Diabetes Care Summit

Friday, September 5, 2025

Rose State College

Jeanie Webb Student Union

OU Health | Harold Hamm Diabetes Center

The UNIVERSITY of OKLAHOMA HEALTH SCIENCES

ADCES Association of Diabetes Care & Education Specialists

2025 HAROLD HAMM DIABETES CARE SUMMIT

September 5, 2025

Rose State College Jeanie Webb Student Union
1910 Hudiburg Drive
Midwest City, Oklahoma

SYLLABUS CONTENT

SUMMIT AGENDA

Friday, September 5, 2025 | Rose State College Jeanie Webb Student Union

7:15 – 7:55 a.m.	Registration, Breakfast and Exhibits
7:55 a.m.	Welcome and Introductory Remarks
8:00 – 9:30 a.m.	*Monogenic Diabetes: Tools for Your Practice* Toni I. Pollin, MS, PhD, LCGC Kristin A. Maloney, MS, MGC, LCGC
9:30 – 10:30 a.m.	*Caring for the Diabetic Foot* Trent Wallace, DPM, DABPM
10:30 – 10:45 a.m.	Break and Exhibits
10:45 – 11:45 a.m.	**KEYNOTE** | *Binge Eating and Diabetes: Understanding the Overlap and Supporting Recovery* Krystal Dunham, MS, RDN, LD
11:45 – 12:30 p.m.	Lunch Buffet, Break and Exhibits
12:30 – 1:30 p.m.	*The role of exercise in diabetes prevention and management* Kevin R. Short, PhD, FACSM
1:30 – 2:30 p.m.	**KEYNOTE** | *And you thought that diabetes was just about the numbers: addressing the emotional side of diabetes in clinical care* Lawrence Fisher, PhD, ABPP
2:30 – 2:45 p.m.	Break and Exhibits
2:45 – 3:45 p.m.	**KEYNOTE** | *Advances in Insulin Delivery and Glucose Monitoring: Practical Technology Updates for the Diabetes Care Team* Jodie Gee, PharmD, BCACP, CDCES
3:45 – 5:00 p.m.	*Guideline Recommended Approaches to Diabetes Management in Underinsured Populations: Challenges and Solutions* Jeremy L. Johnson, PharmD, BCACP, CDCES, BC-ADM Meadow Hazelhoff, MSW, LCSW
5:00 p.m.	Adjourn

PROGRAM INFORMATION

Course Overview

Co-sponsored by the Association of Diabetes Care and Education Specialists, the Harold Hamm Diabetes Care Summit is a one-day course that focuses on the management of the patient with diabetes. It is designed to address the unmet educational needs of the interprofessional diabetes care management team who have a diverse case mix that includes patients with diabetes. The purpose of this conference is to promote excellence in care and provide up-to-date information to enhance knowledge integral to the effective management of diabetes. This continuing education activity is needed because of the explosion of diabetes in our country. The number of persons with diabetes is expected to more than triple by 2050. According to the 2020 National Diabetes Statistics Report from the CDC, diabetes affects 34.2 million people of all ages, which is 10.5 percent of the US population. The Oklahoma State Department of Health also reports a 14 percent prevalence of diabetes in Oklahoma among adults ages 18 and older. In 2021, Oklahoma ranked the fifth highest in diabetes mortality rate in the nation. Because of the size of this problem and the complexity of managing patients with diabetes, health care professionals need continuous training in order to meet the needs of patients with diabetes in our state and region. This course combines best practice strategies and education through case studies and lectures.

Target Audience

Designed for individuals or groups of diabetes care and education specialists including RNs, RDs, Pharmacists, Physician Assistants, MDs, and other health care providers interested in staying up to date on current practices of care for people with diabetes and other related conditions.

Successful Completion

To receive a Statement of Credit you must attend the entire **HHDC Summit.** Your Statement of Credit will be issued **electronically immediately upon submission of the evaluation form**. For questions or issues, please email HHDC@ouhsc.edu.

2025 SUMMIT PLANNING COMMITTEE

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University of Oklahoma Health

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Assistant Professor
Department of Clinical and Administrative Sciences
University of Oklahoma College of Pharmacy
Clinical Pharmacist, OU Health General Internal Medicine

2025 SUMMIT SPEAKERS

Krystal Dunham, MS, RDN, LD
Registered Dietitian Nutritionist
The Mother Road Dietitian

Lawrence Fisher, PhD, ABPP
Professor emeritus
University of California, San Francisco

Jodie Gee, PharmD, BCACP, CDCES
Clinical Assistant Professor
Department of Pharmacy Practice and Translational Research
Ambulatory Care Clinical Pharmacist
Vecino Denver Harbor Family Health Center
University of Houston College of Pharmacy

Meadow Hazelhoff, MSW, LCSW
Director of Behavioral Health Services & Special Populations
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Clinical Pharmacist, Ambulatory Care
Diabetes Care & Education Specialist
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OSU Family Medicine – Health Care Center

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Track Leader, Human Genetics Track in the Epidemiology & Human Genetics PhD Program
Director, Master's Program in Human Genetics & Genomic Medicine
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Department of Pediatrics
Member, Harold Hamm Diabetes Center
University of Oklahoma Health

Trent Wallace, DPM, DABPM
Central Oklahoma Foot and Ankle

PLANNING COMMITTEE AND SPEAKER DISCLOSURES

In accordance with the ACCME Standards for Integrity and Independence, the Association of Diabetes Care & Education Specialists (ADCES) requires anyone in a position to affect or control continuing education content (e.g., authors, presenters, and program planners) to disclose all financial relationships with ineligible companies. It is the responsibility of ADCES to mitigate and disclose all relevant conflicts of interest. Disclosure of a relationship is not intended to suggest or condone bias in any presentation but is made to provide participants with information that might be of potential importance to their evaluation of the presentation.

Relevant disclosures (or lack thereof) among education activity planners and faculty are as follows:

Planning Committee:

Itivrita Goyal, MD – No relevant financial relationships

Kacy Aderhold, DNP, APRN-CNS, BC-ADM, CDCES – No relevant financial relationships

Nicole P. Crossley, PhD, RN, RDN, LD – No relevant financial relationships

Christine Olson, MS, RD, LD, CDCES – No relevant financial relationships

Hayley Sewell, PharmD, BCACP – No relevant financial relationships

Speakers:

Krystal Dunham, MS, RDN, LD – No relevant financial relationships

Lawrence Fisher, PhD, ABPP – Consultant: Eli Lilly

Jodie Gee, PharmD, BCACP, CDCES – Researcher: Dexcom, Inc.

Meadow Hazelhoff, MSW, LCSW – No relevant financial relationships

Jeremy L. Johnson, PharmD, BCACP, CDCES, BC-ADM – No relevant financial relationships

Kristin A. Maloney, MS, MGC, LCGC – No relevant financial relationships

Toni I. Pollin, MS, PhD, LCGC – Grant funding for research/partial salary: Regeneron Pharmaceuticals; Consultant: Ionis

Kevin R. Short, PhD, FACSM – No relevant financial relationships

Trent Wallace, DPM, DABPM – No relevant financial relationships

Disclosure and Mitigation of Relevant Conflicts of Interest: All identified relevant financial relationships have been mitigated.

ACCREDITATION STATEMENTS

In support of improving patient care, this activity has been planned by The Harold Hamm Diabetes Center and the Association of Diabetes Care & Education Specialists. The Association of Diabetes Care & Education Specialists is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialing Center (ANCC) to provide continuing education for the healthcare team.

This activity was planned by and for the healthcare team, and learners will receive 7.75 Interprofessional Continuing Education (IPCE) credits for learning and change.

Accreditation Council for Pharmacy Education
The Universal Activity Number is JA4008258-9999-25-273-L01-P. This knowledge-based activity has been approved for 7.75 contact hour(s).

American Medical Association (AMA)
Association of Diabetes Care & Education Specialists designates this live activity for a maximum of 7.75 *AMA PRA Category 1 Credit(s)™*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

American Nurses Credentialing Center (ANCC)
Association of Diabetes Care & Education Specialists designates this activity for a maximum of 7.75 ANCC contact hours. This activity discusses 1.50 contact hours of pharmacotherapeutic content.

The Association of Diabetes Care & Education Specialists is approved by the California Board of Registered Nursing, Provider Number 10977, for 7.75 contact hours. RNs must retain this document for 4 years after the activity concludes.

The Association of Diabetes Care & Education Specialists has been authorized by the American Academy of PAs (AAPA) to award AAPA Category 1 CME credit for activities planned in accordance with AAPA CME Criteria. This activity is designated for 7.75 AAPA Category 1 CME credits. PAs should only claim credit commensurate with the extent of their participation.

Commission on Dietetic Registration (CDR): CDR Credentialed Practitioners will receive 7.75 Continuing Professional Education units (CPEUs) for completion of this activity. Completion of this RD/DTR profession-specific or IPCE activity awards CPEUs (One IPCE credit = One CPEU). If the activity is dietetics-related but not targeted to RDs or DTRs, CPEUs may be claimed which are commensurate with participation in contact hours (One 60 minute hour = 1 CPEU). RDs and DTRs are to select activity type 102 in their Activity Log. Performance Indicator selection is at the learner's discretion.

Certified Diabetes Care and Education Specialists: To satisfy the requirements for renewal of certification for the Certification Board for Diabetes Care and Education (CBDCE), continuing education activities must be diabetes related and approved by a provider on the CBDCE list of Approved Providers (www.ncbde.org). CBDCE does not approve continuing education. The

Association of Diabetes Care & Education Specialists is on the CBDCE list of Approved Providers.

Other Health Professionals
It is the responsibility of each participant to determine if the program meets the criteria for re-licensure or recertification for their discipline.

To Obtain Continuing Education Credit:
To receive a statement of credit you must attend the entire conference. In order to receive a statement of credit, participants must complete and submit the conference evaluation. The evaluation will be emailed to participants on September 8 at the end of the day. Once the evaluation has been completed and submitted, your statement of credit will be emailed to you. If you have any questions, please contact Lark Zink at lark-zink@ouhsc.edu.

Accommodation Statement
The University of Oklahoma Health Sciences Center fully complies with the legal requirements of the ADA and the rules and regulations thereof. Please notify us if you have any special needs. Accommodations are available by contacting Patricia Parker at (405) 271-2824 or Patricia-Parker@ouhsc.edu or by visiting the registration desk at the conference.

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Presentation

Monogenic Diabetes: Tools for Your Practice

Toni I. Pollin, MS, PhD, LCGC

Kristin A. Maloney, MS, MGC, LCGC

MONOGENIC DIABETES: TOOLS FOR YOUR PRACTICE

University of Oklahoma
Harold Hamm Diabetes Summit
September 5, 2025

Toni I. Pollin, MS, PhD, LCGC
Kristin Maloney, MS, MGC, LCGC
University of Maryland School of Medicine

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Overview

- Goals
- Review: pedigrees, genetics terminology, inheritance patterns
- Monogenic vs. type 1 diabetes (T1D) and type 2 diabetes (T2D)
- Resources

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Aisha

Aisha is a 17-year old with T1D who has come in alone to diabetes education. Her A1c is 14.5%.

She is new to you so you ask her about her diagnosis and family history.

Always ask these 2 questions:

Tell me the story of your diagnosis (how, when)?

Aisha has had diabetes since she was 5 years old and has done much of the management on her own over the years.

Who else in your family has diabetes?

Aisha says her mom has T2D and her dad isn't in the picture. She has an older half brother (maternal side) who also had T1D. Her maternal grandmother has T2D and her maternal grandfather died at age 38, she doesn't know from what.

You are curious about the mixed family history and want to confirm that this is T1D so you ask questions about her management.

- She has used an insulin pump in the past but not for the past couple years. She was annoyed with the alarms.
- She is a bit cagey when it comes to how much insulin she takes every day. She doesn't check her blood sugars, "It always just says 'HI'."
- Upon some further investigation, she has not had her Lantus or Novolog pens filled in over a year. When you ask her about this she admits that she takes the Lantus "maybe 1-2 times per week" and never really takes the Novolog at all.
- She has never been in DKA, her diabetes was found during a work up in childhood for inattention and ADHD. She says she had hypoglycemia as a baby and they had to put a line into her head to treat it. She doesn't know any other details.

Is this Type 1 Diabetes?

Slide courtesy of Chelsea Kilanowski, BSN RN, CDCES

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Learning Objectives

- Participants will recognize clinical characteristics of the most well-known forms of monogenic diabetes.
- Participants will incorporate genetic information to inform management of people with monogenic diabetes.

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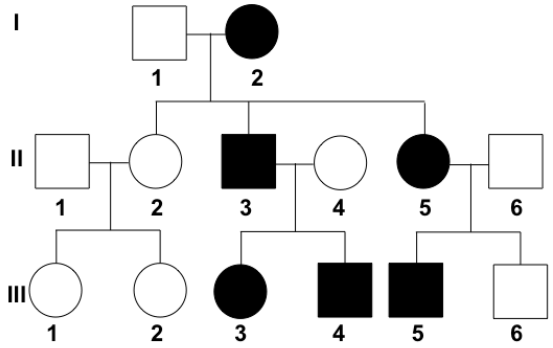
Introduction to Family History/ Pedigrees



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Why Do We Take a Family History?

- Gather information critical to :
  - Visual, simple assessment of family disease history and social issues
  - Proper risk assessment (genetic and environmental, psychosocial)
  - Proper diagnosis
- Identify individuals from at risk populations
- Identify other possible risks
  - Other family members
  - Other disorders

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Why as a Pedigree?

- Quick way for medical professionals to summarize family history provided by patient
- Uniform and standardized, easy to interpret and communicate to other health care professionals
- Can be easily updated

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Common Pedigree Symbols

Gender	Sex		
	Male	Female	Unassigned at Birth
Man/Boy	 56y	 AFAB 34y	 UAAB 28y
Woman/Girl	 AMAB 56y	 34y	 UAAB 28y
Non-binary/Gender Diverse	 AMAB 56y	 AFAB 34y	 UAAB 28y

AFAB: Assigned female at birth
AMAB: Assigned male at birth
UUAB: Unassigned at birth

Bennett et al., 2022

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Toni I. Pollin, MS, PhD, LCGC
Kristin A. Maloney, MS, MGC, LCGC

	Identifies as Man/Boy	Identifies as Woman/Girl	Identifies as Non-Binary/Gender Diverse	Sex and/or gender are not known or not specified
Multiple individuals, number known	2	2	2 AMAB	2
Multiple individuals, number unknown or not specified	n	n	n AMAB/ AFAB	n
Deceased individual	d. 1981	d.4 mo	d.86 AFAB	d. 2002
Stillbirth (SB)				SB 34wk AFAB
Clinically affected individual (define shading in key/legend) Affected individual (> one condition)			AMAB AFAB	
Proband (Always affected with condition)	P	P	P AMAB	
Consultand (Shade, if affected)	b.12/23/1954	31y	44y AFAB	

Bennett et al., 2022

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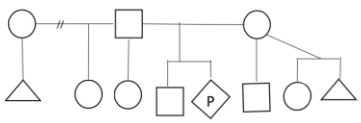
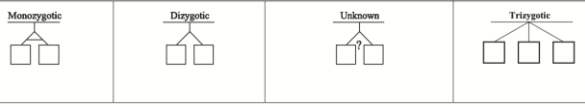
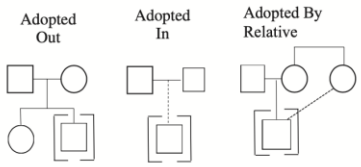
Relationships		A break in a relationship line indicates the relationship no longer exists. Multiple previous partners do not need to be shown if they do not affect genetic assessment.
Consanguinity		If degree of relationship not obvious from pedigree, it should be stated (e.g., third cousins) above relationship line.
Twins, Triplets, etc. In the absence of a "?" or a connecting line, assumed to be dizygotic		
No children by choice or reason unknown. Indicate reason if known.		
Infertility (indicate reason if known)		
Adoption Brackets used for all adoptions. Adoptive and biological parents denoted by dashed and solid lines of descent, respectively.		

Bennett et al., 2022

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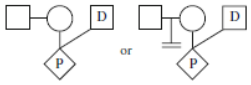
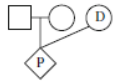
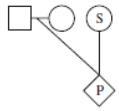
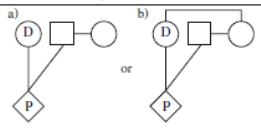
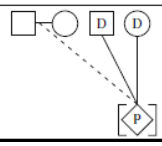
Instructions:
— D represents egg or sperm donor
— S represents surrogate (gestational carrier)
— If the woman is both the ovum donor and a surrogate, in the interest of genetic assessment, she will only be referred to as a donor (e.g., 4 and 5)); the pregnancy symbol and its line of descent are positioned below the woman who is carrying the pregnancy
— Available family history should be noted on the gamete donor and/or gestational carrier

Possible Reproductive Scenarios		Comments
1. Sperm donor		Couple in which woman is carrying pregnancy using donor sperm. No relationship line is shown between the woman carrying the pregnancy and the sperm donor.
2. Ovum donor		Couple in which woman is carrying pregnancy using a donor egg and partner's sperm. The line of descent from the birth mother is solid because there is a biologic relationship that may affect the fetus (e.g., teratogens).
3. Surrogate only		Couple whose gametes are used to impregnate a woman (surrogate) who carries the pregnancy. The line of descent from the surrogate is solid because there is a biological relationship that may affect the fetus (e.g., teratogens).
4. Surrogate ovum donor		Couple in which male partner's sperm is used to inseminate a) an unrelated woman or b) a sister who is carrying the pregnancy for the couple.
5. Planned adoption		Couple contracts with a woman to carry a pregnancy using ovum of the woman carrying the pregnancy and donor sperm.

Bennett et al., 2008

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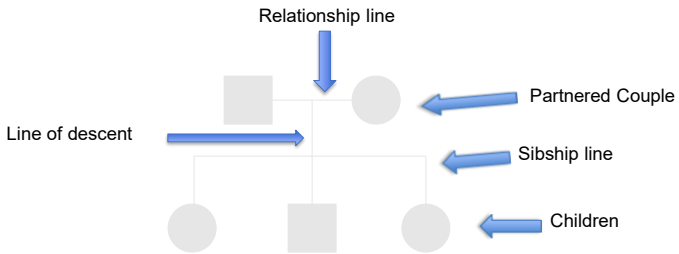
Connecting Pedigree Symbols



If possible, list individuals in sibling/children line in order of age (oldest to youngest)

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Pedigree Key

- Should include all information relevant to interpretation of pedigree (e.g., define fill/shading)
- In the case of same sex partners, adoption, donors, etc. – please refer to
  - Bennett RL, French KS, Resta RG, Austin J. Practice resource-focused revision: Standardized pedigree nomenclature update centered on sex and gender inclusivity: A practice resource of the National Society of Genetic Counselors. J Genet Couns. 2022 Dec;31(6):1238-1248. doi: 10.1002/jgc4.1621. Epub 2022 Sep 15. PMID: 36106433.

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Practical Issues

- DRAW BIG
- Be systematic in your approach
  - Mom's side and then dad's
- Ancestry
- Consanguinity
- Children from previous relationships?
- Social issues
  - Undisclosed adoption
  - Alternate paternity
  - Mental health implications
- List of summary questions

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Let's Practice! Case #1

- An 18 year old female is referred to the PCP for a sports physical prior to starting summer training for the University of Maryland Women's field hockey team. Routine bloodwork shows an HbA1c of 6.1%.
- This student athlete has a BMI of 20. She has no symptoms of diabetes or pre-diabetes.
- A family history is obtained and the athlete reports that her mother (also lean) had gestational diabetes. Her mother's identical twin sister has a 12-year old son with pre-diabetes that was found on routine bloodwork. He is lean and is otherwise healthy.
- She does not know her status or that of her other family members.

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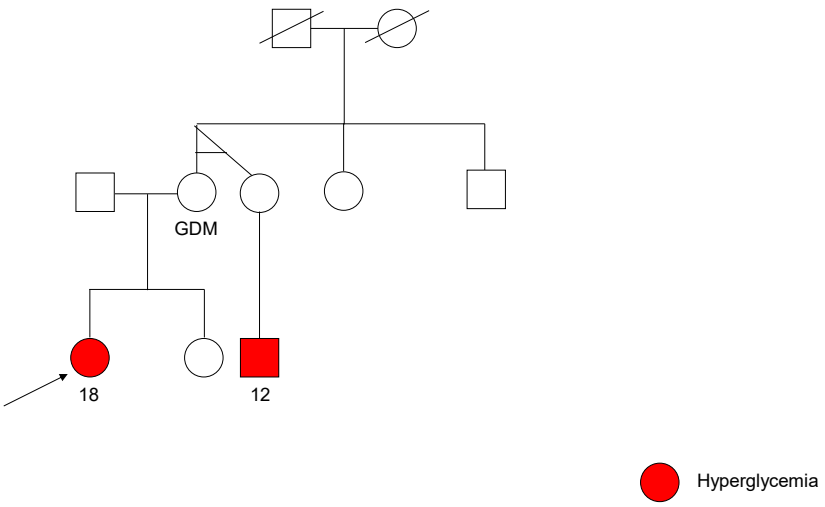

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Practice on Your Own! Case #2

- The patient is a 41-year-old Black female who comes to PT for recurrent knee pain while training for her upcoming ultra-marathon. When the PT asks about the patient's health, the patient reports that she was diagnosed with type 2 diabetes (T2DM) two years ago when she was hospitalized after fainting at the end of a race. She has had problems decreasing her HbA1c despite compliance with metformin. Her vision is also getting progressively worse, making it hard to navigate the trails while running. She is really upset, as she has tried hard her entire life to avoid diabetes by eating well and exercising.

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Family History

- Patient has no children
- Her brother, currently age 45, was diagnosed with T2DM at age 30 via routine bloodwork. He isn't an athlete like her, but he isn't overweight either, so it was a surprise.
  - His daughter, age 16, was diagnosed with type 1 diabetes (T1DM) at age 12. She is treated with insulin, but hasn't been very compliant lately. Still, she has not developed diabetic ketoacidosis. His wife is 8 weeks pregnant.
- Maternal family history:
  - Mother, age 68, was diagnosed with T2DM at age 25. She is, and has always been, very lean. She takes metformin.
  - Uncle, age 72, is overweight and was diagnosed with T2DM at age 62. He has no children.
  - The patient doesn't talk to her aunt very often, but estimates she is in her 70s and was diagnosed with diabetes (not sure what type) around age 40.
    - She has kids, but the patient doesn't know how many or anything about their health.
  - Maternal grandfather died at age 88. He was diagnosed with T2DM at age 20 when he tried to enlist in the military. He was never prescribed insulin, but rather was treated with "pills" and never had any diabetes-related health complications.
  - Maternal grandmother is 90-years old
  - Ancestry: Jamaican
- Paternal family history:
  - Father died last year at age 69 from cirrhosis (patient reports he was an alcoholic)
  - Father's sister and brother are twins, age 75.
  - Aunt has mental health problems (patient guesses bipolar) and has two daughters, ages 46 and 50. Neither have children.
    - Older cousin is obese and was recently diagnosed with T2DM.
  - Uncle has heart disease.
    - He has one son, age 46, who has one daughter, age 18. Neither have any additional medical concerns to the patient's knowledge.
  - Paternal grandmother is 85-years old and was diagnosed with diabetes (unknown type) at age 80.
  - The patient doesn't know anything about her paternal grandfather.
  - Ancestry: African American, Native American
- No individuals whose gender does not match their sex assigned at birth on either side

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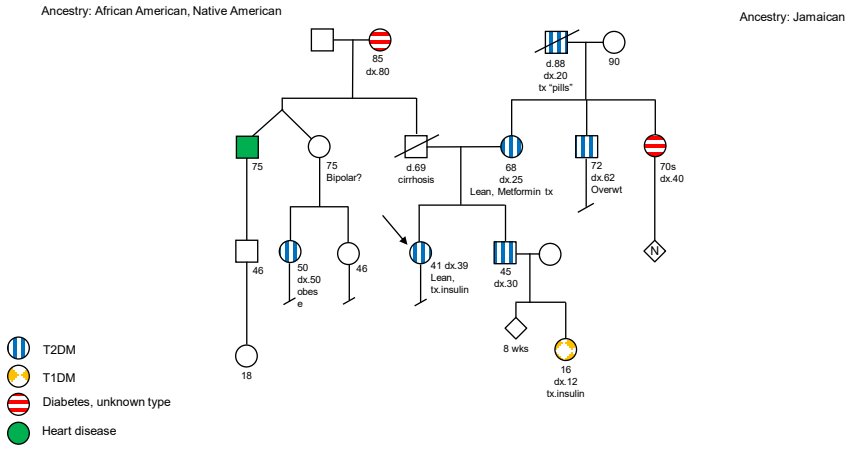

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Genetics Review

https://ar.inspiredpencil.com/pictures-2023/genetics-memes

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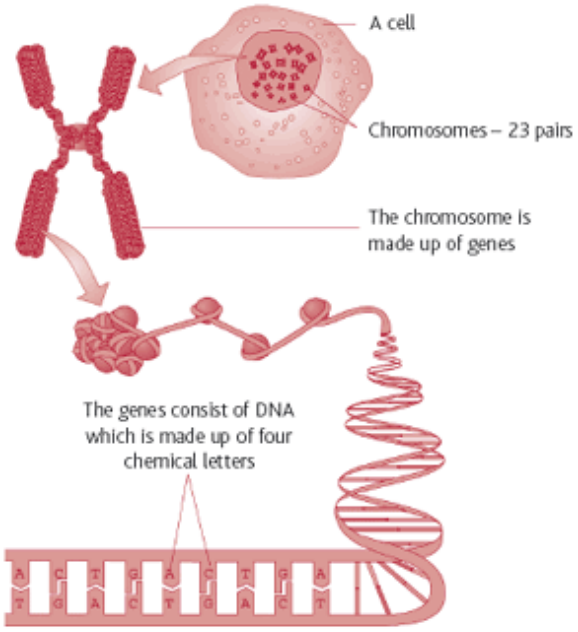
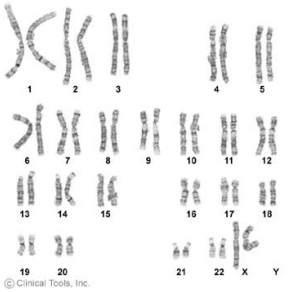
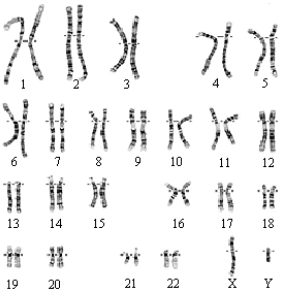
Toni I. Pollin, MS, PhD, LCGC
Kristin A. Maloney, MS, MGC, LCGC

Broad View





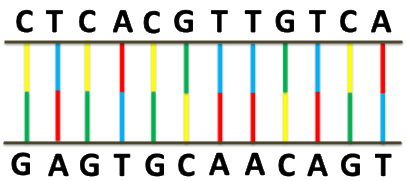


http://www.oncolink.org/treatment/article.cfm?c=15&s=110&id=323

21

Genes

- DNA that codes for a protein
  - "Instruction manuals" or "Recipes"
  - Approximately 25,000 in the human genome
  - About 2-5% of the human genome contains genes
  - Function of much of the genome is unknown
  - A, T, C, G = genetic alphabet
- **Variant**: change in the genetic sequence
  - Pathogenic, likely pathogenic, uncertain significance, likely benign, benign



The order of the letters along the DNA ladder is the "**sequence**" of the DNA.

A	adenine
T	thiamine
G	guanine
C	cytosine

Slide from Michelle Giglio, PhD

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Types of Sequence Variants

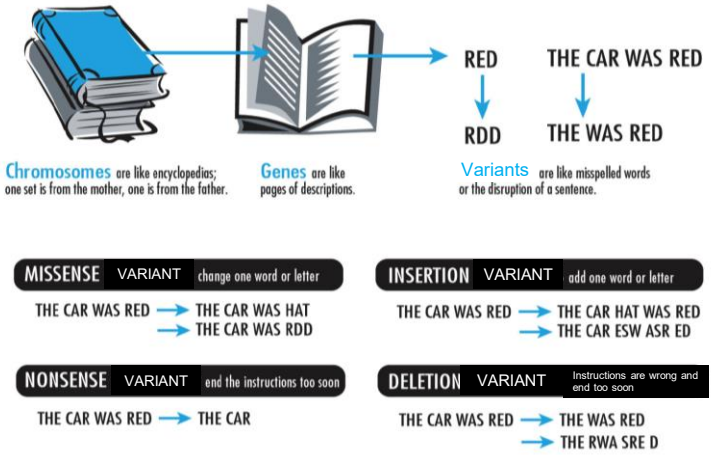

Image adapted from Greenwood Genetic Center

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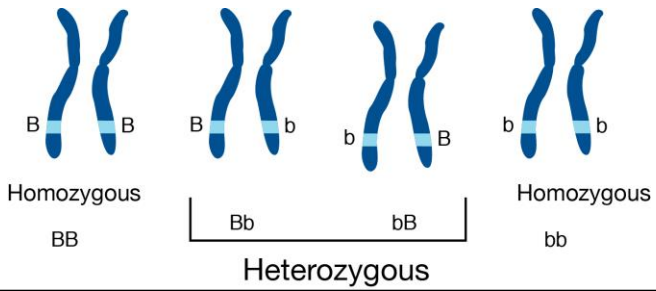
Terminology Review

- Homozygous: DNA is the same at a particular position
  - i.e., the same genetic change inherited from both parents
- Heterozygous: DNA is different at a particular position
  - i.e., genetic change inherited from one parent
  - When one variant is associated with a recessive disease, individual is called a "carrier" of that disease



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Terminology Review

- Penetrance: the proportion of people with a particular genetic variant who show signs and symptoms of a genetic disorder.
  - Complete penetrance: everyone develops the disorder (e.g., Huntington)
  - Reduced penetrance: some people with the genetic disorder never develop symptoms (e.g., Hereditary Breast and Ovarian Cancer from *BRCA*1 or *BRCA2*)
- Variable expressivity: the range of signs and symptoms that can occur in different people with the same genetic condition
  - Cystic fibrosis

Both of these phenomena can make it difficult to predict the onset or severity of genetic disease- even within the same family!

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Inheritance Patterns

- Autosomal Dominant
- Autosomal Recessive
- X linked
- Mitochondrial
- Multifactorial

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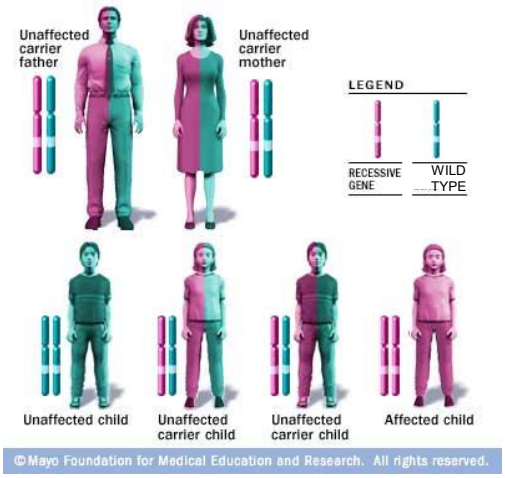
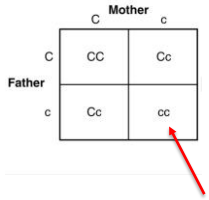
Autosomal Recessive

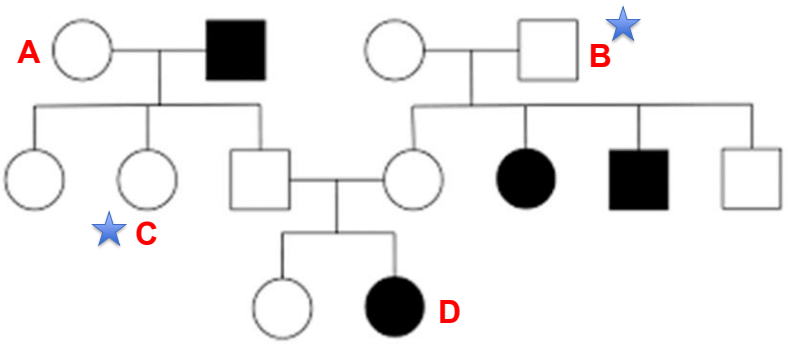
- Both copies of the gene need to not work properly in order to show symptoms
- Don't often see family history of disorder-carriers are usually asymptomatic
- Offspring: 25% or 1/4 chance that each child of two carriers will be affected





27

- Who are obligate carriers among A, B, C, and D?



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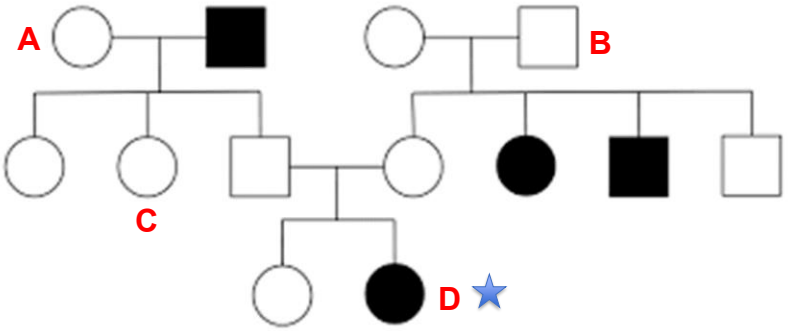
- Whose child(ren) among A, B, C, and D will be at least be carriers?



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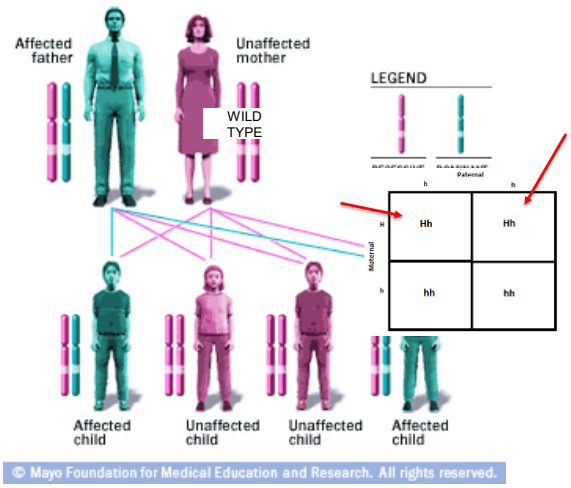
Autosomal Dominant

- Only one copy of the gene needs to not work properly in order to show symptoms
- Often see family history of disease
- Offspring: 50% or 1/2 chance that each child will be affected



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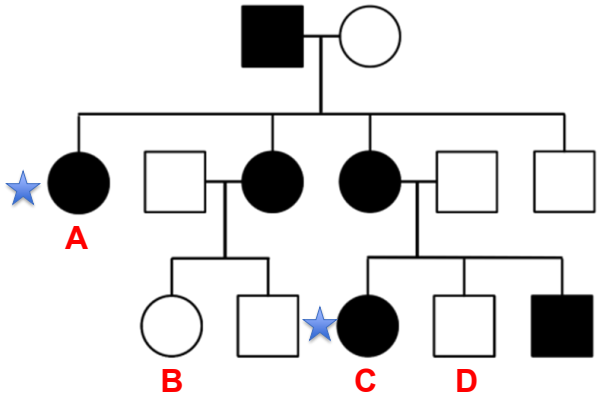
- Among A, B, C, and D, whose children are at risk to develop this disorder?



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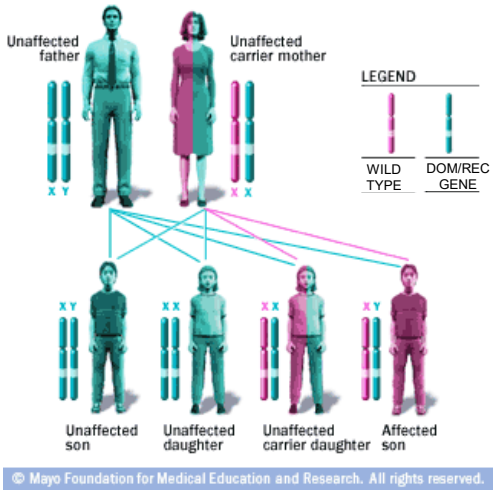
X-Linked

- Gene is on X-chromosome
- Female (XX) carriers (heterozygotes) of some X-linked disorders show symptoms, but usually not as severely affected
- Often see family history of disease
- Offspring: 50% or 1/2 chance that a son will be affected if mother is a carrier. Males (XY) can't pass on to male (XY) offspring



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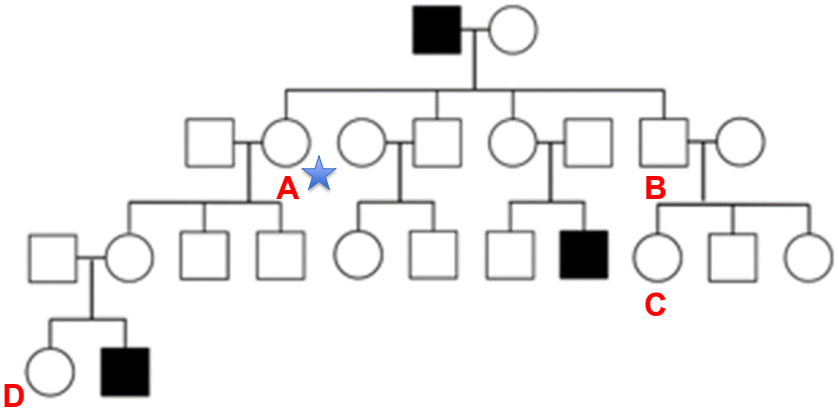
- Who is an obligate carrier?



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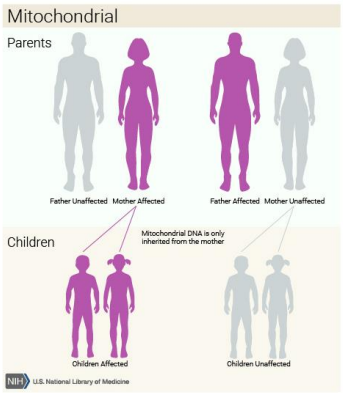
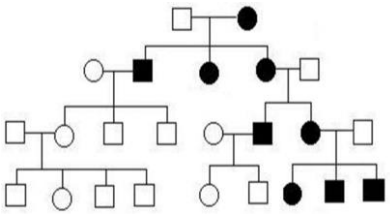
Mitochondrial

- Mitochondria are the "powerhouses" of our cells. There are 100s-1000s of mitochondria in each cell
- mtDNA molecules replicate independently and are not tied to mitotic or meiotic cell division
  - Therefore, mtDNA within cells can be diverse
- All mitochondria are inherited from the oocyte, not the sperm
  - High recurrence risk in offspring of affected/carrier mothers
  - No recurrence risk in offspring of affected/carrier fathers





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Monogenic vs. T1D vs. T2D

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Primary Types of Diabetes

AUTOIMMUNE DESTRUCTION OF PANCREATIC BETA CELLS CHARACTERIZED PRIMARILY BY THE PRESENCE OF ANTIBODIES

HARD TO DEFINE AND IS A DIAGNOSIS OF EXCLUSION, BUT OFTEN SEEN WITH OLDER AGE AND OBESITY CAUSING INSULIN RESISTANCE

DIABETES MANIFESTING SPECIFICALLY IN PREGNANCY, USUALLY NOT UNTIL WEEK 24-28

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Other Types of Diabetes

LADA

AUTOIMMUNE DIABETES (T1D) BUT IN ADULTHOOD, USUALLY SLOWER ONSET THAN CHILDHOOD T1D

A bunch of other specific diabetes caused by other specific issues

CYSTIC FIBROSIS, PANCREATIC INJURY, STEROIDS, DRUGS, TRAUMA, ALCOHOL

Monogenic Diabetes

A GROUP OF DIABETES TYPES CAUSED BY A SINGLE GENE MUTATION, CAN APPEAR TO BE T1D OR T2D SO IT IS VERY SNEAKY. AT LEAST 1/250 PERSONS WITH DIABETES

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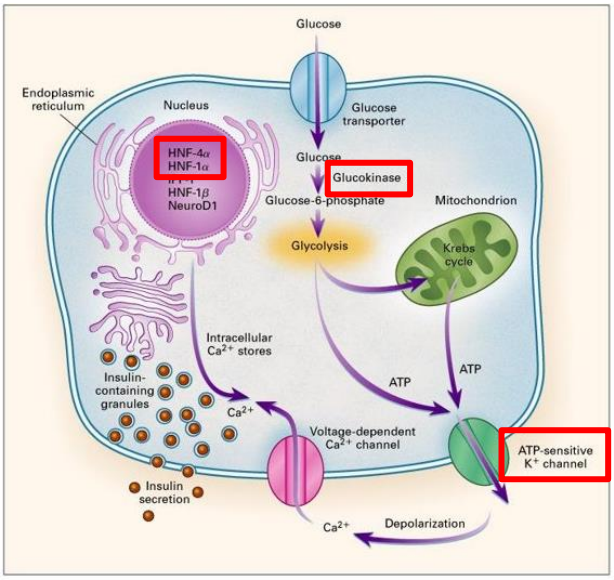
Monogenic Diabetes

Form of diabetes mellitus that is caused by a defect in a single gene
- At least 1/250 cases of all diabetes, greater proportion of young onset cases

- Maturity Onset Diabetes of the Young (MODY)
  - Early-onset, often non-insulin dependent hyperglycemia
  - *Most* cases caused by *HNF1A*, *HNF4A*, or *GCK* variants
  - Autosomal dominant
  - Mostly caused by monogenic defects in β-cell function
- Neonatal diabetes
  - Diagnosed before age 6 months
  - Most cases caused by ATP-sensitive K+ channel (encoded by *ABCC8* & *KCNJ11)* and *INS* variants
  - At least 80% of neonatal diabetes is monogenic
- Syndromic
  - Diabetes is one of many features of a disorder caused by a single gene
  - E.g., Wolfram syndrome, MIDD, IPEX, Wolcott-Rallison, etc.



Fajans et al. NEJM 2001 345:971; PMID: 11575290

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HNF1A + *HNF4A* Monogenic Diabetes

- 2-3 generations of diabetes diagnosed at a young age
  - May appear to be a combination of T1D and T2D
- Often dx before age 30
  - Early teens most common
- Misdiagnosed as T1D or T2D
- Polyuria, polydipsia, weight loss
- Negative antibodies and positive C-peptide
- DKA is rare
- Do well on low dose sulfonylurea. Might even get hypoglycemic from typical dose sulfonylurea.

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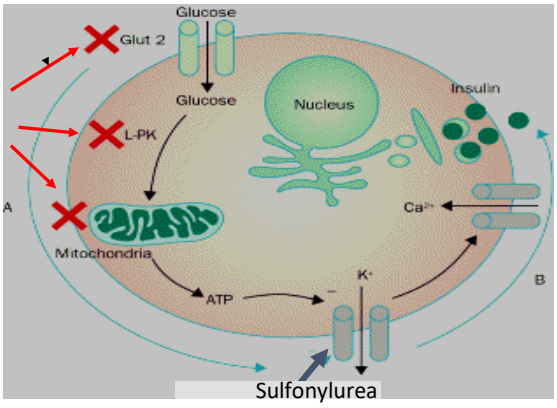
Mechanism for Excellent Response to Sulfonylureas in *HNF1A/HNF4A*

HNF1A/HNF4A defect



Pearson et al. Lancet. 2003 362:1275. PMID: 14575972.

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Slight Difference

HNF1A

Low renal threshold for glucose

Early myocardial infarction risk

Associated with liver adenoma and some risk for adenocarcinoma

HNF4A

Often a higher birth weight in babies who are affected.

Neonatal hypoglycemia

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Aisha

Aisha is a 17 year old with T1D who has come in alone to diabetes education. Her A1c is 14.5%.

She is new to you so you ask her about her diagnosis and family history.

Always ask these 2 questions:

Tell me the story of your diagnosis (how, when)?

Aisha has had diabetes since she was 5 years old and has done much of the management on her own over the years.

Who else in your family has diabetes?

Aisha says her mom has T2D and her dad isn't in the picture. She has an older half brother (maternal side) who also had T1D. Her maternal grandmother has T2D and her maternal grandfather died at age 38, she doesn't know from what.

You are curious about the mixed family history and want to confirm that this is T1D so you ask questions about her management.

- She has used an insulin pump in the past but not for the past couple years. She was annoyed with the alarms.
- She is a bit cagey when it comes to how much insulin she takes every day. She doesn't check her blood sugars, "It always just says 'HI'."
- Upon some further investigation, she has not had her Lantus or Novolog pens filled in over a year. When you ask her about this she admits that she takes the Lantus "maybe 1-2 times per week" and never really takes the Novolog at all.
- She has never been in DKA, her diabetes was found during a work up in childhood for inattention and ADHD. **She says she had hypoglycemia as a baby and they had to put a line into her head to treat it.** She doesn't know any other details.

What about the lab work?

- Antibodies were never drawn when she was diagnosed as a child.
- After discussing the case with her doctor you convince him to get a C Peptide, which is 0.8ng/mL (1.1-4.4ng/mL). He is unphased and says she is "a slow honeymooner."

Aisha clearly doesn't have Type 2 diabetes, and you think it is odd that she would have insulin production so long after her diagnosis of Type 1 diabetes.

So, where do we go from here?

Slide courtesy of Chelsea Kilanowski, BSN RN, CDCES

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Aisha

Aisha's genetic results are back. She has *HNF4A*-MODY.

What should we do with this information? How does it drive treatment?

Aisha isn't taking her insulin almost ever anyway. We can try to transition her to a sulfonylurea (glimepiride, glipizide, glyburide). We will start with the lowest dose and might need to half or quarter the tablet if it is causing lows.

Other considerations?

We don't need to be concerned with early MI or liver adenomas that we might be concerned with in *HNF1A*.

Offer family testing.

Pregnancy? Close monitoring, preparation for baby to be macrosomic/hypoglycemic at birth.

Slide courtesy of Chelsea Kilanowski, BSN RN, CDCES

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GCK-MODY

- Non-progressive hyperglycemia since birth
- Usually asymptomatic
- Diabetes or prediabetes diagnosed after routine lab work
- Not uncommonly first misdiagnosed as GDM
- A1c may slightly increase with age but generally is not expected to ever rise above 8%
- Typically no treatment needed and treatment can usually be discontinued
- GCK can occur with T2D, which itself may require treatment
- Increased prevalence of mild background (non-sight threatening) diabetic retinopathy

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GCK-MODY AND PREGNANCY

- If pre-pregnancy BMI is less than 25 **and** FBG >99mg/dL consider testing for *GCK*
- If known *GCK*:
  - Insulin generally not indicated and not very effective; *may* be needed to prevent macrosomia and related complications ONLY if fetus does NOT inherit *GCK* variant
  - Need to monitor fetal growth carefully if fetal genotype can't be determined because a fetus with the *GCK* variant *needs* higher maternal glucose levels to grow properly and should generally NOT have insulin
  - Treat to fasting glucose normal for *GCK*, not normal in population

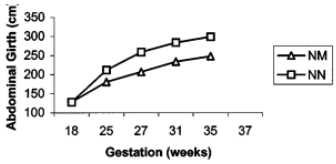

Fig 1. Abdominal girth for child 1 (NM) and child 2 (NN).

Spyer G, Hattersley AT, Sykes JE, Sturley RH, MacLeod KM. Influence of maternal and fetal glucokinase mutations in gestational diabetes. Am J Obstet Gynecol. 2001 Jul;185(1):240-1. doi: 10.1067/mob.2001.113127. PMID: 11483936.

Chakera AJ, Steele AM, Gloyn AL, Shepherd MH, Shields B, Ellard S, Hattersley AT. Recognition and Management of Individuals With Hyperglycemia Because of a Heterozygous Glucokinase Mutation. Diabetes Care. 2015 Jul;38(7):1383-92. doi: 10.2337/dc14-2769. PMID: 26106223

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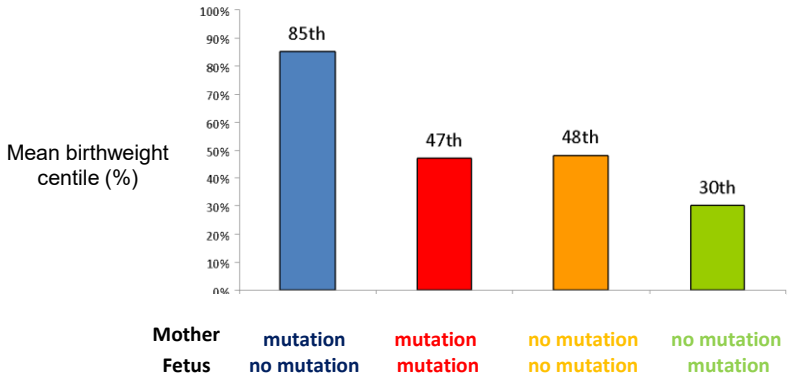
Mean Birth Weight Centile for Pregnancies of a Parent with *GCK-MODY*



Spyer *et al.* Diabetic Medicine 2009 DOI: 10.1111/j.1464-5491.2008.02622.x

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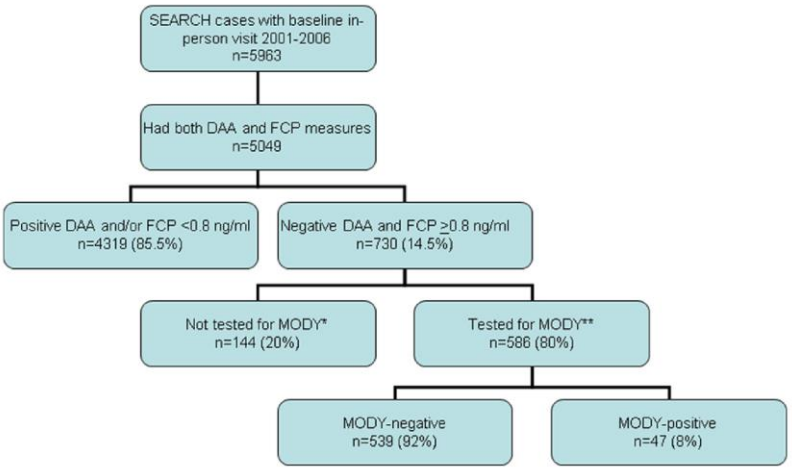
Monogenic Diabetes is Underdiagnosed in the U.S.: THE SEARCH Study



Pihoker et al (2013), *JCEM* 98:4055

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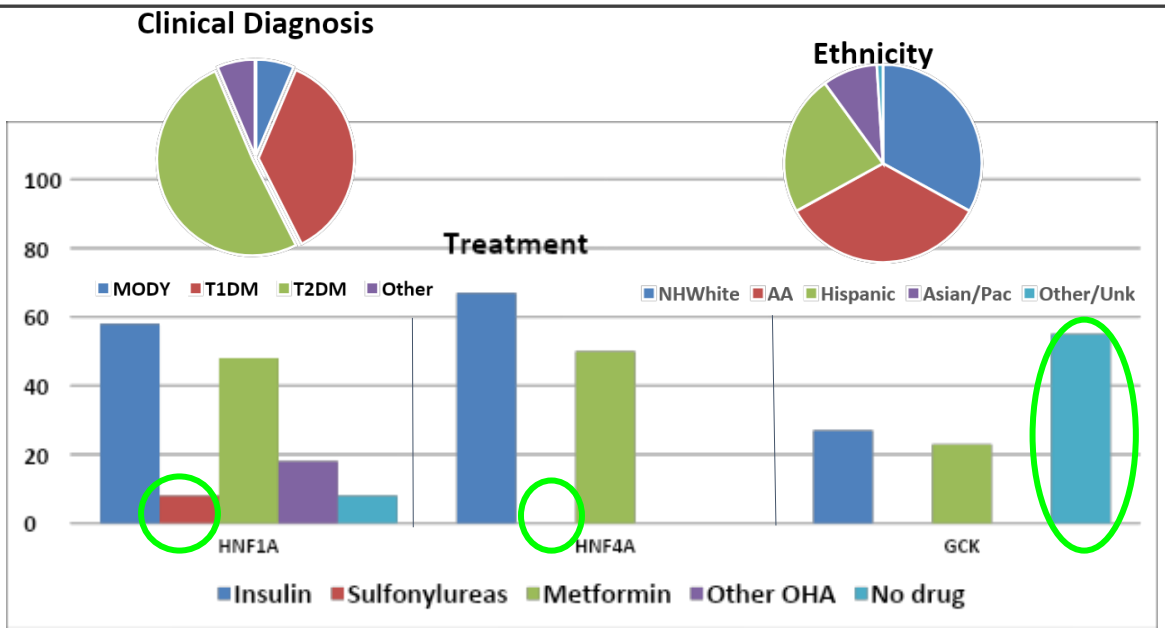
SEARCH Participants with MODY Variant



Adapted from Pihoker et al (2013), *JCEM* 98:4055

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At Least 4.5% (22/488) of Overweight/Obese Youth Diagnosed with T2D have MODY: the TODAY Study

Gene	Sex (age)	Race/ethnicity[a]	Treatment arm[b]	TODAY primary outcome[c]	Amino acid change/site change[d]	ACMG pathogenicity	Previous studies
HNF4A	M (10)	His.	Met. + Ros.	–	p.R64Q	Likely pathogenic	26
HNF4A	F (12)	NHW	Met. + Ros.	+	p.R64fs	Likely pathogenic	Novel
HNF4A	F (13)	NHB	Met.+Life	+	p.Q86X	Pathogenic	Novel
HNF4A	F (13)	His.	Met.+Life	+	p.V105I	Pathogenic	27
HNF4A	F (14)	His.	Met.+Life	+	Splice-site (c.573 +1G > A)	Pathogenic	8
HNF4A	M (16)	His.	Metformin	+	p.R308H	Likely pathogenic	5
HNF4A	F (14)	NHW	Met.+Life	+	p.H365fs	Likely pathogenic	Novel
GCK	M (10)	His.	Met.+Life	–	p.V62M	Pathogenic	28
GCK	F (13)	NHW	Met.+Ros.	–	p.R191W	Likely pathogenic	29
GCK	F (17)	NHW	Met.+Ros.	–	p.T206M	Pathogenic	30
GCK	M (13)	NHW	Met.+Life	–	p.N254H	Likely pathogenic	31
GCK	F (12)	NHW	Metformin	–	p.E265K	Pathogenic	32
GCK	F (13)	NHW	Met.+Life	–	p.R392C	Likely pathogenic	33
GCK	M (13)	NHW	Met.+Life	–	p.S396fs	Likely pathogenic	Novel
HNF1A	M (12)	His.	Metformin	+	p.P112L	Pathogenic	34
HNF1A	F (11)	NHB	Metformin	+	p.R131W	Pathogenic	35
HNF1A	F (12)	NHW	Metformin	–	p.R271Q	Pathogenic	36
HNF1A	M (14)	His.	Met.+Life	+	p.P379A	Pathogenic	37
HNF1A	M (10)	NHW	Met.+Life	–	p.P519L	Pathogenic	35
KLF11	M (16)	His.	Met.+Ros.	+	p.A347S	Pathogenic	38
INS	F (12)	NHB	Metformin	–	p.R6H	Pathogenic	39
INS	M (15)	NHW	Met.+Ros.	–	p.R46Q	Pathogenic	40

Kleinberger, et al., Genetics in Medicine 2017

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John

You see John in the hospital. He is being seen for hyperglycemia and insulin affordability issues. His most recent A1c is 14.2%.

Other than clarifying that he is actually taking his insulin and how often, what questions are you going to ask him?

- Tell me the story of your diagnosis (how, when)?
- Who else in your family has diabetes?

Tell me the story of your diagnosis and how your journey with diabetes has gone since then?

- John was initially diagnosed with diabetes in 1995 when he was *33 years old* and with an A1c of 8.8%. His BMI is usually around 21. He was initially on metformin but quickly became insulin requiring. John's A1c has worsened over the years from 8-9% to 12-14%. He takes his insulin when he feels like he really needs to, otherwise he is rationing it. Within 20 years he had a leg amputation from diabetes, diabetes eye diseases and he also notes that he has was born with a *single kidney*.

Who else in your family has diabetes?

- Positive family history in mom (DM 1) and dad (DM2), He has 3 brothers-one with DM2 and a sister with DM2. He doesn't know about his grandparents and he has a daughter who is 22, but they are estranged and have been since she was a toddler.

What tests will you look for or request?

He is antibody negative and has a C-peptide of 0.8.

What type of diabetes does John likely have?

Slide courtesy of Chelsea Kilanowski, BSN RN, CDCES

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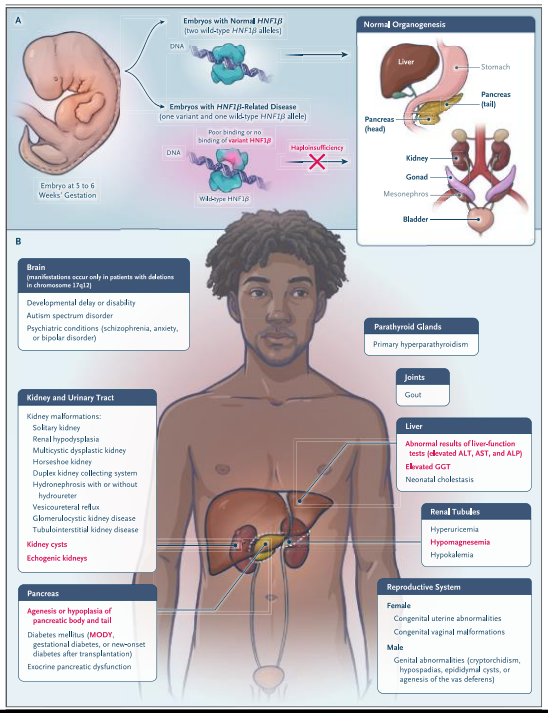
HNF1B- MODY

- AKA RCAD (Renal Cysts and Diabetes Syndrome)
- Results from variants in HNF1B (encodes transcription factor)
- Affects many body systems
- May not have diabetes…or may look like isolated diabetes at first glance
- Renal cysts and congenital urogenital system malformations are frequent
- Diabetes usually requires insulin
- Autosomal dominant inheritance



Vivante A et al (2023) NEJM 389:1993 (PMID: 37991859)

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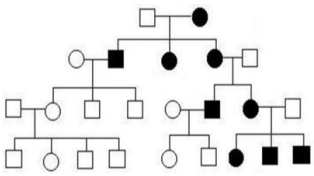
Mitochondrial Diabetes

- AKA Maternally-Inherited Diabetes and Deafness (MIDD)
  - m.3243A>G is most common mtDNA variant
  - Diabetes that frequently requires insulin treatment
  - Sensorineural hearing loss (typically onset is before diabetes)
  - Also at risk for
    - Cardiomyopathy
    - Muscle pain/weakness, exercise intolerance
    - Macular dystrophy
  - All children of a woman with a m.3243A>G variant will also have the variant in at least some percentage of their cells.
    - Genetic testing may not be able to detect the variant
    - Kids should be managed as if they have the variant
  - Children of a man with m.3243A>G are not at risk; their siblings, however, are



Colclough K (2022) Diabetes 2022 71Z:530 (PMID: 34789499)

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Neonatal Diabetes

- Diabetes mellitus occurring within 6 months of birth
- Autoimmune type 1 diabetes is rare in the neonatal period
- At least 80% of neonatal diabetes is monogenic
  - *Nearly 50% of these are due to variants in the genes KCNJ11 and ABCC8 encoding the subunits of the ATP-sensitive potassium (K_{ATP}) channel and are usually treatable with oral sulfonylureas with no insulin injections required*
- Autoantibody negative diabetes with onset between 6 and 12 months is also likely to be monogenic
- Rare: ~1/100,000 births
- May be permanent (PNDM) or transient (TNDM)
- TNDM risk factor for later diabetes recurrence
- May be isolated or syndromic

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Summary of Treatment Implications of a Monogenic Diabetes Diagnosis

- *HNF1A*- and *HNF4A*- MODY: Usually can be managed well with *low dose sulfonylureas without insulin injections*
- GCK-MODY/hyperglycemia: Usually *does not require treatment*
- *HNF1B*-MODY*/ RCAD:* Usually requires *insulin but surveillance for renal and other extra-pancreatic features should be considered*
- K_{ATP} *(KCNJ11/ABCC8)* monogenic diabetes (usually neonatal): Usually can be managed well with *high dose sulfonylureas without insulin injections*

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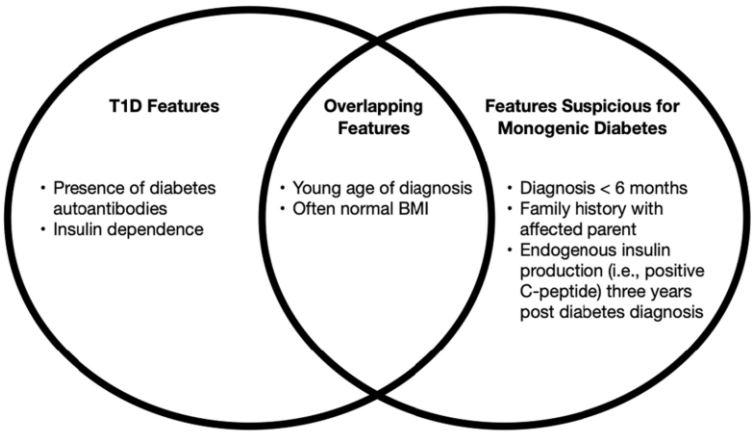
Challenges

- **Lack of provider/consumer/payer awareness**
- **Clinical overlap**
- **Notion that "rare means never"**
- **Life-chang[illegible]vs. life-sa**
- **Expe[illegible]mplexity of**
- **Resource prioritization**
- **Limited professional society guidance**
- **Time allotted to visits**

55

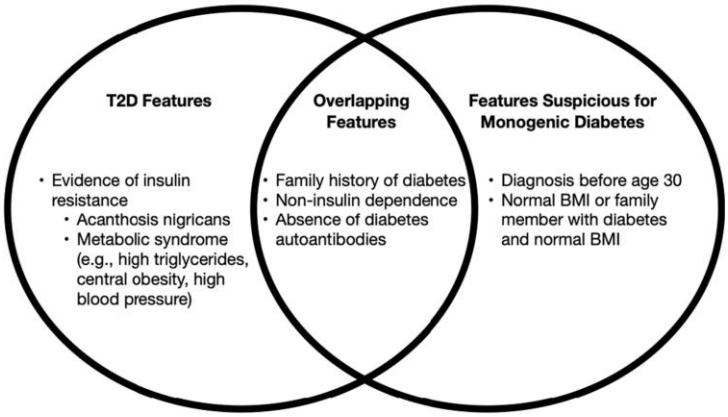
Overlapping and Unique Features of T1D and Monogenic Diabetes



Maloney et al. (2023) Journal of Genetic Counseling, DOI: (10.1002/jgc4.1744)

56

Overlapping and Unique Features of T2D and Monogenic Diabetes



Maloney et al. (2023) Journal of Genetic Counseling, DOI: (10.1002/jgc4.1744)

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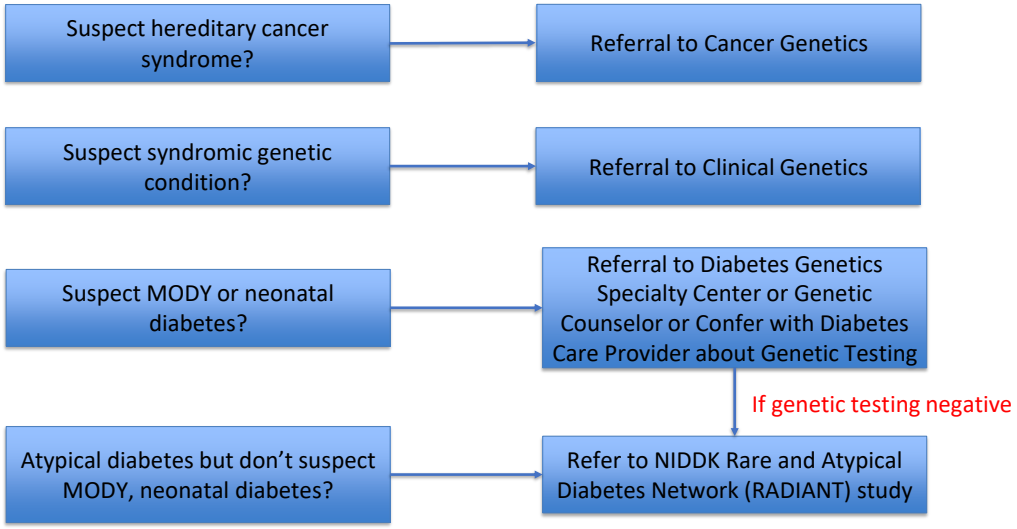
Significance of a Correct Diagnosis

- More optimal therapy
- Preventing or delaying complications
- Explanation of other associated clinical features
- Prediction of clinical course
- Decreased health care costs
- Diagnosis of family members
- Improved quality of life
  - e.g. 4 shots of insulin/day vs. oral therapy or even NO therapy
- May avoid stigma

NEED GENETIC TESTING

58

What to Do if Your Patient Has Monogenic or Atypical Diabetes



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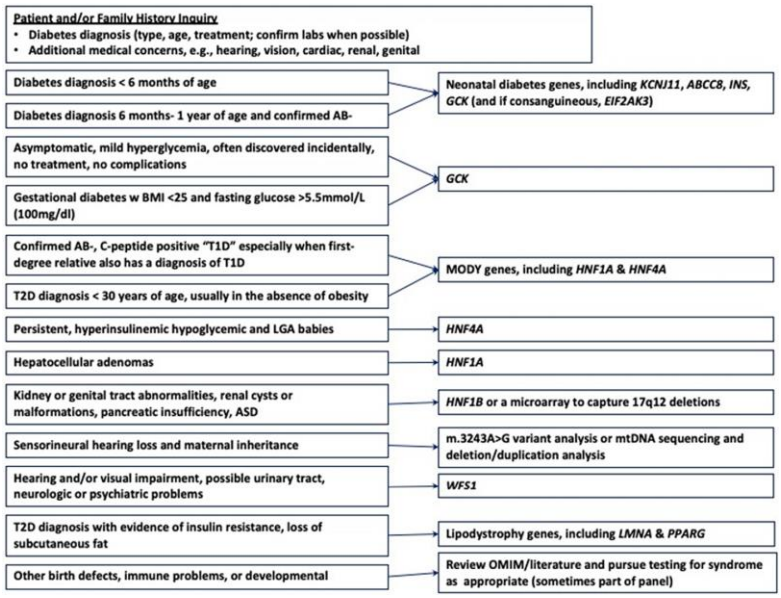
Genetic counseling in diabetes mellitus: A practice resource of the National Society of Genetic Counselors



Maloney et al. (2023) Journal of Genetic Counseling, DOI: (10.1002/jgc4.1744)

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Resources

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General Process of Genetic Testing

- Obtain informed consent
  - Risks, benefits, Genetic Information Nondiscrimination Act (GINA)
- Online test requisition
  - **UPLOAD CLINICAL INFORMATION**
    - Not just ICD-10 codes
    - Clinic note that specifically states why monogenic diabetes is suspected
      - Example: negative antibodies, positive C-peptide, family history (pedigree), treatment info, misc. features (hearing loss, etc.)
- Collect sample (buccal swab or blood – request test kit from lab, send via FedEx)
  - Kit can also be sent directly to patient's home
- Monogenic diabetes panel testing usually takes about 4-6 weeks

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General Process of Genetic Testing

- Decide most appropriate test based on clinical symptoms and patient insurance
  - Prior authorization may be required
- Possible options for genetic testing
  - Ambry Genetics: https://www.ambrygen.com/providers/genetic-testing/50/exome-and-general-genetics/maturity-onset-diabetes-of-the-young-mody
  - Athena: https://www.athenadiagnostics.com/view-full-catalog/monogenic-diabetes-mody-five-gene-evaluation-gckhnf1ahnf1bhnf4aipf11
  - GeneDx: https://providers.genedx.com/tests/detail/maturity-onset-diabetes-of-the-young-mody-panel-870
  - Invitae: https://www.invitae.com/us/providers/test-catalog/test-55001
  - Prevention Genetics: https://www.preventiongenetics.com/testInfo?val=Maturity-Onset-Diabetes-of-the-Young-%28MODY%29-Panel
  - University of Chicago: https://dnatesting.uchicago.edu/tests/monogenic-diabetes-panel

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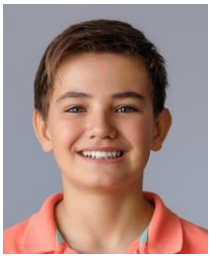
Genetic Test Outcomes

- Positive
  - Pathogenic or likely pathogenic variant ("mutation")
  - Consistent with a diagnosis
- Variant of unknown significance
  - Not enough evidence to conclude a variant is or is not causing disease
  - Changes in medical management are generally NOT recommended because a variant could be reclassified as benign
  - ClinGen's Monogenic Diabetes Expert Panel (MDEP) may be able to help clarify VUS results https://clinicalgenome.org/affiliation/50016/
- Negative
  - No variants that differ from reference genome detected in genes assessed
  - Benign or likely benign variants (usually not included on report) in genes assessed

64



Carson

Carson is 12 and seen in the clinic with his mom and dad and 8 year old sister.

He is an urgent referral with new T1D.

His fasting blood sugar was 128mg/dL at his sports physical. A follow up 1 hour oGTT has him at 204mg/dL. He is otherwise asymptomatic.

His pediatrician wants him to start 5 units of Lantus today.

Who else in your family has diabetes?

No one else in Carson's family has diabetes except for his paternal grandpa, who has prediabetes. His parents are very concerned.

- **What labs do you request?**

  Antibodies

  C-Peptide isn't needed at this point but could be done

  Also a 2 week CGM
- Antibodies are negative and 2 week CGM is back.
- Because of insurance issues, holiday hours and the busy-ness of life, his parents just picked up his insulin yesterday.

Slide courtesy of Chelsea Kilanowski, BSN RN, CDCES

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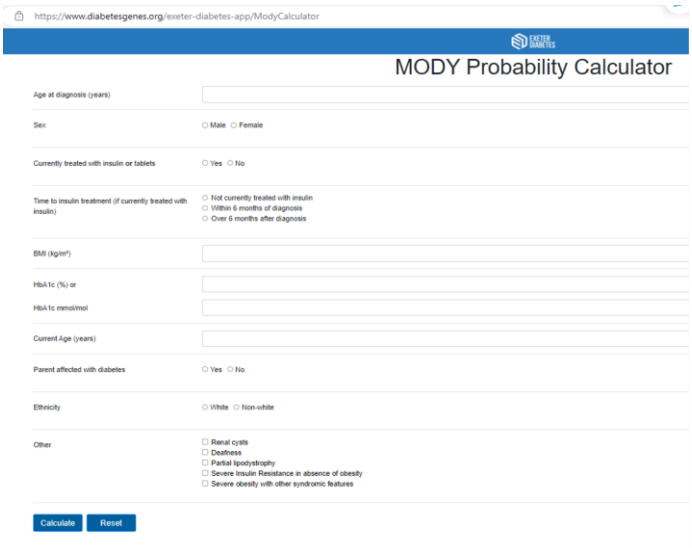
With So Many Types of Diabetes, Wouldn't it be Nice if There Was a Tool to Help Us?



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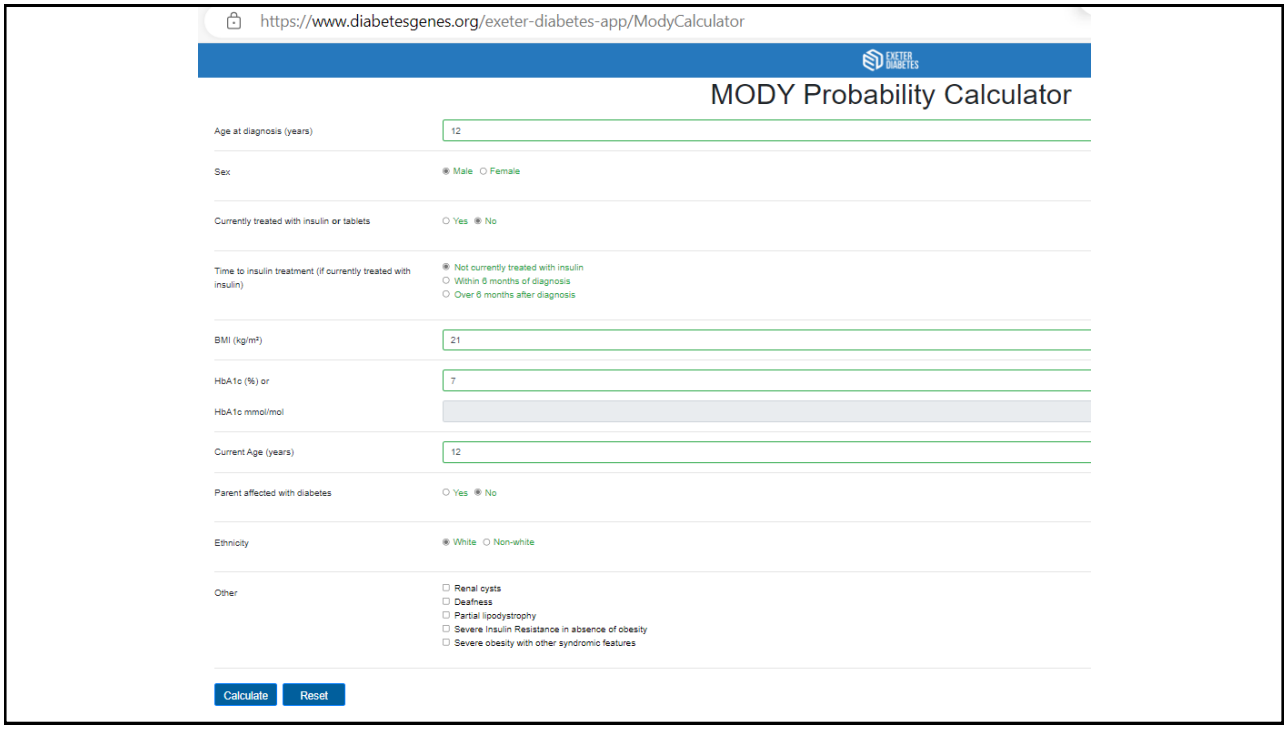
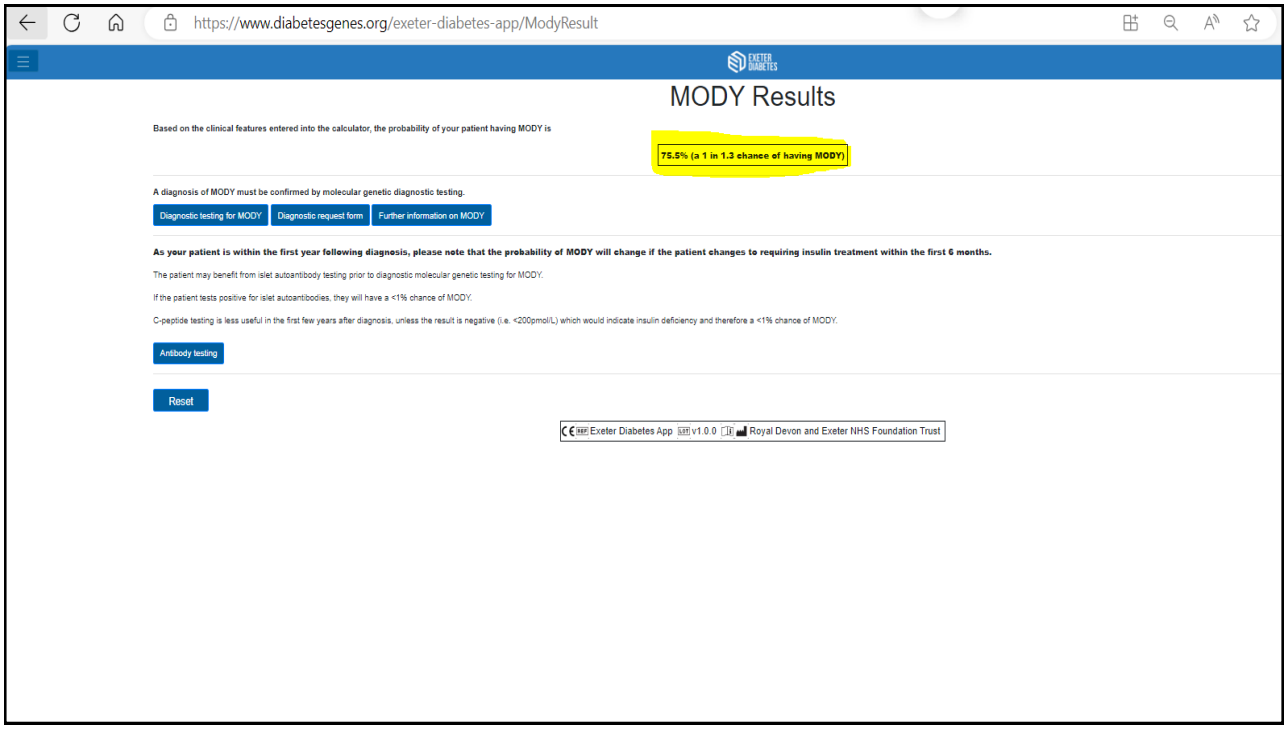
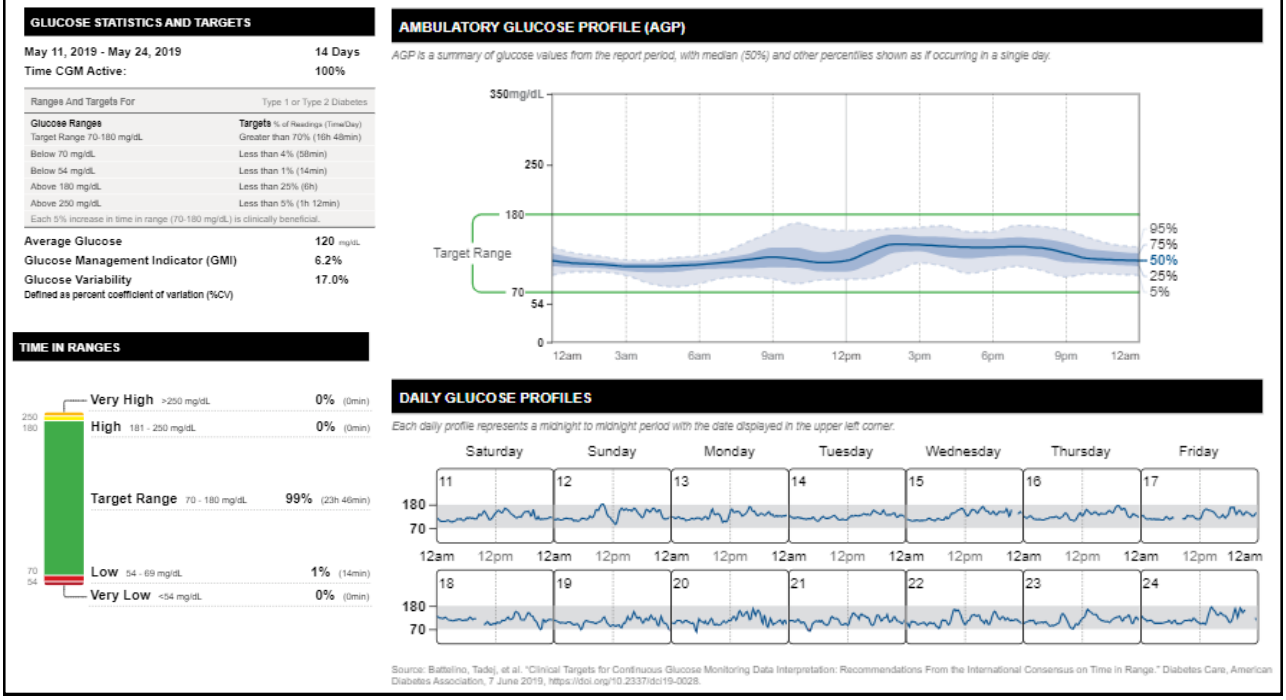

https://www.diabetesgenes.org/exeter-diabetes-app/ModyCalculator
EXETER DIABETES
MODY Probability Calculator
Age at diagnosis (years)
12
Sex
Male
Female
Currently treated with insulin or tablets
Yes
No
Time to insulin treatment (if currently treated with insulin)
Not currently treated with insulin
Within 6 months of diagnosis
Over 6 months after diagnosis
BMI (kg/m²)
21
HbA1c (%) or
7
HbA1c mmol/mol
Current Age (years)
12
Parent affected with diabetes
Yes
No
Ethnicity
White
Non-white
Other
Renal cysts
Deafness
Partial lipodystrophy
Severe Insulin Resistance in absence of obesity
Severe obesity with other syndromic features
Calculate
Reset

67


https://www.diabetesgenes.org/exeter-diabetes-app/ModyResult
EXETER DIABETES
MODY Results
Based on the clinical features entered into the calculator, the probability of your patient having MODY is
75.5% (a 1 in 1.3 chance of having MODY)
A diagnosis of MODY must be confirmed by molecular genetic diagnostic testing.
Diagnostic testing for MODY
Diagnostic request form
Further information on MODY
As your patient is within the first year following diagnosis, please note that the probability of MODY will change if the patient changes to requiring insulin treatment within the first 6 months.
The patient may benefit from islet autoantibody testing prior to diagnostic molecular genetic testing for MODY.
If the patient tests positive for islet autoantibodies, they will have a <1% chance of MODY.
C-peptide testing is less useful in the first few years after diagnosis, unless the result is negative (i.e. <200pmol/L) which would indicate insulin deficiency and therefore a <1% chance of MODY.
Antibody testing
Reset
Exeter Diabetes App v1.0.0
Royal Devon and Exeter NHS Foundation Trust

68



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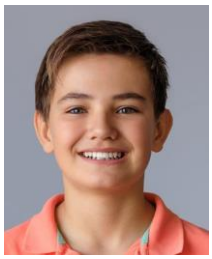

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No one else in Carson's family has diabetes except for his paternal grandpa, who has prediabetes. His parents are very concerned.

- What labs do you request?
  - Antibodies
  - C-Peptide isn't needed at this point but could be done
  - CGM
- Antibodies are negative and 2 week CGM is back.
- Because of insurance issues, holiday hours and the busy-ness of life, his parents just picked up his insulin yesterday.
- Those tracings don't look like Type 1 diabetes. Especially with no insulin. That said, it doesn't look quite normal either with a high glycemic baseline.
- **Now what?**

Slide courtesy of Chelsea Kilanowski, BSN RN, CDCES

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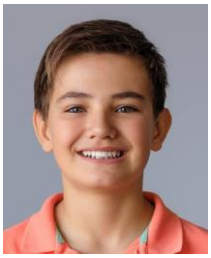

Carson

Send Carson to genetics for testing.

He has a *GCK* mutation.

What should we do with this information? How does it drive treatment?

Advocate for discontinuation of insulin

Other considerations?

Offer family testing.

Healthy lifestyle.

Consider yearly eye exams starting around middle age.

Family planning?

Slide courtesy of Chelsea Kilanowski, BSN RN, CDCES

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Aisha

Slide courtesy of Chelsea Kilanowski, BSN RN, CDCES

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Margie

Initially diagnosed with diabetes in 2002 with an A1c of 8.9%. Diagnosed with T2D and started on metformin with lifestyle changes.

Medicare visit in 2016, Margie is active, BMI is 26, she is still on metformin but her A1c 7.6. Doctor advised better adherence.

3 months later Margie's A1c is 8.8. Doctor sends referral to diabetes ed.

Do we agree with the diagnosis?

- Yes, BUT Margie doesn't appear insulin resistant. She is lean, fairly muscular, and thin.

Tell me the story of your diagnosis (how, when)?

Who else in your family has diabetes?

- T1D in father **and** daughter. She has taken her diagnosis of T2D seriously and has lost 30 pounds in the past 2 years, intentionally, but still her A1c rose to 8.8%.
- There is a **fair amount of other autoimmune disorders in her family**. There is no T2D in her family.
- Weight loss, diabetes history and autoimmunity in family. Now we start to wonder if the diagnosis is correct. Plus 3 generations of diabetes, could it be MODY?

What labs should be requested?

- Antibody testing
- C Peptide

  GAD 2.27, IA-2 0.0, C-Pep 250pmol/L (200-600pmol/L)

Slide courtesy of Chelsea Kilanowski, BSN RN, CDCES

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Margie

What is the diagnosis?

Type 1 diabetes (sometimes called latent autoimmune diabetes of adulthood, or LADA, when occurring in adulthood)

How does that change her treatment?

Stop orals, start insulin (later her C-peptide dropped to 20pmol/L)

Sometimes atypical diabetes ends up being T1D or T2D. The important part is knowing how to think through it and what to do if the person you are working with has an atypical presentation.

Slide courtesy of Chelsea Kilanowski, BSN RN, CDCES

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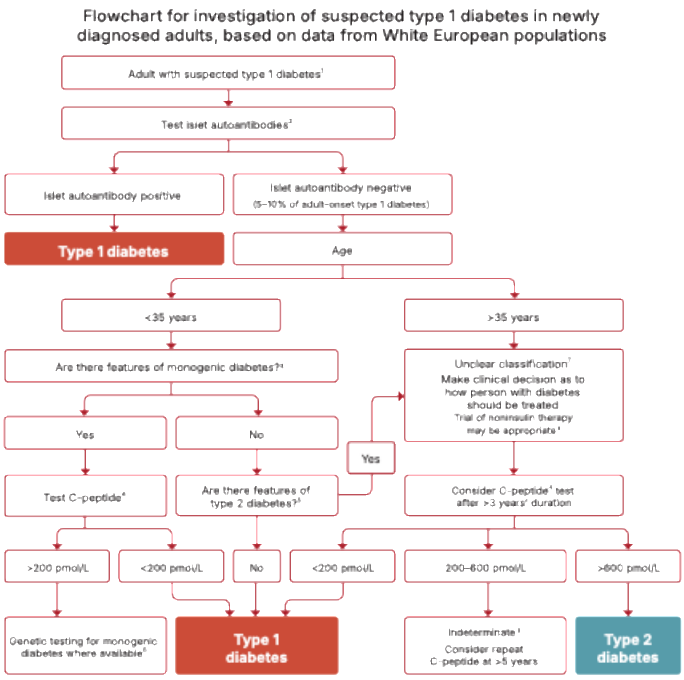

American Diabetes Association Professional Practice Committee. 2. Diagnosis and Classification of Diabetes: Standards of Care in Diabetes-2025. Diabetes Care. 2025 Jan 1;48(1 Suppl 1):S27-S49. doi: 10.2337/dc25-S002. PMID: 39651986; PMCID: PMC11635041.

75

What is genetic counseling?

- A genetic counselor is someone who helps people who are dealing with genetic conditions
- Genetic counseling combines two disciplines:
- MEDICAL GENETICS and PSYCHOLOGY

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More specifically…

- Genetic counselors help people understand the genetic contribution to disease
  - Analyze family and medical histories to assess inheritance patterns
  - Provide education about inheritance, testing, management and prevention
  - Counsel patients about medical and psychological implications of genetic conditions
- Genetic counselors also serve as educators for the public, medical students, support groups, etc.

NSGC Task Force. 2006. J Gen Couns 15: 77-83

77

Genetic Counseling for Monogenic Diabetes

- Obtain a detailed family medical history
- Anticipatory guidance
- Obtain informed consent
- Implications for family members
- Results discussion
- Fear, anxiety, excitement, relief, bitterness, difficulty "letting go"

FORUM

'I don't feel like a diabetic any more': the impact of stopping insulin in patients with maturity onset diabetes of the young following genetic testing

Maggie Shepherd and Andrew T Hattersley

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https://monogenicdiabetes.uchicago.edu/

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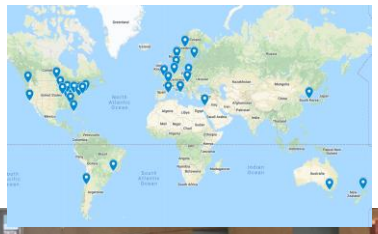
Monogenic Diabetes Expert Panels

- Gene curation expert panel: Is there evidence that a GENE can cause monogenic diabetes?
- Variant curation expert panel: What is the evidence that a VARIANT in a monogenic diabetes gene *actually* causes disease?



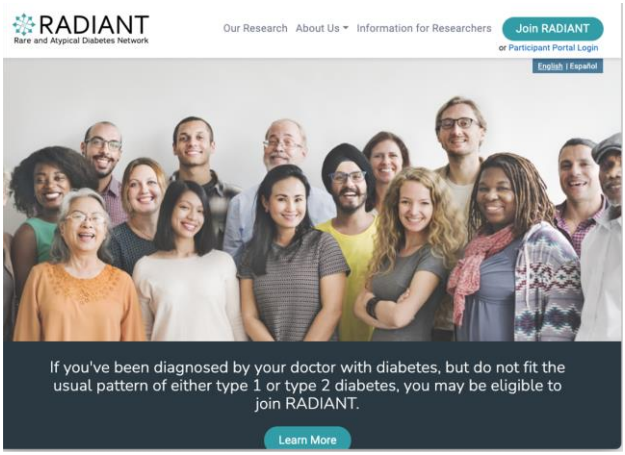
CONTACT US if your patient has a variant of uncertain significance (VUS) on clinical genetic testing!

https://clinicalgenome.org/affiliation/50016/ https://clinicalgenome.org/affiliation/40016/

80

RADIANT: A Next Step in Advancing Precision Medicine

- Objective: To define new forms of diabetes and the unique mechanisms underlying these forms of atypical diabetes
- Seeking patients with atypical diabetes of unknown etiology
- Genome and transcriptome sequencing, metabolomics and deep phenotyping



https://www.atypicaldiabetesnetwork.org/

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Links

- **Genetic counseling in diabetes mellitus: A practice resource of the National Society of Genetic Counselors**
  - **https://onlinelibrary.wiley.com/doi/10.1002/jgc4.1744**
- **Precision Medicine in Diabetes Initiative**
  - **https://www.nature.com/articles/s41591-023-02502-5**
  - **https://www.nature.com/articles/s43856-023-00369-8**
  - **https://medrxiv.org/content/10.1101/2023.05.12.23289807v2**
  - **https://www.nature.com/articles/s43856-023-00368-9**

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- Zhang, H., Colclough, K., Gloyn, A. L., & Pollin, T. I. (2021). Monogenic diabetes: a gateway to precision medicine in diabetes. *The Journal of clinical investigation*, *131*(3), e142244.

- For links to more info: Monogenic Diabetes Research and Advocacy Consortium https://mdrac.org

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QUESTIONS?

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tpollin@som.umaryland.edu

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Diabetes Care Summit

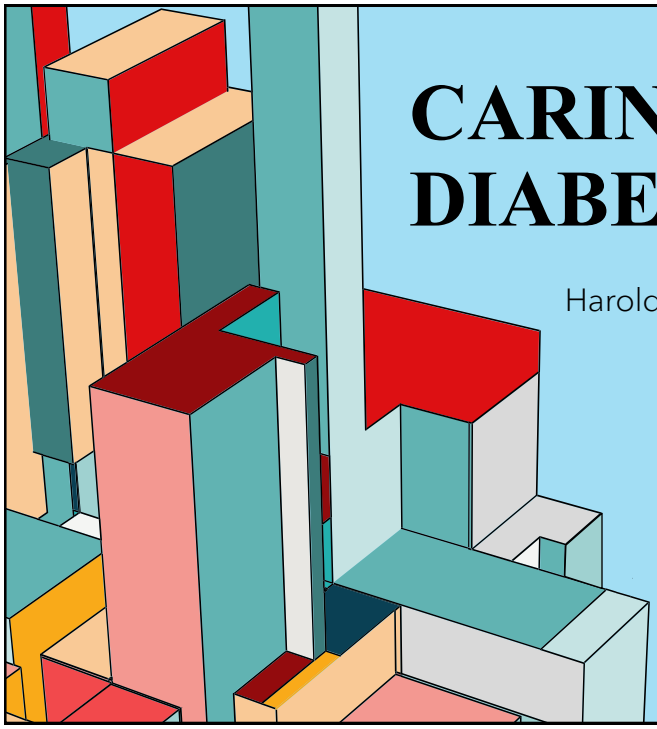
OU Health | Harold Hamm Diabetes Center

ADCES Association of Diabetes Care & Education Specialists

Presentation

Caring for the Diabetic Foot

Trent Wallace, DPM, DABPM



CARING FOR THE DIABETIC FOOT

Harold Hamm Diabetes Center Summit 2025

Trent Wallace DPM, DABPM

Central Oklahoma Foot and Ankle
105 S Bryant Ave, Suite 407
Edmond, OK 73034

(405)359-5206
(405)271-2750

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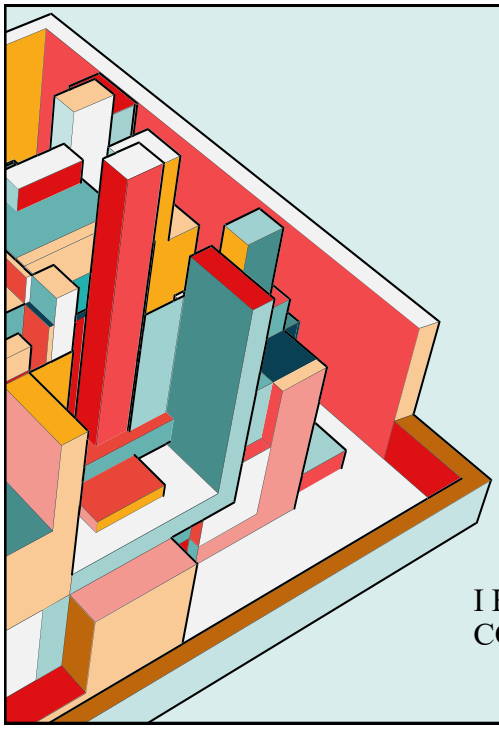


Learning objectives:

- Diabetic statistics and demographics
- Problematic areas:
  - Circulation
  - Sensitivity
- Amputation statistics
- ADA and APMA recommendations
- Diabetic Education
- Proper shoegear
- Important consults

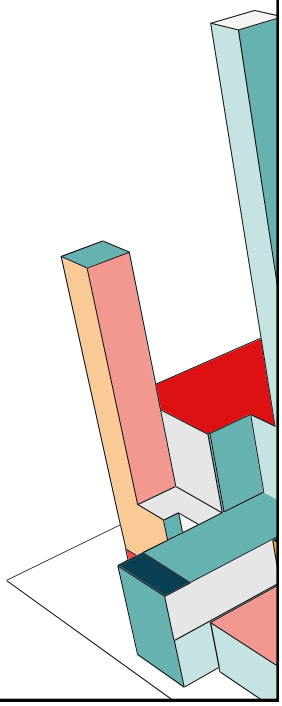
I HAVE NO FINANCIAL RELATIONSHIPS OR CONFLICTS TO DISCLOSE RELATED TO THIS TOPIC

2

A LITTLE BIT ABOUT ME...

- Ada High School
- Oklahoma State University
  - Physiology
- California School of Podiatric Medicine
- West Houston Medical Center- Residency
- OU Health- Central Oklahoma Foot and Ankle
  - 105 S Bryant Ave, Suite 407
    Edmond, OK 73034

    (405)359-5206
    (405)271-2750



3

3

DIABETES STATISTICS

Worldwide

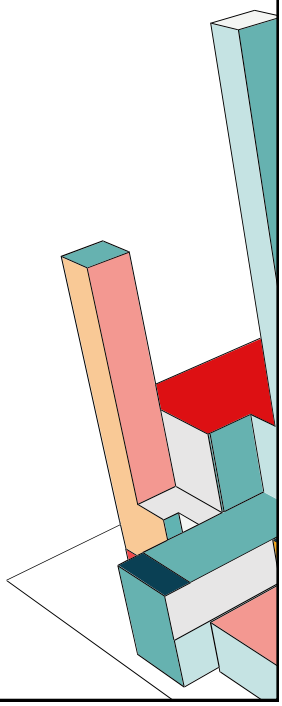
- 589 million Adults with diabetes worldwide
  - 853 million Adults predicted to have diabetes by 2050
  - 252 million people with diabetes undiagnosed
- 3.4 million deaths due to diabetes in 2024

https://idf.org/about-diabetes/diabetes-facts-figures/

National

-In 2021, 38.4 million Americans, or 11.6% of the population, had diabetes
-$412.9 billion: Total cost of diagnosed diabetes in the United States in 2022

https://diabetes.org/about-diabetes/statistics/about-diabetes



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4

DIABETES STATISTICS

Oklahoma

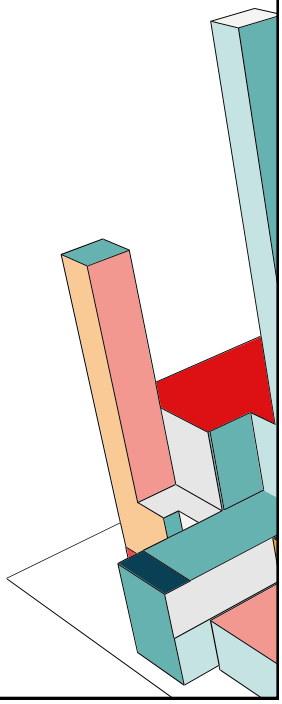
-In 2023, 12.4% of Oklahoma adults had been diagnosed with diabetes. This is higher than the US total of 11.5%

-The death rate for diabetes is higher in Oklahoma than in the U.S.

https://oklahoma.gov/health/health-education

-In Oklahoma, diagnosed diabetes costs an estimated $5.2 billion each year

https://diabetes.org/sites/default/files/2025-05/the-burden-of-diabetes-oklahoma-05-08-25.pdf



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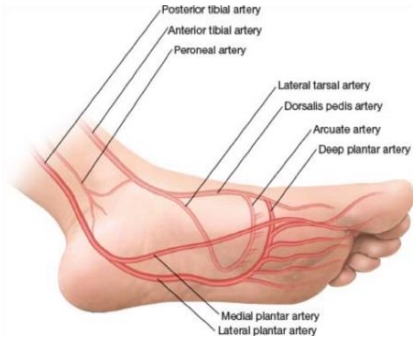
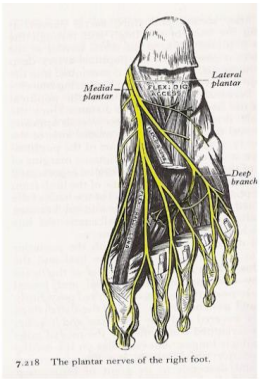
WHY DO WE WORRY ABOUT THE DIABETIC FOOT?

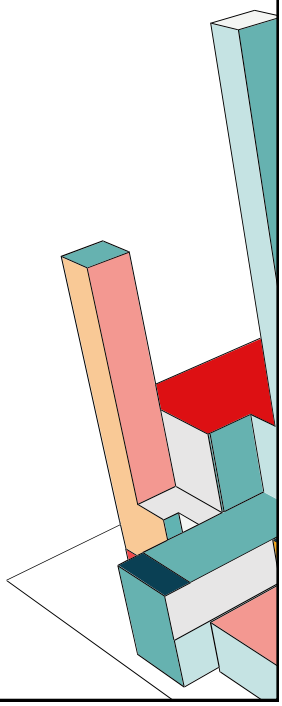
-WHY DO DIABETICS HAVE TO BE EXTRA CAREFUL?

- Circulation



-Sensation





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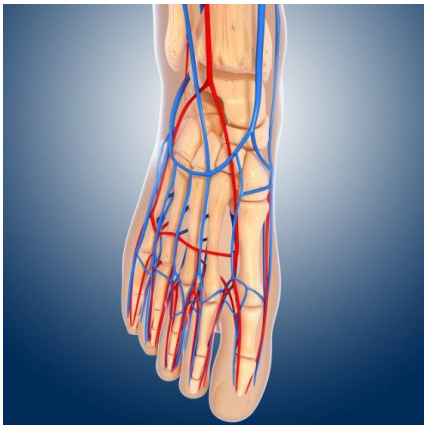
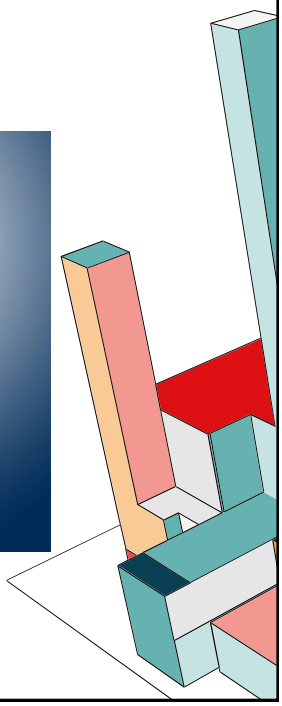
6

PEDAL CIRCULATION

- Edema
- Venous ulcers
- Arterial ulcers
- Poor/delayed healing



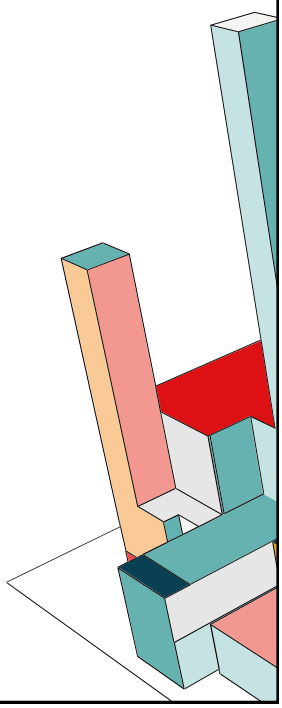


7

7

NERVES/SENSATION

- Insensate foot
- Parasympathetic foot
- Neuropathic pain
- Charcot Neuroarthopathy



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8

NEUROPATHIC PAIN

- Testing
  - Semmes-Weinstein monofilament test and or EMG/NCV
  - Clinical exam
- Treatment
  - Gabapentin- must be dosed correctly
  - Lyrica (pregabalin) and Cymbalta (duloxetine)
  - Qutenza (capsaicin 8% topical)
- Neurology and/or Pain Management consults
  - Nerve stimulators

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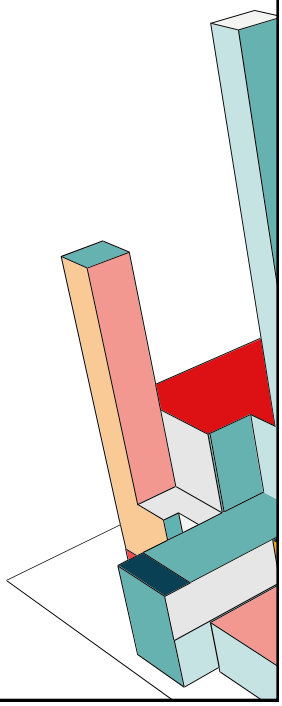
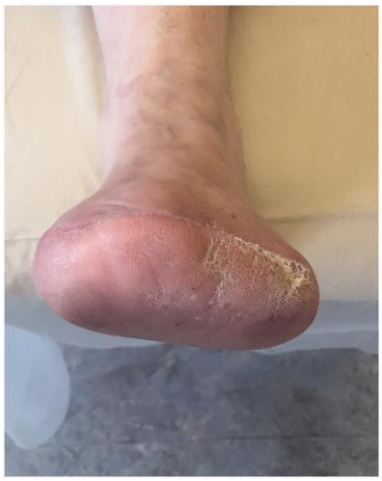


9

AMPUTATION

- Every 3 minutes and 30 seconds in the United States, a limb is amputated due to diabetes
- 80% of non-traumatic lower limb amputations happen due to diabetes complications
  - https://diabetes.org/advocacy/amputation-prevention-alliance



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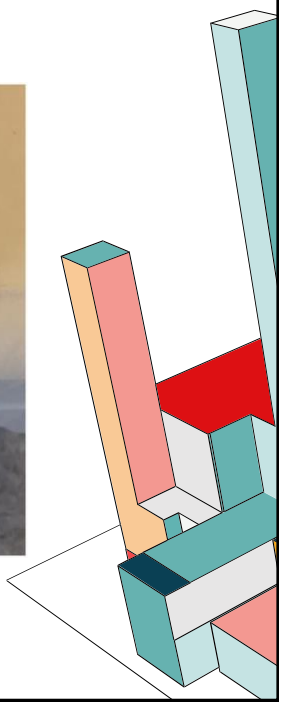


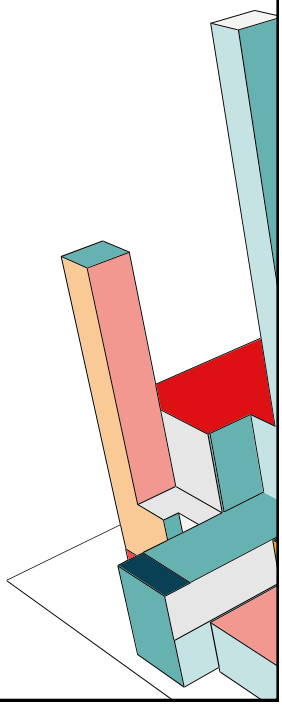
10

HOW WE CARE FOR DIABETIC FEET

- American Diabetes Association

Category	Ulcer risk	Characteristics	Examination frequency*
0	Very low	No LOPS and no PAD	Annually
1	Low	LOPS or PAD	Every 6–12 months
2	Moderate	LOPS + PAD, or LOPS + foot deformity, or PAD + foot deformity	Every 3–6 months
3	High	LOPS or PAD and one or more of the following: • History of foot ulcer • Amputation (minor or major) • End-stage renal disease	Every 1–3 months

https://diabetesjournals.org/care/article/48/Supplement_1/S252/157552/12-Retinopathy-Neuropathy-and-Foot-Care-Standards



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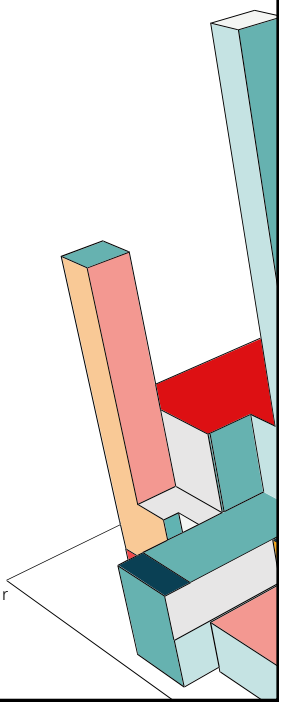
11

HOW WE CARE FOR DIABETIC FEET

- American Podiatric Medical Association
- Inspect feet daily. Check your feet and toes every day for cuts, bruises, sores, or changes to the toenails, such as thickening or discoloration.
- Wear thick, soft socks. Avoid socks with seams, which could rub and cause blisters or other skin injuries.
- Exercise. Walking can keep weight down and improve circulation. Be sure to wear appropriate athletic shoes when exercising.
- Have new shoes properly measured and fitted. Foot size and shape may change over time. Shoes that fit properly are important to those with diabetes.
- Don't go barefoot. Don't go without shoes, even in your own home. The risk of cuts and infection is too great for those with diabetes.
- Never try to remove calluses, corns, or warts by yourself. Over-the-counter products can burn the skin and cause irreparable damage to the foot for people with diabetes.
- See today's podiatrist. Regular checkups by a podiatrist—at least annually—are the best way to ensure that your feet remain healthy.

https://www.apma.org/patients-and-the-public/diabetes-awareness/



12

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ROUTINE DIABETIC FOOTCARE

- Thick and/or mycotic toenails
  - Can lead to painful or ingrown toenails if not cared for
  - Debrided with sterile nippers
- Hyperkeratotic areas (calluses)
  - Naturally present to protect pressure points but can present problems if too thick/deep
  - Debrided with sterile scalpel
- Skin fissures
  - Can lead to infections
  - Debrided with sterile scalpel

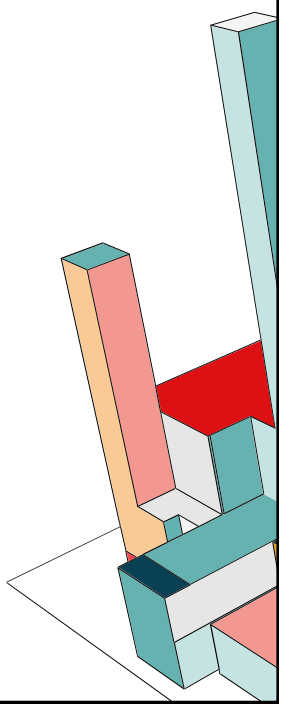
13

13

FUNGAL INFECTIONS OF SKIN AND NAILS

- Toenail fungus
  - Diagnosed by nail sample/stain
  - Extremely common especially at increased age
  - Can make nails hard to trim
  - Antifungals
    - Oral- Terbinafine
    - Topical- Jublia (eficonazole), Kerydin (tavaborole), Penlac (ciclopirox)
- Skin fungus (tinea pedis)
  - Antifungals
    - Topical- Terbinafine 1%
    - Oral- Terbinafine or griseofulvin

14



14

EDUCATION

- Glucose control

- Diet

15

15

PROPER SHOE GEAR

- Diabetic shoes
  - Properly sized/fitted
  - Correct support
  - Pressure-reducing materials
  - Customizable
  - Modifiable

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IMPORTANT DIABETIC CONSULTS

- Vascular
  - Check arterial and venous flow and try to improve it
  - Edema control- compression
  - Revascularize

Neurology
- EMG/NCV testing
- Neuropathic pain
- Stimulators

17

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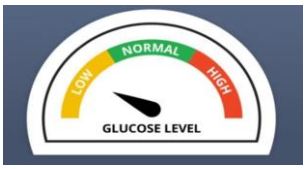
IMPORTANT DIABETIC CONSULTS

- Endocrinology
  - Pretty obvious
- Renal
  - Diabetic nephropathy
- Opthalmology
  - Diabetic retinopathy
  - Diabetic macular edema
  - Cataracts
  - Glaucoma



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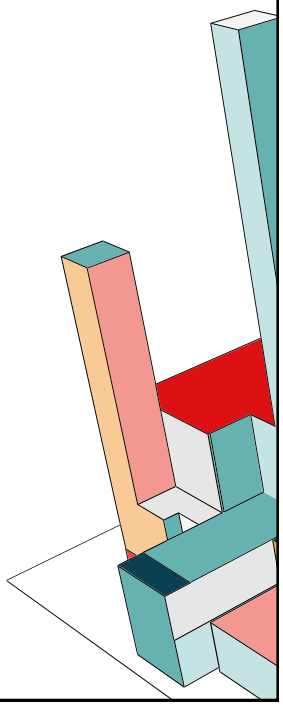
QUESTIONS?



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THANK YOU

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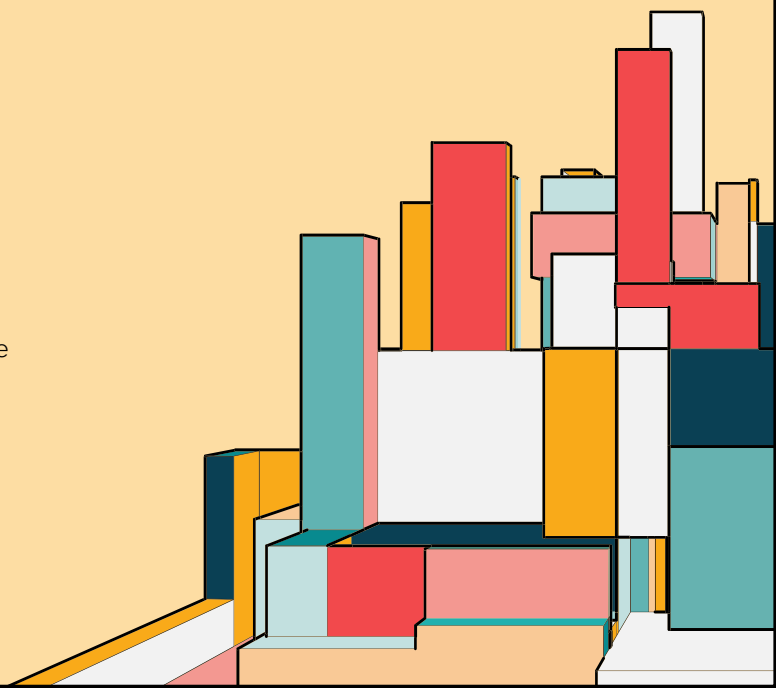


20

Diabetes Care Summit

OU Health | Harold Hamm Diabetes Center

ADCES Association of Diabetes Care & Education Specialists

Keynote Presentation

Binge Eating and Diabetes: Understanding the Overlap and Supporting Recovery

Krystal Dunham, MS, RDN, LD

Binge Eating and Diabetes:

Clinical Complexities, GLP-1s, and Interdisciplinary Interventions

Krystal Dunham, MS, RDN, LD | September 5, 2025

1

Disclosures

No financial disclosures

2

Learning Objectives

After the presentation, attendees should be able to:

1. Recognize the prevalence, clinical impact, and bidirectional relationship between diabetes and Binge Eating Disorder (BED).
2. Apply evidence-based tools and strategies to screen for and identify BED in individuals with diabetes.
3. Implement practical, interdisciplinary approaches for managing BED in diabetes care including using GLP-1 receptor agonists to support nutrition interventions.

3

Words on Language

- Use language that is neutral, non-judgmental, and based on facts, actions and physiology/biology
- Avoid stigma including weight-stigma
- Use language that is strengths-based, respectful, inclusive, and imparts hope
- Fosters collaboration between patients and health care professionals
- Use language that is client-centered

2. Association of Diabetes Care & Education Specialists. 33-24_Language guidance tip sheet-3. Published online 2024.

4

Individuals with T2D,

experience BED

10x

higher than the general population

One study found that

35%

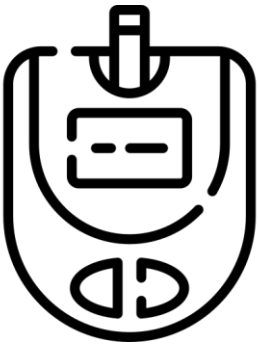
of T2D patients surveyed were at high risk for developing an eating disorder

4. Bottari A, La Giglia F, Magrì R, Marletta L, Prezzavento GC. Bidirectional Relationships between Eating Disorders and Type 1 and 2 Diabetes: A Scoping Review. Psychology International. 2024;6(3):685-694. doi:10.3390/psychol6030042
13. Muley A, Deshmane A, Mahajan A, Shah J. Eating Disorders: Assessing Its Prevalence and Pattern Among Adults With Type 2 Diabetes. *Cureus*. Published online January 17, 2024. doi:10.7759/cureus.52425

5

Why Focus on Binge Eating in Diabetes Care?

- Disrupted blood sugar management
- Challenges with self-management
- Increased risk of complications
- Psychological distress
- Body image and weight fluctuations
- Undetected and untreated eating disorders
- Misuse of medications
- Impact on treatment effectiveness



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Key Factors Contributing to Eating Disorders Include:

- Genetic predisposition
- Psychological factors
- Epigenetic factors
- Societal and cultural pressures
- Psychological trauma
- Chronic disease



Eating disorders can lead to:

- Malnutrition
- Electrolyte imbalances
- Cardiac issues
- Psychological consequences (depression, anxiety)
- Social isolation
- Negatively impacting quality of life

5. Dziewa M, Bańka B, Herbet M, Piątkowska-Chmiel I. Eating Disorders and Diabetes: Facing the Dual Challenge. Nutrients. 2023;15(18):3955. doi:10.3390/nu15183955
9. Kalas M, Stępniewska E, Gniedziejko M, Leszczyński-Czeczatka J, Siemiński M. Glucagon-like Peptide-1 Receptor Agonists in the Context of Eating Disorders: A Promising Therapeutic Option or a Double-Edged Sword? Journal of Clinical Medicine. 2025;14(9):3122. doi:10.3390/jcm14093122

7

The Relationship: Diabetes & Binge Eating Disorder (BED)

Impact of BED on Diabetes:

- Disrupted blood sugar management
- Challenges with self-management
- Increased risk of complications
- Emotional distress

Impact of Diabetes on BED:

- Dietary restrictions and monitoring
- Weight concerns
- Psychological distress

4. Bottari A, La Giglia F, Magrì R, Marletta L, Prezzavento GC. Bidirectional Relationships between Eating Disorders and Type 1 and 2 Diabetes: A Scoping Review. Psychology International. 2024;6(3):685-694. doi:10.3390/psycholint6030042
7. ElSayed NA, McCoy RG, Aleppo G, et al. 5. Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes: Standards of Care in Diabetes—2025. Diabetes Care. 2024;48(Supplement_1):S86-S127. doi:10.2337/dc25-s005
11. Liu, Yunxia, Liu, Chenhui, Effect of the AADE7 Self-Care Behaviors Framework on Diabetes Education Management in a Shared Care Model, International Journal of Endocrinology, 2024, 7278207, 7 pages, 2024. https://doi.org/10.1155/2024/7278207
13. Mulay A, Deshmane A, Mahajan A, Shah J. Eating Disorders: Assessing Its Prevalence and Pattern Among Adults With Type 2 Diabetes. Cureus. Published online January 17, 2024. doi:10.7759/cureus.52425

8

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The Challenge: Treating Eating Disorders and Diabetes

- Lack of screening
- Lack of specialized treatment
- Stigma and shame
- Comorbidity

"BED is therefore estimated to be under-diagnosed because clinicians are not yet familiar with its diagnostic criteria."[13]

"Misconceptions among healthcare professionals about how eating disorder symptoms clinically present may result in under-recognition due to low rates of assessment and diagnostic accuracy, especially for those with BED who live in larger bodies."[14]

2. Association of Diabetes Care & Education Specialists. 33-24_Language guidance tip sheet-3. Published online 2024.
4. Bottari A, La Giglia F, Magri R, Marletta L, Pracoverito GC. Bidirectional Relationships between Eating Disorders and Type 1 and 2 Diabetes: A Scoping Review. Psychology International. 2024;5(3):685-694. doi:10.3390/psychoint5030042
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10. Lindgreen P, Wiberg I, Clausen L, et al. "I Haven't Told Anyone but You": Experiences and Biopsychosocial Support Needs of People With Type 2 Diabetes and Binge Eating. Qualitative Health Research. 2024;34(7):621-634. doi:10.1177/10497323231223367
12. Moskovich AA, Dmitrieva NO, Baliyan MA, et al. Real-time predictors and consequences of binge-eating among adults with type 1 diabetes. Journal of Eating Disorders. 2019;7(1). doi:10.1186/s40337-019-0237-3
14. Shepherd CB, Boswell RG, Genet J, et al. Outcomes for binge eating disorder in a remote weight-inclusive treatment program: a case report. Journal of Eating Disorders. 2023;11(1). doi:10.1186/s40337-023-00804-0

9

DSM-5 criteria for BED

A. Recurrent episodes of binge eating. An episode of binge eating is characterized by both of the following:
   1. eating, in a discrete period of time (for example, within any 2-hour period), an amount of food that is definitely larger than most people would eat in a similar period of time under similar circumstances
   2. a sense of lack of control over eating during the episode (for example, a feeling that one cannot stop eating or control what or how much one is eating)

1. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders : DSM-5-TR. Fifth edition, text revision. (First MB, ed.). American Psychiatric Association Publishing; 2022.

10

DSM-5 criteria for BED

B. The binge-eating episodes are associated with three (or more) of the following:

1. eating much more rapidly than normal
2. eating until feeling uncomfortably full
3. eating large amounts of food when not feeling physically hungry
4. eating alone because of feeling embarrassed by how much one is eating
5. feeling disgusted with oneself, depressed, or very guilty afterwards

C. Marked distress regarding binge eating is present.

D. The binge eating occurs, on average, at least once a week for three months.

E. The binge eating is not associated with the recurrent use of inappropriate compensatory behavior (for example, purging) and does not occur exclusively during the course of bulimia nervosa or anorexia nervosa.

1. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders : DSM-5-TR. Fifth edition, text revision. (First MB, ed.). American Psychiatric Association Publishing; 2022.

11

DSM-5 criteria for BED

- Mild: 1-3 episodes/wk
- Moderate: 4-7 episodes/wk
- Severe: 8-13 episodes/wk
- Extreme: 14+ episodes/wk

1. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders : DSM-5-TR. Fifth edition, text revision. (First MB, ed.). American Psychiatric Association Publishing; 2022.

12

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Differentiating BED from Other Eating Disorders

Bulimia Nervosa (BN)

- Involves recurrent episodes of binge eating followed by behaviors aimed at **compensating**
- Body weight in individuals with BN may fall within a wide range

Diabulimia

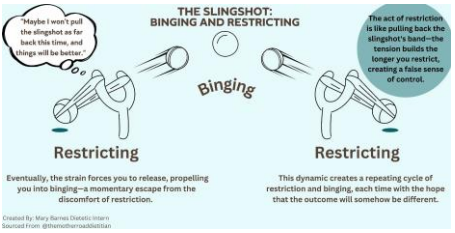
- Refers to the **omission or underuse** of insulin by individuals with T1D
- This behavior can lead to prolonged high blood glucose levels and related medical complications

1. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders : DSM-5-TR. Fifth edition, text revision. (First MB, ed.). American Psychiatric Association Publishing; 2022.

13

Triggers: Restrictive Eating & Food Rules in Diabetes

- Perception of stolen control
- Fixation on “healthy eating”
- Fear of weight gain
- Increased stress, anxiety, and guilt around food choices



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14

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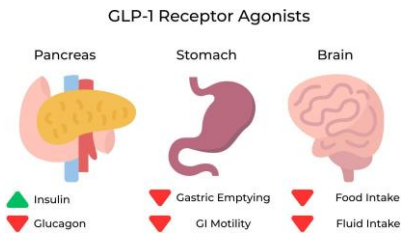
GLP-1 Receptor Agonists (GLP-1 RAs): Method of Action

- Initially developed for T2D but are also used for weight loss
- Method of action:
  - Hormone mimicry
  - Glycemic management
  - Gastric emptying and satiety
  - Longer half-life



7. ElSayed NA, McCoy RG, Aleppo G, et al. 5. Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes: Standards of Care in Diabetes—2025. Diabetes Care. 2024;48(Supplement_1):S86-S127. doi: 10.2337/dc25-s005

15

GLP-1 RAs: Prescription Criteria

Qualifying Conditions for GLP-1 RAs must have (one or more):

- ❏ T2D who have established chronic kidney disease (CKD), atherosclerotic cardiovascular disease (ASCVD), or indicators of high ASCVD risk, regardless of A1C
- ❏ BMI ≥ 30
- ❏ BMI ≥ 27 with at least one weight-related conditions (elevated blood pressure, hyperlipidemia, or T2D)

Metformin remains the initial pharmacotherapy choice for patients with T2D without additional risks

3. Bartel S, McElroy SL, Levangie D, Keshen A. Use of glucagon-like peptide- 1 receptor agonists in eating disorder populations. International Journal of Eating Disorders. 2023;57(2):286-293. doi: 10.1002/eat.24109
7. ElSayed NA, McCoy RG, Aleppo G, et al. 5. Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes: Standards of Care in Diabetes—2025. Diabetes Care. 2024;48(Supplement_1):S86-S127. doi: 10.2337/dc25-s005
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GLP-1 RAs: *Promising* Evidence for Reducing Binge Eating

- Human data also indicated blunted postprandial GLP-1 RAs release in patients with BN and BED
  - Influence of GLP-1 RAs: Stimulating the satiety center in the brain primarily by activating GLP-1 receptors which reduce food intake and body weight

9. Kalas M, Stępniewska E, Gniedziejko M, Leszczyński-Czeczatka J, Siemiński M. Glucagon-like Peptide-1 Receptor Agonists in the Context of Eating Disorders: A Promising Therapeutic Option or a Double-Edged Sword? Journal of Clinical Medicine. 2025;14(9):3122. doi:10.3390/jcm14093122

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GLP-1 RAs: *Promising* Evidence for Reducing Binge Eating

Liraglutide Studies

		Interventions	Participants	Screening Tool	Timeframe	Interventions	Results
Robert et al. (2015)	Randomized, prospective, controlled trial	**liraglutide 1.8 mg/d** ↑ physical activity ↓ energy intake	n= 44 Without Diabetes Subclinical BED BMI: 35.9 ± 4.2 kg/m2	Binge Eating Scale (BES)	12 weeks	**liraglutide 1.8 mg/d** ↑ physical activity ↓ energy intake	↓ binge eating ($p < 0.001$) ↓ body weight ($p < 0.001$) ↓ BMI ($p < 0.001$) ↓ waist circumference ($p = 0.004$)
Allison et al. (2022)	Randomized double-blind controlled trial	**liraglutide 3.0 mg/d** No physical activity or energy intake modifications	n= 27 Without Diabetes With BED BMI = 37.9 ± 11.8 kg/m2	Eating Disorder Examination (EDE)	17 weeks	**liraglutide 3.0 mg/d** No physical activity or energy intake modifications	↓ binge eating ($p = 0.37$) ↓ body weight ($p = 0.003$) ↓ BMI ($p = 0.10$) ↓ waist circumference ($p = 0.06$) Limitations of this study include the impact of the misallocation of liraglutide and placebo
Chao et al. (2019)	Randomized double-blind controlled trial	**liraglutide 3.0 mg/d** intensive behavioral therapy (IBT) ↓ energy intake	n= 150 Without Diabetes Subclinical BED BMI = 38.4 ± 4.9 kg/m2	Eating Disorder Examination Questionnaire (EDE-Q)	24 weeks and 52 weeks	**liraglutide 3.0 mg/d** intensive behavioral therapy (IBT) ↓ energy intake	↓ binge eating ($p = 0.25$) ↓ body weight ($p = 0.23$) ↓ BMI ($p = 0.70$) waist circumference not measured

9. Kalas M, Stępniewska E, Gniedziejko M, Leszczyński-Czeczatka J, Siemiński M. Glucagon-like Peptide-1 Receptor Agonists in the Context of Eating Disorders: A Promising Therapeutic Option or a Double-Edged Sword? Journal of Clinical Medicine. 2025;14(9):3122. doi:10.3390/jcm14093122

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GLP-1 RAs: *Promising* Evidence for Reducing Binge Eating

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19

GLP-1 RAs: *Promising* Evidence for Reducing Binge Eating

Limitations:

- Small sample sizes
- Lack of diversity among participants
- Relatively short durations

9. Kalas M, Stępniewska E, Gniedziejko M, Leszczyński-Czeczatka J, Siemiński M. Glucagon-like Peptide-1 Receptor Agonists in the Context of Eating Disorders: A Promising Therapeutic Option or a Double-Edged Sword? Journal of Clinical Medicine. 2025;14(9):3122. doi:10.3390/jcm14093122

20

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GLP-1 RAs: Risks for Misuse & Monitoring

Risks for Misuse:

- Weight loss focus
- Exacerbation of eating disorder symptom
- Off-label use and unregulated access
- Limited research in ED populations
- Potential for new onset EDs

Importance of Monitoring:

- Screening
- Careful patient selection
- Integrated multidisciplinary care
- Education and communication
- Addressing underlying issues
- Long-term follow-up

2. Association of Diabetes Care & Education Specialists. 33-24_Language guidance tip sheet-3. Published online 2024.
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21

Screening Tools: DEPS-R, BES, EDE-Q

	Diabetes Eating Problem Survey-Revised (DEPS-R)	Binge Eating Scale (BES)	Eating Disorder Examination-Questionnaire (EDE-Q)
Purpose	To screen for eating disorders in individuals with T1D and T2D	To assess the presence and severity of binge eating behaviors	To assess for eating disorders
Key Features	16-items Assess eating behaviors, attitudes, and feelings related to food, weight, and body image in the context of diabetes	16-items Evaluates objective and subjective binge eating episodes Differentiates between feelings and cognitions associated with binge eating and behavioral manifestations	28- items To assesses core features of eating disorders including: • Restraint • Eating Concern • Shape Concern • Weight Concern Assess objective and subjective binge eating episodes, compensatory behaviors
Clinical Utility	Highly relevant; At-risk for or experiencing eating disorders that might complicate their diabetes management	Widely used in practice to identify individuals who may meet BED	Provides detailed information about the severity and specific manifestations of eating disorder symptoms

2. Association of Diabetes Care & Education Specialists. 33-24_Language guidance tip sheet-3. Published online 2024.
3. Bartel S, McElroy SL, Levarge D, Keshen A. Use of glucagon -like peptide- 1 receptor agonists in eating disorder populations. International Journal of Eating Disorders. 2023;57(2):286-293. doi:10.1002/eat.24109
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14. Shepherd CB, Boswell RG, Genet J, et al. Outcomes for binge eating disorder in a remote weight-inclusive treatment program: a case report. Journal of Eating Disorders. 2023;11(1). doi:10.1186/s40337-023-00804-0

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Krystal Dunham, MS, RDN, LD

Treatment Approaches: Cognitive Behavioral Therapy (CBT), Acceptance and Commitment Therapy (ACT), and Dialectical Behavior Therapy (DBT),

Cognitive Behavioral Therapy (CBT)	Acceptance and Commitment Therapy (ACT)	Dialectical Behavior Therapy (DBT)
Effectiveness: Shown long-term effectiveness in reducing the frequency of binges and improving glycemic manage	**Effectiveness:** Helps to develop a more flexible and compassionate relationship with individual and their eating behaviors	**Effectiveness:** Valuable approach for individuals who use binge eating to cope with overwhelming emotions or diabetes-related stress

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23

Medical Nutrition Therapy: Structure & Flexibility

- Comprehensive nutrition assessment
  - May span 2-3 sessions
  - Evaluating food, movement, and body image concerns
- Focus on a healthy relationship with food
  - Not only what, but also how they think and feel about food and their body
- Flexible goal setting and revision
- Ongoing support and resource identification
- Interdisciplinary care
  - Collaborate with other healthcare professionals, such as physicians, endocrinologists, and mental health specialists

2. Association of Diabetes Care & Education Specialists. 33-24_Language guidance tip sheet-3. Published online 2024.
7. ElSayed NA, McCoy RG, Aleppo G, et al. 5. Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes: Standards of Care in Diabetes—2025. Diabetes Care. 2024;48(Supplement_1):S86-S127. doi:10.2337/dc25-s005
8. Flynn C, Dhatariya K. Nutrition in older adults living with diabetes. Practical Diabetes. 2020;37(4):138-142. doi:10.1002/pdi.2287

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Interdisciplinary Collaboration

- Registered Dietitians (RDNs)
- Therapists (Psychologists, Psychiatrists, Social Workers)
- Physicians/Endocrinologists
- Diabetes Educators

- Improved patient outcomes
- Early detection and intervention
- Shared decision-making
- Consistent messaging
- Addressing psychosocial factors

2. Association of Diabetes Care & Education Specialists. 33-34_Language guidance tip sheet-3. Published online 2024.
7. ElSayed NA, McCoy RG, Aleppo G, et al. 5. Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes: Standards of Care in Diabetes—2025. Diabetes Care. 2024;48(Supplement_1):S86-S127. doi: 10.2337/dc25-s005
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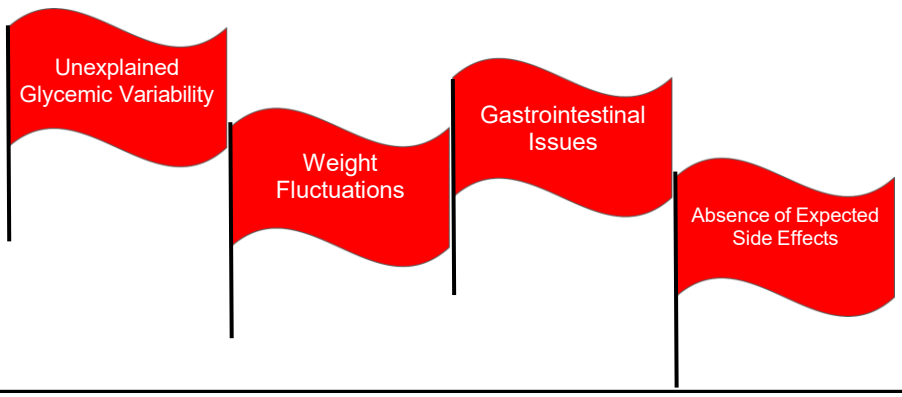
Clinical Red Flags



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Krystal Dunham, MS, RDN, LD

Clinical Case Vignette

During a routine follow-up, a 32-year-old patient, diagnosed with T2D five years prior, has been experiencing increasing A1C over the last year. They recently experienced a severe hypoglycemic episode, which has lead them to waking up multiple times at night to check their blood sugar. Their primary provider recommended increasing their GLP-1.

The endocrinologist initiated a discussion about diabetes management challenges and general eating patterns.

The patient shared that after eating out with friends they come home and consume “everything in sight.” They recently started checking their weight at home up to 7 times a day. They shared that they have been trying to stick to a "good" and "bad" food list they saw on TikTok and it’s “just not working.”

These concerns raised considerations about binge eating disorder.

27

Clinical Case Vignette

During a routine follow-up, a 32-year-old patient, diagnosed with T2D five years prior, has been experiencing increasing A1C over the last year. They recently experienced a severe hypoglycemic episode, which has lead them to waking up multiple times at night to check their blood sugar. Their primary provider recommended increasing their GLP-1.

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The endocrinologist suggested the patient to meet with a registered dietitian and a therapist, both with expertise in diabetes and eating disorders.

28

For Patients And Clients:

Instead of…

Try this…

Instead of…	Try this…
Focusing solely on rigid dietary rules for diabetes management	Collaborate with the patient and dietitian to develop a plan that supports goals and emphasizes building sustainable habits over strict adherence
Focusing primarily on the weight loss benefits of GLP-1 RAs without assessing the potential risks for misuse or impact on eating disorder symptoms	Talk with the patient about the medication's purpose, potential side effects, and the importance of monitoring for any changes in eating patterns or mental health
Providing fragmented care where diabetes and eating disorder treatment are addressed in isolation	Advocate for and participate in an interdisciplinary team approach and integrated care that addresses the patient's physical, psychological, and emotional needs simultaneously
Reinforcing rigid, all-or-nothing thinking about food and eating due to the demands of diabetes management	Help patients understand how different foods affect their blood sugar without labeling foods as "good" or "bad"

29

For Dietitians And Healthcare Providers:

Key Messages to Improve Binge Eating and Diabetes Care

- Screen for eating disorders in people with diabetes using tools like the DEPS-R, BES, and EDE-Q
- Certain medications, like GLP-1 RAs can be helpful for some people, but they also come with risks if not used carefully
- Seek out additional training that focuses on the binge eating and co-existing medical conditions
- Keep up to date on research
- Join or build networks of healthcare professionals

30

Krystal Dunham, MS, RDN, LD

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12. Moskovich AA, Dmitrieva NO, Babyak MA, et al. Real-time predictors and consequences of binge eating among adults with type 1 diabetes. *Journal of Eating Disorders*. 2019;7(1). doi:10.1186/s40337-019-0237-3
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Thank You

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Questions?

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Diabetes Care Summit

OU Health | Harold Hamm Diabetes Center

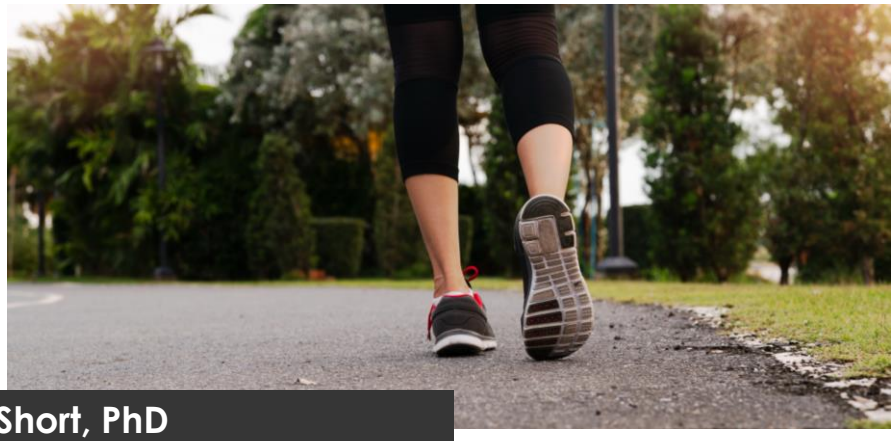
ADCES Association of Diabetes Care & Education Specialists

Presentation

The role of exercise in diabetes prevention and management

Kevin R. Short, PhD, FACSM

The role of exercise in diabetes prevention and management



Kevin R. Short, PhD
Department of Pediatrics, OUHSC

HHDC Summit Sep 5, 2025

1

Disclosures

Notice of Requirements for Successful Completion: Learners must participate in the full activity and complete the evaluation in order to claim continuing education credit/hours.

Presenter Conflicts of Interest/Financial Relationships Disclosures:

Kevin R. Short, PhD: None

Disclosure of Relevant Financial Relationships and Mechanism to Identify and Mitigate Conflicts of Interest: No conflicts of interest.

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2

Learning objectives

- Demonstrate the importance of physical fitness for lifetime health
- Describe how physical activity improves glucose control
- Describe how the type and timing of exercise affects metabolic control in people with and without diabetes
- Review how exercise fits within a diabetes treatment plan that includes medications
- Review exercise guidelines and resources for health care providers

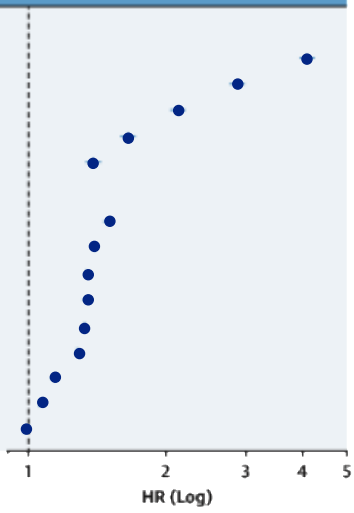
3

The importance of cardiorespiratory fitness

4

Cardiorespiratory Fitness and Mortality

Variable	HR (95% CI)	*P* Value
Extremely Fit (Referrent)		
Least	4.09 (3.94-4.24)	<0.001
Low	2.88 (2.78-2.99)	<0.001
Moderate	2.13 (2.05-2.21)	<0.001
Fit	1.66 (1.60-1.73)	<0.001
High	1.39 (1.34-1.45)	<0.001
Comorbidities		
Chronic Kidney Disease	1.49 (1.46-1.52)	<0.001
Smoking	1.40 (1.39-1.42)	<0.001
Diabetes	1.34 (1.33-1.36)	<0.001
Atrial Fibrillation	1.34 (1.31-1.36)	<0.001
Cancer (all)	1.33 (1.30-1.35)	<0.001
Cardiovascular Disease	1.28 (1.27-1.29)	<0.001
Hypertension	1.14 (1.13-1.16)	<0.001
Age	1.06 (1.06-1.06)	<0.001
Body Mass Index	0.98 (0.97-0.98)	<0.001



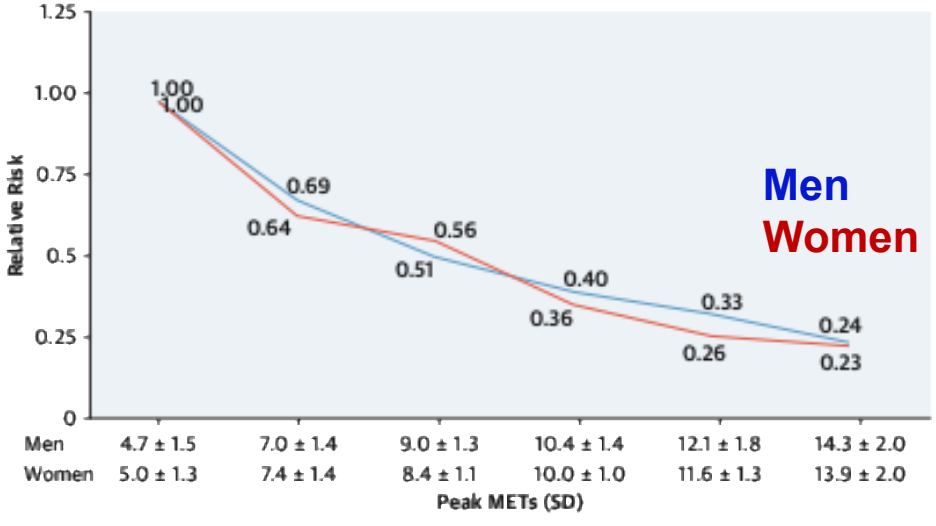
750,302 veterans
94% men
Age 30-95y

Treadmill test,
Median follow-up
= 10.2 years

Kokkinos, *J Am Coll Cardiol* 80:598, 2022

5

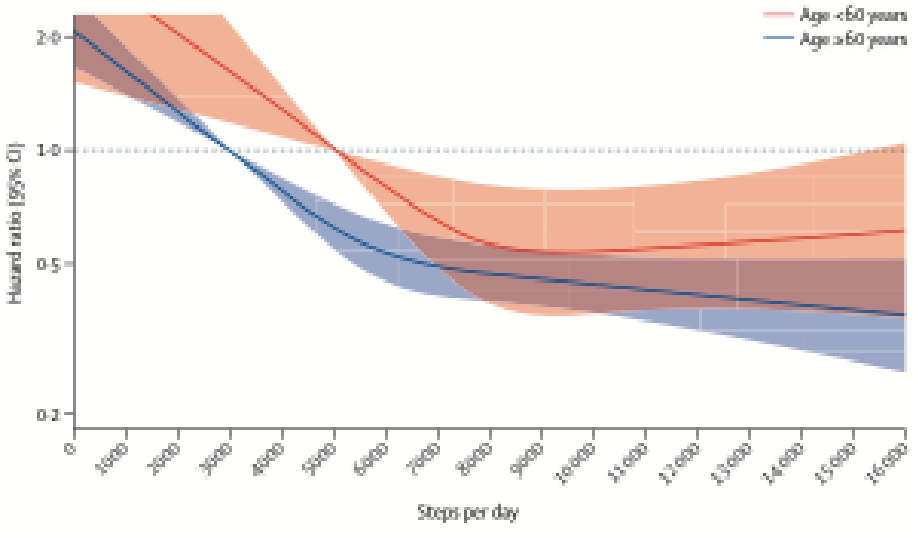
Cardiorespiratory Fitness and Mortality



Kokkinos, *J Am Coll Cardiol* 80:598, 2022

6

Daily Steps and Mortality



Paluch, *Lancet Pub Hlth* 7:e219, 2022

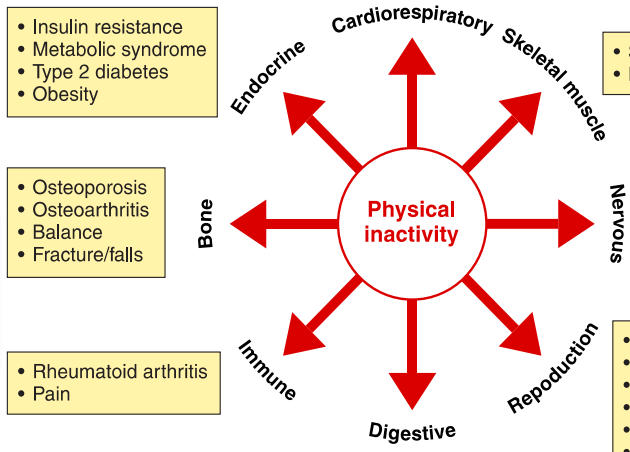
7

How exercise improves diabetes and health

8

Physical inactivity

35 chronic diseases



- Heart disease
- Myocardial infarction
- Hypertension
- Stroke
- Hemostasis
- Congestive heart failure
- Endothelial dysfunction
- Atherosclerosis
- Peripheral artery disease
- Deep vein thrombosis

- Insulin resistance
- Metabolic syndrome
- Type 2 diabetes
- Obesity

- Sarcopenia
- Disuse atrophy

- Osteoporosis
- Osteoarthritis
- Balance
- Fracture/falls

- Cognitive dysfunction
- Depression
- Anxiety

- Rheumatoid arthritis
- Pain

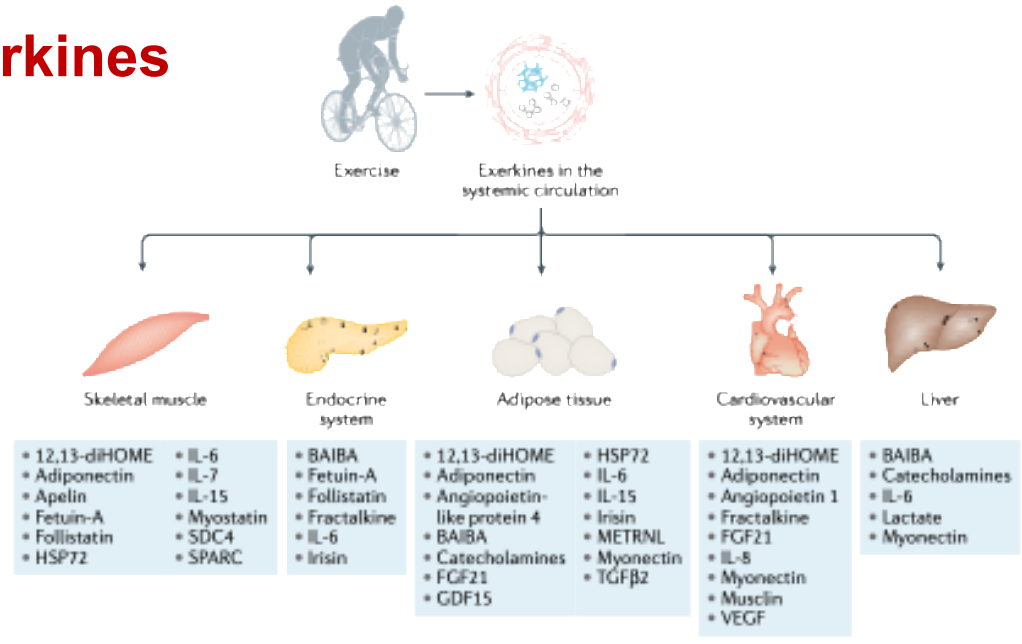
- Breast cancer
- Endometrial cancer
- Polycystic ovary syndrome
- Gestational diabetes
- Pre-eclampsia
- Erectile dysfunction

- Nonalcoholic fatty liver
- Colorectal cancer
- Diverticulitis
- Constipation

Booth, *Physiol Rev* 97:1315, 2017

9

Exerkines

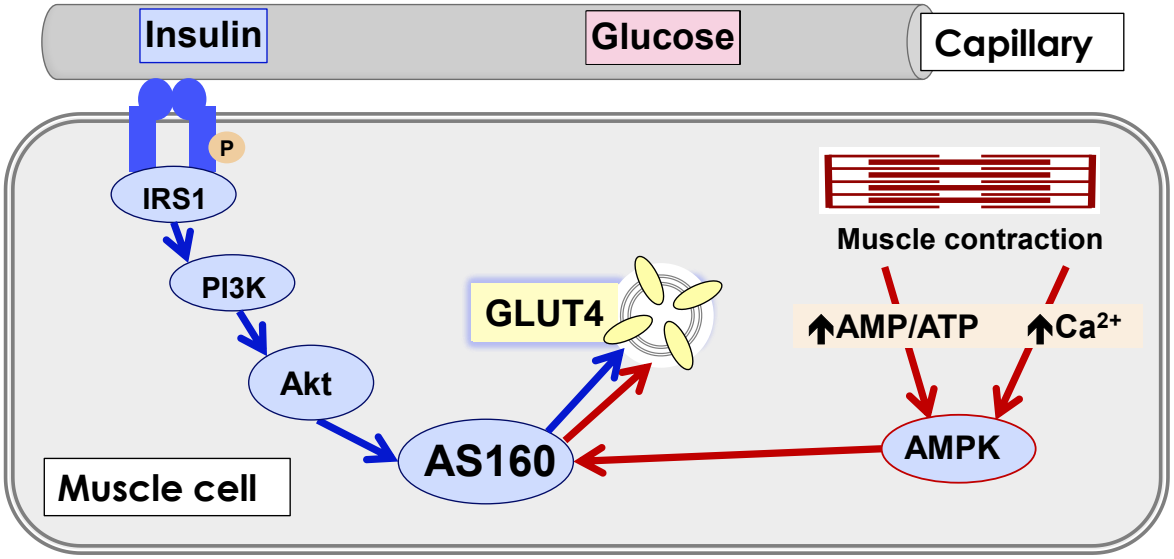


Chow, *Nature Rev Endocrinol* 18:237, 2022

10

Kevin R. Short, PhD, FACSM

Regulated muscle glucose uptake



11

The effects of type and timing of exercise

12

Exercise modality

Aerobic, resistive, and high-intensity interval programs all improve diabetes risk factors.

Endurance and resistive exercises have type-specific benefits on aerobic and strength outcomes, respectively.

Combined AT and RT programs are often superior but might be due to higher volume than AT or RT alone.

High intensity intervals produce the highest increases in cardiometabolic outcomes, but also have higher risk of injury.

Kanaley, *Med Sci Sports Exer* 54: 353, 2022

13

Resistance exercise and T2D

Systematic review

- 50 resistance training RCTs for adults with metabolic syndrome and/or type 2 diabetes
- 1,186 people in intervention, 1,085 controls
- mean age 21-73y
- 48% Female, 48% Male

Variable	Intervention effect
Glucose	↓ 7 mg/dl
TG	↓14 mg/dl
SBP	↓ -4 mg/dl
DBP	↓ -2 mg/dl
Waist	↓ -2 cm
HDL-C	↑ 2 mg/dl

Han, *Diab Res Clin Practice* 222:112077, 2025

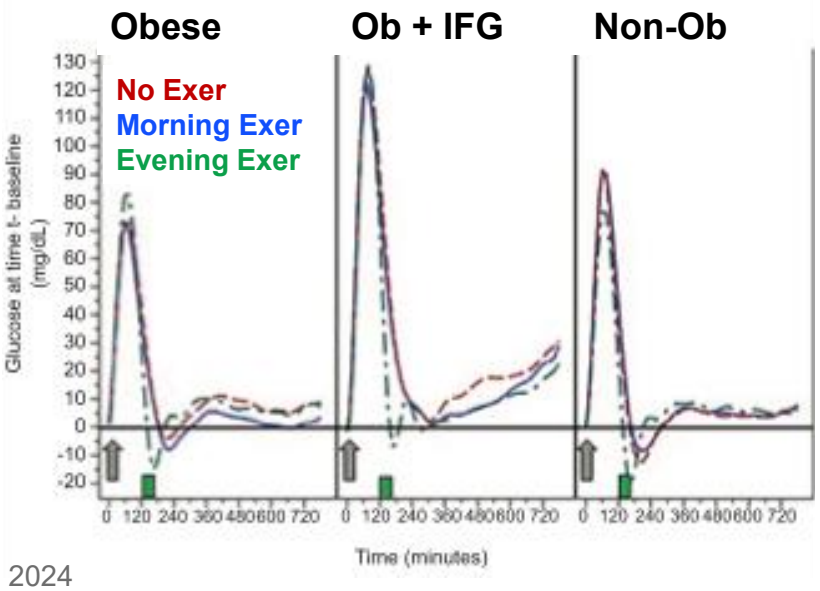
14

Exercise timing and nocturnal glucose

N = 16-18/group

Dinner at 6pm

Exercise = 45 min walk at 60% VO_2pk, at 7am or 8pm



Kanaley, *J Physiol* 602.23: 6477, 2024

15

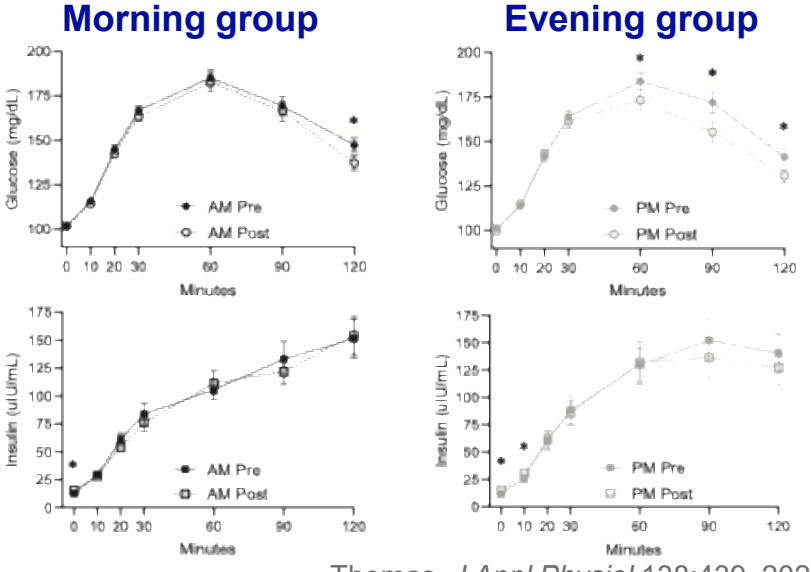
Timing of resistance training

N = 153 adults, ~60y, with pre-diabetes:
- 47% IFG
- 13% IGT
- 40% IFG + IGT

Supervised RT 2x/wk for 12 wks

2-hour OGTT pre and post, 48h after last exercise

Chest press ↑28%
Leg press ↑18%



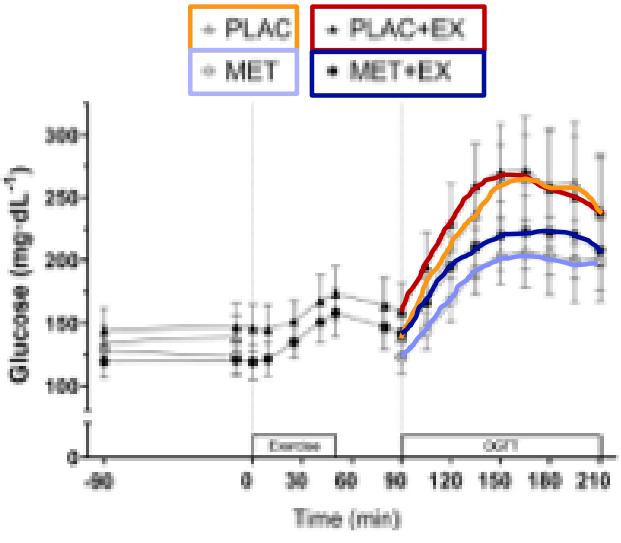
Thomas, *J Appl Physiol* 138:439, 2025

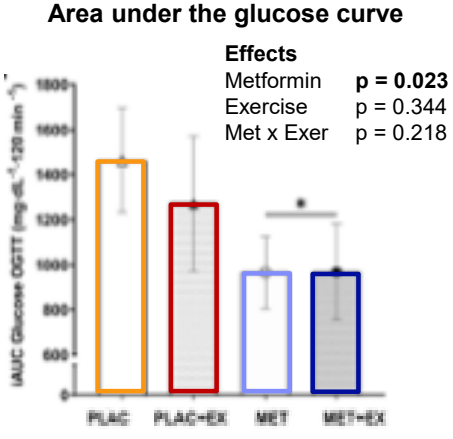
16

How exercise fits within a diabetes treatment plan that includes medications

17

Metformin and exercise





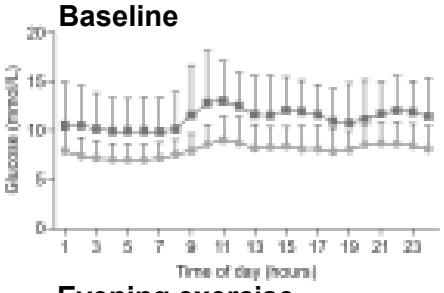
Moreno-Cabañas, *Am J Physiol Endocrinol Metab* 325:E310, 2023

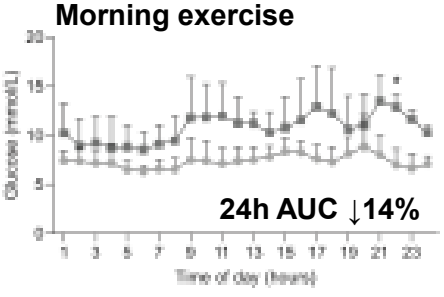
18

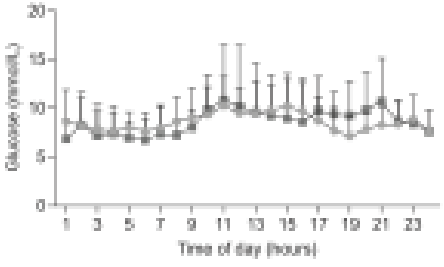
Metformin and exercise timing

18 adults with T2D

Protocol:
2-week baseline
6-weeks AM or PM exercise
2-week washout
6-weeks AM or PM exercise







Carrillo, *J Physiol* 602.23: 6461, 2024

19

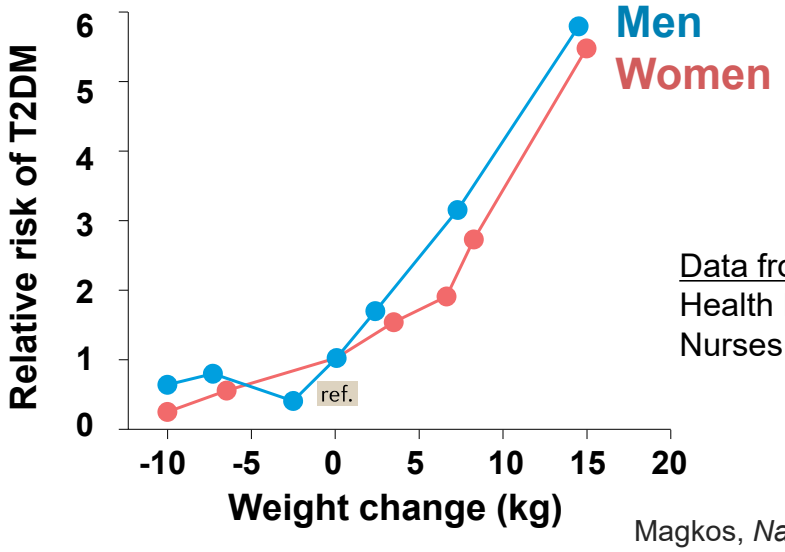
Lifestyle: diet or exercise?

Excess body weight, specifically body fat, is a key:
1) driver of type 2 diabetes risk
2) actionable target to prevent or reverse T2D

Exercise has beneficial effects on diabetes and cardiometabolic risk independent of, and additive to effects of weight loss. Exercise effects are particularly important when weight loss is low or modest. Exercise is key for weight maintenance.

20

Weight gain raises risk for T2D



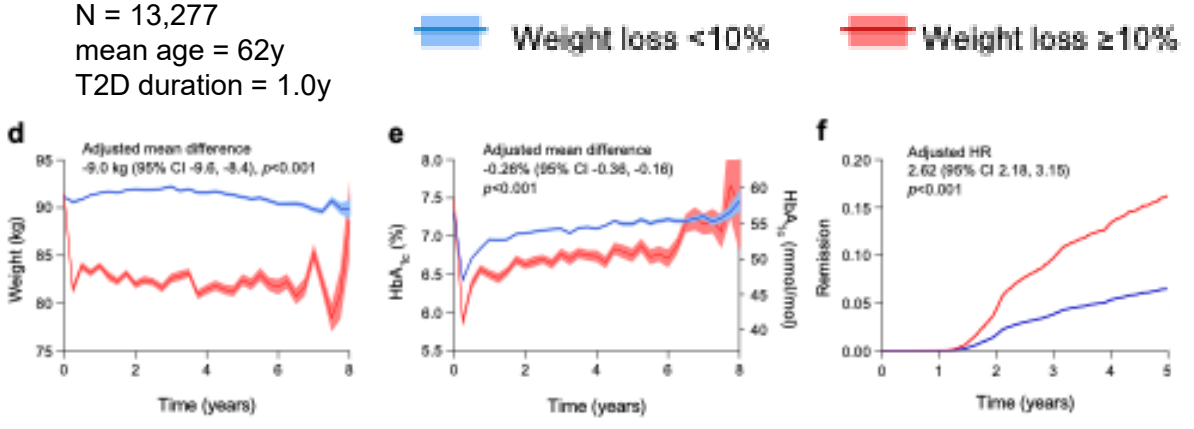
Data from
Health Professionals Study (men)
Nurses Health Study (women)

Magkos, *Nat Rev Endocrinol* 16: 545, 2020

21

Weight loss drives T2D remission

Cohort 2
N = 13,277
mean age = 62y
T2D duration = 1.0y



Morieri, *Diabetelogia* 68:1115, 2025

22

Kevin R. Short, PhD, FACSM

Exercise and body weight

Weight loss achieved from exercise only (without dietary component) is typically small and generally requires an increase of ≥ 1 hour per day of moderate to vigorous activity.

To reduce visceral fat in people with T2D, a moderately high volume of exercise (~500 kcal) on 4–5 days/week is needed.

Exercise is important for sparing lean mass during weight loss, and for body weight maintenance after weight loss.

Kanaley, *Med Sci Sports Exer* 54: 353, 2020

23

Body composition response to GLP1-RAs

Meta analysis

- 7 studies through Jan 2024
- 629 participants with DEXA
- Duration: 12-72 weeks
- Weight loss: 8.1 kg (GLP1) vs. 1.2 kg (placebo)
- Fat mass loss: 5.4 kg (GLP1) vs. 0.8 (placebo)
- Lean mass loss: 2.5 kg (GLP1) vs. 0.6 (placebo) [30% of weight loss]
- Needed: information on bone density

Beavers, *Obesity* 33:225, 2025

24

Sarcopenia risk with GLP1-RAs

Unanswered questions

Is there a reduction in both muscle mass and function with weight-loss drugs?

Does risk of sarcopenia increase with age, obesity, or other conditions?

Does the risk of muscle loss increased with multi-agonists?

What are the best exercise and dietary protein supplementation strategies?

Are muscle anabolic agents a solution to protect skeletal muscle?

Hope, *Nat Rev Endocinol* 20:695, 2024

25

ORIGINAL ARTICLE

Obesity THE OBESITY SOCIETY WILEY

Nutritional priorities to support GLP-1 therapy for obesity: A joint Advisory from the American College of Lifestyle Medicine, the American Society for Nutrition, the Obesity Medicine Association, and The Obesity Society

"Numerous practice guidelines recommend multicomponent, evidence-based nutritional and behavioral therapy for adults with obesity, but use of such therapies with GLP-1s is not widespread."

Critical: preserving muscle and bone mass through resistance training and appropriate diet and complementary lifestyle interventions.

"Supportive strategies include group-based visits, registered dietitian nutritionist counseling, tele-health and digital platforms, and Food is Medicine interventions."

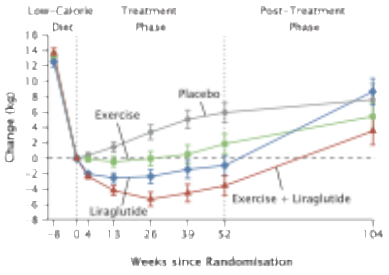
Mozaffarian, *Obesity* Published May 30, 2025

26

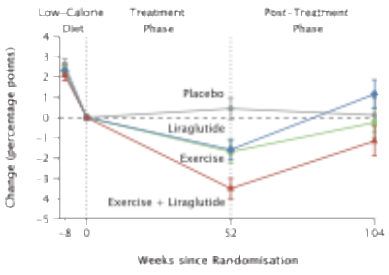
GLP1-RA + exercise for maintaining weight loss

N = 166 adults with obesity. Age ~43y.
After an initial 8-week low calorie diet (-13kg), randomized to 4 maintenance conditions.
+/- Exercise and +/- Liraglutide

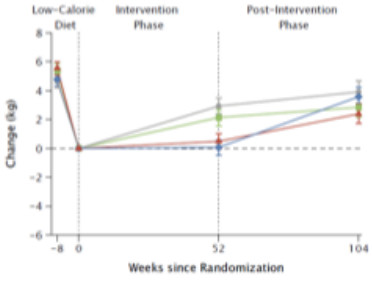
Body weight change



Body fat % change



Lean mass change



Jensen, *eClinicalMedicine* 69:102475, 2024

27

Exercise guidelines and promotion

28

Current guidelines for physical activity

	Adults	Children
Aerobic/ endurance	75 min/wk (vigorous) 150 min/wk (moderate)	60 min/day
Resistive/ strengthening	2 days/week	2 days/week
Sedentary	Avoid sitting more than 30 min	Avoid sitting more than 30 min

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ACSM American Fitness Index 2025

Top Cities

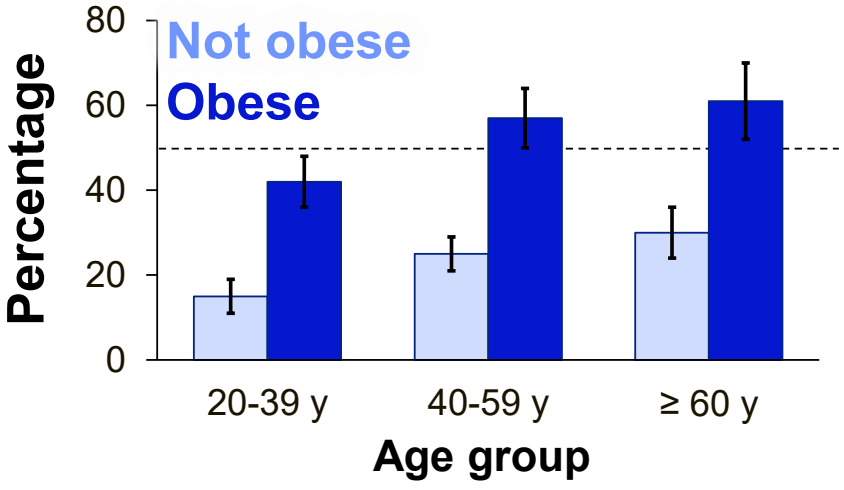
1. Arlington, VA
2. Washington, DC
3. Seattle, WA
4. San Francisco, CA
5. Denver, CO
6. Minneapolis, MN
7. Madison, WI
8. Atlanta, GA
9. Sacramento, CA
10. San Diego, CA

Bottom Cities

90. Tulsa, OK
91. Bakersfield, CA
92. Indianapolis, IN
93. Port St. Lucie, FL
94. San Antonio, TX
95. Detroit, MI
96. Wichita, KS
97. Memphis, TN
98. North Las Vegas, NV
99. Lubbock, TX
100. Oklahoma City, OK

30

Less than half of adults are told by health care providers to increase physical activity



Zwald, *MMWR* 66:1161, 2017

31

Making physical activity a vital sign

Ask patients at each visit:

On average, how many days per week do you engage in moderate to strenuous physical activity (like a brisk walk)?

On average, how many minutes do you engage in physical activity at this level?

Optional: How many days a week do you perform muscle strengthening exercises, such as bodyweight exercises or resistance training?

Salis, *Curr Sp Med Reports 15*: 207, 2016

32

Resources

ADA position statement on physical activity
Diab Care 39:1025, 2016

American College of Sports Medicine
ExerciseIsMedicine.org

Norwegian Univ. Science & Tech, Fitness Calculator
ntnu.edu/cerg/vo2max

33

Summary

Low aerobic fitness is a major risk predictor for diabetes & mortality

Exercise increases muscle glucose uptake independent of insulin action. Exerkines exert positive effects on multiple tissues.

Aerobic and resistive exercise have benefits for metabolic health. Timing of exercise may affect glucose patterns but effects are variable.

Exercise is beneficial for diabetes prevention and management, but most effective when accompanied by weight loss.

Health care providers should promote physical activity. Resources are available.

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Exercising safely with diabetes

Consider medical clearance (and perhaps exercise testing) before starting activities more vigorous than brisk walking for people with:

- Signs or symptoms of CVD
- Longer diabetes duration
- Older age
- Diabetes-related complications

These conditions require special precautions:

- Using insulin or insulin sensitizers
- Autonomic or peripheral neuropathy
- Diabetic retinopathy
- Kidney disease
- Hypertension

Kanaley, *Med Sci Sports Exer* 54: 353, 2022

35

Precautions for exercise

For adults with **signs or symptoms of CVD**, longer diabetes duration, older age, or other diabetes-related complications: Get medical clearance (and perhaps exercise testing) before starting activities more vigorous than brisk walking.

Follow proper hydration before, during, and after exercise.

For people taking **insulin or insulin sensitizers**: carry rapid-acting carbohydrate sources during exercise to treat hypoglycemia and have glucagon available to treat severe hypoglycemia (if prone to developing it).

Kanaley, *Med Sci Sports Exer* 54: 353, 2022

36

Precautions for exercise

Autonomic neuropathy: Be aware of increase likelihood of hypoglycemia, abnormal BP responses, impaired thermoregulation, and elevated resting and blunted maximal HR.

Peripheral neuropathy: Limit exercise participation that may cause foot trauma, such as prolonged hiking, jogging, or walking on uneven surfaces.

Diabetic retinopathy: Avoid vigorous, high-intensity activities that involve breath holding (e.g., weight lifting and isometrics), overhead lifting, or that lower or jar the head (e.g., yoga, gymnastics). Consult an ophthalmologist for specific restrictions and limitations.

Kanaley, *Med Sci Sports Exer* 54: 353, 2022

37

Precautions for exercise

Diabetic kidney disease: Avoid exercise that causes excess increase in BP (e.g., weight lifting, high-intensity aerobic exercise) and refrain from breath holding during activities. Since high BP and fatigue are common, lower intensity exercise might be necessary. Light to moderate exercise during dialysis is possible if electrolytes are managed.

Hypertension: Avoid heavy weight lifting or breath holding. Perform dynamic exercises using large muscle groups, such as walking and cycling at a low to moderate intensity.

Kanaley, *Med Sci Sports Exer* 54: 353, 2022

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Contraindications for exercise

An episode of severe hypoglycemia or recurrent antecedent hypoglycemia within the previous 24h.

Hyperglycemia ≥ 270 mg/dl with concomitant ketonemia/ketonuria due to insulin deficiency, or acute injury or infection.

Blood ketones ≥1.5 mmol/L or urine ketones = 2+ or 4.0 mmol/L. If blood ketone levels are between 0.6 and 1.4 mmol/L, exercise should be postponed until the cause of elevated ketone levels has been evaluated and an insulin bolus dose is given equal to half the usual individual correction dose.

Adofsson, *Pediatr Diabetes* 23: 1341, 2022

39

Contraindications for exercise

For people with significantly **unstable diabetes**, frequent severe diabetic **complications** (severe hypoglycemia, recurrent ketoacidosis) or advanced **chronic complications**: Reduce or stop participating in vigorous exercise until metabolic control has improved and a specific exercise management plan has been made. High intensity exercise is generally contraindicated in those with more advanced or proliferative retinopathy.

Adofsson, *Pediatr Diabetes* 23: 1341, 2022

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Diabetes Care Summit

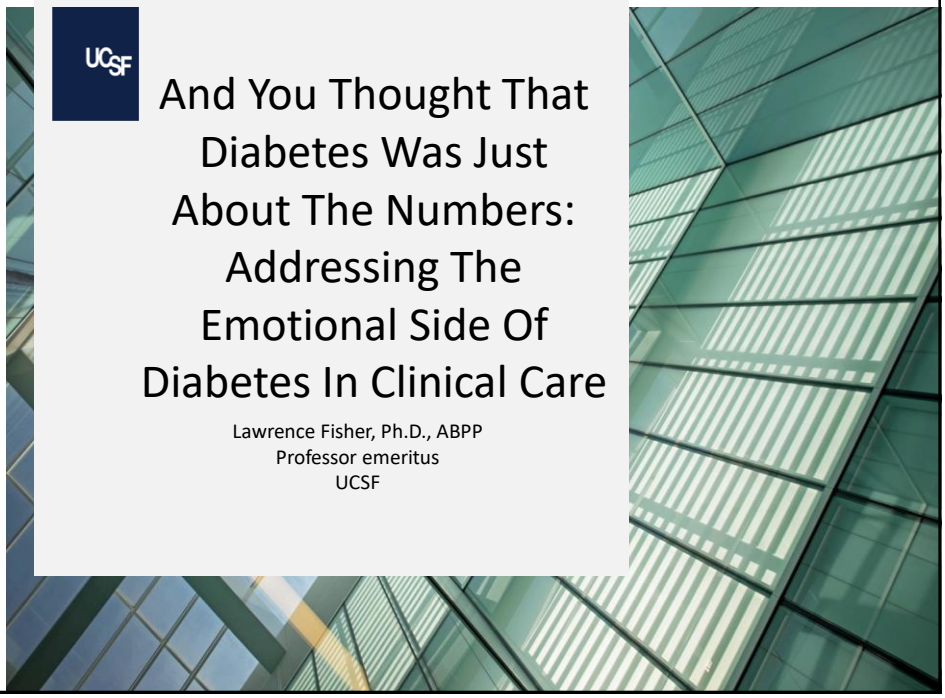
OU Health | Harold Hamm Diabetes Center

ADCES Association of Diabetes Care & Education Specialists

Keynote Presentation

And you thought that diabetes was just about the numbers: addressing the emotional side of diabetes in clinical care

Lawrence Fisher, PhD, ABPP



And You Thought That Diabetes Was Just About The Numbers: Addressing The Emotional Side Of Diabetes In Clinical Care

Lawrence Fisher, Ph.D., ABPP
Professor emeritus
UCSF

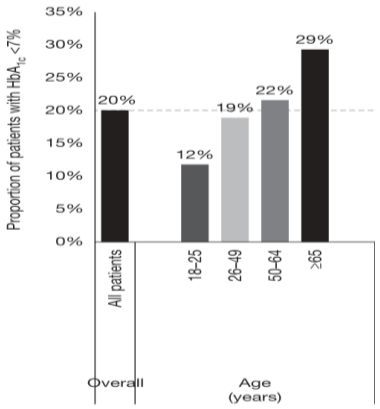
1

Disclosures

A consultant to Eli Lilly on topics unrelated to this presentation.

2

Percentage of People with T1D Achieving ADA Treatment Target Of ≤7%



Pettus et al, 2019

3

Why Are These Numbers So Poor??

- We have excellent medications.
- We have helpful new devices.
- We have large, national, professional & lay supports.

In many ways we know how to "fix" diabetes!
Why are so many PWDs doing so poorly?

4

Why Are These Numbers So Poor??

There are a lot of reasons:
Cost,
Access to Care,
Lack of Knowledge,
Social & Cultural Factors,
Multiple Priorities,
Etc.

But Something Is Missing!!!

(And it might provide the context for understanding many of these other factors.)

5

A Case Study: Nathan (a true story)

- **38 year old small business owner, T1D since adolescence**
- **Very busy with family/kids/work**
- **HbA1C = 8.6%**
- **TIR = 41%**
- **TAR = 55%**
- **Consistent pattern for several years.**
- **Misses appointments.**
- **CGM, pump (not closed loop)**
- **AGP = unpredictable ups and downs**

6

A Case Study: Nathan

- Appears “glum”
- Sporadic eye contact with nurse CDCES
- Knows how to carb count, easily calculates boluses, accounts for corrections
- No site problems
- Devices working
- Insulin not expired, etc.
- Over time, we have changed basals, structured blousing, etc. – no change
- Is he depressed?? Referral??

7

A Case Study: Nathan

What to do??

“Nathan: what do you think is going on?”

8

A Case Study: Nathan

- Long period of quiet.
- Nathan addresses the nurse CDCES directly:

"I hate it. I keep thinking that I am damaged. I have a dead pancreas! I think about it every time I should bolus and I often skip blousing because I don't want to think about it."

9

Nathan's Is A Prototypic Story

- The intensity of emotional disease burden varies across participants, but <u>everyone</u> reports common, impactful feelings, beliefs and expectations related to diabetes, and its management.
- The effects of living with diabetes extend beyond DM.
- They often become part of their overall self-definition – not just about feeling worried about DM – these became reflections upon the "self."
- ***These feelings, beliefs and expectations (their diabetes story) have a major impact on their management choices.***

10

Diabetes Distress (DD)

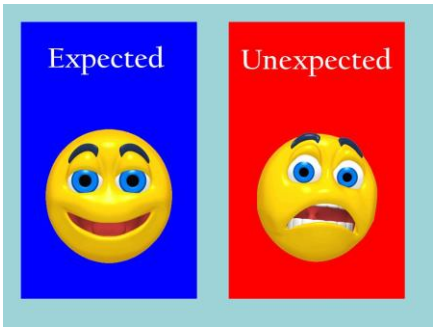
- All of this is reflected in *the emotional side of living with diabetes*.
- We use the generic term *"Diabetes Distress"* to reflect the broad range of feelings, beliefs and expectations that result from struggling with diabetes over time.

11

DD Is To Be Expected

Distress is an *expected* response to living with any chronic disease and is not psychopathology or a co-morbid condition.

DD is simply the **emotional side of living with diabetes**



12

Why is DD Important?

DD is significantly linked cross-sectionally and over time with:

- A1C: high DD associated with high A1C (TIR) (*but impactful throughout the entire A1C range*)
- Low Heart Rate Variability, a CVD risk factor
- Reduced medication/insulin taking
- Missed healthcare visits
- Increased risk of hospitalization
- Less physical activity
- Weight and dietary problems
- Lower quality of life
- Increased costs
- Does not disappear on its own without intervention

DD has a highly significant clinical impact!

Why addressing DD is part of the ADA Standards of Care.

13

DD Prevalence

- High prevalence among adults (T1D = 74%, T2D = 62%; but 97% of those with T1D and 87% of those with T2D express concerns in at least one area of living with diabetes): DD is "ubiquitous."
- <u>This necessitates a shift in perspective</u>:
  - Referring makes no sense: To whom? How?
  - It is part of diabetes – not a separate "condition."
  - We provide "whole-person" care.
  - It is up to us!!

And you can do it!!!!!!!

14

Depression, DD, and Diabetes

- Most people with diabetes who display elevated symptoms of "depression" from screeners (PHQ9) DO NOT meet criteria for MDD.
- The false positive rate of screeners is very high: 54% in ACCORD, 79% in REDEEM.
- Correlations between depression screening scales and DD scales are very high (0.60).

Among those with diabetes, much of what we might think of as 'depression' is really elevated DD.

Fisher, et al, 2016; Sullivan, et al., 2012

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Depression vs. Diabetes Distress?

Depressive Disorder

- Hopelessness about life in general.
- Pervasive and persistent mood problems (most of the day, more days than not).
- Interferes with functioning across domains (relationships, work, health).

"I'm a failure. Everything is hopeless."

Diabetes Distress

- Sadness and tough feelings about diabetes.
- Persistent stressors related to diabetes.
- May or may not affect diabetes management or functioning in other areas.

"I'm failing at diabetes. My efforts at diabetes are hopeless."

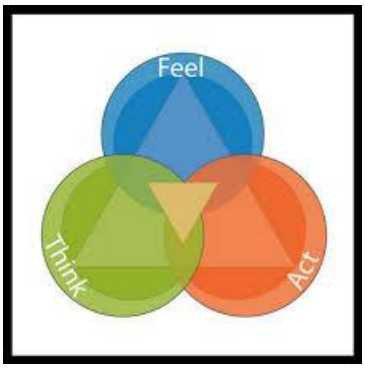
16

Why Does DD Lead To Problematic Management Choices?

How you feel and what you think drives the choices you make!

<u>Feelings and beliefs drive behavior!!</u>

And this plays out in diabetes as it does in other areas of life.



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Why Does DD Lead To Problematic Management Choices?

<u>Examples</u>:

- If you feel that you are powerless to keep BG in range, why try?
- If you think that you will never be safe from a low, why take the right amount of insulin?
- If you feel your efforts are never good enough, why bother trying something new?
- If you are tired being told that you are not doing well with your diabetes, why go to the doctor to hear it again?

18

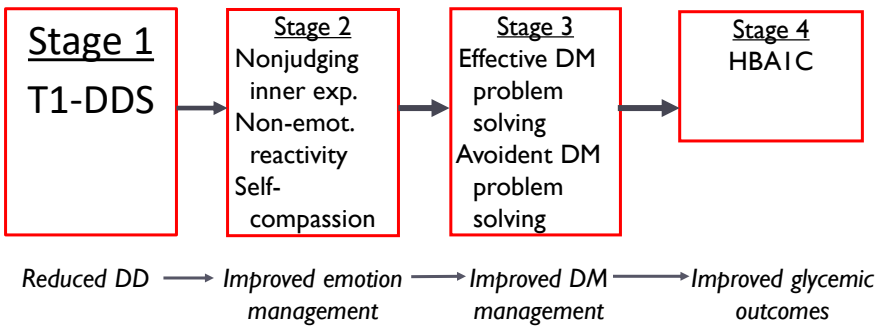
DD Is A Barrier To Change

- **DD reduces responsiveness to education & other interventions.**
- ***To maximize outcomes, best to address DD before education or management interventions, or at the same time.***

Fisher, et al., 2018; Hessler, et al., 2021, 2024; Schinckus, et al., 2018

19

How Does The Process Of Change Occur?



20

Reducing DD: The Good News!!

DD is highly malleable:

- Highly responsive to intervention.
- Dramatic reductions can occur quickly.
- Interventions do not have to be time-consuming or require extensive mental health training.
- Similar findings for adults with T1D or T2D.

21

Reducing DD: The Good News!!

EMBARK: 3- arm clinical trial: education/management, emotion-focused, both combined.

New EMBARK findings: *emotion-focused* interventions led to:

- the largest overall DD *and* A1C improvements
- decreased frequency of hypos
- decreased frequency of missed boluses

Take-home message: Don't neglect DD – it drives management!

Two Recommendations For Addressing DD!

22

Recommendation #1: Assess DD Regularly And Systematically With Standard Scales

- Makes no sense providing education/intervention when elevated DD will limit responsiveness.
- Assess everyone periodically.
- Assessment is comprehensive – leaves no important gaps.
- The results can be used to start an intervention through a clinical conversation.

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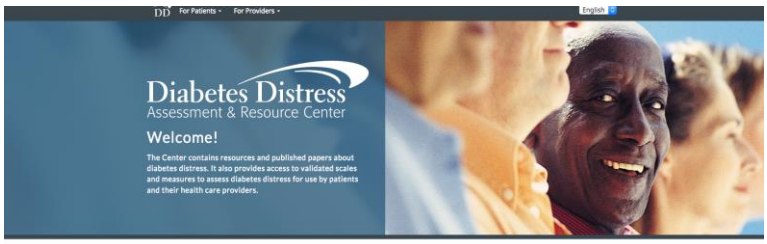

On this site you will find:

- Background information on diabetes distress for patients and providers.
- Links to other diabetes distress resources.
- Online and pdf versions of the Diabetes Distress Scales in several languages.

www.Diabetesdistress.org

- **In English & Spanish for download or automated administration & scoring**
- **T1D: T1-Diabetes Distress Assessment System (T1DDAS)**
- **T2D: T2-Diabetes Distress Assessment System (T2DDAS)**

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The T1/T2-Diabetes Distress Assessment System

How To Administer?

- Tablet or computer kiosk in the waiting room with automated administration and scoring (most common)
- Smart phone prior to appointment (Print/Save PDF)
- Tablet or computer in your office
- Hard copy form in office or waiting room

Scored results then immediately available to the PWD and clinician to review together during the encounter.
(Try it yourself!!)

25

The T1/T2-Diabetes Distress Assessment System

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- Hard copy form in office or waiting room

Scored results then immediately available to the PWD and clinician to review together during the encounter.
(Try it yourself!!)

26

The T1-Diabetes Distress Assessment System (T1-DDAS)

For adults with T1D: 30 items.

- 8-item Core Scale: intensity/extent of DD
- Ten, 2- or 3-item Source Scales: where DD comes from
  - Financial Worries
  - Interpersonal Challenges
  - Management
  - Hypo Concerns
  - Healthcare Quality
  - Shame, stigma
  - Lack Of Diabetes Resources
  - Technology Challenges
  - Burden To Others
  - Worries About Complications

Each has a cut-point (≥2.0) that defines elevated DD.

27

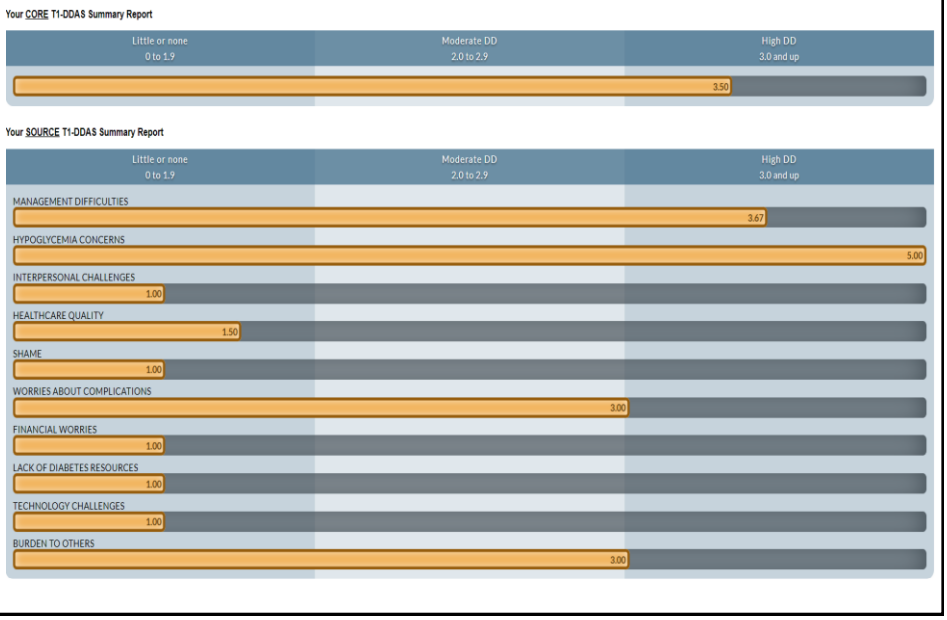
The T2-Diabetes Distress Assessment System (T2-DDAS)

For insulin & non-insulin adults with T2D:

- 8-item Core Scale: intensity/extent of DD
- Seven, 3-item Source Scales: where DD comes from
  - Hypo Distress
  - Long-term health (complications)
  - Healthcare provider (trust, relationship)
  - Interpersonal issues (work, family)
  - Shame, stigma
  - Healthcare access
  - Management demands (meds, food, exercise)

Each has a cut-point (≥2.0) that defines elevated DD.

28



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Question	Not a Problem (1)	A Slight Problem (2)	A Little Problem (3)	A Serious Problem (4)	A Very Serious Problem (5)
Core Level Of Distress					
I feel burned out by all of the attention and effort that diabetes demands of me.			✓		
It bothers me that diabetes seems to control my life.				✓	
I am frustrated that even when I do what I am supposed to for my diabetes, it doesn't seem to make a difference.				✓	
No matter how hard I try with my diabetes, it feels like it will never be good enough.				✓	
I am so tired of having to worry about diabetes all the time.				✓	
When it comes to my diabetes, I often feel like a failure.					✓
It depresses me when I realize that my diabetes will likely never go away.	✓				
Living with diabetes is overwhelming for me.			✓		
Management Difficulties					
I feel discouraged when I see high blood glucose numbers I can't explain.				✓	
I feel that thoughts about food and eating control my life.			✓		
I get angry at myself for not managing diabetes better.				✓	
Hypoglycemia Concerns					
I worry a lot that I could have a serious low glucose event.					✓
I feel so scared of going low that I avoid things in my life.					✓

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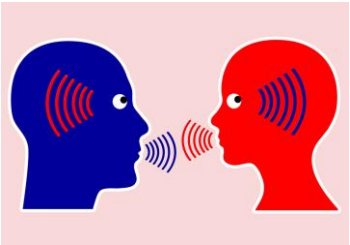
Recommendation #2: Have A Different Kind Of Conversation

Use the T1-DDAS results to help the PWD label, verbalize, and evaluate these frequently unaddressed and often hidden feelings and thoughts about diabetes.

Building the relationship and having the conversation is the intervention!



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Getting The Conversation Started

Start by identifying high Source scores:

"What strikes you about these scores? You scored 'management difficulties' quite high. Can tell me more about why you are feeling this way?"

Then identify all highly scored items:

"I notice that you scored high on the item: 'Feeling that food and eating control my life.' Can you tell me what might be going on?"

Then use the following conversational tools to make the conversation happen – **the conversation is the intervention**.

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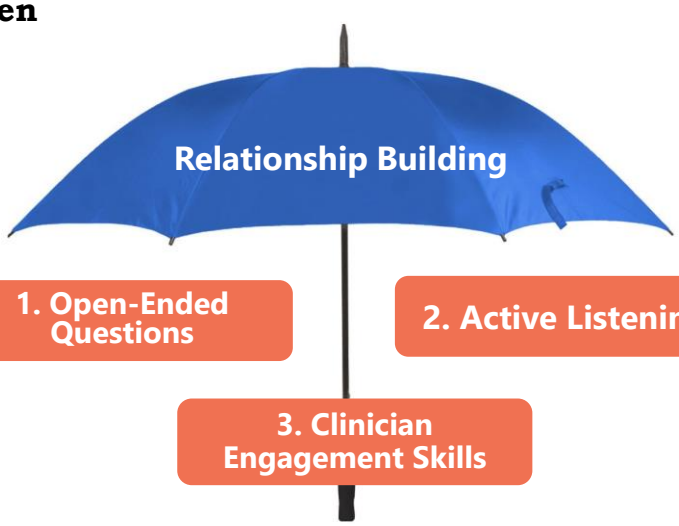
Relationship Building | Three Tools To Make It Happen



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Tools | #1. Open-Ended Questions

What are *closed-ended* questions?

Answers have to do with short, fixed responses (*that then require a clinician to then ask the next question*).

- Examples of *closed-ended* questions:
  - What kind of exercise do you like to do? "Walk!"
  - How often do you walk? "3-times a week."

Closed-ended questions do not help address DD.

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Tools | #1. Open-Ended Questions

What are *open-ended* questions?

Questions that ask "how, what, why."

They require a more detailed response.

Examples:

"What do you do when you go low?"

"What worries you the most about your diabetes?"

"What sense do you make of these BG numbers?"

"Why do *you* think that you are having trouble lowering your BG levels?

35

Tools |#2. Active Listening

What is "active listening?"

- Listen attentively – talk much less (< 50%).
- Alter tone and pace of speech (tolerate silences).
- Attend to the position of HCP and PWD in the room.
- Maintain eye contact (engage physically).

Create an atmosphere of engaged, empathetic, and attentive listening.

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Tools | #3. Clinical Engagement Skills

1. Label Feelings and Beliefs

2. Summarize & Reflect

3. Normalize & Accept

37

Clinical Engagement Tools: Label & Address Feelings

- Many people are unaware of what they feel or cannot label what they feel.
- Many are ashamed or embarrassed about what they feel – "I shouldn't feel this way."
- Look & listen carefully for underlying feelings throughout the conversation.

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Clinical Engagement Tools: Label & Address Feelings

TOOL: Sprinkle feeling words throughout the conversation.

- Focus on feelings – label them explicitly.
- Don't worry about saying the wrong feeling word – they will correct you.
- Examples:
  "Sounds like you were really *frustrated* about …"
  "You must have ended up feeling *disappointed* …"
  "Perhaps you were feeling it was *your fault* anyway, yet you seem to be angry at them at the same time."

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Clinical Engagement Tools: Summarize & Reflect

- It helps the PWD know that you are listening and interested.
- It helps them know that you understand & accept without judgement.
- It helps them to evaluate and consider their own experience – it becomes more objective.
- It helps them consolidate/integrate their experience, feelings and reactions (puts the entire picture together).

40

Clinical Engagement Tools: Summarize & Reflect

TOOL: Periodically summarize and repeat back.

- Do not fix or correct anything, even if it might be factually incorrect.
- Add feeling words, even if they were not used originally.
- Examples:
  "So, you are saying that … Do I have that right?"
  "Let me see if I understand (this happened, that happened, you reacted, etc.; that must have left you feeling..."

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Clinical Engagement Tools: Normalize & Accept

TOOL: Comment that how they feel makes sense, their feelings and experiences are very common, and it is OK that they feel this way.

"Anyone going through this would feel the same way"

"Many of the people I see with diabetes feel exactly the way you do."

"If I were in your shoes, I'd probably feel the same way."

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Use The Tools To Ask Questions:

Focus On Feelings:

- *"What do you think about this?"*
- *"What might this be about?"*
- *"Can you give me an example?"*
- *"Does all of this make sense to you?"*

"You seem so …scared, fearful, embarrassed, angry, frustrated, etc. …What do you think that we might do together to address this so that you can better reach your goals?"

43

A Warning Before We Close

- **You may feel that you don't have the time to do this.**
- **A focus on feelings may make you uncomfortable.**
- **This is not in your job description or what you were trained to do.**

DON'T PANIC:

This is a normal reaction.

Building new skills takes time/practice/patience.

Give it a try.

44

Further Training & Implementation Support

EMBARK:

- **Provided an evidenced-based method for reducing DD in clinical care.**
- **It is practical and effective in day-to-day clinical use.**
- **It does not require any special "mental health" training.**
- **It was designed for diabetes clinicians.**
- **It is based on a simple, time-tested framework called *ACT*.**
- **It is now being widely used in the US, UK, Australia, New Zealand, and Denmark.**
- **Training programs are available.**

Please let me know if you would like to learn more.

45

Thank You!

Lawrence Fisher, Ph.D., ABPP
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Diabetes Care Summit

OU Health | Harold Hamm Diabetes Center

ADCES Association of Diabetes Care & Education Specialists

Keynote Presentation

Advances in Insulin Delivery and Glucose Monitoring: Practical Technology Updates for the Diabetes Care Team

Jodie Gee, PharmD, BCACP, CDCES

Advances in Insulin Delivery and Glucose Monitoring

Practical Technology Updates for the Diabetes Care Team

Jodie Gee, PharmD, BCACP, CDCES

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Disclosures to Participants

Presenter Conflicts of Interest/Financial Relationships Disclosures:

Jodie Gee – Researcher, Dexcom, Inc.

Disclosure of Relevant Financial Relationships and Mechanism to Identify and Mitigate Conflicts of Interest:

Presenting all products related to diabetes technology without bias to one product over another

2

2

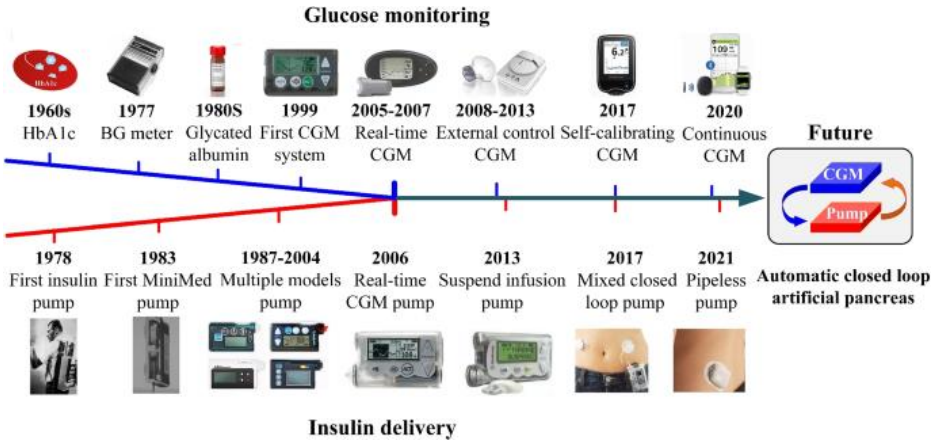
Learning Objectives

- Summarize key developments and updates in continuous glucose monitoring
- Describe recent advances in insulin delivery technologies including insulin pumps, smart pens, and hybrid closed-loop systems
- Apply knowledge of advanced diabetes technologies to patient cases, developing practical strategies for device selection, troubleshooting, and individualized care planning

3

Current Trends

- Technology and Diabetes: The Evolution



Ming, W. *Med Biol Eng Comput* **62**, 1615–1638 (2024)

4

Current Trends (continued)

Adoption trends of tech

- Continuous glucose monitoring is standard in many patients with type 1 diabetes
  - Becoming more common in type 2 diabetes
- Automated insulin delivery
  - Type 1 diabetes
  - Younger patients
- Discrepancies of adoption → Age, insurance coverage, financials, primary care (evolving)

Data driven

- Patients and providers able to have access to more data → patient empowerment, efficiency, accuracy

Access disparities

- Cost, digital/technology literacy

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Overview of Diabetes Technology

- Continuous Glucose Monitors (CGM)
- Smart insulin pens/caps
- Insulin pumps
- Hybrid closed loop systems
- Smart Device integration

6

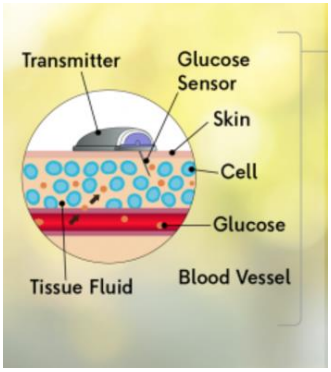
Continuous Glucose Monitoring (CGM): An Overview

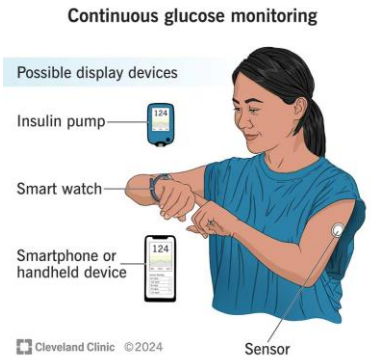
- Measures body's glucose in real-time through the interstitial fluid
- Sensor with a filament inserted under the skin
- Continuous transmission of glucose readings every 1-5 minutes to reader
- Worn on abdomen or back of arm (depending on CGM device)
- Helps to assess safety and effectiveness of treatment
- Detection and prevention of hypoglycemia
- CGM systems have an alarm or alert that sounds with hypo and hyperglycemia

7

Continuous Glucose Monitoring (CGM): An Overview

- Types: Real-time CGM (rtCGM), Intermittently scanned CGM (isCGM), professional CGM
- Components: Wearable sensor +Hand held device reader or application on smartphone
- Replaces or supplements fingerstick testing





https://diatribe.org/continuous-glucose-monitors

8

What's New in CGM?

- Smaller, less invasive sensors
- Longer wear time (up to 16 days)
- Improved accuracy (MARD ~8%)
  - Mean Absolute Relative Difference- the average difference between CGM readings and reference blood glucose measurements (the lower, the better)
- Smartphone and cloud integration
- Expanded insurance coverage
- Examples of CGMs: Dexcom G6/G7, Abbott FreeStyle Libre 2/3 (plus), Medtronic Guardian 3/4, Senseonics Eversense E3
- New over the counter (OTC) options: Dexcom Stelo, Abbott Lingo, Abbott Rio (upcoming)

Trecroci D. The most exciting diabetes technology updates: Summer 2025 edition. Beyond Type 1. Published July 3, 2025. Accessed July 3, 2025. https://beyondtype1.org/top-diabetes-tech-ada-2025/

9

Over the Counter CGM

- CGM available without a prescription
- Intended for patients NOT on insulin
- Enables insight to diet, activity and glucose trends → Support lifestyle changes
- Generally not covered by insurance (out of pocket costs ~ $50 per sensor)

CGM	Indication	Intended audience
Dexcom Stelo	Glucose monitoring (non-insulin users)	Type 2 DM (non-insulin), pre-diabetes, wellness
Abbott Lingo	Metabolic wellness & performance	General health/wellness, fitness
Abbott Rio (upcoming)	Glucose monitoring (non-insulin users)	Type 2 DM (non-insulin), pre-diabetes

10

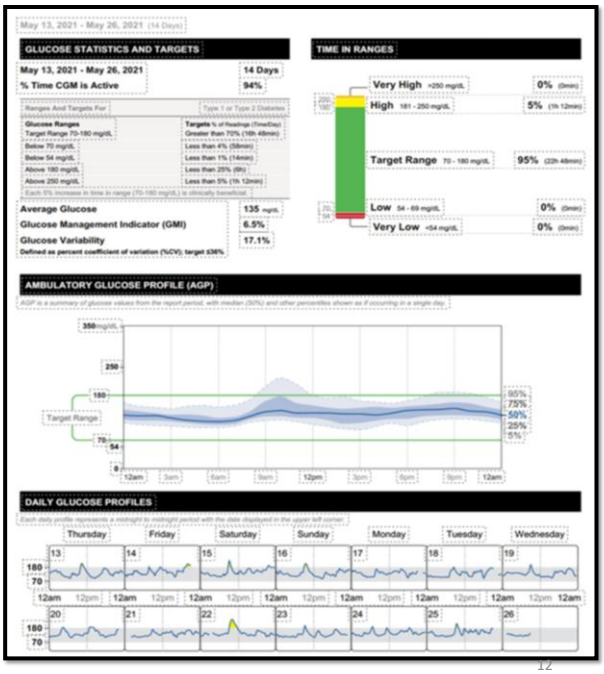
Types of CGM

Type	
Real-time CGM (rtCGM) (ie. Dexcom G6, G7, Freestyle Libre 3)	Measures and displays on glucose continuously on patient's device or smartphone (via app). Patient owns device
Intermittently scanned CGM (isCGM) (ie. Freestyle Libre 2)	Measures glucose continuously, but patient must scan to obtain value on reader or smartphone (via app). Patient owns device
Professional CGM (ie. Freestyle Libre pro, Dexcom G6 Pro)	Patient is blinded to readings (or can be unblinded). Applied at provider's office and worn 7-14 days. Used to assess glucose patterns when pt comes back for f/u after readings are downloaded at office. Patient does not own device

11

CGM Report Overview

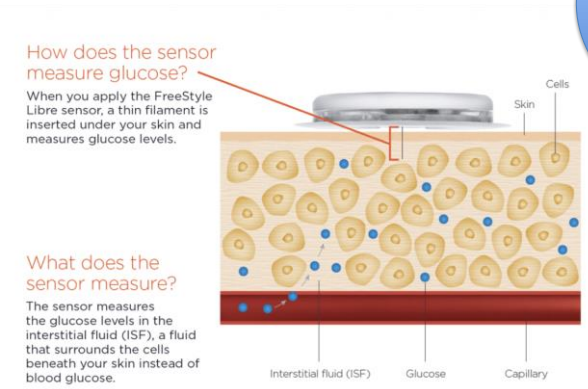
- Time in Range (TIR) ~70%
- Use Ambulatory Glucose Profile (AGP)
- Monitor glycemic variability, average glucose, low/high %



12

"The Lag" of CGM

"I checked my sugars via fingerstick and I immediately checked via CGM, why are the readings different? This CGM isn't accurate"



https://www.freestyleprovider.abbott/us-en/freestyle-libre-3.html?type=fsl3&gclid=CjOKCQjw7uSkBhDGARIsAMCZNItyzU3nlhv6cX6-x8IS8zu57DjG73n0z93gdozSF3PuE6yr1tIfMD0aAs-2EALw_wcB&gclsrc=aw.ds

13

Benefits and Challenges of CGM

Benefits	Challenges
Increased time in range (TIR)→ Better glycemic control	Data overload (both patients and providers)
Reduced hypoglycemia	Cost $$$
Supports data-driven therapy by providers	May be overwhelming or intimidating for patients
Patient empowerment and self-management	Needs training
User-friendly (even in lower health literacy and/or lower socioeconomic populations with proper training)	

Pasour T, et al. *J Am Pharm Assoc.* 64, 102–130 (2024)
Gee JS, et al. *Clin Diab* (2025)

14

CGM

- Great for patients:
  - Type 1 Diabetes (standard of care)
  - Type 2 Diabetes (especially on insulin)
  - Hypoglycemia unawareness or frequent hypoglycemia
  - Patients with high A1c variability
  - Patients who prefer to avoid fingersticks
  - Ideally….anyone who is willing to wear one ☺

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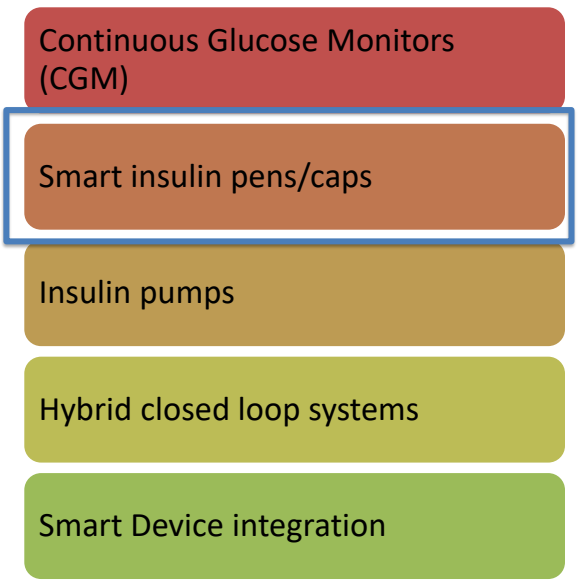
Overview of Diabetes Technology



16

Smart Insulin Pens/Caps

Reusable injector pen or cap connected to smartphone app via Bluetooth

Tracks dose timing, carb intake, and insulin on board

Reminders and dose calculators

Can be attached onto a disposable insulin pen OR use prefilled insulin cartridges

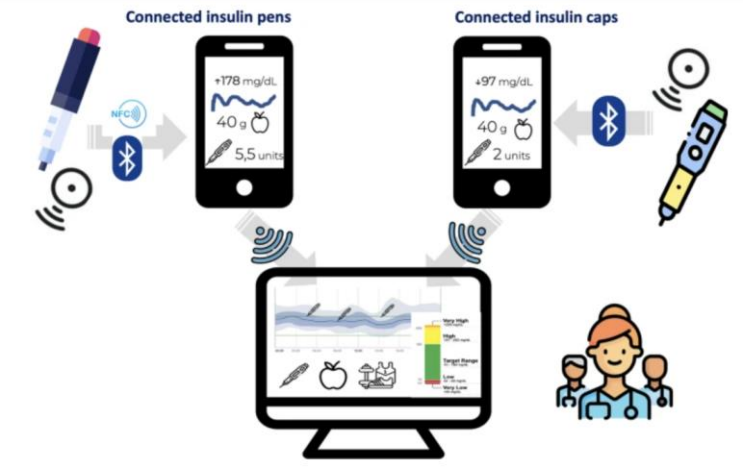
Can be connected to CGM

Examples: Medtronic InPen, Bigfoot Unity Cap, Lilly Tempo pen

Academy of Nutrition and Dietetics. Diabetes Technology News. Diabetes Care and Education Practice Group. Published May 24, 2024. Accessed July 6, 2025. https://www.dce.org/diabetes-technology/tech-news

17

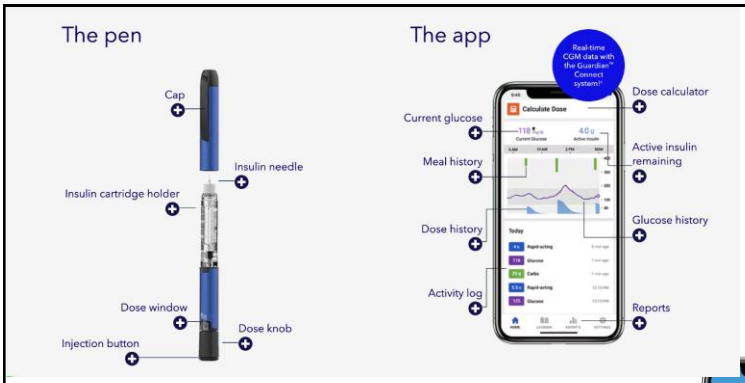
Smart Insulin Pens/Caps



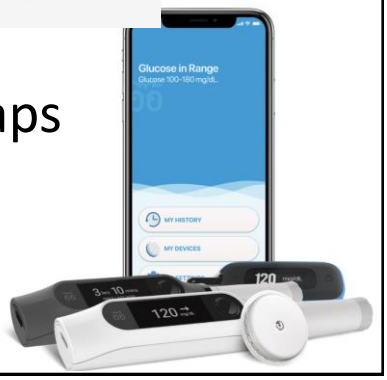
Schematic representation of connected insulin pens and caps

Tejera-Pérez, C. *et al. Diabetes Ther 2023*; **14**, 1077–1091.

18



Smart Insulin Pens/Caps



19

Smart Insulin Pens/Cap

- A smart insulin pen/cap can:
- "Help patients take the right amount of insulin at the right time"
  - Calculate dosing based on current blood sugars, carb counts, active insulin on board
  - Deliver half-unit doses
  - Remind patient of insulin dosing → helps prevent skipped doses

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Smart Insulin Pens/Cap

- Great for patients:
  - Type 1 or Type 2 diabetes on multiple daily injections
  - Patients not ready or able to use an insulin pump
  - Patients needing dose tracking and/or reminders
  - Cost-conscious patients not able to purchase insulin pumps

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Benefits and Challenges of smart insulin pens/caps

Benefits	Challenges
Accurate dose calculation/delivery	Learning curve, especially with technology
Tracking (logs dose and time) and reminders (prevent missed doses)	Compatibility limitations: Not all insulin types or brands are currently supported
Prevents insulin stacking→ Decreases hypoglycemia	Cost/insurance barriers: Less $$ than pumps, but not all insurances cover smart pens
Data sharing: CGM integration, data for health care providers	Technical issues: Connectivity failures, battery
Easy for patients with multiple daily injections (reduces confusion)	Privacy and data security

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Overview of Diabetes Technology

- Continuous Glucose Monitors (CGM)
- Smart insulin pens/caps
- Insulin pumps
- Hybrid closed loop systems
- Smart Device integration

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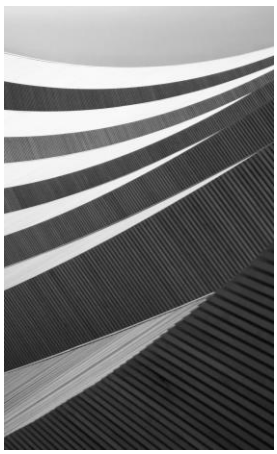
Insulin Pumps: What's New?

- Now more tubeless options
- Tubed systems still available
- Smartphone controls
- Integration with CGM systems
- Data sharing and bolus calculators
- Ideal for patients needing flexible dosing
- Examples: Tandem t:slim X2/Mobi, Medtronic MiniMed 780G, Omnipod DASH



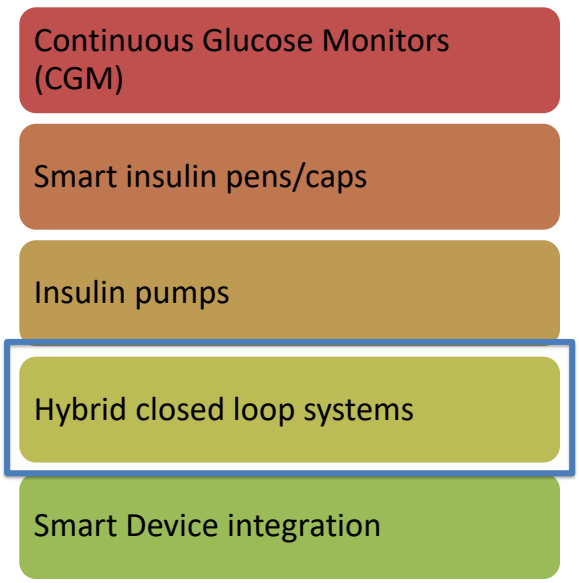
24

Insulin Pumps

- Great for:
  - Type 1 diabetes
  - Patients who need flexible insulin dosing
  - Precise control
  - Tech-savvy patients who are open to managing an insulin pump

25

Overview of Diabetes Technology



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Hybrid Closed-Loop Systems

Insulin pump + CGM + Automated Algorithm

- Automated basal insulin adjustment
  - Increases when glucose rising
  - Suspends insulin when glucose trending low
- Still requires carb input for meals
- Improved algorithms and outcomes
- Examples: Tandem t:slim X2 with Control-IQ, Medtronic MiniMed 780G, Omnipod 5 with Dexcom CGM, iLet Bionic Pancrease, Tidepool Twiist
- Newer product such as Tidepool Twiist uses artificial intelligence through algorithm
  - A.I. data used to continuous adjust basal insulin based on CGM
  - Predictive capabilities based on glucose forecasts

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Hybrid Closed-Loop Systems

- Type 1 diabetes with suboptimal control or frequent variability
- Tech-savvy patients open to automated insulin delivery
- Pediatric or adolescent patients (with proper supervision)
- People with **hypoglycemia unawareness**
- Patients who benefit from less decision fatigue

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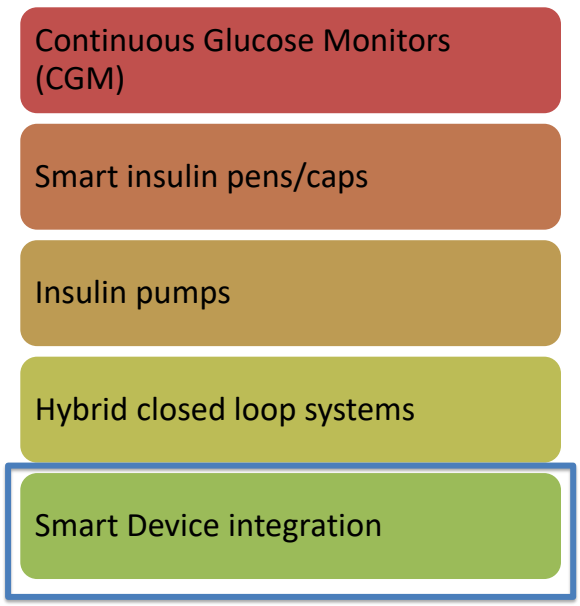
Benefits and Challenges of insulin pumps/hybrid closed loop systems

Benefits	Challenges
Accurate dose calculation/delivery	Learning curve, especially with technology
Reduced glycemic variability	Higher upfront costs, insurance issues
Prevents insulin stacking→ Decreases hypoglycemia	Can be overwhelming, depends on patient readiness
Data sharing: CGM integration, data for health care providers	Technical issues: Pump failures, connectivity issues
Easy for patients with multiple daily injections, reduces injection burden	

29

Overview of Diabetes Technology



30

Smart Device Integration

Insulin pumps and CGM can fully integrate with Apple Watch or Fitbit devices

Cloud portals for data monitoring

- Healthcare providers
- Family members/caregivers

Future trends:

- Fully closed loop systems
- More A.I. based decision making

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Patient Cases

32

Case 1: Sarah, 29, ICU Nurse with T1D

- Type 1 diabetes, diagnosed at age 14
- A1C: 9%, with frequent nighttime lows and daytime highs
- On basal bolus insulin pen injections (MDI)
- Checking blood sugars via fingerstick (average 1-2x/day)
- Often omits bolus injections and checking blood sugars during busy shifts
- Comfortable with technology, and would like tighter blood glucose control and flexibility to manage with her "on the go" lifestyle

Which of the following technology would be the best match for Sarah?
A. Smart insulin pen
B. Hybrid closed-loop system
C. CGM only

33

Case 1: Sarah, 29, ICU Nurse with T1D: Debrief

- Hybrid-closed loop system:
  - Patient comfortable with technology
  - CGM will monitor blood sugars so no need for fingersticks on a regular basis
  - Automates basal adjustments
  - Reduces risk of hypoglycemia
  - Discreet dosing on the go insulin administration

34

Case 2: Henry, 68, T2D on insulin

- Type 2 diabetes, diagnosed at age 45
- A1C: 10%
- On basal bolus insulin pen injections (MDI); had metformin intolerance
- On CGM, which his son helps him manage
- Tends to forget his bolus injections at times, and his son and health care provider are unable to account for missed/taken doses
- Comfortable with basic technology as he uses his smartphone every day, but gets overwhelmed with complex tech

Which of the following technology would be the best match for Henry?
A. Smart insulin pen
B. Hybrid closed-loop system
C. Insulin pump only

35

Case 2: Henry, 68, T2D on insulin: Debrief

- Smart insulin pen
  - Built-in dose reminders to reduce missed boluses
  - Logs and track doses automatically
  - Data sharing helps his son and health care provider support his diabetes care
  - Dose calculator can reduce decision fatigue and improve accuracy

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Case 3: Marie, 47, T2D

- Type 2 diabetes, diagnosed at age 42
- A1C: 9.3%
- On long-acting insulin and once-weekly GLP-1 receptor agonist
- Not checking blood sugars due to pain of fingersticks and difficulty due to her job that requires travel
- Using her phone alarm to remind her of long-acting insulin and GLP-1 RA, which is working well
- Is not ready for "complicated technology"
- Recognizes that she needs to check her blood sugars and is motivated to make lifestyle changes

Which of the following technology would be the best match for Marie?
A. Smart insulin pen
B. Hybrid closed-loop system
C. CGM only
D. Insulin pump

37

Case 3: Marie, 47, T2D: Debrief

- Continuous glucose monitoring
  - Great stepwise approach introducing her to something that is very user friendly and can give her insight on lifestyle
  - Can even offer blinded professional CGM, based on patient preference
  - Provides real-time glucose data
  - Enables behavioral changes and basal titration
  - Team support is important for building patient confidence as well as reassurance with patient concerns

38

Case 4: JJ, 37, Pre-diabetes

- Pre-diabetes, newly diagnosed, works as a physician assistant in the ER
- A1C: 6.0%
- No medications, strong family history of type 2 diabetes
- Exercises (crossfit), 5 days per week
- Diet: ”Healthy diet”, consists of protein, carbs, vegetables – not portion controlled
- Is highly motivated to control blood sugars to prevent progression to diabetes

What would be your recommendation for JJ?

39

Case 4: JJ, 37, Pre-diabetes: Debrief

- Over the counter CGM
  - Start CGM informing patient to continue with daily lifestyle/diet without changes initially
  - Real-time glucose trends can identify glycemic variability despite normal A1C
  - Catch postprandial spikes that may go unnoticed
  - Fine-tune meal composition and portion size
  - Understand glycemic response to specific foods and exercise
  - Encourages behavioral changes
  - Motivates sustained healthy habits

40

Key Points

- Technology is rapidly evolving and beneficial
- CGM and insulin delivery tools improve outcomes
- Individualized selection: Involve the patient and discuss their comfort in which type of technology is suitable for them
- Multidisciplinary care supports patient success- Education, Support, and Troubleshooting

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Food for Thought

- What barriers do you see in practice?
  - How can we overcome these barriers?
- How can your team support patients using new tech?

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Diabetes Care Summit

OU Health | Harold Hamm Diabetes Center

ADCES Association of Diabetes Care & Education Specialists

Presentation

Guideline Recommended Approaches to Diabetes Management in Underinsured Populations: Challenges and Solutions

Jeremy L. Johnson, PharmD, BCACP, CDCES, BC-ADM

Meadow Hazelhoff, MSW, LCSW

1

Guideline Recommended Approaches to Diabetes Management in Underinsured Populations: Challenges & Solutions

Jeremy L. Johnson, PharmD, BCACP, CDCES, BC-ADM
Meadow Hazelhoff, MSW, LCSW

2025 Harold Hamm Diabetes Care Summit
Oklahoma City, OK
September 5, 2025

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Faculty

Jeremy L. Johnson, PharmD, BCACP, CDCES, BC-ADM

Professor of Pharmacy Practice
SWOSU College of Pharmacy

Ambulatory Care Clinical Pharmacist
Diabetes Care and Education Specialist
OSU Family Medicine Health Care Center
Tulsa, Oklahoma

Meadow Hazelhoff, MSW, LCSW

Director of Behavioral Health Services & Special Populations
Oklahoma Primary Care Association

2

Financial Disclosure and Mitigation

3

Under guidelines established under the Standards for Integrity and Independence in Accredited Continuing Education, disclosure must be made regarding relevant financial relationships with ineligible companies within the last 24 months.

Jeremy L. Johnson
Meadow Hazelhoff

I have no relevant financial relationships with ineligible companies to disclose.

3

Learning Objectives

4

At the completion of this activity, participants will be able to:

1. Select guideline recommended optimal pharmacotherapeutic agents for patients with diabetes with or without comorbidities.
2. Identify financial barriers patients may encounter acquiring technology or pharmacotherapeutic agents and potential solutions or options.
3. Utilize a method to identify optimal therapeutic options for the management of type 2 diabetes considering effectiveness, adverse effects, costs, and patient preferences.

4

Overview

5

1. Diabetes and patient populations
2. Guideline treatment algorithms
3. Costs of therapeutic agents
4. Resources for low-income patients
5. Clinician strategies to assist patients

5

Who are our patients?

6

The US Diabetes "Epidemic"

7

- National prevalence of **diabetes**
  - 38.4 million = 11.6% of US population
- National prevalence of **prediabetes**
  - 97.6 million = 38% of US population
- The percentage of adults with diabetes increases with age

	Total Adult DM %
Total	14.7%
Sex	
Men	15.4%
Women	14.1%
Race/Ethnicity	
Black	17.4%
Asian	16.7%
Hispanic	15.5%
White	13.6%

CDC National Diabetes Statistic Report 2024

7

The Oklahoma Diabetes "Epidemic"

8

- Oklahoma prevalence of **diabetes**
  - 520,000 = 13.3% of OK population
- Oklahoma prevalence of **prediabetes**
  - >1 million = 35% of OK population
- Oklahoma ranks in the TOP TEN consistently for highest DM prevalence in the US

diabetes.org/SFSSources.

8

Complications of Diabetes

CDC National Diabetes Statistic Report 2024

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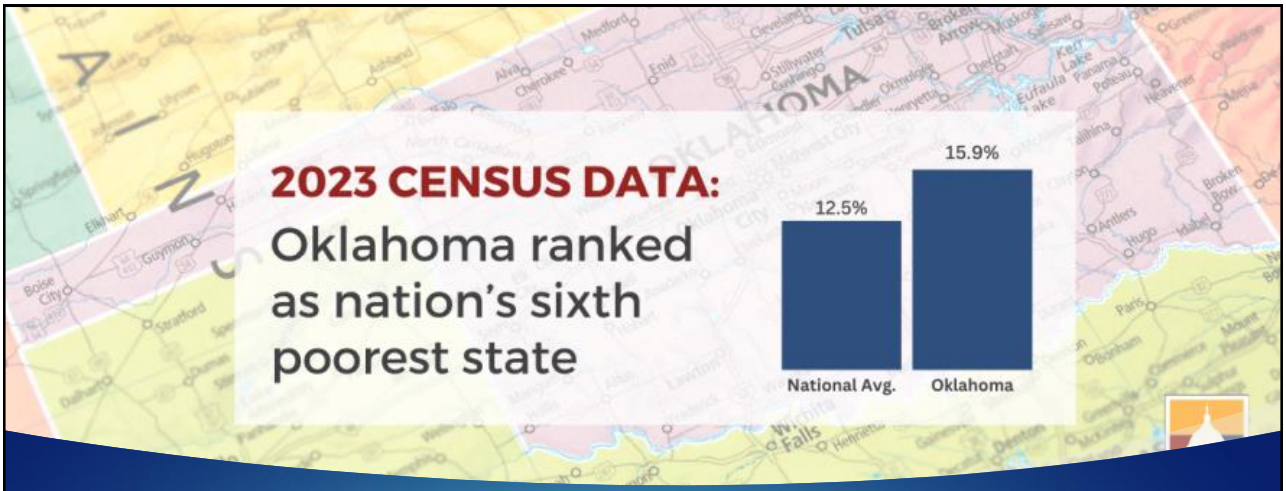

Finances and Poverty

okpolicy.org/2023-census-data-oklahoma-ranks-as-sixth-poorest-state/

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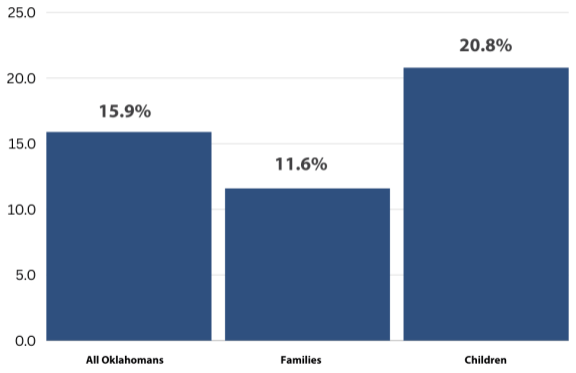
Poverty in Oklahoma

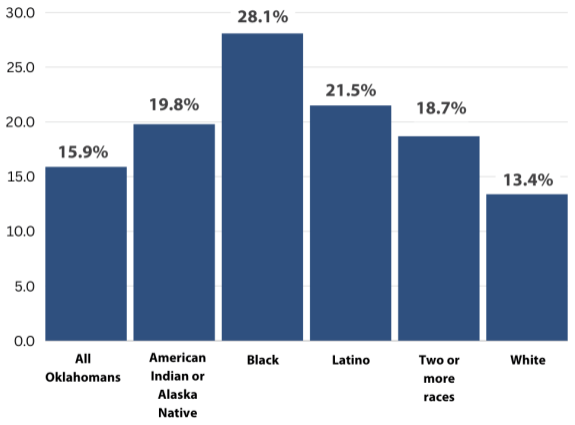
11

Children have higher poverty rate when compared with the general population



Data Source: U.S. Census Bureau's 2023 American Community Survey, Released 09/2024

Oklahoma's poverty rate by race



Data Source: U.S. Census Bureau's 2023 American Community Survey, Released 09/2024

okpolicy.org/2023-census-data-oklahoma-ranks-as-sixth-poorest-state/

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Poverty in Oklahoma

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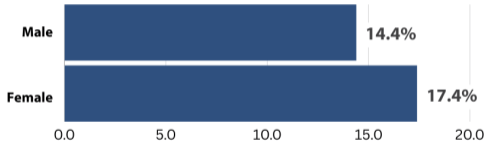
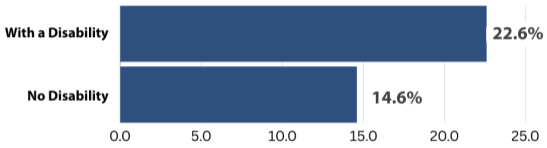
Poverty Rate by Gender (2023)



Poverty Rate by Disability Status (2023)



Data Source: U.S. Census Bureau's 2023 American Community Survey, Released 09/2024

okpolicy.org/2023-census-data-oklahoma-ranks-as-sixth-poorest-state/

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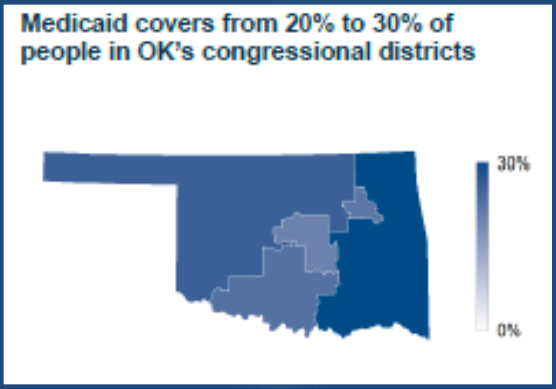
Our Patients

13

- Private insurance
- Private insurance, but very low income
- Medicare
- Medicaid —25% of Oklahomans
- Self-pay



Soonercare fast facts June 2024

13

JAMA Network | Open

14

Original Investigation | Public Health

Type 2 Diabetes and Financial Outcomes

Matthew Pesavento, PhD; Cäzilia Loibl, PhD, CFP; Stephanie Moulton, PhD; Donald Haurin, PhD; Madison Hyer, MS; Djhenne Dalmacy, MS; Joshua J. Joseph, MD, MPH

JAMA Network Open. 2025;8(7):e2523453. doi:10.1001/jamanetworkopen.2025.23453 July 28, 2025 1/12

Question: What is the association of type 2 diabetes with adverse financial outcomes among adult patients of a Midwestern medical center, and which patients are at greater risk?

- Findings: In this economic evaluation study of 166,285 adult patients, the probability of adverse financial outcomes was significantly higher among patients with type 2 diabetes, with higher risk observed among patients of Black race, enrolled in Medicaid, of Hispanic ethnicity, younger than 65 years, without earned income, and of female sex
- Meaning: These findings suggest that patients with type 2 diabetes may experience substantially more adverse financial outcomes compared with patients without diabetes, highlighting the need to consider patient financial health when treating type 2 diabetes, particularly for patient groups at higher risk.

Pesavento M. *JAMA Network Open*. 2025;8(7):e2523453.

14

15

Clinical Practice Guideline Recommendations

THE CHALLENGE IS PROVIDING QUALITY CARE AND TREATMENT THAT IS AFFORDABLE

15

Comparing Guidelines

16

- American Diabetes Association
  - ADA Standards of Medical Care in Diabetes—2025
- American Association of Clinical Endocrinologists
  - AACE Comprehensive Diabetes Management Algorithm 2023

16

American Diabetes Association Approach to Treating Type 2 DM

PATIENT-CENTERED APPROACH

COMORBIDITIES, EFFICACY, HYPOGLYCEMIA RISK, IMPACT ON WEIGHT, COST AND ACCESS, ADRS, PATIENT PREFERENCE

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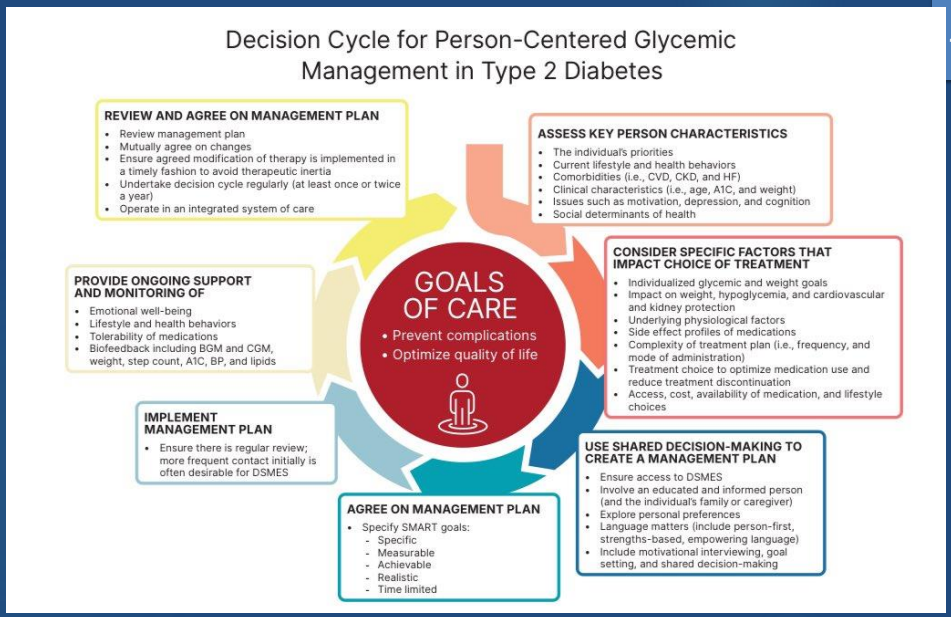
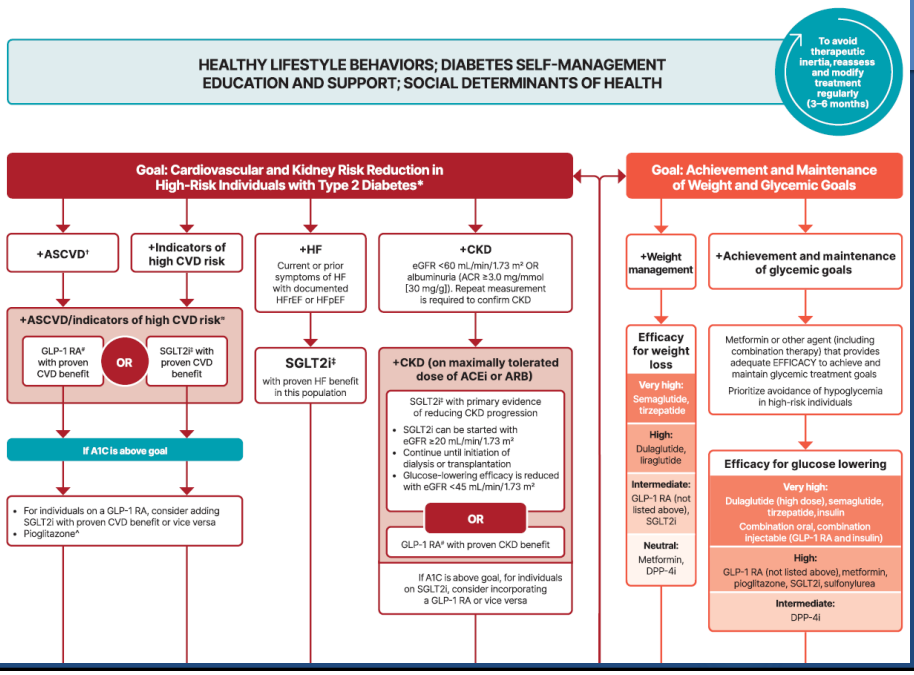


Pharmacologic Approaches to Glycemic Treatment:
Standards of Care in Diabetes - 2025 Diabetes Care 2025;48(Suppl. 1):S181-S206

18

9

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



Pharmacologic Approaches to Glycemic Treatment: *Standards of Care in Diabetes - 2025 Diabetes Care* 2025;48(Suppl. 1):S181-S206

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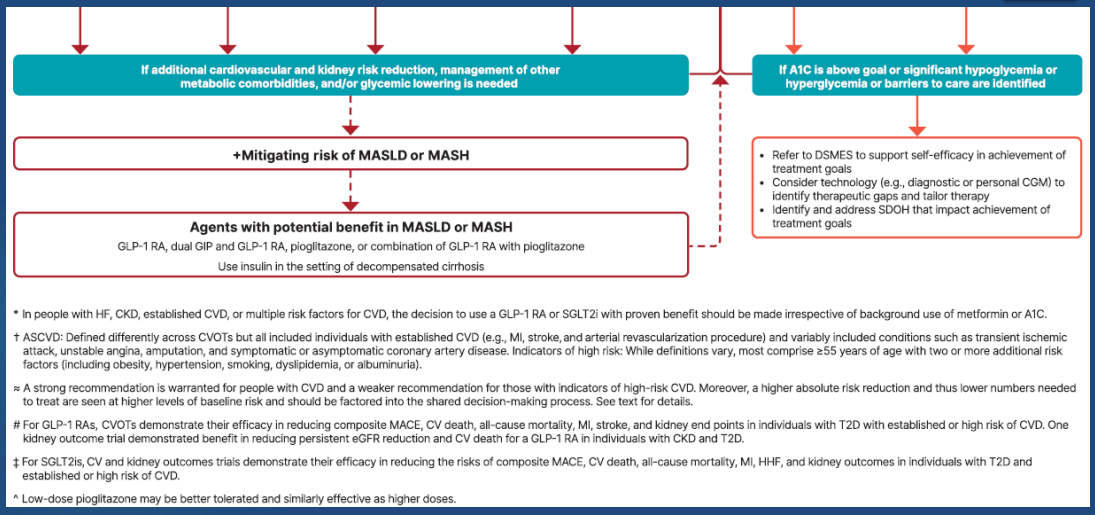
Figure 9.3 (continued)



* In people with HF, CKD, established CVD, or multiple risk factors for CVD, the decision to use a GLP-1 RA or SGLT2i with proven benefit should be made irrespective of background use of metformin or A1C.

† ASCVD: Defined differently across CVOTs but all included individuals with established CVD (e.g., MI, stroke, and arterial revascularization procedure) and variably included conditions such as transient ischemic attack, unstable angina, amputation, and symptomatic or asymptomatic coronary artery disease. Indicators of high risk: While definitions vary, most comprise ≥55 years of age with two or more additional risk factors (including obesity, hypertension, smoking, dyslipidemia, or albuminuria).

≈ A strong recommendation is warranted for people with CVD and a weaker recommendation for those with indicators of high-risk CVD. Moreover, a higher absolute risk reduction and thus lower numbers needed to treat are seen at higher levels of baseline risk and should be factored into the shared decision-making process. See text for details.

For GLP-1 RAs, CVOTs demonstrate their efficacy in reducing composite MACE, CV death, all-cause mortality, MI, stroke, and kidney end points in individuals with T2D with established or high risk of CVD. One kidney outcome trial demonstrated benefit in reducing persistent eGFR reduction and CV death for a GLP-1 RA in individuals with CKD and T2D.

‡ For SGLT2is, CV and kidney outcomes trials demonstrate their efficacy in reducing the risks of composite MACE, CV death, all-cause mortality, MI, HHF, and kidney outcomes in individuals with T2D and established or high risk of CVD.

^ Low-dose pioglitazone may be better tolerated and similarly effective as higher doses.

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Algorithm Considerations
(ADA Figure 9.3)

- **COMORBIDITIES**: In patients with type 2 DM and established/high risk for atherosclerotic cardiovascular disease, heart failure, and/or chronic kidney disease, treatment should include agents that target cardiorenal risk, independent of A1c
  - ASCVD
  - HF
  - CKD

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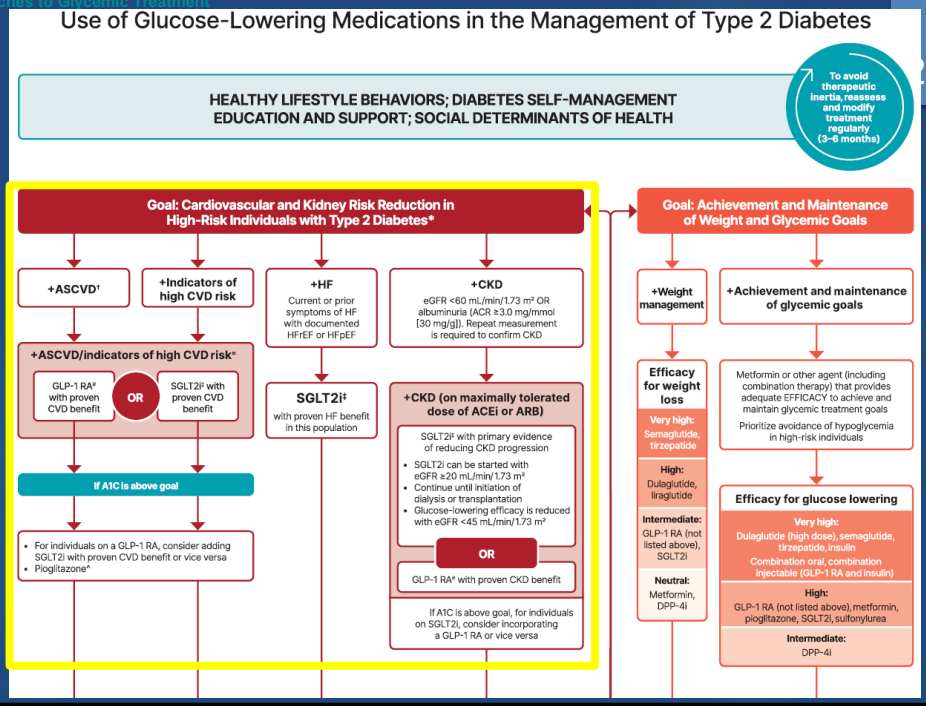
Use of Glucose-Lowering Medications in the Management of Type 2 Diabetes



Pharmacologic Approaches to Glycemic Treatment: *Standards of Care in Diabetes - 2025 Diabetes Care* 2025;48(Suppl. 1):S181-S206

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Algorithm Considerations (ADA)

- **Achievement of glycemic and weight goals**
- Pharmacotherapy that provides adequate **efficacy** to achieve and maintain treatment goals should be considered, such as metformin or others, including combination therapy.
  - Avoid hypoglycemia agents in high-risk pts

Pharmacologic Approaches to Glycemic Treatment:
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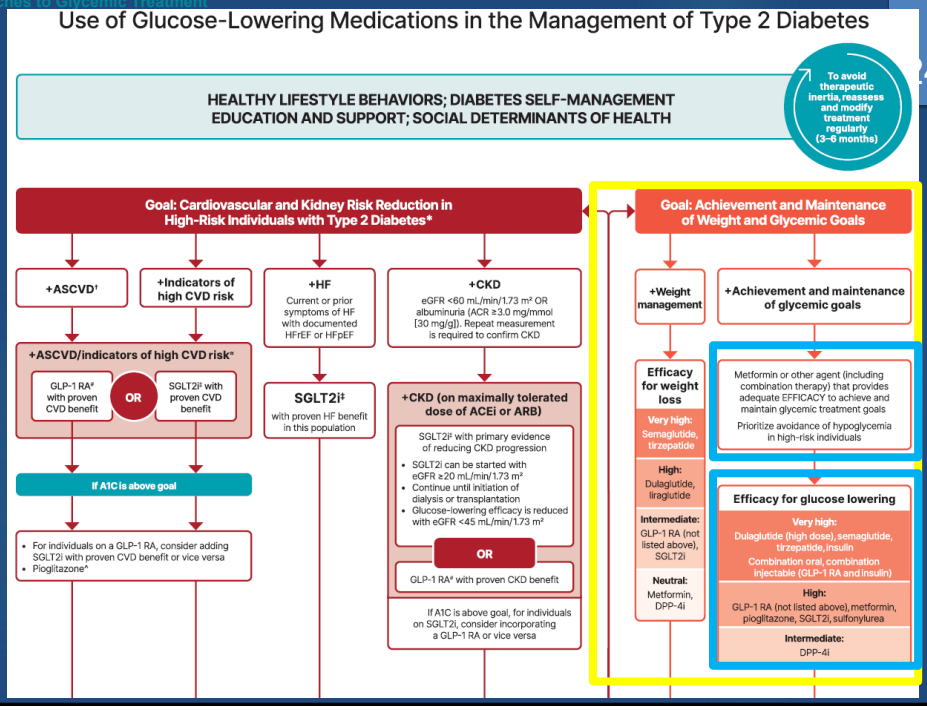
9. Pharmacologic Approaches to Glycemic Treatment



Pharmacologic Approaches to Glycemic Treatment:
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Algorithm

- **Weight management** is impactful so pharmacotherapy should support weight management goals.
  - If not achieved wt goals additional weight management interventions should occur

Pharmacologic Approaches to Glycemic Treatment:
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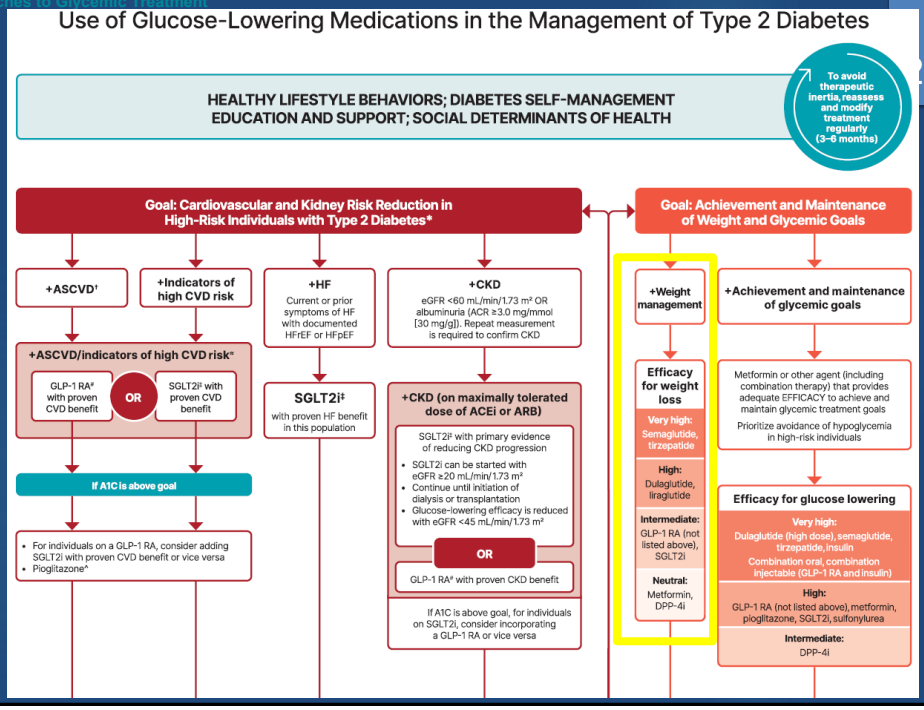
9. Pharmacologic Approaches to Glycemic Treatment



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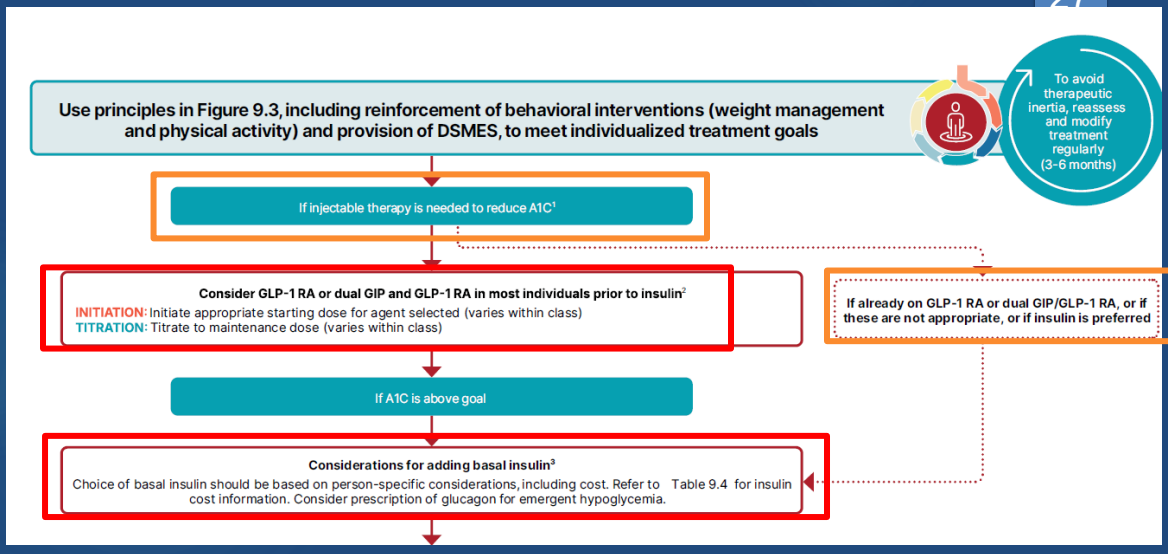

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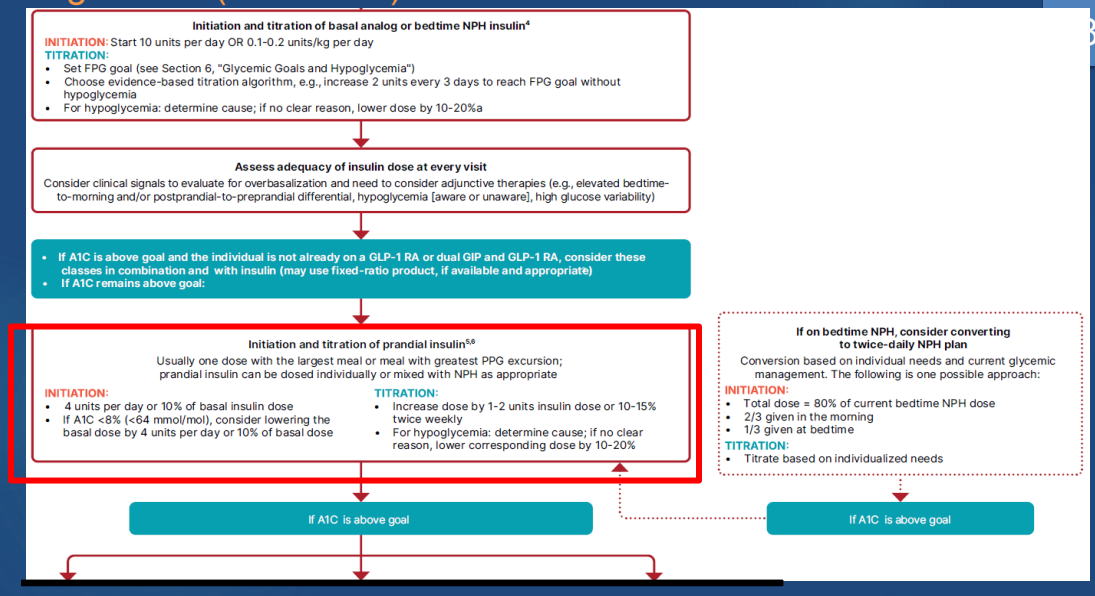
Figure 9.4 (continued)



Pharmacologic Approaches to Glycemic Treatment:
Standards of Care in Diabetes - 2025 Diabetes Care 2025;48(Suppl. 1):S181-S206

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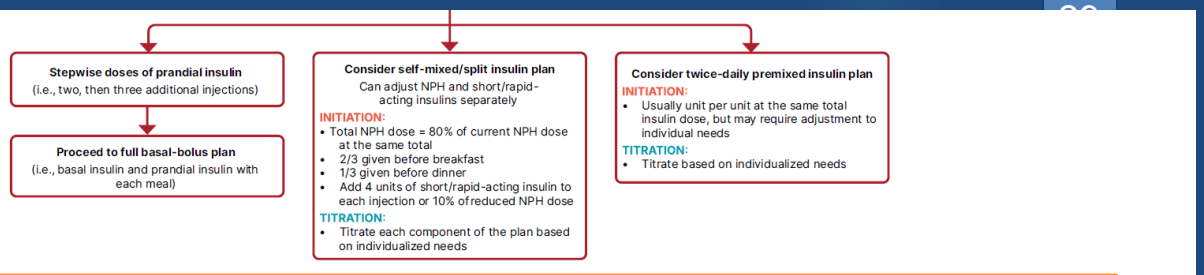
Figure 9.4 (continued)



1. Consider insulin as the first injectable if symptoms of hyperglycemia are present, when A1C or blood glucose levels are very high (i.e., A1C >10% [>86 mmol/mol] or blood glucose ≥300 mg/dL [≥16.7 mmol/L]), or when a diagnosis of type 1 diabetes is a possibility.
2. When selecting GLP-1 RAs, consider individual preference, A1C lowering, weight-lowering effect, and frequency of injection. If CVD is present, consider GLP-1 RA with proven CVD benefit; oral or injectable GLP-1 RAs are appropriate.
3. For people on GLP-1 RA and basal insulin combination, consider use of a fixed-ratio combination product (IDegLira or iGlarLixi).
4. Consider switching from evening NPH to a basal analog if the individual develops hypoglycemia and/or frequently forgets to administer NPH in the evening and would be better managed with a morning dose of a long-acting basal insulin. Consider dosing NPH in the morning for steroid-induced hyperglycemia.
5. Prandial insulin options include injectable rapid- and ultra-rapid-acting analog insulins, injectable short-acting human insulin, or inhaled human insulin.
6. If adding prandial insulin to NPH, consider initiation of a self-mixed or premixed insulin plan to decrease the number of injections required.

Figure 9.4—Intensifying to injectable therapies in type 2 diabetes. DSMES, diabetes self-management education and support; FPG, fasting plasma glucose; GLP-1 RA, glucagon-like peptide 1 receptor agonist; GIP, glucose-dependent insulinotropic polypeptide; PPG, postprandial glucose. Adapted from Davies et al. (242).

Pharmacologic Approaches to Glycemic Treatment:
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Table 9.2—Features of medications for lowering glucose in type 2 diabetes

Medication (route of administration)	Glucose-lowering efficacy[1]	Hypoglycemia risk	Weight effects[2]	CV effects		Kidney effects		MASH effects	Clinical considerations and adverse effects
				Effect on MACE	Effect on HF	Progression of CKD	Dosing/use considerations*		
Metformin (oral) $	High	No	Neutral (potential for modest loss)	Potential benefit	Neutral	Neutral	• Contraindicated with eGFR <30 mL/min/1.73 m²	Neutral	• GI side effects: mitigate with slow dose titration, extended-release formulations, and administration with food. • Potential for vitamin B12 deficiency: monitor and replete as appropriate.
SGLT2 inhibitors (oral) $$$	Intermediate to high	No	Loss (intermediate)	Benefit: canagliflozin, empagliflozin	Benefit: canagliflozin, dapagliflozin, empagliflozin, ertugliflozin	Benefit: canagliflozin, dapagliflozin, empagliflozin	• See labels of individual agents for dosage considerations for kidney function • Glucose-lowering effect is minimal at eGFR <45 mL/min/1.73 m² and lower; continue for cardiovascular and kidney benefit until dialysis or transplantation	Unknown	• DKA risk in individuals with insulin deficiency (rare in T2D): discontinue, evaluate, and treat promptly if suspected; be aware of predisposing risk factors and clinical presentations (including euglycemic DKA); mitigate risk with sick-day planning; discontinue before scheduled surgery (e.g., 3-4 days), during critical illness, or during prolonged fasting. • Genital mycotic infections: mitigate risk with genital hygiene and avoid use in high-risk individuals. • Necrotizing fasciitis of the perineum (Fournier gangrene): rare; prompt treatment if suspected. • Intravascular volume depletion: attention to volume status and blood pressure, particularly when ill or fasting; adjust other volume-contracting agents as applicable; monitor kidney function upon initiation.

Pharmacologic Approaches to Glycemic Treatment:
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Table 9.2 (continued)

GLP-1 RAs (SQ; semaglutide also available in oral formulation) $$$	High to very high	No	Loss (intermediate to very high)	Benefit: dulaglutide, liraglutide, semaglutide (SQ) Neutral: exenatide once weekly, lixisenatide	Neutral	Benefit for renal end points in CVOTs, driven by albuminuria outcomes: dulaglutide, liraglutide, semaglutide (SQ) Demonstrated benefit for progression of CKD for semaglutide (SQ)	• See labels of individual agents for dosage considerations for kidney function • No dose adjustment for dulaglutide, liraglutide, or semaglutide • Monitor kidney function when initiating or escalating doses in individuals with kidney impairment reporting severe adverse GI reactions	Potential benefit	• Thyroid C-cell tumors identified in rodents; human relevance not determined. • Ileus: risk level is not well established; provide guidance on discontinuation prior to surgical procedures. • Pancreatitis: acute pancreatitis has been reported, but causality has not been established. Do not initiate if at high risk for pancreatitis, and discontinue if pancreatitis is suspected. • Biliary disease: evaluate for gallbladder disease if cholelithiasis or cholecystitis is suspected; avoid use in at-risk individuals. • Diabetic retinopathy: close monitoring of retinopathy in those at high risk (older individuals and those with longer duration of T2D [≥10 years]). • Impact on drug absorption: orally administered drug absorption may be impaired during dose titration (including of oral contraceptives). • GI side effects: counsel on potential for GI side effects; provide guidance on dietary modifications to mitigate GI side effects (reduction in meal size, mindful eating practices [e.g. stop eating once full], decreasing intake of high-fat or spicy food); consider slower dose titration for those experiencing GI challenges. Not recommended for individuals with gastroparesis.
Dual GIP and GLP-1 RA (SQ) $$$	Very high	No	Loss (very high)	Under investigation	Under investigation	Under investigation	• See labels of individual agents for dosage considerations for kidney function • No dose adjustment • Monitor kidney function when initiating or escalating doses in individuals with kidney impairment reporting severe adverse GI reactions	Potential benefit	
DPP-4 inhibitors (oral) $$$	Intermediate	No	Neutral	Neutral	Neutral (potential risk: saxagliptin)	Neutral	• Dose adjustment required based on kidney function (sitagliptin, saxagliptin, alogliptin) • No dose adjustment required for linagliptin	Unknown	• Pancreatitis has been reported, but causality has not been established. Discontinue if pancreatitis is suspected. • Postmarketing concerns about joint pain (consider discontinuing if debilitating and other treatment options are feasible) and bullous pemphigoid (discontinue if suspected).

Pharmacologic Approaches to Glycemic Treatment:
Standards of Care in Diabetes - 2025 Diabetes Care 2025;48(Suppl. 1):S181-S206

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Table 9.2 (continued)

Pioglitazone (oral) $	High	No	Gain	Potential benefit	Increased risk	Neutral	• No dose adjustment required • Generally not recommended in kidney impairment due to potential for fluid retention	Potential benefit	• Increased risk of HF and fluid retention. Do not use in the setting of HF. • Risk of bone fractures. • Bladder cancer: do not use in individuals with active bladder cancer, and use caution in those with prior history of bladder cancer.
Sulfonylureas (2nd generation) (oral) $	High	Yes	Gain	Neutral	Neutral	Neutral	• Glyburide: generally not recommended in CKD • Glipizide and glimepiride: initiate conservatively to avoid hypoglycemia	Unknown	• FDA Special Warning on increased risk of CV mortality based on studies of an older sulfonylurea (tolbutamide); glimepiride shown to be CV safe (see text). • Use with caution in individuals at risk for hypoglycemia, particularly if in combination with insulin.
Insulin (human) (SQ; regular insulin also available as inhaled formulation) $-$$$ **Insulin (analogs)** (SQ) $$$	High to very high	Yes	Gain	Neutral	Neutral	Neutral	• Lower insulin doses required with a decrease in eGFR; titrate per clinical response	Unknown	• Injection site reactions • Higher risk of hypoglycemia with human insulin (NPH or premixed formulations) vs. analogs • Risk of hypoglycemia and duration of activity increases with the severity of impaired kidney function. • Refer to device-specific instructions for insulins compatible with different delivery systems (i.e., pumps, connected insulin pens, insulin patches).

CKD, chronic kidney disease; CV, cardiovascular; DKA, diabetic ketoacidosis; DPP-4, dipeptidyl peptidase 4; eGFR, estimated glomerular filtration rate; FDA, U.S. Food and Drug Administration; GI, gastrointestinal; GIP, glucose-dependent insulinotropic polypeptide; GLP-1 RA, glucagon-like peptide 1 receptor agonist; HF, heart failure; MACE, major adverse cardiovascular events; MASH, metabolic dysfunction-associated steatohepatitis; SGLT2, sodium–glucose cotransporter 2; SQ, subcutaneous; T2D, type 2 diabetes. *For agent-specific dosing recommendations, please refer to manufacturers' prescribing information. [1]Tsapas et al. (106). [2]Tsapas et al. (241). Adapted from Davies et al. (89).

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Cost Related Barriers

- Cost-related medication non-adherence
- More affordable agents
  - Metformin
  - Insulin: R or NPH
  - SU
  - TZDs

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Median Monthly Cost of Max Doses

(National Average Drug Acquisition Cost [NADAC])

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Low-Cost Drugs

Class	Drug	NADAC	Notes
Biguanides	Metformin IR	$1-3	Walmart Rx Program
	Metformin ER 500mg	$3	
	Metformin ER 1000mg	$26	
Sulfonylureas	Glimepiride	$2	Walmart Rx Program
	Glipizide IR/XR	$5-8	
	Glyburide	$7-13	
Thiazolidinediones	Pioglitazone	$3	

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Median Monthly Cost of Max Doses
(National Average Drug Acquisition Cost [NADAC])

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High-Cost Drugs

Class	Drug	NADAC	Notes
DPP-4 Inhibitors	Alogliptin, Saxagliptin	$145-165	Coupon codes Patient Assistance Programs
	Sitagliptin, Linagliptin	$503-550	
SGLT2 Inhibitors	Bexagliflozin	$47	
	Dapagliflozin, Ertugliflozin	$343-352	
	Empagliflozin, Canagliflozin	$574-586	
GLP-1 RA	Semaglutide, Dulaglutide	$818-1101	
	Liraglutide, Exenatide IR/ER		
GIP/GLP-1 RA	Tirzepatide	$1030	

Pharmacologic Approaches to Glycemic Treatment:
Standards of Care in Diabetes - 2025 Diabetes Care 2025;48(Suppl. 1):S181-S206

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Median Monthly Cost of Max Doses
(National Average Drug Acquisition Cost [NADAC])

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Insulin (per 1000 units)

Insulin type	Insulin name	NADAC	Notes
Short-acting	Human Regular	$43-58	Walmart ReliOn $25 vials
Intermediate-acting	Human NPH	$45-74	
Premixed	NPH/Regular 70/30	$45-74	
Rapid premixed	Aspart 70/30, Lispro 75/25	$69-82	
Rapid-acting	Aspart, Glulisine, Lispro	$70-105	
	Inhaled	$1300	
Long-acting	Degludec, Glargine	$59-122	
Long-acting/GLP-1RA	iDegLira, IGlarLixi	$791-570	

Pharmacologic Approaches to Glycemic Treatment:
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Psychosocial Strategies in Diabetes Care

OR TAILORING TREATMENT FOR SOCIAL CONTEXT

IMPROVING CARE AND PROMOTING HEALTH IN POPULATIONS:
STANDARDS OF CARE IN DIABETES - 2025 *DIABETES CARE* 2025;48(SUPPL. 1):S14-S26

37

Social Determinants of Health

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- Economic Stability
- Education Access and Quality
- Social and Community Context
- Neighborhood and Bulit Environment
- Healthcare Access and Quality

1.7 During clinical encounters, assess for social determinants of health, including food insecurity, housing insecurity, financial barriers, health insurance and health care access, environmental and neighborhood factors, and social capital/social community support, to inform treatment decisions with referral to appropriate local community resources

https://health.gov/healthypeople/priority-areas/social-determinants-health

IMPROVING CARE AND PROMOTING HEALTH IN POPULATIONS:
STANDARDS OF CARE IN DIABETES - 2025 DIABETES CARE 2025;48(SUPPL. 1):S14-S26

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SDoH Continued

39

Economic Stability	Education Access and Quality	Social and Community Context
• Poverty • Housing • Workplace Injuries • Food Insecurity	• High School Graduation • Early Childhood Education • Students with Disabilities	• Jobs • Poverty • Culture, Ethnicity, Race

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SDoH Continued

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Neighborhood and Built Environment	Healthcare Access
• Walking Paths or nah? • Safety • Access to healthy food • Food Deserts	• Rural vs Urban • Quality Available • Access to Screening

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Connecting the dots: Oklahoma, SDOH, and Diabetes

41

- Food insecurity and access
  - Uninsured and Underinsured
  - Health care access
  - Housing insecurity

All the factors often impact our patients!

41

Connecting the dots: Oklahoma, SDOH, and Diabetes

42

- Social capital and Community Support
  - Access to healthy living, gyms, neighborhood parks, availability of child care, family close by?
- Health Literacy
- Cultural Access

All the factors often impact our patients!

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Difficulties with Insurance

43

Managed Medicare and now Medicaid

Work Status

In addition to: Generic vs. Brand and pre-authorization woes

High Co-Pays and Deductibles

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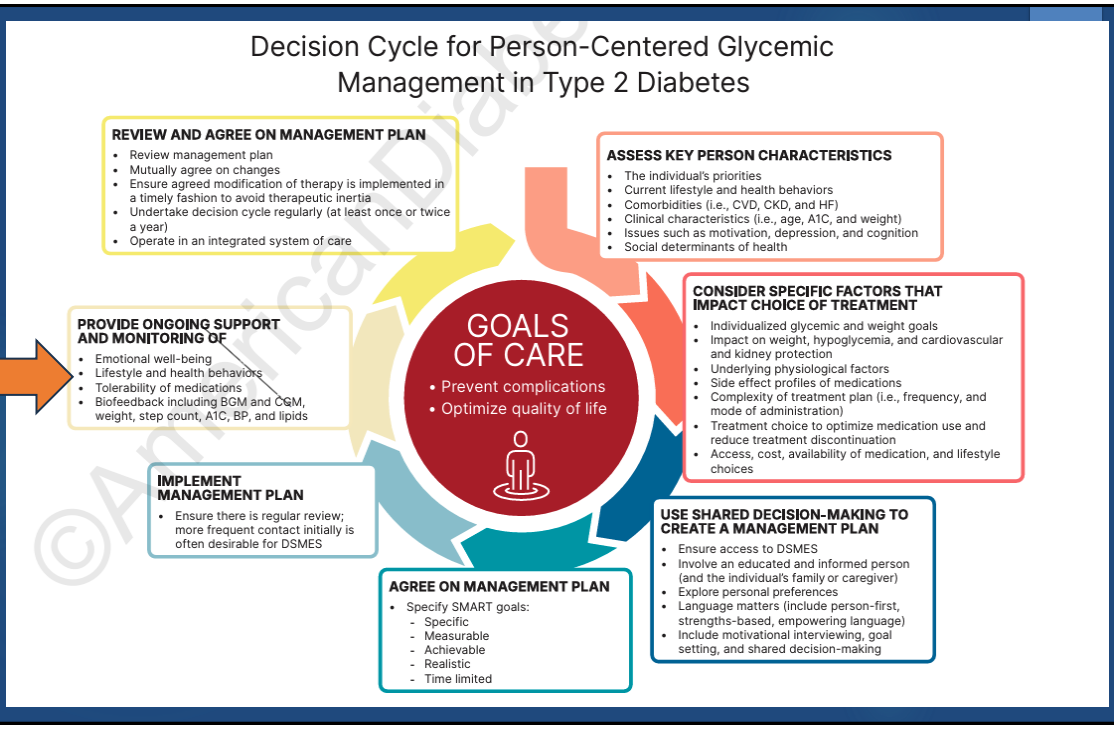

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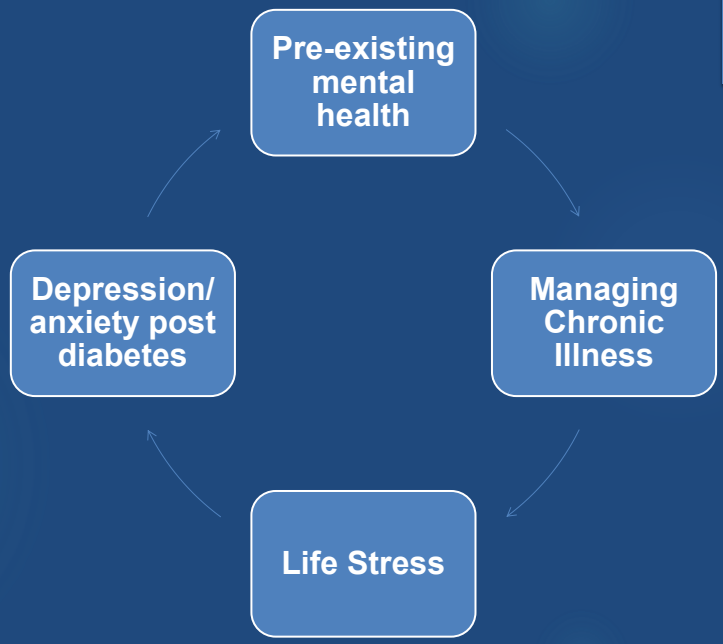
Behavioral Health Factors

45



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Diabetes Distress Scale

HTTPS://BEHAVIORALDIABETES.ORG/SCALES-AND-MEASURES/

TYPE 2 DIABETES DISTRESS ASSESSMENT SYSTEM
Identifying the Core Level of Distress (T2-DDAS CORE)

Living with diabetes can be tough. Listed below are many of the stresses and worries that people with diabetes often experience. Thinking back **over the past month**, please indicate how much each of the following items were a problem for you by marking the appropriate column.

For example, if an item was not a problem for you over the past month, place a mark in the first column: "Not a Problem" (1). If it was a very tough problem for you, place a mark in the last column: "A Very Serious Problem" (5).

	Not A Problem (1)	A Little Problem (2)	A Moderate Problem (3)	A Serious Problem (4)	A Very Serious Problem (5)
1. I feel burned out by all of the attention and effort that diabetes demands of me.					
2. It bothers me that diabetes seems to control my life.					
3. I am frustrated that even when I do what I am supposed to for my diabetes, it doesn't seem to make a difference.					
4. No matter how hard I try with my diabetes, it feels like it will never be good enough.					
5. I am so tired of having to worry about diabetes all the time.					
6. When it comes to my diabetes, I often feel like a failure.					
7. It depresses me when I realize that my diabetes will likely never go away.					
8. Living with diabetes is overwhelming for me.					

T2-DDAS, Core, 12.27.2021 © Behavioral Diabetes Institute

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Managing Motivation & Hope

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- Brief interventions
  - Relaxation Techniques, Cognitive Restructuring,
- Motivational Interviewing
  - Collaborative style of Communication

Steffen, P. L. S., Mendonça, C. S., Meyer, E., & Faustino-Silva, D. D. (2021). Motivational Interviewing in the Management of Type 2 Diabetes Mellitus and Arterial Hypertension in Primary Health Care: An RCT. *American journal of preventive medicine*, *60*(5), e203–e212. https://doi.org/10.1016/j.amepre.2020.12.015

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Behavioral Health Resources

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- CCBHC – Certified Community Mental Health Centers
  - Sliding Scale

48

Medication Resources

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- In addition to the Wal-Mart list:
  - Walgreens Prescription Savings Club
  - Target
  - Costco/Sam's and Sam's Plus
- Needymeds.com and GoodRx
  - Pro-tip: Price shop with the various cards
- Co-pay Cards from manufacturers
- County Pharmacies/Charitable Pharmacies
- RX for Oklahoma Prescription Assistance

https://oklahoma.gov/health/health-education/community-outreach/community-health/nursing-service/rx-for-oklahoma-prescription-assistance.html

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SDoH Resources

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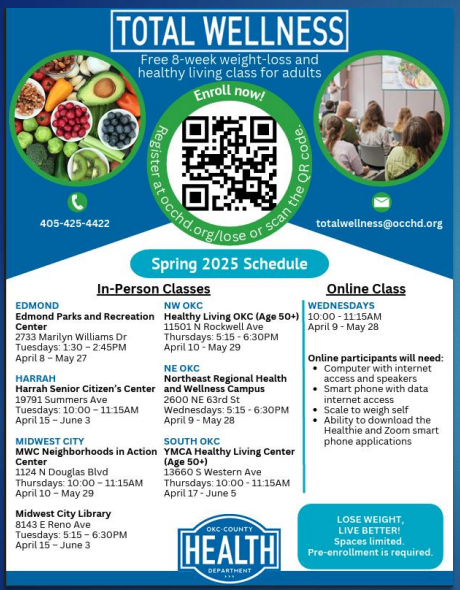

- Total Wellness
  - https://occhd.org/tw/
- Silver Sneakers
  - Over 65 with select Medicare Plans
- https://www.okc.gov/Community-Recreation/Recreation-Activities/Seniors
- MAPS 3 Senior Wellness Centers

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Other Programs and Strategies

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Walmart Prescription Program (Often called the $4 list)

- Two general price points:

  $4 for a 30-day supply AND
  $10 for a 90-day supply

  OR

  $9 for a 30-day supply AND
  $24 for a 90-day supply

  - Diabetes drugs are $9 | $24
  - Cholesterol drugs are $9 | $24
  - Hypertension drugs are in both price points

https://www.walmart.com/cp/4-prescriptions/1078664

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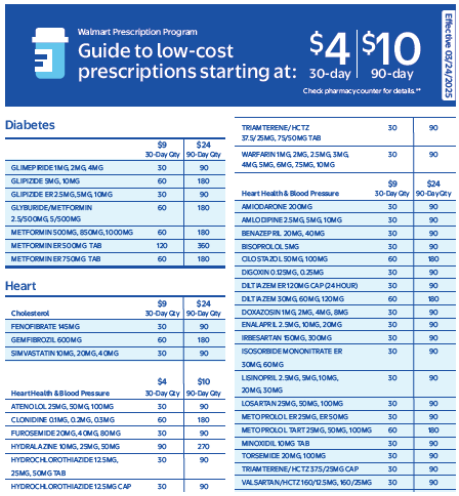

Walmart Prescription Program
Guide to low-cost prescriptions starting at: $4 30-day | $10 90-day
Check pharmacy counter for details.**
Effective 05/24/2025

Diabetes

	$9 30-Day Qty	$24 90-Day Qty
GLIMEPIRIDE 1MG, 2MG, 4MG	30	90
GLIPIZIDE 5MG, 10MG	60	180
GLIPIZIDE ER 2.5MG, 5MG, 10MG	30	90
GLYBURIDE/METFORMIN 2.5/500MG, 5/500MG	60	180
METFORMIN 500MG, 850MG, 1000MG	60	180
METFORMIN ER 500MG TAB	120	360
METFORMIN ER 750MG TAB	60	180

Heart

	$9 30-Day Qty	$24 90-Day Qty
Cholesterol		
FENOFIBRATE 145MG	30	90
GEMFIBROZIL 600MG	60	180
SIMVASTATIN 10MG, 20MG, 40MG	30	90

	$4 30-Day Qty	$10 90-Day Qty
HeartHealth & Blood Pressure		
ATENOLOL 25MG, 50MG, 100MG	30	90
CLONIDINE 0.1MG, 0.2MG, 0.3MG	60	180
FUROSEMIDE 20MG, 40MG, 80MG	30	90
HYDRALAZINE 10MG, 25MG, 50MG	90	270
HYDROCHLOROTHIAZIDE 12.5MG, 25MG, 50MG TAB	30	90
HYDROCHLOROTHIAZIDE 12.5MG CAP	30	90
TRIAMTERENE/HCTZ 37.5/25MG, 75/50MG TAB	30	90
WARFARIN 1MG, 2MG, 2.5MG, 3MG, 4MG, 5MG, 6MG, 7.5MG, 10MG	30	90

Heart Health & Blood Pressure	$9 30-Day Qty	$24 90-Day Qty
AMIODARONE 200MG	30	90
AMLODIPINE 2.5MG, 5MG, 10MG	30	90
BENAZEPRIL 20MG, 40MG	30	90
BISOPROLOL 5MG	30	90
CILOSTAZOL 50MG, 100MG	60	180
DIGOXIN 0.125MG, 0.25MG	30	90
DILTIAZEM ER 120MG CAP (24 HOUR)	30	90
DILTIAZEM 30MG, 60MG, 120MG	60	180
DOXAZOSIN 1MG, 2MG, 4MG, 8MG	30	90
ENALAPRIL 2.5MG, 10MG, 20MG	30	90
IRBESARTAN 150MG, 300MG	30	90
ISOSORBIDE MONONITRATE ER 30MG, 60MG	30	90
LISINOPRIL 2.5MG, 5MG, 10MG, 20MG, 30MG	30	90
LOSARTAN 25MG, 50MG, 100MG	30	90
METOPROLOL ER 25MG, ER 50MG	30	90
METOPROLOL TART 25MG, 50MG, 100MG	60	180
MINOXIDIL 10MG TAB	30	90
TORSEMIDE 20MG, 100MG	30	90
TRIAMTERENE/HCTZ 37.5/25MG CAP	30	90
VALSARTAN/HCTZ 160/12.5MG, 160/25MG	30	90

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Medicaid (Soonercare)

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- Adult members:
  - Are limited to 6 covered prescriptions per month (four generic and two brand-name)
  - Will have a **$4 co-payment**
- Members younger than 21:
  - Have **no limits or co-payments** for medically necessary prescriptions
- Glucose-monitoring supplies are no longer considered DME
- Insulin pump equipment is still considered DME

https://oklahoma.gov/ohca/individuals/mysoonercare/soonercare-benefits/prescriptions-drugs.html

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Medicaid
(Soonercare)

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- Tier 1 medications are preferred
- Tier 2
  - Must have a trial with a tier 1 med (metformin at max dose), or clinical reason tier 1 med is not appropriate
  - Initiating dual/triple therapy, a tier 2 med can be approved based on guidelines
- Tier 3
  - Must have tried a tier 2 med in the same category with a documented reason why it was not appropriate
- Special Prior Authorization
  - Must be currently stabilized on the requested med or have attempted at least 3 other categories of tier 2 or tier 3 meds, or have a documented clinical reason the requested med is necessary

https://oklahoma.gov/ohca/providers/types/pharmacy/prior-authorization/2025/endocrine-diabeticse.html

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Medicaid Tier Drugs 2025

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Tier 1	Tier 2	Tier 3	Special Prior Authorization
Biguanides Metformin Metformin XR Metformin-glyburide Metformin-glipizide **Sulfonylureas** Glimepiride Glyburide Glyburide micronized Glipizide Glipizide XL **SGLT-2i** Dapagliflozin(brand) Empagliflozin **DPP-4i/SGLT-2i** Empagliflozin/Linagliptin **DPP-4i/SGLT-2i/Bi** Empa/Lina/Met **TZD** Pioglitazone **AG inhibitors** Acarbose **Glinides** Repaglinide	**GLP-1 agonists** Liraglutide (brand) Dulaglutide **SGLT-2 Inhibitors** Dapaglif-met IR/XR (brand) Empaglif-met IR/XR **DPP-4 inhibitors** Linagliptin Linagliptin-metformin IR/XR Sitagliptin Sitagliptin-metformin IR/XR **Glinides** Repaglinide-metformin Nateglinide	**GLP-1 agonists** Semaglutide SQ Semaglutide PO Exenatide ER **SGLT2 inhibitors** Canagliflozin Canagliflozin-metformin IR/XR **DPP-4 inhibitors** Alogliptin Alogliptin-metformin Alogliptin-pioglitazone **TZD** Pioglitazone-metformin Pioglitazone-glimepiride **AG inhibitors** Miglitol **Dopamine agonist** Bromocriptine **Basal insulin/GLP-1** iDegLira iGlarLixi	**Biguanides** Metformin solution Metformin "long acting" **Sulfonylureas** Glimepiride 2.5, 3 mg **GLP-1 agonist** Exenatide IR **GIP/GLP-1 agonist** Tirzepatide **SGLT2 inhibitors** Bexagliflozin Dapagliflozin (generic) Dapaglif-met XR (generic) Ertugliflozin Ertugliflozin-metformin Sotagliflozin **DPP-4inhibitors** Saxagliptin Saxagliptin-metformin IM/XR **DPP-4i/SGLT-2i** Dapagliflozin-saxagliptin Ertugliflozin-sitagliptin **Amylinomimetic** Pramlintide

Prior Authorizations may be needed for documentation

https://oklahoma.gov/ohca/providers/types/pharmacy/prior-authorization/2025/endocrine-diabeticse.html

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Continuous Glucose Monitors via Medicaid

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- Claims for the preferred blood glucose testing supplies and CGM will not count against the members monthly script limit.
- These products will also be available with no copay.
- The CGM systems will require prior authorization (PA).
- Initial Approval:
  - A diagnosis of a type of diabetes per ADA **AND**
  - Treated with insulin **OR**
    - 20 years of age or under and meeting hypoglycemia criteria

- **So primarily only insulin users are eligible for CGM via Soonercare**

  Dexcom G6, G7

  Freestyle Libre 2, 3, 3 Plus

https://oklahoma.gov/ohca/providers/types/pharmacy/diabetic-supplies-for-pharmacy.html

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Blood Glucose Monitoring via Medicaid

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Preferred Blood Glucose Monitors

- Accu-Chek Guide Glucose Meter
- Accu-Chek Guide Me Glucose Meter
- ReliOn True Metrix Air Glucose Meter
- True Metrix Air Glucose Meter
- True Metrix Glucose Meter

Preferred Blood Glucose Test Strips

- Accu-Chek Test Strips 50 ct
- Accu-Chek Test Strips 100 ct
- ReliOn True Metrix Glucose Test Strips 50 ct
- ReliOn True Metrix Glucose Test Strips 100 ct
- True Metrix Glucose Test Strips 50 ct
- True Metrix Glucose Test Strips 100 ct

https://oklahoma.gov/ohca/providers/types/pharmacy/diabetic-supplies-for-pharmacy.html

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Insulin via Medicaid

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- Epocrates app

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Patient Assistance Programs

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- Needymeds.org

- Manufacturers may supply medications to patients that qualify
- Application
- Quantity
- Pick up
- Renewal application timeframe

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Association of Diabetes Care and Education Specialists (ADCES) Danatech

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Diabetes Technology Affordability Program Tool

https://www.adces.org/education/danatech/training-education/diabetes-technology-tools/affordability-tool

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Conclusion

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- Medical costs for people with diabetes are **more than twice as high** as for people without diabetes.
- Social Determinants of Health must be addressed for success.
- Many programs and strategies exist to assist patients.
- It takes more work on OUR part. But it is very much worth it.

- **Where there's a will, there's a way!**

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Case 1

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- A 50-year-old woman was diagnosed with Type 2 Diabetes 4 years ago and had an A1c of 11%. She refused insulin therapy due to fears from the perceptions of family members that have used insulin in the past. She initiated aggressive lifestyle changes in her diet and was started on metformin which was appropriately titrated to 1000 mg twice daily with meals.

- Today, her A1c has improved to 8.5%; her SMBG before breakfast and dinner are not at goal, but are all <200 mg/dL; there is no history of hypoglycemia. She eats 3 proper meals a day with occasional appropriate snacks. She has been losing weight and is now slightly overweight with a BMI of 26. She has private insurance, but reports co-pays are often still very high and unaffordable; she does not qualify for Medicaid or Patient Assistance Programs. She agrees that a new medication should be started today to achieve an A1c goal of at least <7%. No drug options are contraindicated due to lab values or comorbidities.

- What would you add if costs were not an issue?
- What is the best course of action today?

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Case 2

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- A 50-year-old woman was recently diagnosed with Type 2 Diabetes with an A1c of 13%. She was prescribed insulin therapy consisting of insulin glargine 20 units at bedtime and insulin aspart 6 units three times daily immediately before meals. She was also started on metformin which was appropriately titrated to 1000 mg twice daily with meals.
- Today, she returns to clinic after 6 months, reporting that she has not been able to afford her insulin and is only taking metformin through a $4 program. Her A1c has only improved to 12%; her SMBG before each meal and at bedtime are all mostly 200-350 mg/dL; there is no history of hypoglycemia. She eats 3 meals a day with occasional snacks. She is working and has private insurance, but reports co-pays are often still very high and unaffordable; she does not qualify for Medicaid or Patient Assistance Programs. She is willing to use insulin and understands that this is important but just can't afford what has been prescribed.
- What is the best course of action today?

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References

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- https://health.gov/healthypeople/priority-areas/social-determinants-health
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Guideline Recommended Approaches to Diabetes Management in Underinsured Populations: Challenges & Solutions

Jeremy L. Johnson, PharmD, BCACP, CDCES, BC-ADM
Meadow Hazelhoff, MSW, LCSW

2025 Harold Hamm Diabetes Care Summit
Oklahoma City, OK
September 5, 2025

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Notes

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Notes

2025 Harold Hamm Diabetes Care Summit

Friday, September 5, 2025

Rose State College Jeanie Webb Student Union
1910 Hudiburg Dr., Midwest City, Oklahoma 73110

7:15 – 7:55 a.m.	Registration, Breakfast and Exhibits
7:55 a.m.	Welcome and Introductory Remarks
8 – 9:30 a.m.	Monogenic Diabetes: Tools for Your Practice *Kristin A. Maloney, MS, MGC, LCGC and Toni I. Pollin, MS, PhD, LCGC*
9:30 – 10:30 a.m.	Caring for the Diabetic Foot *Trent Wallace, DPM, DABPM*
10:30 – 10:45 a.m.	Break and Exhibits
10:45 – 11:45 a.m.	Keynote | Binge Eating and Diabetes: Understanding the Overlap and Supporting Recover *Krystal Dunham, MS, RDN, LD*
11:45 a.m. – 12:30 p.m.	Lunch Buffet, Break and Exhibits
12:30 – 1:30 p.m.	The Role of Exercise in Diabetes Prevention and Management *Kevin R. Short, PhD, FACSM*
1:30 – 2:30 p.m.	Keynote | And You Thought that Diabetes was Just About the Numbers: Addressing the Emotional Side of Diabetes in Clinical Care *Lawrence Fisher, PhD, ABPP*
2:30 – 2:45 p.m.	Break and Exhibits
2:45 – 3:45 p.m.	Keynote | Advances in Insulin Delivery and Glucose Monitoring: Practical Technology Updates for the Diabetes Care Team *Jodie Gee, PharmD, BCACP, CDCES*
3:45 – 5 p.m.	Guideline Recommended Approaches to Diabetes Management in Underinsured Populations: Challenges and Solutions *Jeremy L. Johnson, PharmD, BCACP, CDCES, BC-ADM and Meadow Hazelhoff, MSW, LCSW, BAS*
5 p.m.	Adjourn

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