of the abdomen and legs
- Mental confusion
- Extreme fatigue or tiredness
- Signs of advanced disease include:
  - Portal hypertension, spider angiomas, reddening of palms, declining platelet counts

Mayo Clinic

Question: What does a Liver Elastography reveal?

The provider is sending JR for a Liver Elastography or FibroScan test since JR has elevated ALT and AST levels along with an elevated Fib-4 score. Which of the following are measured during this liver ultrasound procedure?

A. Liver diameter and density.
B. Liver scarring and ductal health.
C. Hepatocyte density and distribution.
D. Liver stiffness and fat density.



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

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

Steatosis Interventions

- Nutrition
  - Weight loss goal of 5-10% or more
  - Mediterranean Diet
  - Avoid alcohol
  - Decrease processed foods, meats and sugary foods.
  - Increase vegetables and other high fiber foods.
- Move more – including aerobic activity and strength training.
- Close follow-up and ongoing monitoring
- Can be associated with worsening renal function

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

Other Treatments for NAFLD and NASH

- 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

Support lifestyle changes

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

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
  - Statin
- Prevention
  - Cancer Screenings
  - Decrease inflammation

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

NEW Bone Health Recommendations

- Diabetes associated with increased fractures
- Take preventive action:
  - For high-risk older adults (aged >65 years) and younger individuals with multiple risk factors.
    - Monitor bone mineral density using dual-energy X-ray absorptiometry every 2–3 years.
  - Avoid medications that increase fractures in high risk
  - Problem solve to prevent falls
  - Adequate calcium and vita D intake
  - Consider antiresorptive meds, osteoanabolic agents for those with low bone mineral density score.

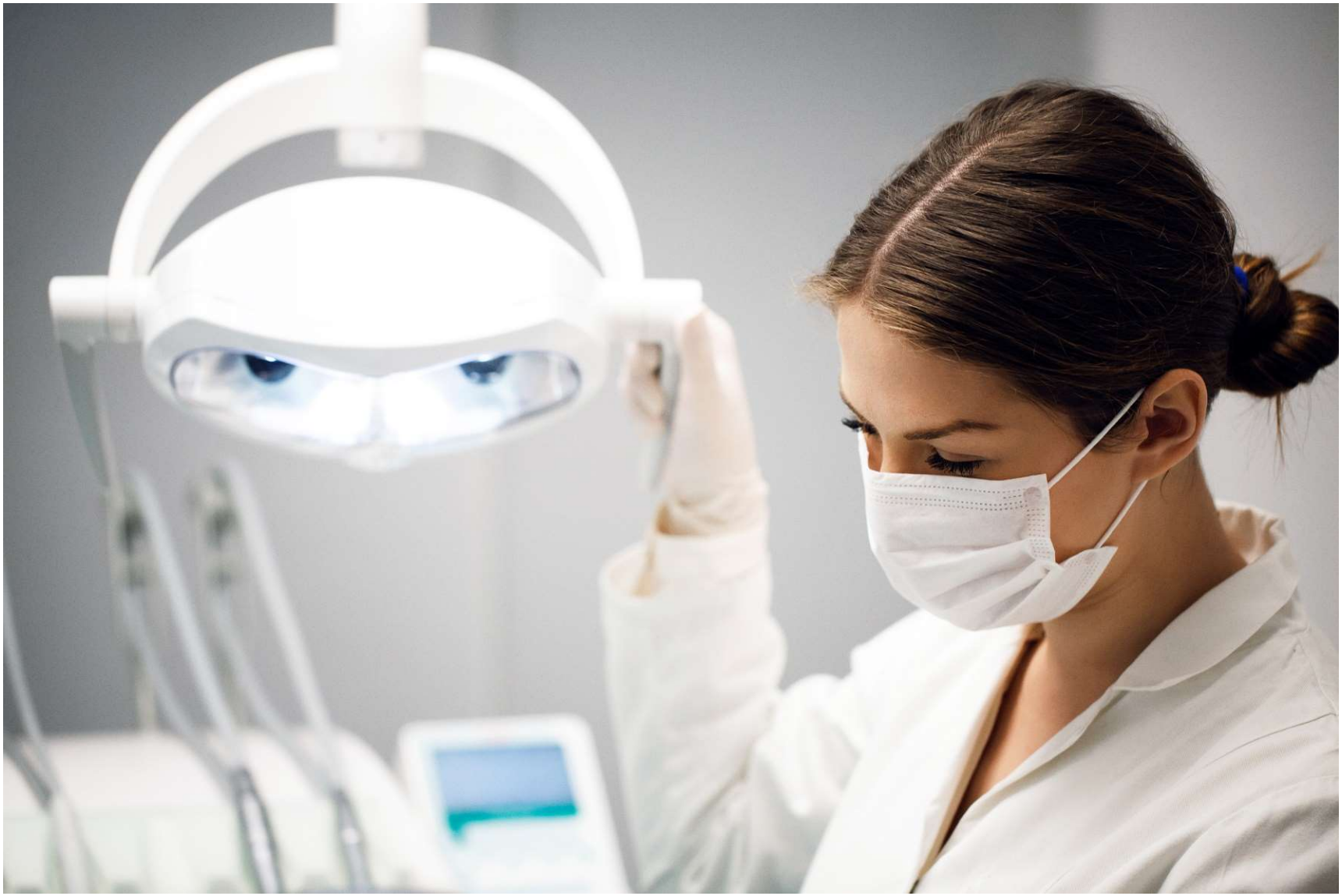
4. Comprehensive Medical Evaluation and Assessment of Comorbidities: *Standards of Care in Diabetes—2024* FREE

Risk Factors for Fracture

- General risk factors
  - Prior osteoporosis fracture
  - Age > 65 years
  - Low BMI
  - Sex
  - Malabsorption
  - Recurrent falls
  - Glucocorticoid use
  - Family history
  - Alcohol /tobacco abuse
  - Rheumatoid arthritis
- Diabetes Specific Risk Factors
  - Lumbar spine or hip T-score ≤ -2.0
  - Frequent hypoglycemia
  - Diabetes >10 years
  - Diabetes meds: TZDs or sulfonylureas, insulin
  - A1C > 8%
  - Peripheral autonomic neuropathy
  - Retinopathy and nephropathy

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: *Standards of Care in Diabetes—2024* FREE

EV Dental, Eye, Kidney and Nerve Care



Poll Question 14

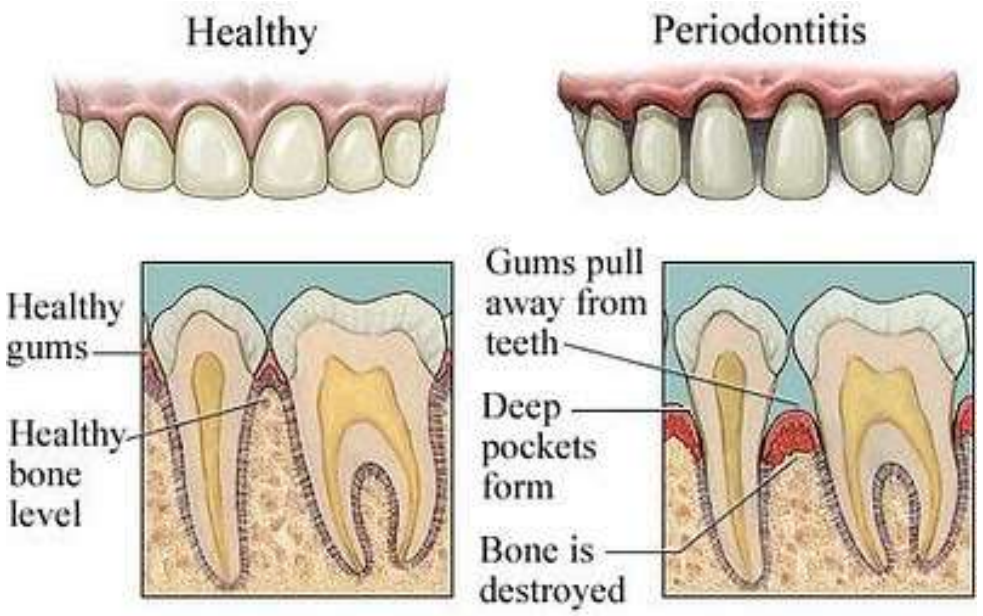
- Diabetes is associated with an increased risk of oral disease. Which of the following statements is true?

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

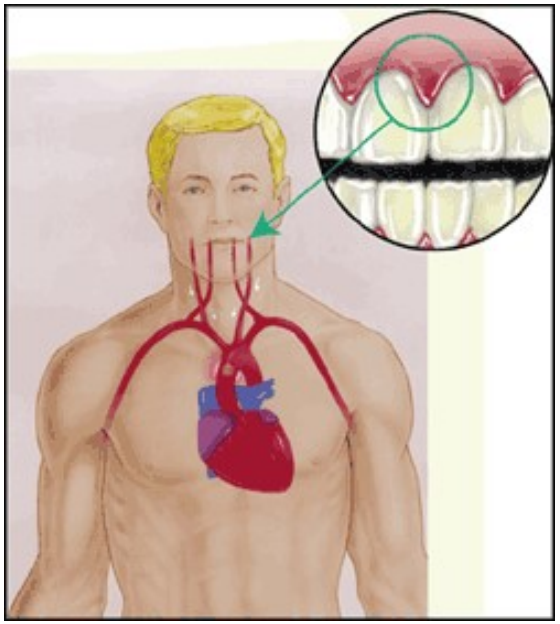
- More severe and prevalent with diabetes and elevated A1c levels.
  - periodontal treatment associated with better glycemic control

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



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

Periodontal disease and Heart Disease



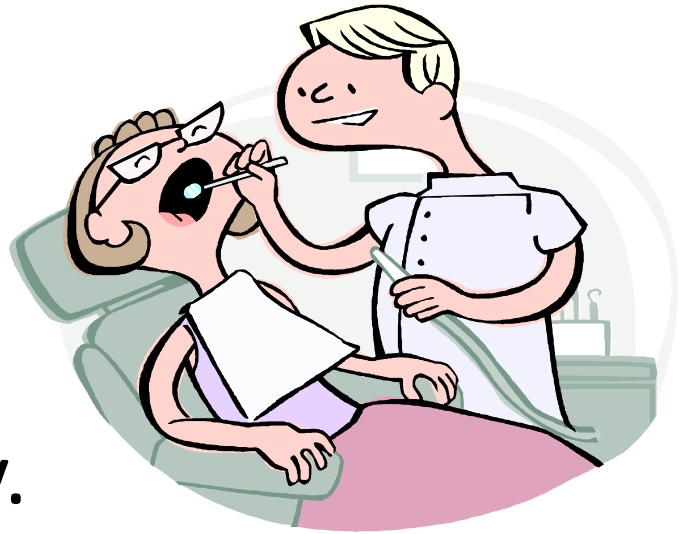
- Heart disease link:
  - oral bacteria enter the blood stream, attach to fatty plaques in coronary arteries increasing clot formation
  - inflammation increases plaque build up, which may contribute to arterial inflammation
- Hyperglycemia = Gingivitis = Heart Disease

Salivary Dysfunction and Xerostomia (dry mouth) in DM

- Less saliva uptake and excretion = less protection against bacteria
- Hyperglycemia increases glucose levels in saliva, providing medium for bacterial growth- also promotes dry mouth
- Dry mouth increases risk of infection and can alter nutritional intake (due to chewing, swallowing difficulties)

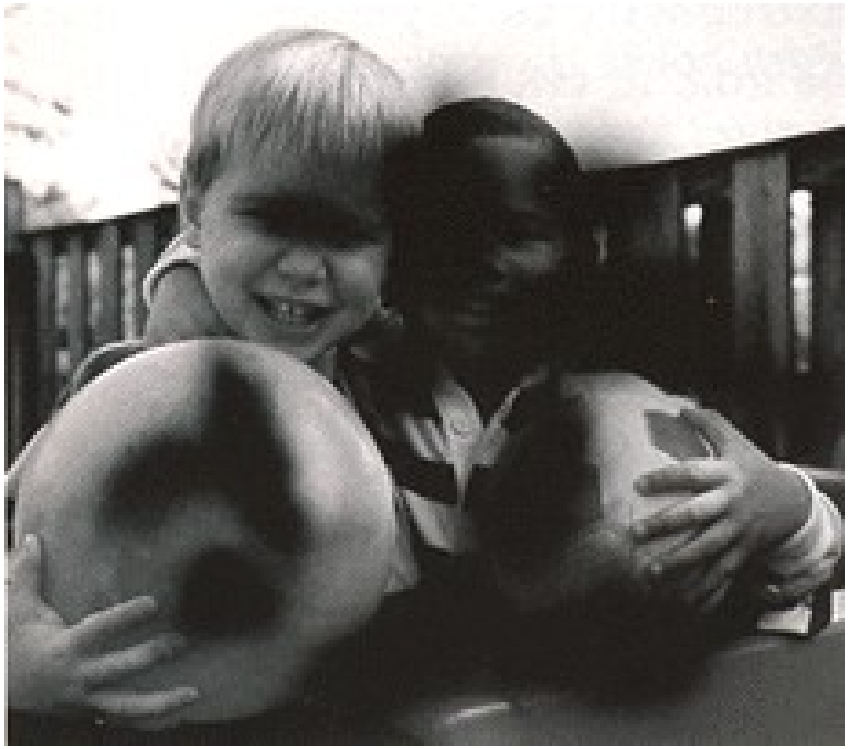
Keeping Oral Healthy

- 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.



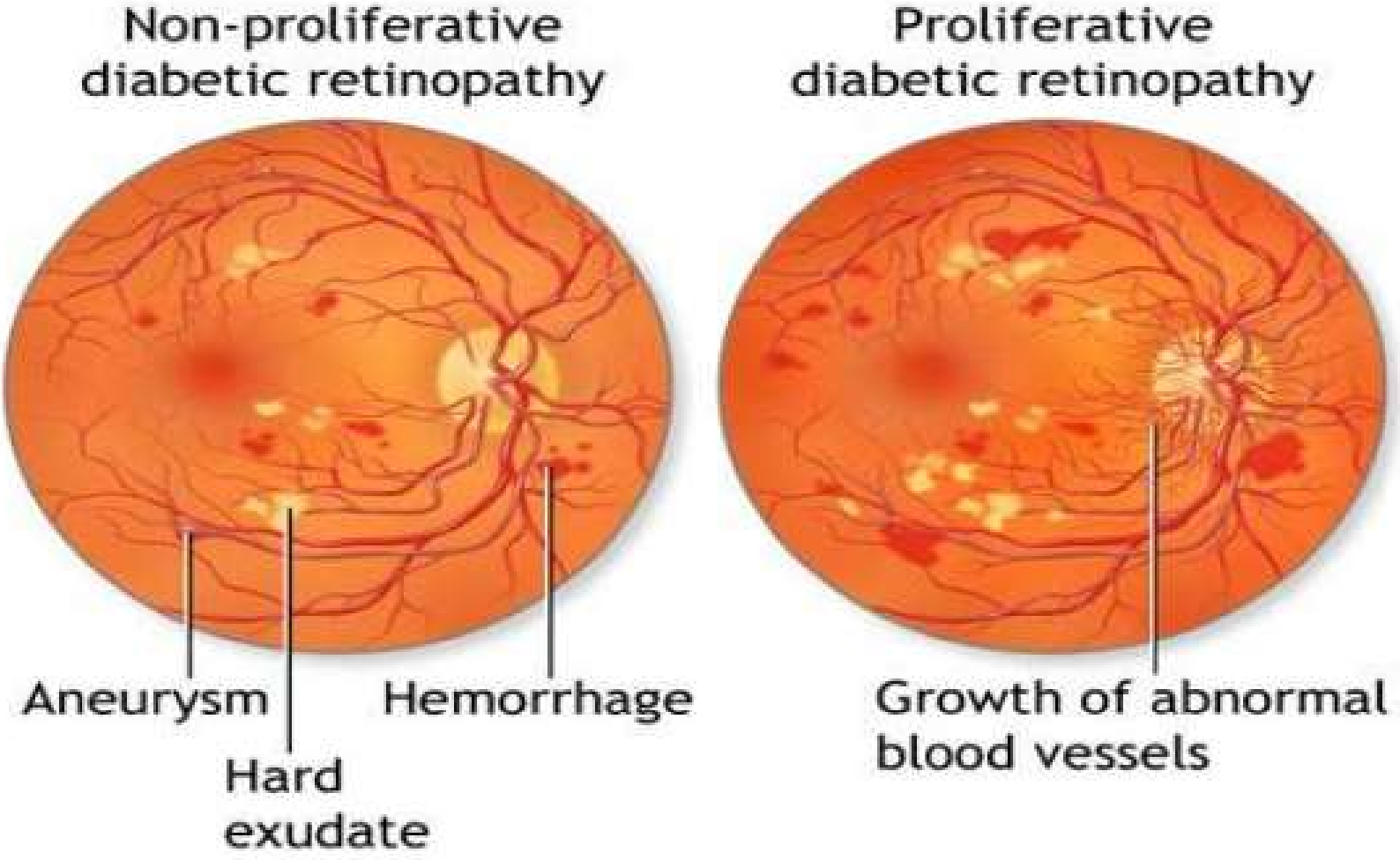
Retinopathy Changes How We See

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*
  - Type 1 or type 2 diabetes need eye exam before pregnancy and 1st trimester. Monitor every trimester and for 1 year postpartum as indicated by the degree of retinopathy.
  - *If **no** evidence of retinopathy **and** glycemic indicators within goal range, then screening every 1–2 years may be considered.
- Appropriate to use retinal photography with remote reading or U.S. FDA of approved artificial intelligence algorithms to improve access to diabetes retinopathy screening.
- Promptly refer people with macular edema, severe non-proliferative disease to trained specialist.

12. Retinopathy, Neuropathy, and Foot Care: *Standards of Care in Diabetes—2024* 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

12. Retinopathy, Neuropathy, and Foot Care: *Standards of Care in Diabetes—2024*

American Diabetes Association Professional Practice Committee

Standard 11 - Chronic Kidney Disease and Risk Management

- **Optimize glucose and B/P Control to protect kidneys**
- Screen Urine Albumin Create ratio (UACR) & GFR
  - Type 2 at dx then yearly
  - Type 1 with diabetes for 5 years, then yearly
  - If urinary albumin ≥300 and GFR 30–60 monitor 1-4 times a year to guide therapy.

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

11. Chronic Kidney Disease and Risk Management: *Standards of Care in Diabetes—2024*

American Diabetes Association Professional Practice Committee

Definitions of Abnormalities in Albumin Excretion

- Urine albumin – creatinine ratio (UACR)

Category	UACR mg/g
Normal	<30
Moderately increased urinary albumin	30-299
Severely increased urinary albumin	>300

- 2 of 3 tests w/in 3-6 mo abnormal to confirm*
  - *Exercise within 24 h, infection, fever, congestive heart failure, marked hyperglycemia, menstruation, and marked hypertension may elevate UACR independently of kidney damage.

11. Chronic Kidney Disease and Risk Management: *Standards of Care in Diabetes—2024*

American Diabetes Association Professional Practice Committee

Optimizing Health - Kidney Disease

Optimize glucose and B/P to protect kidneys

- If UACR > 30 mg/g treat hypertension with ACE or ARB, monitor K+
- For people with type 2 diabetes and CKD eGFR ≥20 and urinary albumin ≥200 mg/g.
- For cardiovascular risk reduction:
  - Use SGLT2 inhibitor (if eGFR is ≥20)
  - Use a glucagon-like peptide 1 agonist,
  - or a nonsteroidal mineralocorticoid receptor antagonist (if eGFR is ≥25).
    - Potassium levels should be monitored.
- Refer to nephrologist if GFR <30

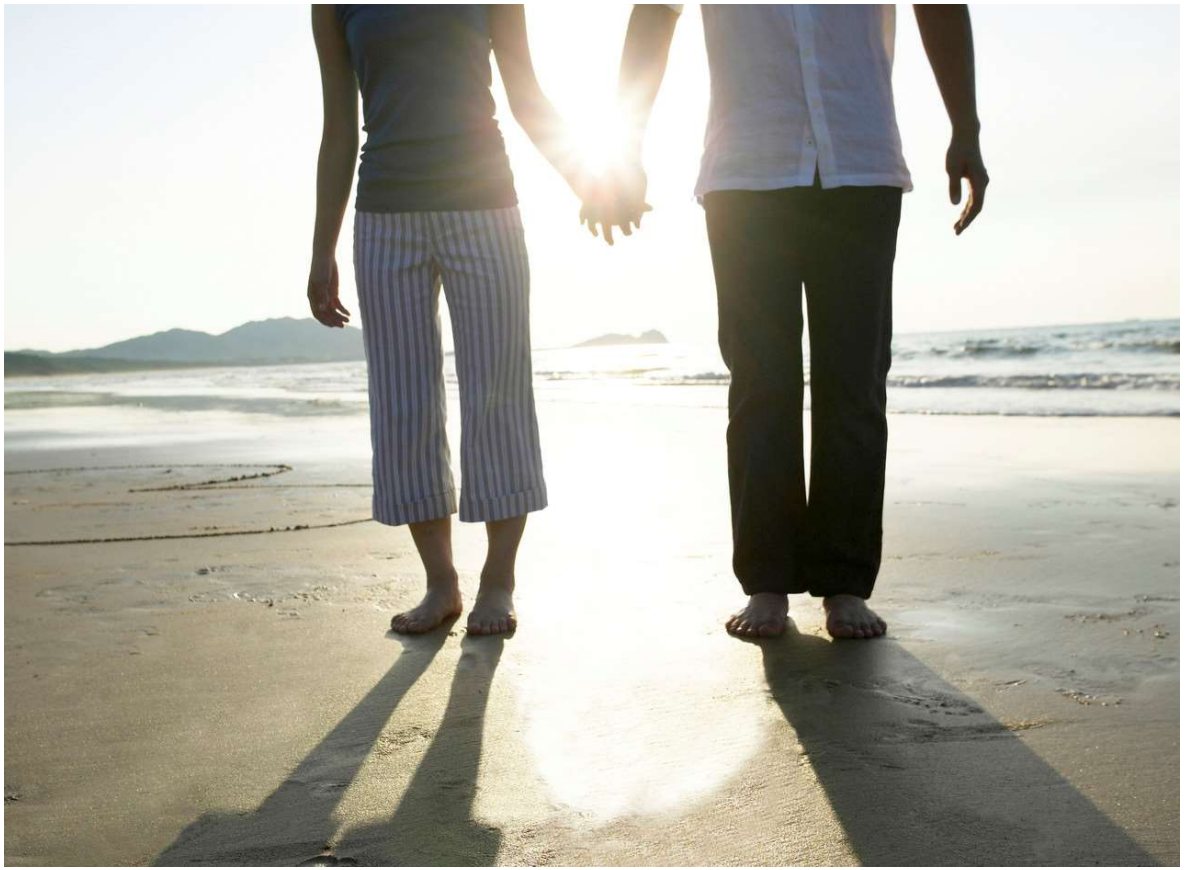
At higher risk of Hypoglycemia

11. Chronic Kidney Disease and Risk Management: *Standards of Care in Diabetes—2024*

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

Resurgence of Diabetes-Related Nontraumatic Lower Extremity Amputation in the Young and Middle-Aged Adult U.S. Population

https://doi.org/10.2337/DC18-1380

Diabetes Care 2018

Poll Question 16

- 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

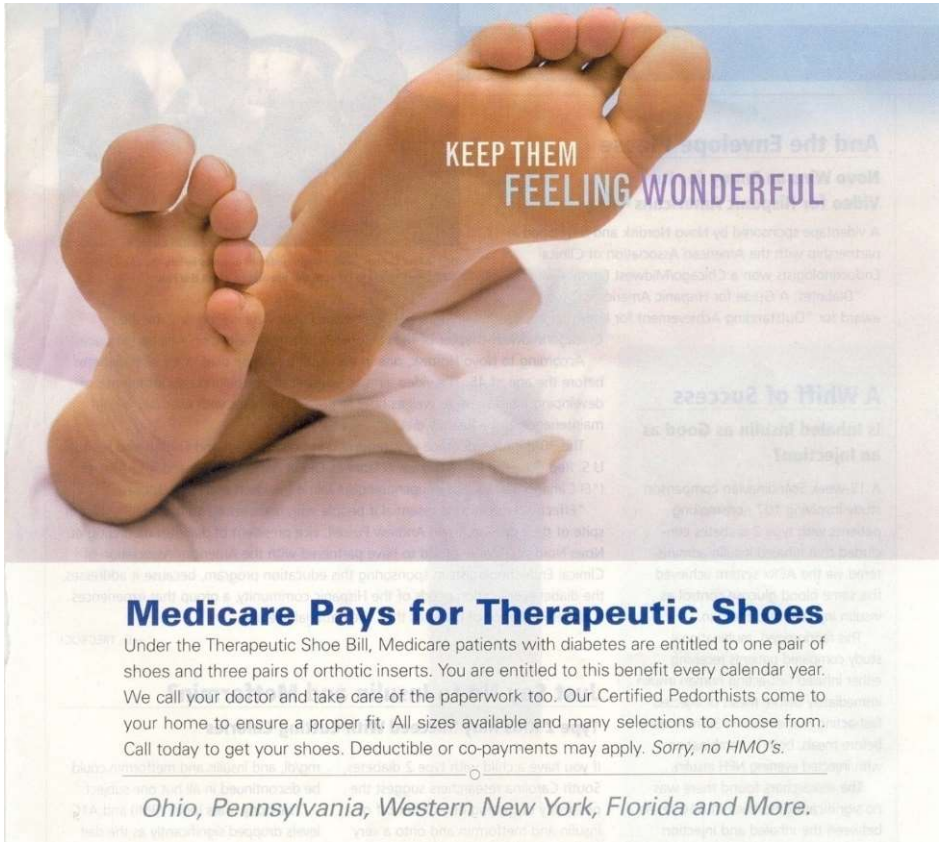
d. Once a person with diabetes has an amputation, they are not likely to have another.

Lower Extremities

- Lift the Sheets and Look at the Feet

No DeFEET

Feet Deserve Special Care



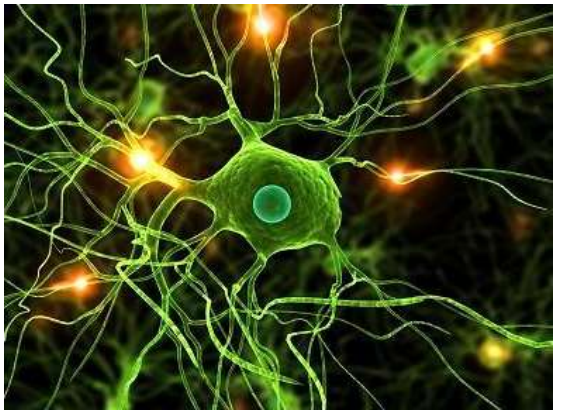
- Daily inspection
- With order from MD and Loss of Protective Sensation (LOPS), Medicare Covers:
  - Annual custom shoes
  - 3 pairs of orthotic inserts

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

Nerve disease Screening



- Screen all people with diabetes for nerve disease using simple tests, such as pinprick, vibration & monofilament sensation.
  - Type 2 at diagnosis, then annually
  - Type 1 diabetes at 5 years, then annually
- Glycemic management is the main strategy to prevent or delay the development and progression of neuropathy.
- Assess and treat to reduce pain and symptoms to improve quality of life.

12. Retinopathy, Neuropathy, and Foot Care: *Standards of Care in Diabetes—2024*

American Diabetes Association Professional Practice Committee

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.

12. Retinopathy, Neuropathy, and Foot Care: *Standards of Care in Diabetes—2024*

American Diabetes Association Professional Practice Committee

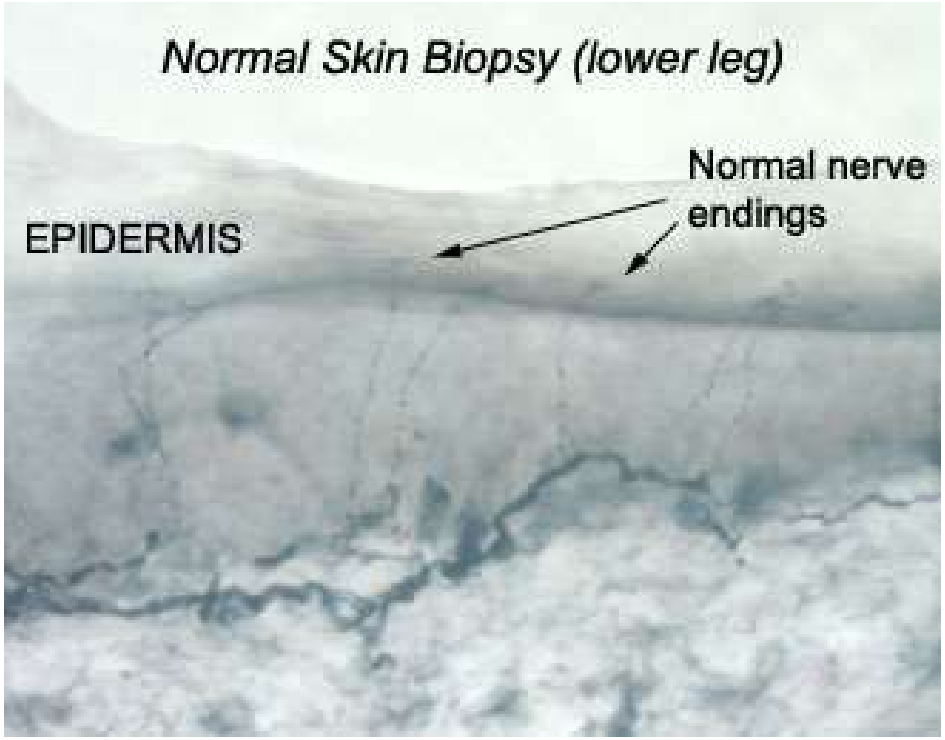
Consider Other Causes of Neuropathy

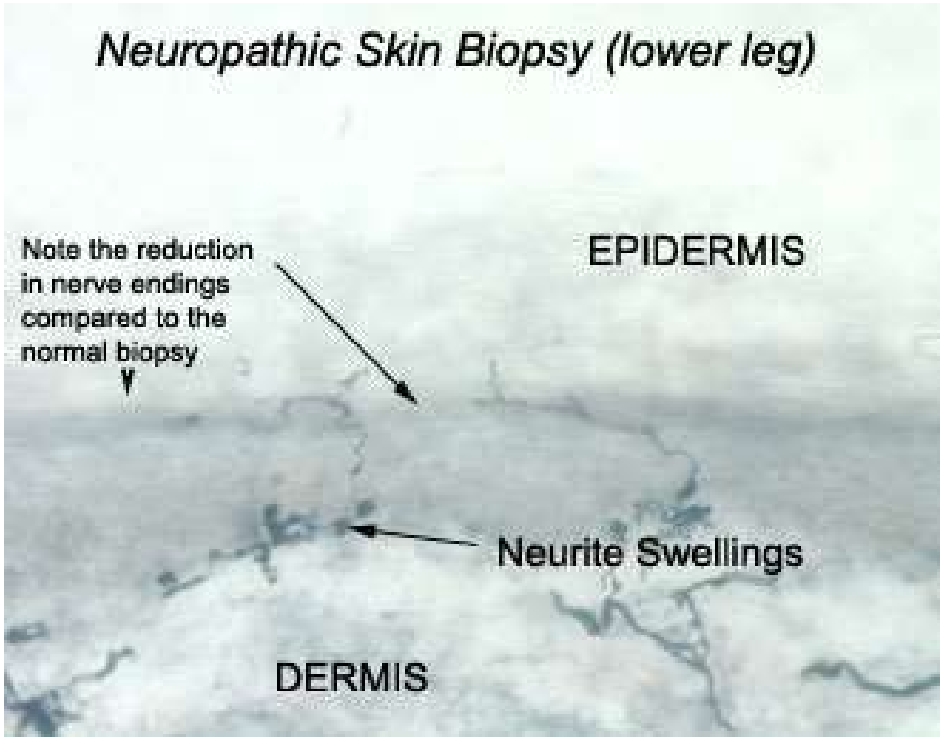
- toxins (e.g., alcohol)
- neurotoxic medications (e.g., chemotherapy)
- vitamin B12 deficiency
- hypothyroidism
- renal disease
- malignancies (e.g., multiple myeloma, bronchogenic carcinoma)
- infections (e.g., HIV)
- chronic inflammatory demyelinating neuropathy
- inherited neuropathies, and vasculitis

12. Retinopathy, Neuropathy, and Foot Care: *Standards of Care in Diabetes—2024*

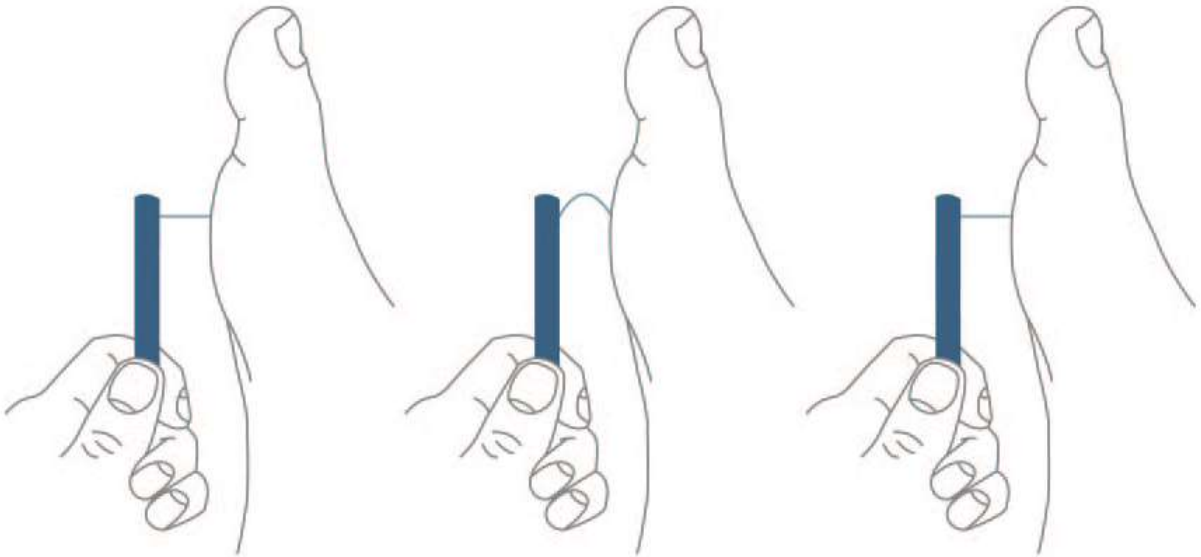
American Diabetes Association Professional Practice Committee

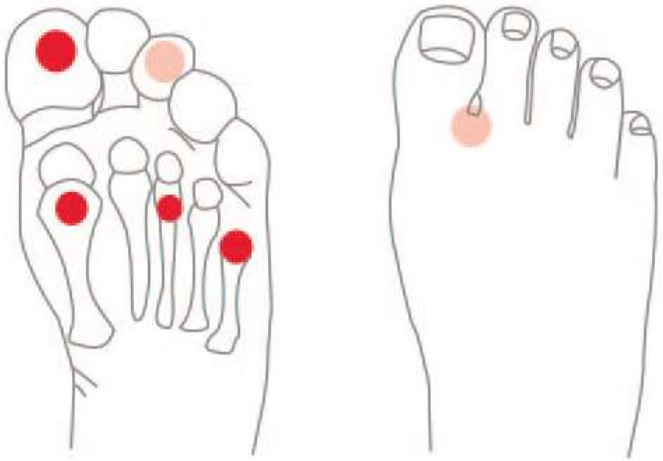
Skin Biopsy to Assess Neuropathy





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 (Tramadol, Oxycodone)

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 St Saved to this PC	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	Weak opioids Tramadol / Ultram	50 – 400 mg	Sedation, nausea, constipation (always prescribe stool softener) **Caution:** abuse, suicide risk, short acting	
	Strong opioids	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—2024*

American Diabetes Association Professional Practice Committee

Other strategies to help ease the pain

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

- Tylenol / 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

“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

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?

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

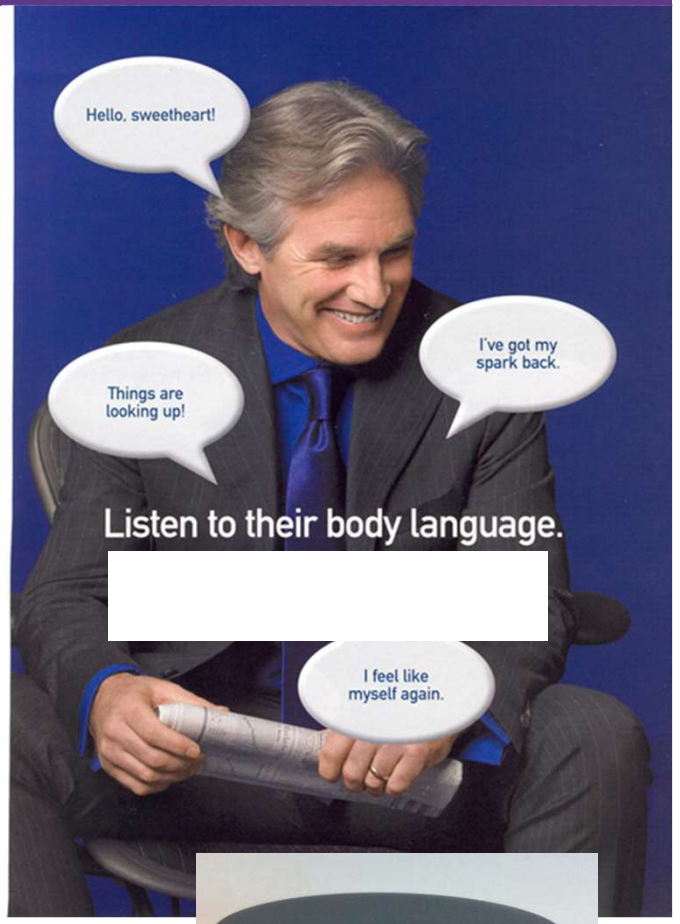
Many people with diabetes have issues with sexual desire, arousal, or orgasm. How about you?"

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

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



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

Integrating Technology: CGM Connected Pens and Insulin Pumps

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

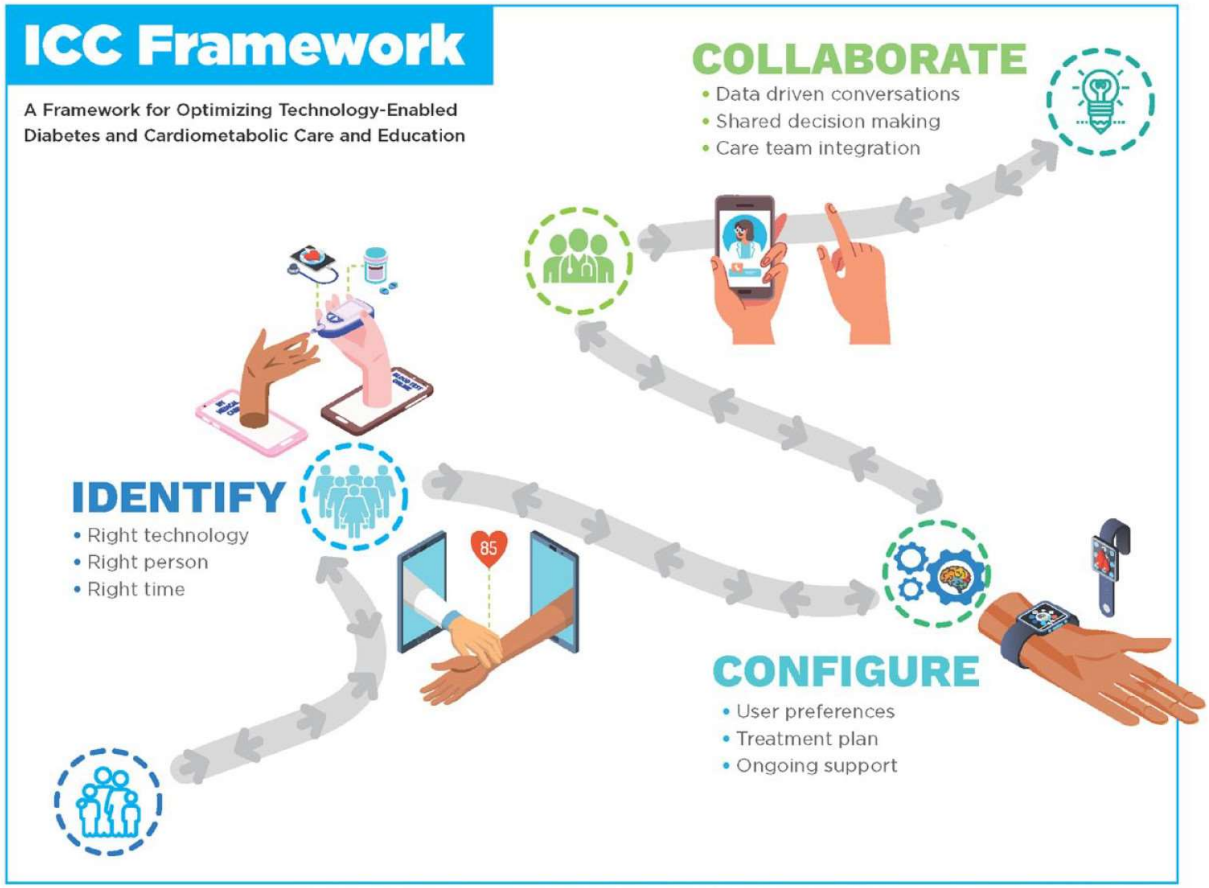
Director, Education & Training in Diabetes Technology

Learning Objectives

- Discuss continuous glucose monitoring (CGM) and the clinical benefits for managing diabetes
- Compare and contract 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



Copyright © 2020 Association of Diabetes Care & Education Specialists. All rights reserved. Reproduction or republication strictly prohibited without prior written permission.

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 follow-up."

ADA. Diabetes Care. 2024.

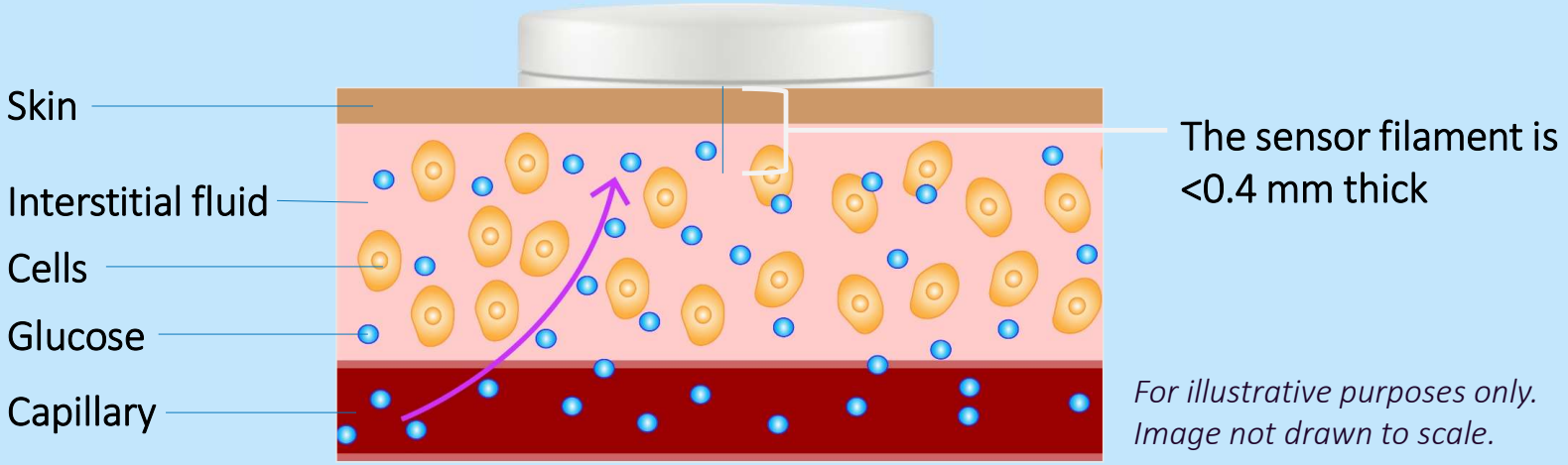
Guidelines: ADA

- Initiation of CSII and/or AID early, even at diagnosis, in the treatment of diabetes can be beneficial depending on a person's or caregiver's needs and preferences. (C)
- AID systems should be offered for diabetes management to youth and adults with T1D (A) and other forms of insulin deficient diabetes (E) who are capable of using the device safely.
- Connected insulin pens can be helpful for diabetes management and may be used in people with diabetes taking subcutaneous insulin. E
- Systems that combine technology and online coaching can be beneficial in managing prediabetes and diabetes for some individuals. B
- The choice of device should be made based on the individual's circumstances, preferences and needs.

Diabetes Care 2024;47(Suppl. 1):S126–S144

Continuous Glucose Monitors (CGM)

- Measures glucose (sugar) every 1-5 mins and records it every 5-15 mins (up to 288 readings/day)
- Includes 3 components: transmitter, sensor, receiver/reader



For illustrative purposes only. Image not drawn to scale.

Illustration adapted from: Association of Diabetes Care & Education Specialists. ADCES Practice Paper. Accessed 11/9/21. https://www.diabeteseducator.org/docs/default-source/practice/practice-documents/practice-papers/the-diabetes-educator-role-in-continuous-glucose-monitoring.pdf?sfvrsn=4

CGM: Real-Time Data

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 or scan for feedback (flash device)
Short-term use (3-14 days)	Long-term use
Insurance coverage for most people with type 1 or type 2 diabetes	Insurance coverage more focused on type 1 diabetes or those on intensive insulin regimens
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.

Professional CGM Comparison

	Dexcom G6 Pro	LibrePro
Blinded vs unblinded	Both	Blinded
Maximum wear time of sensor	10 days	14 days
Calibration	None	None
Downloading reports	Clarity	LibreView
Care between transmitter use	Disposable-1 time use, must attached transmitter	Disposable 1-time use, combined sensors/transmitter
Alarms for high/low glucose alerts	Yes	No
Interfering substances	Hydroxyurea	Salicylic acid and high-dose vitamin C

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

Personal CGM Options (Rx)

Owed by the person with diabetes → Typically used long term → Device options include real-time glucose monitoring (rtCGM) or intermittent scanning (isCGM) → Some options can be integrated with insulin pumps or connected insulin pens

- Freestyle Libre 2 and 2+
- Freestyle Libre 3 and 3+
- Eversense
- Guardian 4
- Simplera
- Dexcom G6
- Dexcom G7

Slide 12

AS1 Added Dexcome to G6

Added FreeStyle to Libre 2 and Libre 14 Day

Added Sensor to Guardian 3

Alissa Scott, 11/9/2021

CGM Comparison

	G6	G7	Libre 2	Libre 3	Guardian 4	Simplera	Eversense E3
Integration	T:Slim X2, Omnipod5, InPen, Tempo, iLet	T:Slim X2 Tempo, iLet	Bigfoot Unity, T:Slim X2 (Libre 2+)	No	780G	InPen	No
Type	rtCGM	rtCGM	isCGM	rtCGM	rtCGM	rtCGM	rtCGM
Maximum wear time	10 days	10.5 days	14 days (15 days with Libre2+and 3+)		7 days	7 days	180 days
Warm-up time	2 hours	30 min	1 hour		Up to 2 hours	Up to 2 hours	24 hours
Calibrations required	0	0	0		At least 2/day	0	2/day for 21 days, then 1/day
Water depth	8 feet, 24h	8 feet, 24h	3 feet, 30 min		8 feet, 30 min		3.28 feet, 30 min
Sharing Data	Dexcom Clarity		LibreView		Carelink	Carelink	Eversense Data Management System

CGM Comparison (Continued)

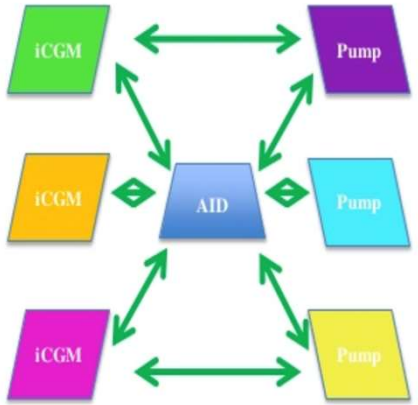
	G6	G7	Libre 2	Libre 3	Guardian 4	Simplera	Eversense
FDA approved sites	Abdomen (ages2+) Upper buttocks (ages 2-17)	Upper arm (ages 7+) Upper buttocks (ages 2-6)	Upper arm		Upper arm, abdomen Upper buttocks (ages 2-13)		Upper arm
Approved in pregnancy	No	Yes	Yes		No	**No**	No
Transmitter	3 months	Disposable	Disposable		Charge weekly	Disposable	Charge daily
FDA approved ages (years)	≥2	≥2	≥4 (2 with Libre2+ and 3+)		≥2		≥18
Drug interactions	Hydroxyurea	Hydroxyurea	Vitamin C (not with Libre 2+ and 3+)		Acetaminophen Hydroxyurea		Tetracycline antibiotics, mannitol

Product user guides: Dexcom G6, Dexcom G7, Libre 2, Libre 3, Medtronic Guardian Connect, Guardian 4, Eversense

Integrated CGM

- Dexcom G6, G7, Libre 2, Libre 2+ Libre 3+, Eversense are integrated CGM (iCGM)
- Integration with digitally connected devices (eg, pumps, pens, automated insulin dosing [AID] systems)

Goal: Greater Interchangeability



- More efficient regulatory pathways
- Faster innovation
- A more vibrant device ecosystem

Poll Question 12

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

A. Dexcom G6
B. Dexcom G7
C. Libre 3
D. Dexcom Stelo

Dexcom Stelo

- For people over 18 that don’t take insulin
- Glucose range: 70-250mg/dL
- Updates every 15 minutes, 30 minute warm-up
- Stelo app + Dexcom Clarity
- Spike detection, no high/low alerts
- Education in app
- https://www.dexcom.com/stelo

Abbott Lingo

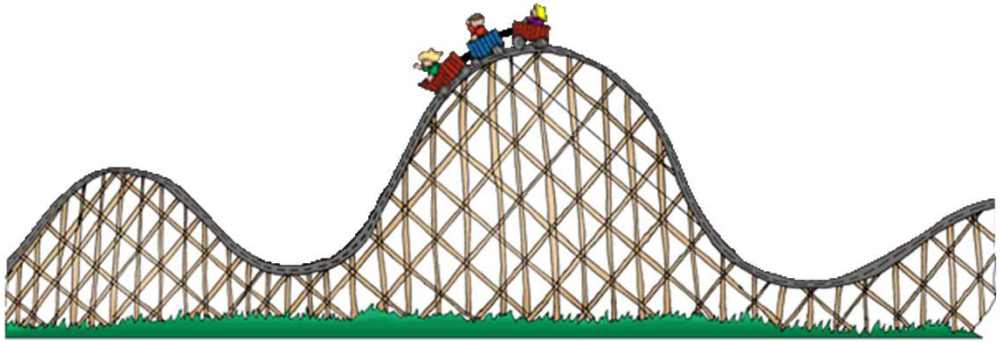
- For people over 18 not on insulin
- Glucose range: 55-200mg/dL
- Updates every minute, 1 hour warm-up
- Lingo app
- No real time alerts
- Education in app, goal to stay under lingo count
- www.hellolingo.com

CGM Counseling Points

- Important to check glucose when indicated
  - Symptoms do not match sensor value
  - During warm-up period
  - When making dosing decisions for select devices
- 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
- 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

Lag Time

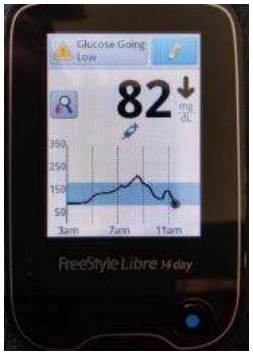
- Refers to a delay in CGM sensor readings compared to finger stick blood glucose readings
  - Estimated CGM sensor reading ~5 minutes behind
- Most apparent when glucose is changing rapidly
- Counsel patients on the train analogy



Causes of Falsely High or Low Readings

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

When to Check BGM?



- A calibration or blood glucose symbol appears on the device
- Symptoms or expectations do not match CGM readings
- Off-label indications: dialysis
- After correcting a low
- If taking an interfering substance (ex. vitamin C, acetaminophen hydroxyurea)
- Counsel patients about “lag time”

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

ADCES Practice Paper. The Diabetes Care and Education Specialist’s Role in Continuous Glucose Monitoring. Updated March 2021

ADA Standards of Care 2024.

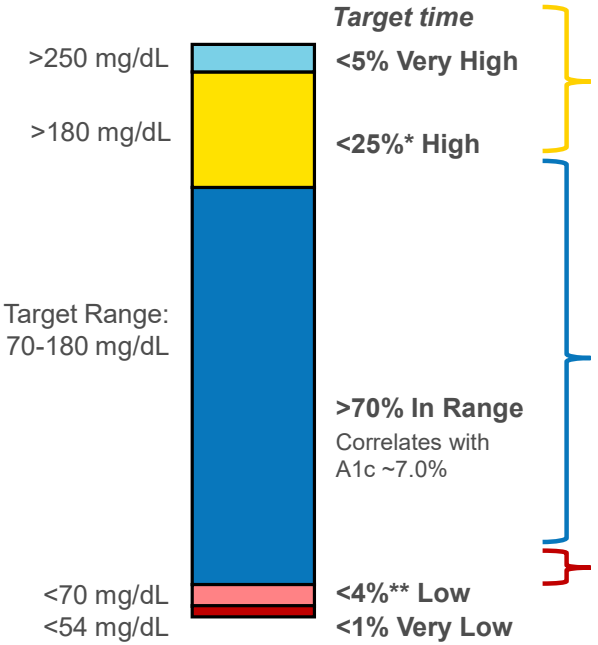
Downloading CGM Data

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

Director, Education & Training in Diabetes Technology

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.

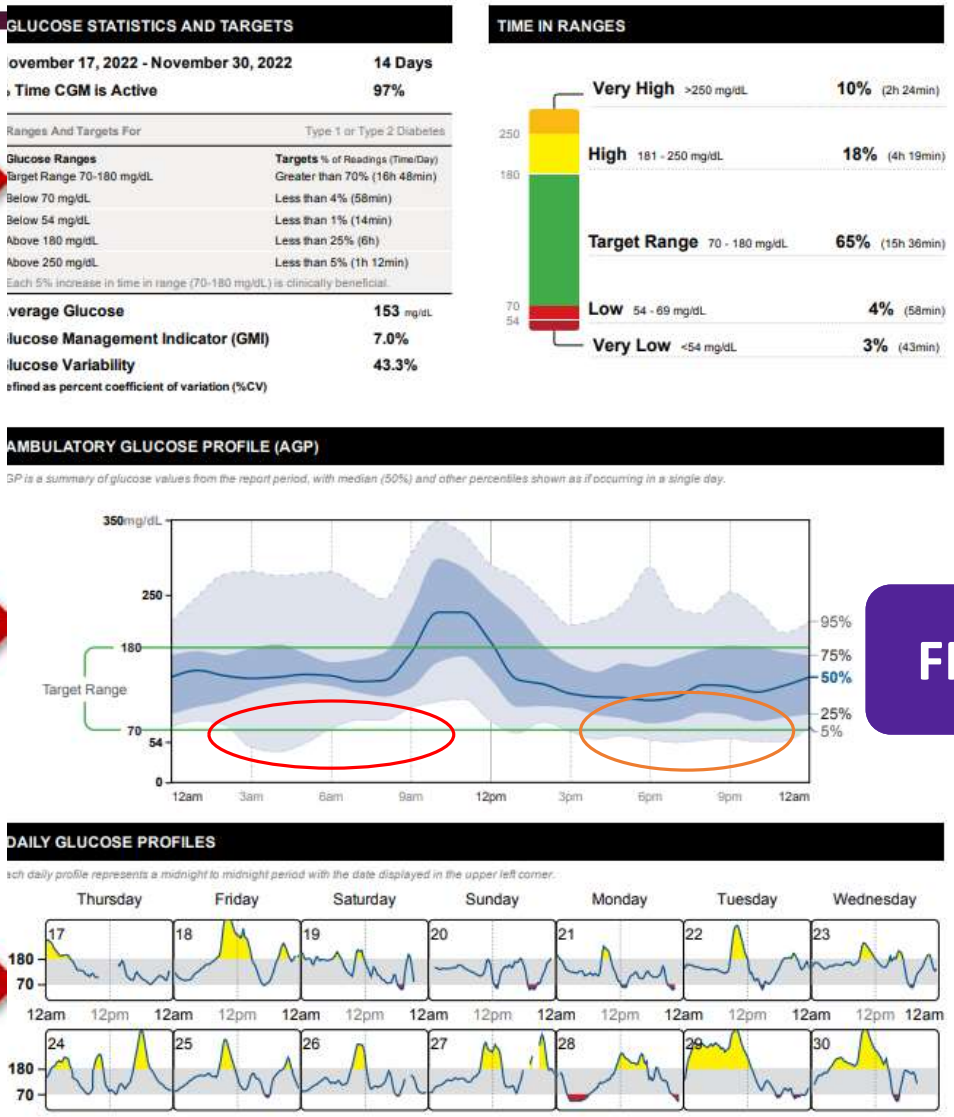
1. Battelino T et al. *Diabetes Care*. 2019;42(8):1593-1603. . 2. American Diabetes Association. *Diabetes Care 2021;44(Suppl. 1):S73–S84 | https://doi.org/10.2337/dc21-S006.*

AGP report

Metrics and targets

Daily views

AGP profile (14 days)



More Green, Less Red

FNIR

Flat Narrow In Range

Treat Hypo 1st

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

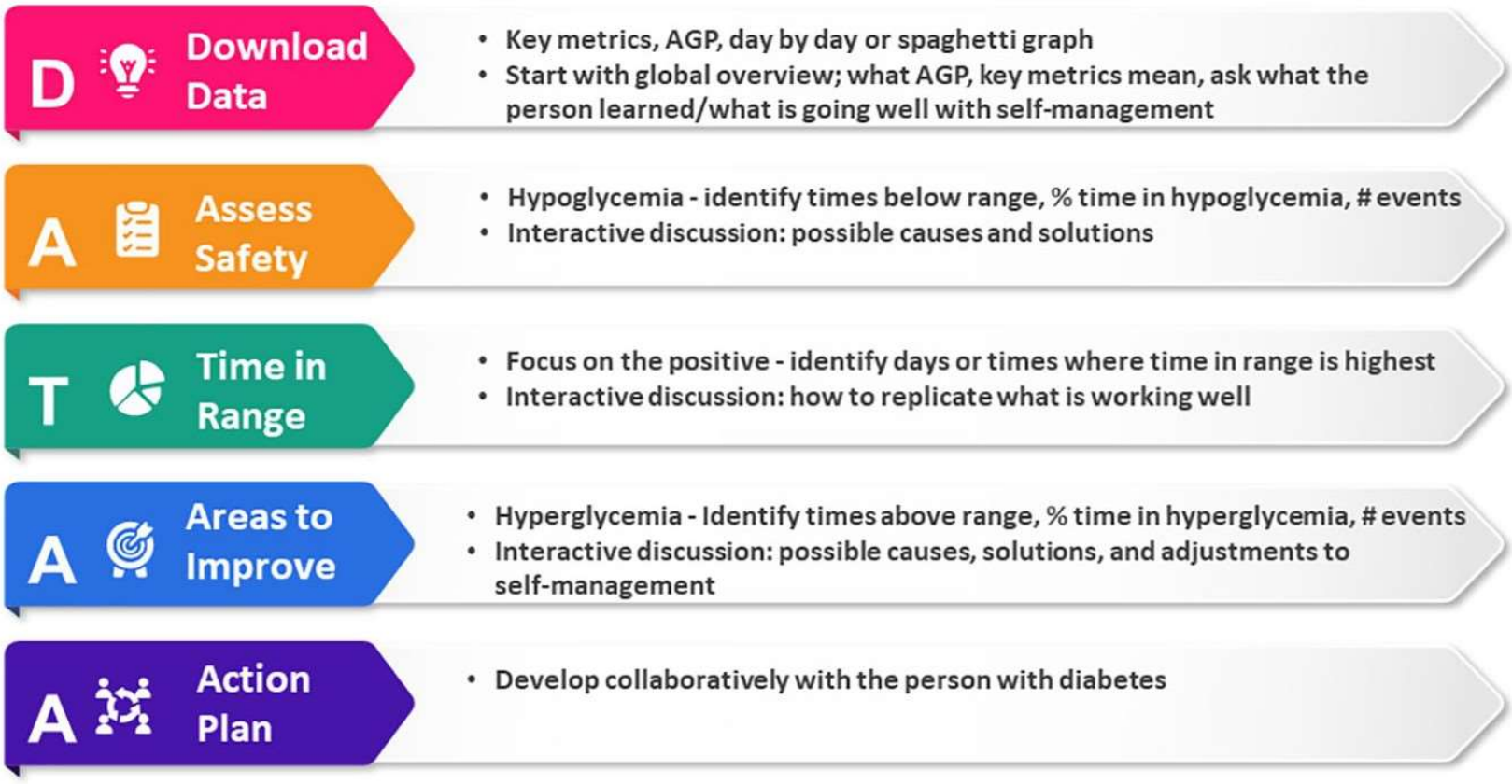
Time in Range

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 ra

Review of CGM - DATAA

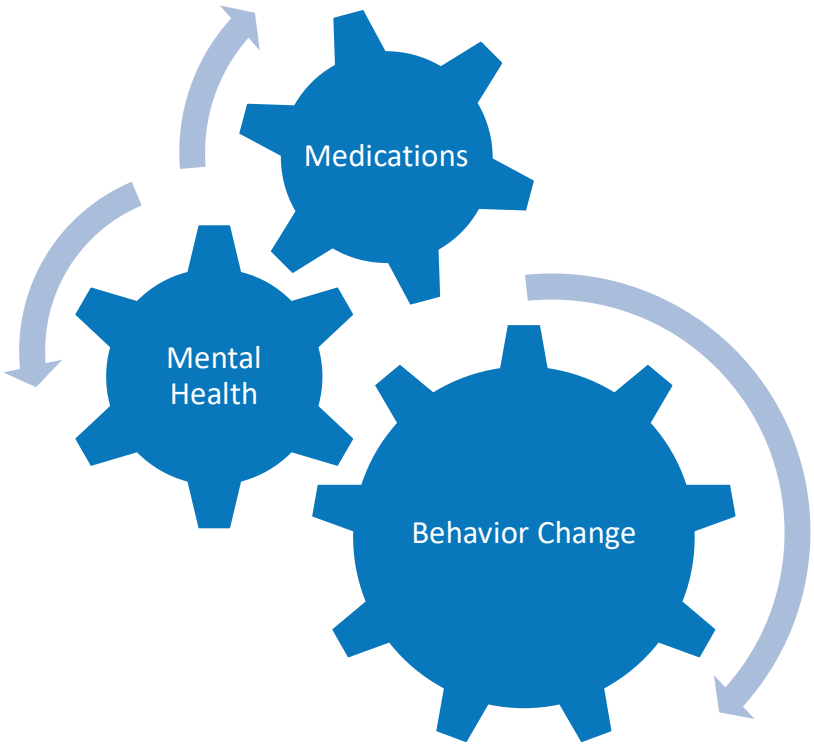


At each step, express that this is information, not good or bad

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 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.

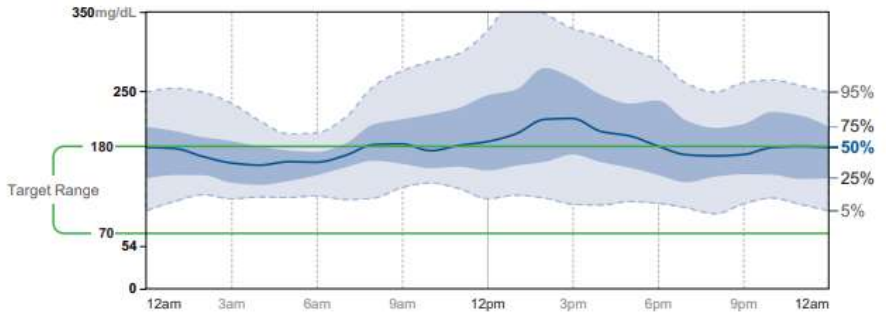
Average Glucose	**185** mg/dL
Glucose Management Indicator (GMI)	**7.7%**
Glucose Variability	**29.7%**

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

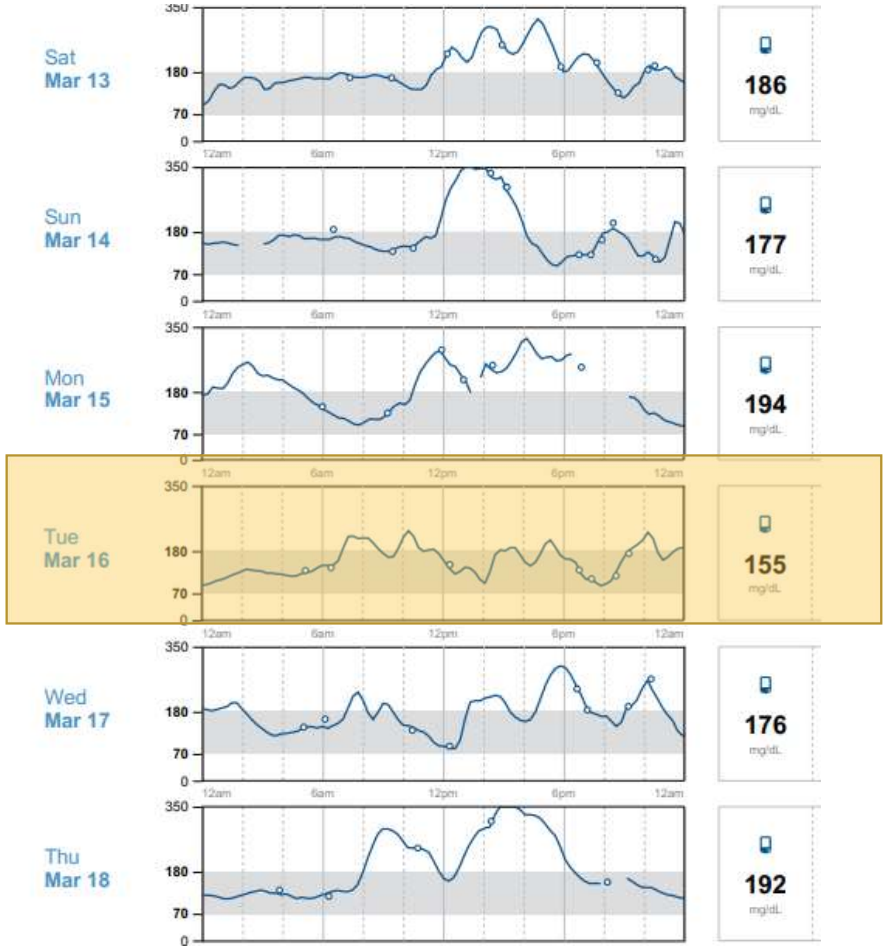
Which CGM key metrics are at goal?

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

Time in Range

Time in Range

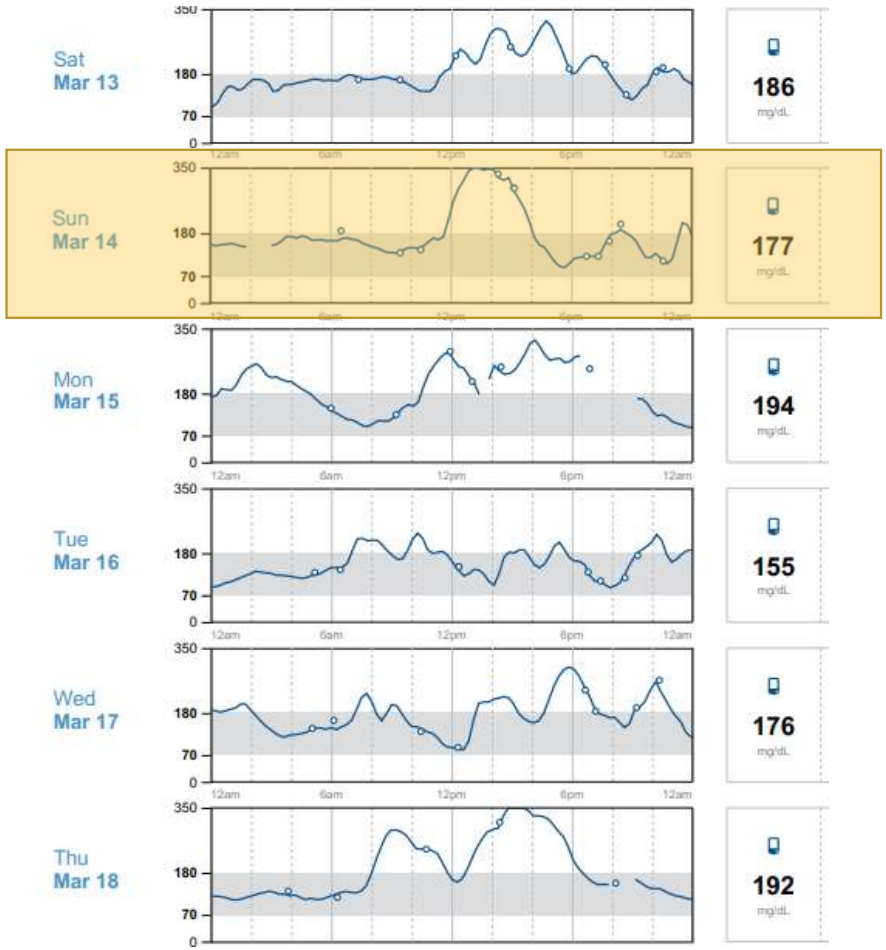
- Focus on the positive: what's worked well on Tue 3/16?
- Time in range is high this day
- Ate a granola bar for breakfast, grilled chicken salad at lunch, steak, greens, potato at dinner
- No missed medication doses
- Good night's sleep, low stress

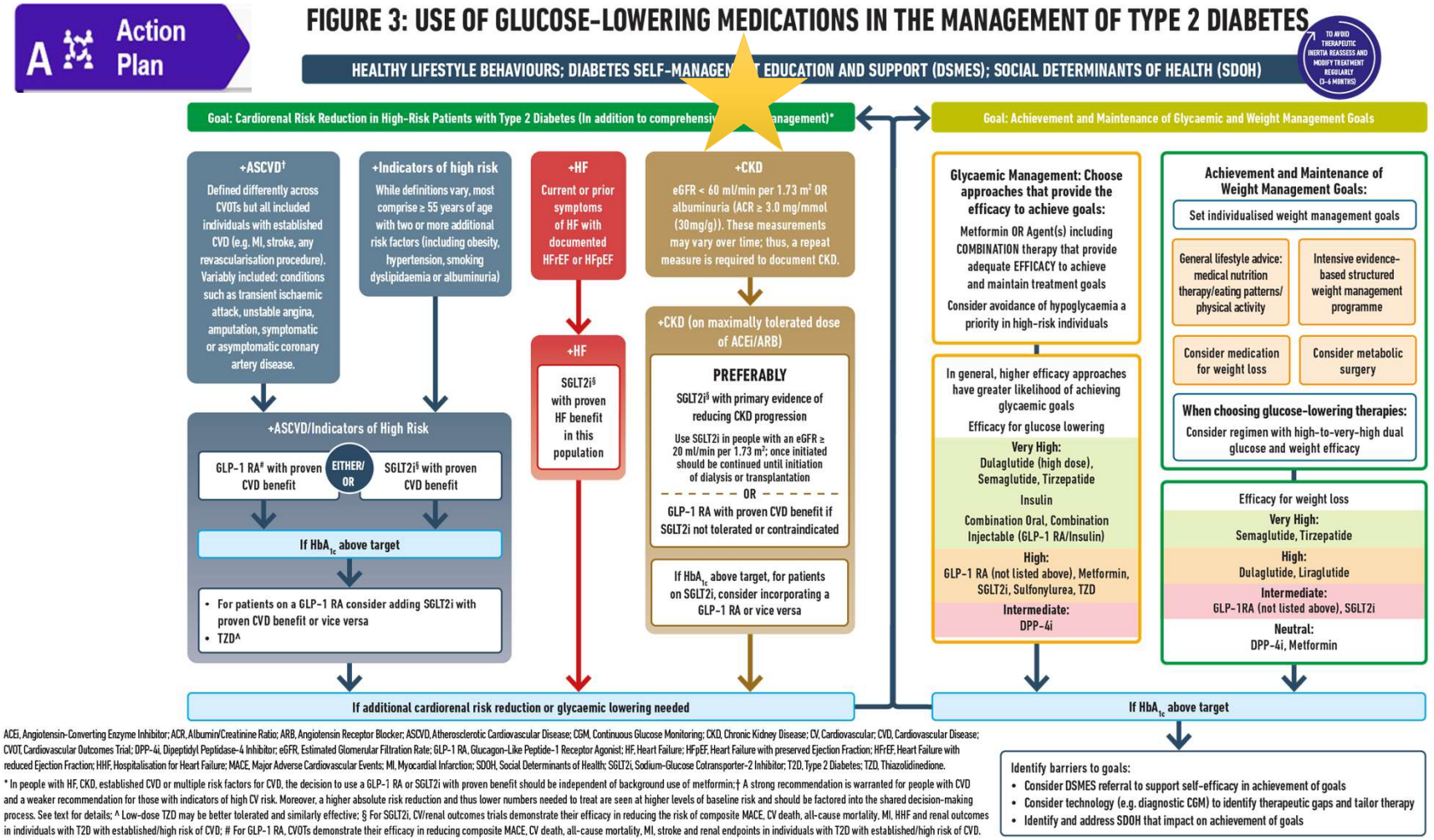


Areas for Improvement

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





ACEi, Angiotensin-Converting Enzyme Inhibitor; ACR, Albumin/Creatinine Ratio; ARB, Angiotensin Receptor Blocker; ASCVD, Atherosclerotic Cardiovascular Disease; CGM, Continuous Glucose Monitoring; CKD, Chronic Kidney Disease; CV, Cardiovascular; CVD, Cardiovascular Disease; CVOT, Cardiovascular Outcomes Trial; DPP-4i, Dipeptidyl Peptidase-4 Inhibitor; eGFR, Estimated Glomerular Filtration Rate; GLP-1 RA, Glucagon-Like Peptide-1 Receptor Agonist; HF, Heart Failure; HFpEF, Heart Failure with preserved Ejection Fraction; HFrEF, Heart Failure with reduced Ejection Fraction; HHF, Hospitalisation for Heart Failure; MACE, Major Adverse Cardiovascular Events; MI, Myocardial Infarction; SDOH, Social Determinants of Health; SGLT2i, Sodium-Glucose Cotransporter-2 Inhibitor; T2D, Type 2 Diabetes; TZD, Thiazolidinedione.

* 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 independent of background use of metformin; † A strong recommendation is warranted for people with CVD and a weaker recommendation for those with indicators of high CV risk. 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; ^ Low-dose TZD may be better tolerated and similarly effective; § For SGLT2i, CV/renal outcomes trials demonstrate their efficacy in reducing the risk of composite MACE, CV death, all-cause mortality, MI, HHF and renal outcomes in individuals with T2D with established/high risk of CVD; # For GLP-1 RA, CVOTs demonstrate their efficacy in reducing composite MACE, CV death, all-cause mortality, MI, stroke and renal endpoints in individuals with T2D with established/high risk of CVD.

Davies MJ, Aroda VR, Collins BS, Gabbay RA, Green J, Maruthur NM, Rosas SE, Del Prato S, Mathieu C, Mingrone G, Rossing P, Tankova T, Tsapas A, Buse JB

Diabetes Care 2022; https://doi.org/10.2337/dci22-0034. *Diabetologia* 2022; https://doi.org/10.1007/s00125-022-05787-2.

Poll Question 19

What is the most appropriate medication adjustment for Terrance?

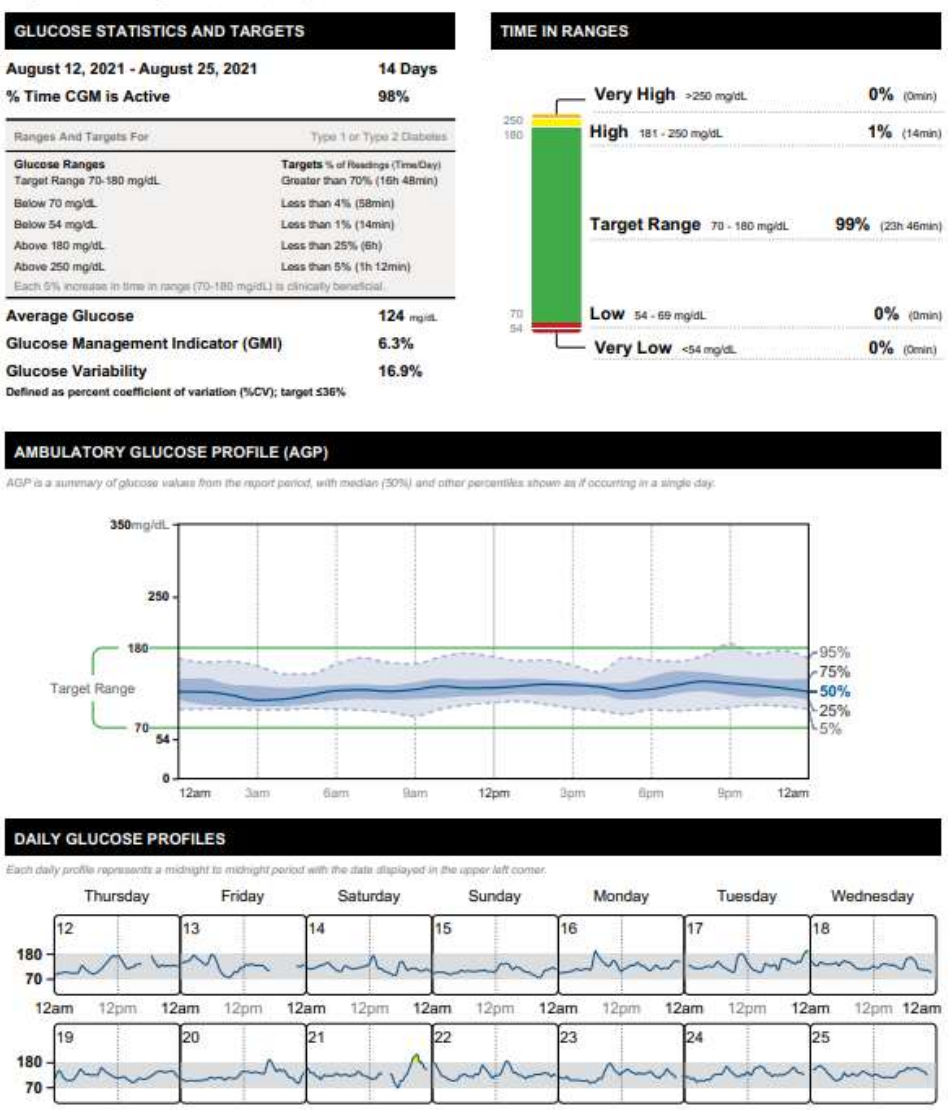
A. Add DPP4 inhibitor
B. Add GLP-1 receptor agonist
C. Add SGLT2 inhibitor
D. Lifestyle modifications only

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

DM2 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 Target Range 70-180 mg/dL	**Targets** % of Readings (Time/Day) Greater than 70% (16h 48min)
Below 70 mg/dL	Less than 4% (58min)
Below 54 mg/dL	Less than 1% (14min)
Above 180 mg/dL	Less than 25% (6h)
Above 250 mg/dL	Less than 5% (1h 12min)

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

Average Glucose	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

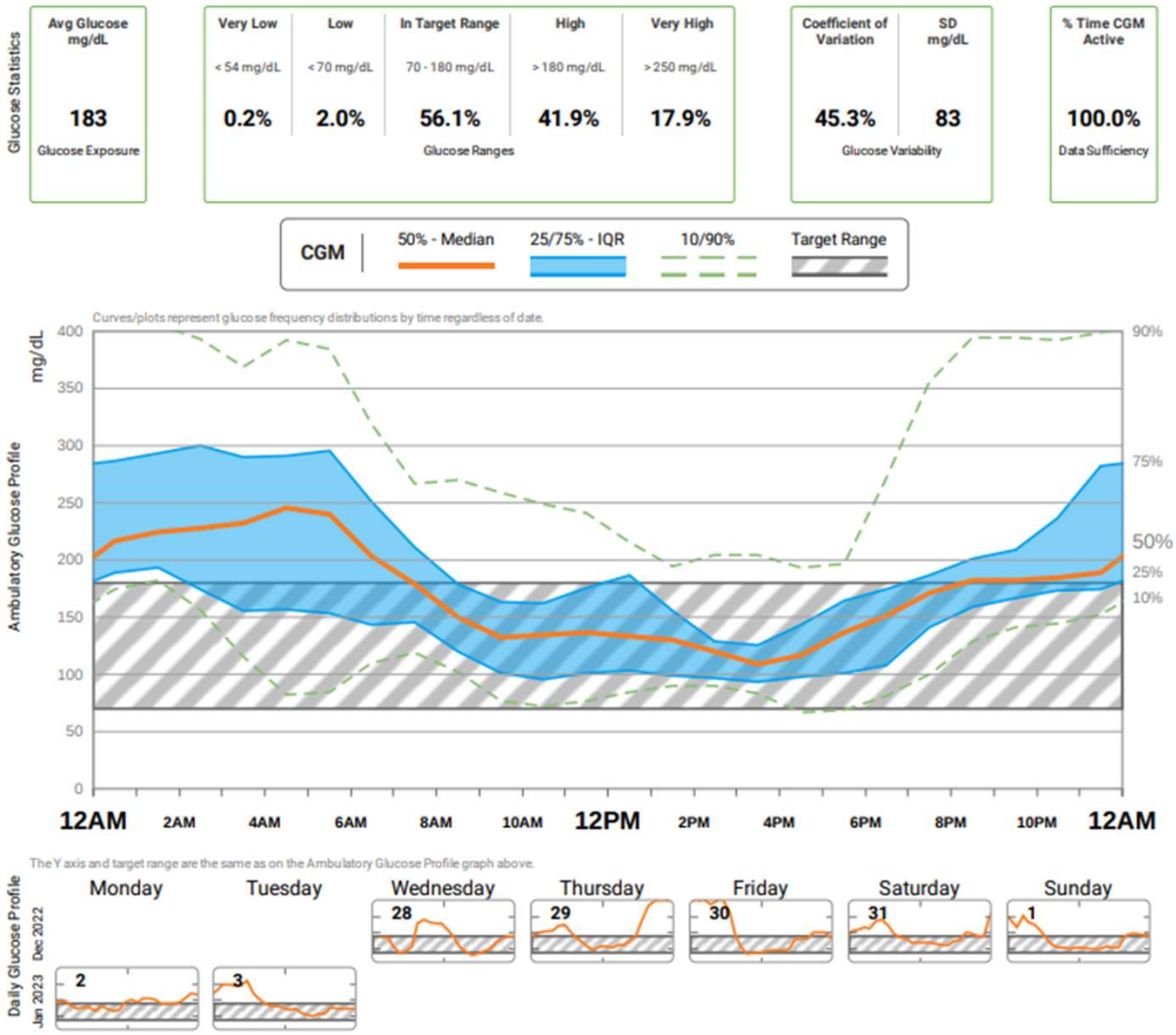
Each daily profile represents a midnight to midnight period with the date displayed in the upper left corner.

Case 2

75 yo F with 25 year h/o T2DM. 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)

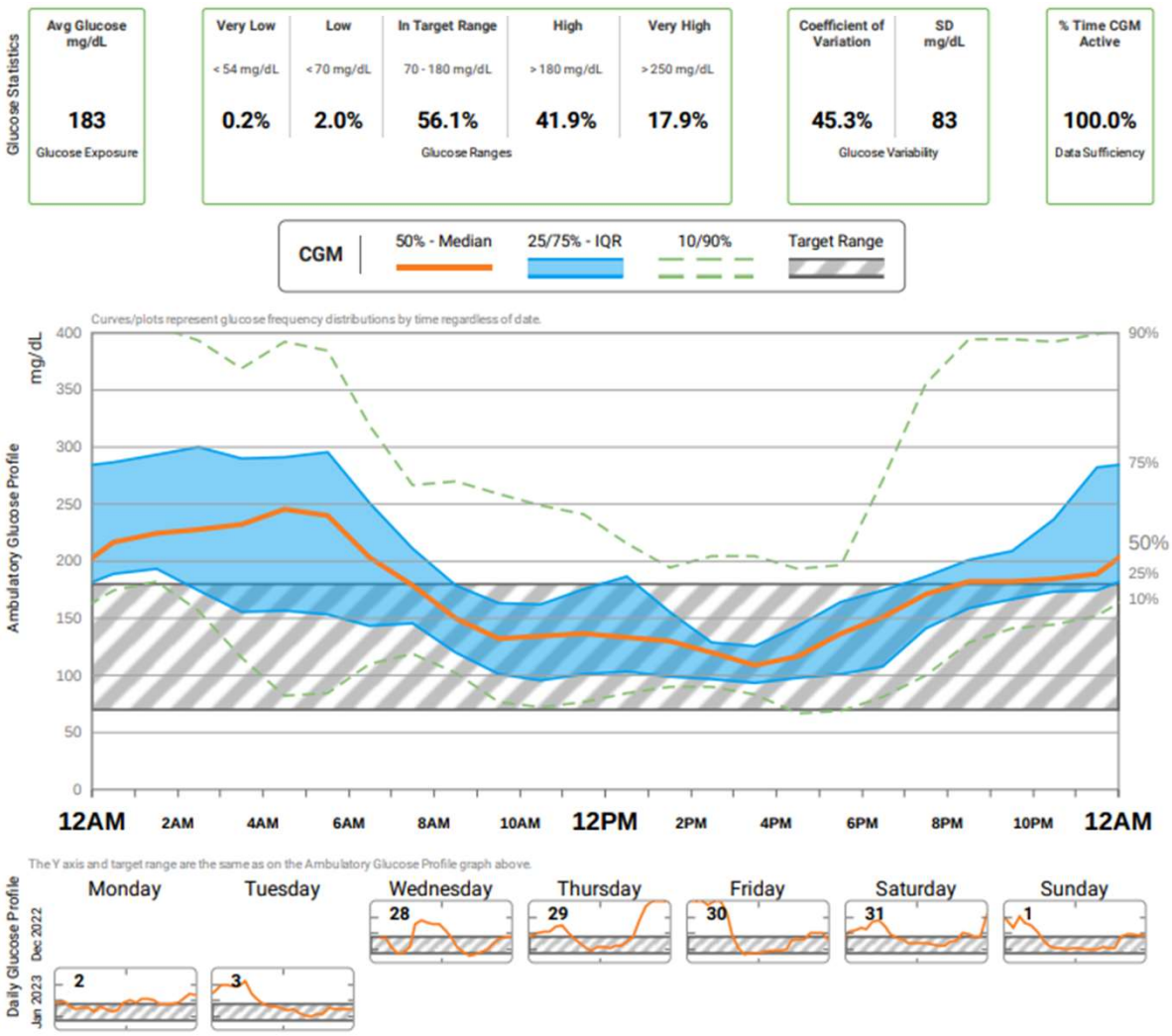
Wears rtCGM



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

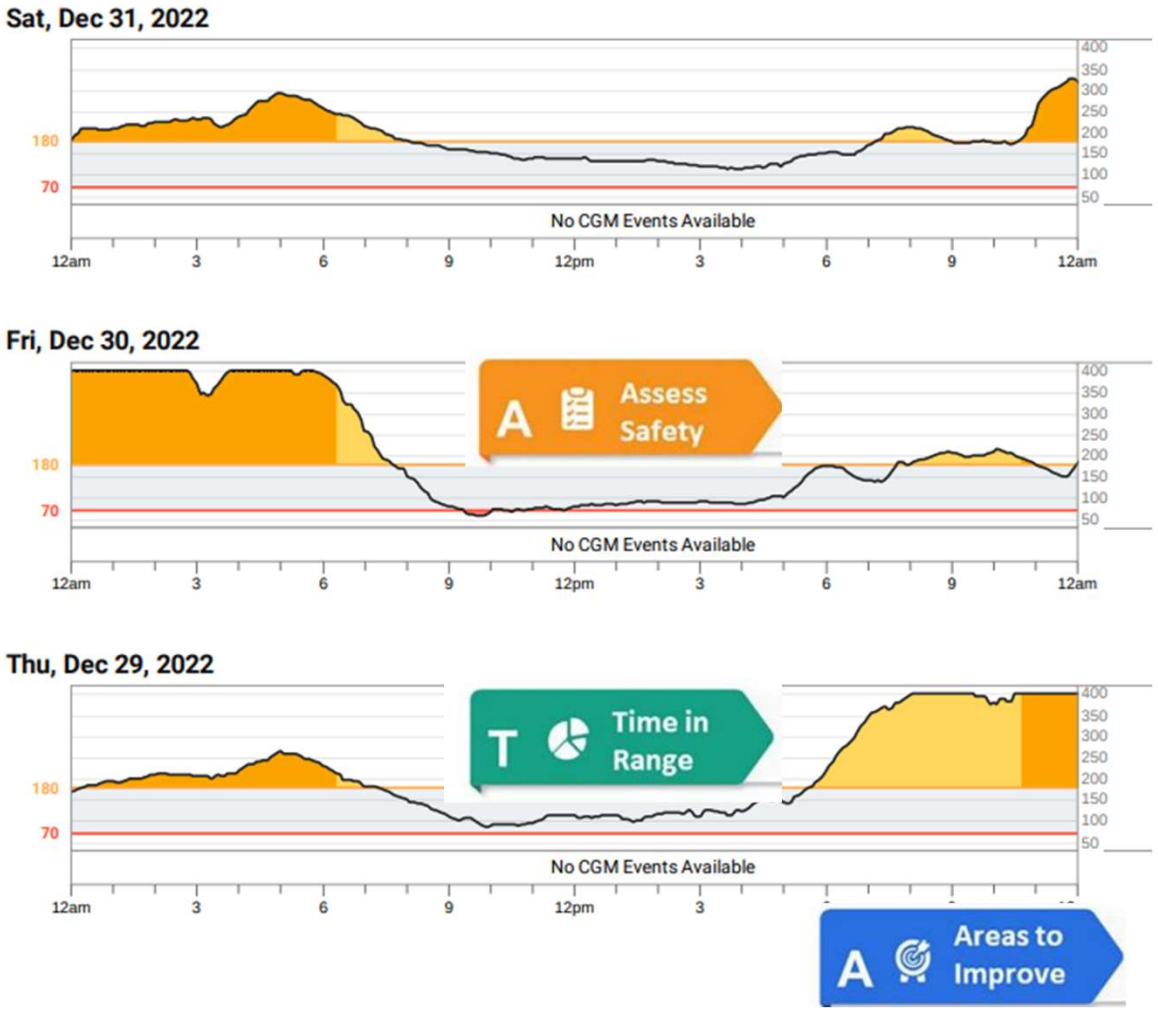
Less of an appetite since taking semaglutide, often going low during the day

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



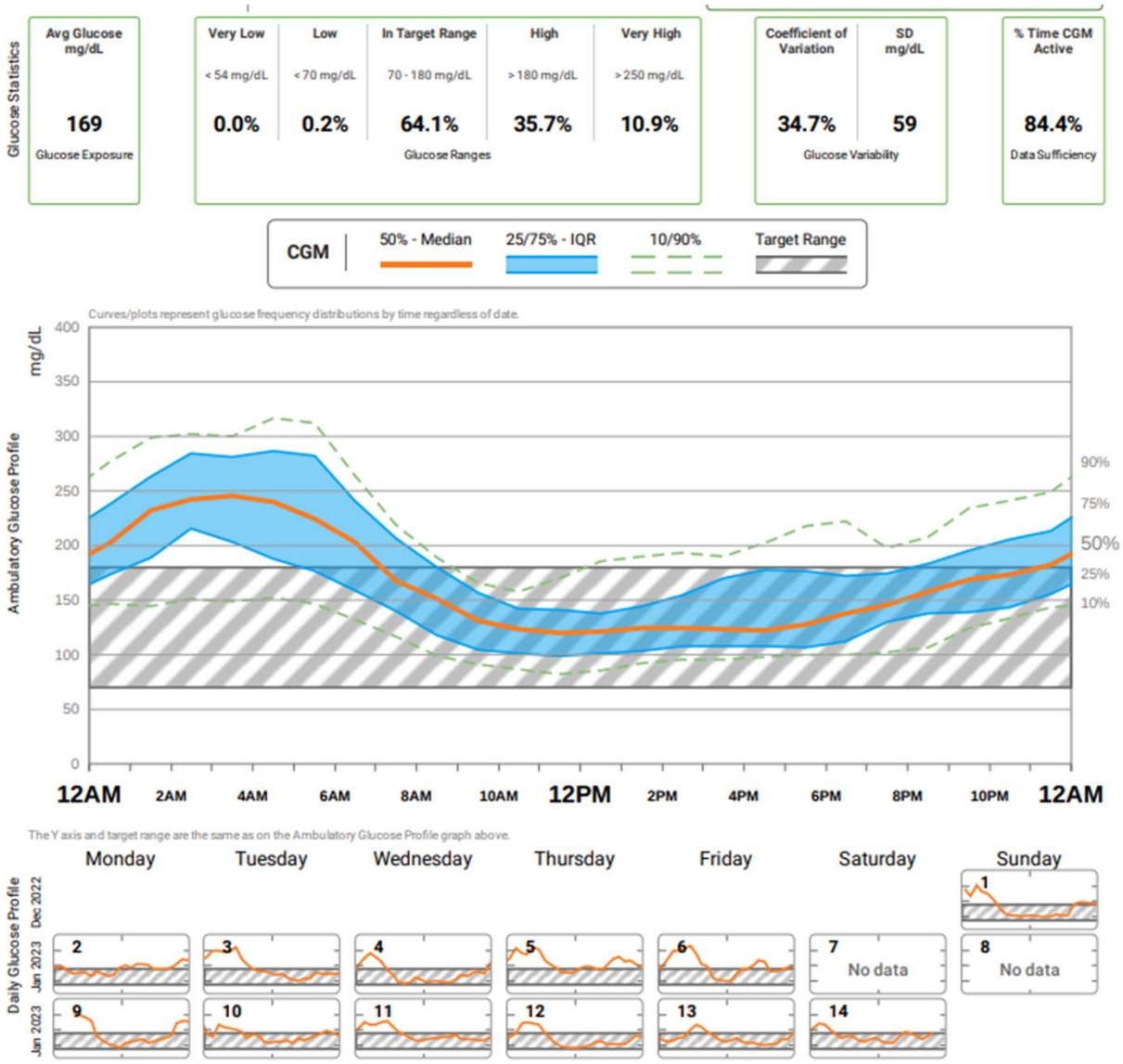
Clarity report obtained from Diana Isaacs

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

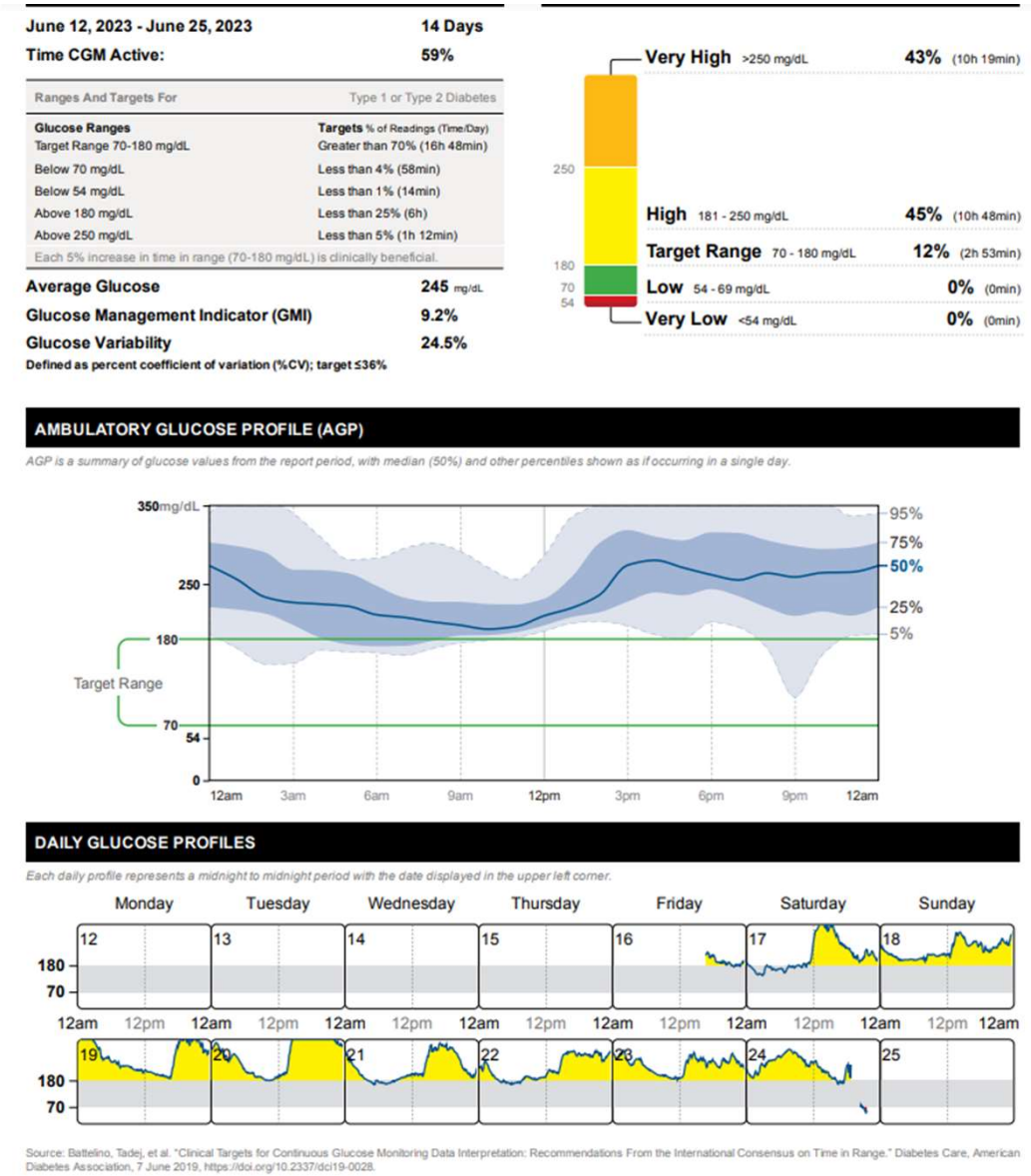
- Average glucose improved
- Time in range increased
- Glucose variability improved
- Less hypoglycemia



Clarity report obtained from Diana Isaacs

Case 3

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



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

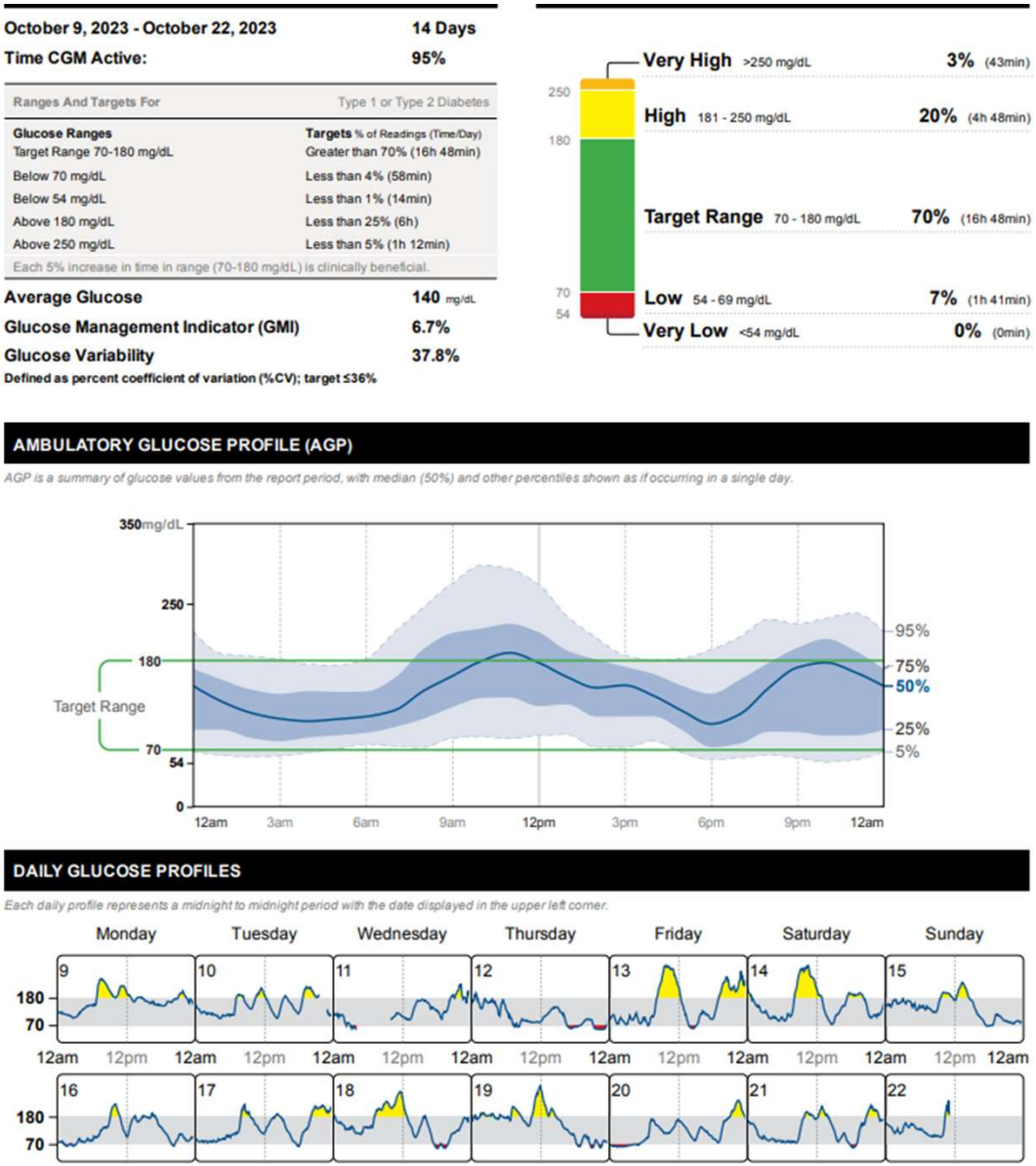
19 20 21 22 23 24 25

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

GLUCOSE STATISTICS AND TARGETS

March 3, 2022 - March 16, 2022	**14 Days**
% Time CGM is Active	**91%**

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.

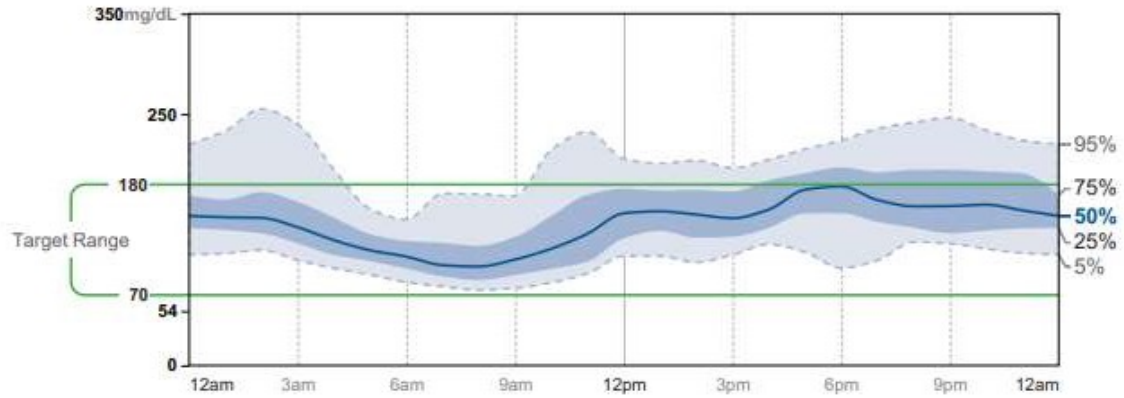
Average Glucose	**146** mg/dL
Glucose Management Indicator (GMI)	**6.8%**
Glucose Variability	**28.1%**

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

TIME IN RANGES

AMBULATORY GLUCOSE PROFILE (AGP)

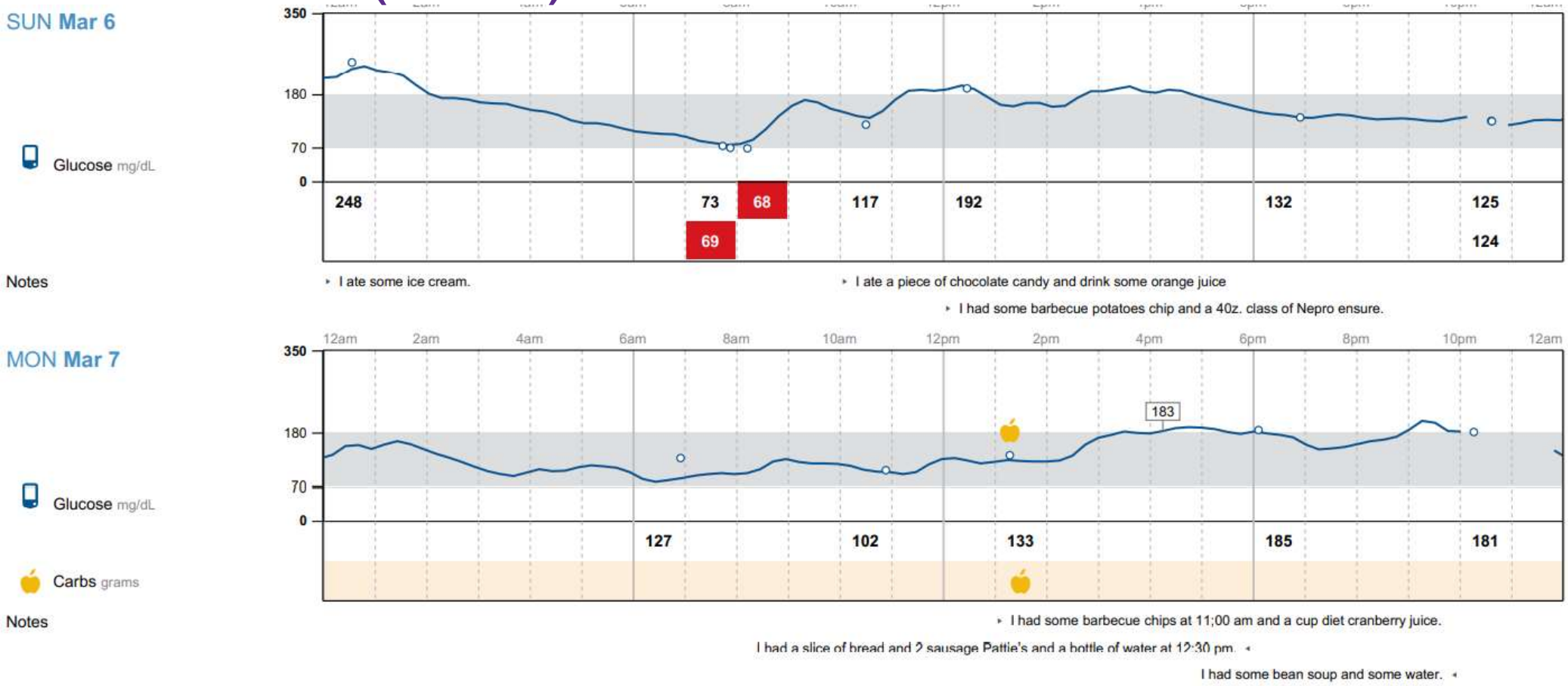
AGP is a summary of glucose values from the report period, with median (50%) and other percentiles shown as if occurring in a single day.



Case 5

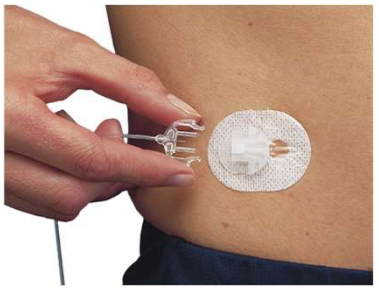
- 57 year old woman with obesity, A1C=9.1%, needs a total knee replacement, but A1C was too high for surgery
- Current DM2 meds:
  - Insulin glargine 40 units daily
  - Dulaglutide 4.5 mg weekly

Case 5 (Cont)

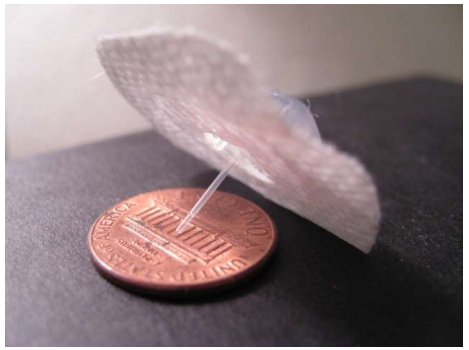

SUN Mar 6
350
180
70
0
Glucose mg/dL
248
73
68
69
117
192
132
125
124
Notes
I ate some ice cream.
I ate a piece of chocolate candy and drink some orange juice
I had some barbecue potatoes chip and a 40z. class of Nepro ensure.
MON Mar 7
12am
2am
4am
6am
8am
10am
12pm
2pm
4pm
6pm
8pm
10pm
12am
350
180
70
0
183
Glucose mg/dL
Carbs grams
127
102
133
185
181
Notes
I had some barbecue chips at 11;00 am and a cup diet cranberry juice.
I had a slice of bread and 2 sausage Pattie's and a bottle of water at 12:30 pm.
I had some bean soup and some water.

Common Insulin Pump Features

- Bolus calculator
- Temporary basal or temporary target
- Insulin-on-board/active insulin feature to prevent stacking
- Multiple basal patterns
- Small dose increments
- Integration with CGM
- Designed to work with U100 insulin
- Most have a 4-5 year warranty/contract



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

Filling the Pump

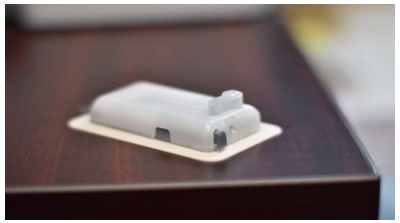
- Only fill with how much insulin you expect to use in 3 days + ~30 units
- Pumps hold 200-300 units
- Caution with air bubbles
- Fill cannula amount
  - Steel needle (0 units)
  - 6mm cannula (0.3 units)
  - 9mm cannula (0.5 units)

- If cannula overfilled, can lead to lows
- If cannula under-filled or air bubbles, can lead to highs

Ideal Pump Candidates

- Require meal time insulin
- Wearing CGM or frequently checking BGM
- Carbohydrate counting or good with estimates
- Ability to learn pump programming or have caregivers that can
- Willing to follow up regularly with health care team
- Can afford the pump/supplies
- Following hyperglycemia treatment instructions
- Problem solving skills (ex. high or low glucose)

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

https://myceqursimplicity.com/

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

https://www.go-vgo.com/

Automated Insulin Delivery Systems

Omnipod 5
(Insulet)

T:slim X2 (Tandem)
Control IQ

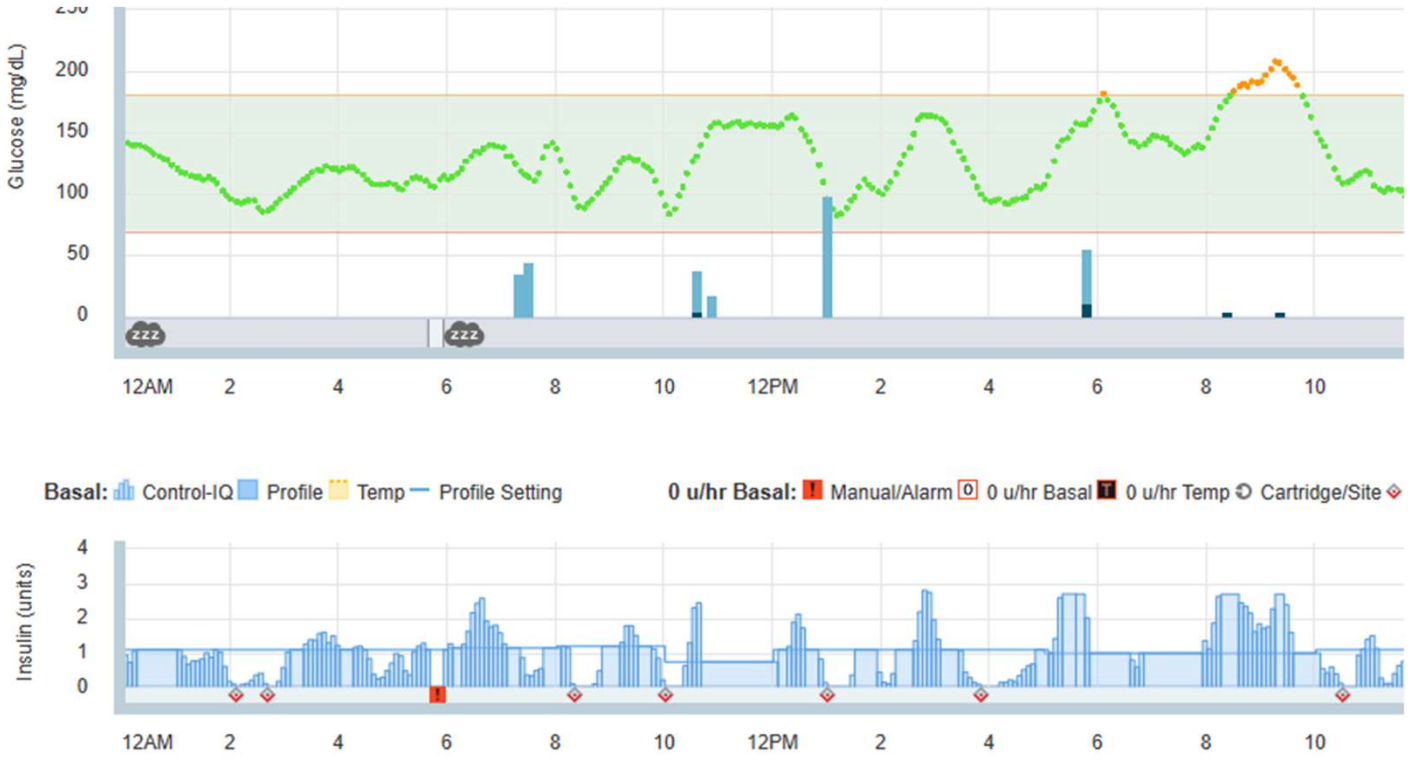
780G
(Medtronic)

iLet
(Beta Bionics)

Mobi (Tandem)
Control IQ

Tidepool Loop (Sequel)

Hybrid-Closed Loop



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

Omnipod® 5

- No tubing
- Holds 200 units
- Uses last 4-5 pods for adjustments, based on TDD
- Control system from a compatible smartphone or controller
- Requires Dexcom G6® use from a compatible smart device
- SmartBolus calculator informed by CGM value and trend
- Glucose targets from 110-150 mg/dL adjustable in 10 mg/dL increments
- HypoProtect mode to reduce risk of lows
- Bluetooth connectivity with glooko, automatic data download
- Requires charging cable

Omnipod® 5 Automated Insulin Delivery System. User Guide.

Medtronic 780G

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

Beta Bionics iLet

- Holds 180 units of insulin
- Works with Dexcom G6 and G7
- Uses pre-filled insulin cartridges or fillable cartridge
- Programmed by entering body weight
  - No other insulin pump settings
- Enter in meal estimates (usual, less, more)
- Provides calculated back up settings
- Requires charger

https://www.betabionics.com/

Tandem T:Slim X2 with Control-IQ

- Holds 300 units
- Compatible with Dexcom G6, Dexcom 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)
- T:Connect app to bolus and for remote downloads (changing to Source soon)
- Requires charging cable
- Bolus from T:connect app from phone

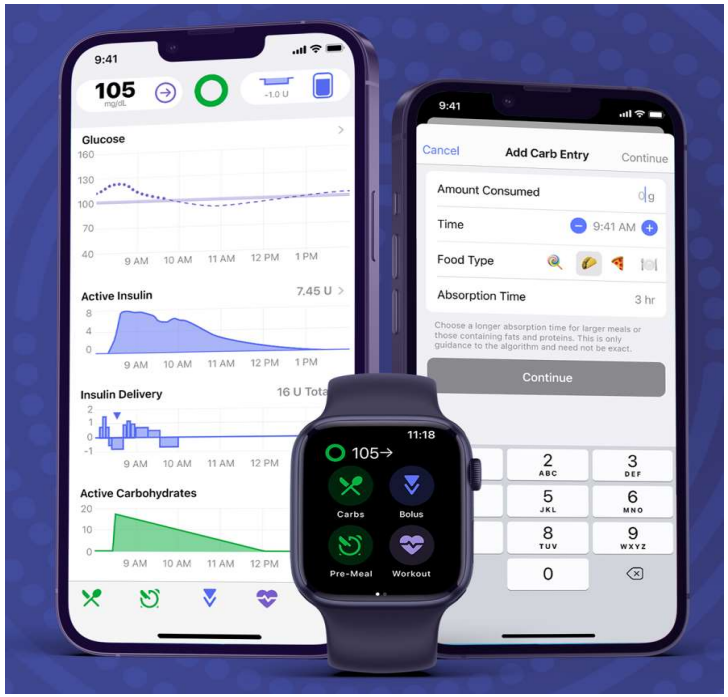
Control IQ Targets

		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

Tandem Mobi

- FDA approved 6 + years
- Compatible with Dexcom G6, iphone
- 200 unit cartridge
- Controlled with iphone
- Half the size of T:Slim X2
- 5 inches of tubing
- Everything controlled from mobile app (iPhone)
- New syringe-driven pump fill
- Wireless charging
- IP28 water resistant rating (8 feet for 2 hours)

Sequel MedTech Tidepool Loop



- At Launch iPhone
- FDA approved Ages 6 and Up.
  - Download the app from the App Store.
  - Prescription code needed
- Correction Range 87 mg/dL-180 mg/dL.
- Food type for extended boluses: Lollipop, Taco, Pizza Bolus
- Insulin action is fixed with Ultra Rapid, Rapid Acting
- Apple watch compatibility: bolus from watch

Pump Comparison

	Omnipod 5	Control IQ	780G	ILet
Min age	2 years	6 years	7 years	6 years
Min daily insulin	5 units	10 units, 55lbs	8 units	8 units
Max fill	200 units	300 units	300 units	160 units
Basal increment	0.05 units	0.001 units	0.025 units	NA
Bolus increment	0.05 units	0.01 units	0.025 units	NA
Site change frequency	3 days	3 days	7 days (extended infusion set)	3 days
CGM compatibility	G6, G7	G6, G7, Libre 2+	Guardian 4	G6, G7
Calibration	No	No	3-4/day	No
CGM trend in calculator	Increase up to 30% Decrease down to 100%	No	No	NA

Pump Comparison

	Omnipod 5	Control IQ	iLet	780G
Algorithm target	110, 120, 130, 140, 150mg/dL	112.5 – 160 mg/dL	110, 120, 130mg/dL	100, 110, 120mg/dL
Basal automation	Calculated from total daily insulin, updated each pod change, 60 min prediction	Increases or decreases from programmed basal rates, 30 min prediction	Initiated based on user weight and adapts with glucose profile	Calculated based on total daily insulin from past 2-6 days
Automated Corrections	No	Max 1/hour if glucose predicted >180 mg/dL, 60% of calculated dose	No	If glucose > 120 mg/dL and at max "auto basal" delivery, up to every 5min
Extended bolus	No, manual mode only	Yes, up to 2 hours	No	No, manual mode only
Insulin action time (IAT)	2-6 hours	5 hours (automated mode)	NA	2-8 hours
Temporary targets	Activity 150 mg/dL	Exercise 140 -160 mg/dL Sleep 112.5 – 120 mg/dL	NA	150 mg/dL
Bolus adjustments	ISF, IAT, ICR, max bolus, reverse correction	ISF, ICR, max bolus, reverse correction	Usual, more, Less meal announcements	ICR, IAT, max bolus
Ability to override bolus	Yes	Yes	No	No

Sharing Pump Data

System:	Associated Mobile Apps	Website to Access Portal	Data Sources
Glooko	Glooko	Glooko.com	Insulin pumps (Omnipod, Tandem)
Carelink	MiniMed Mobile	https://carelink.medtronic.com/login	Medtronic pumps
Tidepool	Tidepool Mobile	Tidepool.org	Insulin pumps (Medtronic, Tandem)
T:Connect/Source	T:Connect Mobile	https://tconnecthcp.tandemdiabetes.com/hcp_account/#/hcplogin	Tandem pumps
Beta Bionics User Portal	Beta bionics smartphone app	https://report.betabionics.com/	iLet

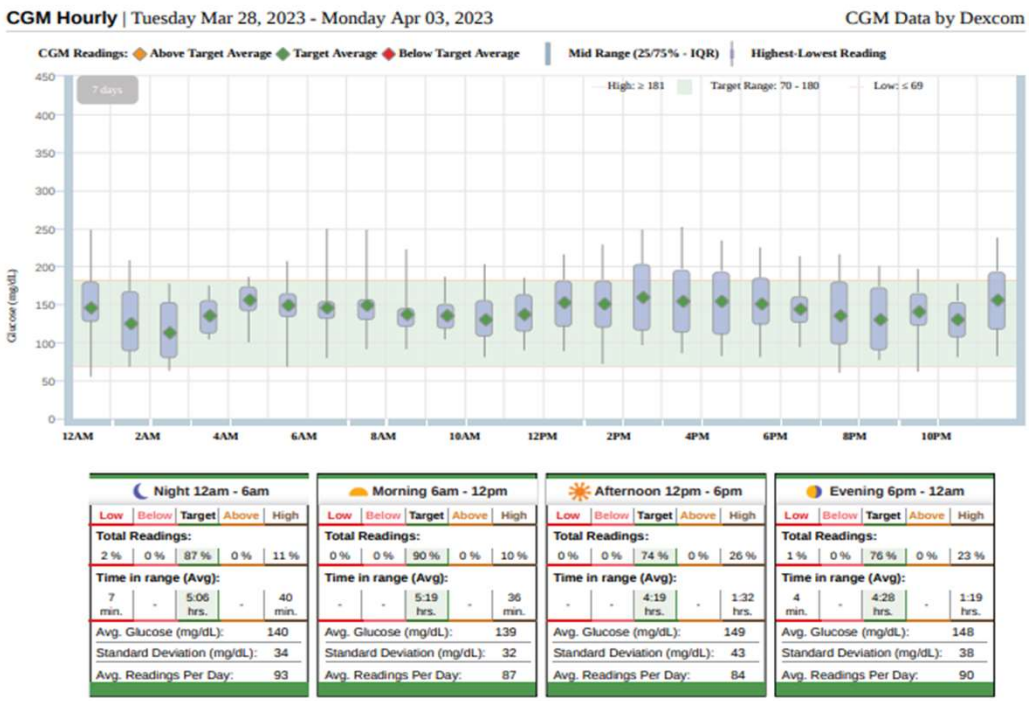
Patient Case

- 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?

Case Study

47yo T2DM, A1C=8.1%, BMI=39kg/m²

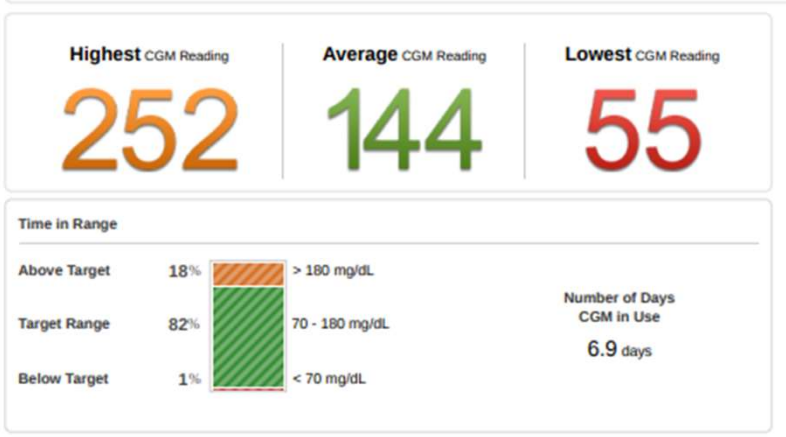


Night 12am - 6am				
Low	Below	Target	Above	High
Total Readings:				
2 %	0 %	87 %	0 %	11 %
Time in range (Avg):				
7 min.	-	5:06 hrs.	-	40 min.
Avg. Glucose (mg/dL):	140			
Standard Deviation (mg/dL):	34			
Avg. Readings Per Day:	93			

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			

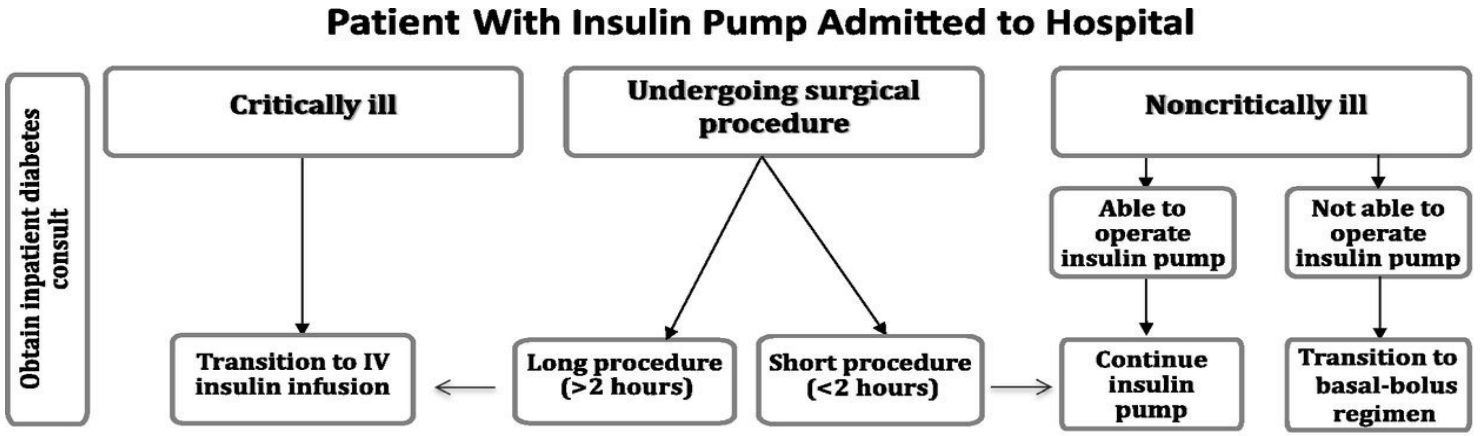
Afternoon 12pm - 6pm				
Low	Below	Target	Above	High
Total Readings:				
0 %	0 %	74 %	0 %	26 %
Time in range (Avg):				
-	-	4:19 hrs.	-	1:32 hrs.
Avg. Glucose (mg/dL):	149			
Standard Deviation (mg/dL):	43			
Avg. Readings Per Day:	84			

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.

Clinical Evidence

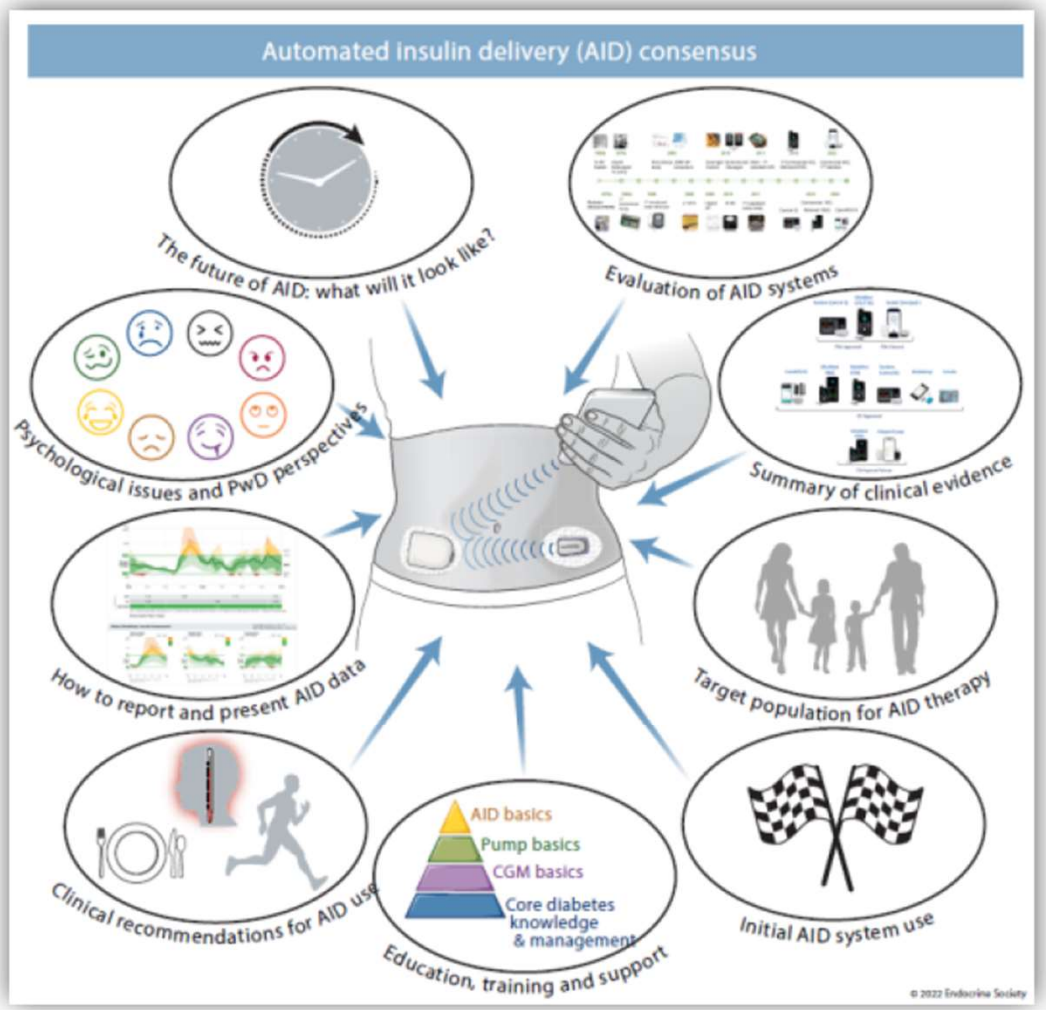
Diana Isaacs, PharmD, BCPS, BC-ADM, BCACP CDCES, FADCES, FCCP
Director, Education & Training in Diabetes Technology

AID Use in Clinical Practice Recommendations

AID therapy should be considered for all populations with T1DM

AID systems still require basic diabetes management skills

All payers (government and private) should reimburse/cover AID systems



HCPs need to be aware of the different AID systems available, their benefits, and their limitations, to advise and support people with diabetes to reach AID benefits

Multifactorial racial and ethnic disparities in prescribing AID system technologies.
Preconceptions and unconscious biases about individual, family, and psychological attributes required to use AID technology effectively **should be recognized and mitigated to ensure fair and equitable access to AID systems**

Phillip M et al. Endocr Rev. 2023 44(2):254-280.

Medtronic 780G Pivotal Trial

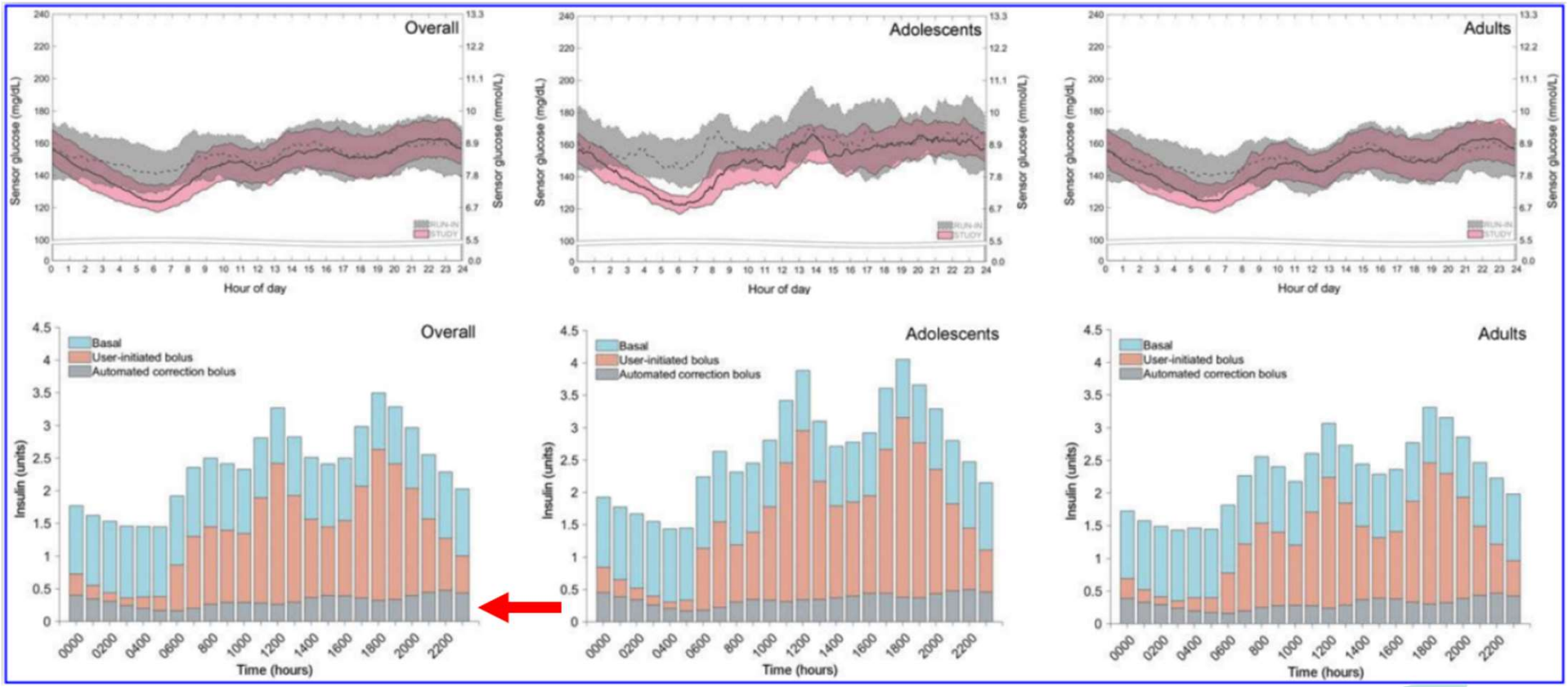
- FDA approved April, 2023

	Overall (n = *157*)	*Adolescents* (n = *39*)	*Adults* (n = *118*)
Age, years	38.3 ± 17.6	16.2 ± 2.1	45.6 ± 14.0
Female, *n* (%)	86 (54.8)	23 (59.0)	63 (53.4)
A1C, %	7.5 ± 0.8	7.6 ± 0.8	7.5 ± 0.9
Diabetes duration, years	22.6 ± 13.3	9.2 ± 3.7	27.0 ± 12.3
Weight, kg	80.1 ± 18.5	68.8 ± 11.9	83.9 ± 18.8
BMI, kg/m^2	27.5 ± 5.7	24.2 ± 4.0	28.6 ± 5.8
Therapy			
HCL	82	25	57
SAP	70	13	57
CSII	5	1	4

	Overall (n = *157*)		
	Run-in[a]	*Study*[b]	P
A1C, %[c]	7.5 ± 0.8	7.0 ± 0.5	<0.001[d]
24-h day			
Time in closed loop, %	—	94.9 ± 5.4	—
TBR <50 mg/dL	0.5 ± 0.7	0.3 ± 0.4	0.003[d]
TBR <54 mg/dL	0.8 ± 1.1	0.5 ± 0.6	0.001[d]
TBR <70 mg/dL	3.3 ± 2.9	2.3 ± 1.7	<0.001[d]
TIR 70–180 mg/dL	68.8 ± 10.5	74.5 ± 6.9	<0.001[d]
TAR >180 mg/dL	27.9 ± 11.0	23.1 ± 7.2	<0.001[d]
TAR >250 mg/dL	6.2 ± 4.7	4.6 ± 3.0	<0.001[d]
TAR >300 mg/dL	1.7 ± 1.9	1.2 ± 1.1	<0.001[d]

Carlson AL, et al. Diabetes Technol Ther. 2022 Mar;24(3):178-189

Medtronic 780G Pivotal Trial



Carlson AL, et al. Diabetes Technol Ther. 2022 Mar;24(3):178-189

Real World 780G Data

	Pediatric		Adult	
	Pivotal CAS (7-17 years) N=109	Real-world (≤15 years) N=10,204	Pivotal CAS (>17 years) N=67	Real-world (>15 years) N=26,099
AHCL use, %	94.4 ± 6.0	91.5 ± 14.0	95.1 ± 7.0	91.3 ± 14.4
CGM use, %	93.7 ± 4.9	92.6 ± 9.4	94.1 ± 6.5	92.0 ± 10.6
Mean SG, mg/dL	153.0 ± 13.0	154.0 ± 17.1	147.6 ± 13.6	152.2 ± 17.6
CV of SG, %	36.2 ± 4.3	37.4 ± 4.9	32.0 ± 4.2	33.1 ± 4.6
GMI, %	7.0 ± 0.3	7.0 ± 0.4	6.8 ± 0.3	7.0 ± 0.4
24-hour day Time at SG ranges, %	6.9 / 19.4 / 71.5 / 1.8 / 0.4	7.9 / 19.5 / 69.9 / 2.1 / 0.5	4.2 / 17.6 / 76.6 / 1.3 / 0.3	5.8 / 19.4 / 73.0 / 1.5 / 0.3
Nighttime Time at SG ranges, %	3.6 / 13.4 / 81.6 / 1.1 / 0.3	4.6 / 14.2 / 79.2 / 1.5 / 0.4	2.9 / 14.6 / 81.3 / 1.0 / 0.2	4.0 / 15.6 / 79.1 / 1.0 / 0.3

Data are shown as mean ± SD or mean.
Nighttime was defined as 12:00AM to 05:59 AM.
AHCL, advanced hybrid closed loop; CGM, continuous glucose monitoring; SG, sensor glucose; CV, coefficient of variation; GMI, glycemic management indicator.

- Continued Access Study participants Pivotal
  - 780G+G4S for 3 months
  - N = 109, aged 7-17 years
  - N = 67, aged >17 years
- Data of real-world 780G+G4S system users uploaded from 09-2021 to 12- 2022
  - N = 10,204 aged ≤15 years
  - N = 26,099 aged >15 years

Cordero TL, et al. Diabetes Technol Ther. 2023 Sep;25(9):652-658

Bionic Pancreas Pivotal Trial

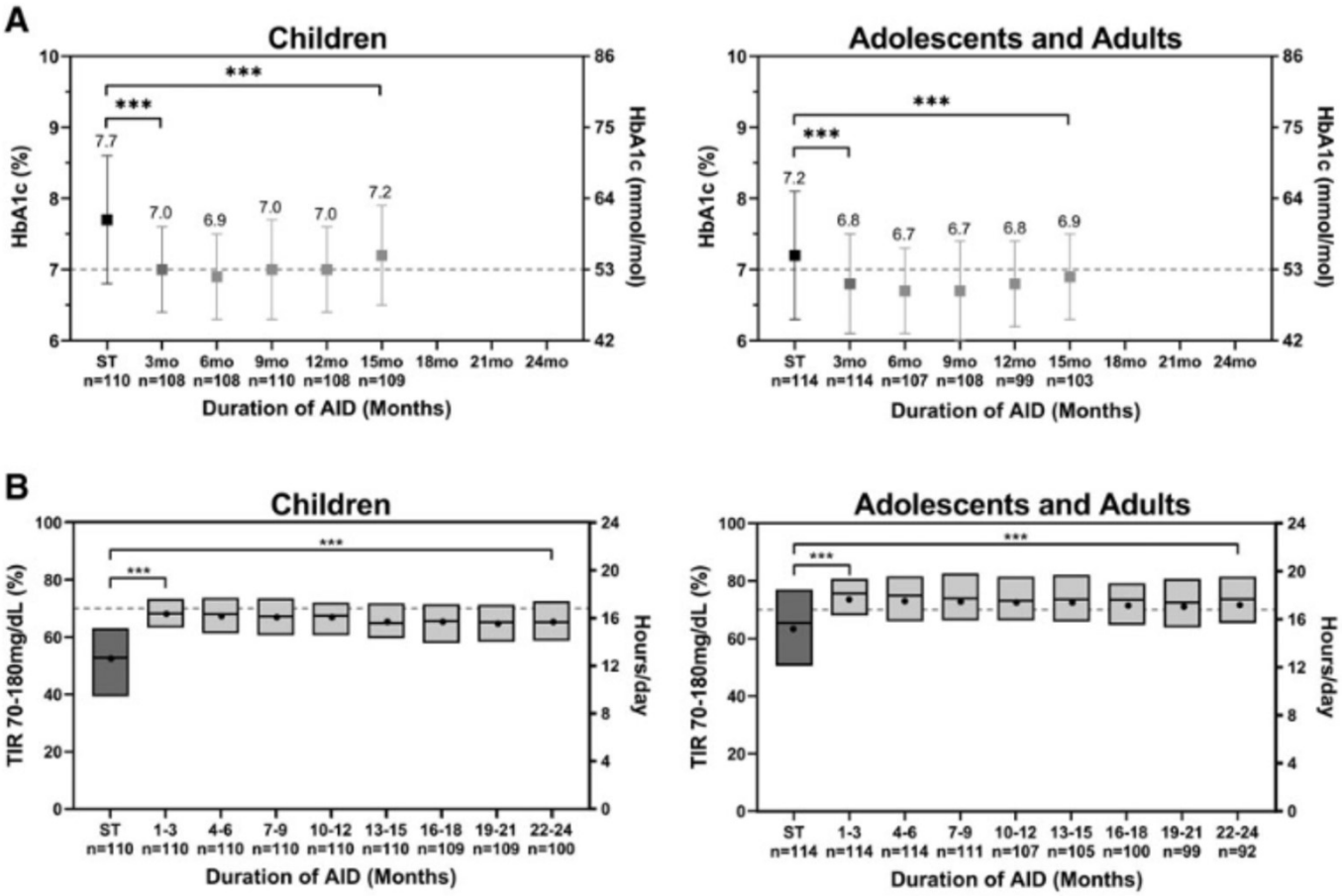
- FDA cleared May 22, 2023
- N=326 T1D ages 6 to 79 yrs randomized 2:1 to bionic pancreas vs. standard of care
- 13 weeks
- A1C decrease of -0.5% (p<0.001)

Table 2. Primary and Secondary Hierarchical Efficacy Outcomes.*

Outcome	Baseline		Follow-up over 13 Wk or at 13 Wk		Adjusted Difference (95% CI)†	P Value
	Bionic Pancreas (N=219)	Standard Care (N=107)	Bionic Pancreas (N=219)	Standard Care (N=107)		
Primary outcome						
Glycated hemoglobin — %	7.9±1.2	7.7±1.1	7.3±0.7	7.7±1.0	−0.5 (−0.6 to −0.3)	<0.001
Key secondary outcome						
Median percentage of time with glucose level <54 mg/dl (IQR) — %	0.2 (0.02 to 0.6)	0.2 (0.0 to 0.4)	0.3 (0.2 to 0.6)	0.2 (0.1 to 0.6)	0.0 (−0.1 to 0.04)	<0.001‡
Other secondary hierarchical outcomes in prespecified order						
Mean glucose level — mg/dl§	187±40	190±42	164±15	181±32	−16 (−19 to −12)	<0.001
Percentage of time with glucose level in range 70–180 mg/dl — %	51±19	51±20	65±9	54±17	11 (9 to 13)	<0.001
Percentage of time with glucose level >180 mg/dl — %	46±20	47±21	33±9	44±18	−10 (−12 to −8)	<0.001
Median percentage of time with glucose level >250 mg/dl (IQR) — %	16.0 (7.0 to 27.3)	17.8 (6.0 to 33.5)	8.5 (5.3 to 13.2)	14.9 (6.3 to 25.3)	−5.0 (−6.6 to −3.6)	<0.001
Glucose SD — mg/dl¶	67±16	68±18	60±11	67±16	−7 (−8 to −5)	<0.001
Median percentage of time with glucose level <70 mg/dl (IQR) — %	1.5 (0.5 to 2.8)	1.4 (0.4 to 2.9)	1.8 (1.1 to 2.9)	1.8 (0.8 to 3.1)	−0.1 (−0.3 to 0.2)	0.51
Median percentage of time with glucose level <54 mg/dl (IQR) — %‖	0.2 (0.02 to 0.6)	0.2 (0.0 to 0.4)	0.3 (0.2 to 0.6)	0.2 (0.1 to 0.6)	0.0 (−0.1 to 0.04)	—
Glucose coefficient of variation — %¶	36±6	36±6	36±5	37±5	−0.8 (−1.6 to 0.0)	—

Russell, S et al. N Engl J Med 2022; 387:1161-1172

Omnipod 5 – 2 Year Data



FDA cleared 1/27/22

N=224 T1D, age 6-70 years

2 wk standard, 12 wk AID,

2 year optional follow-up 224/235 elected to continue

Criego A, et al. Diabetes Technol Ther. 2023 Oct 18. doi: 10.1089/dia.2023.0364.

Real World Data: Control IQ

	Baseline (Basal-IQ)	*12-mth control-IQ use*	P
All users			
No. of participants	9010	9010	
Mean sensor glucose [mg/dL]	164 (146–185)	152 (140–166)	<0.001
Sensor time <54 mg/dL [%]	0.10 (0.00–0.30)	0.15 (0.06–0.30)	<0.001
Sensor time 54–70 mg/dL [%]	0.8 (0.3–1.8)	0.9 (0.4–1.6)	0.053
Sensor TIR [%]	63.6 (50.0–75.7)	73.6 (64.5–81.8)	<0.001
Sensor time 180–250 mg/dL [%]	25.1 (18.0–31.1)	19.7 (14.2–24.3)	<0.001
Sensor time >250 mg/dL [%]	8.1 (2.9–16.7)	4.6 (1.9–9.5)	<0.001
Coefficient of variation [%]	33.7 (30.0–37.6)	32.9 (29.5–36.3)	<0.001
GMI	7.2 (6.8–7.7)	6.9 (5.6–7.3)	<0.001
T1DM users			
No. of participants	7813	7813	
Mean sensor glucose [mg/dL]	163 (141–190)	151 (134–170)	<0.001
Sensor time <54 mg/dL [%]	0.01 (0.00–0.35)	0.02 (0.00–0.4)	<0.001
Sensor time 54–70 mg/dL [%]	0.9 (0.3–1.9)	0.9 (0.5–1.7)	0.123
Sensor TIR [%]	63.2 (49.8–75.1)	73.5 (64.4–81.6)	<0.001
Sensor time 180–250 mg/dL [%]	25.2 (18.2–31.0)	19.7 (14.3–24.2)	<0.001
Sensor time >250 mg/dL [%]	8.3 (3.1–16.9)	4.7 (2.0–9.6)	<0.001
T2DM users			
No. of participants	378	378	
Mean sensor glucose [mg/dL]	158 (138–184)	150 (136–169)	<0.001
Sensor time <54 mg/dL [%]	0.00 (0.0–0.07)	0.04 (0.01–0.10)	<0.001
Sensor time 54–70 mg/dL [%]	0.2 (0.0–0.6)	0.2 (0.0–0.6)	0.337
Sensor TIR [%]	69.9% (55.1–82.6)	78.0% (66.2–86.1)	<0.001
Sensor time 180–250 mg/dL [%]	23.9 (14.6–32.0)	19.0 (12.4–25.5)	<0.001
Sensor time >250 mg/dL [%]	3.6 (0.7–10.4)	2.3 (0.8–6.7)	<0.001

Data are expressed as median (IQR) unless otherwise specified.
GMI, glucose management indicator; IQR, interquartile range; T1DM, type 1 diabetes; T2DM, type 2 diabetes; TIR, time in range.

T1D: TIR increased from 63% to 73%

T2D: TIR increased from 69% to 78%

Breton MD, et al. Diabetes Technol Ther. 2021 Sep;23(9):601-608

AiDAPT Study (T1D, Pregnancy)

- N=124 T1DM pregnant participants < 14 weeks gestation RCT AID vs standard care
- Primary Outcome=% TIR 63 to 140 mg/dL from week 16 gestation until delivery
- Utilized Dexcom G6 with CamAPS app on smartphone with Dana insulin pump, Glucose targets 81-90 mgL

Table 2. Primary and Secondary Maternal Glucose Outcomes.*

Outcomes	Baseline†		Antenatal Intervention Phase‡		
	Closed Loop (N=59)	Standard Care (N=59)	Closed Loop (N=59)	Standard Care (N=61)	Adjusted Treatment Difference (95% CI)§
Primary outcome					
Percentage of time with glucose level in range 63–140 mg/dl	47.8±16.4	44.5±14.4	68.2±10.5	55.6±12.5	10.5 (7.0 to 14.0)¶
Key secondary outcomes					
Percentage of time with glucose level >140 mg/dl	48.7±18.0	51.8±16.2	29.2±10.6	41.4±13.2	−10.2 (−13.8 to −6.6)
Percentage of overnight time with glucose level in range 63–140 mg/dl (11 p.m. to 7 a.m.)†	47.4±20.8	44.5±16.6	70.8±11.2	56.7±13.6	12.3 (8.3 to 16.2)
Other secondary outcomes					
Percentage of time with glucose level in range 63–180 mg/dl	71±16	68±15	87±9	80±10	6 (3 to 9)
Percentage of time with glucose level >180 mg/dl	26±17	28±16	11±9	17±11	−5 (−8 to −3)
Glucose area under the curve >120 mg/dl	39.5±23.7	41.3±19.7	19.3±12.2	27.9±12.9	−7.4 (−11.1 to −3.7)
Mean glucose level — mg/dl‖	149±28	151±24	125±14	136±16	−9.2 (−13.7 to −4.7)
Glycated hemoglobin level — %	7.6±1.1	7.9±1.3	6.0±0.5	6.4±0.5	−0.3 (−0.5 to −0.1)
Glucose SD — mg/dl**	54±14	55±12	42±11	47±10	−4.5 (−7.3 to −1.6)
Glucose coefficient of variation — %	36±5	37±6	33±5	34±5	−1.1 (−2.5 to 0.3)

Lee TTM, et al. N Engl J Med. 2023 Oct 5. doi: 10.1056/NEJMoa2303911.

Technology Use and Glycemic Outcomes during Pregnancy with Type 1 Diabetes

Satish K. Garg, M.D., and Sarit Polsky, M.D., M.P.H.

Table 1. Unknowns about Closed-Loop Use in Pregnancy.

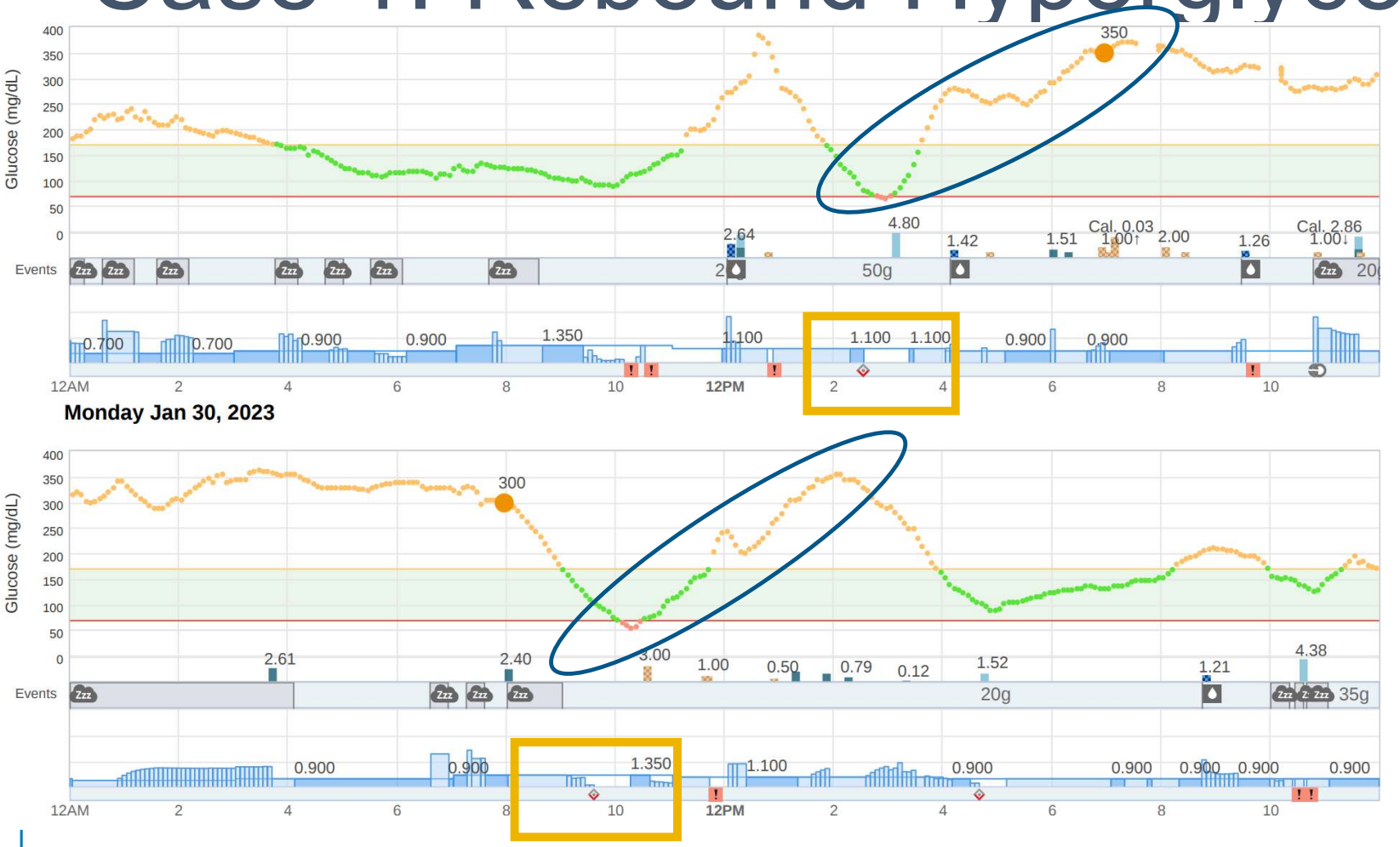
Unanswered Question	Hypotheses	Challenges
When should closed-loop therapy be initiated?	Preconception closed-loop initiation is likely to improve maternal and fetal outcomes.	Nearly 50% of pregnancies are unplanned. This approach may be cost-prohibitive.
Will closed-loop use be beneficial in persons with a glycated hemoglobin level <6.5% at the start of pregnancy?	Closed-loop use in pregnant patients with low glycated hemoglobin levels will still reduce hypoglycemia.	Some patients are unwilling to relinquish glucose control during pregnancy.
Should a closed-loop system have a pregnancy-specific glucose target range or an algorithm?	Both options are likely to be beneficial for maternal and gestational health outcomes.	This may require buy-in from manufactures and regulators.
Can closed-loop use early in pregnancy avoid all adverse maternal and neonatal health outcomes?	Adverse health outcomes would be significantly reduced but not completely eliminated.	Some outcomes are affected by nonglycemic factors (e.g., preeclampsia).
Can closed-loop use help pregnant patients with type 2 diabetes or gestational diabetes?	Anyone requiring intensive insulin treatment will benefit from closed-loop use in pregnancy.	Substantial education or resources are needed with closed-loop initiation, which may be cost-prohibitive.

Garg SK, Polsky S. N Engl J Med. 2023 Oct 5. doi: 10.1056/NEJMe2310798

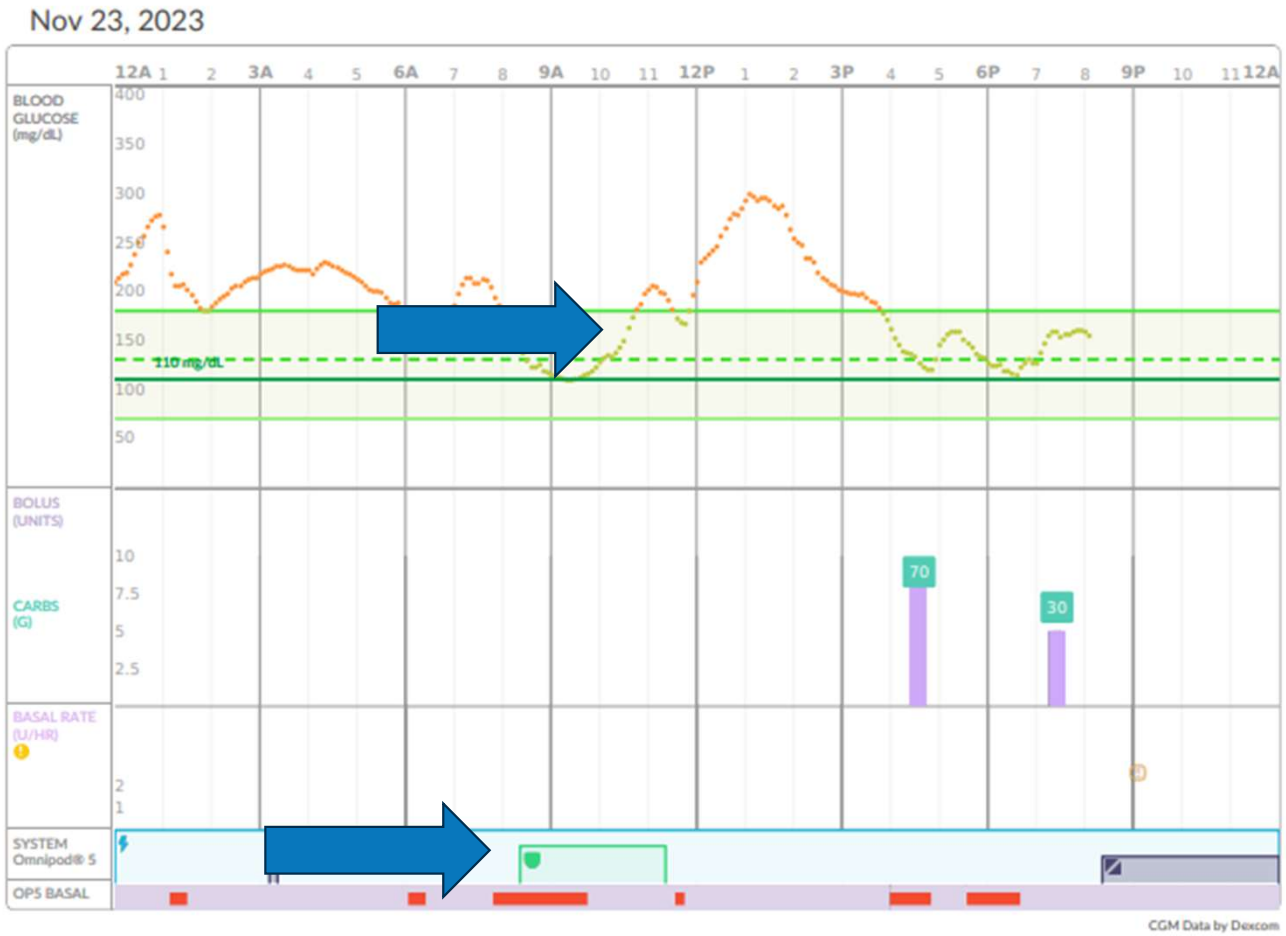
Clinical Scenarios

Diana Isaacs, PharmD, BCPS, BC-ADM, BCACP CDCES, FADCES, FCCP
Director, Education & Training in Diabetes Technology

Case 1: Rebound Hyperglycemia

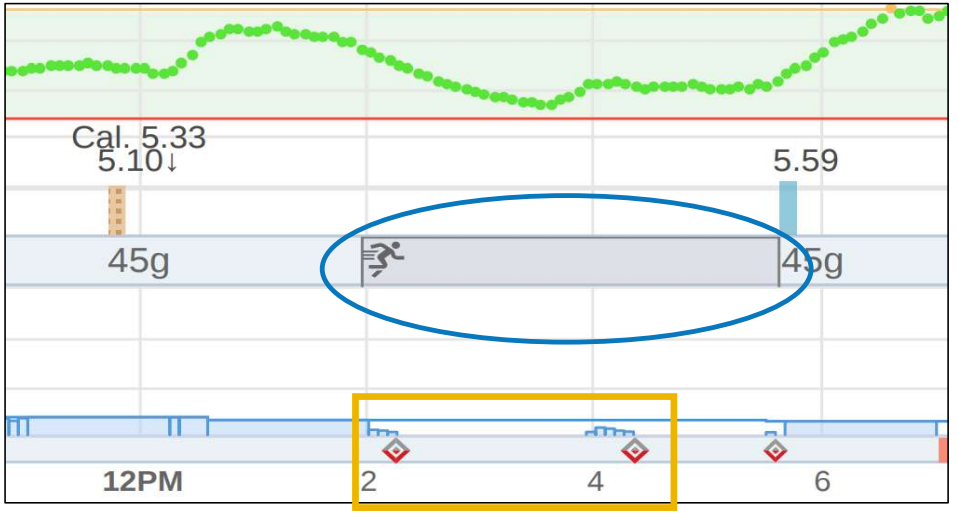


Case 2: Exercise



Case 3: More Optimal Exercise

Glucose steady



Glucose trending down
Insulin suspended

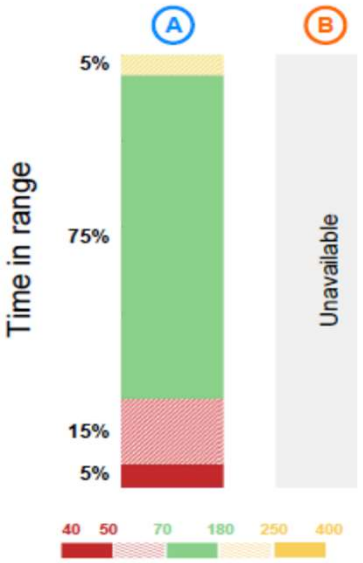
Exercise Activity increases target to
140-160 ★

Case 4: Fake Carbs

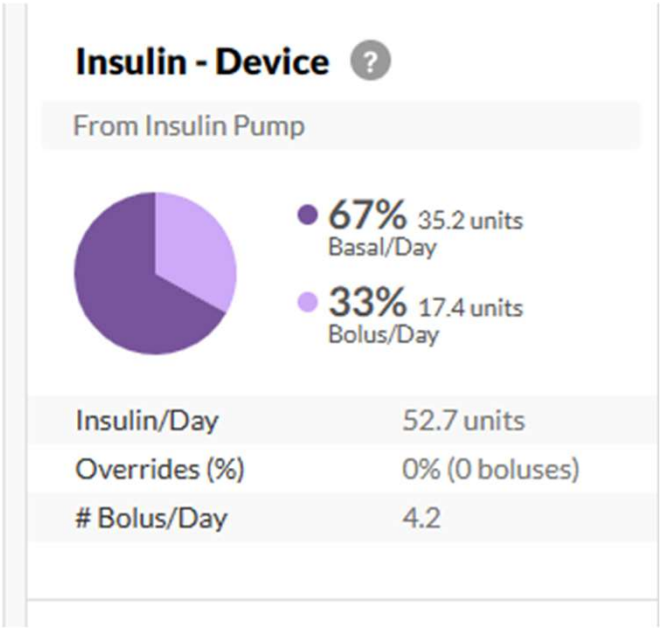
Total daily dose (per day)	24 units
Bolus amount (per day)	18U (75%)
Auto Basal / Basal amount (per day)	6U (25%)
Set Change	Every 6.5 days
Reservoir Change	Every 4.3 days
Meal (per day)	8.9
Carbs entered (per day)	403 ± 159 g

Statistics (A)

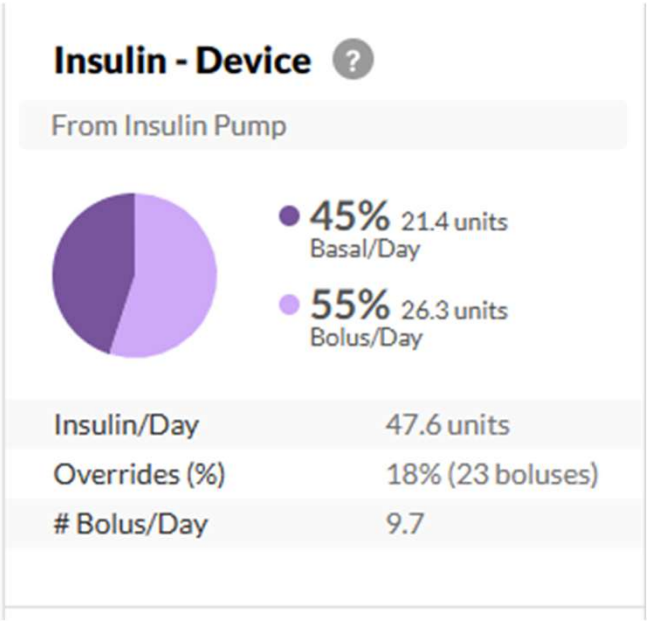
Auto Mode (per week)	77% (5d 09h)
Manual Mode (per week)	23% (1d 15h)
Sensor Wear (per week)	94% (6d 14h)
Average SG ± SD	106 ± 42 mg/dL
Average BG	116 ± 56 mg/dL
BG / Calibration (per day)	7.8 / 5.9



Case 5: Overrides



- vs



InPen

- Delivers up to 30 units of insulin per dose
- Delivers in ½-unit increments
- Disposable needles (not included)
- 1 year life span
- Does not require charging
- Comes in blue, gray, and pink
- Integrates with Apple Health and Glooko
- Requires a prescription, uses cartridges
- Compatible with: Humalog, NovoLog, and Fiasp U100 3.0 mL prefilled cartridges
- Multiple pens can be paired to the InPen app.

https://www.companionmedical.com/InPen

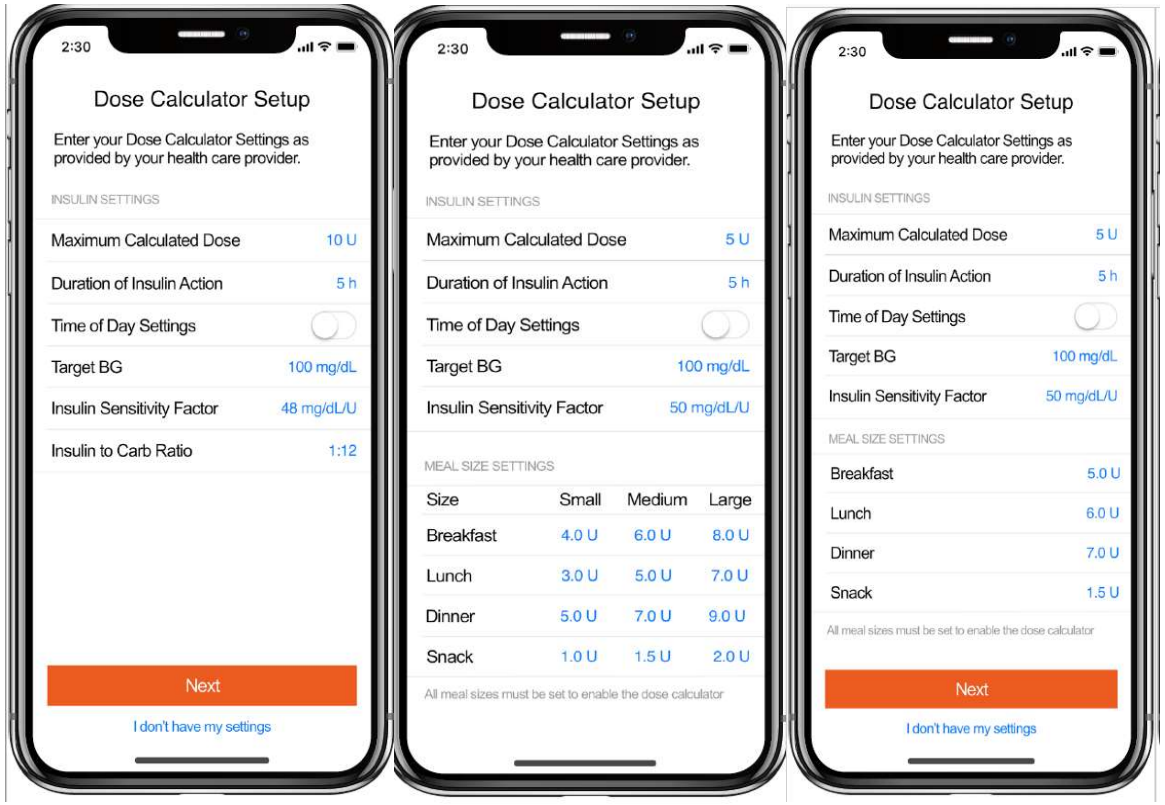
Bigfoot Unity Diabetes Management System

- Cleared by the FDA for ages over 12 years
- Smart insulin pen caps fits onto most commercially available insulin pens
- 2 versions of the pen cap:
  - Black for basal and white for bolus
- Uses glucose data from Freestyle Libre 2 CGM
  - Scan the sensor with the pen cap
- Recommended dose displayed by pen cap
  - 3 options based on small, medium large or carb counts
- Will not recommend insulin within 3 hours of last dose
- Records when a dose was taken (pen cap off for >4 seconds)
- Pen caps are rechargeable

Lilly Tempo Smart Button

- Tempo pen available with Lyumjev, Basaglar, Humalog
- Button uses Bluetooth to transfer insulin dose to mobile app
- TempoSmart App integrates insulin dosing data with glucose, food, exercise, and sleep data
- Set personalized reminders and alerts
- Basal dose optimization

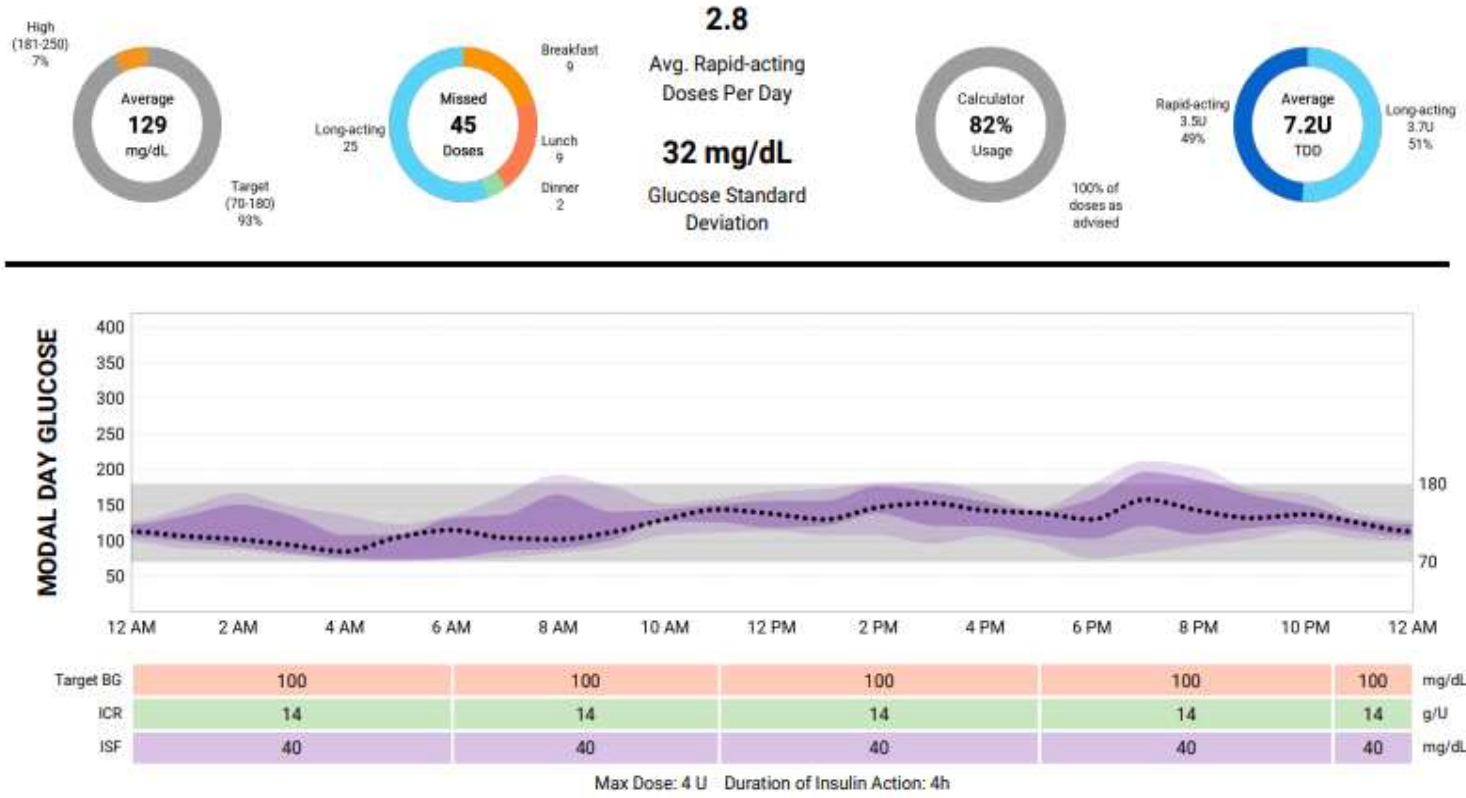
Therapy Settings



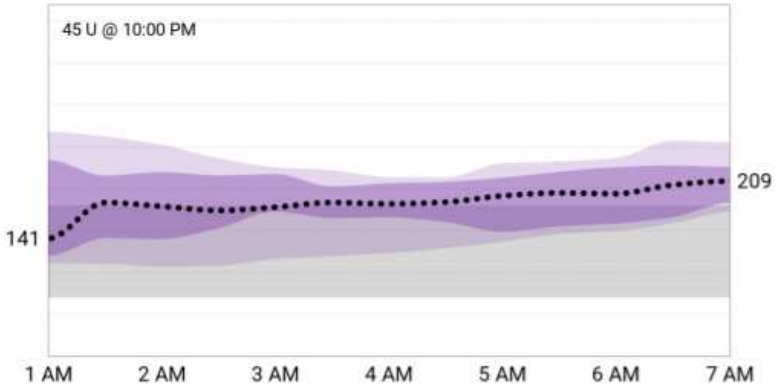
Time of Day Settings

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

Connected Pen + CGM Data



LONG-ACTING ASSESSMENT

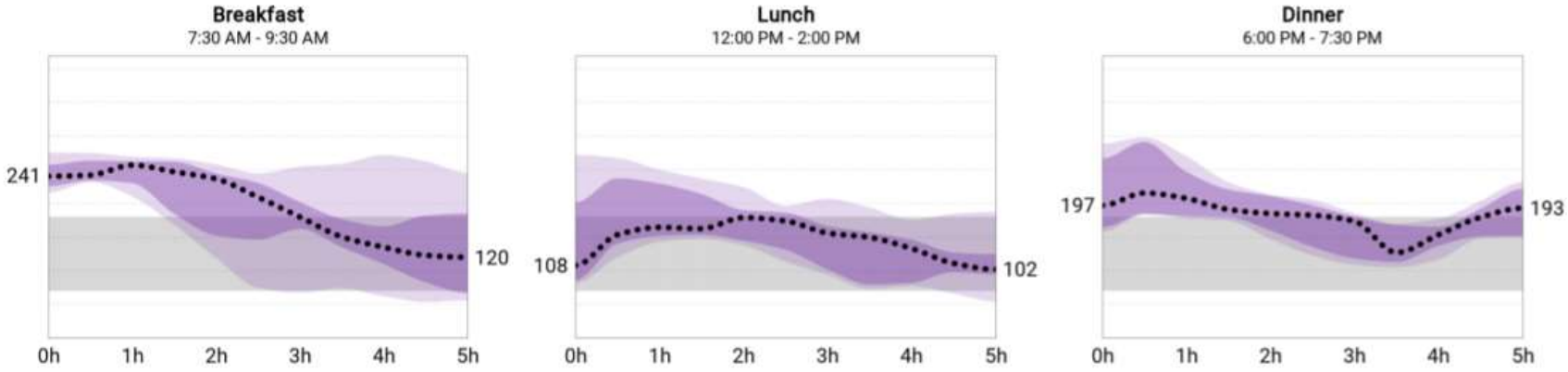


Days Included in Assessment	7 of last 14 days
Average Daily Dose Taken	45 U
# Days with Glucose < 70 mg/dL	0
Median Bedtime to Fasting (Change)	141 to 209 (+68 mg/dL) ▲

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.

MEAL ASSESSMENT



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

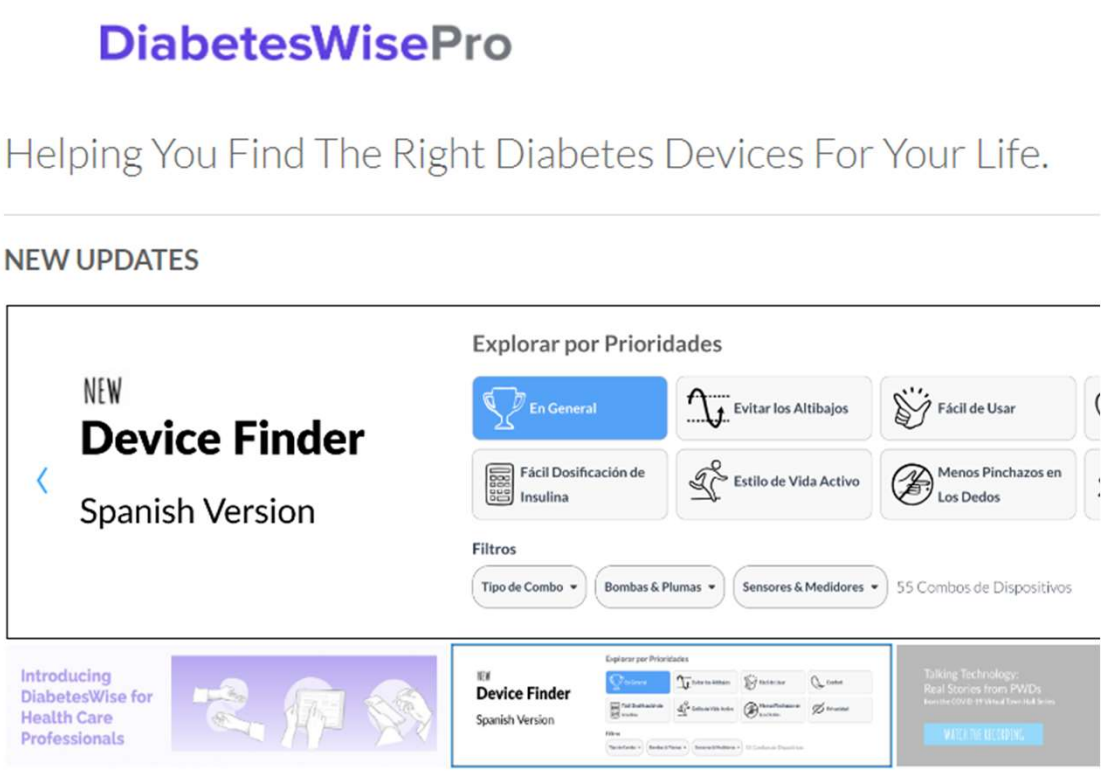
Diana Isaacs, PharmD, BCPS, BC-ADM, BCACP CDCES, FADCES, FCCP

Director, Education & Training in Diabetes Technology

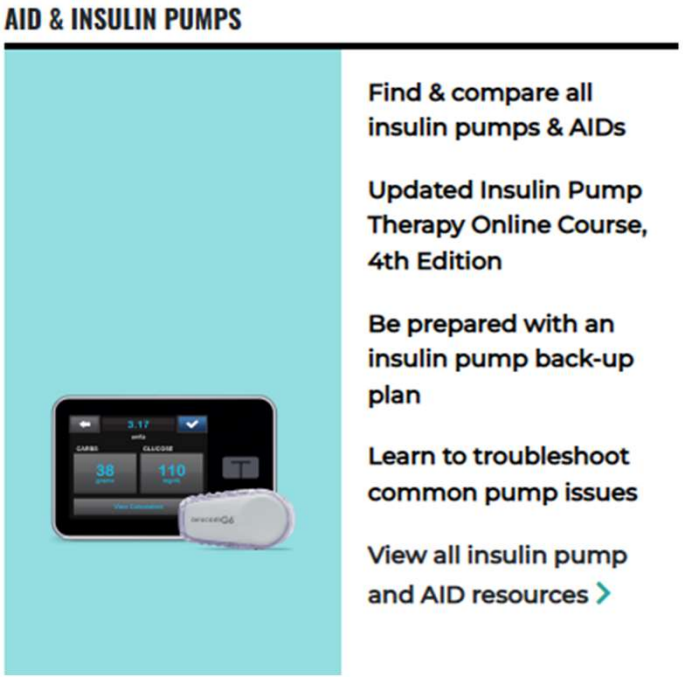
Collaborate: How to Share Data

System:	Associated Mobile Apps	Data Sources
Glooko	Glooko	Insulin pumps (Omnipod, T:slim X2), Dexcom, Eversense, many glucose meters, InPen
Clarity	Dexcom G6, G7, Clarity, Dexcom Follow, Undermyfork, Sugarmate	Dexcom, InPen
LibreView	LibreLink, LibreLinkUp, Libre 14 day, Libre 2, Libre 3	Libre 14 day, Libre 2, Libre 3
Carelink	Guardian Connect, Carelink	770G, Guardian CGM, InPen
Tidepool	Tidepool Mobile	Insulin pumps (770G, T:Slim X2, Tandem, Omnipod), Dexcom, Guardian, Libre, many glucose meters, InPen
T:Connect	T:Connect Mobile	T:Slim X2, G6
Eversense Data Management System	Eversense	Eversense
InPen Insights Report	InPen	InPen, Dexcom, Guardian Connect
Bigfoot Unity	Bigfoot Unity	Bigfoot Unity pen cap, Libre 2
Tempo Platform	TempoSmart	TempoSmart Button, Dexcom

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.
- Infusion site failure: Check ketones and replace Pod if

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 Tools

	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.		

Diana Isaacs, PharmD
Instagram/Twitter: @dianamisaacs
Podcast: Diabetes Dialogue available at
https://www.hcplive.com/podcasts/diabetes-dialogue

From Dis-Ease to Well- Being

Beverly Thomassian, RN, MPH, BC-ADM, CDCES
Founder, DiabetesEd Services

From Dis-Ease to Well- Being. Assessment Tools & Coping

- State strategies to assess and address social determinants of health
- Discuss health care delivery systems using a person-centered approach
- List screening tools that can help detect depression, trauma and cognitive decline
- Describe psycho-social and emotional barriers to diabetes self-management
- Provide strategies for healthcare professionals to identify and overcome barriers to self-care.

Psychosocial Care

- Inspired by
- Psychosocial Care for People with Diabetes: A Position Statement of the American Diabetes Association
- New Language for Diabetes

Psychosocial Care for People With Diabetes: A Position Statement of the American Diabetes Association

Deborah Young-Hyman[1], Mary de Groot[2], Felicia Hill-Briggs[3], Jeffrey S. Gonzalez[4], Korey Hood[5] and Mark Peyrot[6]

Author Affiliations

Corresponding author: Deborah Young-Hyman, younghyd@od.nih.gov.

Diabetes Care 2016 Dec; 39(12): 2126-2140.
https://doi.org/10.2337/dc16-2053

Check for updates

Well-Being Key Goal of Care

- Clinical outcomes, health status, and well-being are key goals of diabetes self-management education and support
- Address as part of routine care
- Psychological and social barriers can impair the ability for self-care and lead to poor health outcomes.

Providing Successful Diabetes Care

- Set up delivery systems using chronic care model of pro-active instead of re-active.
- Assess the unique needs of each individual
- Encourage and support diabetes self-management
- All treatment decisions are made in conjunction with the person's preferences, needs & values.
- Person centered care.

Warm-Up Poll Question

- TR is a health care professional getting ready to take their certification exam. They are interested in providing more person-centered care. Which of the following statements verifies they are on the right track?

1. Adherence to the diabetes self-care plan takes time.
2. Motivating individuals to engage in their self-management is the first step.
3. Adult learners do best when provided a step-by-step demonstration.
4. Creating mutual agreement on the plan for next steps.

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.

How do Diabetes Specialists Help?

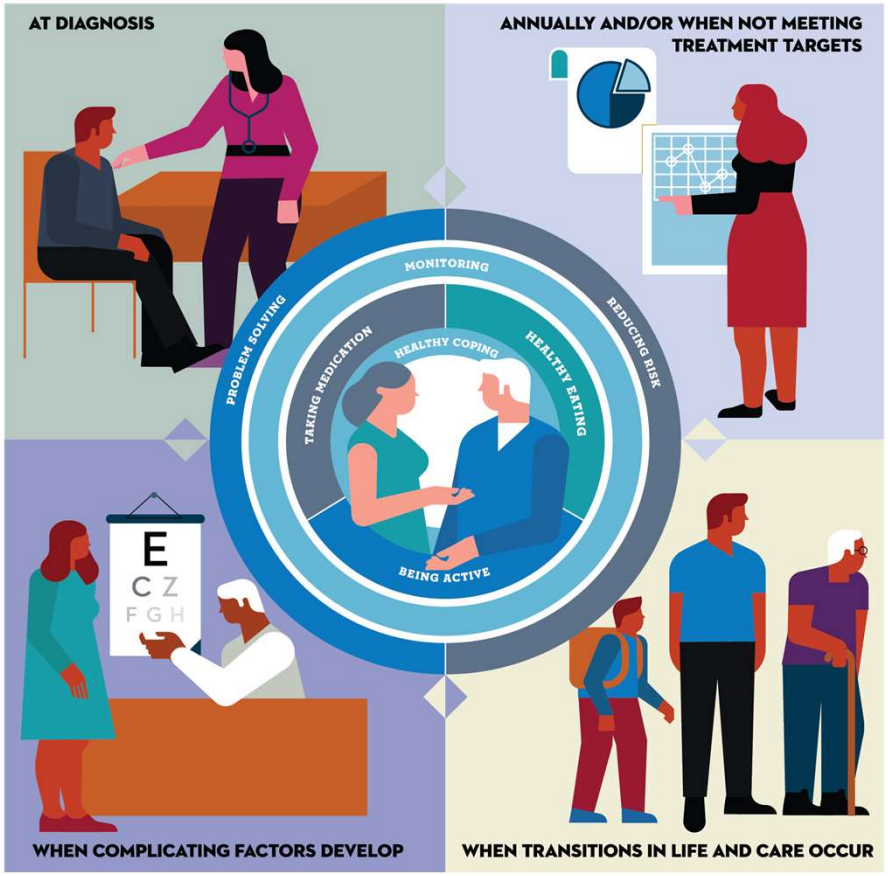
How Do Diabetes Educators Help?

- AADE7™ Self-Care Behaviors:

Healthy eating	Being active	Monitoring
Taking medication	Problem-solving	Healthy coping
	Reducing risks	

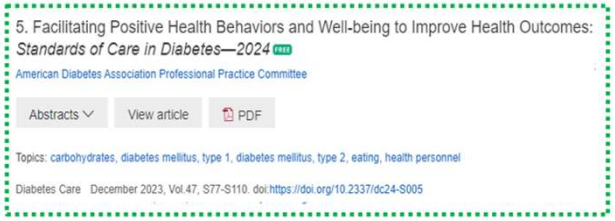
From Dis-Ease to Well-Being

FIVE critical times to provide and modify DSMES



1) At diagnosis.
2) When not meeting treatment goals.
3) Annually
4) When complicating factors develop (medical, physical, psychosocial).
5) When transitions in life and care occur.

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


5. Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

Abstracts | View article | PDF

Topics: carbohydrates, diabetes mellitus, type 1, diabetes mellitus, type 2, eating, health personnel

Diabetes Care December 2023, Vol.47, S77-S110. doi:https://doi.org/10.2337/dc24-S005

(cdc.gov/diabetes/professional-info/training.html)

Diabetes Self Management Ed Benefits

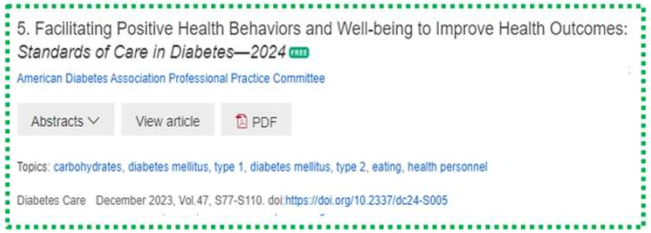
- Improved knowledge
- Lower weight
- Improved quality of life
- Reduced mortality
- Positive coping
- Reduced cost

- Increased primary care, preventive services
- 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.*

DSMES is for Everyone

- All people with diabetes should participate in diabetes self-management education and support to facilitate the knowledge, decision-making, and skills mastery for diabetes self-care.


5. Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes: *Standards of Care in Diabetes—2024*

American Diabetes Association Professional Practice Committee

Abstracts | View article | PDF

Topics: carbohydrates, diabetes mellitus, type 1, diabetes mellitus, type 2, eating, health personnel

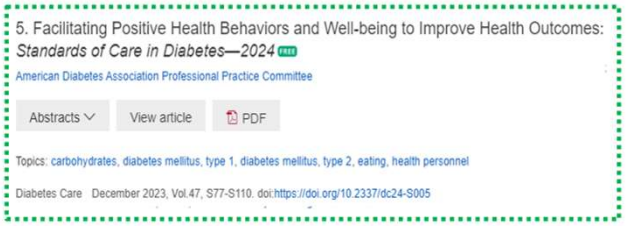
Diabetes Care December 2023, Vol.47, S77-S110. doi:https://doi.org/10.2337/dc24-S005

- Assess clinical outcomes, health status, well being and support.
- Person centered
- Digital coaching
- Identify barriers
- Eval SDOH
- Consider barriers

DSMES is underutilized

Despite the benefit of DSMES, data from the 2017 and 2018 Behavioral Risk Factor Surveillance System of 61,424 adults with self-reported diabetes indicate that

53% of individuals eligible for DSMES through their health insurance receive it


5. Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

Abstracts View article PDF

Topics: carbohydrates, diabetes mellitus, type 1, diabetes mellitus, type 2, eating, health personnel

Diabetes Care December 2023, Vol.47, S77-S110. doi:https://doi.org/10.2337/dc24-S005

Social Determinants of Health and Equity

- Recognize the need to provide person-centered services that embrace each individual and acknowledge their SDOH.
- Goal is to increase health equity through access to this critical service while focusing *more* on person-centered care and decreasing administrative complexities.

Poll Question 2

- LS has type 1 diabetes and reports to clinic with unusual hyperglycemia and some weight loss. Tells you they barely have enough money to pay for rent and food. What are you considering?
- A. Disordered eating
- B. Food insecurity
- C. Insulin rationing
- D. Diabetes distress

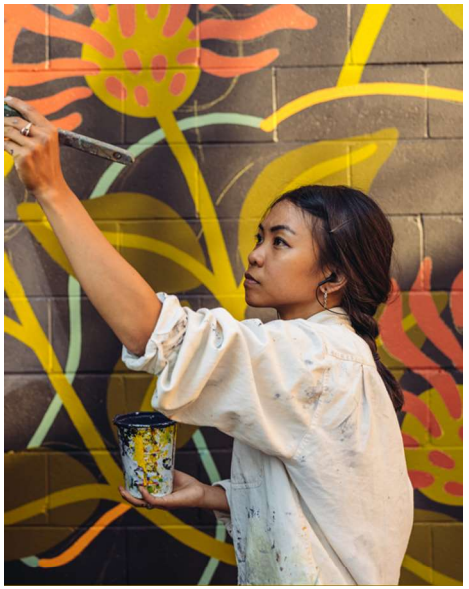
Tailor Treatment for Social Context

- Consider individualized care and provide resources
- These factors impair ability to self-manage diabetes.
  - 20% of people with food insecurity have diabetes
  - Financial barriers can lead to less healthy food choices and inability to access medications.
  - Lack of housing – 8% of people without homes have diabetes.

1. Improving Care and Promoting Health in Populations: *Standards of Care in Diabetes—2024*
American Diabetes Association Professional Practice Committee

Tailor Treatment for Social Context

- Consider individualized care and provide resources
  - Migrant and seasonal workers at higher risk of diabetes due to stress, food insecurity, lack of med care
  - Health literacy limits ability to navigate HC systems
  - Social capital/ Community Support
    - Health inequities related to Social Determinants of Health
  - Need to make more community connections through Community Health Workers



1. Improving Care and Promoting Health in Populations: *Standards of Care in Diabetes—2024*

American Diabetes Association Professional Practice Committee

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
©2019, American Association of Diabetes Educators, Chicago, IL

Look Beyond – What impacts DSM

- Improving diabetes treatment outcomes requires looking at multiple factors:
  - Living situation
  - Adequacy of medical management
  - Duration of diabetes
  - Weight gain / weight loss
  - Other health related problems
  - Social structural factors
  - Childhood trauma – Adverse Childhood Experiences

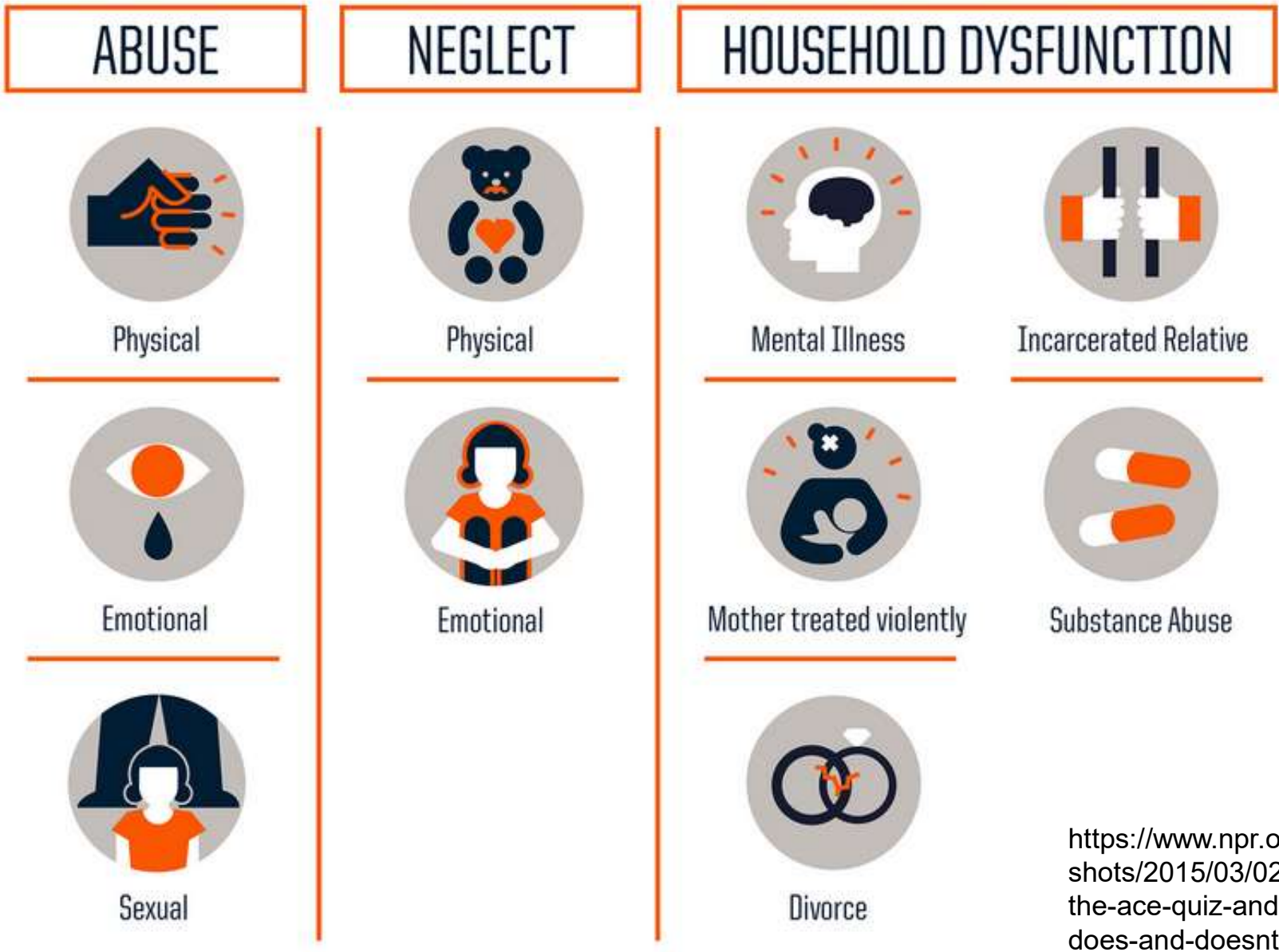
Question - What is ACE?

- ACE =
  - Adverse
  - Childhood
  - Experiences
    - (before 18 yrs)

- What is the relationship between childhood trauma, diabetes and health?

www.AcesAware.org

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

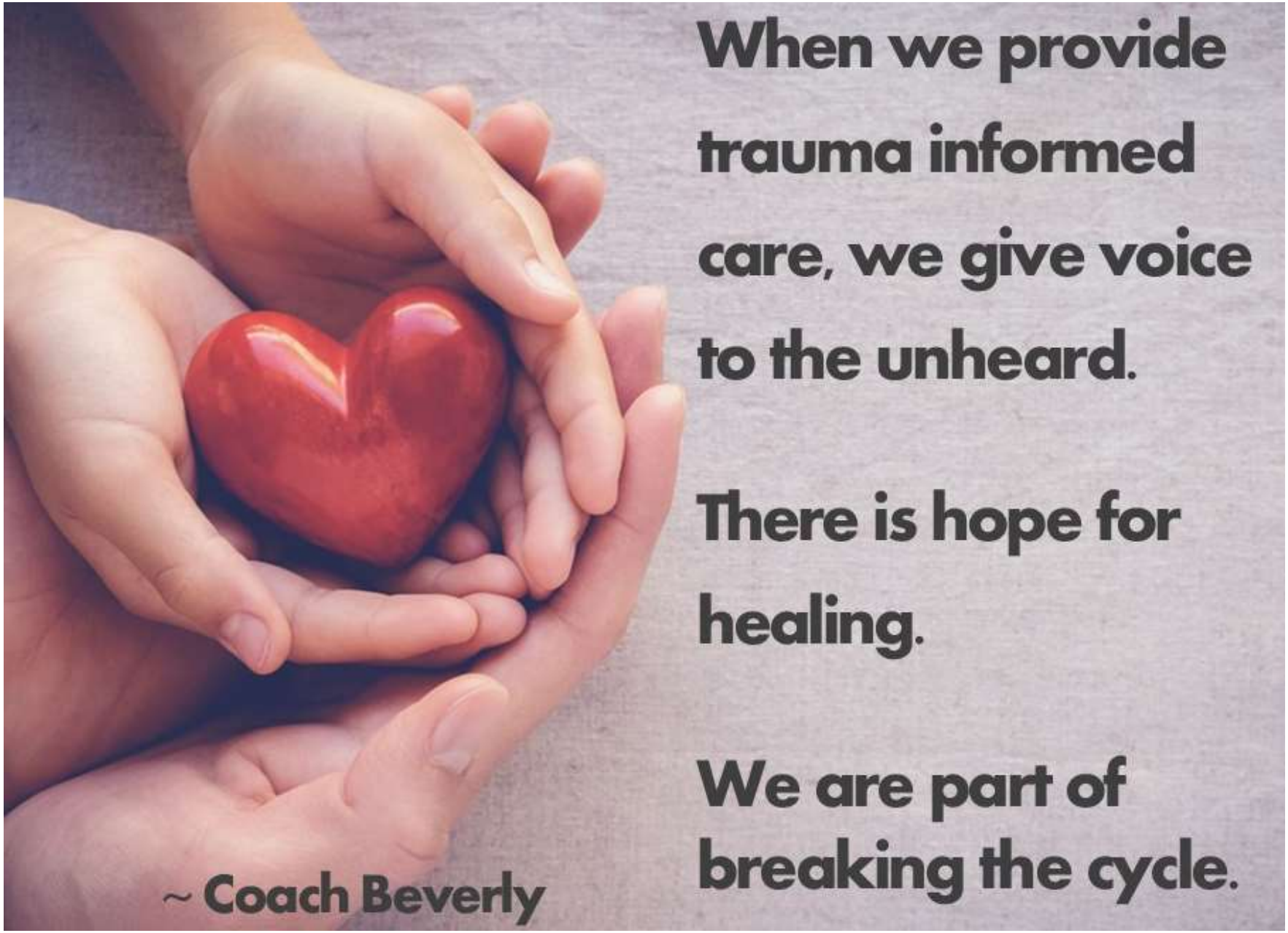
https://www.cdc.gov/vitalsigns/aces/index.html

3 Realms of ACEs

Adverse childhood and community experiences (ACEs) can occur in the household, the community, or in the environment and cause toxic stress. Left unaddressed, toxic stress from ACEs harms children and families, organizations, systems and communities, and reduces the ability of individuals and entities to respond to stressful events with resiliency. Research has shown that there are many ways to reduce and heal from toxic stress and build healthy, caring communities.

PACEs Connection thanks **Building Community Resilience Collaborative and Networks** and the **International Transformational Resilience Coalition** for inspiration and guidance. Please visit **PACEsConnection.com** to learn more about the science of ACEs and join the movement to prevent ACEs, heal trauma and build resilience.

The Act of Recognition is Healing



Other factors - Assess Literacy

- Numeral
  - 130 could look same as 310, 013
- Health
  - Not sure how to use the health system
  - Prescriptions, appointments, insurance coverage
- Functional
  - Ability to use reading, writing and computation at levels adequate to everyday situations (checkbooks, signs, apps)

Poll question 3

- Which of the following strategies are best used when someone has low literacy skills?

  A. speak slowly and clearly

  B. underline key points on educational materials

  C. direct the teaching to the support person and encourage reinforcement.

  D. be concrete and focus on problem solving

Teaching Approaches: Low Literacy

- Be Concrete
- Word usage (be sensitive!)
- Identify 1-2 messages
- Be patient, use teaching aids
- Small group- problem solving
- Tech level - video, computer, printed info, “apps”
- Engage support people

Quick Self-Assessment

- LS arrives late for appointment and says they forgot their log book. LS has only been taking their metformin a couple times a week and has gone back to getting fast food each morning for breakfast.
- What feelings would this evoke?
  - LS doesn't care
  - Non-compliant
  - Lazy
  - Better scare them
  - Exasperation

curiosity

Expectancy Theory and Language

- When we label people, we form biases.
- We act out behaviors based on this label.
  - Providers also modify behavior in response to label
- The person labeled may take on attributes of that label.

- Do our language choices lead to clinical inertia?

Limit Advice Giving, Expand Curiosity

- As the person with diabetes is sharing their “story”, we might be thinking of a whole range of solutions that will fix the situation.
- The truth is, the person sitting across from us knows what will fix the situation. Our goal is to help them in the process of self-discovery.
- By being curious and asking questions, we can help them explore different strategies and determine the best fit.
- “What would you like to work on today?”

“Our goal is to help in the process of self-discovery”

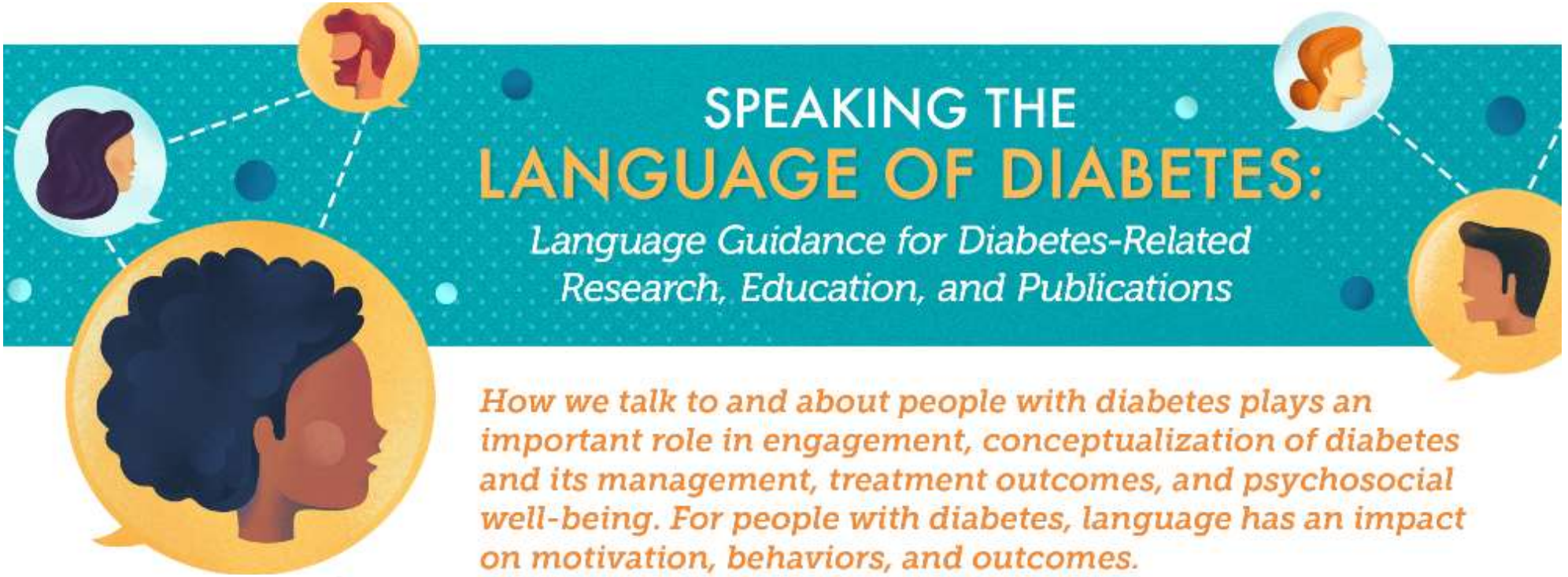
Guiding Language Principles

Strength Based

- Emphasize what people know, what they *can* do.
- Focus on strengths that empower people

Person-first

- Words that indicate awareness
- Sense of dignity
- Positive attitude toward person with diabetes



SPEAKING THE LANGUAGE OF DIABETES:

Language Guidance for Diabetes-Related Research, Education, and Publications

How we talk to and about people with diabetes plays an important role in engagement, conceptualization of diabetes and its management, treatment outcomes, and psychosocial well-being. For people with diabetes, language has an impact on motivation, behaviors, and outcomes.

The Use of Language in Diabetes Care and Education

Four principles guided this work and served as a core set of beliefs for the paper:

- Diabetes is a complex and challenging disease involving many factors and variables
- Every member of the health care team can serve people with diabetes more effectively through a respectful, inclusive, and person-centered approach
- Stigma that has historically been attached to a diagnosis of diabetes can contribute to stress and feelings of shame and judgment
- Person-first, strengths-based, empowering language can improve communication and enhance motivation, health and well-being of people with diabetes

https://diabetesed.net/language-and-diabetes/

Take a Strength Based Approach

- Individuals asked to take active role in directing the day-to-day planning, monitoring, evaluation and problem-solving.
- Need to eval perceptions about their own ability and self-efficacy to manage diabetes
- Explore past situations where they have had past success
- Use strength-based language

Highlight What The Person Is Doing Right

- Our belief in people's ability to change is powerful.
- We can transmit our belief in others through body language, affirmation and encouragement.
- When we use a strength-based approach, confidence in success increases – for both parties.
- Use phrases like, "You've overcome this in the past and I believe in your ability to figure out what will work best for you now.

“Mindfulness-based Interventions”

- Avoid compliance model
- Focus on empowerment and acceptance
- Mindfulness
  - “Pay attention-on purpose “
  - Non-judgmental
  - In-the-present
  - Better chance to be present to life and become less reactive to the tides of distraction.
  - Really HEAR your clients!

Poll Question 4

Which phrase represents the principles for communicating with and about people living with diabetes?

A. Your BMI indicates you are in the obese category

B. Your fasting blood sugar is above normal

C. You should try and exercise 150 minutes a week.

D. You are checking your blood sugar daily.

Psychosocial Assessment

- Integrate psychosocial care using a collaborative, person centered approach for all people with diabetes, to optimize health outcomes and health-related quality of life

- Assess for:
  - Anxiety
  - Cognitive capacities
  - Depression
  - Distress
  - Disordered eating
- Use validated tools
- Initial visit & periodically
- If over 65, screen for depression & cognitive impairment

Anxiety – Exaggerated response to normal fears

- Anxiety
- Symptoms - (must have 5 for over 6mo's)
  - restlessness,
  - keyed-up or on-edge
  - easily fatigued
  - difficulty concentrating or mind going blank
  - irritability
  - muscle tension
  - sleep disturbances

Diabetes causes fear –

- Hypoglycemia
- Complications
- Living with chronic condition

- Impact of Anxiety
  - 1.Counterreg hormones
  - 2. Self-care behavior diminishes

Keeps forgetting insulin

- Cheerful and fun loving
- At diabetes support group, isn't feeling well
- BG 493
- Ran out of insulin "a while ago"

Cognition, Alzheimer's and Dementia

- Diabetes increases risk of cognitive impairment
  - 73% increased risk of dementia,
  - 56% increased risk of Alzheimer's
  - 127% increased risk of vasculature dementia
  - Cognitive impairment influences treatment goals
  - Less intensive, realistic, get support
- People with Alzheimer's and dementia are more likely to get diabetes
  - Rates increase over time

Cognitive Impairment Treatment

- Treatment:
  - Refer to specialist for assessment
  - Achieve optimal BG control
  - Pharmacist to evaluate drug safet and potential drug interactions
  - Keep physically active
  - Nutrition and gut health
  - Community engagement and support

Poll Question 6

- A 47 year old enters your office and says, “the doctor made me come here. I don’t know why, I just have borderline diabetes”. A1c is 8.7%. What is the most appropriate response?
  - A. Based on your A1c level, it looks like you have diabetes.
  - B. We don’t use the term “borderline diabetes anymore
  - C. Let’s just start with carb counting.
  - D. It sounds like you aren’t sure why you are here.

Adaptation to the Emotional Stress of Chronic Disease

(Kubler-Ross, Rubin RR, WHPolonsky)

Denial	Don't agree, but listen Acknowledge Survival Skills only!
Anger	Indicates: Awareness, Learning Begins Be clear, concise instructs No long WHY answers
Bargaining	ID's w/ others Group classes good Ed: "what" pt. wants to know
Depression & Frustration	Realize permanency of DSC Tx Psycho-social support referral Emphasize + change made
Accept & Adapt	Sense of responsibility for Self-care;

Depression

- Characterized by depressed mood
- Loss of interest in activities usually found pleasurable
- Difficulty concentrating, sleeping, changes in appetite
- Difficulty in following through with self care behaviors
- Person may actually be experiencing diabetes distress.

NAME:_____ DATE:_____

Over the last *2 weeks*, how often have you been bothered by any of the following problems?
(use "✓" to indicate your answer)

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself—or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite — being so figety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead, or of hurting yourself	0	1	2	3
add columns		+	+	

PHQ- 9

Quick Depression Assessment

- If there are at least four 3s in the shaded section (including Questions #1 and #2), consider a depressive disorder. Add score to determine severity.
- Consider Major Depressive Disorder - if there are at least five 3s in the shaded section (one of which corresponds to Question #1 or #2)
- Consider Other Depressive Disorder - if there are two to four 3s in the shaded section (one of which corresponds to Question #1 or #2)

My spouse doesn’t want to hear

- Living with type 1
- Afraid to exercise due to risk of hypoglycemia
- Afraid to go to sleep for fear of going low even though has CGM and pump
- Spouse does not want them to share about day-to-day diabetes issues.

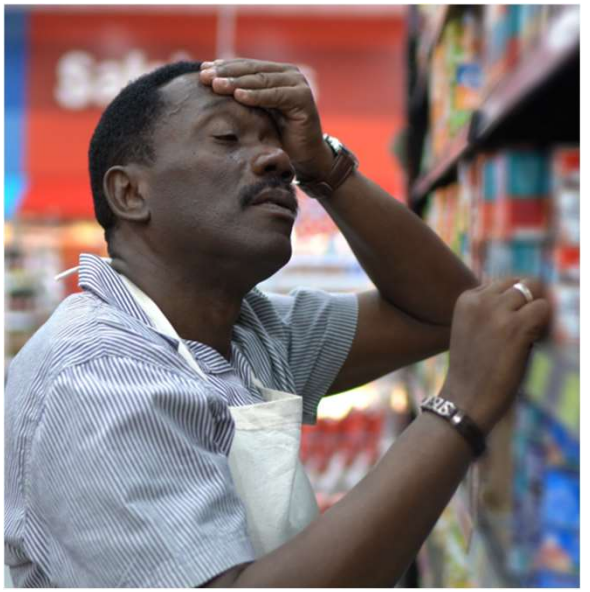
Diabetes Distress (DD)

DD refers to the *expected* worries, concerns, fears, and threats that are associated with a demanding chronic disease (e.g., management struggles, threats of complications, loss of functioning, access to care).

DD can show itself in many forms

Most common:

- May not show itself outwardly.
- Feelings of frustration, powerlessness, hopelessness.
- Pronounced fear of hypos or complications.
- Avoidance of tough feelings “Who me?” “Everything is fine.”
- Burnout because of all of the management tasks, frustrating results, dealing with insurance.
- Anger/frustration with providers: distrust, no-shows.
- Hyper attention to CGM screens and excessive BG checking.



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 reported diabetes distress
- Only 24% of providers asked pts how diabetes affected their life (DAWN Study)

Diabetes Distress – Assess Annually

Type 1 Diabetes Distress Scale (T1-DDS)

Instructions: Living with type 1 diabetes can be tough. Listed below are a variety of distressing things that many people with type 1 diabetes experience. Thinking back over the past month, please indicate the degree to which each of the following may have been a problem for you by circling the appropriate number. For example, if you feel that a particular item was not a problem for you over the past month, you would circle 1. If it was very tough for you over the past month, you might circle 6.

		Not a problem	Slight problem	Moderate problem	Somewhat serious problem	Serious problem	Very serious problem
1	Feeling that I am not as skilled at managing diabetes as I should be.	☐1	☐2	☐3	☐4	☐5	☐6
2	Feeling that I don't eat as carefully as I probably should.	☐1	☐2	☐3	☐4	☐5	☐6
3	Feeling that I don't notice the warning signs of hypoglycemia as well as I used to.	☐1	☐2	☐3	☐4	☐5	☐6
4	Feeling that people treat me differently when they find out I have diabetes.	☐1	☐2	☐3	☐4	☐5	☐6
5	Feeling discouraged when I see high blood glucose numbers that I can't explain.	☐1	☐2	☐3	☐4	☐5	☐6
6	Feeling that my family and friends make a bigger deal out of diabetes than they should.	☐1	☐2	☐3	☐4	☐5	☐6
7	Feeling that I can't tell my diabetes doctor what is really on my mind.	☐1	☐2	☐3	☐4	☐5	☐6
8	Feeling that I am not taking as much insulin as I should.	☐1	☐2	☐3	☐4	☐5	☐6
9	Feeling that there is too much diabetes equipment and stuff I must always have with me.	☐1	☐2	☐3	☐4	☐5	☐6
10	Feeling like I have to hide my diabetes from other people.	☐1	☐2	☐3	☐4	☐5	☐6
11	Feeling that my friends and family worry more about hypoglycemia than I want them to.	☐1	☐2	☐3	☐4	☐5	☐6
12	Feeling that I don't check my blood glucose level as often as I probably should.	☐1	☐2	☐3	☐4	☐5	☐6
13	Feeling worried that I will develop serious long-term complications, no matter how hard I try.	☐1	☐2	☐3	☐4	☐5	☐6
14	Feeling that I don't get help I really need from my diabetes doctor about managing diabetes.	☐1	☐2	☐3	☐4	☐5	☐6
15	Feeling frightened that I could have a serious hypoglycemic event when I'm asleep.	☐1	☐2	☐3	☐4	☐5	☐6
16	Feeling that thoughts about food and eating control my life.	☐1	☐2	☐3	☐4	☐5	☐6
17	Feeling that my friends or family treat me as if I were more fragile or sick than I really am.	☐1	☐2	☐3	☐4	☐5	☐6
18	Feeling that my diabetes doctor doesn't really understand what it's like to have diabetes.	☐1	☐2	☐3	☐4	☐5	☐6
19	Feeling concerned that diabetes may make me less attractive to employers.	☐1	☐2	☐3	☐4	☐5	☐6
20	Feeling that my friends or family act like "diabetes police" (bother me too much).	☐1	☐2	☐3	☐4	☐5	☐6

5. Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes: *Standards of Care in Diabetes—2024*

American Diabetes Association Professional Practice Committee

Abstracts | View article | PDF

Topics: carbohydrates, diabetes mellitus, type 1, diabetes mellitus, type 2, eating, health personnel

Diabetes Care December 2023, Vol.47, S77-S110 doi:https://doi.org/10.2337/dc24-S005

www.behavioraldiabetes.org

https://professional.diabetes.org/sites/default/files/media/ada_mental_health_toolkit_questionnaires.pdf.

Poll question 7

- You assess that a person with new LADA is struggling with diabetes distress. What is an appropriate intervention?
- A. Encourage them to ask their provider about starting antidepressants.
- B. Set a SMART goal that is very challenging to help move them forward.
- C. Support them in making a realistic goal
- D. Remind them that alcohol is actually a depressant

Mental health – Build a Foundation

- Although the educator might not feel qualified to treat psychological problems, optimizing the individual / educator relationship as a foundation to increase likelihood of acceptance.

- Determine if help is needed
- Have a list of mental health providers
- Resource list of phone helplines
- Help individual problem solve to get access
- If individual cannot act on behalf of themselves, help identify a support person

Psychosocial Assessment

Problem Areas In Diabetes (PAID) Scale

Instructions: Which of the following diabetes issues are **currently** a problem for you? Tick the box that gives the best answer for you. Please provide an answer for each question.

		Not a problem	Minor problem	Moderate problem	Somewhat serious problem	Serious problem
1	Not having clear and concrete goals for your diabetes care?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
2	Feeling discouraged with your diabetes treatment plan?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
3	Feeling scared when you think about living with diabetes?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
4	Uncomfortable social situations related to your diabetes care (e.g. people telling you what to eat)?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
5	Feelings of deprivation regarding food and meals?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
6	Feeling depressed when you think about living with diabetes?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
7	Not knowing if your mood or feelings are related to your diabetes?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
8	Feeling overwhelmed by your diabetes?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
9	Worrying about low blood glucose reactions?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
10	Feeling angry when you think about living with diabetes?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
11	Feeling constantly concerned about food and eating?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
12	Worrying about the future and the possibility of serious complications?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
13	Feelings of guilt or anxiety when you get off track with your diabetes management?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
14	Not accepting your diabetes?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
15	Feeling unsatisfied with your diabetes physician?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
16	Feeling that diabetes is taking up too much of your mental and physical energy every day?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
17	Feeling alone with your diabetes?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
18	Feeling that your friends and family are not supportive of your diabetes management efforts?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4

ADA provides screening tools for specific psychosocial topics, such as diabetes distress, fear of hypoglycemia, and other relevant psychological symptoms- See Resource Page https://professional.diabetes.org/sites/default/files/media/ada_mental_health_toolkit_questionnaires.pdf.

Psychosocial Assessment

Informal check in or can utilize more formal assessments

- Adverse Childhood Experiences – ACE – early childhood experience can affect health outcomes for life. Read more about ACE here.
- Psychosocial Care for People with Diabetes: A Position Statement of the American Diabetes Association 2016. (See chart below excerpted from Position Statement)
- Diabetes Distress Scale
- PHQ-9 Depression Screening Scale
- PAID – Problem Areas in Diabetes Survey – Pediatric Version Youth perceived burden of type 1 diabetes.
- General Health Numeracy Test – A 6 question assessment on numeral literacy
- The **Mini–Mental State Examination (MMSE)** or Folstein test is a 30-point questionnaire that is used extensively in clinical and research settings to measure cognitive impairment. It is commonly used in medicine and allied health to screen for dementia.

Consider Referral to Mental Health Provider for Eval and Treatment

- Diabetes distress even after tailored education
- 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

*FoH – Fear of Hypoglycemia

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

Empowering and Promoting Health for Individuals and Populations

Our Actions Make a Difference

Move away from term "Non-Compliance"

- People with diabetes are asked to take active role in directing the day-to-day planning, monitoring, evaluation and problem-solving.
- Non-compliance denotes a passive, obedient role or "following doctor's orders" without any input
- Need to eval perceptions about their own ability and self-efficacy to manage diabetes

Empowerment Defined

- “Helping people discover and develop their inherent capacity to be responsible for their own lives and gain mastery over their diabetes”.
- Posits:
  - Choices made by individuals (not HCPs) have greatest impact.
  - Individuals are in control of their self-management
  - The consequences of self-management decisions affect the individual most. It is their right and responsibility to be the primary decision makers.

Traditional vs Empowerment Based

Traditional vs Empowerment Based

Table 3.5 *Comparison of Traditional and Empowerment –Based DSME and DSMS*

Traditional DSME and DSMS	***Empowerment-Based DSME and DSMS***
Diabetes is a physical illness.	Diabetes is a biopsychosocial illness.
Professional is viewed as teacher and problem solver, and responsible for outcomes.	Patient is viewed as problem solver and self-manager: professional acts as a resource and shares responsibility for outcomes.
Learning needs are usually identified by professional	Problems and learning needs are identified by patient.
Education is curriculum-driven.	Education is patient-centered and consistent with adult learning principals.
Education is primarily didactic.	Patient experiences are used as learning opportunities for problem solving and serve as the core for the curriculum.
Emotional issues are a separate component of the curriculum.	Emotional issues are integrated with clinical content.
Behavioral strategies are used to increase compliance with recommended treatment.	Behavioral strategies are integrated with clinical content and taught to patients to help them change behaviors of their choosing.
Goal of education is compliance/adherence with recommendations.	Goal is to enable patients to make informed choices.
A lack of goal attainment is viewed as a failure by both the patient and the educator.	A lack of goal attainment is viewed as feedback and used to modify goals and action plans.
Behavior changes are externally motivated.	Behavior changes are internally motivated.
Patients is relatively powerless, professional is powerful.	Patient and professional are equally powerful.

Source: Adapted from MM Funnell, RM Anderson, "Patient empowerment: from revolution to evolution," Treat Strategies Diabetes 3 (2011): 98-105.

This philosophy is important to know for the exam

How to Succeed with Person-Centered Coaching

- A diagnosis of diabetes often carries a significant emotional response. A person with diabetes might report shame, fear, and guilt as they come to terms with their diagnosis and anticipate their future. As diabetes healthcare providers, we can learn to address these feelings while helping people move forward!
- Using a person-centered approach, we can identify the individual's strengths and expertise and then leverage this information to open a door of possibilities.
- Our choice of communication techniques can spark behavior change in people living with diabetes.

Motivational Interviewing

- The primary goal is to evoke intrinsic motivation and commitment to change by creating a collaborative and non-judgmental atmosphere.

- The approach recognizes that individuals often have mixed feelings about changing their behaviors, and it aims to guide them towards resolving this ambivalence in a positive and constructive manner.

Motivational Person-Centered Coaching

- **Express Empathy:**
  - Active listening and empathy
  - Open ended questions
  - Understand the individual's perspective without judgment
  - Individual feels heard and understood.
- **Develop Discrepancy:** recognize discrepancy between their current behavior and their broader goals, values, or aspirations.
- **Roll with Resistance:** Rather than confronting or challenging resistance, "roll with it." Acknowledging and respecting resistance while gently exploring its roots and potential effects.
- **Support Self-Efficacy:** enhance belief capacity to change. Identify and reflect on their past successes, skills, and resources to achieve their goals.
- **Develop a Plan:** If ready to change, help them create a concrete plan for moving forward. This plan is collaboratively developed, with the client taking an active role in defining the steps they're willing to take.
- **Avoid Arguing and Confrontation:** since can lead to resistance and defensiveness. Instead, seek to understand the client's perspective and work from there.

Mindfully Listen to the individuals' problems and fears.

Listening and then reflecting back the struggles of the individual is the first phase of energizing the visit.

- "It's hard to eat more vegetables because you are a long-haul truck driver."

Focus on curiosity before exploring possible changes in behavior can provide comfort and open the door to insights.

- "As a truck driver, I am curious to learn more about your food choices when driving."

With a person-centered approach, spend more time in the "curiosity" phase before moving to the "action" phase."

Listen for insights and ideas, "what are your ideas about how you can improve this situation?"

- "I could buy a veggie tray before heading out in my truck,"

Ask questions and collaborate

- "So, you think you could buy a vegetable tray before heading out?"

FIVE M'S
FOR DIABETES SELF-MANAGEMENT

Mood

Meals

Movement

Medicines

Minutes

Based on 5 M Framework Tool by Funnell et al. www.DiabetesEd.net

- Use the 5 M's approach to help the person with diabetes find their expert within.

Informed vs Wise Decisions

- Informed:
- I know that tomatoes are a fruit.

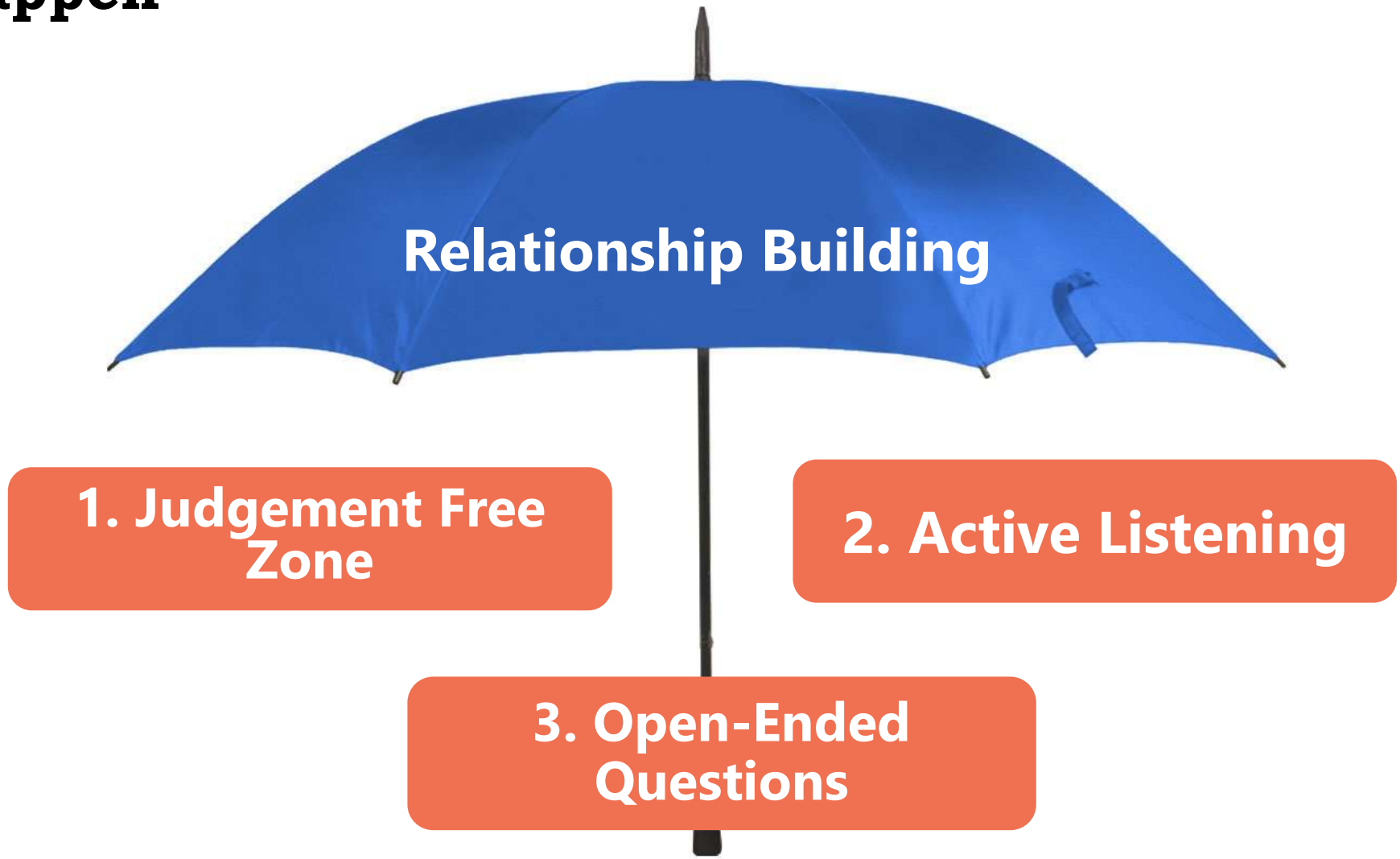
- Wise
- I know not to put tomatoes in my fruit salad.

Avoid and Lean Into

- **AVOID: Pressure, fix, or control.**
- We are careful to avoid forced solutions or controlling language. Our job is to help the person with diabetes find their own answers and solutions.
- **Let's stop "Shoulding" on people**.
- It's time to let go of terms like "You must, you should, you have to, it's better, it's important, do it for me" since they fall under the category of "controlling motivation"—which can be hurtful and lead to the individual becoming defensive or shutting down.
- **Ditch the scare tactics too!**

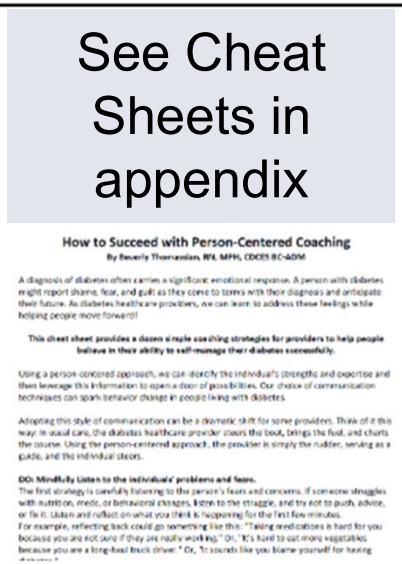
- Lean into - A person-centered approach energizes individuals to take the lead in managing their condition, in step with their providers and supporters.

Relationship Building | Three Tools To Make It Happen



SMART Goals

See Cheat Sheets in appendix



How to Succeed with Person-Centered Coaching

By Beverly Thorwaldson, RN, MPH, CDCES BC-ADM

A diagnosis of diabetes often carries a significant emotional response. A person with diabetes might report shame, fear, and guilt as they come to terms with their diagnosis and anticipate their future. As diabetes healthcare providers, we can learn to address these feelings while helping people move forward!

This cheat sheet provides a dozen simple coaching strategies for providers to help people believe in their ability to self-manage their diabetes successfully.

Using a person-centered approach, we can identify the individual's strengths and expertise and then leverage this information to open a door of possibilities. Our choice of communication techniques can spark behavior change in people living with diabetes.

Adopting this style of communication can be a dramatic shift for some providers. Think of it this way: In usual care, the diabetes healthcare provider steers the boat, brings the fuel, and charts the course. Using the person-centered approach, the provider is simply the rudder, serving as a guide, and the individual steers.

DO: Mindfully Listen to the individuals' problems and fears.

The first strategy is carefully listening to the person's fears and concerns. If someone struggles with nutrition, meds, or behavioral changes, listen to the struggle, and try not to push, advise, or fix it. Listen and reflect on what you think is happening for the first few minutes.

For example, reflecting back could go something like this: "Taking medications is hard for you because you are not sure if they are really working." Or, "It's hard to eat more vegetables because you are a long-haul truck driver." Or, "It sounds like you blame yourself for having

Person-Centered Coaching

How to Succeed with Person-Centered Coaching

This cheat sheet provides a dozen simple coaching strategies for providers to help people believe in their ability to self-manage their diabetes successfully.

A diagnosis of diabetes often carries a significant emotional response. A person with diabetes might report shame, fear, and guilt as they come to terms with their diagnosis and anticipate their future. As diabetes healthcare providers, we can learn to address these feelings while helping people move forward! Using a person-centered approach, we can identify the individual's strengths and expertise and then leverage this information to open a door of possibilities. Our choice of communication techniques can spark behavior change in people living with diabetes.

Support Self-Confidence

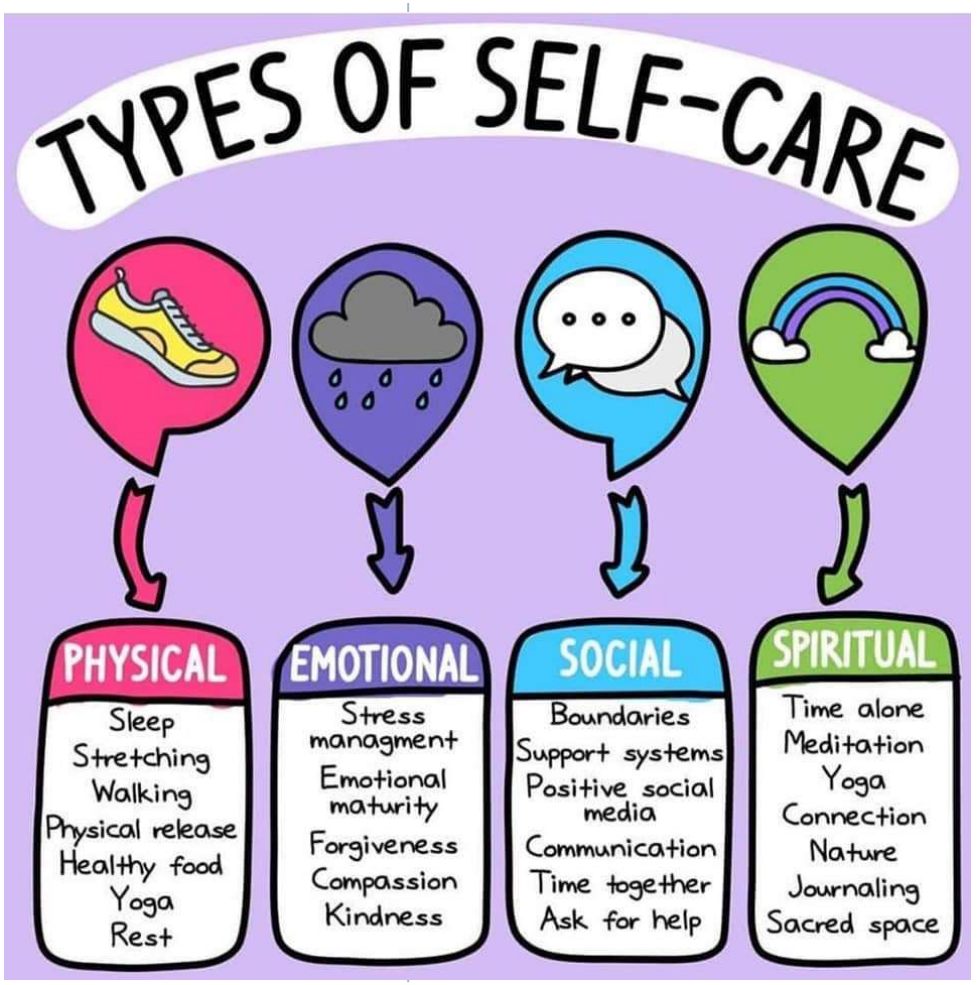
- Support positive expectations for change…
  - emphasize personal responsibility,
  - instill confidence and hope,
  - increase sense of ability to cope.

"From what you've told me about your past successes…it really seems like you can do this!"

Step 8

Take Care of 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!

Your Turn

- What actions have you initiated to improve diabetes care in your community?
- What barriers did you overcome?
- Any words of wisdom to pass along to your fellow diabetes advocates?

DiaBingo - N

N DPP demonstrated that exercise and diet reduced risk of DM by__%

N Average A1c of 7% = Avg BG of ____

N The goal is to eat 14 gms per 1000 cals of this nutrient a day

N Rebound hyperglycemia

N Scare tactics are effective at motivating behavior change

N Get LDL less than ____for most people with diabetes 40 years+

N Drugs that can cause hyperglycemia

N 2/3 cups of rice equals _____ serving carbohydrate

N 1% A1c = how many points of blood sugar _____

N One % drop in A1c reduces risk of complications by ___ %

N 1 gm of fat equal _____kilo/calories

N Metabolic syndrome = hyperinsulinemia, hyperlipidemia, hypertension

N Average American consumes 15 teaspoons of sugar a day.

N Medication derived from the saliva of the Gila Monster

See you Tomorrow at 0800

Jessica Jones, MS, RDN, CDCES will present on Medical Nutrition Therapy.

DiabetesEd Training Conference |San Diego *

Day Three | October 11, 2024 (Pacific Time)

Medical Nutrition Therapy & Pattern Management

Time	Topic	Speaker
7:30 – 8:00am	**Breakfast & Welcome**	
8:00 – 10:00	**Medical Nutrition Therapy – Keeping it Person Centered** **Micro and Macronutrients** **Evidence based approaches to MNT**	Jessica Jones MS, RDN, CDCES
10:00 – 10:15	**Movement Break**	
10:20 -11:40	**Meal Planning- How to Eat by the Numbers**	
11:40 – 12:00	**Keeping Active with Diabetes**	

Thank you for joining us!

**Topics, Timing and Speakers Subject to Change*

Allow Me to Introduce Myself

- I am a Registered Dietitian, CDCES & Co-Founder and CEO of Diabetes Digital–an insurance-based group practice providing 1:1 nutrition counseling for people with DM & PreDM
- Worked in many institutions, from NYC Dept of Health to the University of California San Francisco to Private Practice
- Values: Culturally Humble, Accessibility, Weight Inclusivity, Promoting a Positive Relationship with Food

Healthy Eating

- Healthy Eating involves behaviors and decisions on what, when, and how much to eat
- Influences on healthy eating are complex and numerous
- Many clinicians consider healthy eating to be the most challenging of the AADE7 Self-Care Behaviors to implement successfully

©Copyright 1999-2024, Diabetes Education Services

Healthy Eating

- Medical Nutrition Therapy (MNT)
  - Evidence-based treatment of a condition through the modification of nutrient or whole-food intake
  - Often provided by a RD/RDN or similarly qualified professional
  - All diabetes care and education specialists must be ready and able to apply the principles of MNT

Goals of MNT for All Persons With Diabetes (PWD)

1. Decrease the risk of diabetes and cardiovascular disease with intensive lifestyle modification
   - Refer those at risk for diabetes to an intensive lifestyle program
     - Ex: Diabetes Prevention Program and/or individualized MNT

The Power of Prevention

- Diabetes Prevention Program (DPP) shows lifestyle changes may reduce risk of incident T2DM by 58% over 3 years
  - Benefit of lifestyle change is more significant in those over the age of 60 – may decrease risk of T2DM by 71%
  - Lifestyle intervention was effective in both sexes, across all racial and ethnic groups, and in people predisposed to diabetes

The Diabetes Prevention Program Research Group. (2002). Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *New England Journal of Medicine, 346*(6), 393–403. https://doi.org/10.1056/nejmoa012512

The Power of Prevention

- Lifestyle intervention/goals in DPP included:
  - Increase physical activity: goal of 150 minutes of physical activity per week
  - Decrease fat and calorie intake*
  - Decrease weight: sustained loss of 7% of initial body weight

*DPP initially encouraged a lower fat/calorie eating plan but current data suggests there is no ideal percentage of calories from carbs, protein, and fat to prevent diabetes. A variety of eating patterns may be appropriate.

Diabetes Prevention Program (DPP) Research Group. (2002). The Diabetes Prevention Program (DPP): Description of lifestyle intervention. *Diabetes Care, 25*(12), 2165-2171. doi:10.2337/diacare.25.12.2165

Having Said That!

- 10-year follow-up of DPP study, many participants regained most of the weight they initially lost
- Despite weight regain, participants in the lifestyle intervention group continued to experience a reduced risk of developing type 2 diabetes
  - Delay in development of DM by 34%
- Similar results at 15-year follow-up
  - Delay in development of DM by 27%
- Suggests that the benefits observed in the study—such as reduced diabetes risk—were not solely dependent on weight loss

10-year follow-up of diabetes incidence and weight loss in the Diabetes Prevention Program Outcomes Study. (2009b). *The Lancet*, *374*(9702), 1677–1686. https://doi.org/10.1016/s0140-6736(09)61457-4

There is No "Prediabetes Diet"

- Many eating patterns may be appropriate
- Overall quality of food is associated with lower risk of type 2 diabetes

Diabetes Prevention Program (DPP) Research Group. (2002). The Diabetes Prevention Program (DPP): Description of lifestyle intervention. *Diabetes Care, 25*(12), 2165-2171. doi:10.2337/diacare.25.12.2165

Slide 8

JJ1 ADDED
Jessica Jones, 9/16/2024

The Power of Prevention

- Find a DPP in your community:
  - CDC-recognized DPP Lifestyle Change programs:
    - https://www.cdc.gov/diabetes-prevention/lifestyle-change-program/find-a-program.html
  - Medicare-enrolled CDC-recognized programs:
    - https://innovation.cms.gov/innovation-models/medicare-diabetes-prevention-program/mdpp-map

Goals of MNT for All Persons With Diabetes

1. Promote/support healthful eating patterns, emphasizing a variety of nutrient dense foods in appropriate portion sizes, to improve overall health and:
   - Achieve individualized glycemic, blood pressure, and lipid goals, achieve/maintain body weight goals, delay/prevent complications of diabetes

Goals of MNT for All Persons With Diabetes

2. Address individual nutritional needs based on:
   - Personal and cultural food preferences
   - Health literacy and numeracy
   - Access to healthful food choices
   - Willingness and ability to make changes
   - Barriers to change

©Copyright 1999-2024, Diabetes Education Services

Goals of MNT for All Persons With Diabetes

3. Maintain the pleasure of eating by:
   - Providing positive/nonjudgmental messages about food choices
   - Limiting food choices only when evidence-based
4. Provide practical tools for day-to-day meal planning and healthful eating patterns (rather than focusing on individual macros, micros, or single foods)

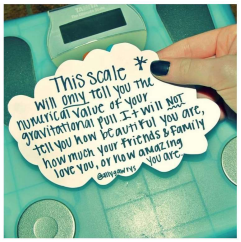
Benefit of MNT for Those With Diabetes

Decrease in A1C After 3-6 Months of Receiving MNT	
Type 1 Diabetes	1.0% - 1.9%
Type 2 Diabetes	0.3% - 2.0%

•Refer people with diabetes to RDN at dx and as needed
- Sustained A1C improvement with ongoing support from RD/RDN
- MNT is cost-effective

Franz, M. J., MacLeod, J., Evert, A., Brown, C., Gradwell, E., Handu, D., Reppert, A., & Robinson, M. (2017). Academy of Nutrition and Dietetics Nutrition practice guideline for type 1 and type 2 diabetes in adults: Systematic review of evidence for medical nutrition therapy effectiveness and recommendations for integration into the Nutrition Care Process. *Journal of the Academy of Nutrition and Dietetics*, *117*(10), 1659–1679. https://doi.org/10.1016/j.jand.2017.03.022

Rethinking Weight and Health



Introduction to Health at Every Size (HAES®)

HAES® Overview

- Developed in the late 1990s, rooted in the civil rights movements of the 1960s.
- Focuses on providing equitable healthcare without centering weight loss.
- Aims to challenge weight-based oppression and promote compassionate care for all body sizes.
- Healthcare as a Human Right: Everyone, regardless of size, deserves access to comprehensive and compassionate healthcare.
- Rejecting weight-based discrimination and ensuring care for all body sizes.

How HAES® Affects Health

Sustainability of Healthy Behaviors

- Intentional weight loss is often unsustainable, with most dieters regaining more weight than they lose, leading to weight cycling. Repeated dieting can lower resting metabolic rate, making weight regain more likely. Weight cycling is linked to higher risks of hypertension, insulin resistance, and hyperlipidemia.

Health Beyond Weight

- Health can improve through behaviors like balanced eating, regular physical activity, and stress management, regardless of weight changes.

Reducing Health Risks

- Adopting HAES®-aligned practices can reduce risks associated with chronic diseases, independent of weight loss.

JJ2

Tylka, Tracy L., et al. "The Weight-Inclusive versus Weight-Normative Approach to Health: Evaluating the Evidence for Prioritizing Well-Being over Weight Loss." *Journal of Obesity*, vol. 2014,

Slide 18

JJ2 added
Jessica Jones, 9/16/2024

Restrictive Eating Cycle

The restrict-binge cycle starts in **an attempt to control weight or "improve your health" by restricting food intake**.

1. Puhl R, Suh Y. Stigma and eating and weight disorders. Curr Psychiatry Rep. 2015 Mar;17(3):552. doi: 10.1007/s11920-015-0552-6. PMID: 25652251.
2. Levinson JA, Kirtkel-Ram S, Myers B, Hunger JM. A systematic review of weight stigma and disordered eating cognitions and behaviors. Body Image. 2024 Mar;48:101678. doi: 10.1016/j.bodyim.2023.101678. Epub 2024 Jan 25. PMID: 38278088; PMCID: PMC11180546.

How Does this Compare to 2024 ADA Standards?

	HAES	ADA
Focus on Weight	Emphasizes that health can be achieved at any size, discouraging intentional weight loss as a primary goal. It promotes body diversity and challenges the societal focus on thinness.	While the ADA does not solely focus on weight loss, it acknowledges weight management as an important factor in diabetes care. The 2024 Standards recommend weight loss for "overweight" or "obese" individuals as a means to improve glycemic control, blood pressure, and lipid levels.
Health Goals	Prioritizes overall well-being, mental health, and sustainable behaviors, such as intuitive eating and enjoyable physical activity, over weight loss. HAES® argues that these behaviors can lead to improved health outcomes regardless of changes in weight.	The ADA Standards focus on managing diabetes and preventing complications. While it does promote lifestyle changes, such as diet and exercise, these recommendations are often tied to achieving and maintaining weight loss to improve metabolic health.
Approach to Treatment	Advocates for a person-centered approach that respects individual autonomy and informed consent, without emphasizing weight loss. It calls for compassionate care, free from weight bias and discrimination.	The ADA Standards provide evidence-based guidelines for managing diabetes, including the use of medications, monitoring blood glucose, and lifestyle interventions. Weight management is recommended as part of a comprehensive treatment plan for people with diabetes or at risk for diabetes.

How Does this Compare to 2024 ADA Standards?

	HAES	ADA
Social Justice and Equity	Strongly rooted in social justice, HAES® addresses the broader social determinants of health, such as access to healthcare, food security, and environmental factors. It seeks to dismantle systemic biases, including anti-fat bias and racism, that affect health outcomes.	The ADA acknowledges disparities in diabetes care and outcomes, particularly among racial and ethnic minorities, and emphasizes the need for culturally competent care. However, it does not specifically address weight bias or promote a framework that explicitly challenges systemic oppression as HAES® does.
Research and Evidence	Questions the validity of much of the research linking weight and health, arguing that many studies are biased due to weight-centric assumptions. HAES® advocates for a broader interpretation of health data that includes social and psychological factors.	Bases its recommendations on a large body of clinical research, which often includes studies showing that weight loss can improve various health markers. The ADA uses this evidence to support its guidelines for diabetes management, including weight management as a key component.

ADA Weight Recommendations & Guidelines

•Leans on studies that suggest an increasing BMI is associated with an increasing prevalence of insulin resistance/DM, hypertension, and dyslipidemia. **These studies suggest that a 7-10% reduction in body weight can improve these markers.**

Classification*	Body Mass Index (BMI), kg/m^2
"Underweight"	<18.5
"Healthy Weight"	18.5 – 24.9
"Overweight"	25 – 29.9
"Obesity"	> 30

Overview of 2024 ADA Standards Weight Recommendations

- Nutrition, physical activity, and behavioral therapy to achieve and maintain a ≥5% weight loss are recommended for people with diabetes and overweight or obesity.
- Frequent counseling (≥16 sessions in 6 months) focusing on nutrition, exercise, and behavior strategies to achieve a 500-750 kcal/day energy deficit is beneficial and recommended if available.
- Long-term support (≥1 year) is advised for those meeting weight loss goals, offering monthly support, body weight monitoring, self-monitoring strategies, and regular physical activity (200-300 minutes/week).

Do We Need to Weigh Clients?

- ADA Standards:
  - Calculate BMI and document in medical record at medical annual visit
- If weighing is questioned or refused:
  - Be mindful of possible prior stigmatizing experiences
  - Consider the value of weight monitoring
- Situate scales in a private area or room
- Measure and report weight non-judgmentally
- Take care to regard weight and BMI as sensitive health information
- Use non-judgmental language

How Can We Help Our Clients?

- Don't assume weight loss is a goal. If weight loss is a goal, ask "what benefits do you hope weight loss will bring?"
- Ask about their goals: "If weight weren't a concern, what would healthy eating look like for you?"
- Be compassionate and listen to lived experience
- Also note that patient has autonomy over their life

HAES®-Aligned Approach To Helping Our Clients

- Nourish, Don't Restrict
  - Encourage a variety of nourishing foods without targeting specific calorie deficits.
  - Use the My Plate method as a place to start
- Focus on balanced nutrition, regular physical activity, and stress management rather than a number on the scale as a goal.
- Emphasize health-promoting habits through regular, behavior-focused counseling rather than weight as a primary outcome.

Setting Goals with a Weight-Inclusive Approach

- I will continue to care for my body by doing [x].
  - x = walking 10 minutes after lunch each day
  - x = having a vegetable with dinner every night
  - x = honoring my hunger and eating consistently
  - x = keeping all my appointments with my therapist
  - x = getting 7-8 hours of sleep each night
  - x = checking my blood sugar every morning

Review Question

Joe is 5'9" and weighs 202 lbs. (BMI 29.8). He was just diagnosed with prediabetes with an A1C at 6.3%. He does not want to start medication. What is his best option?

A. Lose 14-20 lbs
B. Focus on a nutrient-rich eating pattern, increased physical activity, and reduced stress
C. Decrease his fat intake by 5-10%
D. Reconsider medications and try Metformin

Common Eating Pattern

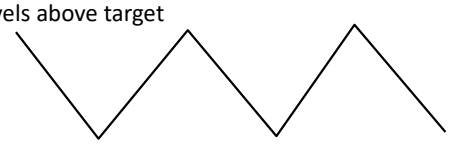
- **Breakfast:** Skipped or just coffee
- **Lunch:** Salad, low or no carbs, diet soda
- **Afternoon snack:** fruit, veggies and hummus, yogurt, granola, candy
- **Dinner:** Pizza, burger and fries, takeout
- **Evening snack:** Cookies, ice cream, chips, cereal, sweets, crackers

Why This Common Eating Pattern Can Be Physiologically Challenging

- By 3pm, blood glucose levels dropping
- Feel hangry (hungry + angry)
- Brain seeks quick energy from high carb/calorie foods
- Eat to the point of being over full
- Blood glucose levels rise
- Elevated postprandial and fasting glucose levels

Instead of this approach …

- Sharp drops in blood glucose from under-eating early in the day can cause intense hunger and eating past point of fullness and inconsistent blood glucose levels above target



We want this…

- Slight dips in blood glucose gently signal it's time to eat
- Eat adequately and consistently, including all? food groups at each meal

©Copyright 1999-2024, Diabetes Education Services

Healthy Eating Patterns

- Consensus Recommendation: There is no ideal percentage of calories from carb, protein, and fat for people with diabetes.
- A healthy eating pattern includes:
  1. ↑ non-starchy vegetables, whole fruit and grains, legumes, nuts, seeds, low-fat diary
  2. ↓meat, SSBs, sweets, refined grains, ultra-processed foods
- This eating approach limits saturated and trans fats, added sugar, and sodium.

Carbohydrates

- Inconclusive evidence for ideal amount of carbohydrate per day
  - RDA is 130 g/day in people w/o diabetes. This can be fulfilled via intake or by body's metabolic processes
- Amount of carb eaten is main dietary influence on postprandial BG
  - Type/quality of carb makes a difference

©Copyright 1999-2024, Diabetes Education Services

Carbohydrates

- Reducing overall carbohydrate intake for individuals with diabetes shows evidence for improving glycemia
  - Low and very low carb diets lower A1C in short-term only; difficult to sustain macronutrient distribution changes long-term
  - Most PWD report moderate carb intake (44-46% of total calories)

Carbohydrates

- Focus on the "quality of carbohydrate foods selected"
  - Nutrient dense carbs with dietary fiber, vitamins, and minerals
  - Low in added sugars, fats, and sodium
  - Minimally processed

Sugars

- Types: glucose, fructose, sucrose (glucose + fructose), and others
  - Glucose: If eaten alone, has highest glycemic peak relative to other sugars
  - Fructose: metabolized mostly in the liver; goes to replenish liver glycogen & triglyceride synthesis so it has less acute impact on BG
  - Sucrose: Broken into 50% glucose and 50% fructose

©Copyright 1999-2024, Diabetes Education Services

Fructose as a Sweetener

- Lower postprandial response compared to other sweeteners
- Not recommended as a sweetening agent because it may adversely affect lipids

Franz, M. J., MacLeod, J., Evert, A., Brown, C., Gradwell, E., Handu, D., Reppert, A., & Robinson, M. (2017). Academy of Nutrition and Dietetics Nutrition practice guideline for type 1 and type 2 diabetes in adults: Systematic review of evidence for medical nutrition therapy effectiveness and recommendations for integration into the Nutrition Care Process. *Journal of the Academy of Nutrition and Dietetics*, *117*(10), 1659–1679. https://doi.org/10.1016/j.jand.2017.03.022

Fructose in Fruit

- No reason to avoid naturally occurring fructose in fruits and vegetables
  - "Free fructose" in fruit may result in better glycemic control compared with isocaloric intake of sucrose or starch and is not likely to have detrimental effects on triglycerides

A Unique Sugar: Allulose

- A type of sugar that is GRAS by the FDA
  - Small amounts naturally in wheat and some fruits; can be manufactured
  - ~70% as sweet as table sugar
  - Contributes few calories, produces negligible increases in blood glucose and insulin levels, does not promote dental decay
- Labeling for allulose:
  - Not included in "Total Sugars" or "Added Sugars"
  - Included in Total Carbohydrates
  - Calories calculated with 0.4 kcals/gram
  - Must be in ingredient list

A Unique Sugar: Allulose

Nutrition Facts

About 12 servings per container

Serving size 2 tbsp (30 mL)

Amount per serving

Calories 20

	% Daily Value*
Total Fat 0g	0%
Saturated Fat 0g	0%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 0mg	0%
Total Carbohydrate 28g	10%
Dietary Fiber 0g	0%
Total Sugars 0g	
Includes 0g Added Sugars	0%
Allulose 26g	
Protein 0g	

* Percent Daily Values (DV) are based on a 2,000 calorie diet.

2G NET CARBS = 28G TOTAL CARBS - 26G ALLULOSE

INGREDIENTS: Besti Monk Fruit Allulose Blend (Liquid Allulose, Monk Fruit Extract), Vegetable Glycerin, Natural Flavors

Sugar Sweetened Beverages (SSBs)

- General population: SSBs should be avoided to ↓risk of type 2 diabetes, heart disease, weight gain, non-alcoholic liver disease, and tooth decay.
- In people with and without diabetes: replace SSBs with water as often as possible.
  - Helps ↓ calorie intake.

Hypoglycemia Treatment

- Treat hypoglycemia with 15g fast-acting carbs if glucose level reaches <70 mg/dl
  - Best option: pure glucose
  - Other options: glucose-containing carbs
  - Do NOT select foods with fat or protein
- Recheck 15 minutes later; retreat if still low
- If on AID system, consider less treatment (5-10g)

Non-Nutritive Sweeteners

- Also known as High Intensity Sweeteners & Artificial Sweetners
- Ingredients used to sweeten and enhance the flavor of foods
- FDA approved for consumption by the general public and PWD
- Safety is a source of concern and confusion for the public
- Very sweet, so smaller amounts are needed to achieve the same sweetness as sugar in food

FDA Response to External Safety Reviews of Aspartame

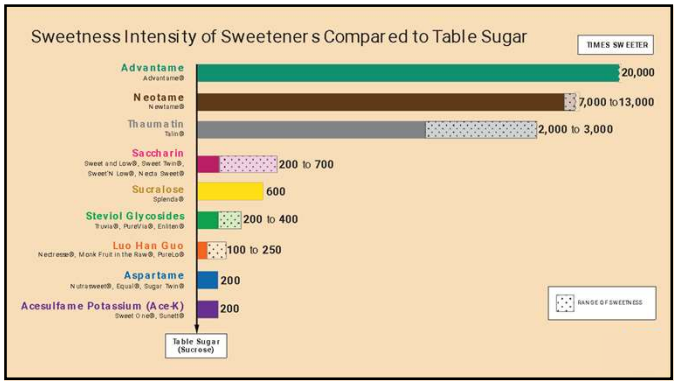
The FDA is aware of the International Agency for Research on Cancer (IARC) and Joint FAO/WHO Expert Committee on Food Additives (JECFA) conclusions about aspartame issued July 14, 2023. Aspartame being labeled by IARC as "possibly carcinogenic to humans" does not mean that aspartame is actually linked to cancer.

The FDA disagrees with IARC's conclusion that these studies support classifying aspartame as a possible carcinogen to humans. FDA scientists reviewed the scientific information included in IARC's review in 2021 when it was first made available and identified significant shortcomings in the studies on which IARC relied. We note that JECFA did not raise safety concerns for aspartame under the current levels of use and did not change the Acceptable Daily Intake (ADI).

Aspartame is one of the most studied food additives in the human food supply. FDA scientists do not have safety concerns when aspartame is used under the approved conditions. The sweetener is approved in many countries. Regulatory and scientific authorities, such as Health Canada and the European Food Safety Authority have evaluated aspartame and also consider it safe at current permitted use levels.

Non-Nutritive Sweeteners

- Six are approved by the FDA as food additives
  1. Advantame
  2. Neotame
  3. Saccharin
  4. Sucralose
  5. Aspartame
  6. Acesulfame potassium
- Plant and fruit-based GRAS Sweeteners
  1. Thaumatin
  2. Stevia
  3. Luo Han Guo (Monk Fruit)



Non-Nutritive Sweeteners

- Non-nutritive sweeteners contribute no/few calories to the diet and do not raise blood glucose levels
  - Could reduce overall calorie/carb intake as long as there is no compensatory energy increase elsewhere
  - No reduction to weight without energy restriction

Sugar Alcohols

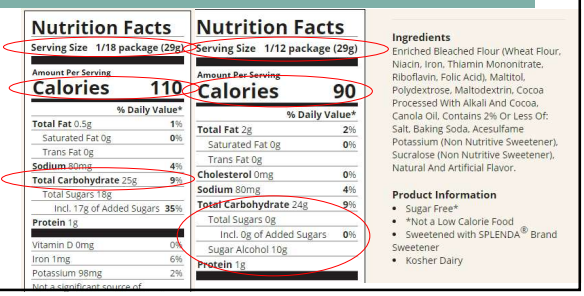
- Another category of sweeteners approved for consumption for general public and PWD
  - Calorie contribution is often similar to sugar
  - Associated with bloating, flatulence, and diarrhea
- Examples: Sorbitol, maltitol, erythritol, isomalt, xylitol, lactitol

©Copyright 1999-2024, Diabetes Education Services

Sugar Alcohols

- Little evidence on benefit for people with diabetes
- Consumption produces a small rise in blood glucose
  - Postprandial response is lower than with fructose, glucose, or sucrose
  - To carb count: consider subtracting ½ of sugar alcohol from total carb grams

Sugar Alcohols



Nutrition Facts

Serving Size 1/18 package (29g)

Amount Per Serving

Calories 110

% Daily Value*

Total Fat 0.5g 1%
Saturated Fat 0g 0%
Trans Fat 0g
Sodium 80mg 4%
Total Carbohydrate 25g 9%
Total Sugars 18g
Incl. 17g of Added Sugars 35%
Protein 1g
Vitamin D 0mg 0%
Iron 1mg 6%
Potassium 98mg 2%
Not a significant source of

Nutrition Facts

Serving Size 1/12 package (29g)

Amount Per Serving

Calories 90

% Daily Value*

Total Fat 2g 2%
Saturated Fat 0g 0%
Trans Fat 0g
Cholesterol 0mg 0%
Sodium 80mg 4%
Total Carbohydrate 24g 9%
Total Sugars 0g
Incl. 0g of Added Sugars 0%
Sugar Alcohol 10g
Protein 1g

Ingredients
Enriched Bleached Flour (Wheat Flour, Niacin, Iron, Thiamin Mononitrate, Riboflavin, Folic Acid), Maltitol, Polydextrose, Maltodextrin, Cocoa Processed With Alkali And Cocoa, Canola Oil, Contains 2% Or Less Of: Salt, Baking Soda, Acesulfame Potassium (Non Nutritive Sweetener), Sucralose (Non Nutritive Sweetener), Natural And Artificial Flavor.

Product Information
- Sugar Free*
- *Not a Low Calorie Food
- Sweetened with SPLENDA® Brand Sweetener
- Kosher Dairy

Non-nutritive Sweeteners

- For both non-nutritive sweeteners and sugar alcohols, recommend:
  - Reductions in sugar intake and calories with or without use of non-nutritive sweeteners
  - Moderation

Starch

- The digestive tract is efficient in breaking starches into glucose
- Glycemic effect of a particular starch is determined by:
  - Type/structure of starch
  - Types of processing and cooking used
  - Other macronutrients consumed with the starch
- Focus on starches with fiber, rather than refined/processed grains

Impact of Starch on BG

- Structure/type of the starch
  - Amylose vs. amylopectin

AMYLOSE
More "resistant starch"
Lesser impact on glucose levels
Example: Long grain rice, beans, lentils

AMYLOPECTIN
Greater impact on glucose levels
Example: Short grain rice, potatoes

Impact of Starch on BG

- Structure/type of the starch
  - Ripeness
    - Example: As a banana ripens, resistant starch converts into sugars

©Copyright 1999-2024, Diabetes Education Services

Impact of Starch on BG

- Types of processing and cooking used
  - Cooking method and time
  - Amount of heat and moisture
    - Example: The longer pasta cooks, the more water-logged its molecules become, making it easier for the body to break it down to glucose

Fiber

- A type of carbohydrate that passes through the body largely undigested, thus contributes minimal glucose to the postprandial rise
- Intake is inversely associated with risk of T2DM
- Sufficient intake is associated with lower all-cause mortality in people with diabetes

Fiber

- Sources of fiber:
  - Whole fruits, starchy and non-starchy vegetables, beans, peas, lentils, nuts, seeds, and whole grains
- Goal: 14 grams of fiber/1000 kcal
  - Typical American gets ~15 grams/day
  - Improved glycemia with ~44-50 grams/day; may be difficult due to palatability and GI side effects
- 50% of grain consumption from whole intact grains

©Copyright 1999-2024, Diabetes Education Services

Tips to Increase Fiber

- Real-world tips to increase fiber:
  - Eat whole fruit instead of drinking juice
  - Replace white flour products/rice with brown rice and whole grains
  - Snack on nuts, seeds, fruit, or vegetables more often
  - Substitute beans/lentils for meat in a salad, chili, or soup

Fiber & Carbohydrate Counting

- Since fiber is a type of carbohydrate that the body can't digest, it does not affect blood sugar levels like other carbs.
- On Nutrition Facts food labels, the grams of dietary fiber are already included in the total carbohydrate.
- In those who are intensively managed with insulin and carb counting, consider subtracting the grams of fiber from the total carbohydrate.

Knowledge Check

Taylor, who has type 1 diabetes, begins experiencing symptoms of hypoglycemia after a long-day of swimming. When she checks, her blood sugar is 63 mg/dl. What should she do?

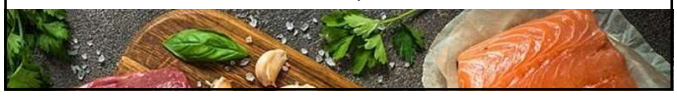
A. Drink 8 oz of soda and recheck her glucose level in 15 minutes
B. Eat 4 glucose tablets and recheck her glucose level in 15 minutes
C. Drink 15g of liquid glucose and recheck her glucose level in 30 minutes
D. Eat a piece of fruit and recheck her glucose level in 30 minutes

Protein Sources

- Meat: beef, pork, lamb, veal, etc.
- Plant-based meats
- Poultry: chicken, turkey, duck, emu, goose, bush birds, etc.
- Fish and seafood: fish, prawns, crab, lobster, scallops, etc.
- Eggs
- Dairy products: milk, yogurt, cheese, cottage cheese
- Soy milk
- Nuts, seeds, nut butters
- Tofu, tempeh, edamame
- Beans, lentils, peas, hummus
- Grains: quinoa, wheat berry, millet, couscous, buckwheat, oatmeal, high protein cereal

Protein

- Recommended vs. Actual Intake
  - RDA: 0.8 g/kg body weight/day
  - Most Americans eat 1-1.5 g/kg body weight/day or 15-20% of total calories from protein
- No evidence that adjusting actual intake towards the recommended intake will improve health



©Copyright 1999-2024, Diabetes Education Services

Protein

- Dietary protein in diabetes management:
  - Inconclusive research regarding the ideal amount of dietary protein to optimize glycemic management or CVD risk
  - Individualize protein goals based on current eating patterns

Protein & CKD

- Dietary protein in diabetes management for persons with nondialysis-dependent CKD
  - Intake goal is 0.8g protein/kg body weight/day
    - Less doesn't provide benefits and may increase malnutrition risk
    - More is associated with an accelerated decline in kidney function

Protein & CKD

- For persons with diabetes on dialysis
  - Malnutrition is common
  - Consider intake higher than 0.8g protein/kg body weight/day to reduce the risk of under nourishment

Protein

- In someone living with T2DM, protein intake may stimulate the release of insulin
  - Therefore, use of carb sources high in protein to treat/prevent hypoglycemia should be avoided
  - Examples of foods to avoid are milk, nuts, peanut butter

Protein

- In someone living with T2DM, consuming non-starchy vegetables and protein 5-15 minutes prior to eating carbohydrate foods has been shown to lower postprandial glucose and insulin excursions

Fats

- Sources: a variety of foods including meat, poultry, fish/seafood, eggs, dairy products, nuts and seeds, avocado, butter/oil, processed and fried foods
- Dietary fat is needed for absorption of fat-soluble vitamins (A, D, E, and K), function of nerves and brain, and healthy skin and body cells.

Fats

- There is not an ideal percentage of calories from fat for people at risk for or living with diabetes
- Type of fat consumed is more important than total fat
  - Limit intake of saturated fat
  - Avoid trans fat
  - Keep cholesterol intake as "low as possible" w/o compromising adequacy of the diet

Saturated Fat

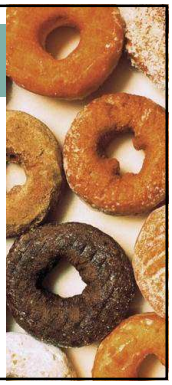
- Sometimes Fat (Less Healthy)
- Primary sources of saturated fats include:
  - Red meat (beef, lamb, pork)
  - Chicken skin
  - Whole fat dairy products (milk, cream, and cheese), butter, and ice cream
  - Lard
  - Tropical oils like coconut and palm oil
  - Processed foods

Saturated Fat

- Limit calories from saturated fat
  - Quality of fat is more important that quantity of fat
  - Replace saturated with unsaturated fat to reduce total and LDL cholesterol
  - Replace saturated with unsaturated fat; not refined carb
    - This would also reduce total and LDL cholesterol, but may increase triglycerides and reduce HDL

Trans Fat

- Avoid, considered "unhealthy fat"
- Historical sources: processed foods like baked goods, microwave popcorn, frozen pizza, refrigerated dough like biscuits and rolls, fried foods, nondairy coffee creamer
- Trans fat should be avoided; associated with all-cause mortality, total CHD, and CHD mortality.



Trans Fat

- Most trans fat in food is formulated through partial hydrogenation
  - Manufacturers added hydrogen to vegetable oil, turning the liquid into a solid fat (like shortening or hard margarine)
  - Process increases the shelf life and flavor stability of foods

Trans Fat

- The FDA's Ban of Partially Hydrogenated Oils (PHOs)
  - In 2015 the FDA determined that PHOs are not GRAS*
  - Food manufacturers were allowed time to reformulate foods and move foods already produced through distribution
  - Compliance date to move these food through distribution was January 1, 2021.

*GRAS: "generally recognized as safe"

Mono and Polyunsaturated Fats

- Always, as these fats have health promoting properties
- Eating patterns rich in these can improve glycemic control and blood lipids (Ex: Mediterranean diet)

Type of Fat	Sources
Monounsaturated	Foods: avocado, edamame, olives, nuts Oils: avocado, olive, peanut, canola
Polyunsaturated	Foods: Walnuts, sesame, flax, and sunflower seeds, fish (salmon, albacore tuna) Oils: corn, soybean, safflower, sesame

Polyunsaturated Fats

- Increasing foods with the long-chain omega-3 fatty acids (EPA and DHA) is recommended for prevention of cardiovascular disease
  - Have two servings of fatty fish per week
    - Wild salmon, mackerel, herring, anchovies
    - NOT commercially fried fish filets
  - Plant sources for vegetarian/vegan eating patterns (ALA)
    - Ground flaxseed/flax meal, chia seeds, walnuts, soybeans, mung beans, green leafy vegetables, whole grains, and beans

Polyunsaturated Fats

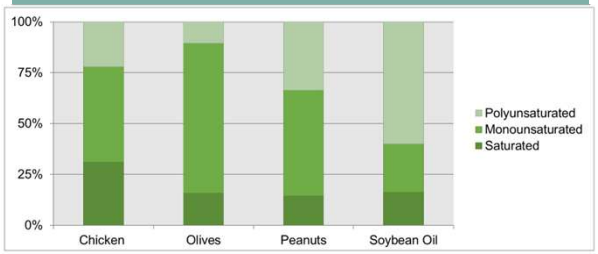
- Evidence does not conclusively support recommending omega-3 (EPA and DHA) supplements for all people with diabetes for the prevention or treatment of cardiovascular events

Knowledge Check

Which of the following food items has the highest percentage of saturated fat per ounce?

A. Chicken
B. Olives
C. Peanuts
D. Soybean oil

Knowledge Check: Answered



Knowledge Check

Olive oil and canola oil are good sources of:

A. Monounsaturated fats
B. Polyunsaturated fats
C. Saturated fats
D. Trans fats

Sodium

- Limit sodium intake to less than 2300 mg/day
  - Limit of <1500 mg/day is not recommended
- Sodium recommendations should consider palatability, availability, affordability, and the difficulty of achieving low-sodium recommendations in a nutritionally adequate diet.

Calcium & Vitamin D

- Fracture risk is higher in people with diabetes
- Advise those with diabetes on dietary or supplemental intake of intake of Calcium and Vitamin D
  - Calcium – meet age specific recommendations for intake
  - Vitamin D – aim for serum levels ≥20 or >30 ng/mL

Micronutrients & Supplements

- Nutrition therapy should include education on how to acquire adequate amounts of vitamins and minerals from food
- Typically, unless deficient, use of herbal, vitamin, or mineral supplementation in those with diabetes is not supported

Micronutrients & Supplements

- Select groups with may need a multivitamin supplement
  - Elderly
  - Women planning pregnancy, currently pregnant, lactating
  - Strict vegetarians/vegans
  - People with celiac disease
  - Those on calorie or carb-restricted diets

Micronutrients & Supplements

- Long-term metformin use may be associated with vitamin B12 deficiency
  - Consider periodic testing of of B12 status if taking Metformin chronically, especially for those with anemia or peripheral neuropathy

Micronutrients & Supplements

- Ask PWD about supplement use
- Routine supplementation with antioxidants such as vitamins E, C, and carotene is not advised
- Insufficient evidence to support the routine use of most herbal supplements and micronutrients
  - See Bev's handout for more information

Micronutrients & Supplements

Alcohol & Glycemia

- Moderate consumption has minimal acute or long-term effect on glucose and insulin concentrations
- Limit intake to:
  - 1 drink or less per day for women
  - 2 drinks or less per day for men

Alcohol & Glycemia

- What is a drink?
  - 5 ounces of wine
  - 12 ounces of beer
  - 1½ ounces of a hard alcohol
- 1 drink has approximately ~15 grams of alcohol
- 1 gram of alcohol = 7 calories
  - Consider when discussing wt. management

©Copyright 1999-2024, Diabetes Education Services

Alcohol & Glycemia

- Risk of hyperglycemia:
  - Consistently having 3+ drinks/day can contribute to hyperglycemia
  - Carb consumed with alcohol (e.g. mixed drink, beer, wine) may acutely raise BG

Alcohol & Glycemia

- Risk of hypoglycemia:
  - Individuals using insulin or insulin secretagogues are at risk for hypoglycemia following consumption
    - Evening drinking may increase the risk of nocturnal/fasting hypo
  - Individuals may consume food with alcohol reduce the risk

Knowledge Check

Chris has had T1D for 30 years. They use Multiple Daily Injections and wear a CGM. They are out celebrating and have 4 rum and cokes and appetizers. They take insulin for carbs. When they get home, the CGM shows a glucose at 162 mg/dl. What advice would you give?

A. The ADA recommends limiting alcohol to no more than 2 drinks a day.
B. Have you ever wondered if you are drinking too much alcohol?
C. Make sure they have glucagon rescue medication by their bed.
D. Investigate how they would usually handle this situation.

Slide 99

JJ4 The answer looks cut off here
Jessica Jones, 9/16/2024

Macronutrients: Final Thoughts

1. "People eat foods, not nutrients, and nutrient recommendations need to be applied to what people eat."
2. Macros vary in quality, not all within the group are interchangeable
    1. E.g. Carbs include legumes, whole grains, and fruits – this is the same category as candy and refined grains, yet the health impact of these is not the same

Youth with Diabetes

- Key concepts for youth with all types of diabetes
    - Meet energy requirements for growth and activity
    - Use *food plan* or *meal plan* not *diet*
    - Engage the child or adolescent in planning, shopping, and preparing healthy foods for the entire family

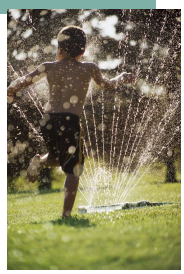
©Copyright 1999-2024, Diabetes Education Services

Youth with T1D

- Balance carb intake and insulin
  - Educate on impact of high-fat/protein
- Integrate insulin regimen into lifestyle
- Avoid withholding food to prevent hyperglycemia or having a child eat without an appetite to avoid hypoglycemia

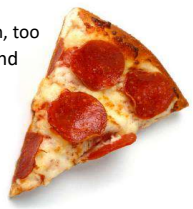
Youth with T1D

- For those on fixed insulin program, focus on consistent carb intake considering timing and amount
- For those on flexible insulin program, provide education on carb estimating/counting



T1D & Flexible Insulin Therapy

- In a mixed meal (carb + high in fat/protein), insulin need is not based on carb alone
  - Consider the glycemic impact of fat and protein, too
- Relative to a lower fat/protein meal, high-fat and high-protein meals may require:
  - More insulin
  - A different approach to insulin timing
- More research is needed to determine optimal insulin dose and delivery strategy



©Copyright 1999-2024, Diabetes Education Services

Youth with T2D

- Youth and family must prioritize lifestyle modifications
  - Dietary recommendations:
    - Focus on nutrient-dense, high-quality foods / decrease calorie-dense, nutrient-poor foods (particularly SSBs)
  - Increase exercise
  - ADA: Aim for a sustainable 7-10% decrease in excess weight for youth with "overweight/obesity"
    - AAP's stance is to prioritize overall health improvement and to avoid an exclusive focus on weight, recognizing the importance of addressing the broader context in which "obesity" exists.
    - Pediatricians should evaluate patients for disordered eating and unhealthy weight-control behaviors at annual health supervision visits.

Hampl, Sarah E., et al. "Clinical Practice Guideline for the Evaluation and Treatment of Children and Adolescents with Obesity." *Pediatrics*, vol. 151, no. 2, 2023, publications.aap.org/pediatrics/article/151/2/e2022060640/190443/Clinical-Practice-Guideline-for-the-Evaluation-and?autologincheck=redirected, https://doi.org/10.1542/peds.2022-060640.

Youth with T2D

- With dyslipidemia, use MNT to support:
  - Limit calories from fat: 25-30%
  - Limit calories from saturated fat: <7%
  - Limit cholesterol: <200 mg/day
  - Avoid trans fat
  - Aim for ~10% of calories from monounsaturated fat
  - For elevated triglycerides: ↓ simple sugar, ↑ omega-3s

Youth with T2D

- Assess for steatosis / MASLD*
- With overweight/obesity: aim for 7-10% weight loss
- With nephropathy: protein intake at the RDA of 0.85-1.2 g/kg/day (based on age)

*metabolic associated steatotic liver disease

Pregnancy

- With pre-existing diabetes planning pregnancy, refer to RDN
- Prenatal vitamins:
  - At least 400 µg folic acid
  - 150 mg potassium iodide

Pregnancy

- For women with diabetes in pregnancy or GDM, focus on:
  - Adequate calories for appropriate weight gain (weight loss not recommended)
  - Minimize blood glucose excursions
  - Ensure nutrient-dense, safe nutrition

Pre-pregnancy BMI and Weight Gain

Weight-for-Height Category	Recommended Total Weight Gain (Singleton Gestation)
With Underweight (BMI ≤18.5)	28-40 lbs
Healthy Weight (BMI 18.6 – 24.9)	25-35 lbs
With Overweight (BMI 25.0 – 29.9)	15-25 lbs
With Obesity (BMI ≥ 30)	11-20 lbs

Moore Simas, T. A., Waring, M. E., Sullivan, G. M., Liao, X., Rosal, M. C., Hardy, J. R., & Berry Jr, R. E. (2013). Institute of Medicine 2009 gestational weight gain guideline knowledge: Survey of obstetrics/gynecology and family medicine residents of the United States. *Birth*, *40*(4), 237–246. https://doi.org/10.1111/birt.12061

DRIs and Pregnancy

- For pregnant women, dietary reference intake recommend a minimum of:
  - 175 grams/day of carbohydrates
  - 71 grams/day of protein
  - 28 grams/day of fiber
- Amount/type of carb will impact postprandial glucose levels
- Emphasize mono- and polyunsaturated fats

Knowledge Check

Sara has just been diagnosed with gestational diabetes. Her current weight is 176 lbs. and her pre-pregnancy BMI was 28. What is the total recommended weight gain for Sara's pregnancy?

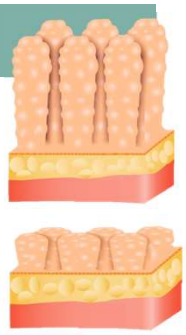
A. 15 pounds
B. 15-25 pounds
C. 25-35 pounds
D. 28-40 pounds

Knowledge Check

What are the nutrient goals for pregnant women?

A. 130 grams of carbohydrate/day, 71 grams of protein/day, 14 grams of fiber/day
B. 130 grams of carbohydrate/day, 90 grams of protein/day, 28 grams of fiber/day
C. 175 grams of carbohydrate/day, 90 grams of protein/day, 14 grams of fiber/day
D. 175 grams of carbohydrate/day, 71 grams of protein/day, 28 grams of fiber/day

Celiac Disease



- Immune-mediated disorder where destruction of the small intestine villi occurs following exposure to gluten
- Occurs more often in people with T1D
  - 1%-16% of individuals compared to 0.3%-1% in general population

Celiac Disease

When to Screen for Celiac Disease	
Pediatrics with T1D	Adults with T1D
• Within 2 years of diagnosis • Again 5 years after diagnosis or sooner if symptoms present	With suggestive • GI symptoms (diarrhea, malabsorption, abdominal pain) • Signs (Osteoporosis, vitamin deficiency, iron deficiency anemia)

Celiac Disease

- Diagnosis via blood tests and a small intestine biopsy
  - Screen for celiac by testing IgA if person with T1D has suggestive symptoms or signs:
    - If normal serum IgA, measure IgA-tTG antibodies
    - If IgA deficient, measure IgG tTg and IgG DGA

IgA: immunoglobulin A
IgG: immunoglobulin G
tTG: tissue transglutaminase
DGA: deaminated gliadin antibodies

Celiac Disease

- Treatment for celiac disease is a lifetime gluten-free diet
  - Eliminate all wheat (including durum, semolina, spelt, and farro) and the related grains of rye, barley, and triticale.
  - Caution with oats – may be contaminated with wheat
  - Remember "BROW" – Barley, Rye, (some) Oats, Wheat
- Refer to a dietitian for help with food selection/label reading

Nutrition Interventions: Celiac Disease

Gluten Free Whole Grains & Starches include:

- Quinoa
- Potatoes
- Beans & Peas
- Cassava
- Corn
- Oats*
- Flax
- Amaranth
- Millet
- Rice
- Wild rice
- Buckwheat
- Job's Tears (Hato Mugi)
- Montina (Indian rice grass)
- Sorghum
- Teff

**Oats are inherently gluten-free may be contaminated with wheat during growing or processing.*

Disordered Eating Patterns

- Estimated prevalence of disordered eating behavior and eating disorders varies in people with diabetes
- Most reported disordered eating behaviors:
  - T1D: insulin omission causing loss of glucose/calories via the urine
  - T2D: bingeing (excessive intake with sense of loss of control)

Disordered Eating Patterns

- Anorexia nervosa: restricted energy intake relative to need
  - Marked by low body weight, fear of weight gain, and disturbance in the way in which one's body weight or shape is experienced
- Bulimia nervosa: recurring binge eating and compensatory behavior
  - Binging characterized by a sense of a lack in control.
  - Compensatory behaviors vary
- Diabulimia (unofficial diagnostic term): reduction/omission of insulin doses
  - This causes hyperglycemia and loss of glucose calories through the urine.

Disordered Eating Patterns – Case Study

- MR is a 59-year-old living with type 2 diabetes who shares that their provider keeps telling them to lose weight. MR is trying to eat less and decrease portions, but then they get "so hungry, they end up bingeing on ice cream or other treats. Then, their blood glucose levels go up and they feel really bad about themselves".

- What is your first reaction when you hear MR's story?
- How would you approach this honest sharing by MR in a way that helps move MR toward healing?
- Do you want to consider any referrals?

Disordered Eating Patterns

- Screen for it along with regular medical care
  - Especially if patterns when hyperglycemia and weight loss are unexplained
- Multidisciplinary team approach to treatment is a standard of care
  - Early referral to mental health professional

Prediabetes – Case Study

CK, a 44-year-old woman currently experiencing perimenopause, has observed a steady weight gain of 30 pounds over the last five years, primarily around her midsection, without significant changes to her lifestyle. She walks most days, averaging 5,000 steps, but does not engage in weight training or other forms of structured exercise. Her diet is generally balanced, with regular meals, though she occasionally skips one and compensates later. Despite these habits, her A1C has risen to 6.0%, signaling a shift toward prediabetes. Additionally, she notes increasing difficulty with sleeping, which may be contributing to her overall health challenges.

- What is your first reaction when you hear CK's story?
- What strategies could help her address her weight gain, rising A1C, and sleep difficulties?
- Do you want to consider any referrals?

Mediterranean Eating Pattern

Description & Notes	• Encourages plant-based foods, fish and shellfish, some dairy. Olive oil is primary fat source. • Limitations: • Moderate number of eggs, minimal red meat, wine in low to moderate amount, rare use of concentrated sugars or honey.
Current Literature	• Improves CVD risk factors • Energy restricted version of these meal plans can improve weight and glycemia

Slide 124

JJ7 added this case study, goal is to show that women may need HRT as low estrogen will cause increased weight and issues w glucose metabolism and refer out to places like Midi etc
Jessica Jones, 9/16/2024

DASH Eating Pattern

Description & Notes	*Dietary Approaches to Stop Hypertension* Encouraged foods: •Fruits & Veg (8-10 servings/day), whole grains (6-8 servings/day), low-fat dairy (2-3 servings/day), poultry & fish (6 servings/week), nuts & seeds (4-5 servings/week) •Limitations: • Red meat, sweets, sugar-containing, processed food, excessive alcohol consumption
Current Literature	• Improves BP and reduces risk for CVD in people w/o diabetes • Limited evidence exists for people with diabetes but "one would expect similar results"

Plant-Based Eating Pattern

Description & Notes	• Limited/no flesh foods; may allow egg and/or dairy • Associated with lower intake of saturated fat and cholesterol
Current Literature	• Energy restricted version of these meal plans can improve CVD risk factors, weight, and glycemia

Intermittent Fasting & Time Restricted Eating

Description & Notes	• Alternate-day fasting • 5:2 diet • Time-restricted eating
Current Literature	• Results in mild to moderate weight loss over short durations • No difference vs. continuous calorie restriction • Time restricted eating may be easier to follow due to ease, no need to count calories, sustainability

Other Eating Patterns/Plans

Partial/Total Meal Replacements	• Bars, shakes, soups with set macros/micros • Shown to improve nutrient quality and glucose control • Effective short-term strategy for weight loss
Chrononutrition	• Growing specialty • Aims to understand how timing of nutrition impacts metabolic health • Early studies indicate benefit of eating earlier

Nutrition for Lipid Management

- Per ADA: Consider a calorie restriction for weight loss in people with a BMI of 25 or more
- Mediterranean-style or DASH eating pattern
- Reduce saturated and trans fat, increase omega-3 fatty acids
- Increase fiber
- Increase plant stanols/sterols
- Add physical activity

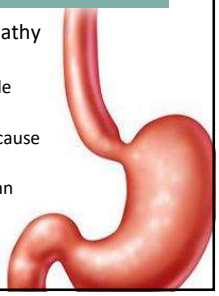
Nutrition for Hypertension

- Managing HTN reduces rate of micro/macrovascular complications
- For individuals with BP >120/80 mmHg, focus on:
  - ADA: Weight loss
  - Increase physical activity
  - Try DASH diet for healthy eating
  - Sodium restriction (~2300 mg/day)
  - Avoid excessive alcohol consumption

©Copyright 1999-2024, Diabetes Education Services

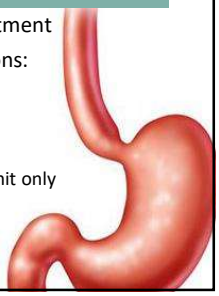
Nutrition for Gastroparesis

- Gastroparesis: a form of autonomic neuropathy that delays emptying of the stomach
  - Symptoms: nausea, vomiting, fullness with little food, bloating, and low appetite.
  - Unpredictable movement of food thru GI can cause erratic BGs
  - Timing of insulin delivery is important; hypo can result if insulin is given and gastric emptying is delayed



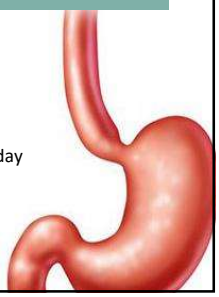
Nutrition for Gastroparesis

- Dietary changes are a high priority in treatment
- Consider the following dietary modifications:
  - Decrease fiber (may lead to bezoar formation)
  - Evaluate fat intake
    - Fat is a good/high source of calorie so limit only after other measures are exhausted
    - Liquid fats may be tolerated better



Nutrition for Gastroparesis

- Consider dietary modifications:
  - Multi supplement if intake is insufficient
  - Small and frequent meals
  - Liquid/pureed calories
    - May need to try liquid calories later in the day
  - Chew foods well
  - Sit up for 1-2 hours after eating



©Copyright 1999-2024, Diabetes Education Services

Nutrition for MAFLD

- Metabolic-Associated Fatty Liver Disease includes a range of liver conditions
- Studies estimate it is prevalent in >70% of people with T2DM
- Nutrition-Related Management
  - Reduce calories and add exercise for weight loss of ≥5%, preferably ≥10% to improve liver histology
  - Limit saturated fat, sugar, starch, and sugar
  - Mediterranean diet has the best evidence

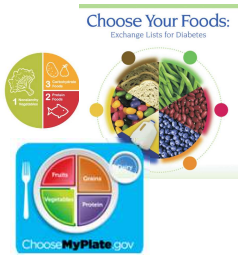
Knowledge Check

Jane has type 1 diabetes and was recently diagnosed with gastroparesis. She is a runner and has not been able to exercise recently due to nausea, vomiting, bloating, and intestinal pain. She experiences lows about 3 times a week. What hypoglycemia treatment should she use?

A. Juice
B. Fruit
C. Glucose tablets or gels
D. Peanut butter crackers

Dietary Approaches

- Practical tool(s) to develop healthy eating patterns
  - Plate Method
  - Carbohydrate exchanges
  - Carbohydrate Counting
  - DASH Diet



Dietary Approaches

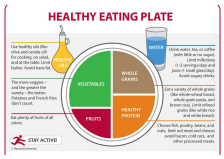
Therapy	Dietary Approach
Nutrition therapy only or on meds excluding insulin or insulin secretagogues	Consider reducing overall carb intake, portion sizes, plate method, or food exchange lists
Fixed insulin doses or insulin secretagogues	Educate on carbohydrate consistency with respect to time and amount. Consider tools like carbohydrate counting or choices, plate method, simplified meal plan, or food exchange lists
Flexible insulin therapy	Educate on carbohydrate counting and using an insulin-to-carb ratio

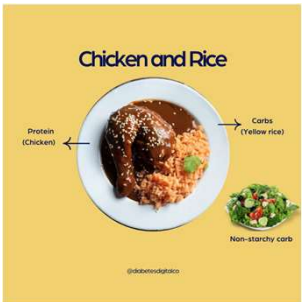
Plate Method

- MyPlate introduces simple nutrition
  - Emphasizes portion recommendations and healthy food choices
  - Using a small plate and filling ½ plate with fruits and veg helps with calorie management
  - Consider using with:
    - Individuals with T2D not on insulin
    - Those with limited health literacy or numeracy
    - Older adults prone to hypoglycemia

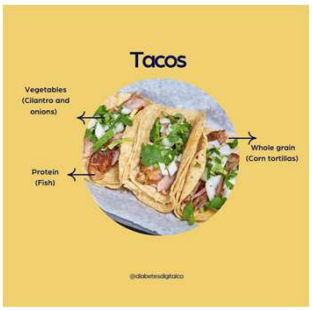
Plate Method Alternatives

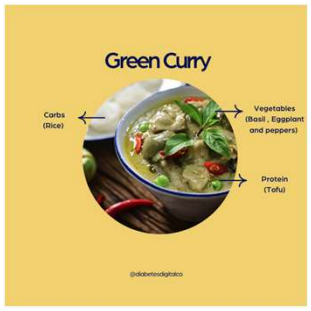
- Harvard School of Public Health alternative =“Healthy Eating Plate”
  - Visit www.hsph.harvard.edu/nutritionsource
- ADA alternative = “Diabetes Plate Method”
  - Visit diabetesfoodhub.org





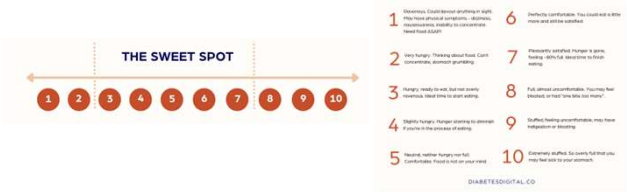
©Copyright 1999-2024, Diabetes Education Services





Helping Patients Meal Planning

Tool: The Hunger-Fullness Scale



Diabetes Digital Handouts

diabetesdigital.co/handouts

Exchanges

- The exchange system groups like foods that have similar nutritional value (specifically macronutrient and caloric value) into exchanges that can be swapped for another
  - Example: the "starch" category has food items in predetermined servings that are ~80 kcals, ~15g of carb, and ~3g protein
- An individual may count the number of food exchanges in each category at each meal/thru the day

Exchanges

Advantages

- Allows for flexibility and personalization
- Encourages consistency in the timing and amounts at meals and snacks

Disadvantages

- Requires learning how to fit unlisted foods into the plan (especially today with so many food choices)
- Less attention given to micronutrient content

©Copyright 1999-2024, Diabetes Education Services

Exchanges

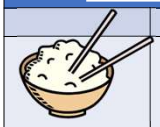
- Categories within the exchange system
  - Starch
  - Fruit
  - Dairy / Milk
  - Sweets/ Dessert
  - Vegetable
  - Meat / Protein
  - Fats
  - "Free"

	Exchange	Carb	Prot	Fat	Cals	Examples
	Starch	15	3	0-1	80	⅓ cup beans, lentils, peas, rice, ½ cup cooked cereal, corn, potato, pasta 1 oz. bread (1 slice) or bagel (½), ½ english muffin
	Fruit	15	0	0	60	1 small apple or kiwi, ½ large banana, 1¼ cup whole strawberries, 1 cup raspberries, ¾ cup blackberries, ½ (most) to ⅓ (grape, cran) cup juice
	Dairy / Milk	12	8	0-8	90-120	1 cup milk, 8 oz. plain yogurt (any fat content)
	Sweets/ Desserts	15	Varies	Varies	Varies	¼ cup granola, 1 small granola bar, ½ cup frozen fruit yogurt, ½ cup ice cream (any flavor)

	Exchange	Carb	Prot	Fat	Cals	Examples
	Veggies	5	2	0	25	1 cup raw vegetables, ½ cup cooked vegetables of vegetable juice
	Meat / Protein	0	7	1-8	35-100	1 oz. fish, chicken, beef, pork or cheese, ½ cup tofu, 1 egg
	Fat	0	0	5	45	1 tsp. oil, butter, or mayo, 6 almonds, 2 whole walnuts
	Free	0-5	0	0	0-25	Sugar free gelatin, 1 tbsp catsup 2 tsp sugar free jam, 1-2 tbsp sugar free syrup, coffee, tea, spices

©Copyright 1999-2024, Diabetes Education Services

General Rules for Serving Sizes

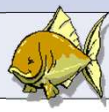


Exchange	Category	Measure
Starch	Beans/Lentils/Peas/Rice	⅓ cup
	Cooked Cereals/Pasta/Potato	½ cup
	Bread Products	1 ounce
Fruit	Fresh	1 small piece
	Dried	¼ cup
	Juice/Canned/Applesauce	½ cup
	Cubed Melon	1 cup

General Rules for Serving Sizes

Exchange	Category	Measure
Dairy / Milk	Skim, 1%, 2%, Whole	1 cup
	Ice Cream	½ cup
	Yogurt	1 cup
Sweets / Desserts	Cookies	1 small (1¾")
	Granola	¼ cup
	Cake	1½" square

General Rules for Serving Sizes



Exchange	Category	Measure
Vegetables	Raw	1 cup
	Cooked	½ cup
	Juice	½ cup
Protein	Meats/Chicken/Fish	1 ounce
	Cheese	1 ounce
	Egg	1

©Copyright 1999-2024, Diabetes Education Services

General Rules for Serving Sizes

	Exchange	Category	Measure
	Fat	Avocado	1/8 whole
		Butter/Margarine/Oil/Mayo	1 tsp
		Nuts/Seeds	1 tbsp
	Free	Coffee, tea	Unlimited
		SF Syrup	1-2 tbsp
		SF Jam/Jelly	2 tsp

Carbohydrate Counting

- Reading nutrition facts to carb count
  1. Look at the serving size
  2. Look at "Total Carbohydrates"
     - Consider subtracting ½ of sugar alcohols and fiber content
  3. Adjust the count depending on the number of servings that will be eaten
  4. Total the carbs for all items in the snack/meal

Nutrition Facts

8 servings per container

Serving size **2/3 cup (55g)**

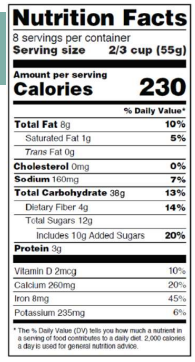
Amount per serving

Calories **230**

	% Daily Value*
Total Fat 8g	**10%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 38g	**13%**
Dietary Fiber 4g	**14%**
Total Sugars 12g	
Includes 10g Added Sugars	**20%**

Carbohydrate Counting

- Things to consider:
  - Will simpler portion guidelines suffice?
  - Does the PWD have measuring tools?
  - Does the PWD feel comfortable doing the math?
  - Is the PWD motivated to learn carb counting?



Nutrition Facts

8 servings per container

Serving size **2/3 cup (55g)**

Amount per serving

Calories **230**

	% Daily Value*
Total Fat 8g	**10%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 38g	**13%**
Dietary Fiber 4g	**14%**
Total Sugars 12g	
Includes 10g Added Sugars	**20%**
Protein 3g	
Vitamin D 2mcg	10%
Calcium 260mg	20%
Iron 8mg	45%
Potassium 235mg	6%

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Tips for Carb Counting

- Understanding and teaching carb counting:
  - Practice carb counting your own meals!
  - Keep foods in your office for practice
  - Encourage the PWD to bring in familiar foods into the office to practice with you
  - Encourage a "cheat sheet" with counts for regularly consumed foods

Tips for Carb Counting

- Understanding and teaching carb counting:
  - Buy measuring cups/spoons at the dollar store
  - Watch/share online tutorials on fractions
  - Encourage a calculator for math
  - Encourage the PWD practice/record using food logs; review logs prior to moving on to more complicated topics like using an ICR
  - Encourage books, phone apps, and carb counting sheets for assistance

Tools for Carbohydrate Counting

- Resources for carbohydrate counting:
  - Calorie King (book, website, smartphone app for iOS and Android – available in English & Spanish)
  - Diabetes Tracker (app $)
  - MyFitnessPal (smartphone application for iOS and Android)
  - UnderMyFork (app) Take photo of food to get nutrition info
  - Nutrition.gov (website)
  - Smart food scales

NOTE: The 1 cup measure as the serving size is for convenience only! All information provided by the Nutrition Facts label is based on the weight (the information in parentheses) of the food serving.

Tools for Carbohydrate Counting

- Smart food scales can be purchased to do the math

Kitrics Nutritional Scale

Perfect Portions Scale

Case Study: Patient L.J.

- L.J. is a 43 year old Black female dx with T2DM 8 days ago
- At dx, her PCP started her on the following medications:
  - Metformin: 1000 mg BID
  - Crestor: 10 mg per day
  - Amlodipine: 5 mg per day

Lab Work / Vitals at Dx	
BMI	29.6 kg/m^2
A1C	6.9%
Total Cholesterol	198 mg/dL
LDL	127 mg/dL
HDL	36 mg/dL
Triglycerides	207 mg/dL
BP	148/90 mm Hg

Case Study: Patient L.J.

Other important considerations:

- Eager to making dietary changes; would really like guidance on what types of foods to eat more/less of
- Has a family hx of CVD
- Has a strong family support system
- Enjoys a variety of foods, cooking with her family, and her partner's favorite dishes are chicken mole and pollo verde
- Would like to increase the nutritious foods in her children's diet, as well.

Cultural Humility

Cultural humility is a lifelong process of self-reflection and self-critique, whereby individuals continuously learn about and respect different cultures, recognizing and challenging their own biases, assumptions, and power imbalances. It involves approaching every cultural encounter with openness, humility, and a commitment to understanding the unique experiences and perspectives of others. Unlike cultural competence, which implies a mastery of knowledge about other cultures, cultural humility emphasizes the ongoing process of learning and the importance of building respectful, equitable relationships.

Cultural Humility

"...eliminates the need for a complete mastery of every group's health beliefs... because the patient, in the ideal scenario, is encouraged to communicate how little or how much culture has to do with that particular clinical encounter."

Tervalon, M., & Murray-García, J. (1998). Cultural humility versus cultural competence: a critical distinction in defining physician training outcomes in multicultural education. Journal of Health Care for the Poor and Underserved, 9(2), 117–125.

Slide 166

BT2 deleted : -)
Beverly Thomassian, 9/16/2024

JJ9 Should we have some points of reflection for these case studies?

Also the next dash slide, is that supposed to be there?
Jessica Jones, 9/16/2024

Cultural Humility in Practice

- Your patient is the expert of themselves and their cultural identities
- Prioritize listening, connecting, and learning
- Respect your patient as an individual
- Incorporate preferences, culture and boundaries
- Always involved patient in decision making
- Educate yourself on historical realities and injustices that shape today

Resources for Professional Development

- Diversify Dietetics - https://www.diversifydietetics.org/ddwebinars
- EatWell Exchange
- Culinary Nutrition Collaborative- Global Cuisine Series
- BIPOC Eating Disorder Conference
- Academy of Nutrition and Dietetics Member Interest Groups
  a. National Organization of Blacks in Nutrition and Dietetics (NOBIDAN)
  b. Latino and Hispanics in Nutrition and Dietetics (LAHIDAN)
  c. Asian Americans and Pacific Islanders (AAPI)
  d. Cultures of Gender and Age (COGA)
  e. Disabilities MIG

Social Determinants of Health (SDOH)

- **Understanding SDOH**: Social determinants of health are the conditions in which people are born, grow, live, work, and age, which can significantly influence health outcomes.
- **Impact on Diabetes Management**:
  - **Food Access:** Economic stability and neighborhood environments impact the availability and affordability of healthy food options.
  - **Healthcare Access and Quality**: Disparities in healthcare access and quality can lead to delayed diagnosis, inadequate treatment, and poor management of diabetes.
  - **Education and Health Literacy**: Patients with higher levels of education and health literacy are better equipped to manage their diabetes effectively.
  - **Social Support Networks**: Strong social connections can enhance self-care behaviors and provide emotional support for diabetes management.
  - **Economic Stability**: Financial resources affect a patient's ability to afford medications, regular healthcare visits, and healthy foods, all of which are crucial for managing diabetes.

Food Insecurity: Defined

- Unreliable availability of nutritious food and inability to consistently obtain nutritious food
- Lack of consistent access to enough food for an active, healthy life

Food Insecurity: Screening

- Assess food insecurity with two questions:
  1. "Within the past 12 months, we worried whether our food would run out before we got money to buy more."
  2. Within the past 12 months the food we bought just didn't last, and we didn't have the money to get more."
- Answers and their corresponding risk:
  - Never true: not at risk
  - Sometimes true: at risk
  - Often true: at risk

©Copyright 1999-2024, Diabetes Education Services

Food Insecurity: Providing Support

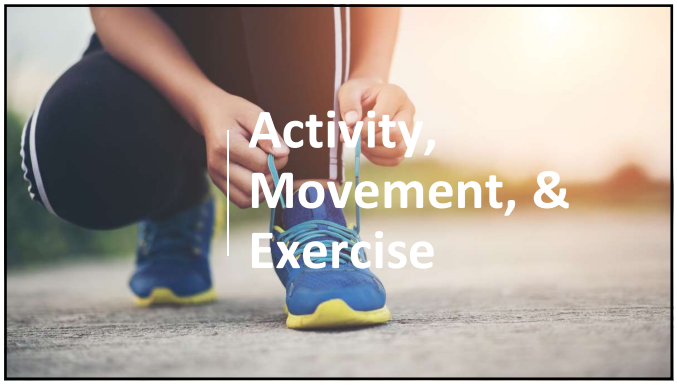
- Refer to food programs when possible
- Educate on:
  - Planning meals
  - Shopping with in season produce, frozen or canned fruits and vegetables, low-cost proteins (beans, peas, lentils, canned tuna, eggs), grains like brown rice and oatmeal are often more affordable
- Remember: eating out is often more expensive than nutrient dense home prepped options!

Healthy Eating on a Budget

Breakfast at Home		**Fast Food Breakfast**	
Bottle of water (16 oz)	$0.21	Sausage Egg Sandwich	$5.15
2 eggs	$0.45	Hash brown	$3.01
½ banana	$0.13	Orange Juice	$2.75
½ cup dry oatmeal	$0.18	**Total**	**$10.91**
Total	**$0.97**		

Healthy Eating on a Budget – How would you approach this?

- A 21-year-old Latino/Latinx college student is newly diagnosed with type 2 diabetes. Mom had GDM. Since leaving home and living in an apartment with roommates, they have been eating more fast foods and processed foods because they are "cheaper".
- Their A1C is 9.3%, BMI 29.3 and LDL is 119 mg/dL. BP is 118/76.
- What questions would you ask regarding nutrition and health?
- What would be the end goal of this visit?

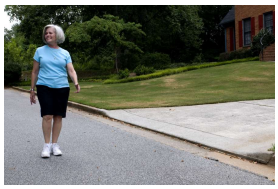


Types of Exercise: Aerobic Activity

- Aerobic, also called "Cardio"
  - Repeated/continuous movement of the same large muscle groups
  - Typically have the greatest acute impact on BG
  - Examples: walking, biking, dancing, swimming
- Studies show benefit of walking 10,000 steps a day
  - 2,000 steps = 1 mile

Impact of Aerobic Activity on DM

- BG improves for 2-72 hours after aerobic activity; thus need to do it regularly to maintain improved BGs
- Postprandial exercise can prevent/reduce the rise in BG levels that occurs after eating



Types of Exercise: Resistance Training

- Use of muscular strength to move a weight or work against a resistive load
- Increases strength, endurance, and overall calories burned in a day
- Example: weightlifting, sprinting

Impact of Resistance Training on DM

- Resistance training may improve glycemic levels more than aerobic activity in T2D
  - Best results come from mix of resistance and aerobic
  - Results are less clear for individuals with T1D

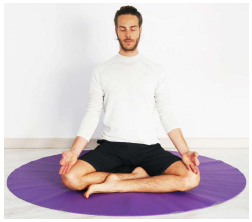
©Copyright 1999-2024, Diabetes Education Services

Impact of Resistance Training on DM

- Resistance exercise may weaken the exercise related decrease in BGs during and after exercise
  - In T1D: complete resistance training 1st, aerobic training 2nd to ↑ glycemic stability ↓ post exercise hypo
- Key for older adults for maintaining independence
  - Improved strength/balance reduces fall risk
  - Increases mobility

Types of Exercise: Flexibility

- Flexibility (stretching / postural):
  - The ability to move a joint through complete range of motion
  - Examples: Yoga, tai chi, or other with balance, agility, coordination



Impact of Flexibility Training on DM

- Benefits less established than other exercise types
  - Yoga and tai chi may improve glucose and lipid levels, body comp, neuropathic symptoms, and quality of life
  - May help prevent falls
- Minimal precautions needed with this type of activity

Sedentary Time: The benefit of Reducing It

- Long-periods of sedentary activity (regardless of physical activity) may be associated with the onset of T2D.
  - Encourage breaks in sedentary activity every 30 minutes
  - Small increases in activity may reduce mortality from all causes and improve insulin resistance/BG, BP, and BMI

Exercise: All Children

- Exercise Goals:
  - Aerobic: 60 minutes of moderate to vigorous-intensity activity daily
  - Resistance training: at least 3 days/week
- Other considerations if using insulin
  - Due to risk of hypo, advise frequent glucose monitoring before, during, and after. Use CGM when possible
  - Educate on targets, management of blood sugars including hypo

Exercise: Children with T1DM

- If using insulin, educate on strategies to prevent hypo before, during, and after exercise. Consider:
  - Lowering meal or snack time insulin before exercise
  - Reducing basal insulin
  - Increasing carb intake
  - Eating a bedtime snack
- Some of these recommendations may be helpful for kids with T2DM on insulin, as well.

Exercise: Adults with Prediabetes

- Exercise Goals:
  - Increase moderate-intensity physical activity to at least 150 minutes/week
    - Example: brisk walking
    - May include resistance training
  - Break-up sedentary time
- Achieving the behavioral goal of 150 minutes of physical activity per week reduces the incidence of type 2 diabetes by 44% (even w/o weight loss!)

Exercise: Adults with T1 or T2 Diabetes

- Exercise Goals:
  - Aerobic: ≥150 minutes/week of moderate to vigorous-intensity activity
    - Tips: spread over 3 or more days/week with no more than 2 consecutive days w/o activity
    - For those who achieve weight loss goals, long-term maintenance is supported by 200-300 minutes/week
  - Resistance exercise: 2-3 sessions/week on nonconsecutive days

Exercise: Adults with T1 or T2 Diabetes

- Exercise Goals:
  - Sedentary Time: All adults, particularly those with T2DM, should reduce sedentary time
    - Interrupt sitting every 30 minutes
  - Flexibility and balance training: recommended 2-3x per week for older adults

Exercise, Medications, and Hypoglycemia

- T1DM
  - Exogenous insulin can prevent the increased mobilization of glucose needed in exercise
- T2DM
  - Low risk for hypo if treated by diet and/or medications that do not cause hypo
  - Concern if on insulin, and/or insulin secretagogues
  - Anecdotal reports of hard-to-treat hypo with activity and GLP-1 agonists and pramlinitide

Hypoglycemia Risk

- Risk is high during and immediately after exercise
- Post exercise late onset hypoglycemia
  - More often seen in T1D
  - Associated with high intensity exercise >30 minutes
  - May occur at night and up to ~24 hours after exercise
- Best indicator of hypo risk is experience in the past

Hypoglycemia Prevention

- Planned exercise: reduce insulin or medications
- Unplanned exercise: eat a snack with carbohydrate
  - Consider a snack according to starting BG level and anticipated activity
  - Not recommended unless on insulin or insulin secretagogues
- Carry fast-acting carbohydrates
- Consume extra carb in the post-exercise period
- Caution use of alcohol after exercise

Hypoglycemia Prevention for those on Insulin or Secretagogues

Carbohydrate Replacement During Physical Activity			
BG Level	**Duration**	**Carb Replacement**	**Frequency**
150 or more	<30 minutes	May not be needed	
90-150	30-60 minutes	15 - 30 grams	Each hour
Less than 90	Eat carbs first	15-30 grams	Each hour

5. Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes: *Standards of Care in Diabetes—2024*

Knowledge Review

- AR ate breakfast, took 1000 mg of metformin, BG – 98, and is going to take a brisk 30 minutes walk. How much carb should they eat prior to exercise to prevent hypo?

A. 15 gms
B. 30 gms
C. 5 gms
D. none

Hyperglycemia Risk

- Hyperglycemia during exercise occurs when there is too little insulin in circulation
- T2D: Low risk of exercise worsening hyperglycemia
- T1D: Risk of hyperglycemia with exercise
  - Possible lack of insulin can impair glucose utilization
  - Excessive counter-regulatory hormones
  - Enhanced hepatic glucose production
  - Lipolysis and ketogenesis

Ketone Testing

- Type 1 – BG > 240 mg/dl
- Type 2 – BG > 300 mg/d

  Plus

- Positive ketones
  - Exercise NOT recommended
  - Can worse hyperglycemia and ketosis
- Negative ketones
  - Not necessary to postpone exercise if feels well and is adequately hydrated

©Copyright 1999-2024, Diabetes Education Services

Knowledge Review

CR has type 1 diabetes and uses an insulin pump. Gave 4 units bolus insulin to cover 60gms of carb, ate breakfast, post meal BG 198, took a brisk 30-minute walk. Post walk BG 324. Best action?

A. Verify results
B. Check ketones
C. Check pump patency
D. All of the above

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 – 2024

CRITERIA FOR TESTING FOR DIABETES AND PREDIABETES IN ASYMPTOMATIC ADULTS – TABLE 1

DIABETES TYPE	RISK FACTORS and FREQUENCY OF SCREENING and TESTING FOR DIABETES
Type 1	Screen for presymptomatic type 1 diabetes, by testing autoantibodies to insulin, GAD, islet antigen 2, or ZnT8 is recommended. Also test antibodies for those with type 1 phenotypic risk (younger age, 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 with 1 or more risk factors: • History of cardiovascular disease • First or second degree relative with diabetes • HDL ≤ 35 mg/dl or triglyceride ≥ 250 mg/dl • If taking antipsychotic, antiretroviral meds* • Other conditions associated with insulin resistance (PCOS, Acanthosis Nigricans) • High risk ethnicity (African American, Latino, Native American, Asian American, Pacific Islanders) • Physical inactivity • History of GDM (repeat test at least every 3 years) • Hypertension ≥ $^{130}/_{80}$ or on therapy for HTN • A1c ≥ 5.7% or Impaired Fasting Glucose (test yearly) 3. If results normal, repeat test at a minimum of 3-year intervals or more frequently based on risk status. 4. *Screen people with HIV, exposure to high-risk medicines, history of pancreatitis and re-check annually.

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 2024 Jan; 47 (Supplement 1): S20-S42. **Compliments of Diabetes Education Services www.DiabetesEd.net**

USE OF GLUCOSE-LOWERING MEDICATIONS IN THE MANAGEMENT OF TYPE 2 DIABETES

HEALTHY LIFESTYLE BEHAVIORS; DIABETES SELF-MANAGEMENT EDUCATION AND SUPPORT (DSMES); SOCIAL DETERMINANTS OF HEALTH (SDOH)

TO AVOID THERAPEUTIC INERTIA REASSESS AND MODIFY TREATMENT REGULARLY (3–6 MONTHS)

Goal: Cardiorenal Risk Reduction in High-Risk Individuals with Type 2 Diabetes (in addition to comprehensive CV risk management)*

+ASCVD†

Defined differently across CVOTs but all included individuals with established CVD (e.g., MI, stroke, any revascularization procedure). Variably included: conditions such as transient ischemic attack, unstable angina, amputation, 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)

+ASCVD/Indicators of High Risk

GLP-1 RA# with proven CVD benefit **EITHER/OR** SGLT2i§ with proven CVD benefit

If A1C above target

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

+HF

Current or prior symptoms of HF with documented HFrEF or HFpEF

+HF

SGLT2i§ with proven HF benefit in this population

+CKD

eGFR <60 mL/min per 1.73 m² OR albuminuria (ACR ≥3.0 mg/mmol [30 mg/g]). These measurements may vary over time; thus, a repeat measure is required to document CKD.

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

PREFERABLY

SGLT2i§ with primary evidence of reducing CKD progression

Use SGLT2i in people with an eGFR ≥20 mL/min per 1.73 m²; once initiated should be continued until initiation of dialysis or transplantation

OR

GLP-1 RA with proven CVD benefit if SGLT2i not tolerated or contraindicated

If A1C above target, for patients on SGLT2i, consider incorporating a GLP-1 RA or vice versa

If additional cardiorenal risk reduction or glycemic lowering needed

Goal: Achievement and Maintenance of Glycemic and Weight Management Goals

Glycemic Management: Choose approaches that provide the efficacy to achieve goals:

Metformin OR Agent(s) including COMBINATION therapy that provide adequate EFFICACY to achieve and maintain treatment goals

Prioritize avoidance of hypoglycemia in high-risk individuals

In general, higher efficacy approaches have greater likelihood of achieving glycemic goals

Efficacy for glucose lowering

Very High:
Dulaglutide (high dose), Semaglutide, Tirzepatide

Insulin

Combination Oral, Combination Injectable (GLP-1 RA/Insulin)

High:
GLP-1 RA (not listed above), Metformin, SGLT2i, Sulfonylurea, TZD

Intermediate:
DPP-4i

Achievement and Maintenance of Weight Management Goals:

Set individualized weight management goals

General lifestyle advice: medical nutrition therapy/eating patterns/ physical activity

Intensive evidence-based structured weight management program

Consider medication for weight loss

Consider metabolic surgery

When choosing glucose-lowering therapies:

Consider regimen with high-to-very-high dual glucose and weight efficacy

Efficacy for weight loss

Very High:
Semaglutide, Tirzepatide

High:
Dulaglutide, Liraglutide

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

Neutral:
DPP-4i, Metformin

If A1C above target

Identify barriers to goals:

- Consider DSMES referral to support self-efficacy in achievement of goals
- Consider technology (e.g., diagnostic CGM) to identify therapeutic gaps and tailor therapy
- Identify and address SDOH that impact achievement of goals

* 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 independent of background use of metformin; † A strong recommendation is warranted for people with CVD and a weaker recommendation for those with indicators of high CV risk. 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; ^ Low-dose TZD may be better tolerated and similarly effective; § For SGLT2i, CV/renal outcomes trials demonstrate their efficacy in reducing the risk of composite MACE, CV death, all-cause mortality, MI, HHF, and renal outcomes in individuals with T2D with established/high risk of CVD; # For GLP-1 RA, CVOTs demonstrate their efficacy in reducing composite MACE, CV death, all-cause mortality, MI, stroke, and renal endpoints in individuals with T2D with established/high risk of CVD.

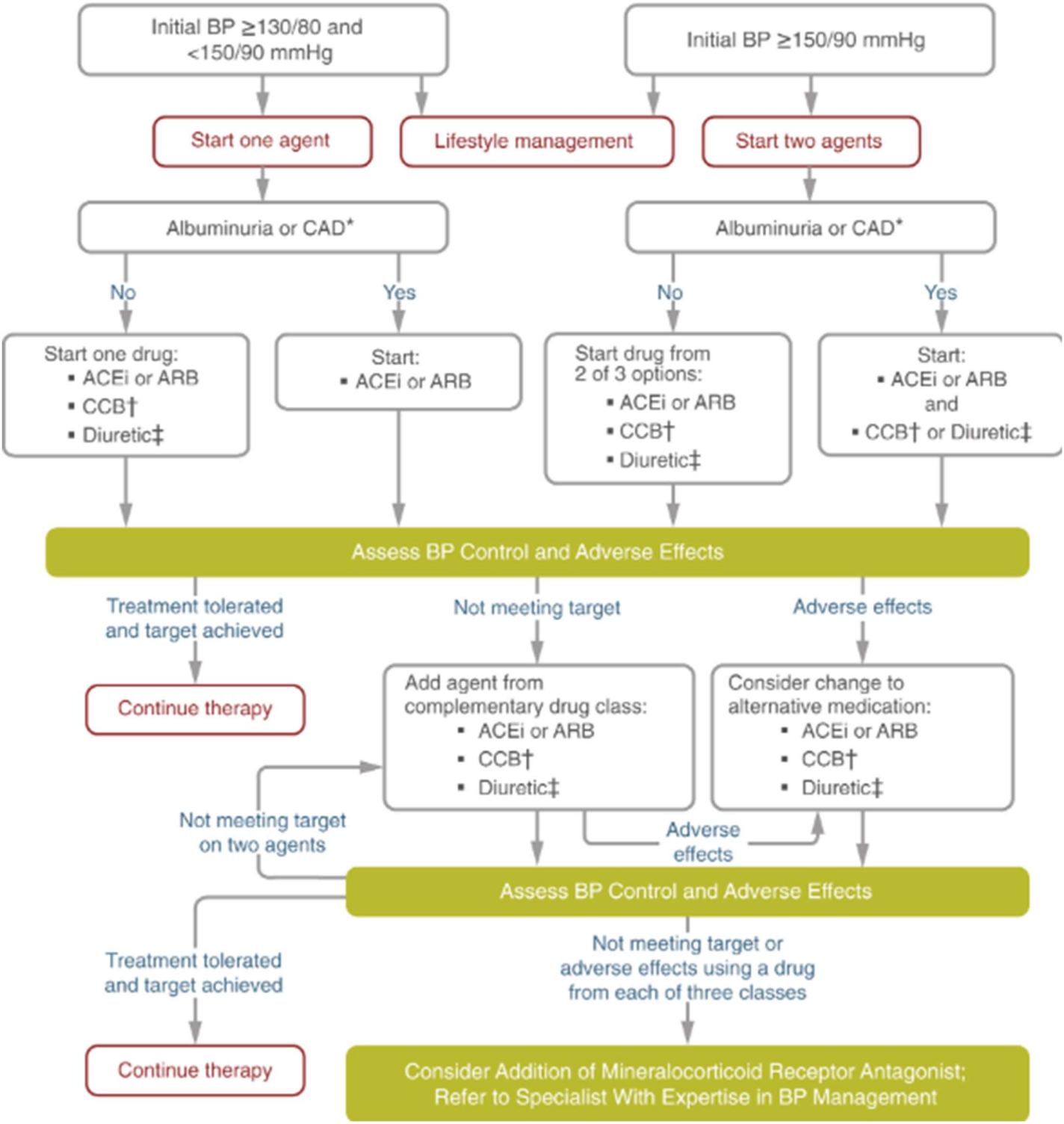
9. Pharmacologic Approaches to Glycemic Treatment: *Standards of Care in Diabetes*—2024 FREE

American Diabetes Association Professional Practice Committee

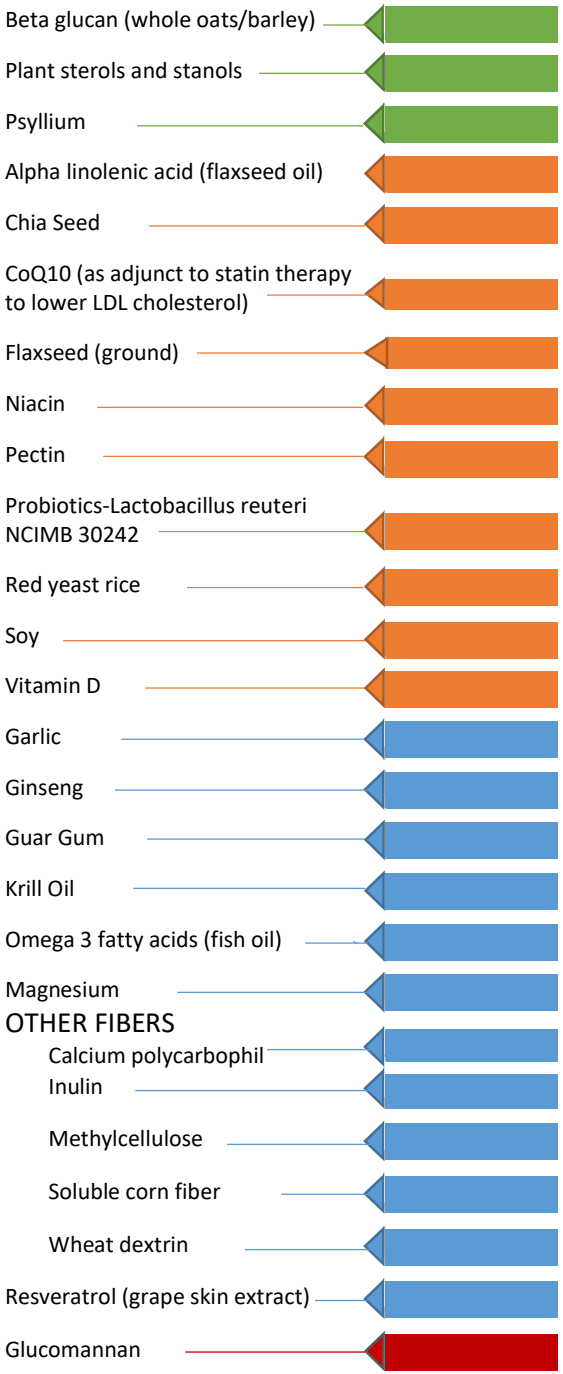
Compliments of Diabetes Ed Services 2024 | www.DiabetesEd.net

Recommendations for the Treatment of Confirmed Hypertension in Nonpregnant People With Diabetes

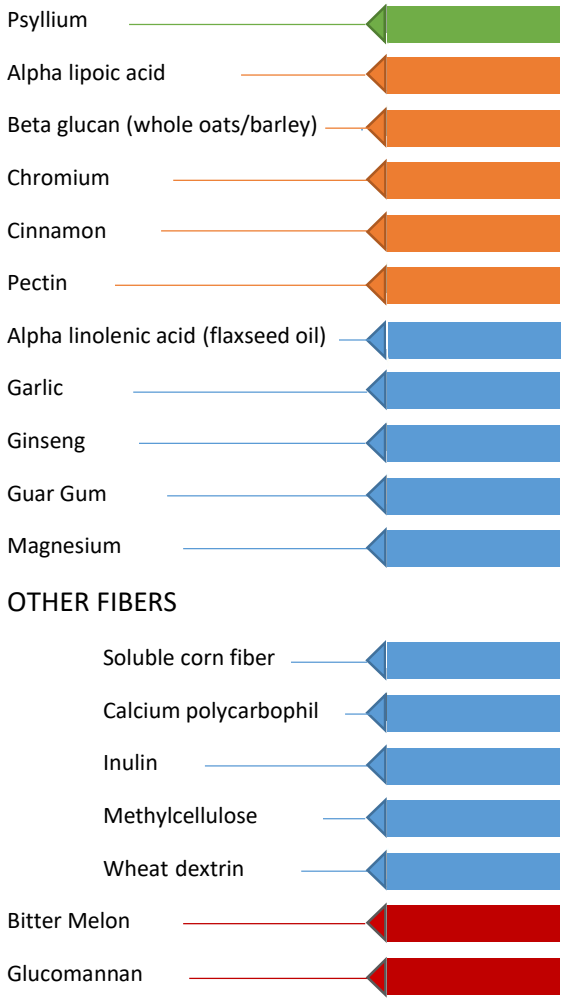
ADA 2024 Standards of Diabetes Care
Figure 10.2 Vol.47, S179-218



Supplements to Help Manage Total Cholesterol, LDL, and HDL



Supplements to Help Lower Blood Sugar



This downloadable version is compliments of

www.DiabetesEd.net

Supplement Safety Ratings from Cleveland Clinic

Safety Rating Color Key

Recommended: Several well-designed studies in humans have shown positive benefit. Our team is confident about its therapeutic potential.

Recommended with Caution: Preliminary studies suggest some benefit. Future trials are needed before we can make a stronger recommendation.

Not Recommended-Evidence: Our team does not recommend this product because clinical trials to date suggest little to no benefit.

Not Recommended-High Risk: Our team recommends against using this product because clinical trials suggest substantial risk is greater than the benefit

This content was adapted from The Cleveland Clinic Wellness flyer. For more detailed information, access full supplement review at www.clevelandclinicwellness.com/suppreview

2024

INTENSIFYING INJECTABLE THERAPY IN TYPE 2 – ADA STANDARDS Figure 9.4 2024

Including reinforcement of behavioral interventions (weight management and physical activity) 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.

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

Consider clinical signals to evaluate for overbasalization and need for adjunctive therapies (e.g., basal dose >0.5 units/kg/day, 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:

Add 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 2024 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).

This larger font handout is provided compliments of ~ Diabetes Education Services 2024~ www.DiabetesEd.net