DiabetesEd Specialist Virtual Course 2022

www.DiabetesEd.net

DiabetesEd Specialist Virtual Course 2022

Welcome

We are proud to welcome you to our 21st Annual DiabetesEd Specialist Course. Your attendance demonstrates a commitment to improving diabetes care for the 37 million people with this manageable condition. We encourage you to share the new ideas and information garnered from this seminar with your community of people with diabetes and colleagues. As advocates, specialists and coaches, we believe that we can make dramatic differences in improving the lives of people living with prediabetes and diabetes. We thank you for your participation and invite you to enjoy the program.

Faculty Biographies

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

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

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

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

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

As the CGM Program Coordinator and clinical pharmacist specialist in the Cleveland Clinic Diabetes Center, Dr. Isaacs brings a wealth of clinical knowledge combined with extensive research experience to this program.

Ashley LaBrier, MS, RD, CDCES

Ashley is an educator, dietitian, and Diabetes Education Program Coordinator at the Salinas Valley Medical Clinic's Diabetes & Endocrine Center. Her work with people living with diabetes focuses on the value of healthy nutrition and movement to improve well-being.

Ashley is passionate about providing person-centered education to empower those who live with diabetes. Having been diagnosed with type 1 diabetes herself nearly 20 years ago, she combines her professional knowledge with personal experience and understanding.

Faculty Biographies (cont'd)

Bryanna Sabourin - Director of Operations and Customer Happiness
For the past two years, Bryanna has made significant contributions to improve our customer experience as the Director of Operations & Customer Happiness. Bryanna is excellent at problem solving and helping students find the courses and resources that best match their needs!

Bryanna has worked in healthcare operations for nearly a decade with a strong emphasis on customer experience and satisfaction. Bryanna is focused on empowering each person she works with, so they can reach their individualized goals. She is passionate about identifying the factors that limit healthcare accessibility and bridging those gaps

Accreditation Info
This program is approved for Contact Hours for Nurses and CA Pharmacists and 18 CPE, Level III for RDs. Provider is approved by the California Board of Registered Nursing, Provider # 12640 and Commission on Dietetic Registration (CDR), Provider # DI002. Need hours for your CDCES? We have great news. This program is accredited by the CDR so all hours of instruction can be used to renew your CDCES regardless of your profession.

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

Sincerely,

Beverly Thomassian

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

Bryanna Sabourin

Bryanna Sabourin
Director of Operations, Customer Happiness
Diabetes Education Services

Have questions?

Please feel free to reach out. We love our customers.

Email: **info@diabetesed.net**
Phone: 530/893-8635
Online Chat: wwwDiabetesEd.net

DiabetesEd Specialist Virtual Course*
Day One – October 12, 2022 (Pacific Time)

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

Diabetes Education Services — Advancing Your Career in Diabetes Education

**Topics and Timing Subject to Change*

Virtual DiabetesEd Specialist Course – Day 1

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

Welcome Everyone

Good Morning and Welcome Everyone.

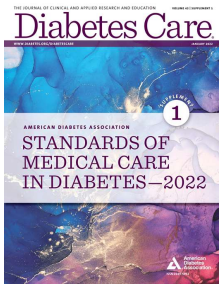
Grab your coffee, tea or other beverage, a healthy snack and get comfy.

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

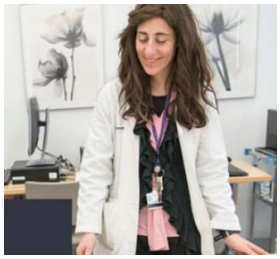
If you are having any technical difficulty, please chat with Bryanna at www.DiabetesEd.net or call 530 / 893-8635 or email at info@diabetesed.net

Bev has no Conflict of Interest

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



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



- Provides diabetes care to all regardless of insurance
- Provides care to specialized populations especially transplant, pregnancy and other high-risk individuals.
- Usually sees about 10 clients a day
- Author & contributor

Endocrine Clinical Pharmacy Specialist
CGM Program Coordinator
Co-Director Center of Excellence for Endocrine Disorders in Pregnancy
Cleveland Clinic Endocrinology and Metabolism Institute
ADCES Educator of the Year in 2020

Disclosures for Dr. Isaacs

- Diana Isaacs, PharmD, BCPS, BCACP, CDCES, BC-ADM, FADCES, FCCP declares the following disclosures:
- Speaker: Abbott, Dexcom, Novo Nordisk, Insulet, Medtronic, Bayer
- Consultant: Lilly, Sanofi, Cequr, Undermyfork
- CBDCES Credentialing Committee
- ADA Professional Practice Committee
- ADCES Board Member

Diabetes Overview and Glycemic Goals

Objectives:

1. Discuss current state of diabetes and prediabetes in the U.S.
2. Identify social determinants of health impacting diabetes care.
3. List screening guidelines and diagnosis of Type 1, Type 2, LADA and GDM
4. Describe glycemic goals across the lifespan

17. Diabetes Advocacy

- People living with diabetes should not face discrimination
- We need to all be a part of advocating for the best care and the rights of people living with diabetes.
- Insulin should be affordable for all

Diabetes Care should meet standards in all standards.
- In school setting
- Young children in childcare
- For occupational drivers
- In work settings
- In Correctional Institutions

Global Epidemic

- World Diabetes Day is November 14

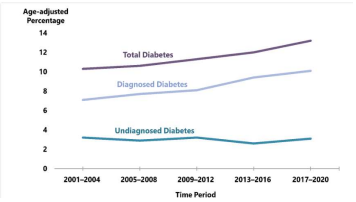
Poll Question 1

- According to the CDC, what best describes the current prevalence of prediabetes and diabetes in the U.S.?
  a. 30% of people above the age of 20 have type 2 diabetes.
  b. The rate of type 1 and type 2 diabetes have tripled since 2010.
  c. A total of 50% of people have prediabetes or diabetes.
  d. 1 out of 2 persons above age 20 have prediabetes.

Diabetes in America 2022 - CDC

- 11% of adults have diabetes (37.3 mil)
  - 23% of those don't know they have diabetes
- 38% of adults have prediabetes (96 mil)
  - 19% reported being told they have prediabetes.

Figure 1. Trends in age-adjusted prevalence of diagnosed diabetes, undiagnosed diabetes, and total diabetes among adults aged 18 years or older, United States, 2001–2020.



CDC 2022 Report
https://www.cdc.gov/diabetes/data/statistics-report/diagnosed-diabetes.html

www.DiabetesEd.net

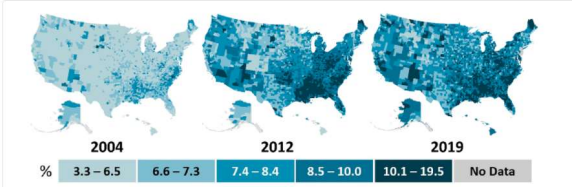
Diabetes in U.S.

County-Level Prevalence Among Adults

Among US adults aged 20 years or older, age-adjusted, county-level data indicated:

- In 2019, estimates of diagnosed diabetes prevalence varied across US counties, ranging from 4.1% to 17.6% (Figure 3).
- Median county-level prevalence of diagnosed diabetes increased from 6.3% in 2004 to 8.4% in 2019.

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



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

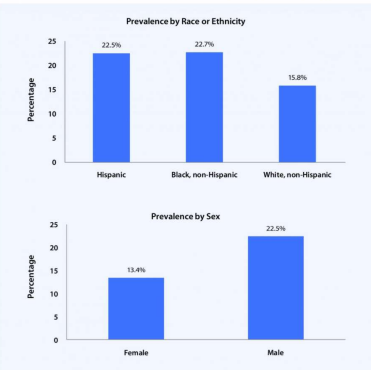
https://www.cdc.gov/diabetes/data/statistics-report/diagnosed-diabetes.html

CDC Announces

35% of Americans will have Diabetes by 2050

Boyle, Thompson, Barker, Williamson
2010, Oct 22:8(1)29
www.pophealthmetrics.com

Figure 9. Prediabetes Prevalence Among US Adolescents Aged 12–18 Years by Racial and Ethnic Group and by Sex



Prediabetes in Youth - CDC 2021

https://www.cdc.gov/diabetes/library/reports/reportcard/prediabetes-in-youth.html

Appendix Table 3. Age-adjusted prevalence of diagnosed diabetes by detailed race/ethnicity, education level, family income level, and sex among adults aged 18 years or older, United States, 2018–2019.

Characteristic	Total Percentage (95% CI)	Men Percentage (95% CI)	Women Percentage (95% CI)
Race-ethnicity			
American Indian/Alaska Native	14.5 (14.5–14.6)	14.4 (14.3–14.5)	14.7 (14.6–14.8)
Asian, non-Hispanic, overall	9.5 (8.2–10.9)	10.4 (8.6–12.4)	8.6 (6.9–10.8)
Black, non-Hispanic	12.1 (11.3–13.0)	12.2 (11.0–13.5)	12.1 (10.9–13.3)
Hispanic, overall	11.8 (10.8–12.8)	11.6 (10.4–13.0)	12.0 (10.8–13.2)
White, non-Hispanic	7.4 (7.1–7.7)	8.0 (7.6–8.5)	6.9 (6.5–7.3)
Education			
Less than high school	13.4 (12.5–14.4)	12.2 (10.9–13.6)	14.8 (13.5–16.2)
High school	9.2 (8.7–9.6)	10.2 (9.5–11.0)	8.3 (7.8–8.9)
More than high school	7.1 (6.8–7.5)	7.6 (7.1–8.1)	6.7 (6.3–7.2)
Family income to poverty ratio			
Less than 100% FPL	14.1 (13.1–15.2)	13.7 (12.0–15.5)	14.4 (13.2–15.7)
100–299% FPL	10.8 (10.3–11.4)	11.1 (10.4–11.9)	10.6 (9.9–11.4)
300–499% FPL	7.8 (7.3–8.3)	9.1 (8.4–9.9)	6.6 (6.0–7.2)
500% FPL or more	5.6 (5.2–6.1)	6.4 (5.8–7.1)	4.8 (4.3–5.3)

Ethnicity, Education, Family income
CDC Data 2022

https://www.cdc.gov/diabetes/data/statistics-report/appendix.html#tabs-1-6

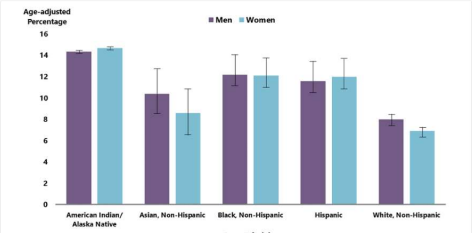
FPL – Federal poverty level

Diagnosed Diabetes by Ethnic Group

- Highest prevalence among
  - Indigenous people
  - Mexican and Puerto Ricans
  - Asian Indians and Filipinos

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

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

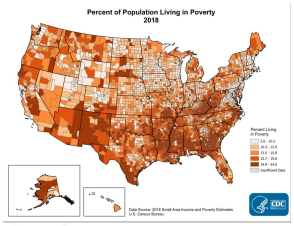


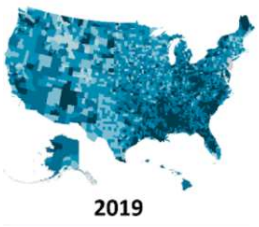
Socioeconomics – Diabetes Diagnosis

- Prevalence varied significantly by education level, an indicator of SES status
  - 13.4% - Less than high school education
  - 9.2% - High school education
  - 7.1% - More than high school education

CDC 2022

Poverty and Diabetes Intersect





Poll Question 2

- Which of the following interventions is most likely to decrease the prevalence of diabetes in the U.S.?
  a. Public health campaigns that encourage diabetes screenings.
  b. Community health programs that address social inequities and improve access to care.
  c. Funding to encourage daily exercise in high-risk communities.
  d. Increasing access to centers that offer metabolic surgery.

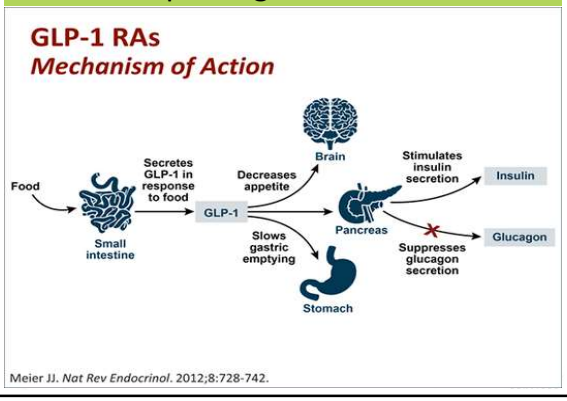
1. Improving Care and Promoting Health in Populations

- Population Health includes:
  - Outcomes (mortality, morbidity)
  - Disease burden (incidence and prevalence)
  - Behavioral and metabolic factors (A1c, MNT, exercise
- Diabetes annual cost 2017 - $327 bil
- Targets
  - 64% of ind's met A1c targets
  - 70% achieved BP targets
  - 57% met LDL target
  - In total, 23% met all targets

Hormones Effect on Glucose

Hormone	Effect
Glucagon (pancreas)	↑
Stress hormones (kidney)	↑
Epinephrine (kidney)	↑
Insulin (pancreas)	↓
Amylin (pancreas)	↓
Gut hormones - incretins (GLP-1) released by L cells of intestinal mucosa, beta cell has receptors)	↓

GLP-1 Receptor Agonist Mechanism



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

Pocket Card: GLP-1 RA Comparison

GLP-1 & GIP Receptor Agonists

Class/Main Action	Name	Dose Range	Considerations
GLP-1 Receptor Agonist (GLP-1 RA) **"Incretin Mimetic"** • Increases insulin release with food • Slows gastric emptying • Promotes satiety • Suppresses glucagon	exenatide (Byetta)	5 and 10 mcg BID	**Side effects for all:** Nausea, vomiting, weight loss, injection site reaction. Report signs of acute pancreatitis (severe abdominal pain, vomiting), stop med. Increase dose monthly to acheive targets. **Black box warning:** Thyroid C-cell tumor warning (avoid if family history of medullary thyroid tumor). *Significantly reduces risk of CV death, heart attack, and stroke. †Approved for pediatrics 10-17 yrs Lowers A1c 0.5 – 1.6% Weight loss of 1.6 to 6.0 kgs
	exenatide XR† (Bydureon)	2 mg 1x a week Pen injector - Bydureon BCise	
	liraglutide (Victoza)*†	0.6, 1.2 and 1.8 mg daily	
	dulaglutide* (Trulicity)	0.75, 1.5, 3.0 and 4.5 mg 1x a week pen injector	
	lixisenatide (Adlyxin)	10 mcg 1x a day for 14 days 20 mcg 1x day starting day 15	
	semaglutide* (Ozempic)	0.5, 1.0 and 2.0 mg 1x a week pen injector	
	(Rybelsus) Oral tablet	3, 7, and 14 mg daily in a.m. Take on empty stomach w/H2O sip	
Dual Incretin Agonist Combines both GLP-1 and GIP Incretins. Same action profile as GLP-1 RA, with more intensive action profile.	Tirzepatide (Mounjaro)	2.5, 5.0, 7.5, 10, 12.5 and 15 mg 1x a week prefilled single dose pen Increase dose by 2.5 mg once monthly to reach targets.	**Side effects include:** Nausea, diarrhea, injection site reactions. Avoid if family history medullary thyroid tumor. Report pancreatitis. Lowers A1C ~ 1.8 - 2.4% Weight loss of ~ 5.4 – 10 kgs

DiabetesEd.net ©7/2022

GLP-1 Receptor Agonist Devices

5mcg or 10mcg pen
1 pen/month
Requires Rx for needles

3 pen options: 0.5, 1, 2mg
1 pen/month
Comes with needles

1.2mg, 2 pens/month
1.8mg, 3 pens/month
Requires Rx for needles

Contains 14 doses (20mcg)
2 pens/month
Requires Rx for needles

2mg pen
4 pens/month
Shake 15 seconds
Never see needle

0.75, 1.5, 3, 4.5mg pens
4 pens/month
Never see needle

Diabetes Education Services

Oral Semaglutide (Rybelsus)

- Dose: 3, 7 and 14 mg daily
- Take daily at least 30 mins before first food, beverage, or other oral meds
- Take with no more than 4 ounces of plain water
- Swallow tablets whole (don't cut or crush)
- Dosing:
  - Start with 3 mg once daily for 30 days
  - Then increase to 7mg once daily for 30 days
  - If A1c at target, maintain at 7mg daily
  - If A1c not at target, increase to 14 mg once daily

Diabetes Education Services

Cardiovascular Outcomes: GLP-1 RA

Major adverse cardiovascular events generally include: nonfatal MI, stroke and cardiovascular death

GLP-1 RA: Study name	No. of patients	Median follow-up (years)	% with CV disease*	% of statin use	Baseline age	Baseline HgA1c	Baseline BMI	Primary composite CV outcome HR (95% CI)	P value
Lixisenatide: ELIXA	6068	2.1	100%	93%	60.3	7.7%	30.1	1.02 (0.89 to 1.17)	0.81
Liraglutide: LEADER	9340	3.8	81%	72%	64.3	8.7%	32.5	0.87 (0.78 to 0.97)	0.01
Semaglutide: SUSTAIN-6	3297	2.1	60%	73%	64.6	8.7%	32.8	0.74 (0.58 to 0.95)	0.02
Exenatide QW: EXSCEL	14752	3.2	73.1%	74%	62.0	8.0%	31.8	0.91 (0.83 to 1.00)	0.06
Albiglutide: Harmony	9463	1.6	100%	84%	64.1	8.7%	32.3	0.78 (0.68 to 0.90)	0.0006
Dulaglutide: REWIND	9901	5.4	31.5%	66%	66.2	7.2%	32.3	0.88 (0.79 to 0.99)	0.026
Oral semaglutide: PIONEER 6	3183	1.3	84.7%	85%	66.0	8.2%	32.3	0.79 (0.57 to 1.11)	0.17

****HR < 1 favors the GLP-1 RA. P value should be <0.05 to be statistically significant and the CI should not cross 1.**

Sheahan KH, Wahlberg EA, Gilbert MP et al. Postgrad ed J2019;0:1-6.

GLP-1 RA Outcomes: CV, HF, Renal

Drug/ Size	Trial	Major Adverse Cardiovascular Events (MACE-stroke, nonfatal MI, CV death)	MACE Benefit	Hospitalization for Heart Failure (HHF)	HHF Benefit	Renal Outcomes	Renal Benefit
Lixisenatide N=6,068	ELIXA	1.02 (0.89-1.17)*^	N	0.96 (0.75-1.23)	N	NA	NA
Liraglutide N=9,340	LEADER	0.87 (0.78-0.97)*	Y	0.87 (0.73-1.05)	N	0.78 (0.67-0.92)	Y
Semaglutide N=3,297	SUSTAIN-6	0.76 (0.78-0.97)*	Y	0.82 (0.47-1.44)	N	0.64 (0.46-0.88)	Y
Semaglutide oral N=3,183	PIONEER-6	0.78 (0.57-1.11)*	N	0.86 (0.48-1.55)	N	NA	NA
Exenatide N=14,752	EXSCEL	0.91 (0.83-1.0)*	N	1.05 (0.74-1.50)	N	NA	NA
Dulaglutide N=9,901	REWIND	0.88 (0.79-0.99)*	Y	0.93 (0.77-1.12)	N	0.85 (0.77-0.93)	Y

MACE refers to 3-point MACE (stroke, nonfatal MI, CV death) except lixisenatide (4-point MACE included hospitalization for unstable angina).
*: primary outcome, renal outcomes refer to worsening nephropathy; Y-yes, N-no. HHF: hospitalizations for heart failure
Confidence interval <1 means that the drug was beneficial compared to placebo

GLP-1 Receptor Agonist Indications

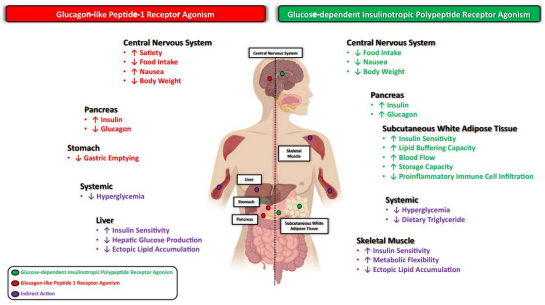
Drug	Indication
Exenatide IR **(Byetta)** Lixisenatide **(Adlyxin)** Semaglutide **(Rybelsus)**	• As an adjunct to diet and exercise to improve glycemic control in adults with type 2 DM-All
Exenatide ER **(Bydureon)**	• As an adjunct to diet and exercise to improve glycemic control in patients **10 years and older** with type 2 DM
Dulaglutide **(Trulicity)**	• To reduce the risk of **major adverse CV events (CV death, non-fatal myocardial infarction, or non-fatal stroke**) in adults with type 2 DM and **established CVD** or **multiple CVD risk factors**
Semaglutide **(Ozempic)**	• To reduce the risk of **major adverse CV events** in adults with type 2 DM and established CVD • Higher dose (2.4mg-Wegovy) approved for weight loss
Liraglutide **(Victoza)**	• As an adjunct to diet and exercise to improve glycemic control in patients **10 years and older** with type 2 DM • To reduce the risk of **major adverse CV events** in adults with type 2 DM and established CVD • Higher dose (3mg-Saxenda) approved for weight loss

Package inserts, dailymed.nlm.nih.gov

GIP/GLP-1 Receptor Agonist

- Tirzepatide (Mounjaro) is a GIP/GLP-1 Receptor Agonist
  - GIP: glucose-dependent insulinotropic polypeptide
  - GLP-1: glucagon like peptide-1
- Studied in the SURPASS clinical program (T2DM)
- Studied in the SURMOUNT clinical program (Obesity)
- Once weekly injectable disposable pen: abdomen, legs, arms
- FDA approved for T2DM: May, 2022

Mechanism of Action



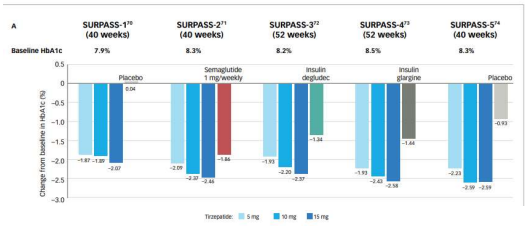
Samms RJ, Coghlan MP, Sloop KW. How May GIP Enhance the Therapeutic Efficacy of GLP-1? Trends Endocrinol Metab. 2020 Jun;31(6):410-421.

SURPASS Clinical Program

Study acronym	Study type	Number of participants	Eligibility	Comparator	Study duration (weeks)	Primary outcome
SURPASS-1[10]	Randomized double-blind	478	Drug-naïve	Placebo	40	HbA1c
SURPASS-2[11]	Randomized open-label	1,879	Metformin	Semaglutide	40	HbA1c
SURPASS-3[12]	Randomized open-label	1,947	Metformin w/wo sGLT2i	Insulin degludec	52	HbA1c
SURPASS-4[13]	Randomized open-label	2,002	1–3 antidiabetic medicines (metformin, SGLTi or sulfonylurea) with cardiovascular risk	Insulin glargine	52	HbA1c
SURPASS-5[14]	Randomized double-blind	475	Insulin glargine (U100) w/wo metformin	Placebo	40	HbA1c

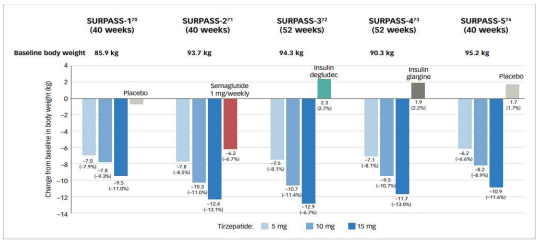
Rosenstock J, et al. Lancet. 2021;398:143–55. Frias JP, et al. N Engl J Med. 2021;385:503–15.82. Ludvik B, et al. Lancet. 2021;398:583–98. 83. Del Prato S et al. Lancet. 2021;398:1811–24. 84. Dahl Det al. Diabetologia. 2021 64(Suppl. 1):S1 3. Abstr 20. Kaneko S.. touchREV Endocrinol. 2022 Jun;18(1):10-19.

SURPASS: A1C Change



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

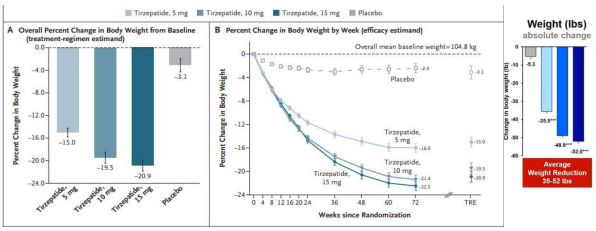
Change in Body Weight



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

Surmount-1 Study Results (Tirzepatide)

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



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

Other Weight Loss Medications

Medication name	Typical adult maintenance dose	Average wholesale price (30-day supply) (130)	National Average Drug Acquisition Cost (30-day supply) (131)	1-Year (52- or 56-week) mean weight loss (% loss from baseline)		Common side effects (132–136)	Possible safety concerns/ considerations (132–136)
				Treatment arms	Weight loss (% loss from baseline)		
Glucagon-like peptide 1 receptor agonist							
Liraglutide (16)**	3 mg q.d.	$1,619	$1,296	3.0 mg q.d. 1.8 mg q.d. PBO	6.0 4.7 2.0	Gastrointestinal side effects (nausea, vomiting, diarrhea, esophageal reflux), injection site reactions, elevated heart rate, hypoglycemia	• Pancreatitis has been reported in clinical trials but causality has not been established. Discontinue if pancreatitis is suspected. • Use caution in patients with kidney disease when initiating or increasing dose due to potential risk of acute kidney injury **Black box warning:** • Risk of thyroid C-cell tumors in rodents; human relevance not determined
Semaglutide (139)	2.4 mg once weekly	$1,619	$1,302	2.4 mg weekly PBO	9.6 3.4	Gastrointestinal side effects (nausea, vomiting, diarrhea, esophageal reflux), injection site reactions, elevated heart rate, hypoglycemia	• Pancreatitis has been reported in clinical trials, but causality has not been established. Discontinue if pancreatitis is suspected. **Black box warning:** • Risk of thyroid C-cell tumors in rodents; human relevance not determined

Diabetes Care 2022;45(Supplement_1):S113–S124

Diabetes Education Services

Tirzepatide Clinical Use

Diabetes Education Services

Tirzepatide Safety Profile

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

Mounjaro package insert.

Diabetes Education Services

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

- Avoid if personal or family history of medullary thyroid cancer
- Start at lower dose and titrate
- Eat smaller meals to reduce nausea
- Avoid high fat meals
- Rotate sites
- Store extra pens in fridge
- Avoid in combo with DPP-4 inhibitors
- Caution with pancreatitis
- Ask about recent eye exam
  - Potential increase in diabetes retinopathy

Diabetes Education SERVICES

Poll Question 2

- Alice injects exenatide XR (Bydureon) once a week. Which of the following is true?

a. May experience nausea
b. Weight loss is uncommon
c. Muscle aches are common
d. Doubles risk of pancreatic cancer

Diabetes Education SERVICES

Incretin Mimetics – How Do They Rate?

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

Diabetes Education SERVICES

Medication Taking Behaviors

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

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

Work on targeted approach for specific barrier

Diabetes Education SERVICES

2. Pre Diabetes & Type 2- Screening Guidelines (ADA 2022 Clinical Practice Guidelines)

1. Start screening at age 35 for ALL
2. Screen adults if BMI ≥ 25 (Asians BMI ≥ 23) plus one or > additional **risk factor**:
   - First-degree relative w/ diabetes
   - Member of high-risk population
   - Habitual physical inactivity
   - PreDiabetes*
   - HIV on antiretroviral meds
   - History of heart disease

Screen using A1c, Fasting Blood Glucose or OGTT.

Repeat screening at least every 3 years if negative.

If prediabetes or high risk, recheck yearly

2. Classification and Diagnosis of Diabetes: *Standards of Medical Care in Diabetes—2022*

Diabetes 2 - Who is at Risk?
(ADA Clinical Practice Guidelines)

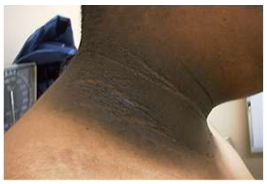
Risk factors cont'd

- HTN - BP > 140/90
- HDL < 35 or triglycerides > 250
- History of Gestational Diabetes Mellitus
- Polycystic ovary syndrome (PCOS)
- Other conditions assoc w/ insulin resistance:
  - Elevated BMI, acanthosis nigricans (AN)

Screening in dental practices can help detect diabetes. ~30% of dental patients over age of 30, have some degree of dysglycemia.

Acanthosis Nigricans (AN)

- Signals high insulin levels in bloodstream
- Patches of darkened skin over parts of body that bend or rub against each other
  - Neck, underarm, waistline, groin, knuckles, elbows, toes
  - Skin tags on neck and darkened areas around eyes, nose and cheeks.
- No cure, lesions regress with treatment of insulin resistance



Poll Question 3

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

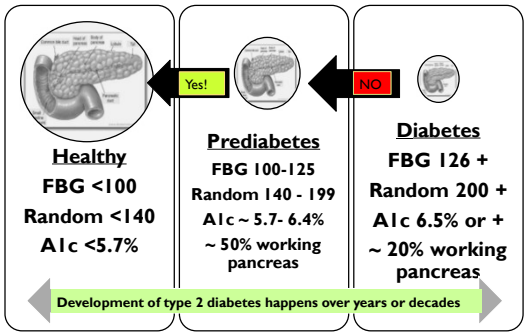
a. Fasting BG of 62

b. A1c of 5.9 %

c. After meal BG of 137

d. A1c of 7.1 %

Natural History of Diabetes



PreDiabetes is FREAKING ME OUT

- 96 million people in US
- 80% don't know they have it
- In 3-5 years, about 30% of predm will get diabetes
- Associated with higher rates of heart attack, stroke, neuropathy and vessel disease
- Why isn't is called stage 1 diabetes?

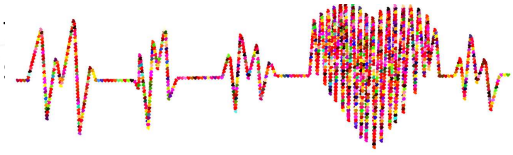
Do I look like I am freaking out?

Poll Question 4

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

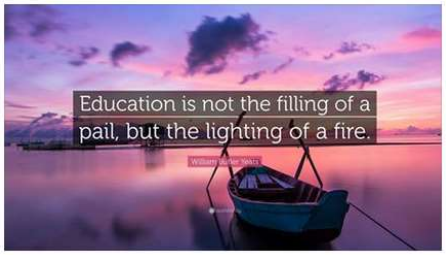
Prevention or Delay of Type 2

- Prediabetes is associated with heightened cardiovascular risk; therefore, screening for and treatment of modifiable risk factors



Standards of Medical Care in Diabetes - 2022.

Let's meet people where they are at.



Rediscover the Spark

Diabetes is Complex

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

Social Determinants of Health

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

Directly affects their health risks and outcome

AADE Population Health & Diabetes Educators Evolving Role 2019

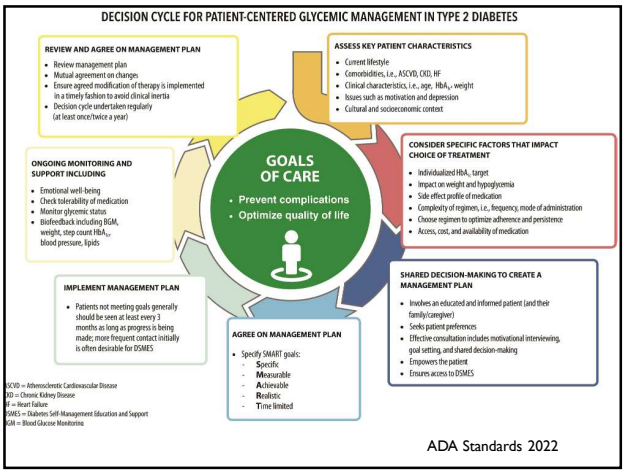
Person Centered Care

- Considers individual comorbidities and prognoses
- Provides care that is respectful and responsive to the individuals preferences, needs and values.
- Ensuring that the person's values guide all clinical decisions

Individualized Care Requires

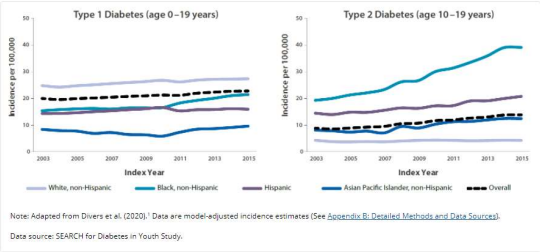
- Clear communication
- Problem identification
- Psychosocial screening
- Diagnostic evaluation
- Intervention services

The science and art come together when faced with making treatment recommendations for someone who may not meet the criteria used in the studies on which guidelines are based.



Type 1 & 2 Incidence in Children

Figure 5. Trends in incidence of type 1 and type 2 diabetes in children and adolescents, overall and by race/ethnicity, 2002–2015



Note: Adapted from Divers et al. (2020).[1] Data are model-adjusted incidence estimates (See Appendix B: Detailed Methods and Data Sources).

Data source: SEARCH for Diabetes in Youth Study.

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

Type 1 Rates Increasing Globally

Why the increase?

- Autoimmune disease rates increasing over all
- Changes in environmental exposure and gut bacteria?
- Hygiene hypothesis
- Increased weight?

Prevalence and incidence of type 1 diabetes in the world: a systematic review and meta-analysis – 2020 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7146037/

Type 1 – 10% of all Diabetes

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

Poll Question 5

Which factor would most make you suspect type 1 diabetes?

a. Enuresis

b. Presents with low HDL cholesterol

c. Friend tells you she has been eating "tons of sweets“

d. Reports vivid dreams

Signs of Type 1 Diabetes

- Sudden onset of nighttime bedwetting
- Weight loss, thirst, hunger
- May present in DKA
  - Fruity breath
  - Hypothermic
  - Poor skin turgor
  - “Out of it”
  - Ketone positive (blood or urine)
  - Other

14. Children and Adolescents

- Type 1 or Type 2 Diabetes?
  - Many children overweight (type 1, 2)
  - 6% of kids new type 2 present in DKA.
  - Type 2 in kids different than adult
  - more rapid decline in beta cell function, accelerated complications.
- Evaluate autoantibodies
- careful history, determine correct diagnosis
- Provide early, appropriate treatment.

Want more info?
Tots to Teens Level 2

Poll Question 6

- Which of the following lab test can be used to determine if someone has autoimmune diabetes?
- A. Glutamic acid decarboxylase
- B. Transglutaminase
- C. Beta cells auto antibodies
- D. Langerhan's antibody titer

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

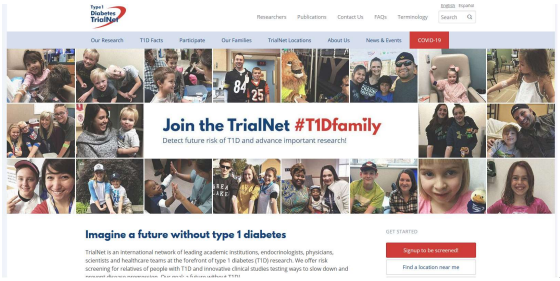
- Type 1
  - Positive antibodies
    - GAD65 - Glutamic acid decarboxylase
    - ICA - Islet Cell Cytoplasmic Autoantibodies
    - IAA - Insulin Autoantibodies
- Younger people develop quickly
- Older people take longer to develop
- Body wt and presentation

Medalist Study – Harvard Joslin Diabetes Center

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

How to Get Screened? www.DiabetesTrialNet.org

- How to get families linked to screening?



Question and Break Time

- Energizing Ideas
  - Dance
  - Walk outside
  - Get a nourishing snack
  - Drink some spa water
  - Do some jumping jacks
  - Stretch and Breathe

Break 10:00 to 10:15

What kind of Diabetes?

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

25% of ind's with Type 1 also have type 2 diabetes.
ADA Post Grad, 2010

What type of Diabetes?

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

Latent AutoImmunity Diabetes in Adults (LADA)

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

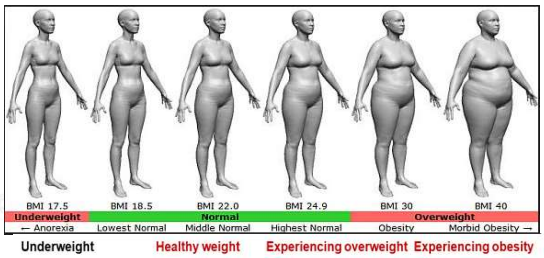
Diabetes Care 26:536-538, 2003
Jerry P. Palmer, MD and Irl B. Hirsch, MD

LADA Clinical Features Compared to Type 2

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

Practical Diabetology March 08, Unger MD

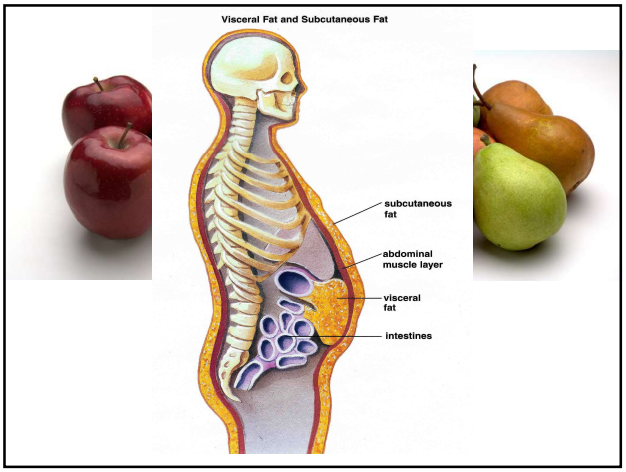
BMI – Visual Image



Signs of Diabetes

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

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



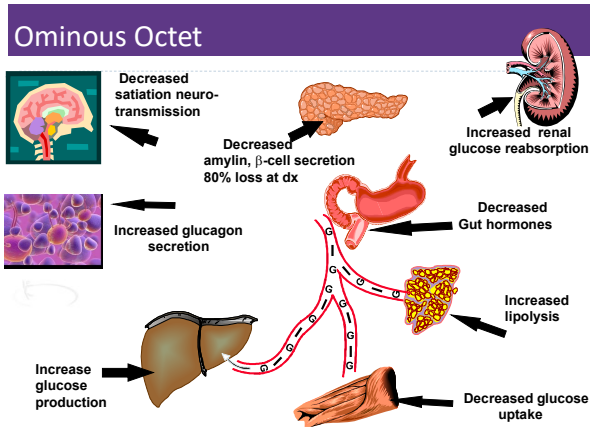
What is Type 2 Diabetes?

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

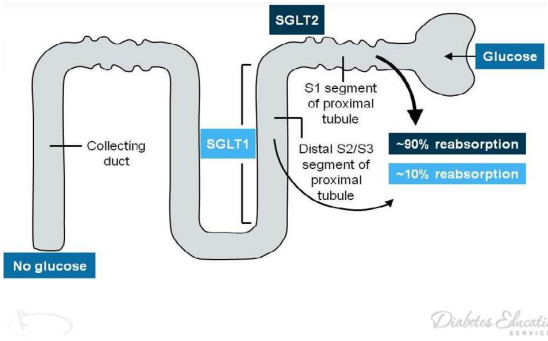
with social, behavioral and environmental risk factors unmasking the effects of genetic susceptibility.

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

Ominous Octet



SGLT and the Kidney



Poll Question 7

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

a. ketoacidosis
b. Hypertension
c. Kidney tenderness
d. Increased uric acid

SGLT-2 Inhibitors Comparison

Common Oral Diabetes Meds

Class/Main Action	Name(s)	Daily Dose Range	Considerations
SGLT2 Inhibitors "Glucoretic" • Decreases glucose reabsorption in kidneys	Canagliflozin* (Invokana) Dapagliflozin* (Farxiga) Empagliflozin* (Jardiance) Ertugliflozin (Steglatro)	100 - 300 mg 1x daily 5 - 10 mg 1x daily 10 - 25 mg 1x daily 5 – 15 mg 1x daily	**Side effects:** hypotension, UTIs, genital infections, increased urination, weight loss, ketoacidosis. **Heart Failure, CV & Kidney Protection:** 1st line therapy for Heart Failure (HF), Kidney Disease (CKD), Cardiovascular Disease, before or with metformin. **Considerations:** See Package Insert (PI) for GFR cut-offs, dosing. Limited BG lowering effect if GFR < 45, still benefits kidneys & heart at lower GFR. For renal protection, use SGLT-2 therapy if eGFR ≥ 25 & UACR ≥ 300 (ADA). **Benefits:** SGLT-2s* reduce BG, CV death & HF, slow CKD. Lowers A1c 0.6% -1.5%.

SGLT2 Inhibitors Outcomes

Drug/ Size	Trial	Primary MACE	MACE Benefit	HHF	HHF Benefit	Renal Outcomes	Renal Benefit
Empagliflozin N=7,020	EMPA-REG Outcomes	0.86 (0.74-0.99)	Y	0.65 (0.5-0.85)	Y	0.61 (0.53-0.70)	Y
Empagliflozin N=3,730 (1,856 w/ DM)	EMPEROR Reduced	0.75 (0.65-0.86) HHF + CV death only	Y	0.69 (0.59-0.81)	Y	0.50 (0.32-0.77)	Y
Empagliflozin N= 5,998 (49% w/ DM)	EMPEROR Preserved	0.79 (0.69-0.90)	Y	0.71 (0.60-0.83)	Y	Change in mean eGFR slope/year: -1.25 vs. -2.62 (p < 0.001)	Y
Canagliflozin N=10,142	CANVAS program	0.86 (0.75-0.97)	Y	0.67 (0.52-0.87)	Y	0.60 (0.47-0.77)	Y
Canagliflozin N=4,401	CREDENCE	0.80 (0.67-0.95)	Y	0.78 (0.61-1.0)	N	ESRD, doubling of Scr or death from renal of CV cause: 0.70 (0.59-0.82)	Y
Dapagliflozin N=17,160	DECLARE-TIMI 58	0.93 (0.84-1.03)	N	0.73 (0.61-0.88)	Y	0.53 (0.43-0.66)	Y
Dapagliflozin N=4,744 (1,983 with diabetes)	DAPA-HF	0.74 (0.65-0.85) HHF + CV death only	Y	0.70 (0.59-0.83)	Y	0.71 (0.44-1.16)	N
Ertugliflozin N=8,246	VERTIS-CV	0.97 (0.85-1.11)	N	0.70 (0.54-0.90)	Y	0.81 (0.63-1.04)	N
Dapagliflozin N=4304 ((2906 w/ DM)	DAPA-CKD	See renal, All cause mortality and CV death reduced	NA		NA	>50% decline in eGFR, ESKD or death from renal or CV cause, 0.61 (0.51-0.72)-primary	Y

Renal outcomes refer to worsening nephropathy unless otherwise indicated, Y-yes, N-no. HHF: hospitalizations for heart failure, HR<1 favors SGLT2i

SGLT-2 Inhibitors, Indications

Drug	Indication
Ertugliflozin (Steglatro)	• As an adjunct to diet and exercise to improve glycemic control in adults with type 2 diabetes mellitus (DM)-**All**
Canagliflozin (Invokana)	• To reduce the risk of **major adverse cardiovascular (CV) events (CV death, nonfatal myocardial infarction and nonfatal stroke**) in adults with type 2 DM and established cardiovascular disease (CVD). • To reduce the **risk of end-stage kidney disease (ESKD), doubling of serum creatinine, CV death**, and **hospitalization for heart failure (HHF)** in adults with type 2 DM and diabetic nephropathy with albuminuria > 300 mg/day.
Dapagliflozin (Farxiga)	• To reduce the risk of **hospitalization for heart failure** in adults with type 2 DM and established CVD or **multiple CV risk factors**. • To reduce the risk of **CV death and hospitalization for heart failure in patients with** heart failure (NYHA class II-IV) with **reduced ejection fraction**. • To reduce the risk of **sustained eGFR decline, ESKD, CV death, and HHF in** adults **with CKD at risk of progression**
Empagliflozin (Jardiance)	• To reduce the risk of **CV death** in adult patients with type 2 diabetes mellitus and **established CVD**. • To reduce the risk of **CV death and HHF** in **adults with heart failure**.

79

Daily med, package inserts.

Benefits of SGLT-2 Inhibitors

- A1C lowering
- Weight loss
- Cardiovascular benefits
- Renal benefits
- Heart failure benefits
- Blood pressure lowering

Side Effects of SGLT-2 Inhibitors

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

Amputation risk? Fournier's gangrene?

SGLT2i: Managing Adverse Effects

- Maintain good hygiene to reduce risk of genital mycotic infections
  - Higher risk with higher glucose
- DKA risk
  - Use caution with reducing insulin dose
- Monitor BP
  - May need to reduce antihypertensive meds
- UTI risk greater with hyperglycemia
- Amputations observed with canagliflozin
  - Good foot care, check feet daily
- Monitor renal function/potassium

Case Study: Rick

Rick is a 51yoM diagnosed with type 2 diabetes 5 years ago.

He takes metformin 1000mg twice daily and semaglutide 1mg weekly. His A1C=7.3%.

In the last 3 months, he was diagnosed with kidney disease. He has albuminuria and eGFR=56.

Weight: 205lbs, 5"7, BMI=32kg/m^2

He lost 20lbs in the last year

Case Study: Rick (continued) Poll 8

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

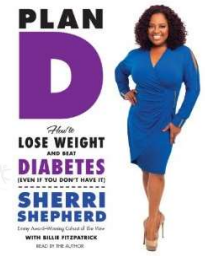
A. Glipizide
B. Dapagliflozin (Farxiga)
C. Pioglitazone (Actos)
D. Linagliptin (Tradjenta)
E. More than 1 correct answer

Don't forget managing other risk factors:
- Use of ACE-inhibitor,/ARB, BP management, +/- finerenone
- Statin for CV risk

SGLT2 Inhibitors- How do they rate?

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

"Getting diabetes saved my life."
~ Sherri Sheperd



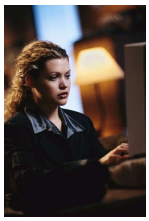
Sherri Shepard decided to embrace diabetes and use it as a motivator to improve her health.

Comparison of Type 1,Type 2, LADA

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

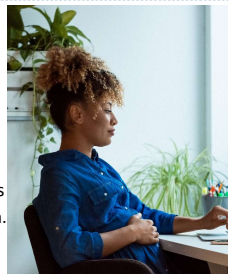
Other Types of Diabetes

- Gestational
- Other specific types of diabetes



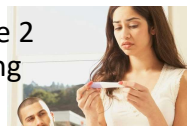

Screening in early Pregnancy

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



Screen Pregnant Women Before 13 weeks

- Screen for undiagnosed Type 2 at the first prenatal visit using standard risk factors.
  - If normal, recheck at 24-28 weeks
- "Diabetes in Pregnancy" Women found to have diabetes at their initial prenatal visit treated as



Poll question 9

- What best describes gestational diabetes?

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

Gestational DM ~ 9% of all Pregnancies

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

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

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

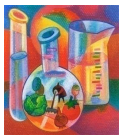
CDC
https://www.cdc.gov/reproductivehealth/maternalinfanthealth/diabetes-during-pregnancy.htm

GDM Criteria - 2 Options
"1 Step" – 75 gm OGTT

- 24-28 weeks
- OGTT in am after overnight fast of 8 or > hrs
- **GDM Diagnosis if ANY** of the following values met or exceeded:

FBG		1 HR		2HR
≥92	or	≥180	or	≥153

Based on Hyperglycemia and Adverse Pregnancy Outcomes Study - IADPSG



KR Life Study – Review Question 10

- KR is 25 weeks pregnant and goes to the lab for one step 75gm OGTT.
  - Blood glucose results
    - FBG 91
    - 1 hour 183
    - 2 hr 156
- What best describes KRs status?
  - A. Normal blood glucose with pregnancy
  - B. Pre diabetes associated pregnancy
  - C. Gestational diabetes
  - D. Diabetes in pregnancy

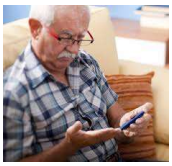
GDM Criteria – Option 2
"NIH 2 step"

- Step 1
  - 50 gm Oral Glucose Tolerance Test (non-fasting)
  - If BG 140* at 1 hour proceed to Step 2
- Step 2 – 100 gm Oral Glucose Tolerance (fasting)

GDM - If at least two of the following four plasma glucose levels (measured fasting and at 1, 2, and 3 h during OGTT) are met or exceeded (Carpenter-Coustan criteria)
Fasting: 95 mg/dL (5.3 mmol/L)
1 h: 180 mg/dL (10.0 mmol/L)
2 h: 155 mg/dL (8.6 mmol/L)
3 h: 140 mg/dL (7.8 mmol/L)

Other Specific Types of DM

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



DiaBingo

B Frequent skin and yeast infections can indicate?
B A BMI of _____ or more increases risk of diabetes
B To reduce complications, control **A**1c, **B**lood pressure, **C**holesterol
B PreDiabetes – fasting glucose level of ___ to _____
B Erectile dysfunction indicates greater risk for _____
B Diabetes – fasting glucose level_____ or greater
B Type 1 diabetes is best described as an _____ disease
B People with diabetes are _____ times more likely to die of heart dx
B Each percentage point of A1c = _____ mg/dl glucose
B At dx of type 2, about __% of the beta cell function is lost
B Diabetes – random glucose _____ or greater

6. Glycemic Targets

A1C
Blood Pressure
Cardiovascular risk reduction

6. Glycemic Targets for Non-Pregnant Adults

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

6. Glycemic Targets
Individualize Targets – ADA

- Pre-Prandial BG 80- 130
- 1-2 hr post prandial < than 180
  *for nonpregnant adults
- Time in Range: 70%

A1c and Estimated Avg Glucose (eAG)

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

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

6. Glycemic Targets: *Standards of Medical Care in Diabetes—2020*

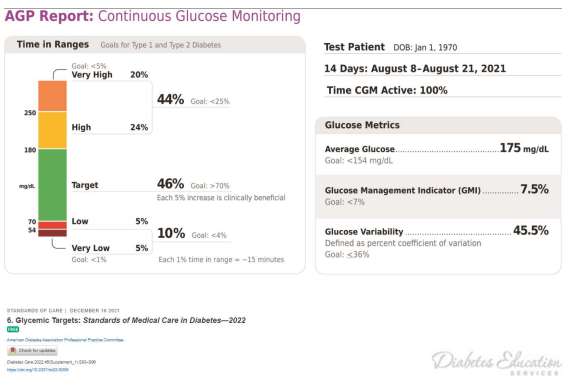
American Diabetes Association
Diabetes Care 2020 Jan; 43(Supplement 1): S66-S76.
https://doi.org/10.2337/dc20-S006

Ambulatory Glucose Profile

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

- For under 25 years, with A_{1c} goal is < 7.5%, time-in-range target is set to about 60%.

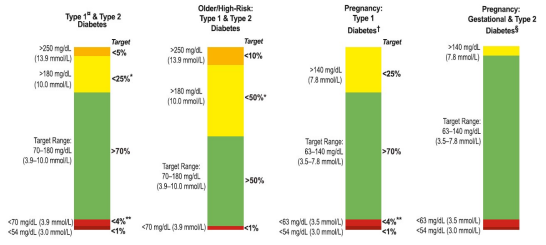
Ambulatory Glucose Profile



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

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

Time in Range (TIR) Goals: International Consensus



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

Diabetes Education Services

Pharmacologic Treatment during Pregnancy

- Insulin is preferred therapy for GDM, type 1 and 2
  - Does not cross placenta
  - Can overcome insulin resistance assoc w/ type 2
- Sulfonylureas pass through placenta / associated with neonatal hypo (glyburide)
- Metformin – lower risk of hypo and maternal wt gain but may increase prematurity rate
  - Passes through placenta
  - If using for PCOS, stop by end of first trimester
- Refer to specialized center

Diabetes Education Services

Pregnancy and Hypertension

- If pregnant with diabetes and chronic hypertension
  - Blood pressure target of 110–135/85 mmHg
    - Reduces risk for accelerated maternal hypertension
    - Minimizes impaired fetal growth
  - Stop potentially harmful medications in prep for pregnancy
    - Avoid ACE inhibitors, angiotensin receptor blockers (ARBs), statins in sexually active women of childbearing age if not using reliable contraception
    - Stop these meds at conception

Diabetes Education Services

Quick Question 11.

- Karen had GDM, now has prediabetes. She is started on Metformin 500mg BID. Which of the following is true?

a. Hold metformin if your blood glucose is below 80 mg/dl
b. If you forget to take metformin before the meal, hold the dose
c. Metformin may cause loose stools
d. Metformin should not be used if serum creatinine is over 1.5mg/dL

Diabetes Education SERVICES

Metformin is "Usually" 1st Line for Type 2 Diabetes

- Why metformin?
  - Longstanding evidence for efficacy and safety, inexpensive
- If ASCVD, HF or CKD or high ASCVD risk, use SGLT2i or GLP-1 RA +/- metformin
- Mechanism: decreases hepatic glucose production
- Data suggest metformin may be safely continued with eGFR of 30-45 mL/min/1.73m^2 with dose reductions
- Do not <u>initiate</u> when eGFR < 45
- Monitor vitamin B12 levels and renal function
- GI issues: nausea, vomiting, diarrhea
  - Consider long-acting formulation, dose reduction

Diabetes Education SERVICES

Common Oral Diabetes Meds

Diabetes Education SERVICES

Download Success! Get Our Free CDE® Coach App

Class/Main Action	Name(s)	Daily Dose Range	Considerations
Biguanides • Decreases hepatic glucose output • First line med at diagnosis of type 2	metformin (Glucophage) Riomet (liquid metformin)	500 - 2500 mg (usually BID w/ meal) 500 - 2500mg 500mg/5mL	**Side effects:** nausea, bloating, diarrhea, B12 deficiency. To minimize GI Side effects, use XR and take w/ meals. **Obtain GFR before starting.** • If GFR <30, do not use. • If GFR <45, don't start Meformin • If pt on Metformin and GFR falls to 30-45, eval risk vs. benefit; consider decreasing dose. **For dye study,** if GFR <60, liver disease, alcoholism or heart failure, restart metformin after 48 hours if renal function stable. **Benefits:** lowers cholesterol, no hypo or weight gain, cheap. Approved for pediatrics, 10 yrs + Lowers A1c 1.0%-2.0%.
	Extended Release-XR (Glucophage XR) (Glumetza) (Fortamet)	(1x daily w/dinner) 500 – 2000 mg 500 – 2000 mg 500 – 2500 mg	

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

Diabetes Education SERVICES

Metformin – How Does it Rate?

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

Risk based Screening for PreDiabetes or Type 2 in Children and Youth

- Test youth with excess weight (BMI >85% percentile)
- Plus any ONE of following risk factors:
  - Maternal diabetes or GDM during child's gestation
  - Family history type 2 in 1st or 2nd degree relative
  - Native American, African American, Latin, Asian, Pacific Islander
  - Signs of insulin resistance (acanthosis nigricans, HTN, dyslipidemia, Polycystic Ovary Syndrome – PCOS or small for gestational age birth weight
- Test at 10 yrs or puberty and every 3 yrs or more frequently if indicated

14. Type 2 and Kids Goals

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

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

14. Pediatric Glycemic Targets

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

Quick Question 12

- What percent of the population over the age of 65 has type 2 diabetes?
  - A. 9.3%
  - B. 18%
  - C. 26%
  - D. 34%

13. Older Adults Goals – Whole Picture

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

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

See Level 2 Course, Older Adults and Diabetes

Treatment Goals Based On:

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

Poll Question 13

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

Healthy & Good Functional Status

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

- **Goals:**
  - Reasonable A1c goal <7.0 - 7.5%
  - Fasting BG 80 – 130
  - Bedtime Glucose 80-180
  - Blood Pressure < 140/90
  - Statin unless contraindicated or not tolerated

Poll 14 – Review Question

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

Older Adults with Complications and Reduced Functionality - Less Intense Goals

- Intermediate remaining life expectancy, high treatment burden, hypo and fall risk.
- Consider DE-Intensification
- Goals:
  - Reasonable A1c goal <8.0%
  - Fasting BG 90 – 150
  - Bedtime BG 100-180
  - Blood Pressure < 140/90
  - Statin unless contraindicated or not tolerated

Older Adults (≥65 years) with diabetes

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

Older Adults and Medications

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

4. ADA – Complete Medical Evaluation

- At initial visit to:
  - Review and confirm diabetes diagnosis
  - Look for diabetes complications
  - Investigate if there are co-conditions
  - Review previous treatment
- Begin engagement in formulation of a care management plan
- Develop a plan for continuing care

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

		INITIAL VISIT	EVERY FOLLOW-UP VISIT	ANNUAL VISIT
PAST MEDICAL AND FAMILY HISTORY	**Diabetes history**			
	• Characteristics at onset (e.g., age, symptoms)	✓		
	• Review of previous treatment regimens and response	✓		
	• Assess frequency/cause/severity of past hospitalizations	✓		
	Family history			
	• Family history of diabetes in a first-degree relative	✓		
	• Family history of autoimmune disorder	✓		
	Personal history of complications and common comorbidities			
	• Comorbid conditions (e.g., obesity, OSA, NAFLD)	✓		✓
	• High blood pressure or abnormal lipids	✓		✓
	• Macrovascular and microvascular complications	✓		✓
	• Hypoglycemia awareness/frequency/causes/timing of episodes	✓	✓	✓
	• Presence of hemoglobinopathies or anemias	✓		✓
	• Last dental visit	✓		✓
	• Last dilated eye exam	✓		✓
	• Visits to specialists	✓	✓	✓
	Interval history			
	• Changes in medical/family history since last visit		✓	✓
BEHAVIORAL FACTORS	• Eating patterns and weight history	✓	✓	✓
	• Assess familiarity with carbohydrate counting (e.g., type 1 diabetes, type 2 diabetes treated with MDI)	✓		
	• Physical activity and sleep behaviors	✓	✓	✓
	• Tobacco, alcohol, and substance use	✓		✓
MEDICATIONS AND VACCINATIONS	• Current medication regimen	✓	✓	✓
	• Medication-taking behavior	✓	✓	✓
	• Medication intolerance or side effects	✓	✓	✓
	• Complementary and alternative medicine use	✓	✓	✓
	• Vaccination history and needs	✓		✓
TECHNOLOGY USE	• Assess use of health apps, online education, patient portals, etc.	✓		✓
	• Glucose monitoring (meter/CGM): results and data use	✓	✓	✓
	• Review insulin pump settings and use	✓	✓	✓
SOCIAL LIFE ASSESSMENT	**Social network**			
	• Identify existing social supports	✓		✓
	• Identify surrogate decision maker, advanced care plan	✓		✓
	• Identify social determinants of health (e.g., food security, housing stability & homelessness, transportation access, financial security, community safety)	✓		✓

STANDARDS OF CARE | DECEMBER 16 2021
4. Comprehensive Medical Evaluation and Assessment of Comorbidities: *Standards of Medical Care in Diabetes—2022*
American Diabetes Association Professional Practice Committee
Check for updates
Diabetes Care 2022;45(Supplement_1):S46–S59
https://doi.org/10.2337/dc22-S004

American Diabetes Association.

Table 4.1 (cont.)– Components of the comprehensive diabetes medical evaluation at initial, follow-up, and annual visits

		INITIAL VISIT	EVERY FOLLOW-UP VISIT	ANNUAL VISIT
PHYSICAL EXAMINATION	• Height, weight, and BMI; growth/pubertal development in children and adolescents	✓	✓	✓
	• Blood pressure determination	✓	✓	✓
	• Orthostatic blood pressure measures (when indicated)	✓		
	• Fundoscopic examination (refer to eye specialist)	✓		✓
	• Thyroid palpation	✓		✓
	• Skin examination (e.g., acanthosis nigricans, insulin injection or insertion sites, lipodystrophy)	✓	✓	✓
	• Comprehensive foot examination			
	◦ Visual inspection (e.g., skin integrity, callous formation, foot deformity or ulcer, toenails)[¶]	✓		✓
	◦ Screen for PAD (pedal pulses–refer for ABI if diminished)	✓		✓
	◦ Determination of temperature, vibration or pinprick sensation, and 10-g monofilament exam	✓		✓
	• Screen for depression, anxiety, and disordered eating	✓		✓
	• Consider assessment for cognitive impairment*	✓		✓
	• Consider assessment for functional performance*	✓		✓
LABORATORY EVALUATION	• A1C, if the results are not available within the past 3 months	✓	✓	✓
	• If not performed/available within the past year	✓		✓
	◦ Lipid profile, including total, LDL, and HDL cholesterol and triglycerides*	✓		✓^
	◦ Liver function tests*	✓		✓
	◦ Spot urinary albumin-to-creatinine ratio	✓		✓
	◦ Serum creatinine and estimated glomerular filtration rate*	✓		✓
	◦ Thyroid-stimulating hormone in patients with type 1 diabetes*	✓		✓
	◦ Vitamin B12 if on metformin (when indicated)	✓		✓
	◦ Serum potassium levels in patients on ACE inhibitors, ARBs, or diuretics*	✓		✓

STANDARDS OF CARE | DECEMBER 16 2021
4. Comprehensive Medical Evaluation and Assessment of Comorbidities: *Standards of Medical Care in Diabetes—2022*
American Diabetes Association Professional Practice Committee
Check for updates
Diabetes Care 2022;45(Supplement_1):S46–S59
https://doi.org/10.2337/dc22-S004
American Diabetes Association.

Diabetes Education SERVICES

ADA Assess and Treatment Plan

- **Assess risk of diabetes complications**
  - ASCVD and heart failure history
  - ASCVD risk factors and 10-year ASCVD risk assessment
  - Staging of chronic kidney disease (see Table 11.1)
  - Hypoglycemia risk
- **Goal setting**
  - Set A1C/blood glucose target
  - If hypertension is present, establish blood pressure target
  - Diabetes self-management goals
- **Therapeutic treatment plans**
  - Lifestyle management – referral to RD, DSME and specialists
  - Pharmacologic therapy: glucose lowering
  - Pharmacologic therapy: cardiovascular disease risk factors and renal
  - Use of glucose monitoring and insulin delivery devices

Physical Exam

- Height, weight, BMI, pubertal development
- Blood pressure
- Fundoscopic exam
- Skin exam – insulin insertion sites, acanthosis, fungus, sores
- Comprehensive foot exam
  - Visual eval
  - Screen for Peripheral Arterial Disease
  - Monofilament and vibration assessment

Lab Eval

- A1c (each 3-6 mo's)
- Each year
  - Lipids
  - Liver function
  - Spot urinary albumin-to-creat ratio (UACR))
  - Serum creat and GFR
  - TSH (type 1)
  - B12 check (on metformin if needed)
- Serum K
  - If on ACE, ARBs or diuretics

Referrals for Initial Care Mgmt

- Family planning if reproductive age
- RD for nutrition therapy
- DSMES - Diabetes Self-Management Education and support
- Dentist for comprehensive dental and periodontal examination
- Mental health professional, if indicated
- Audiology if indicated

ADA – Follow-up Visit to include:

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

Vaccination Schedule for Diabetes 2022

Vaccine	Who by Age	Series and Frequency
Hepatitis B Vaccine	Less than 60 years*	2-3 dose series
Human papilloma virus (HPV)*	9-14 years 15 – 26 years	2 dose series 3 dose series
Influenza	All	Annually
Pneumonia (PPSV23) Pneumovax	19-64 – first dose 65 + - second dose	
*Pneumonia (PCV13) Prevnar	Only for adults 19+ who are immunocompromised	
Tetanus, diphtheria, pertussis (TDAP)	All adults; extra dose during pregnancy	Booster every 10 years.
Zoster	50+	2 dose Shingrix
COVID	All people with diabetes	Frequency /boosters TBD

Diabetes Care 2022;45(Supplement_1):S46–S59
https://doi.org/10.2337/dc22-S004

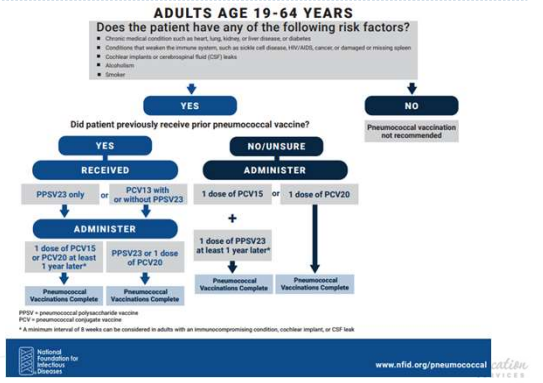
*See Standards pgs S48-53 for more info

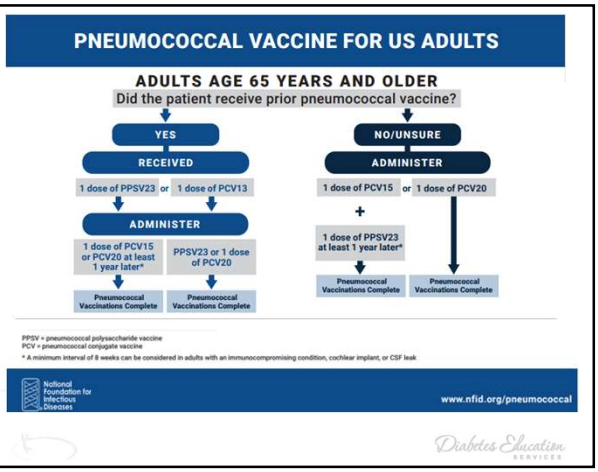
Poll Question – 1

- JL is 49 years old and has diabetes. JL tells you they got their influenza and COVID Vaccine this year. **What other vaccines are recommended for JL?**

A. Hepatitis B and Pneumonia (Pneumovax)
B. Influenza booster and Hepatitis B
C. Pneumonia (Prevnar) and Human Papilloma Virus (HPV)
D. Herpes Zoster and TDAP

Pneumococcal Vaccine for US Adults





Social History and Med Taking

- Eating Patterns & weight history
- Sleep behaviors – goal 7 hrs
- Tobacco, alcohol, substance use
- Social supports and coping skills
- Medication taking behaviors
  - How many times a day/week are you taking this medication?
  - Complimentary meds
  - Evaluate for hyper and hypo glycemia

Diabetes Education Services

Cheat Sheet Page

Diabetes Education Services

Cost Related Non-Adherence (CRN)

- Among people with chronic illnesses, 2/3 of those who reported not taking medications as prescribed due to CRN never shared this with their physician.

- *CRN = Cost related non-adherence.
- Especially associated with diabetes medications and insulin.

Diabetes Education Services

Diabetes Toolkit

Meter
- Strips that aren't expired?

List of Meds

Plan for Lows

Emergency Plan

Power back-up

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

Hypoglycemia (Glucose) Alert Values

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

- **BG < 54mg/dl – Level 2**
- Indicates serious hypo. Contact provider for med change. Glucagon Emergency Kit
- **Severe Hypoglycemia – Level 3**
- Requires external assistance – no threshold

Hypoglycemia: Identify, Treat, & Prevent

Diabetes Education Services

Step 1	Step 2	Step 3
Identify your signs of hypoglycemia or low blood sugar: • Sweaty • Shaky • Hungry • Can't think straight • Headache • Irritated, grouchy • Other	**If have signs of hypo, treat with carbs until glucose reaches 70+, then eat usual meal.** • Sugary drink, 4–8oz • Piece of fruit • Raisins, handful • Glucose tabs, 4+ • Honey or glucose gel • Skittles candy, 15+	**Have glucagon rescue meds available.** In case of severe hypo, identify someone (ahead of time) who can get medical help & give a glucagon rescue medication. **Notify your provider of low blood sugar events.**

Hypoglycemia Levels:

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

Identify Causes of Hypo & Problem Solve to Prevent Future Episodes

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

Medic Alert -

LaurensHope.Com

MedicAlert.org

Elegant Medical Alert

If on insulin or sulfonylurea – special precautions required

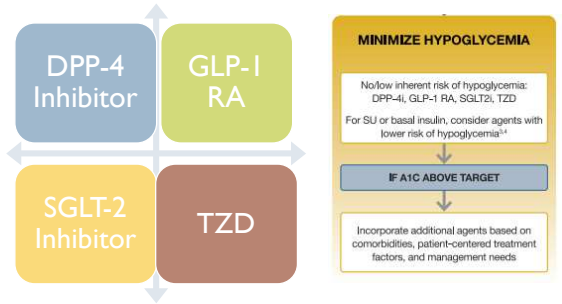
- Carb source on person, car, by bed at all times
- Identification
  - Phone (ICE)
  - Wallet Card
  - Bracelet
- If pattern of lows, med adjustment required
- Pre-meal target
  - 100-130?
- Post meal
  - Less than 180
- Bedtime
  - 110 - 180

Sulfonylureas

- Second generation: glipizide, glimepiride, glyburide
- Dosed 1-2x daily before meals
- Mechanism: Stimulate beta cells in the pancreas to release insulin
- Adverse effects
  - Hypoglycemia, Weight gain
- Beta cell burnout? - Decreased longevity
- Low cost, effective A1C lowering

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

Reducing Hypoglycemia



Diabetes Care 2022;45(Suppl. 1):S125-S143.

Diabetes Education Services

Case Study Ken – Poll 2

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

A. Metformin
B. Sitagliptin (Januvia)
C. Glimepiride (Amaryl)
D. Pioglitazone (Actos)

Diabetes Education Services

Glucagon Rescue Medications for Diabetes-Related Hypoglycemia

Download Success! Get Our Free CDCES Coach App

Name/Delivery	Supplied	Dose Range		Age / Route / Storage
		Adult	Peds / Age WT Dosing	
Glucagon Emergency Kit Injection requires mixing glucagon powder	1mg / 1mL vial + syringe	1mg	0.03mg/kg or < 6yrs or < 25 kgs | 0.5mg ≥ 6yrs or > 25kgs | 1mg	All ages approved SubQ or IM admin Expires in 2 years at room temp.
Baqsimi Nasal glucagon powder	3 mg intranasal device	3 mg	< 4 yrs: not recommended 4 yrs or older | 3mg dose	Approved Age 4+ Nasal admin Expires ~ 2 years at room temp (keep in shrink-wrapped tube).
Gvoke Injectable liquid stable glucagon solution	0.5mg/1.0mg prefilled syringe or 0.5mg/1.0mg HypoPen auto-injector	1 mg	< 2yrs: not recommended 2- 12 yrs < 45kg | 0.5mg ≥ 45kg | 1mg 12 yrs or older | 1mg	Approved Age 2+ SubQ admin in arm, thigh, abdomen Expires in 2 years at room temp (keep in foil pouch).
Dasiglucagon (Zegalogue) Stable liquid glucagon analog	0.6mg/0.6mL Prefilled syringe Autoinjector	0.6mg	< 6yrs: not recommended 6 yrs or older | 0.6mg	Approved Age 6+ SubQ in abdomen, buttocks, thigh outer upper arm Expires in 1 year at room temp. (store in red protective case).

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

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

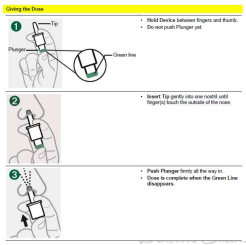
DiabetesEd.net Copyright Diabetes Education Services 2021 ©2021

Glucagon Emergency Kit

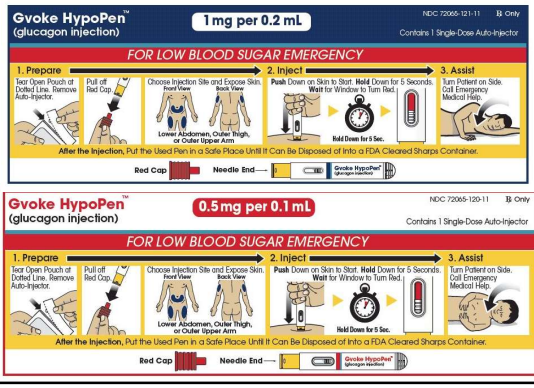
Store 68-77 degrees prior to reconstitution, single use only

Nasal Glucagon - Baqsimi

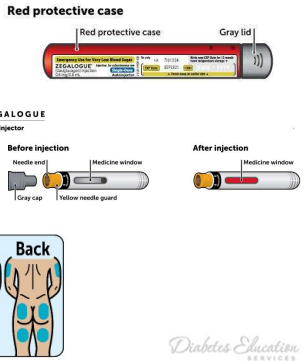
- Approved for ages 4 +
- Absorbed nasally
- No reconstitution or refrigeration needed
- Kept in temps up to 86
- Raises BG 67-73 mg/dl
- Don't use in those with
  - Pheochromocytoma
  - Insulinoma
  - See package insert

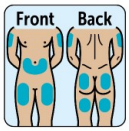


Gvoke HypoPen – Single dose injector
For children ages 2+. Peds dose up to 45kg



Dasiglucagon (Zegalogue)





Diabetes Education SERVICES

Quick Question 3

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

A. Does he change his needle each time?

B. Why is he adjusting glargine?

C. Is he adjusting insulin for exercise?

D. How many hypoglycemic events per week?

Diabetes Education SERVICES

Preventing Hypoglycemia

Nocturnal Lows

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

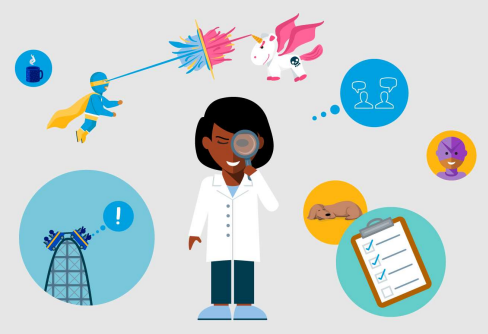
Other

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

Diabetes Education SERVICES

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

Landmark Trials



Quick Question 4

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

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

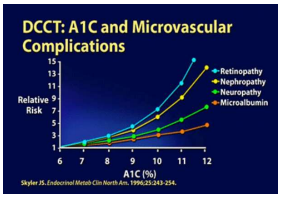
Diabetes Control and Complications Trial (DCCT) Type 1 – Does getting A1c <7% matter?

The largest, most comprehensive diabetes study ever conducted.

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

Compared the effects of two treatment regimens:

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



DCCT Conclusions

By maintaining A1C < 7%:

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

Management elements included:

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

UKPDS Results

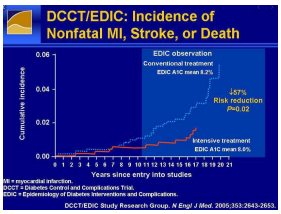
United kingdom Prospective Diabetes Study

- Conducted over 20 years involving over 5,100 patients with Type 2 diabetes
- 1% decrease in A_1c reduces microvascular complications by 35%
- 1% decrease in A_1c reduces diabetes related deaths by 25%
- B/P control (144/82) reduced risk of:
  - Heart failure (56%)
  - Stroke (44%)
  - Death from diabetes (32%)

Lancet 352: 837-865, 1998

"Legacy Effect"

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



DiaBingo- G

G ADA goal for A1c is less than ____%

G Blood pressure goal is less than

G People with DM should see eye doctor (ophthalmologist) at least

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

G People with DM should get this shot every year

G People with DM need to get these kidney tests yearly
G Periodontal disease indicates increased risk for heart disease

G The goal for blood sugar levels before meals is:
G The activity goal is to do ___ minutes on most days
G Name 3 healthy foods to include in daily meal plan

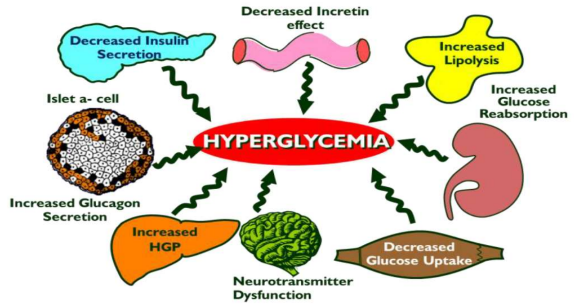
ADA Standards of Care Section 9 - Pharmacologic Approaches to Glycemic Treatment

More Insulin and Medication Info in your Bonus Courses

How Many Drug Options for Diabetes?

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

Drug Targets in Diabetes



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

Case Study - Rick

Rick is a 46yoM newly diagnosed with type 2 diabetes. His A1C=8.2%. He has normal kidney function. Past medical history includes hypertension for which he takes HCTZ 25mg daily.

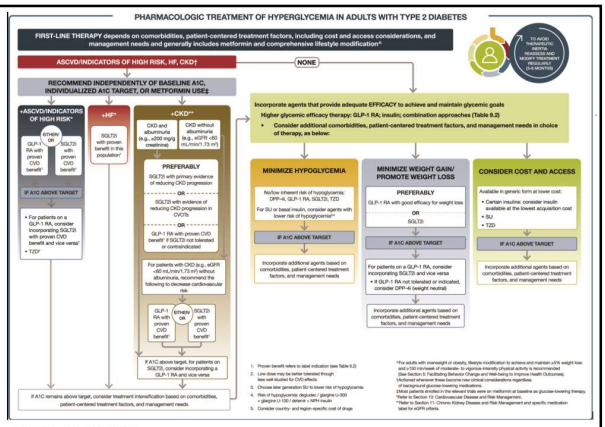
Weight: 220lbs, BMI=34kg/m^2

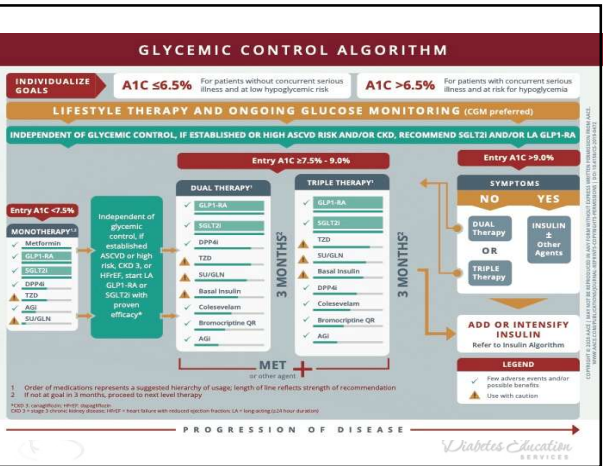
Social history

- Works full time as an accountant
- Skips breakfast, eats a small lunch, eats a large dinner, snacks in evening
- No Exercise
- Loves beer (drinks 3-4/day on weekends)

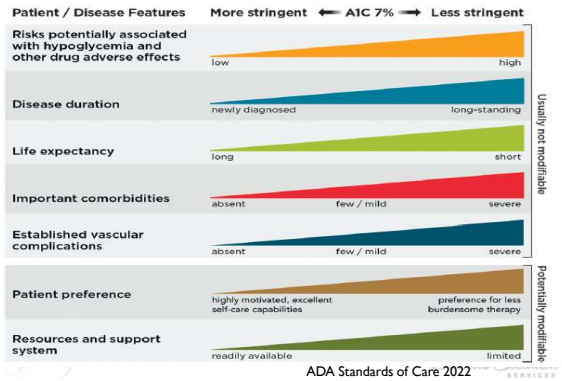
Poll 5. What Drug Should Rick Be Started On?

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





Individualize Glycemic Targets



ADA Standards of Care 2022

Other Oral Diabetes Medications

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

Diabetes Education SERVICES

Thiazolidendiones (TZD's)

- TZD's include pioglitazone, rosiglitazone
- Dosed once daily without regard to food
- Mechanism: activates the nuclear transcription factor PPAR-gamma, increases peripheral insulin sensitivity
- Adverse effects
  - Bone fractures, Edema/fluid retention, Weight gain
- Avoid in heart failure
- Association with bladder cancer (pioglitazone)
- 12 weeks to full effect

Thiazolidinediones "TZDs" • Increases insulin sensitivity	pioglitazone (Actos) rosiglitazone (Avandia)	15 – 45 mg daily 4 – 8 mg daily	Black Box Warning: TZDs may cause or worsen CHF. Monitor for edema and weight gain. Increased peripheral fracture risk. Actos may increase risk of bladder cancer. Lowers A1c 0.5% – 1.0%

TZDs – How Do They Rate?

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

Alpha-glucosidase Inhibitors

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

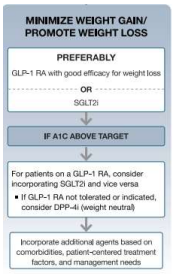
Case Study: Rick Continued

- After 3 months, Rick's A1C has decreased to 7.1%. He met with the diabetes care and education specialist and increased physical activity to 3 days/week of walking. He lost 6lbs and would like to lose more.
- Current DM Meds: metformin 1000mg twice daily
- BMI=34kg/m^2

- What drug should he be started on next?

When Goal is to Avoid Weight Gain

- These meds associated with wt loss
  - GLP-1 agonists (Semaglutide > liraglutide > dulaglitide > exenatide > lixisenatide
  - SGLT-2 Inhibitors (empagliflozin, dapagliflozin, canagliflozin, ertugliflozin)
  - Symlin (Pramlintide)
- These meds are weight neutral
  - Metformin
  - DPP-4 Inhibitors: sitagliptin, saxgliptin, linagliptin, alogliptin
  - Acarbose



Diabetes Care 2022;45(Suppl. 1):S125-S143.

GLP-1 RA Approved for Weight Loss

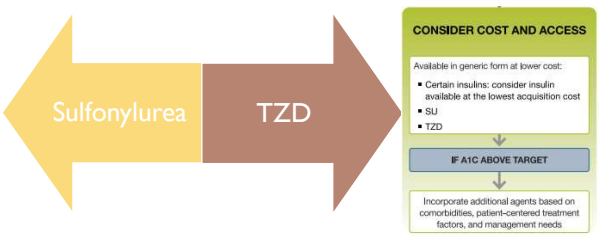
- Saxenda and Victoza contain the same active ingredient (liraglutide) at different doses
  - Saxenda 3 mg and Victoza 1.8 mg SC injection
- Wegovy and Ozempic contain the same active ingredient (semaglutide) at different doses
  - Wevovy 2.4mg and Ozempic 1mg SC injection
- Both are FDA approved as a treatment option for chronic weight management in addition to a reduced calorie diet and physical activity.
- Approved for use in adults with a
  - BMI of ≥ 30 or
  - BMI of ≥ 27 or greater who have hypertension, type 2 diabetes, or dyslipidemia.

Poll 6 - Check Your Knowledge

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

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

Reducing Cost



Diabetes Care 2022;45(Suppl. 1):S125-S143.

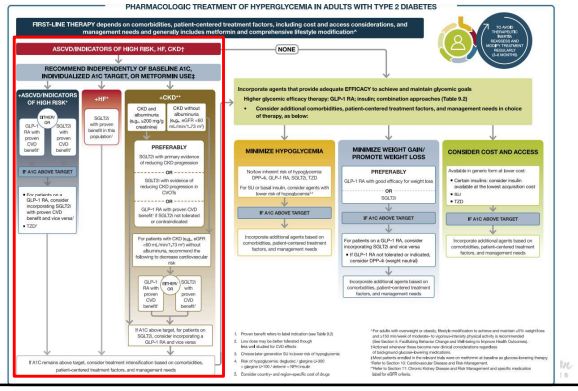
Diabetes Education SERVICES

How much do they cost?

- Which of the following groups of meds for a month supply are cheapest? (multiple)
  - a. Actos and Avandia $5 & $324
  - b. Glipizide, Glyburide, Glimepiride $10 for 3 mo's
  - c. Metformin and Metformin XR $10 for 3 mo's
  - d. Januvia and Onglyza $596 & $549
  - e. Exenatide and Semaglutide $909, $1022
  - f. Empagliflozin $658

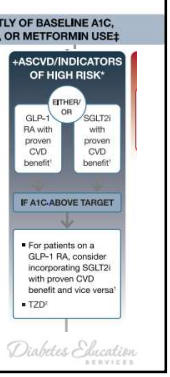
See Table 9.3 in ADA Standards on Median Monthly Average Wholesale Price (AWP) 2022

High Risk or Establish CVD, CKD, HF



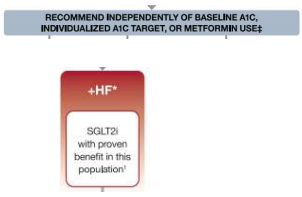
Atherosclerotic Cardiovascular Disease

- ASCVD risk
  - Established CV disease
  - High CV Risk
    - 55+ with coronary, carotid or lower extremity artery stenosis > 50%
    - Left Ventricular Hypertrophy (LVH)
  - Most effective meds based on Cardiovascular Outcomes Trial (CVOT)
    - SGLT2i - Empagliflozin (Jardiance) & canagliflozin (Invokana)
    - GLP-1 RAs - Semaglutide (Ozempic), liraglutide (Victoza), dulaglutide (Trulicity)



Diabetes Care 2022;45(Suppl. 1):S125-S143.

Heart Failure



- If HF or reduced Ejection Fraction (rEF) and Left Ventricular Ejection Fraction (LVEF) <45%
- Empagliflozin FDA approved for preserved EF
- SGLT-2 inhibitor if eGFR is adequate
- Avoid TZD
- If using a DPP4 inhibitor, avoid saxagliptin and alogliptin

Proven benefit:
Empagliflozin, ertugliflozin, canagliflozin, dapagliflozin

Diabetes Care 2022;45(Suppl. 1):S125-S143.

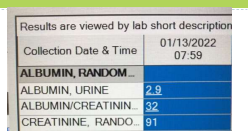
Diabetes + CKD – Increases CVD Risk

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

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

Evaluating Kidney Function - Albumin

- Urinary Albumin Creatinine Ratio (UACR)
- UACR can be assessed with a urinary spot collection.
  - Evaluates ratio of urine albumin /creatinine in mg/g
  - Target range < 30mg/g
  - If elevated, repeat test to verify
- Check at diagnosis in T2D and within 5 years in T1D



2.9 / 91 = 0.0318 mg/mg or 31.8 (32) in mg/g

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

Evaluating Kidney Function - GFR

- Glomerular Filtration Rate (GFR)– target is 60 or greater
  - Stage 3 indicates progressive renal failure
    - GFR 30 to 59
  - Stage 4 and 5 indicates severe loss and failure
    - GFR 29 or less

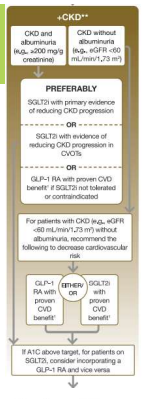
Kidney Disease Stage	GFR
Stage 1 – Normal	90+
Stage 2 – Mild loss	89 - 60
Stage 3a – Mild to Mod	59 - 45
Stage 3b – Mod to Severe	44 - 30
Stage 4 – Severe loss	29 -15
Stage 5 – Kidney failure	14 - 0

www.DiabetesEd.net

Diabetes Education SERVICES

Chronic Kidney Disease (CKD) or Diabetes Kidney Disease (DKD)

- Preferably use SGLT2i with primary evidence of reducing CKD progression if DKD (eGFR 30-60) and albuminuria (ex. UACR >200)
  - Canagliflozin (Invokana), dapagliflozin (Farxiga)
- Or SGLT2 with evidence of reducing CKD progression in CVOTs
  - Empagliflozin (Jardiance), canagliflozin (Invokana), dapagliflozin (Farxiga)
- If can't tolerate or CKD without albuminuria, use GLP-1 RA with proven CVD benefit to reduce CV Event Risk
  - Semaglutide (Ozempic), liraglutide (Victoza), dulaglutide (Trulicity)



Diabetes Education SERVICES

SGLT2 Primary Kidney Outcome Trials

Trial Name	SGLT2 Inhibitor	Outcomes
CREDENCE	Canagliflozin	N=4401, Median follow-up 2.6 years, Prior CVD 50.4% ESRD, doubling of create or death from renal or CV cause (primary): 0.70 (0.59-0.82), 3 point MACE 0.80 (0.67-0.95)
DAPA-CKD	Dapagliflozin	N=4304, 2906 with diabetes, Median follow-up 2.4 years, Prior CVD 37.4% >50% decline in eGFR, ESKD or renal/CV death (primary): 0.61 (0.51-0.72)

Drug	Dose	Renal Adjustment	FDA Approved Kidney Indication
Canagliflozin (Invokana)	100-300mg daily	eGFR 30 to <60: 100 mg once daily eGFR < 30: avoid initiation, may continue 100mg daily for CKD CI in dialysis	To reduce the risk of ESKD, doubling of serum creatinine, CV death, and hospitalization for HF in adults with T2DM and diabetic nephropathy with albuminuria >300 mg/day.
Dapagliflozin (Farxiga)	5-10 mg daily	Avoid initial if eGFR <25, may continue for CV, CKD benefits CI in dialysis	To reduce the risk of sustained eGFR decline, end-stage kidney disease, CV death, and hospitalization for HF in adults with CKD at risk of progression.

Standard 11 - Chronic Kidney Disease and Risk Management

- **4 Kidney function findings that impact our practice**:
- **Predicts CV Disease** – albuminuria is associated with kidney disease and is a predictor of cardiovascular events
  - Accurate evaluation of urine protein and action to prevent cardiovascular events.
- **SGLT2's slow progression of chronic kidney disease and decrease risk of CV events.**
  - SGLT2 therapy is recommended for those with a GFR>20 with urinary albumin creatinine 200mg/g or more (A) and GFR>20 with urine albumin <200 with DKD (B).

Standard 11 - Chronic Kidney Disease and Risk Management

- **Kidney function findings that impact our practice**:
- **Frequency of measure depends on findings**.
  - Measure Urinary Albumin Creatinine Ratio (UACR) at least annually.
  - If UACR is 300mg/g or greater and GFR<60, check kidney function twice a year.
- **Measure of success**:
  - If urine albumin severely increased, the goal is to provide an intervention and decrease albuminuria by 30%.
- Optimize glucose and BP control to reduce the risk or slow the progression of chronic kidney disease.

ADA SOC 2022.

Standard 11 - Chronic Kidney Disease and Risk Management

- **Kidney function findings that impact our practice**:
  - For people with stage 3 or higher CKD, dietary protein intake should be a max 0.8 g/kg/day (the recommended daily allowance). **A**
  - For patients on dialysis, higher levels of dietary protein intake should be considered, since malnutrition is a major problem in some dialysis patients. **B**
  - In nonpregnant patients with diabetes and hypertension, ACE inhibitor or ARB is recommended for UACR (30–299 mg/g creatinine) **B** and strongly recommended for UACR ≥300 mg/g creatinine and/or eGFR <60. **A**

ADA SOC 2022.

Diabetes Education SERVICES

New Kidney Protective Med Approved

New nonsteroidal MRAs for Type 2 and Chronic Kidney Disease

Nonsteroidal Selective Mineralocorticoid Antagonist

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

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

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

Diabetes Education SERVICES

Finereone Place in Therapy

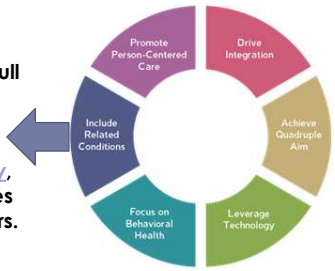
- In people with CKD who are at increased risk for CV events or CKD progression or are unable to use a SGLT2i
  - a nonsteroidal mineralocorticoid receptor antagonist (finerenone) is recommended to reduce CKD progression and CV events.
- First optimize ACEI or ARB

ADA SOC 2022.

Diabetes Education SERVICES

ADCES New Focus – Diabetes Specialists and CVD Management

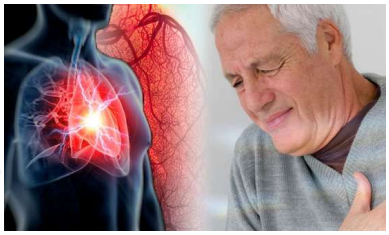
Demonstrate your expertise within the full range of cardiometabolic conditions: hypertension, obesity, prediabetes, diabetes and cardiac disorders.



CVD Resources (diabeteseducator.org)

Diabetes Education Services

Cardiovascular Disease is the Leading Cause of Death in Diabetes



Heart Disease & DM = 3-5xs Risk

- CHF
  - 7.9 % w/ diabetes vs.
  - 1.1 % no diabetes
- Heart attack
  - 9.8 % w/ diabetes vs.
  - 1.8 % no diabetes
- Coronary heart disease
  - 9.1 % w/ diabetes vs.
  - 2.1 % no diabetes
- Stroke
  - 6.6 % w/ diabetes vs.
  - 1.8 % no diabetes

AACE Website

Stroke and Heart Attack

SPOT A STROKE™

F.A.S.T.

FACE Drooping

ARM Weakness

SPEECH Difficulty

TIME to Call 911

StrokeAssociation.org

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

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

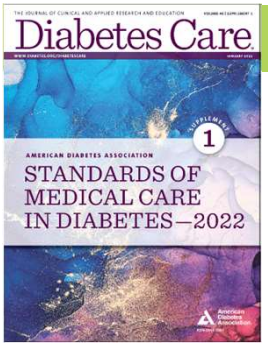
People with diabetes may not experience intense chest or jaw pain during heart attack due to neuropathy.

Atherosclerotic Cardiovascular Disease (ASCVD)

- ASCVD is defined as:
  - Coronary heart disease
  - Cerebrovascular disease
  - Peripheral arterial disease

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

Diabetes Education Services



- Endorsed by the American College of Cardiology

10. Cardiovascular Disease and Risk Management: *Standards of Medical Care in Diabetes—2022* FREE

American Diabetes Association Professional Practice Committee

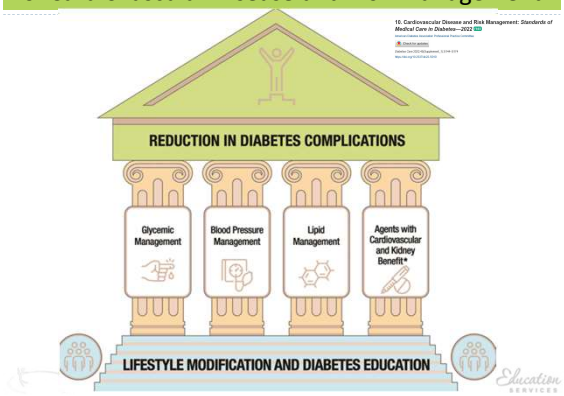
Check for updates

Diabetes Care 2022;45(Supplement_1):S144–S174

https://doi.org/10.2337/dc22-S010

Diabetes Education Services

10. Cardiovascular Disease and Risk Management



Assess ASCVD and Heart Failure Risk Yearly

- Duration of diabetes
- BMI of 25+
- Hypertension
- Dyslipidemia
- Smoking
- A family history of premature coronary disease
- Chronic kidney disease
- Presence of albuminuria

Meet Alice

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

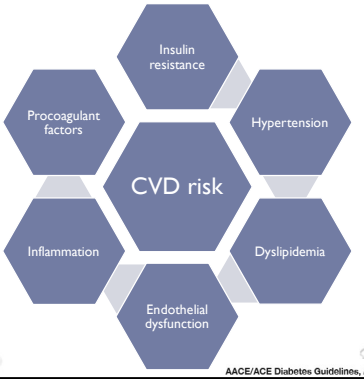
- **PMH**
  - Type 2 diabetes x5 years
  - HTN x 5 years
  - Depression
- **Meds**
  - Metformin1000mg PO bid
  - Glipizide 10mg PO qam
  - Chlorthalidone 25mg PO daily
  - Escitalopram 10mg PO daily
- **PE**
  - Ht: 5'3" Wt: 185lbs , BMI:32.8kg/m²
  - BP: 140/88mmHg
  - A1c=6.9%, K: 4.5mEq/L, Scr:0.8mg/dL, ACR 202 mg/g
  - Tchol=204mg/dL, HDL=34mg/dL, LDL=120mg/dL, TG=250mg/dL

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

Questions to Think About

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

Why Does Diabetes Increase ASCVD risk?



AACE/ACE Diabetes Guidelines, *Endocr Pract.* 2016;21(Suppl 1)

Hypertension Management in People with Diabetes

Classifying Hypertension

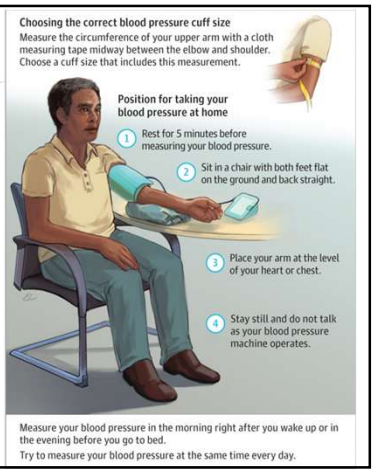
BP Category	SBP		DBP
Normal	<120 mmHg	And	<80mmHg
Elevated	120-129mmHg	And	<80mmHg
Hypertension			
Stage 1	130-139 mmHg	Or	80-89mmHg
Stage 2	≥140mmHg	Or	≥90mmHg

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

Whelton et al. 2017 High Blood Pressure Clinical Practice Guideline

Diabetes Education SERVICES

Taking an accurate Blood Pressure



BP Treatment Strategies

- Assess BP at every office visit
- If BP >120/80 mmHg
  - Encourage lifestyle changes to reduce BP
- Lifestyle changes
  - Weight loss
  - DASH Style diet (fresh fruit, veggies, whole grains, reducing sodium and increasing potassium intake)
  - Moderation of alcohol intake
  - Increased physical activity

Diabetes Education SERVICES

Blood Pressure goals

- BP goal <140/90mmHg if 10 year ASCVD risk <15% (ADA)
- BP goal <130/80mmHg (AACE, ACC/AHA)
  - if ASCVD risk ≥15% (ADA)
- BP target based on individual assessment and shared decision making that addresses CV risk and potential adverse effects of BP meds.

Prompt initiation of drug therapy when BP is above target

BP Drug Treatment

- **No albuminuria** – Use any of 4 classes of meds
  - Includes ACE Inhibitors, ARBs, thiazide-like diuretics or calcium channel blockers
- **With albuminuria or ASCVD**– Start ACE Inhibitor or ARB
  - (Avoid ACEi and ARB at same time)
  - Multiple drug therapy often required
- If BP≥160/100 start 2 drug combo

Back to Alice

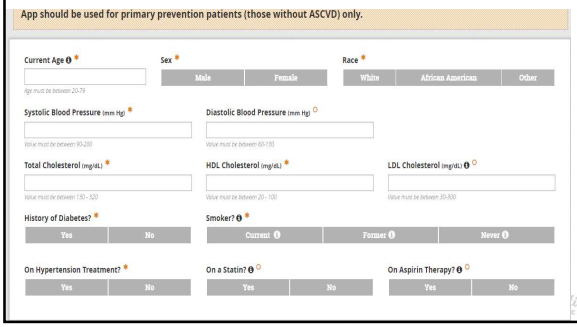
Alice is a 56yo AAF presenting for follow-up for type 2 diabetes. Alice reports that her blood pressure has been higher lately. Denies s/sx of hypoglycemia.

- **PMH**
  - Type 2 diabetes x5 years
  - HTN x 5 years
  - Depression
- **Meds**
  - Metformin1000mg PO bid
  - Glipizide 10mg PO qam
  - Chlorthalidone 25mg PO daily
  - Escitalopram 10mg PO daily
- **PE**
  - Ht: 5'3" Wt: 185lbs , BMI:32.8kg/m²
  - BP: 140/88mmHg
  - A1c=6.9%, K: 4.5mEq/L, Scr:0.8mg/dL, ACR 202 mg/g
  - Tchol=204mg/dL, HDL=34mg/dL, LDL=120mg/dL, TG=250mg/dL

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

Calculating ASCVD Risk

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



What Is Alice's ASCVD risk?

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

Poll 7 - What is the blood pressure goal for Alice?

A. BP<120/80 mmHg
B. BP<130/80 mmHg
C. BP<140/80 mmHg
D. BP<140/90 mmHg

Does Alice have albuminuria?

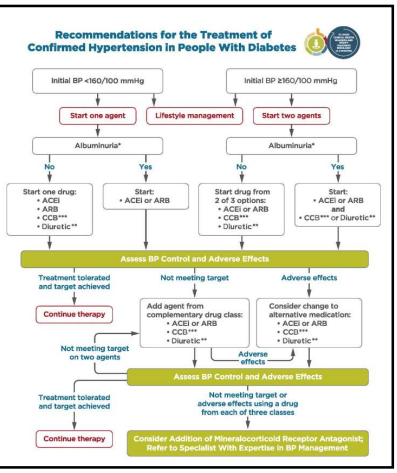
Albumin to Creatinine ratio (ACR)= 202 mg/g

YES

Recommendations for the treatment of confirmed hypertension in people with diabetes.

*An ACEi or ARB is suggested to treat hypertension for patients with UACR 30–299 mg/g creatinine and strongly recommended for patients with UACR ≥300 mg/g creatinine.

**Thiazide-like diuretic; long-acting agents shown to reduce cardiovascular events, such as chlorthalidone and indapamide, are preferred.
***Dihydropyridine calcium channel blocker.



ACE Inhibitors

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

Initial dose adjustment may be needed for renal dysfunction or elderly

Angiotensin Receptor blockers (ARB's)

Class / Action	Generic / Trade Name	Usual Daily Dose Range	Frequency	Considerations
ARBs -Angiotensin Receptor Blockers **Action** -Block AT-I receptor which reduces aldosterone secretion and vasoconstriction	Azilsartan/Edarbi	40 - 80 mg	1 x daily	Try to take same time each day
	Azilsartan/ Chlorthalidone combo (Edarbyclor)	40 mg 12.5 - 25 mg		**Side effects**- Can cause dizziness, drowsiness, diarrhea, hyperkalemia, hypotension.
	Candesartan/Atacand†	8 – 32 mg		†These meds are also available as a combo w/ low dose HCTZ (hydrochlorothiazide).
	Eprosartan/Teveten†	400 - 600 mg		
	Irbesartan/ Avapro†	75 – 300 mg		‡These meds are also available as a combo w/ CCB (calcium channel blocker) usually amlodipine
	Losartan / Cozaar*†	25 – 100 mg		
	Olmesartan / Benicar†‡ Tribenzor (triple combo)	20 – 40 mg		
	Telmisartan / Micardis	20 – 80 mg		
	Valsartan / Diovan†‡ Exforge HCT (triple combo)	80 – 320 mg		
	Valsartan/ Nebivolol combo (Byvalson)	80 mg 5 mg		

Initial dose adjustment may be needed for renal dysfunction or elderly

ACEI/ARB Adverse Effects

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

- Contraindications
  - Pregnancy
  - Bilateral renal artery stenosis

Thiazide diuretics

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

Calcium Channel Blockers

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

Class / Action	Generic / Trade Name	Usual Daily Dose Range	Frequency	Considerations
Calcium Channel Blocker *Nondihydropyridine* Relaxes coronary blood vessels to decrease heart rate and cardiac output.	**Diltiazem immediate release***	30 – 360 mg	4 x day	**Monitor** BP, heart rate, liver enzymes and cardiac function a baseline and periodically. Take at the same time each day (with meals if possible). Take in evening if experience drowsiness. **Side Effects**: Watch for cardiac conduction abnormalities, bradycardia, CHF and edema. Can cause peripheral edema and constipation. Metabolized through CYP3A4, so review package insert for drug and food interactions (ie grapefruit).
	Diltiazem extended release*			
	Cardizem CD	120 – 480 mg	1 x day	
	Tiazac	120 – 540 mg	1 x day	
	Dilacor, Diltia	180 – 540 mg	1 x day	
	Verapamil immediate release* Calan	80 -320 mg	3 x day	
	Verapamil sustained release* Calan SR, Veralan	120 mg – 480 mg	1 -2 x day	
	Verapamil extended release*			
	Covera-HS	120 – 480 mg	1 x day	
	Verelan PM	100 – 400 mg		
Calcium Channel Blocker – *Dihydropyridine* Causes vasodilation and decreases peripheral vascular resistance.	Amlodipine/Norvasc	2.5 – 10 mg	1 x day	
	Felodipine / Plendil	2.5 – 10 mg	1 x day	
	Isradipine controlled release DynaCirc CR	2.5 – 10 mg	1 x day	
	Nicardipine sustained release / Cardene SR	30 – 60 mg	2 x day	
	Nifedipine long-acting* Adalat CC /Procardia XL	30 – 120 mg	1 x day	
	Nisoldipine / Sular	10 – 40 mg	1 x day	

Resistant hypertension

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

Beta Blockers

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

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

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

Other Hypertension Meds

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

- Combined alpha and beta blockers (ex. Carvedilol)
  - Similar precautions as beta blockers, additional MOA
- Loop diuretics (Furosemide, Torsemide, Bumetanide)
  - Use when eGFR<30 or if greater diuresis is needed, monitor electrolytes
- Potassium sparing diuretics (ex. Amiloride, Triamterene)
  - Use in combination with thiazide to retain potassium, minimal effect on BP

Diabetes Education SERVICES

Other hypertension meds (cont)

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

α1 – Receptor Blockers - Often used for pts with DM & benign prostatic hypertrophy (BPH).

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

Poll 8 - What Changes are Best to Make to Alice's Hypertension Regimen?

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

Assume all choices include lifestyle modifications

Diabetes Education Services

Lipid Monitoring

- Obtain a lipid panel at time of diagnosis and every 5 years after if under 40 years old (if not taking lipid lowering therapy)
- Obtain a lipid panel at initiation of therapy, 4-12 weeks after or a change in dose and annual thereafter
- Intensify lifestyle therapy and optimize glycemic control in patients with elevated TG ≥150mg/dL) and/or low HDL (<40mg/dL mean, <50mg/dL women)

Diabetes Education Services

Statin Recommendations

All ages – DM + ASCVD 10 year risk >20%	High intensity statin
Under age 40 with CV Risk Factors	Consider moderate intensity statin
Age 40-75 without CV Disease	Moderate intensity statin

ASCVD Risk include: LDL >100, HTN, Smoke, CKD, albuminuria, family hx ACSVD

Diabetes Education Services

Statin Dosing

High Intensity: Lowers LDL ≥50%

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

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

Moderate Intensity: Lower LDL 30-<50%

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

Diabetes Education Services

Do Statins Lower Mortality?

- Meta-analysis of data from 18,000 patients with diabetes from 14 randomized statin trials (mean follow-up 4.3 years)
- Each 38 mg/dl LDL reduction reduces relative risk of death and CVD by 9-13%.

Kearney PM et al. Lancet 2008;371:117-125, ADA Standards of Care 2020

Diabetes Education Services

Statin: Then What?

- Consider fibrates or fish oil when TG>500mg/dL and definitely when TG>1000mg/dL
  - High TG puts people at increased pancreatitis risk
  - Rule out secondary causes
- In People with ASCVD on a statin with controlled LDL but elevated TG (135-499mg/dL), adding icosapent ethyl can be considered to reduce CV risk (REDUCE-IT trial)
- In patients with DM + ASCVD, if LDL ≥70mg/dL on maximum tolerated statin, consider adding ezetimibe or PCSK9 inhibitor

Diabetes Education Services

Clinical Trials Showing CVD Risk Reduction

Source of Evidence	Mean LDL-C Achieved, mg/dL	Outcome	RR (95% CI)	Median Duration years
Statins:				
CTT meta-analysis[a] (high-intensity vs standard statin; subgroup < 2.0 mmol/L)	66 vs 50	MI, CHD death, stroke, coronary revasc	0.71 (0.56, 0.91)	5.1
Ezetimibe:				
IMPROVE-IT[b] (ezetimibe plus statin vs statin)	70 vs 54	CV death, MI, stroke, UA, coronary revasc	0.94 (0.89, 0.99)	6
PCSK9 Monoclonal Antibodies:				
FOURIER[c] (evolocumab vs placebo on background moderate-to-high intensity statin ± eze)	92 vs 30	CV death, MI, stroke, UA, coronary revasc	0.85 (0.79, 0.92)	2.2
ODYSSEY OUTCOMES[d] (alirocumab vs placebo on background moderate-to-high intensity statin ± eze)	92 vs 53	MI, CHD death, stroke, UA	0.85 (0.78, 0.93)	2.8

a. CTT Collaborators, et al. *Lancet*. 2010;376:1670-1681; b. Cannon CP, et al. *N Engl J Med*. 2015;372:2387-2397; c. Sabatine MS, et al. *N Engl J Med*. 2018;379:2097-2107; d. Schwartz GG, et al. *N Engl J Med*. 2018;379:2097-2107.

New Lipid Lowering Medications

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

PCSK9 Inhibitors Lipid Medications
Proprotein convertase subtilisin/kexin type 9

	Alirocumab (Profluent)	Evolocumab (Repatha)
FDA-approved indications	• Primary hyperlipidemia (HLD) • Homozygous familial hypercholesterolemia (HoFH) • Secondary prevention of cardiac events	
Dosing	• **HoFH**: 150 mg SC q2 weeks • **HLD or secondary cardiac prevention**: 75 mg SC q2 weeks or 300 mg SC q4 weeks; if adequate LDL response not achieved, may increase to max of 150 mg q2 weeks	• **HoFH**: 420 mg SC q4 weeks; may increase to 420 mg q2 weeks if meaningful response not achieved in 12 weeks • **HLD or secondary cardiac prevention**: 140 mg q2 weeks or 420 mg q4 weeks
Dosage forms	• Auto-injector 75 mg/mL or 150 mg/mL	• Repatha Sure Click (auto-injector) 140 mg/mL • Repatha Pushtronex System (single use infusor with pre-filled cartridge) 420 mg/3.5 mL – administered over 9 minutes
Storage	• Store in refrigerator in outer carton until used • Once used, keep at room temperature, use within 30 days	
Injection clinical pearls	• Do not shake or warm with water • Administer by SC injection into thigh, abdomen, or upper arm • Rotate injection site with each injection	

From Meds Cheat Sheet Page – Diabetesed.net

Back to Alice

- Alice's lipid panel is as follows:
  - Total cholesterol: 204mg/dL
  - LDL: 120mg/dL
  - HDL: 34mg/dL
  - Triglycerides: 250mg/dL
- Which ASCVD risk factors does Alice have?
  Low HDL, smokes, obesity, HTN, albuminuria
- 10 year ASCVD risk=42%

Poll 9 - What is the best Lipid Recommendation for Alice?

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

Diabetes Education Services

Antiplatelet Agents

Click to edit Master subtitle style

Diabetes Education Services

10 - ADA Antiplatelet Agents (Here is my 2022 update)

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

Diabetes Education Services

Primary Prevention

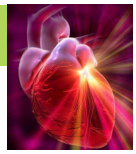
- Consider aspirin therapy (75-162 mg/day) for most men or women w DM age ≥ 50 years, with 1 additional CVD risk factor and not at increased risk of bleeding
- Caution in patients over 70 (higher bleeding risk)
- In patients who can't tolerate, use Plavix, (clopidogrel)

CVD risk factors: family history of premature ASCVD, hypertension, smoking, dyslipidemia, CKD/albuminuria

Secondary prevention

- Use aspirin (75-162mg/day) in those with diabetes and a history of ASCVD
- Dual antiplatelet therapy with a P2Y12 inhibitor for 1 year after acute coronary syndrome and may have benefits beyond

Coronary Vessel Disease



- With known CVD and HTN, use:
  - Aspirin
  - Statin
  - B/P Med
    - If prior MI, continue Beta Blockers for at least 2 years after the event
  - Don't use Actos or Avandia with CHF
  - Diabetes Meds that decrease CV events:
    - SGLT2 Inhibitors – empagliflozin, canagliflozin, dapagliflozin
    - GLP-1 RAs – liraglutide, dulaglutide, semaglutide

Poll 10 - Should Alice start aspirin?

A. Yes

B. No

Would you change Alice's Diabetes Regimen?

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

Which of the Following Changes Would you Make to Alice's regimen? Poll 11

A. No changes since A1C is at target

B. Add empagliflozin (Jardiance)

C. Add dulaglutide (Trulicity)

D. Add linagliptin (Tradjenta)

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

Lifestyle Modifications to Reduce CV risk

Diabetes Education SERVICES

Lifestyle modifications

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

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

Diabetes Education SERVICES

Poll 12 - What Lifestyle Modifications are Recommended for Alice?

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

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

Select all that apply

Diabetes Education SERVICES

In summary: the ABCs of Diabetes

- A1C and aspirin
  - A1C less than 7% for most (avg 2-3 month BG)
    - Pre-meal BG 80-130
    - Post meal BG <180
  - Aspirin: previous CVD event or ages 50-70 with CVD risk factors
- Blood Pressure < 140/90 or 130/80 based on risk assessment
- Cholesterol
  - Eval if statin therapy indicated

Providing Extraordinary Diabetes Care and Education

Objectives

1. Describe approaches to providing exceptional diabetes care and education.
2. List 8 aspects of providing extraordinary diabetes care.

Extraordinary Care

- Begins with the ordinary. Then moves toward gaining skills, knowledge, succeeding and failing, moving past our fear and then
  - **owning our extraordinary.**
- **Extraordinary** goes above and beyond what is expected.

Flower Scholarship Recipients 2022

Congrats Janeka Owens!

Janeka Owens is a recipient of Our "Flower Scholarship" because of her belief that "Diversity and representation matter in diabetes education". She turns this belief into action in her work as a Nurse Educator in a hospital and in an outpatient Population Health Department in Pensacola, Florida. Thank you, Janeka, for being a trusted health care provider and advocating to improve access to diabetes self-management and support programs for your community members.

Congrats Patricia Hillman!

Patricia Hillman provides diabetes care at a federally qualified health center in an underserved community. Many of the people she serves have no insurance and struggle to manage their diabetes. Patricia works directly with her Maternal/Fetal physician to co-manage people during pregnancy and often follows up with high-risk individuals on weekends. Patricia plans to apply the knowledge garnered from the course to continue empowering her community.

Step 1

Consider Your Emotional And Scientific Relationship With Diabetes

Consider

- How do you perceive diabetes?
- How has diabetes affected your life?
- What are your scientific beliefs around the cause and treatment of diabetes?
- Explore any biases you may be holding about people with diabetes and their communities.

Step 2

Become A Diabetes Scholar & Advocate

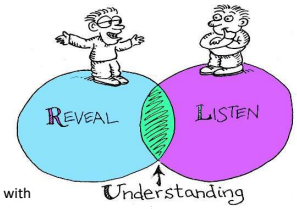
- Study and refer to recognized Standards and research
- Share your findings with colleagues
- Pursue diabetes specialty certification
- Keep up-to-date with blogs, articles, conferences and online learning
- Stand up for best care.

Step 3
Discover Colleagues' Gifts

- View diabetes care from another lens
- Make a list of who you would like to shadow and seek them out
- Identify approaches that match your values and that resonate with people with diabetes
- Incorporate observed wisdom into your own practice

Step 4

Fine Tune Empathy



- Practice mindfulness with a sincere intention to understand the persons with prediabetes or diabetes story.
- Pay attention to body language – yours and the person with diabetes. What is it saying?
- Call upon empathy and non-judgement with the belief that this person is doing their best at this moment.
- Meet them where they are at.
- Try to hear what is not said.

Step 5

Highlight What The Person Is Doing Right

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

Step 6

Limit Advice Giving, Expand Curiosity

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

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

Step 7

Believe In You

- We may not always know the answer, it's okay.
- Allow room for self-grace.
- Sometimes listening and connecting is more important than being a smarty pants.
- Seek resources to fill in knowledge gaps.
- If you receive resistance from others, try to seek understanding and consider a different approach.

Step 8

Take Care of Yourself

- Get enough sleep
- Keep active
- Remind yourself that you are not responsible for the decisions of others. Love and release.
- Connect with friends and family
- Investigate unhealthy behaviors
- Nourish your body
- Consider a hobby

Your Turn

- What extraordinary qualities do you bring to your work?
- What improvements have you noticed as a result?

Summary

Thank you for providing **extra**ordinary diabetes care, and education and advocacy

Thank You – We DID IT

- Go To Webinar Pop Up Survey – if you want to share something that we can pass along to our team.
- We will resume the Virtual Conference at 8:00am Pacific Time on Thursday with Coach Beverly and Diana Isaacs.

Diabetes Education SERVICES

Thank You – Questions?

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

Diabetes Education SERVICES

DiabetesEd Specialist Virtual Course*
Day Two - October 13, 2022 (Pacific Time)

Time	Topic	Speakers
7:30am – 8:00am	**Login / Welcome**	
8:00 – 9:30	**Insulin - the Ultimate Hormone Replacement Therapy**	Diana Isaacs, PharmD, BCPS, BCACP, CDCES, BC-ADM, FADCES, FCCP
9:30 – 9:45	**Break**	
9:45 – 10:45	**Insulin Pattern Management and Dosing Strategies**	and Beverly Dyck Thomassian, RN, BC-ADM, MPH, CDCES
10:45– 12:00	**Diabetes Interview – From Head to Toe** **Microvascular Risk Reduction**	
12:00 – 1:00	**Lunch Break**	
1:00 - 2:15	**Diabetes Technology- Monitors, Pumps and Data Interpretation**	
2:15– 2:30	**Break**	
2:30 – 3:15	**Diabetes Technology- Monitors, Pumps and Data Interpretation**	
3:15 – 4:30	**Integrating Mental Health with Body Health.** **Assessment Tools and Coping**	

Diabetes Education SERVICES | Advancing Your Career in Diabetes Education

**Topics and Timing Subject to Change*

Virtual DiabetesEd Specialist Course Part 1 – Day 2

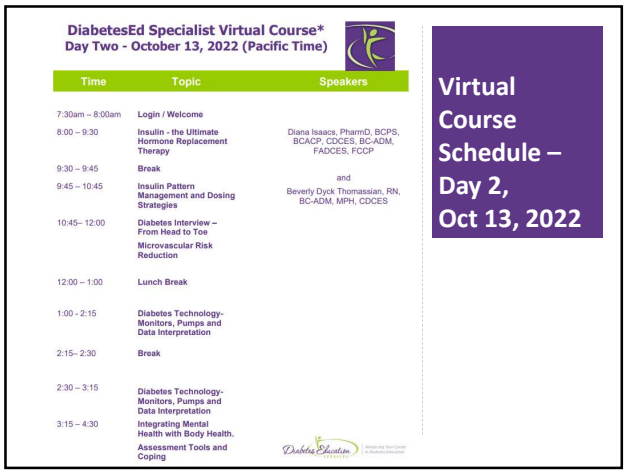
Beverly Thomassian, RN, MPH, BC-ADM, CDCES
President, Diabetes Education Services

Welcome to Day 2

- Courses recorded and available for viewing within one week.
- Login to Online University for recorded version, take quiz, get CEs
- Bryanna is here to help! Chat at www.diabetesed.net, email info@diabetesed.net or call 530-893-8635
- Questions? Will address as time allows during designated Q & A periods

Thank you to our Speakers

Thank you, Bryanna Sabourin
Director of Operations &
Customer Happiness



Insulin – Ultimate Hormone Replacement Therapy

Diana Isaacs, PharmD, BCPS, BCACP, CDCES, BC-ADM, FADCES, FCCP
Endocrine Clinical Pharmacy Specialist
CGM Program Coordinator
Co-Director Center of Excellence for Endocrine Disorders in Pregnancy
Cleveland Clinic Diabetes Center

Disclosures for Dr. Isaacs

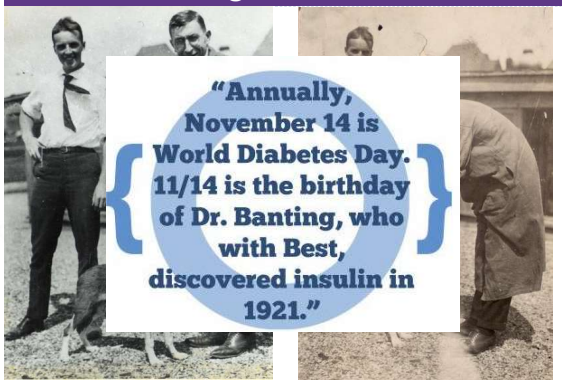
- Diana Isaacs, PharmD, BCPS, BCACP, CDCES, BC-ADM, FADCES, FCCP declares the following disclosures:
- Speaker: Abbott, Dexcom, Novo Nordisk, Insulet, Medtronic, Bayer
- Consultant: Lilly, Sanofi, Cequr, Undermyfork
- CBDCES Credentialing Committee
- ADA Professional Practice Committee
- ADCES Board Member

Objectives – Insulin –The Ultimate Hormone Replacement Therapy

Objectives:

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

Best and Banting – U of Toronto 1921



History of insulin

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

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

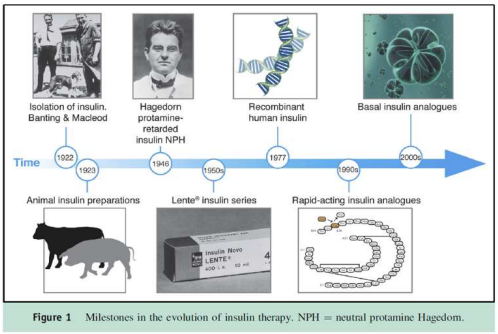


Figure 1 Milestones in the evolution of insulin therapy. NPH = neutral protamine Hagedorn.

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

Basal aka "Background" Insulin

- The liver plays a major role in maintaining glucose levels by regulating the process of gluconeogenesis and glycogenolysis in the liver
- Excessive hepatic glucose leads to hyperglycemia
- In a person without diabetes, there is a low level of insulin to keep glucose homeostasis from glucose produced by the liver (**basal insulin**)
- People with type 1 diabetes lack the ability to produce insulin to counteract the liver's effects
- In people with type 2 diabetes, there may not be enough insulin due to insulin resistance
- Long-acting insulins or intermediate-acting insulins serve as a basal or "background insulin"
- In an insulin pump, a regular or rapid-acting insulin can be given continuously to serve as the basal

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

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

Bolus Insulin

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

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

Physiologic Insulin Release

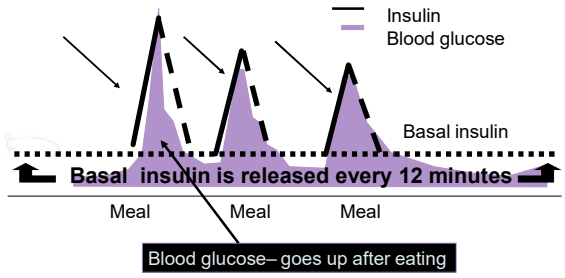
- **1st phase:** peak 1-2 minutes, duration 10 minutes, suppresses hepatic glucose production
- **2nd phase:** duration 1-2 hours

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

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

Normal Insulin Release:
Individuals without diabetes

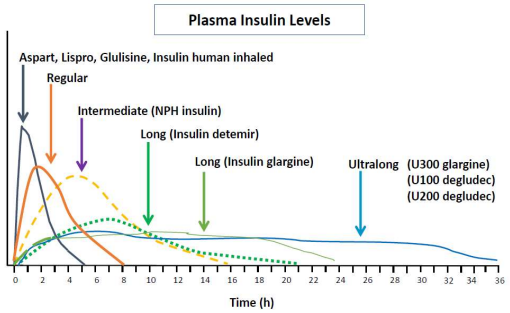
Insulin bolus occurs in the first 10 minutes after eating



Available Insulins

- None of the commercially available insulins are as fast as true physiologic insulin (as made from a person without diabetes)
- Almost all insulin is injected (SC or IV)
- Oral insulin is not available and degrades too quickly
- One inhaled insulin option (Afrezza®)

Insulin Profiles



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

Insulin PocketCard™

Diabetes Education Services

Download Success! Get Our Free CDCES Coach App

Action		Insulin Name	Onset	Peak	Effective Duration	Considerations
Bolus	Very Rapid Acting Analogs	Aspart (Fiasp)	2.5 min	~60 min	3-5 hours	Bolus insulin lowers after-meal glucose. Post meal BG reflects efficacy. Basal insulin controls BG between meals and nighttime. Fasting BG reflects efficacy. Side effects: hypoglycemia, weight gain. Typical dosing range: 0.5-1.0 units/kg body wt/day. Discard most open vials after 28 days. For pen storage guidelines, see package insert.
		Lispro-aabc (Lyumjev)	1 min	~60 min	4-5 hours	
	Rapid Acting Analogs	Aspart (Novolog)	5 - 15 min	30 - 90 min	< 5 hrs	
		Lispro (Humalog*/ Admelog)				
		Glulisine (Apidra)				
	Short Acting	Regular*	30 - 60 min	2 - 4 hrs	5 - 8 hrs	
Basal	Intermediate	NPH	2 - 4 hrs	4 - 10 hrs	10 - 16 hrs	
	Long Acting	Detemir (Levemir)	3 - 8 hrs	No peak	6 - 24 hrs	
		Glargine	2 - 4 hrs		20 - 24 hrs	
		Degludec (Tresiba)*	~ 1 hr		< 42 hrs	
Basal + Bolus	Intermediate + short	Combo of NPH + Reg 70/30 = 70% NPH + 30% Reg 50/50 = 50% NPH + 50% Reg	30 - 60 min	Dual peaks	10 - 16 hrs	
	Intermediate + rapid	Novolog® Mix - 70/30 Humalog® Mix - 75/25 or 50/50	5 - 15 min		24 hrs	

Concentrated insulins available - see Concentrated Insulin Card for details. Insulin action times vary; time periods are general guidelines only. All PocketCard content is for educational purposes only. Please consult prescribing information for detailed guidelines. © 3/2022

Insulin Concentration

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

Afrezza, Novolog, Humalog, Lantus, Levmir (package inserts) 2022
Image: :Blausen.com staff (2014). Medical gallery of Blausen Medical 2014. WikiJournal of Medicine 1 (2).

Concentrated and Inhaled Insulin

Name/Concentration	Insulin/Action	Considerations
Humulin Regular U-500 • 500 units insulin/mL • KwikPen or Vial	Regular Bolus / Basal	Indicated for those taking 200+ units daily. 3 mL pen holds 1,500 units. Max dose 300 units. Once opened, good for 28 days. 20 mL vial holds 10,000 units. Max dose 250 units using U-500 syringe. Once opened, good for 40 days.
Humalog KwikPen U-200 200 units insulin/mL.	Lispro (Humalog) Bolus	3 mL pen holds 600 units. Max dose 60 units. Once opened good for 28 days.
Lyumjev KwikPen U-200 200 units insulin/mL.	Lispro (Lyumjev) Bolus	3 mL pen holds 600 units. Max dose 60 units. Once opened good for 28 days.
Toujeo Solostar U-300 Pen 300 units insulin/mL.	Glargine (Lantus) Basal	1.5 mL pen holds 450 units. Max dose 80 units. 3 mL Max Solostar pen holds 900 units. Max dose 160 units. Once opened good for 56 days.
Tresiba FlexTouch U-200 Pen 200 units insulin/mL.	Degludec (Tresiba) Ultra basal	3 mL pen holds 600 units. Max dose 160 units. Once opened good for 56 days.

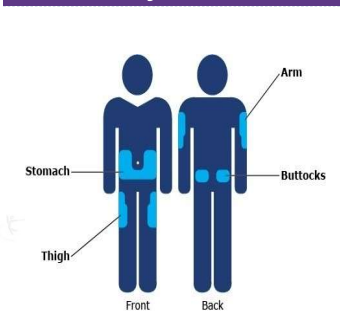
All concentrated insulin pens and the U-500 syringe automatically deliver correct dose (in less volume). No conversion, calculation or adjustments required. For example, if order reads 30 units, dial the concentrated pen to 30 units or draw up 30 units on the U-500 syringe. **Important – never withdraw concentrated insulin from the pen using a syringe.**

Inhaled Insulins

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

The information listed here are not guidelines. Please consult prescribing information for details. DiabetesEd.net ©2022

Insulin Injection Sites



Rotate Sites
Stay 1" away
from last
injection

Insulin Key Counseling Points

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

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

Priming insulin

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

Importance of Insulin Storage

- Insulin is a peptide hormone drug
- It is susceptible to changes in stability when exposed to environmental factors
- These factors accelerate physical and chemical degradation
- If unopened, insulin should be stored in a refrigerator at 2℃ to 8℃ (36℉ - 46℉) to keep their quality until the expiration date
  - Max temperature 8℃ (46℉)
- Once opened, Insulin can be stored at room temperature up to 25℃ or 30℃ (77℉ or 86℉)
  - No need to keep in fridge
  - Injecting cold insulin may be uncomfortable

Heinemann, L et al. J Diabetes Sci Techno. 2020.

Storage Options

Insulin & Expiration

Type		Expiration Once Open
Long Acting		
Toujeo	Glargine U-300	56 days
Lantus, Basaglar, Semglee	Glargine U-100	28 days
Tresiba	Degludec U-100, U-200	56 days
Rapid Acting		
Novolog, Fiasp	Aspart	28 days
Humalog, Admelog	Lispro U-100, U-200	28 days
Apidra	Glulisine	28 days
Lyumjev	Lispro-aabc	28 days

Package Inserts

Side Effects of Insulin

Weight Gain

Lipodystrophy/ Lipohypertrophy

Hypoglycemia

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

Insulin Teaching Keys

- Rotate
- Stay 1" away from previous site
- Don't re-use syringes/needles
- Look for:
  - Lipodystrophy
  - Lipohypertrophy
- Proper disposal
- Review patient's ability to withdraw and inject

Sharps Disposal: Product and Info

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

Polling Question 1

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

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

How to Dose Insulin

Diabetes Education Services

Type 1 Diabetes (T1D)

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

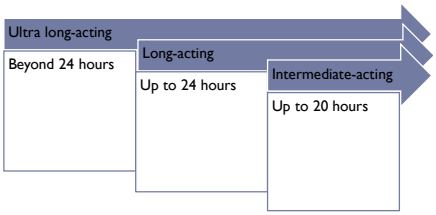
Basal Insulin + Bolus Insulin

How to Dose Insulin? T1D

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

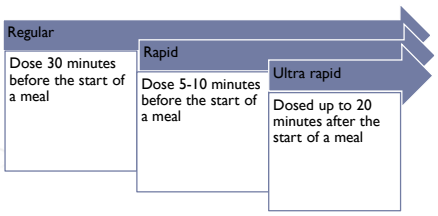
Pamagluapatai LG et al. In: Cornell S et al., Pharmacolotherapy for Glucose Management. The art and science of diabetes self-management education desk reference. 5th ed.

Types of Basal Insulin



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

Types of Bolus Insulin



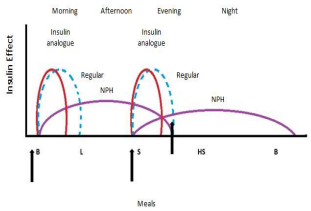
Pamagluapatai LG et al. In: Cornell S et al., Pharmacotherapy for Glucose Management. The art and science of diabetes self-management education desk reference. 5th ed.

T1D: Insulin Dosing Regimens

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

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

Intermediate-acting Insulin + Regular Insulin or Insulin Analog



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

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

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

Method 1 Example

- Lacy has T1D and prefers a simple regimen with less insulin injections. She also has difficulty paying for the more expensive insulin analogs. Lacy takes the following regimen:

- Insulin NPH 27 units QAM and 13 units QPM (intermediate insulin)
- Insulin regular 13 units QAM and 7 units QPM (regular insulin)

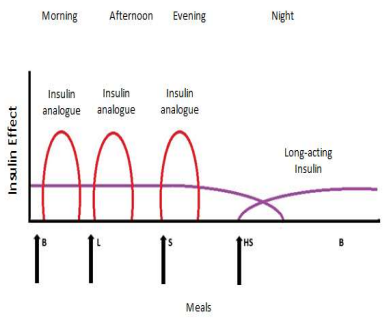
- She has the option of using a 70/30 formulation dosed twice daily or
- She can mix NPH and regular insulin if using vials (not commonly done anymore)

Patient Education: Mixing Insulin

- NPH can be mixed with regular or rapid-acting insulins when using vials
- Inject air into NPH vial first (# of units for the NPH dose) and pull syringe out without NPH
- Then inject air into regular or rapid-acting insulin vial (# of units for the regular or rapid-acting dose) and this time draw out the exact amount of insulin
- Then put syringe filled with regular or rapid-acting insulin into NPH vial and draw out the full dose of NPH
- This is a way to reduce injections, but isn't commonly done anymore
- Other insulins should not be mixed!

ADCES. Insulin injection resources

Long-acting Insulin with Insulin analog



Long-acting serves as basal insulin analog serves as bolus

Method 2 Example

- Genie is 15 years old and newly diagnosed with T1D. She weighs 60kg and is started on 0.5 units/kg/day. (30 units total)
- She takes insulin glargine 15 units once daily (long-acting insulin)
- She takes insulin lispro 5 units TID a.c. (rapid-acting insulin)
- Question: Can these types of insulins be mixed?
- **NO**

Carbohydrate Ratio

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

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

Correction Factor

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

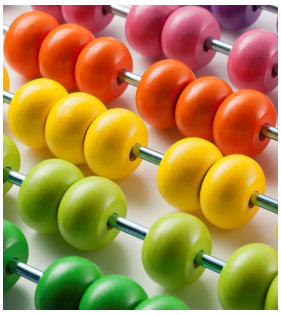
Trujillo J et al. Diabetes mellitus. In: Dipiro JT et al., eds. Pharmacotherapy: a pathophysiologic approach. 11th ed.

An Example: Meet Larry

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

Larry Calculation cont'd

- Larry is ready for carbohydrate counting
- Based on the rule of 500 and rule of 1700, what should his ICR and ICF be?



Poll Question 2

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

A. ICR=25, ISF=85
B. ICR=20, ISF=60
C. ICR=15, ISF=50
D. ICR=30, ISF=75
E. I am not sure

Answer and Explanation

- ICR=500/20=25
  - This means that 1 unit of insulin covers 25 grams of carbohydrate
  - If Larry eats 50 grams of carbohydrate, he should inject 2 units
- ISF=1700/20=85
  - This means that 1 unit of insulin is expected to lower glucose by 85 mg/dL
  - Larry's glucose target is 100
  - If his current glucose is 185, he should take 1 extra unit of insulin

Correction Bolus (Common Scale)

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

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

Correction Bolus (Common Scale)

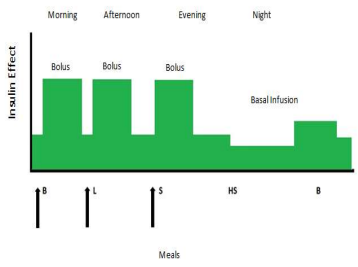
Rapid/Fast Acting Insulin (2 units:50 mg/dl>150)

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

Poll Question 3

- How much insulin does a person with type 1 diabetes need a day?
  a. About 1 unit per pound per day
  b. No more than 0.5 units/kg per day
  c. Approximately 5 units/kg per day
  d. About 0.5 to 1.0 units/kg per day

Insulin Pump Therapy



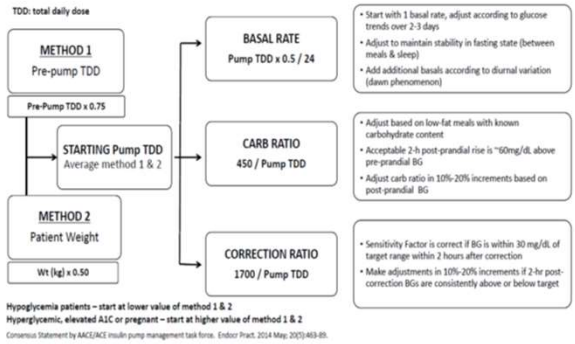
Regular or insulin analogs serve as both the basal and bolus

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

Pump Terminology

- Basal rate - a continuous 24-hour delivery of insulin, "background" insulin
- Bolus dose – used for carbohydrate and correction doses
- Insulin-to-carb ratio – how many grams of carbs will be covered by 1 unit of insulin
- Insulin sensitivity factor (aka correction bolus or ISF) – how much 1 unit of insulin is expected to lower glucose
- Target – the goal glucose level
- Insulin-on-board (aka active insulin time or IOB) – a pump feature that keeps track of a previous bolus

Initial Pump Calculations



Nick is a 21 year old male about to start insulin therapy

- Weight: 72kg
- Weight based dosing
  - 72*0.5=36 units
- Basal=36/2=18 units
  - If using injections, plan for a basal of 18 units daily
  - If using a pump, start at 18/24=0.75 units/hour

Nick's Bolus Settings

- Rule of 500 for insulin to carb ratio
  - 500/36=13.88
  - What does this mean?
    - 1 unit of insulin is expected to cover 14 grams of carbohydrate
- Rule of 1700 for sensitivity factor
  - 1700/36=47
  - What does this mean?
    - 1 unit of insulin is expected to lower glucose by 47 points

In Depth: Types of Insulin

So Much Insulin…

Insulin PocketCard™ Diabetes Education Services

Action		Insulin Name	Onset	Peak	Effective Duration	Considerations
Bolus	Very Rapid Acting Analogs	Aspart (Fiasp)	2.5 min	~60 min	3-5 hours	Bolus insulin lowers after-meal glucose. Post meal BG reflects efficacy. Basal insulin controls BG between meals and nighttime. Fasting BG reflects efficacy. Side effects: hypoglycemia, weight gain. Typical dosing range: 0.5-1.0 units/kg body wt/day. Discard most open vials after 28 days. For pen storage guidelines, see package insert.
		Lispro-aabc (Lyumjev)	1 min	~60 min	4-5 hours	
	Rapid Acting Analogs	Aspart (Novolog)	5 - 15 min	30 - 90 min	< 5 hrs	
		Lispro (Humalog*/ Admelog)				
		Glulisine (Apidra)				
	Short Acting	Regular*	30 - 60 min	2 - 4 hrs	5 - 8 hrs	
Basal	Intermediate	NPH	2 - 4 hrs	4 - 10 hrs	10 - 16 hrs	
	Long Acting	Determir (Levemir)	3 - 8 hrs	No peak	6 - 24 hrs	
		Glargine	2 - 4 hrs		20 - 24 hrs	
		Degludec (Tresiba)*	~ 1 hr		< 42 hrs	
Basal + Bolus	Intermediate + short	Combo of NPH + Reg 70/30 = 70% NPH + 30% Reg 50/50 = 50% NPH + 50% Reg	30 - 60 min	Dual peaks	10 - 16 hrs	
	Intermediate + rapid	Novolog® Mix - 70/30 Humalog® Mix - 75/25 or 50/50	5 - 15 min		24 hrs	

*Concentrated insulins available - see Concentrated Insulin Card for details. Insulin action times vary; time periods are general guidelines only. All PocketCard content is for educational purposes only. Please consult prescribing information for detailed guidelines. © 3/2022

Insulin Selection

- Cost
- Adherence
- Formulary
- Onset of Action
- Hypoglycemia
- Duration of Action
- Volume per injection
- Compatibility with Technology
- Patient Preference

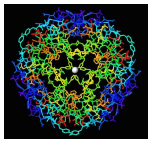
Biosimilar and Follow-On Insulin

- The expiration of patents for brand name insulin opens up the insulin market worldwide to manufacturers of insulin copies or biosimilars
- Can't use the term generics for *large* molecule biologicals because they are manufactured in living organisms (bacteria and yeast)
- Terminology
  - **Biologic products**: large, complex molecules produced through biotechnology in a live system such a microorganism, plan cell or animal cell
  - **Biosimilar**: a biologic product highly similar and has no clinically meaningful difference from an FDA-approved reference product
  - **Follow-on product**: copies of biologic products approved under the Food, Drug, and Cosmetic Act 505b2 pathway

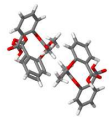
White J et al. J Pharm Technol. 2019; 35(1):25–35.

Follow-On Insulin

- Follow-on insulin products <u>usually</u> require a separate prescription (not directly interchangeable)
  - Examples:
    - Insulin glargine (Lantus), follow-on products (Basaglar),
    - Insulin lispro (Humalog), follow-on product (Ademlog)
- The FDA announced that Semglee has biosimilar status and can be interchangeable with Lantus



Insulin – Large Molecule



Aspirin – Small Molecule

Generic Insulins

- Insulin aspart
- Insulin lispro

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

Basal Insulin Summary

- Covers in between meals, through night
- Starts working slow (4 hours)
- Stays in long (12-42 hours)
- Fasting blood glucose and pre-meal glucose levels reflect effectiveness
- Fix fasting first but don't overbasalize

Poll 4: Which Insulin is Interchangeable with Lantus (Insulin glargine U100)?

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

Bolus Insulins (½ of total daily dose ÷ meals)

Action		Insulin Name	Onset	Peak	Effective Duration
Bolus	Very Rapid Acting Analogs	Aspart (Fiasp)	2.5 min	~60 min	3-5 hours
		Lispro-aabc (Lyumjev)	1 min	~60 min	4-5 hours
	Rapid Acting Analogs	Aspart (Novolog)	5 - 15 min	30 - 90 min	< 5 hrs
		Lispro (Humalog*/ Admelog)			
		Glulisine (Apidra)			
	Short Acting	Regular*	30 - 60 min	2 - 4 hrs	5 - 8 hrs

Inhaled Insulins

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

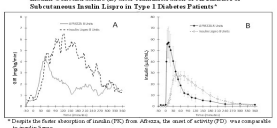
The information listed here are not guidelines. Please consult prescribing information for details. DiabetesEd.net ©2022

Afrezza – Inhaled Insulin

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

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

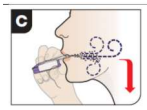
Figure 3. Baseline-Corrected Glucose Infusion Rate (A) and Baseline-Corrected Serum Insulin Concentration (B) after Administration of AFREZZA or Subcutaneous Insulin Lispro in Type 1 Diabetes Patients*



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

Afrezza Inhaler

Know your AFREZZA® inhaler:

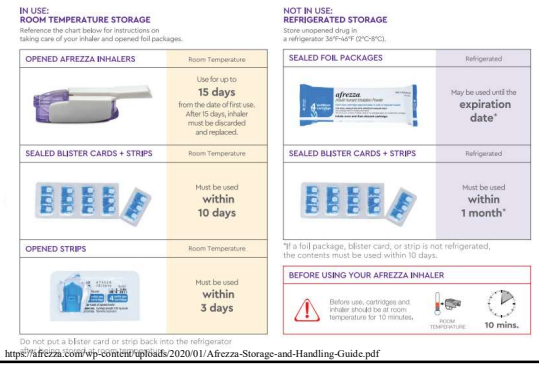


Inhale Deeply and Hold Breath

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

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

Afrezza Storage



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

Afrezza Dosing and Considerations

- Bolus regular insulin – inhaled before meals
- Dosing: 4, 8 and 12 unit cartridges
- Lung function test before start (FEV1)
  - Not for pts w/ chronic lung issues
    - Asthma, COPD, history of lung cancer, smokers
    - Can cause acute bronchospasm – Black box warning
- Side effects:
  - Hypoglycemia, sore throat, cough
  - Less hypoglycemia than injected insulin

Bolus Insulin Timing

- How is the effectiveness of bolus insulin determined?
  - 1-2 hours post meal
  - Before next meal blood glucose
- Glucose goals may be modified by HCP/pt
  - 1-2 hours peak post meal <180 (ADA)
  - 2 hour post meal <140 (AACE)
  - Before next meal 80 - 130

Poll Question 5

- Mary takes 4 units lispro (Humalog) before breakfast. Which BG result reflects that the dose was the right dose?

1. Before breakfast BG of 97
2. 1 hour post breakfast BG of 190
3. Before lunch BG of 69
4. 2-hour post breakfast BG of 154

Concentrated Insulin

More than 200 units a day?

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

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

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

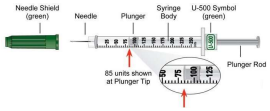
Switching to u500 insulin

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

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

U500 example

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



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

Concentrated Insulin

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

- Advantages of Tresiba U200 and Toujeo U300 is that the pens go up to 160 units/injection
- Humalog and Lyumjev U200 have less volume per injection and more units in pen (600 vs. 300)

Barriers to Insulin Use

Poll Question 6

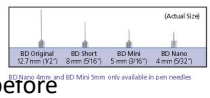
- AJ tells you she doesn't want to start on insulin. What is your best response?
  a. The needles are so small, you won't even feel it.
  b. Lots of people are afraid of insulin.
  c. It sounds like you are refusing to take insulin?
  d. I'm sorry, but there is a doctors' order to start insulin.
  e. What concerns do you have about taking insulin?

Psychological Insulin Resistance (PIR)

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

Diabetes Attitudes, Wishes, Needs Study - Rubin

Needle Size often a Barrier: Size Matters



- Use shortest needles – 4 mm
- Effective for almost ALL patients
- Keeps it subq
- If thin, inject at angle
- To avoid leakage, count to 10 before withdrawing needle
- ½ the patients who could benefit from insulin are not using it due to needle phobias
- Also consider insulin pumps, patches, iport, and inhaled insulin

How To's of Adding Insulin in Type 2 DM

Injectable Therapy for Type 2 DM

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

Intensifying Injectable Footnotes 9.2

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

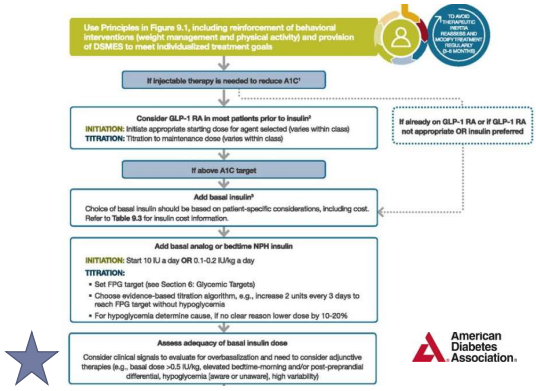
Insulin/Injectable Combos

PocketCards updated annually. Download FREE CDCES Coach App for latest updates and notifications.

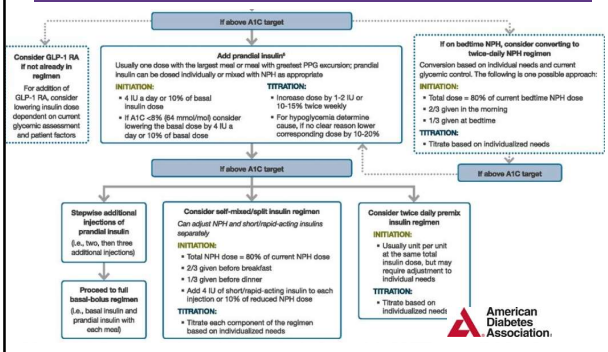
Name	Combines	Considerations
IDegLira* Xultophy 100/3.6	Insulin degludec (IDeg or Tresiba) Ultra long insulin + Liraglutide (Victoza) GLP-1 Receptor Agonist (GLP-1 RA)	**Xultophy 100/3.6 pre-filled pen** = 100 units IDeg / 3.6 mg liraglutide per mL Once daily injection – Dose range 10 to 50 = 10 – 50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

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

Insulin for Type 2DM, Avoid Overbasalization



T2D: Intensifying Insulin Therapy



Case Study: Jenny

Jenny is a 50-year-old woman that takes insulin glargine 100 units daily, glipizide 10mg BID, metformin 1000mg BID, and linagliptin 5mg daily. A1C is 9.3%. She weighs 110kg. She checks glucose in the AM only and reports it's 90-130mg/dL. Her eGFR is 70. She previously had UTI's with empagliflozin.

What is the best recommendation to adjust this regimen?

Thinking about the choices

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

Piecing it Together

- New Regimen:
  - Insulin glargine 80 units once daily (20% reduction)
- Semaglutide 0.25mg weekly, titrated up to 1.0mg weekly
- Stop linagliptin
- Continue glipizide (for now)
- Next step could be to retry SGLT2i with counseling on how to avoid UTIs
- Or replacing glipizide with prandial insulin with largest meal

Switching Insulin

How to Switch Basal Insulin

- When going from twice daily basal insulin to once daily, reduce dose by 20%
  - Examples:
    - Insulin NPH BID to insulin glargine daily
    - Insulin detemir BID to insulin degludec daily
- When switching between once daily, a unit per unit conversion is okay
- Long-acting to glargine U300 often requires higher doses (10 to 18%) but start with a unit to unit conversion
- When switching from glargine U300 to another long-acting insulin, reduce dose by 20%
- Need to use clinical judgement
  - For example, if A1C, FBG, and pre-meal BG are all above target, then may not be necessary to reduce basal insulin dose

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

Poll 7 - Making the switch: Meet Joan

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

A. Insulin degludec 30 units twice daily
B. Insulin degludec 60 units once daily
C. Do not switch since her A1C is well-controlled and get a prior authorization to continue with insulin glargine
D. Insulin degludec 48 units once daily

Switching Meal time Insulin

- This is a 1:1 conversion when switching between regular insulin, aspart, lispro, and glulisine including Fiasp® and Lyumjev™.
- The exception is when switching to Afrezza

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

Clinical Resource. Pharmacist's Letter/Prescriber's Letter. August 2019.
Afrezza (package insert) 2019.

Poll 8. Patient Case: Lumy

- Lumy's insurance formulary changed from insulin lispro to insulin aspart.
- She was following an insulin to carbohydrate ratio of 1:12 and a correction factor of 1:50.
- How should she dose insulin aspart when she switches?

A. Reduce all doses by 10%
B. Increase all doses by 10%
C. Same dosing
D. Submit prior authorization so she doesn't change insulin

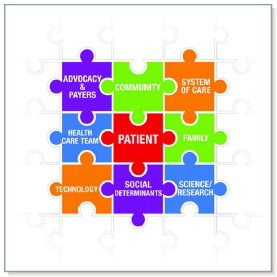
Insulin Pattern Management

Pattern Management –AKA

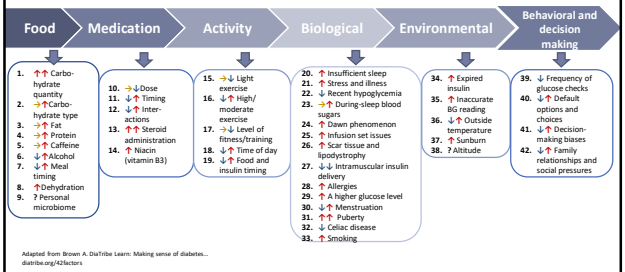
How to think like a pancreas

What do the numbers mean?

It's like a BIG puzzle!



At Least 42 Factors Affect Glucose!



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

Poll Question 9

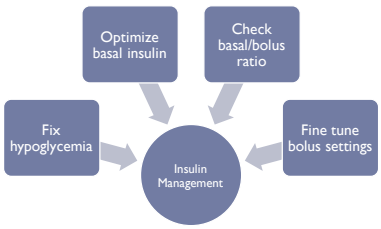
- When looking at glucose patterns, which problem do you fix first?
  - a. Hyperglycemia
  - b. Hypoglycemia
  - c. Non-compliance
  - d. Legible writing

Pattern Management

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

General Rules in T1DM

- Optimize basal dose (stay within 30mg/dL when not eating)

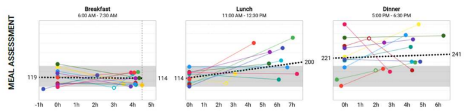


Adjusting Insulin doses in a Basal/Bolus regimen (T1DM & T2DM)

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

Meal Time Data Review

- Glucose data before and after breakfast, lunch and dinner
- Ideally, 2 hour post-meal should not rise above 180mg/dL or 50mg/dL from the pre-meal start
- By 4-5 hours, glucose should return to pre-meal level



Insulin Sensitivity Adjustments

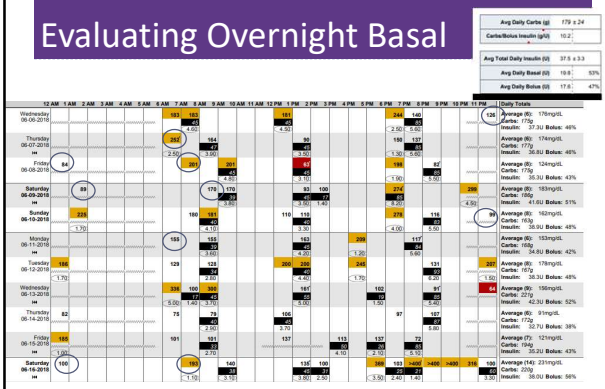
- When BG is above target and correction dose is taken (without food), does glucose return to target within 3-4 hours?
- If BG is low at 3-4 hours, the ISF is likely too strong
  - Increase by 10-20%
  - Example: 50→55 or 60
- If BG is high after 3-4 hours, the ISF is too weak
  - Decrease by 10-20%
  - Example: 50→45 or 40

Bolus Pattern Management

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

Adjustments typically made 10-20% at a time

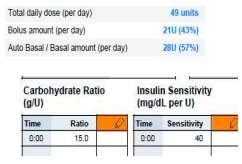
Evaluating Overnight Basal



Do you see any problems?

Checking the Sensitivity

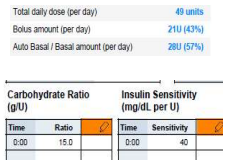
- TDD=49 units
- Rule of 1700
  - 1700/49=35
- Current sensitivity is 40



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

Checking the Carb Ratio

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



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

Insulin Pump adjustments

- Use calculations as a starting point

- Fix fasting first
  - If you wake up high, more likely to run high all day
  - If traditional pump, consider basal rate testing
- Multiple patterns can be set throughout the day
- Alternative basal patterns can be set for sick days, menstruation, etc
- Once basal at goal, focus on bolus settings

Basal Rate Testing

- Start with glucose 80-180mg/dL with last bolus > 4 hours
- Wear CGM or check glucose every 2 hours
- Glucose should not change by more than 30mg/dL if basal is effective
- Avoid physical activity, stress, and high fat meals before test
- Start with overnight, and then work on the rest of the day in smaller segments
- If >30mg/dL rise or fall, make basal rate adjustment, 10-20% increments

Case Study: Larry Poll Question 12

Larry takes metformin 1000mg BID, insulin glargine 50 units once daily, empagliflozin 10mg daily. His A1C is 7.8%. He weighs 90kg. FBG averages 100mg/dL. PP breakfast=190mg/dL, PP lunch=210mg/dL, and PP dinner is 240mg/dL. What is the best recommendation for an agent to add to the regimen to achieve A1C target?

A. Initiate insulin aspart 5 units at dinner, decrease insulin glargine to 45 units daily
B. Initiate insulin aspart 5 units with all meals, decrease insulin glargine to 35 units daily
C. Initiate insulin aspart 5 units at dinner, continue insulin glargine 50 units daily
D. Initiate dulaglutide 0.75mg weekly, decrease insulin glargine to 45 units daily

Meet Tori

- Tori is a 43 year old woman with T2DM for 4 years. She takes the following medications:
  - metformin 1000mg twice daily
  - glimepiride 4mg daily
  - saxagliptin 5mg daily
  - pioglitazone 15mg daily
- A1C is 10.1%. Weight is 167lbs and height is 61 inches. BMI=31.6.
- She rarely checks glucose and denies hypoglycemia

Meet Tori

What is the best recommendation for drug therapy intensification?

A. Increase metformin
B. Increase glimepiride
C. Increase pioglitazone
D. Start basal insulin
E. Start basal + GLP-1 agonist

Basal + GLP-1 Agonist

- Remember, GLP-1 agonist should be 1st injectable
- However, with high A1C, Tori is likely going to also need insulin
- A combined product would mean just 1 co-pay and allow her to start both with 1 injection
- Another option would be a weekly GLP-1 agonist and a daily insulin
- Do any of her medications need to be stopped when adding this combination?

Tori Worries about Weight Gain

- Tori heard that insulin will cause her to gain weight. She is concerned about weight gain. How could her regimen be adjusted to reduce weight gain?
- Which drugs on her list contribute to weight gain?

Summary

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

Diabetes Interview – From Head to Toe & Microvascular Risk

www.DiabetesEd.net

Beverly Thomassian, RN, MPH, BC-ADM, CDCES 2022
President, Diabetes Education Services

Honing Detective Skills

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

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: *Standards of Medical Care in Diabetes—2022* FREE

American Diabetes Association Professional Practice Committee

Check for updates

Diabetes Care 2022;45(Supplement_1):S46–S59
https://doi.org/10.2337/dc22-S004

Objectives

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

4. Comprehensive Medical Evaluation and Assessment of Comorbidities

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

EV Arrives and Requests Help

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

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

EV Arrives and Requests Help

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

What does this tell us about EV?

- Struggling with weight
- B/P & A1C above target
- Overbasalized (max dose 0.5 units/kg a day
- Why not taking thyroid med?
- Lower extremity pain contributing to distress?
- Elevated CV risk?

EV is Gaining Weight and is Tired

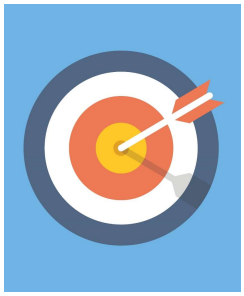
- 58 yr old complains of 4 lb wt gain for past month. BMI 31, wt 90 kg. B/P 142/96. Checks BG in morning; 150ish. A1C 8.3%
- Meds include:
  - Sitagliptin, Metformin
  - Actos 15mg ac breakfast
  - Basaglar 58 units
  - Semaglutide 0.5mg weekly
  - Levothyroxine – ran out
  - Lisinopril 10mg
  - Gabapentin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

Labs
A1C – 8.3%
UACR 26 GFR >60
TSH 10.6
LDL 98 mg/dl, Trig 158
ALT 85 IU/L, AST 90 IU/L
(normal range 25-50)

Life situation
Takes care of dad with dementia
Gums inflamed
No eye doctor for year
Both feet hurt at night

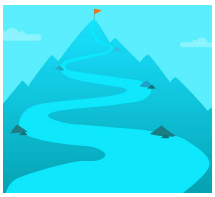
ABCs of Diabetes

- A1c less than 7%
  - Pre-meal BG 80-130
  - Post meal BG <180
- Blood Pressure < 140/90
  - BP target <130/80
    - If CVD or 10-year CVD Risk > 15%
- Cholesterol
  - Statin therapy indicated if 40+



Advocating for Best Health for people with Diabetes

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



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

Diabetes is a long path

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

Obstructive Sleep Apnea - OSA

- OSA affects ~25% of people with type 2
  - Up to 60% of those with type 2 have disordered sleep
- Associated with increased CVD risk
- 4-10 increased risk if BMI 30+ with visceral adiposity
- Treatment:
  - Lifestyle modification
  - Continuous positive oral airway pressure and devices
  - Surgery

Where are we on this continuum?

Only about 50% of us are meeting activity goals

Benefits of Exercise and Diabetes

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

Exercise decreases:

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

Best Medicine

- **Exercise is the best medicine.** Structured exercise of 8 weeks duration, has been shown to lower A1c by and average of 0.66% in people with type 2, even without a significant change in BMI.

Smoking and Diabetes

Smoking increases risk of diabetes 30%

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

USDA www.myplate.gov

Balancing Calories

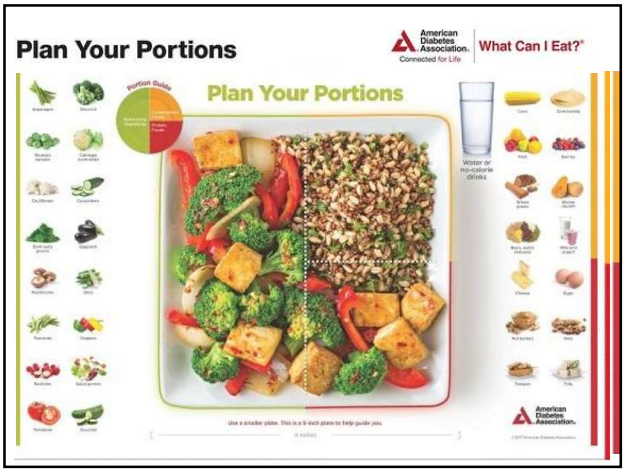
- Enjoy your food, but eat less.
- Avoid oversized portions.

Foods to Increase

- Make half your plate fruits and vegetables.
- Make at least half your grains whole grains.
- Switch to fat-free or low-fat (1%) milk.

Foods to Reduce

- Compare sodium in foods like soup, bread, and frozen meals — and choose the foods with lower numbers.
- Drink water instead of sugary drinks.

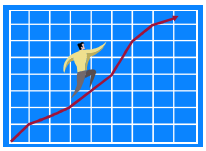


Diabetes Toolkit

- Meter
  - Strips that aren't expired?
- Medication supply
- Pump Supplies
- CGM Supplies
- Power back-up

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

EV asks why the weight gain?



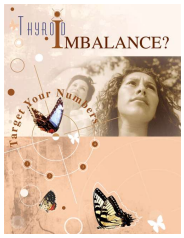
- Fluid retention - diabetes doubles risk for Congestive Heart Failure (CHF). Check lower extremities.
- Inaccurate nutrition knowledge
- Actos and Avandia, (TZD's) associated with edema
- Blood sugars improving
- Thyroid disease under treated
- Novel Antipsychotics
- Depression / Increased intake

Thyroid Disease and Diabetes

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

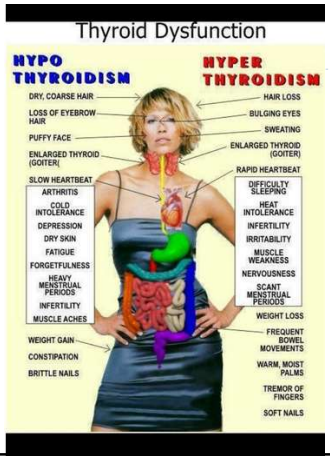
AACE Website

Thyroid & TSH* Levels



AACE Guidelines

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



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

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

A low TSH indicates hyperthyroidism (0.1 ish)

Poll question 13

- Which of the following is a true statement?

a. Atypical antipsychotics are contraindicated for people with diabetes.
b. Hyperthyroidism is more common than hypothyroidism.
c. Depression can be associated with weight gain or weight loss.
d. Hypothyroidism causes LDLs to decrease.

Novel / Atypical Antipsychotics Linked to Hyperglycemia

- Severe cases of hyperglycemia – even death reported
- Monitor BG regularly for DM individuals started on this class of med
- If at risk for DM, determine fasting glucose before initiating therapy and monitor closely during treatment
- Weight gain may require increased dosing of diabetes therapies.

Summary of FDA warning statement for atypical antipsychotics

Novel/ Atypical Antipsychotics Linked to Hyperglycemia

- Zyprexa – olanzapine
- Geodon - ziprasidone
- Seroquel – quetiapine
- Risperdal - risperadone
- Clozaril - clozapine
- Abilify – aripiprazole
- Latuda - lurasidone

Consensus Development Conference on Antipsychotic Drugs and

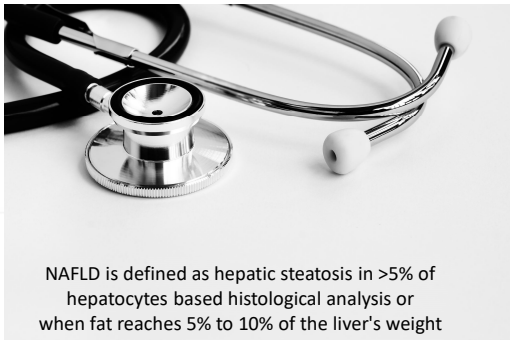
Collaborative Action Plan

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

What about alcohol intake?

Are these goals realistic?

EV has the beginning of NAFLD



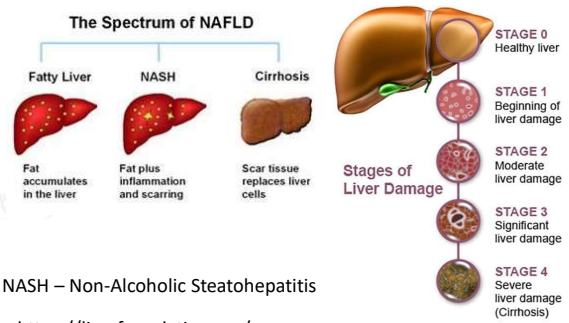
NAFLD is defined as hepatic steatosis in >5% of hepatocytes based histological analysis or when fat reaches 5% to 10% of the liver's weight

Stages of liver failure

- NAFLD – non alcoholic fatty liver disease
  - NAFL – simple fatty liver, doesn't usually progress to cause liver damage
  - NASH – non alcoholic steatohepatitis
    - Liver inflammation and cell damage.
    - Can cause fibrosis, scarring
    - About 35% of NASH cases progress to liver fibrosis
- Cirrhosis – degeneration of cells, inflammation, fibrous thickening
- End-stage liver disease & Liver Cancer

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

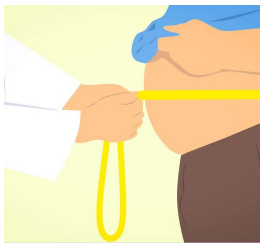
Natural History of NAFLD to NASH



NASH – Non-Alcoholic Steatohepatitis

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

Fatty liver disease and diabetes



The growing epidemic of NAFLD in western societies:
- 20 to 30% of overall population
- 45 to 75% of ind's with type 2 diabetes

Associated with :
- Increased BMI (30+)
- Larger waist circumference,
- Elevated triglycerides
- Lower HDL cholesterol levels. ADA 2022

First indicators may include elevated alanine transaminase (ALT) and aspartate transaminase (AST).

Review article | Open Access | Published: 05 June 2020

Nonalcoholic fatty liver disease and type 2 diabetes: where do Diabetologists stand?

Shaheen Tomah, Naim Alkhouri & Osama Hamdy

Clinical Diabetes and Endocrinology 6, Article number: 9 (2020) | Cite this article

https://clindiabetesendo.biomedcentral.com/articles/10.1186/s40842-020-00097-1

Symptoms of Fatty Liver

If symptoms do appear, they may include:
- A feeling of fullness in the middle or upper right side of the abdomen
- Abdominal pain, nausea
- Loss of appetite or weight loss
- Weakness
- Jaundice
- Swelling of the abdomen and legs
- Mental confusion
- Extreme fatigue or tiredness
- Signs of advanced disease include:
  - Portal hypertension, spider angiomas, reddening of palms, declining platelet counts

Mayo Clinic

Finding Liver Disease

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

Mayo Clinic

Treatment for NAFLD and NASH

Interventions that improve metabolic abnormalities include: weight loss, glycemic improvement and meds that treat hyperglycemia, dyslipidemia

Table 4.6—Management of patients with nonalcoholic fatty liver disease and nonalcoholic steatohepatitis

Variable	Lifestyle intervention[a]	Liver-directed pharmacotherapy	Diabetes care (in individuals with diabetes)	Cardiovascular risk reduction
NAFLD	Yes	No	Standard of care	Yes
NASH with fibrosis stage 0 or 1 (F0, F1)	Yes	No	Standard of care	Yes
NASH with fibrosis stage 2 or 3 (F2, F3)	Yes	Yes	Pioglitazone, GLP-1 receptor agonists[b]	Yes
NASH cirrhosis (F4)	Yes	Yes	Individualize[c]	Yes

NAFLD, nonalcoholic fatty liver disease; NASH, nonalcoholic steatohepatitis. [a]All patients require regular physical activity and healthy diet and to avoid excess alcohol intake; weight loss recommended. [b]Among glucagon-like peptide 1 (GLP-1) receptor agonists, semaglutide has the best evidence of benefit in patients with NASH and fibrosis. [c]Evidence for efficacy of pharmacotherapy in patients with NASH cirrhosis is very limited and should be individualized and used with caution. Adapted from "Preparing for the NASH Epidemic: A Call to Action" (62).

For biopsy proven NAFLD – these treatments improve liver histology but need long term studies (ADA 2022):
Pioglitazone (Actos) Vitamin E GLP-1 Receptor Agonists

EV Dental, Eye, Kidney and Nerve Care

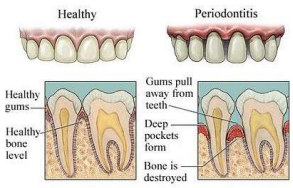
Poll Question 14

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

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

Periodontal Disease

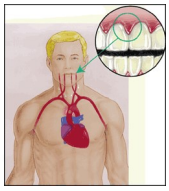
- More severe and prevalent with diabetes and elevated A1c levels.
  - periodontal treatment associated with better glycemic control
    (A1C 8.3% vs. 7.8%)
  - Benefits lasted for 12 mo's
- People with periodontal disease have higher rates of diabetes.
- Bidirectional



Gingivitis

Mild to Severe Periodontitis

Periodontal disease and Heart Disease



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

Salivary Dysfunction and Xerostomia (dry mouth) in DM

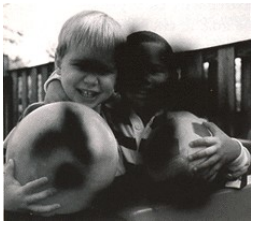
- Less saliva uptake and excretion = less protection against bacteria
- Hyperglycemia increases glucose levels in saliva, providing medium for bacterial growth- also promotes dry mouth
- Dry mouth increases risk of infection and can alter nutritional intake (due to chewing, swallowing difficulties)

Keeping Oral Healthy

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

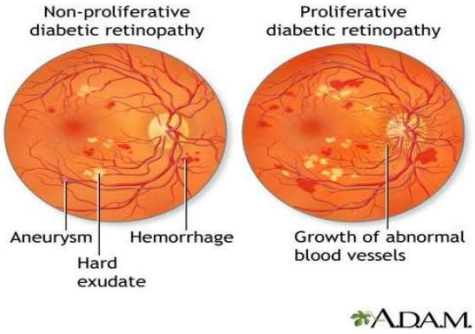
Retinopathy Changes How We See

View of boys by person with normal vision



View of boys by person with diabetic retinopathy.

Non - Proliferative to Proliferative Diabetic Retinopathy



Quick Question 15

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

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

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

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

D. People with diabetes over age of 60 should receive an eye exam every 6 months.

Eye Screening Recommendations

Screen with initial dilated and comprehensive eye exam by ophthalmologist or optometrist

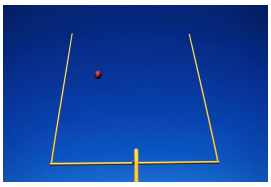
- **Type 2 at diagnosis, then every one to 2 years**
- **Type 1 within 5 years of dx, then every 1-2 years**

- Programs that use validated retinal photography with remote reading can be used for screening with in-person follow-up as needed.
- Promptly refer those with macular edema, severe non-proliferative disease to trained specialist

Keep Eyes and Kidneys Healthy

To reduce the risk or slow the progression of nephropathy

- Optimize glucose control (A)
- Optimize blood pressure control (A)



Kidney Screening Guidelines

- Screen Urine Albumin Creatinine Ratio UACR and GFR
  - Type 2 at diagnosis then yearly
  - Type 1 with diabetes for 5 years, then yearly
    - Twice annually if:
      - UACR> 300mg/g or GFR 30-60 mL/min

Optimize glucose and B/P to protect kidneys

- If UACR > 30 mg/g treat hypertension with ACE or ARB
- Monitor serum creat and K+ if on ACE, ARB or diuretics
- If Chronic Kidney Disease (CKD), consider SGLT2 to slow progression and decrease CV Risk
- If CKD consider using GLP-1 to reduce CV Risk

Urine Albumin Creatinine Ratio - UACR

- UACR | Urine albumin – creatinine ratio (spot collection)

Category	mg/g creatinine
normal	<30 mg/g
Moderately increased	30+ mg/g
Severely increased	300 + mg/g

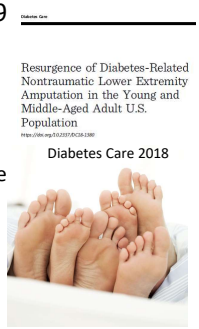
- 2 of 3 tests w/in 3-6 mo abnormal to confirm
- Exercise within 24 h, infection, fever, CHF, marked hyperglycemia, and marked hypertension may elevate urinary excretion over baseline values.

Collaborative Action Plan and F/U

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

Diabetes and Amputations

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



Poll Question 16

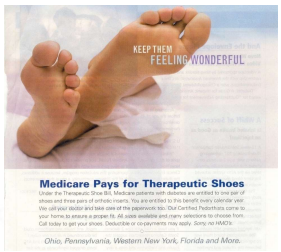
- Which of the following is true about diabetes and lower extremities?

a. Excess hair on the toes indicates compromised circulation.
b. People with diabetes need to inspect lower extremities weekly.
c. People over 65, with high-risk feet, qualify for a pair of custom shoes annually
d. Once a person with diabetes has an amputation, they are not likely to have another.

Lower Extremities

- Lift the Sheets and Look at the Feet

Feet Deserve Special Care

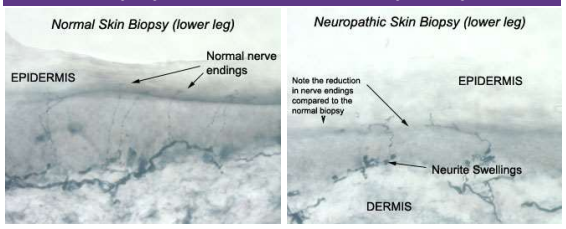


- Daily inspection
- With order from MD and Loss of Protective Sensation (LOPS), Medicare Covers:
  - Annual custom shoes
  - 3 pairs of orthotic inserts

Nerve disease Screening

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

Skin Biopsy to Assess Neuropathy

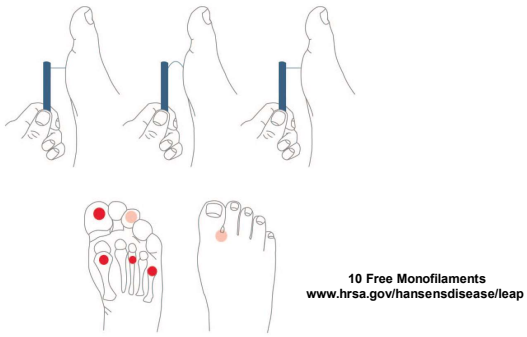


Testing for Small and Large Nerve Fiber Loss

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

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

5.07 monofilament delivers 10gms linear pressure



10 Free Monofilaments
www.hrsa.gov/hansensdisease/leap

Treating Neuropathy

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

Meds for Neuropathy – Cheat Sheet

Neuropathy Medication for Diabetes

Prevention – Maintain glycemic control; quit smoking, alcohol reduction, exercise.

Pathogenetically Oriented Therapy
- Alpha lipoic acid 600 – 1,800 mg a day

Prescription Therapy:

1st line – Tricyclic Antidepressants (Amitriptyline, Nortriptyline, Desipramine)
- Calcium Channel Modulators (Gabapentin, Pregabalin)
- Serotonin Norepinephrine Reuptake Inhibitors (SNRI – Venlafaxine, Duloxetine)

2nd Line - Topical Capsaicin Cream for localized pain – Apply 2-4 x daily for up to 8 wks
- Opioids (Tramadol, Oxycodone)

Reasons for Treatment Failure
- Dose too low
- Inadequate trial – requires 2-8 weeks of treatment to observe symptom reduction
- Pt expecting elimination of symptoms – only reduces symptoms by about 50%
- Incorrect diagnosis: If in doubt, refer to neurologist
- If patient does not respond or has adverse effects, change medication class
- In patient has some but inadequate relief, raise the dose and consider adding or changing meds.

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

Meds for Neuropathy – Cheat Sheet

Class	Generic / Trade Name	Usual Daily Dose Range	Comments	Side Effects/ Caution
1st Line Agents **Tricyclic Antidepressants TCA** Improves neuropathy and depression	Amitriptyline / Elavil	25 – 100 mg* Avg dose 75mg	Usually 1st choice	Take 1 hour before sleep. Side effects; dry mouth, tiredness, orthostatic hypotension. **Caution**: not for pts w/ unstable angina (<6 mo), MI, heart failure, conduction system disorder.
	Nortriptyline / Pamelor	25 - 150 mg* (for burning mouth)	Less sedating and anticholinergic	
	Desipramine / Norpramine	25 – 150 mg* *increase by 25mg weekly till pain relieved		
Calcium Channel Modulators	Gabapentin/ Neurontin	100 - 1,200mg TID	Improves insomnia, fewer drug interactions	Sedation, dizziness, peripheral edema, wt gain **Caution**; CHF, suicide risk, seizure disorder.
	Pregabalin / Lyrica *FDA approved for neuropathy treatment	50 - 200mg TID		
Serotonin Norepinephrine Reuptake Inhibitor SNRI	Duloxetine / Cymbalta *FDA approved for neuropathy treatment	60 mg daily Start at 30 mg	Improves depression, insomnia	Nausea, sedation, HTN, constipation, dizziness, dry mouth, blurred vision. **Caution**: adjust dose for renal insufficiency, do not stop abruptly, taper dose.
	Venlafaxine/ Effexor	75 - 225 mg daily		
2nd Line Agents **Opioids**	Weak opioids Tramadol / Ultram	50 – 400 mg	Sedation, nausea, constipation (always prescribe stool softener) **Caution:** abuse, suicide risk, short acting opioids not recommended for long term tx, can develop tolerance	
	Strong opioids Oxycodone	10 – 100 mg		
Local Treatment	Capsaicin Cream (0.025%) Apply 2-4 x daily for up to 8 wks			
Other choices	If above medications not effective, contraindicated or intolerable consider: Buproprion/Wellbutrin Paroxetine / Paxil Citalopram / Celexa Topiramate / Topamax Topical Lidocaine (for localized pain).			

Other strategies to help ease the pain

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

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

Fancy Creams and Stuff

We Can Make A Difference

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

Lower Extremities

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

"DAN" Diabetic Autonomic Neuropathy

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

Sexual Functions as We Age

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

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

Asking about sexual health

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

Improving Sex Life

People with diabetes get more vaginal and bladder infections

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

Treatment

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

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

Erectile Dysfunction

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

Low Testosterone

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

EV is feeling Empowered

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

Important Themes

- Start with the individual
- Careful listening
- Be curious
- Think outside the box
- Review labs for clues
- Encourage preventive screenings
- Collaborate with other members of the health care team

ReViVE 5 Training Program

ReViVE 5 Diabetes Training Program

Unlocking Hidden Barriers to Diabetes Self-Management

- Assess diabetes distress and other barriers to self-management.
- Identify negative self-talk and explore a more positive inner conversation.
- Develop skills to foster a new narrative using self-compassion.
- Optimize glucose self-management—"find the expert within."
- Create a plan for next steps based on different choices & individual values.

Starts November 1st
4 Interactive Sessions

Thank You

- Questions?
- Info@diabetesed.net
- 530-893-8635
- www.DiabetesEd.net

Diabetes Education SERVICES

Integrating Technology: CGM Connected Pens and Insulin Pumps DiabetesEd Virtual Course – Day 2

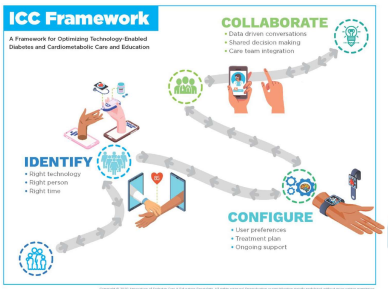
Diana Isaacs, PharmD, BCPS, BC-ADM, BCACP CDCES
CGM and Remote Monitoring Program Coordinator
Cleveland Clinic Diabetes Center

Learning Objectives

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

ICC Framework – Identify-Configure-Collaborate

A framework to overcome barriers to technology use and therapeutic inertia



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

Technology is Here


CONTINUOUS GLUCOSE MONITORS (CGM)

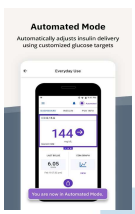

INSULIN PUMPS


CONNECTED PENS AND CAPS


MOBILE APPS

Identify: PWD Identify the "Right" Technology

Simulation Apps to Test it Out



Configure: The Importance of Education & Training

"No device used in diabetes management works optimally without education, training, and follow-up."

ADA. Diabetes Care. 2022;45:S1.

Continuous Glucose Monitors

Continuous Glucose Monitors (CGM)

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

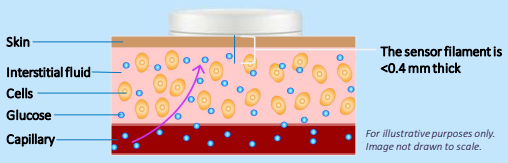
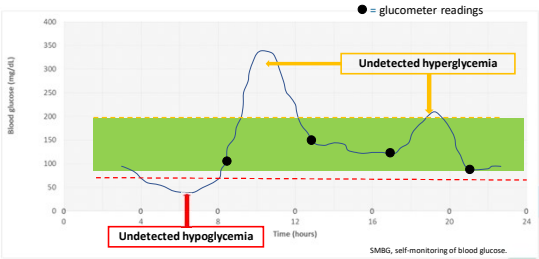
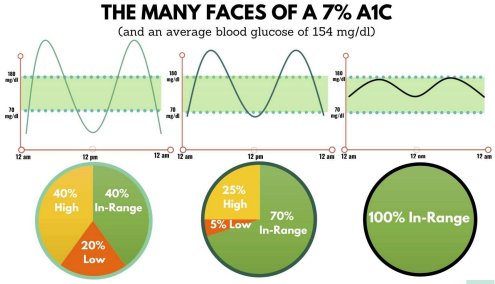


Illustration adapted from: Association of Diabetes Care & Education Specialists. ADCES Practice Paper. Accessed 11/9/21. https://www.diabeteseducator.org/docs/default-source/practice/practice-documents/practice-papers/the-diabetes-educator-role-in-continuous-glucose-monitoring.pdf?sfvrsn=4

BGM vs CGM



A1C Alone is Just Not Enough



CGM: Real-Time Data

Types of CGM

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

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

Professional CGM Options

Abbott FreeStyle Libre Pro

Dexcom G6 Pro

Professional CGM Comparison

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

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

Personal CGM Products

Current	Next Generation
Freestyle Libre 2	Guardian 4
Freestyle Libre 3	Dexcom G7
Dexcom G6	
Eversense 90 & 180 day	
Guardian Connect & Guardian 3	

Dexcom G6

17

- 10 day wear
- 2 hour warm-up
- FDA approved ages 2 and over
- No calibrations required-optional
- 1 press inserter, must attach transmitter
- Reusable transmitter-3 months
- FDA approved for dosing decisions
- Choice of receiver or smart phone
- High, low, predictive low alert
- Hydroxyurea drug interference
- Dexcom G6, Clarity, and Dexcom follow apps (up to 10 followers)
- iCGM Status

https://www.dexcom.com/g6-cgm-system

Inserting the G6 Sensor

Guardian Connect and Guardian 3

- 7 day wear
- Up to 2 hour warm-up
- Not FDA approved for dosing decisions
- Calibrations required 2-4 times/day
- Acetaminophen and Hydroxyurea interference
- Guardian 3 sensor –compatible with 670G and 770G inulin pumps
- Guardian Connect- compatible with smart phone (no separate receiver)
- Reusable transmitter
  - Charge every 7 days, transmitter lasts for ~1 year
- Guardian Connect, Sugar IQ apps
  - Sugar IQ provides predictive glycemic patterns based on user input
- Ability to have followers through carelink website
- Carelink Connect Mobile app for 770G users

https://www.medtronicdiabetes.com/products/guardian-connect-continuous-glucose-monitoring-system

Inserting the Guardian Sensor

Freestyle Libre 2

- 14 day wear
- 1 hour warm-up
- FDA approved ages ≥ 4 years
- Real time alerts (hypo, hyper, out of range) - must scan for actual number
- FDA approved for insulin dosing except for the first 12 hours after insertion
- Must scan every 8 hours to avoid data gaps
- Vitamin C interference (>500mg)
- 1 press inserter, disposable transmitter included with sensor
- Libre2 mobile app, required alert when glucose is urgent low (55mg/dL)
- LibreLinkUp allows up to 20 followers
- iCGM status

https://www.freestylelibre.us/safety-information.html

Inserting the Libre 2

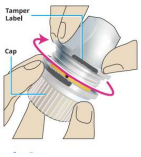


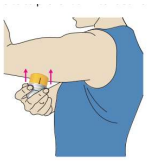
Freestyle Libre 3

- FDA Approved May 31, 2022
- 14 day wear, 1 hour warm-up, >4 years
- Improvements:
  - No scanning required, 33 foot range
  - Continuous streaming (no gaps in data)
  - Decreased size (2/3 the size of Libre 2)
  - Records user views of data
  - Easier insertion
- Differences:
  - Only compatible with smartphones (no reader-yet?)

https://www.freestyle.abbott/eu-en/products/freestyle-libre-3.html

Inserting the Libre 3




Eversense

- Implantable CGM sensor – lasts 90 days
  - Sensor is MRI safe
  - 180 version was just FDA approved
- Removable, rechargeable transmitter
  - Taped above sensor
  - Communicates to smartphone (no separate receiver)
  - On-body vibe high and low glucose alerts
- FDA-approved for insulin dosing
- 24-hour warm-up (dressing for 2 days after insert)
- Requires calibrations every 12 hours
- 180 day version only requires 1 calibration/day after 21 days
- Eversense CGM Mobile app with predictive alerts
- Eversense Now app allows 5 followers

https://www.eversensediabetes.com/

Personal CGM Comparison (FDA approved products)

	G6	Libre 2	Libre 3	Guardian Connect or Guardian 3	Eversense
Integration	T:Slim X2, Omnipod 5, InPen	Bigfoot Unity	No	Medtronic 770G, InPen	No
Display device	Smartphone or receiver	Smart phone or reader	Smartphone only	Smartphone or insulin pump	Smartphone only
Maximum wear time	10 days	14 days	14 days	7 days	180 days
Warm-up time	2 hours	1 hour	1 hour	Up to 2 hours	24 hours
Calibrations required	0	0	0	At least 2/day	2/day for 21 days, then 1/day
FDA approved sites	Abdomen (ages 2+) Upper buttocks (ages 2-17)	Upper arm	Upper arm	Upper arm, abdomen Upper buttocks (ages 7-13)	Upper arm
FDA Approved for dosing (non-adjunctive indication)	Yes	Yes	Yes	No	Yes
FDA Approved ages (years)	≥2	≥4	≥4	≥2 Guardian 3 ≥14 Guardian Connect	≥18
Drug Interactions	Hydroxyurea	Vitamin C	Vitamin C	Acetaminophen, Hydroxyurea	Tetracycline antibiotics, mannitol
MARD	9%	9.2%	7.9%	9.64%	8.5%
Alarms	High, Low, Predictive	High, Low	High, Low,	High, Low, Predictive	High, Low, Predictive

ADCES Practice Paper. The Diabetes Care and Education Specialist Role in CGM. Available at: https://www.diabeteseducator.org/practice/educator-tools/diabetes-management-tools/self-monitoring-of-blood-glucose.

Poll Question 12

- Which of the following drugs interact with the Libre systems?

A. Aspirin
B. Vitamin C
C. Hydroxyurea
D. Acetaminophen
E. More than 1 of the above

iCGM: The Future of Diabetes Devices

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

CGM Counseling Points

- Important to check glucose when indicated
  - Symptoms do not match sensor value
  - During warm-up period
  - When making dosing decisions for select devices
- Sensors are waterproof
  - Showering, bathing, swimming OK
- Avoid with MRI, CT, diathermy
  - Exception: Eversense implantable, transmitter should be removed
- Not FDA approved
  - Pregnancy, dialysis, critically ill
  - If people choose to use, it is important they know it is off-label and discuss potential risks

Troubleshooting Site Adhesiveness

Lag Time

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

Poll 13. Which of the Following is considered an iCGM?

A. Dexcom G6 Pro
B. Libre 2
C. Guardian 3
D. Eversense

Downloading CGM Data

Collaborate: How to Share Data

Data Platform	Associated Mobile Apps	Data Sources
Glooko	Glooko	Insulin pumps (Omnipod, Tandem), Dexcom, Eversense, many glucose meters, InPen
Clarity	Dexcom G6, Clarity, Dexcom Follow, Undermyfork, Sugarmate	Dexcom, InPen
LibreView	LibreLink, LibreLinkUp, Libre 2	FreeStyle Libre 14 day, Libre 2
Carelink	Guardian Connect, Carelink	Medtronic insulin pump and Medtronic CGM
Tidepool	Tidepool Mobile	Insulin pumps (Medtronic, Tandem, Omnipod), Dexcom, Guardian, many glucose meters, InPen
Eversense Data Management System	Eversense	Eversense
InPen Insights Report	InPen	InPen, Dexcom, Guardian Connect
Bigfoot Unity	Bigfoot Unity	Bigfoot Unity pen cap data, Libre 2

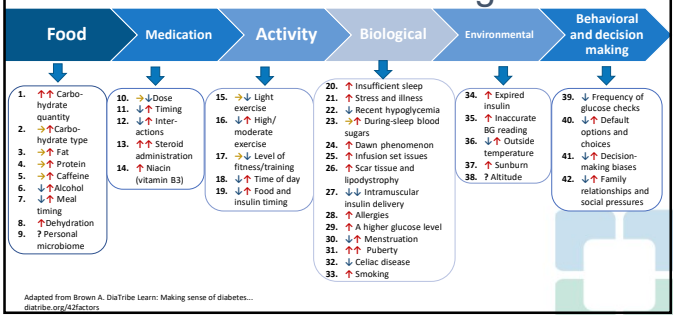
Collaborate: How to Share Data

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

14. How does exercise affect glucose levels?

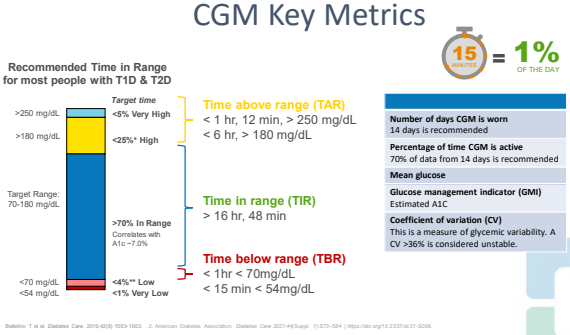
A. Increase
B. Decrease
C. No effect
D. I have no idea

At least 42 factors affect glucose!



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

CGM Key Metrics



15 MINUTES = 1% OF THE DAY

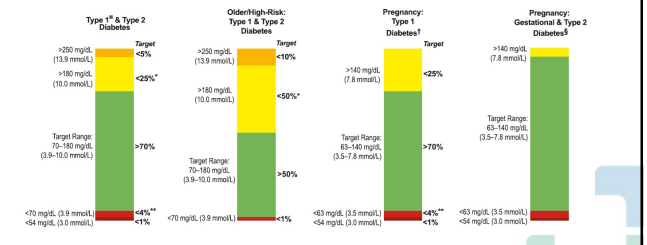
Number of days CGM is worn 14 days is recommended
Percentage of time CGM is active 70% of data from 14 days is recommended
Mean glucose
Glucose management indicator (GMI) Estimated A1C
Coefficient of variation (CV) This is a measure of glycemic variability. A CV >36% is considered unstable.

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

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

A. ≥50%
B. ≥70%
C. ≥80%
D. ≥90%

Time in Range (TIR) Goals: International Consensus



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

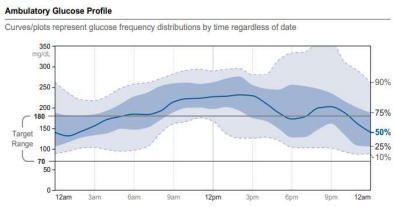
Time in Range and A1C Correlation

N = 545 participants with type 1 diabetes

Measured TIR	A1C	95% CI
40%	8.4%	7.1%-9.7%
50%	7.9%	6.6%-9.2%
60%	7.4%	6.1%-8.8%
70%	7.0%	5.6%-8.3%
80%	6.5%	5.2%-7.8%

Beck RW, et al. *J Diabetes Sci Technol*. 2019;13(4):614-626.

Ambulatory Glucose Profile (AGP)



Spaghetti Graph

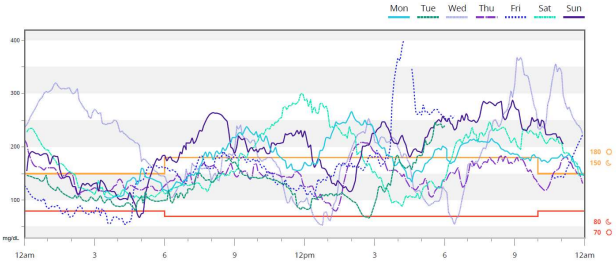


Image obtained from Dexcom CLARITY report.

Snapshot to Assess Hypoglycemia

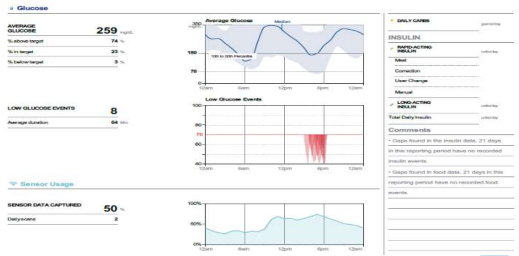


Image obtained from LibreView report.

- Day by Day Graphs

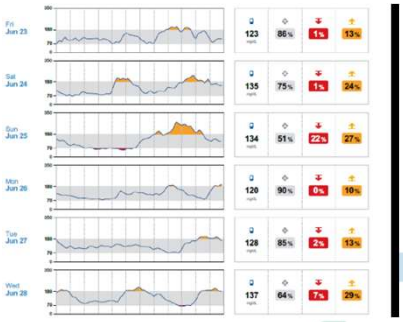


Image obtained from LibreView report.

Review of CGM - DATAA

D	Download Data	• Key metrics, AGP, day by day or spaghetti graph • Start with global overview; what AGP, key metrics mean, ask what the person learned/what is going well with self-management
A	Assess Safety	• Hypoglycemia - identify times below range, % time in hypoglycemia, # events • Interactive discussion: possible causes and solutions
T	Time in Range	• Focus on the positive - identify days or times where time in range is highest • Interactive discussion: how to replicate what is working well
A	Areas to Improve	• Hyperglycemia - Identify times above range, % time in hyperglycemia, # events • Interactive discussion: possible causes, solutions, and adjustments to self-management
A	Action Plan	• Develop collaboratively with the person with diabetes

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

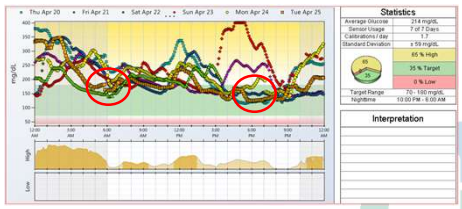
Isaacs D, Cox C, Schwab K, et al. Technology Integration: The Role of the Diabetes Care and Education Specialist in Practice. The Diabetes Educator. 2020;46(4):323-334. doi:10.1177/0145721720935123

Case Studies & 2 min Stretch

Meet Derek

- 48-year-old man, type 2 diabetes x 10 years, maxed out on metformin, GLP-1 agonist, SGLT2 inhibitor, sulfonylurea
- A1C = 9%-9.5% for 12 months, FBG and pre-dinner BG ≈150 mg/dL
- He agreed to wear a professional CGM for 7 days

Derek was shocked by what happened between breakfast and dinner; he agreed to start insulin.

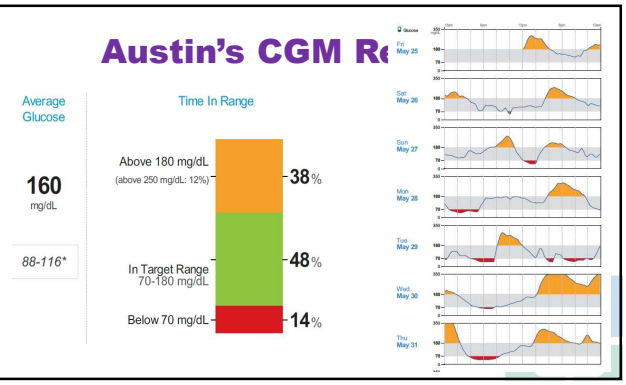


Meet Austin

- Austin is a 20-year-old male with T1DM x 6 years. He is in college studying English, reports an unpredictable schedule.
  - Drinks alcohol on weekends, 4-5 drinks
  - Current Meds
    - Insulin detemir 16 units every 12 hours
    - Insulin lispro, ICR: 15, ISF 50
    - isCGM
  - Reports grazing and missing or being late to take lispro
  - Estimates skipping detemir evening dose 3-5 times/week
  - A1C=8.4%
  - BMI=23kg/m^2

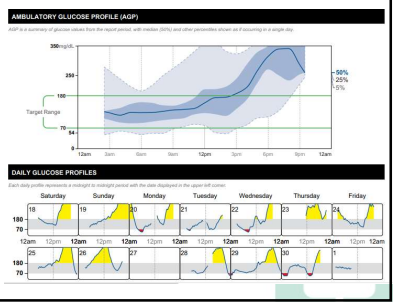
ICR = insulin-to-carbohydrate ratio; isCGM = intermittent scanned continuous glucose monitor; ISF = insulin sensitivity factor.

Austin's CGM Re



Austin's AGP

- What do you notice?
- Is Adriane meeting targets?
- What questions to ask?



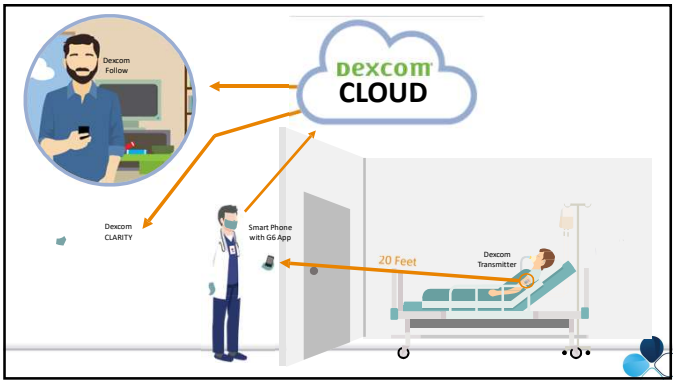
The Plan

- Diabetes Education
  - Rule of 15 for treatment
  - Glucagon prescription with instruction on how to use
  - Effects of alcohol
- Medication adjustments
  - Stop insulin detemir and start insulin degludec
    - 20% reduction = 25.6 units daily
    - Decrease to 20 units daily due to hypoglycemia with frequent missed doses of detemir
  - Change insulin lispro to 12 ICR, continue 50 ISF
- Additional options
  - Hybrid-closed loop insulin pump
  - Ultra rapid acting insulin: lispro-aabc, faster aspart, inhaled insulin

CGM in the Hospital

- Dexcom G6 and Freestyle Libre available for inpatient remote monitoring
  - FDA temporarily approved due to the public health crisis of COVID-19 and the need to preserve PPE and reduce hospital staff exposure to coronavirus
- March 1, 2022
  - FDA grants breakthrough device designation for Dexcom hospital CGM system
  - Designed to expedite the development and regulatory review

https://www.dexcom.com/news/dexcom-cgm-hospital-covid19
https://abbott.mediaroom.com/2020-04-08-Abbotts-FreeStyle-R-Libre-14-Day-System-Now-Available-in-U-S-for-Hospitalized-Patients-with-Diabetes-During-COVID-19-Pandemic



Insulin Pumps

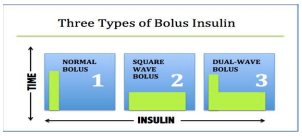
First Pumps: 1963

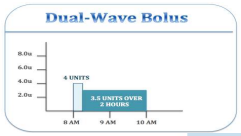
Common Insulin Pump Features

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

Extended Boluses

- Great for high-fat foods or people with gastroparesis





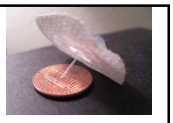
Temp Basals

- Temporarily increase or decrease basal settings
- A great option for high stress, sick days, steroid bursts, exercise
- Start the temp basal 1-2 hours prior to exercise or activity requiring the change
- Depending on pump report view, you may not see the temp basals
- Hybrid-closed loop
  - Temp target option (Medtronic), 150mg/dL
  - Exercise mode (Tandem), 140-160mg/dL
  - Hypo-protect (Omnipod 5), 150mg/dL

Safety Features

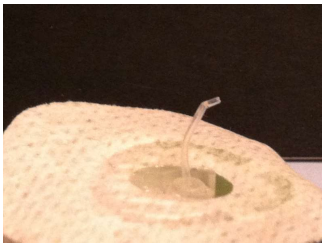
- Alarms for occlusion or low insulin reservoir
- Active insulin to prevent stacking
- Keypad lock
- Waterproof or watertight
- Communication with CGM for auto-suspend and auto adjustment of basal
- Reminders to bolus, change infusion set, etc

Infusion Sets



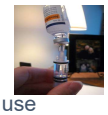
- Infusion sets are usually Teflon
  - Available in different sizes (ex. 9mm vs 6mm)
  - Silhouette (angled) may be better for kids/thinner/very active people
  - Steel infusion sets a good option for people with frequent site occlusions
- Insert at least 1 inch from CGM site
  - Auto-injectors vs. manually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

What Happens with a Bent Cannula?



A. Hyperglycemia
B. Hypoglycemia
C. No effect

Filling the Pump



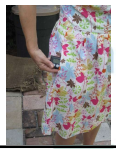
- Only fill with how much insulin you expect to use in 3 days + ~30 units
- Pumps hold 200-300 units
- Caution with air bubbles
- Fill cannula amount
  - Steel needle (0 units)
  - 6mm cannula (0.3 units)
  - 9mm cannula (0.5 units)
- If cannula overfilled, can lead to lows
- If cannula under-filled or air bubbles, can lead to highs

Where to Wear?







Ideal Pump Candidates

- Motivated
- Checking BG 4+ times/day or wearing CGM
- A1C <10%
- Carbohydrate counting or good with estimates
- Ability to learn pump programming
- Willing to follow up regularly with health care team
- Can afford the pump/supplies
- Following hyperglycemia treatment instructions

Hybrid-Close Loop (HCL)

- Automates insulin delivery based on CGM readings
- All systems auto-adjust basal rates
- Some systems give auto-corrections
- All systems require the user to bolus for carbohydrates
- Requires user to use CGM and maximize time spent in HCL to get most benefits
- Current systems: Medtronic 670G/770G, Tandem Control IQ
- Up-coming: Medtronic 780G, Omnipod 5, Beta bionics ilet

"Smart" Insulin Pumps

Omnipod DASH
(Insulet)

Omnipod 5
(Insulet/Dexcom)

T:slim X2 with G6 CGM
(Tandem/Dexcom)
Basal IQ
Control IQ

770G with Guardian 3
(Medtronic)

Patch Pumps

Cequr Simplicity
- Bolus pump patch only
- Approved for adults with T1DM or T2DM
- Holds up to 200 units of rapid acting insulin
- On-demand bolus doses in 2 unit increments
- Doses administered via clicks directly on the device
- Must be changed every 3 days

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

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

Omnipod DASH

- No tubing
- Pod (pump) includes infusion set
- All programming done via PDM
  - Locked Android smartphone
  - Bluetooth connection
- Rechargeable battery
- Food database
- Holds 200 units
- 0.05 unit basal increment
- Automatic cannula insertion and priming
- Dash blue tooth connected with contour meter

Omnipod 5

- HCL system
- Minimum age, 2 years, 10 units of insulin
- Glucose targets from 110-150mg/dL adjustable by time or day
- Adaptive basal rates
- HypoProtect for times to reduce risk of lows
  - Reduce insulin to target of BG 150
- SmartBolus calculator informed by Dexcom G6 CGM value and trend
- Control system from a compatible personal smartphone
- Adjustable settings: carb ratio, sensitivity, active insulin time, recommended bolus dose
- Plans to integrate with Libre in the future

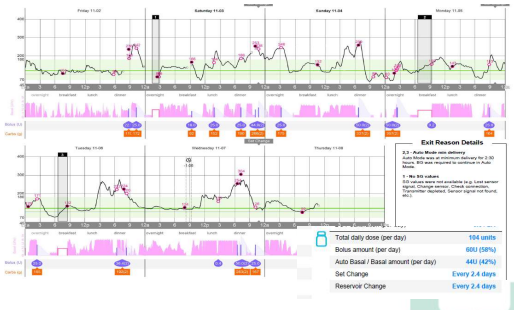
Device Comparison — Panther Program (bdcpantherdiabetes.org)

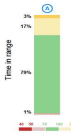
Medtronic 770G

- 770G with SmartGuard™ Auto Mode
  - Adjusts basal insulin every 5 min based on CGM readings to target glucose of 120 mg/dL
  - Bluetooth connectivity
  - 780G software upgrade when approved
- Minimum age: 2 years, 8 units insulin
- Suspend before/on low options (in manual mode)
- Temp target of 150 available
- 300 unit reservoir
- Connected Accu-check Guide meter and Guardian 3 CGM
- Mobile app for data sharing/viewing
- 300-unit reservoir
- 0.025 unit basal increment

https://www.medtronic.com/us-en/healthcare-professionals/products/diabetes/insulin-pump-systems.html

Medtronic 770G Example





Tandem t:slim X2

- Touch screen
- Rechargeable
- 300-unit reservoir
  0.001 unit basal increment
  Integrated Dexcom G6 CGM
  Software updates available
- 2 algorithms:
  - Basal IQ – basal adjusts and suspends for lows
  - Control IQ – basal adjusts for lows and highs; automatic hourly correction boluses for highs

Tandem T:Slim X2 with Basal IQ

- Touch screen
- Lithium rechargeable battery
- 300-unit reservoir
- Indicated ages ≥ 6 years
- 0.001 unit basal increment
- Integration with Dexcom G6
- Basal IQ- suspends basal if CGM predicted to decrease to < 80 mg/dl within 30 minutes

BASAL IQ Example

Tandem T:Slim X2 with Control-IQ

- Advanced hybrid-closed loop system
- Algorithm adjusts insulin delivery from programed "manual" settings
- Automatic correction doses
  - Up to 1 every hour
  - Calculated at 60% of programmed correction factor (target of 110)
- User must still bolus for carbs (and additional correction doses)
- FDA approved 6+ years, 55lbs, 10 units insulin/day
- Basal-IQ users who update to Control-IQ cannot switch back to Basal-IQ mode

Control IQ Targets

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

Coming Soon: Dose off Phone app

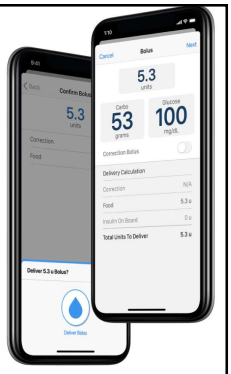
Give yourself the freedom to more easily manage your diabetes with the t:slim X2 insulin pump and t:connect mobile app

With this much-anticipated feature, expected summer 2022* you'll have the freedom to bolus without having to touch your t:slim X2 insulin pump. That increased flexibility decreases how often you need to interact with your pump. Read our press release announcing FDA clearance to learn more. We'll let you know as soon as it becomes available.

Enjoy the Freedom to See Clearly
Conveniently view your pump data, including basal and bolus events, pump and sensor status, insulin on board, carbs, and settings on your compatible smartphone.

Enjoy the Freedom to be Discreet
Serving as a secondary display for your t:slim X2 insulin pump, the t:connect mobile app allows you to view alerts from your pump as push notifications.†

See Smartphone Compatibility



Future Pumps

Beta Bionics iLet

Medtronic 780G

Tidepool Loop

Medtronic 780G

- Basal rate automation
- Automatic correction boluses
- Adjustable target to 100mg/dL
- Increased time in closed loop
- Bluetooth connectivity, remote software upgrades
- Mobile app for secondary data display and wireless data uploads
- CE-marked in Europe
- >80% time in range goal
- Guardian Sensor 4 non-adjunctive (no calibrations)
- Future:
  - Synergy sensor: disposable, 50% smaller

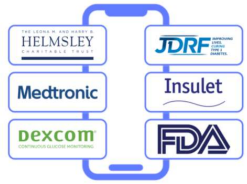
Beta Bionics iLet

- HCL system
- Holds 160 units of insulin
- Dual hormone automation with glucagon and insulin
- Programmed by entering body weight and starting CGM
  - No other insulin pump settings
- Enter in meal estimates (less, usual, more)
- Ability to use prefilled insulin cartridges

https://www.betabionics.com/

Tidepool Loop

- The Tidepool Loop app will be submitted to FDA as a controller (iAGC) that pairs with an ACE insulin pump and an iCGM using Bluetooth wireless communication.
- Goal is for the app to be FDA approved and available for download from the App Store and compatible with commercially-available, in-warranty insulin pumps and CGMs.



Automated insulin dosing | Tidepool

16. Which pump is considered a hybrid-closed loop?

A. Cequr simplicity
B. Tandem Basal IQ
C. Medtronic 770G
D. Omnipod Dash

HCL Pump Comparison

	MiniMed™ 670G / 770G	MiniMed™ 780G*	t:SLIM X2 WITH CONTROL-IQ	OMNIPOD 5*
		*AVAILABLE OUTSIDE US, NOT FDA APPROVED.		* NOT FDA APPROVED, SUBJECT TO CHANGE.
CALCULATE				
What is automation called?	Auto Mode	Auto Mode	Control-IQ	Automated Mode
Basal automation?	Automated basal insulin delivery calculated based on total daily insulin from past 2-6 days ("auto basal")	Automated basal insulin delivery calculated based on total daily insulin from past 2-6 days ("auto basal")	Automated basal insulin delivery that increases or decreases programmed basal rates	Automated basal insulin delivery calculated from total daily insulin from last pod change (~3 days) ("adaptive basal")
Bolus automation?	No (auto basal only to respond to hyperglycemia)	Auto-correction bolus if glucose > 120 mg/dL and at maximum "auto basal" delivery	Auto-correction bolus (max 1/hour) if glucose predicted to be >180 mg/dL delivers 60% of calculated dose	No (adaptive basal only to respond to hyperglycemia)
Algorithm target BG/range?	120 mg/dL	100 mg/dL OR 120 mg/dL	112.5-160 mg/dL (range)	110, 120, 130, 140, 150 mg/dl

Automated Insulin Delivery — Panther Program (bdcpantherdiabetes.org)

Critical Thinking

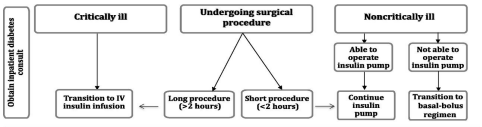
When should a provider consider discontinuing an insulin pump during hospitalization?

Technology in the Hospital

- Several inpatient studies have shown that CGM detected a greater number of hypoglycemic events than POC glucose testing
  - Overall, did not improve glucose control
- Patients who are comfortable using their diabetes devices (insulin pumps, sensor) should be given the chance to use them in an inpatient setting if they are competent to do so.
- Health care institutions must have clear policies and procedures to maximize safety and to comply with existing regulations related to self-management of medication.

Diabetes Care 2020 Jan; 43(Supplement 1): S77-S88
Umpierrez G et al. Diabetes Care 2018 Aug; 41(8): 1579-1589..

Patient With Insulin Pump Admitted to Hospital



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

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

Contraindications to Insulin Pumps in the Hospital

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

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

Insulin Pump Data Management Tools

System	Website	Associated Mobile Apps	Integration
Glooko	glooko.com	Glooko Omnipod Demo PodderCentral Omnipod Display Omnipod View	Insulin pumps (Omnipod, Tandem), Dexcom, Eversense, many glucose meters
Carelink	carelink.medtronic.com	MiniMed Simulator	Medtronic insulin pumps and Medtronic CGM
Tidepool	tidepool.org	Tidepool Mobile	Insulin pumps (Medtronic, Tandem, Omnipod), FreeStyle Libre, Dexcom, Guardian Connect, many glucose meters
T:Connect	tconnect.tandemdiabetes.com	T:simulator T:connect mobile	Insulin pump (Tandem), Dexcom

Connected Insulin Pens

The Insulin Delivery Landscape

Smart Insulin Pens

10.5% of US population with diabetes (34.2 million people)
7.2 million using insulin

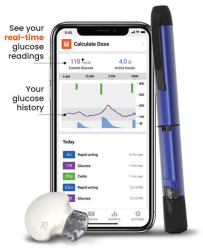
Traditional Insulin Pen, Vial and Syringe

Smart Insulin Pumps

Basic Patch Pumps, Inhaled Insulin

Diabetes Care 2018 Jun; 41(6): 1299-1311

Connected Pen Options



InPen with Guardian Connect or Dexcom G6

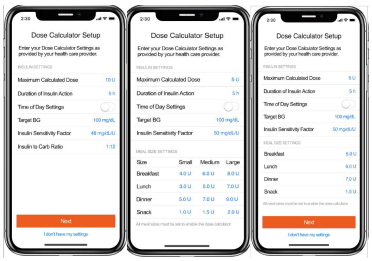
Bigfoot Unity with Libre 2

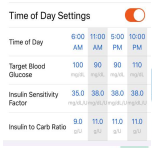
InPen

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

https://www.companionmedical.com/InPen

Therapy Settings





Bigfoot Unity Diabetes Management System

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

In Summary

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

Additional Resources

- Integrated Diabetes Services
  - https://integrateddiabetes.com/updated-insulin-pump-comparisons-and-reviews/
- ADCES Insulin pump therapy resources
  - https://www.diabeteseducator.org/practice/practice-tools/diabetes-management-tools/ipt-resources
- Diatribe.org
- Diabeteswise.org
- Danatech.org

Additional Resources

Diabetes Advanced Network Access (DANAtech)	danatech.org
Association of Diabetes Care and Education Specialists (ADCES) glucose monitoring resources	diabeteseducator.org/practice/educator-tools/diabetes-management-tools/self-monitoring-of-blood-glucose
diaTribe	diatribe.org
DiabetesWise and DiabetesWisePro	Diabeteswise.org https://providers.diabeteswise.org/#/
ADCES Insulin pump therapy resources	https://www.diabeteseducator.org/practice/practice-tools/diabetes-management-tools/ipt-resources
Integrated Diabetes Services	https://integrateddiabetes.com/updated-insulin-pump-comparisons-and-reviews/

Cleveland Clinic

Every life deserves world class care.

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

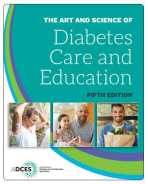
Beverly Dyck Thomassian, RN, MPH, BC-ADM, CDCES
President, Diabetes Education Services
2022

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

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

Resources

- ADA Standard 1 and 5
- Psychosocial Resources on Article page (DES)
- ADCES Desk Reference



Ch1 Diabetes Care and Education: Rich Past, Challenging Present, Promising Future
Ch2 The Diabetes Self-Management Process
Ch3 Theoretical and Behavioral Approaches to Self-Management of Health
Ch4 Healthy Coping
Ch5 Healthy Eating
Ch6 Being Active
Ch7 Taking Medication
Ch8 Monitoring
Ch9 Reducing Risks
Ch10 Problem Solving
Ch11 Diabetes Education Program Management

Psychosocial Care

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

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

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

Author Affiliations

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

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

Check for updates

Well-Being Key Goal of Care

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

Providing Diabetes Care

- Setting up successful delivery systems
- Assessing the unique needs of each individual
- Supporting diabetes self-care
- All treatment decisions are made in conjunction with the person's preferences, needs & values.
- Person centered care.

Poll Question 1

- RT often skips breakfast in the morning so he can sleep as long a possible before going to work. Since he takes morning insulin, this often results in hypoglycemia at work. After meeting with RT, a plan is made to have a granola bar in the car to eat on the way to work. What does this exemplify?
- A. Problem solving
- B. Adult learning theory
- C. Transtheoretical model
- D. DASH Approach

How do Diabetes Specialists Help?

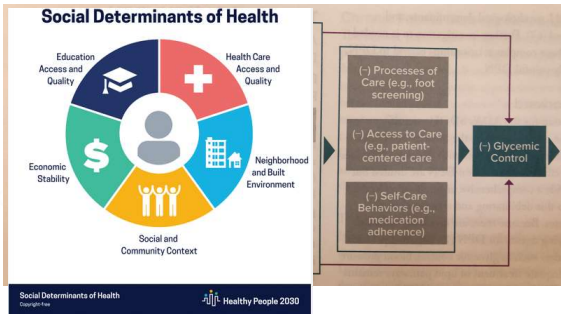
How Do Diabetes Educators Help?

- AADE7™ Self-Care Behaviors:

Problem Solving Strategies

- Reassess treatment regimen and barriers
  - Competing demands including those related to family responsibilities and dynamics
  - Chronic stress
  - Diabetes related distress or depression
  - Financial barriers
  - Cognition issues
  - Social inequities / isolation
  - Medication taking behavior and regimen
  - Other?

Social Determinants of Health and Diabetes Interrelationship



Tailor Treatment for Social Context

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

Poll Question 2

- LS has type 1 diabetes and reports to clinic with unusually frequent hypoglycemia and some weight loss. LS appears distraught and says that since the pandemic, their work hours have been dramatically reduced and paying bills has been a struggle. Based on this information, which of the following topics would the diabetes specialist most want to explore further?

- A. Disordered eating
- B. Food insecurity
- C. Insulin rationing
- D. Diabetes distress

Food Insecurity impact on self care

- Lower medication adherence
- Depression, distress
- Elevated glucose
- More hospital visits
- Interventions
  - Food prescription programs
  - Food banks & other
- Treatment priorities
  - Decrease severe hyper and hypoglycemia
  - Affordable medication plan
  - Connect with social services programs

Assessing for Food Insecurity

- 1. Within the past 12 months we worried whether our food would run out before we got money to buy more"
- 2. Within the past 12 months the food we bought just didn't last and we didn't have money to get more.
- An affirmative response to either statement had a sensitivity of 97% and specificity of 83%.

Houselessness

- The prevalence of diabetes in the homeless population is estimated to be around 8%
- Need secure places to keep supplies and meds
- Help connect with social resources

Social Capital

- Living with racism and discrimination may drive underlying causes of nonadherence to regimen behaviors.

- Health care community linkages promote translation of clinical goals into lifestyle changes in real world.
  - Community health workers
  - Peer supporters
  - Lay leaders helpful

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

Definitions[2]

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

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

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

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

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

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

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

AADE American Association of Diabetes Educators

Content provided by Theresa Garnero, APRN, BC-ADM, MSN, CDE

Tailor Treatment for Social Context

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

Other factors - Assess Literacy

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

Poll question 3

- Which of the following strategies are best used when someone has low literacy skills?
  - A. speak slowly and clearly
  - B. underline key points on educational materials
  - C. direct the teaching to the support person and encourage reinforcement.
  - D. be concrete and focus on problem solving

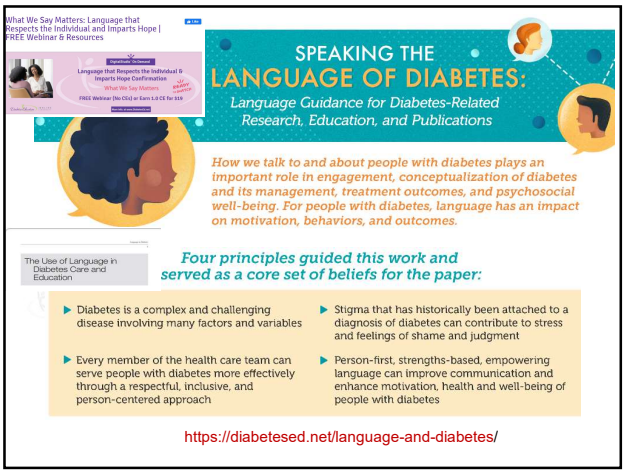
Guiding Language Principles

Strength Based

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

Person-first

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



Quick Self-Assessment

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

curiosity

Poll Question 4

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

A. Your BMI indicates you are in the obese category

B. Your fasting blood sugar is above normal

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

D. You are checking your blood sugar daily.

Take a Strength Based Approach

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

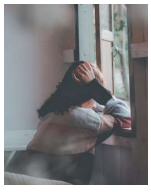
Strength-Based Approach

- Identify barriers and help with problem solving
- Offer evidence-based hope message
- Frequent contact – phone, support group, letter, etc.
- Let them know you believe in them
- Ask ind, "Tell me 1 thing that is driving you crazy about your diabetes
- Discuss medication beliefs, ask ask ask!
- To improve outcomes, see ind's more often

Bill Polonsky, PhD, CDE

Expectancy Theory and Language

- When we label people, we form biases.
- We act out behaviors based on this label.
  - Providers also modify behavior in response to label
- The person labeled may take on attributes of that label.
- Do our language choices lead to clinical inertia?



"Mindfulness-based Interventions"

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

Mindfulness and Compassion in the Diabetes Encounter.
A Special Webinar for Diabetes Specialists

Psychosocial Assessment

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

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

Poll Question 5

- Which of the following statements reflects depression?
  - A. I used meet with my friends weekly, now I don't even care.
  - B. Yes, I feel sad that I have diabetes.
  - C. Some mornings, it's just hard to check my blood sugars.
  - D. I am so tired of everyone telling me how to eat!

Depression

- Characterized by depressed mood
- Loss of interest in activities usually found pleasurable
- Difficulty concentrating, sleeping, changes in appetite
- Difficulty in following through with self care behaviors

NAME:_____ DATE:_____

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

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

PHQ- 9
Quick Depression Assessment

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

Anxiety – Exaggerated response to normal fears

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

Diabetes causes fear –

- Hypoglycemia
- Complications
- Living with chronic condition

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

Poll Question 6

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

Adaptation to the Emotional Stress of Chronic Disease

(Kubler-Ross, Rubin RR, WHPolonsky)

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

My spouse doesn't want to hear

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

Diabetes Related Emotional Distress=DRED

- DRED - unique emotional issues directly related to the burdens and worries of living with a chronic disease. (embarrassed, guilty)
  - More than worry: can overlap with depression, anxiety and stress.
  - Normal-to some extent
  - Associated with stress of living with diabetes
  - Express high levels stress and depressive symptoms; but not clinical depression
  - Not rare: linked to poor health outcomes

DDS 17: Diabetes Distress Scale

- Yields a total Diabetes Distress Scale score plus 4 sub scores:
  - Emotional burden
  - Physician related Distress
  - Regimen related Distress
  - Interpersonal Distress

Begin a conversation with any item rated 3 or more – See Distress Scale in your resources page

- 44.5% of reported diabetes distress
- Only 24% of providers asked pts how diabetes affected their life (DAWN Study)

Diabetes Distress Scale

1. Feeling that diabetes is taking up too much of my mental and physical energy every day.
2. Feeling that my doctor doesn't know enough about diabetes and diabetes care/ doesn't give me clear enough directions .
3. Feeling angry, scared, and/or depressed … think about living with diabetes
4. Feeling that I am not testing my blood sugars frequently enough.

	Not a Problem	A Slight Problem	A Moderate Problem	Somewhat Serious Problem	A Serious Problem	A Very Serious Problem
1. Feeling overwhelmed by the demands of living with diabetes.	1	2	3	4	5	6
2. Feeling that I am often failing with my diabetes routine.	1	2	3	4	5	6

Poll question 7

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

Diabetes Distress Reframes

12 Reframes to Help with Diabetes Burnout or Distress

- It's not your fault you have diabetes. It's not your fault your pancreas doesn't work right.
- You can't control your blood sugars all the time, but you can take actions to manage your diabetes to the best of your ability.
- Blood sugars are not good or bad, they are just numbers that inform us of what action is needed next.
- Listen to your self-talk. It is tempting to be overly self-critical and blame ourselves. Try to imagine you are coaching a friend with diabetes. What advice or coaching would you provide?
- Diabetes isn't about perfect or getting it right all the time. Its about taking baby steps to make small improvements and keep safe.
- Take short mental breaks from your diabetes – walk outside, enjoy a hobby, listen to music, volunteer, join a group.
- Talk about your feelings to friends and family. Let them know how to help you succeed and things that don't help.
- Keep active, nourish your body, try meditation, enjoy oxygen cocktails, get out in nature.
- Remind yourself of all the work you ARE doing to manage your diabetes
- Join diabetes camps, social media groups, find your people, your community.
- Consider connecting with a mental health professional.
- Remember, you are not alone. You are resilient. You are not your blood sugars. You got this. Baby Steps.

Download PDF List of 12 Reframes to Share

Download List of 12 Reframes to Share

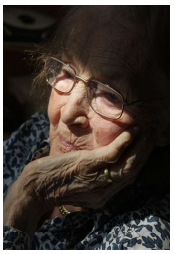
https://diabetesed.net/dealing-with-diabetes-burnout-or-distress-12-attitude-shifts-that-can-help/

Keeps forgetting insulin

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

Cognition, Alzheimer's and Dementia

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



Cognitive Screening - Mini-Cog

- "I am going to say three words that I want you to remember now and later.
- The words are banana, sunrise, chair.
- Please say them now." Give the person three tries to repeat the words.
- You may repeat the words to them for each try.
- If they are unable to repeat the words back to you after three tries, go directly to the clock drawing.
- Next, ask them to draw a clock

https://mini-cog.com/mini-cog-instrument/standardized-mini-cog-instrument/

Cognitive Screening – Mini-Cog

- Tasks - "Please draw a clock in the circle."
- "Put all the numbers in the circle"
- "Now set the hand to show ten past eleven."
- Recall the 3 items banana, sunrise, chair.
- Score 1 for each task performed and for each item
- A score less than 3 of the 5 items suggests cognitive impairment

Example of the same person drawing a clock over time with increasing dementia

Cognitive Impairment Treatment

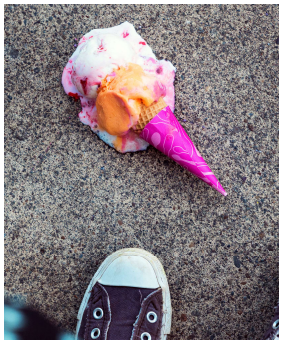
- Treatment:
  - Refer to specialist for assessment
  - Achieve optimal BG control
  - Pharmacist to evaluate drug safety and potential drug interactions
  - Keep physically active
  - Nutrition and gut health
  - Community engagement and support

Look Beyond – What impacts DSM

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

I am falling

- 53 yr old with type 1 diabetes.
- A1c 7.6
- B/P 130ish/80 ish
- No new meds started
- Teenager is “using drugs”
- Says they have fallen 3 times in last month



Question - What is ACE?

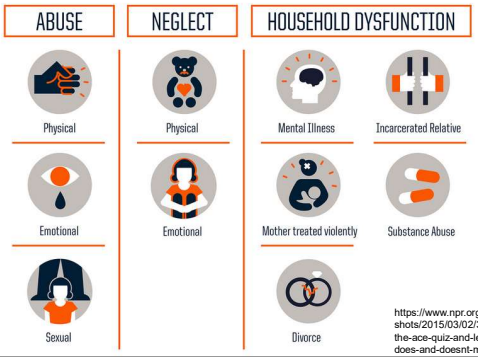
- ACE =
  - Adverse
  - Childhood
  - Experiences
    - (before 18 yrs)
- What is the relationship between childhood trauma, diabetes and health?

www.AcesAware.org

A Note to My Colleagues

- Many of us have experienced childhood trauma
- This information my evoke strong feelings or difficult memories
- You may want to share your story or maybe you're not ready.
- We will discuss coping and healing strategies.

10 Assessment Areas for ACE – Use 10 Question Screening Tool to Assess



https://www.npr.org/sections/health-shots/2015/03/02/387007941/take-the-ace-quiz-and-learn-what-it-does-and-doesnt-mean

The impact of childhood trauma and Toxic Stress?

- Leads to:
  - Neuroendocrine dysregulation
  - Altered immune response
  - Disrupts DNA packaging
  - Epigenetic tags can alter genetic makeup

ACE increases risk for 9 out of 10 leading causes of death in US

Leading Cause of Death	Odds Ratio with ≥ 4 ACEs
Heart Disease	2.1
Stroke	2.0
Diabetes	1.4
Kidney Disease	1.7
Cancer	2.3
Alzheimer's	4.2
Suicide(attempts)	37.5

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

Client Action

- Not keeping appointments
- Not taking meds as prescribed
- Not adopting new behaviors

Providing Trauma Informed Approach

Provider Reaction

- Refrain from accusatory language or judgement
- Encourage collaboration
- Be curious
- Ask open ended questions

Diabetes Education SERVICES

As health care providers, let's Ask!

- Trauma can have a significant impact on health
- What might be traumatic for one person may not be traumatic for another
- People may want to compartmentalize painful experiences from the past
- But chronic stress associated with trauma can wreak havoc on long term health.

As health care providers, asking about trauma let's people know we care and we hear them!

How to Ask questions about trauma

In addition to the stresses of daily life, sometimes people with diabetes might have experienced something particularly difficult or traumatic.

We also know that experiencing violence is very common in many people's lives.

I'm just wondering if there's anything like this you might want to talk about?

The clinical response to identification of toxic stress should include:

1. Applying principles of trauma-informed care, including establishing trust, safety, and collaborative decision-making.

2. Supplementing usual care for ACE-Associated Health Conditions with patient education on toxic stress and discussing strategies that can help regulate the stress response, including:

- Supportive relationships, including with caregivers (for children), other family members, and peers
- High-quality, sufficient sleep
- Balanced nutrition
- Regular physical activity
- Mindfulness and meditation
- Experiencing nature
- Mental health care, including psychotherapy or psychiatric care, and substance use disorder treatment, when indicated

3. Validating existing strengths and protective factors.

4. Referrals to patient resources or interventions, such as educational materials, social workers, school agencies, care coordination or patient navigation, and community health workers.

https://numberstory.org/

Awareness >> to Healing

Yet many people, parents, health professionals, and educators don't know about ACEs. This lack of knowledge leads to significant illness and unimaginable expense – much of which could be averted through awareness, education, and action.

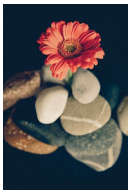
https://aceresourcenetwork.com/

You can heal from ACEs.

ACEs have affected all of us in one way or another. ACEs are what happened to us. They are not who we are. They are part of our story and they shape it. If our well-being has been affected, change is possible and there is hope.

ACEs are Not Destiny

Diabetes Care Specialists can help interrupt intergenerational transmission of toxic stress



- 'With early detection and evidence-based intervention, we can transform health outcomes"

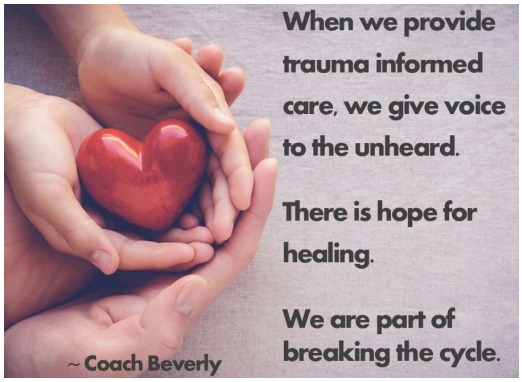
Nadine Burke Harris, MD
1st Surgeon General of California
Pediatrician, Activist, Role Model

Please visit this site | Free Training

www.ACEsAware.org

www.acesaware.org/heal/provider-toolkit/

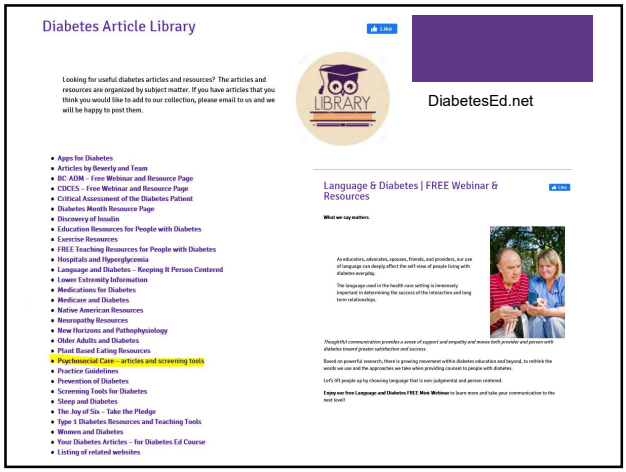
The Act of Recognition is Healing



Consider Referral to Mental Health Provider for Eval and Treatment

- Diabetes distress even after tailored education
- Screens positive for depression, anxiety, FoH*
- Disordered eating or disrupted eating patterns
- Not taking insulin/meds to lose weight
- Serious mental illness is suspected
- Youth with repeated hospitalizations, distress
- Cognitive impairment or impairment of DSME
- Before bariatric/metabolic surgery

*FoH – Fear of Hypoglycemia



Psychosocial Assessment

Informal check in or can utilize more formal assessments

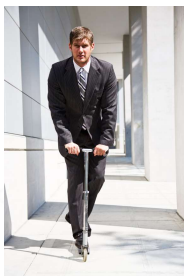
- Adverse Childhood Experiences – ACE – early childhood experience can affect health outcomes for life. Read more about ACE here.
- Psychosocial Care for People with Diabetes: A Position Statement of the American Diabetes Association 2016. (See chart below excerpted from Position Statement)
- Diabetes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

Learning and Behavior Change

Poll Question 8

- Mary has had diabetes for over 35 years and tells you she knows everything about diabetes. But her doctor insisted she come see you for to check in with her diabetes. What approach recognizes Adult Learning Theory? A1c is 7.3.
- A. Please share how you have been managing your diabetes.
- B. Can I please see your Ambulatory Glucose Profile?
- C. Please demonstrate how you use your meter
- D. Are you meeting your targets 80% of the time?

Adult Learners



- Self-directed must ***feel need*** to learn
- ***Problem oriented*** rather than subject oriented
- Learn better when ***own experience*** is used
- Prefer ***active participation***

Empowerment Defined

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

Traditional vs Empowerment Based

Traditional vs Empowerment Based

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

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

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

This philosophy is important to know for the exam

Empowerment Based, Self-Directed Behavior Change Protocol

- Define problem
  - What part of living with diabetes is most difficult or unsatisfying for you?
- Identify feelings
  - How does the situation make you feel?
- Identify long term-goal
  - How would this situation have to change for you to feel better about it?
  - What barriers will you face?
  - How important is it for you to address this issue?
  - What are the costs and benefits of addressing or not addressing this problem?

Empowerment Based, Self-Directed Behavior Change Protocol

- Identify short-term behavior change experiment
  - What are some steps that you could take to bring you closer to where you want to be?
  - Is there on thing that you will do when you leave to improve things for yourself?
- Implement and evaluate plan
  - How diet the plan we discussed at your last visit work out?
  - What did you learn?
  - What would you do differently next time?
  - What will you do when you leave here today?

Transtheoretical Model - Readiness determines Approach





PreContem-plation:	Contemplation	Preparation:	Action/Maint:	Relapse or Stuck
Raise doubt Re: status quo. Info?	Explore + resolve ambivalence. Focus on gains	Committed to change just needs to know how!	Who-What-When-Where Encourage & Plan	Support-plan-reframe? OOOOPS
NOPE!	*Maybe*	OK! I want to!	I'm Doing It! x 6m	

Poll Question 9

- A 49 year old started bike riding as part of their goal to lose 14 pounds. Using the transtheoretical model, what best describes their state of change?

A. Action
B. Contemplation
C. Relapse
D. Pre-Contemplation

Empowering and Promoting Health for Individuals and Populations

Our Actions Make a Difference

GREAT DREAM

Ten keys to happier living

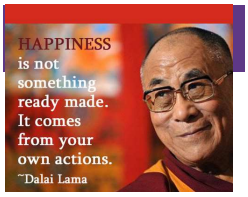
Action for Happiness has developed the 10 Keys to Happier Living based on a review of the latest scientific research relating to happiness.

Everyone's path to happiness is different, but the research suggests these ten things consistently tend to have a positive impact on people's overall happiness and well-being.

The first five relate to how we interact with the **outside** world in our daily activities. The second five come more from **inside** us and depend on our attitude to life.

GIVING	Do things for others
RELATING	Connect with people
EXERCISING	Take care of your body
APPRECIATING	Notice the world around
TRYING OUT	Keep learning new things
DIRECTION	Have goals to look forward to
RESILIENCE	Find ways to bounce back
EMOTION	Take a positive approach
ACCEPTANCE	Be comfortable with who you are
MEANING	Be part of something bigger

ACTION FOR HAPPINESS Actionforhappiness.org



"People will forget what you said, people will forget what you did, but people will never forget how you made them feel" ~ Maya Angelou

Thank You

- Questions?
- Email info@diabetesed.net
- Web www.diabetesed.net
- Phone: 530/ 893-8635

Diabetes Education SERVICES

DiabetesEd Specialist Virtual Course*
Day Three – October 14, 2022 (Pacific Time)

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

Thank you for joining us!

Diabetes Education SERVICES | Advancing Your Career in Diabetes Education

www.DiabetesEd.net | 530-893-8635
info@diabetesed.net

**Topics and Timing Subject to Change*

Medical Nutrition Therapy

Ashley LaBrier, MS, RD, CDCES
Diabetes Education Program Coordinator
SVMC Diabetes & Endocrine Center

Healthy Eating

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

Healthy Eating

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

Goals of MNT for All Persons with Prediabetes

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

The Power of Prevention

- Diabetes Prevention Program (DPP) shows that lifestyle changes may reduce the risk of incident type 2 diabetes by 58% over 3 years
  - Benefit of lifestyle change is more significant in those over the age of 60 – may decrease risk of T2DM by 71%
  - Lifestyle intervention was effective in both sexes, across all racial and ethnic groups, and in people predisposed to diabetes

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

The Power of Prevention

- Lifestyle intervention/goals in DPP included:
  - Increase physical activity: goal of 150 minutes of physical activity per week
  - Decrease fat and calorie intake*
  - Decrease weight: sustained loss of 7-10% of initial body weight

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

Diabetes Prevention Program (DPP) Research Group. (2002). The Diabetes Prevention Program (DPP): Description of lifestyle intervention. *Diabetes Care, 25*(12), 2165-2171. doi10.2337/diacare.25.12.2165

The Power of Prevention

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

Goals of MNT for All Persons With Diabetes

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

Goals of MNT for All Persons With Diabetes

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

Goals of MNT for All Persons With Diabetes

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

Benefit of MNT for Person With Diabetes

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

- Sustained A1C improvement with ongoing support from RD/RDN
- MNT is cost-effective

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

Nutrition Therapy for Weight Management

In Those at Risk for Diabetes and Those Living with Diabetes

BMI and Diabetes Risk

- An increase in BMI is generally associated with an increase in the prevalence of insulin resistance/DM, hypertension, and dyslipidemia

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

Effectiveness of Weight Loss

- Feasibility of reaching diabetes remission or prediabetes level glycemia without meds is a particular research interest
- DiRECT Trial explores possibility of remission of T2D (up to 6 years duration) with weight loss

Lean, Michael EJ, et al. "Primary Care-Led Weight Management for Remission of Type 2 Diabetes (Direct): An Open-Label, Cluster-Randomised Trial." *The Lancet*, vol. 391, no. 10120, 2018, pp. 541–551., https://doi.org/10.1016/s0140-6736(17)33102-1.

Low Calorie Diets and Remission

- Diabetes Remission Clinical Trial (DiRECT)
  - Participants:
    - 20-65 years old
    - T2D for 6 years or less
    - BMI 27-45 kg/m^2
    - Not on insulin

Lean, Michael EJ, et al. "Primary Care-Led Weight Management for Remission of Type 2 Diabetes (Direct): An Open-Label, Cluster-Randomised Trial." *The Lancet*, vol. 391, no. 10120, 2018, pp. 541–551., https://doi.org/10.1016/s0140-6736(17)33102-1.

Low Calorie Diets and Remission

- Diabetes Remission Clinical Trial (DiRECT) intervention group:
  - Participants ate ~850 calories per day for three months
  - Followed by 2-8 weeks on a food reintroduction program
  - Followed by wt loss maintenance program and monthly check-ins

Lean, Michael EJ, et al. "Primary Care-Led Weight Management for Remission of Type 2 Diabetes (Direct): An Open-Label, Cluster-Randomised Trial." *The Lancet*, vol. 391, no. 10120, 2018, pp. 541–551., https://doi.org/10.1016/s0140-6736(17)33102-1.

Low Calorie Diets and Remission

- Diabetes Remission Clinical Trial (DiRECT)
  - After one year:
    - 46% of low-calorie diets achieved remission
    - 4% of standard diet participants achieved remission
    - Of those who gained weight during the study, zero achieved remission

Lean, Michael EJ, et al. "Primary Care-Led Weight Management for Remission of Type 2 Diabetes (Direct): An Open-Label, Cluster-Randomised Trial." *The Lancet*, vol. 391, no. 10120, 2018, pp. 541–551., https://doi.org/10.1016/s0140-6736(17)33102-1.

Low Calorie Diets and Remission

- Diabetes Remission Clinical Trial (DiRECT) suggests remission is closely related to weight loss
- Average wt. at start: 223 lbs. / 101 kg
  - Lost 0-11 lbs. (0-5 kg), 7% achieved remission;
  - Lost 11-22 lbs. (5-10 kg), 34% achieved remission;
  - Lost 22-33 lbs. (10-15 kg), 57% achieved remission;
  - Lost 33 lbs. (15kg) or more, 86% achieved remission.

Lean, Michael EJ, et al. "Primary Care-Led Weight Management for Remission of Type 2 Diabetes (Direct): An Open-Label, Cluster-Randomised Trial." *The Lancet*, vol. 391, no. 10120, 2018, pp. 541–551., https://doi.org/10.1016/s0140-6736(17)33102-1.

Low Calorie Diets and Remission

- Diabetes Remission Clinical Trial (DiRECT)
  - Two-year results (Lancet, 5/2019) showed that 70% of those in remission at the first year maintained remission
  - The average weight loss at two years was about 17 pounds (7.6 kg)

Lean, Michael E, et al. "Durability of a Primary Care-Led Weight-Management Intervention for Remission of Type 2 Diabetes: 2-Year Results of the Direct Open-Label, Cluster-Randomised Trial." *The Lancet Diabetes & Endocrinology*, vol. 7, no. 5, 1 May 2019, pp. 344–355., https://doi.org/10.1016/s2213-8587(19)30068-3.

Effectiveness of Weight Loss in T2D

Percent Weight Loss from Initial Weight	Results
≥5%	Benefit on glycemic control, lipids, and blood pressure Recommended for most people w/ T2D and BMI ≥25
≥15% *When feasible and safe	Optimal, especially in those who are newly diagnosed.
Clinical benefit of weight loss is progressive; more intensive loss maximizes benefit	

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

Lean, Michael E, et al. "Durability of a Primary Care-Led Weight-Management Intervention for Remission of Type 2 Diabetes: 2-Year Results of the Direct Open-Label, Cluster-Randomised Trial." *The Lancet Diabetes & Endocrinology*, vol. 7, no. 5, 1 May 2019, pp. 344–355., https://doi.org/10.1016/s2213-8587(19)30068-3.

Nutrition for Weight Management

- Weight loss is primarily associated with energy-reduction NOT macronutrient composition or type of eating pattern
  - For weight loss, aim for 500-750 kcals/day energy deficit
- Calorie restriction
  - 3500 calories = 1 pound
    - Fat: 9 kcals/gram
    - Protein and carbohydrate: 4 kcals/gram
  - Calorie deficit of 500 kcals/day = 1 lb. wt. loss/wk.

Challenges: Diabetes Meds & Weight

- Glucose-lowering medications may impact weight

Impact on Weight	Medication Class
Associated w/ Some Degree of Weight Loss	Metformin, alpha-glucosidase inhibitors, SGLT-2 inhibitors, GLP-1 RAs, amylin mimetics
Weight Neutral	DPP-4 inhibitors
Associated w/ Some Degree of Weight Gain	Sulfonylureas, TZDs, meglitinides, insulin

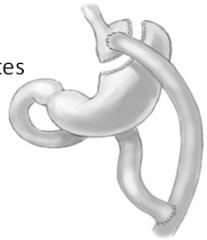
- When selecting a med, consider impact on weight

Meds for Weight Loss

- Weight loss meds can be effective (>5% weight loss after 3 months) when used with diet, activity, and behavior change
  - Consider for those with T2DM and BMI ≥ 27 kg/m^2
  - Med should be discontinued if early response to it is ineffective (<5% weight loss after 3 months)

Metabolic Surgery for Weight Loss

- Recommended as an option to treat T2DM for screened surgical candidates with:
  - BMI ≥ 40 kg/m^2
  - BMI 35 - 39.9 kg/m^2 for those who don't achieve wt. loss w/ nonsurgical methods



**All BMI thresholds need to be reduced by 2.5 kg/m^2 for Asian Americans*

Metabolic Surgery for Weight Loss

- Considered as an option to treat T2DM for screened surgical candidates with:
  - BMI 30 – 34.9 kg/m^2 for those who don't achieve wt. loss w/ nonsurgical methods

**All BMI thresholds need to be reduced by 2.5 kg/m^2 for Asian Americans*

Metabolic Surgery for Weight Loss

Advantages in T2DM

- Diabetes remission in 30-63% of those with RYGB.
  - 35-50% of those who go into remission experience recurrence, but median disease-free period is 8.3 years.
- Many with diabetes will sustain glycemic improvement for 5-15 years.
- Additional health benefits

Metabolic Surgery for Weight Loss

Disadvantages in T2DM

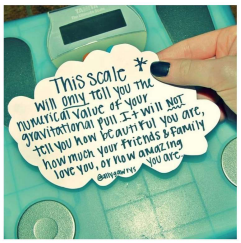
- Costly (but likely cost effective)
- Long-term concerns: dumping syndrome, anemia, osteoporosis, severe hypoglycemia, nutrient deficiency.
- Increased risk of substance use, new-onset depression/anxiety

Knowledge Check

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

A. Lose 10-15 lbs.
B. Lose 14-20 lbs.
C. Decrease his fat intake by 5-10%
D. Reconsider medications and try Metformin

Weight is a Heavy Issue



Weight and Respect

- If weighing is questioned or refused:
  - Be mindful of possible prior stigmatizing experiences
  - Consider the value of weight monitoring - is it needed to inform treatment decisions?
- Situate scales in a private area or room
- Measure and report weight non-judgmentally
- Take care to regard weight and BMI as sensitive health information

Weight and Respect

- ADA Standards:
  - Calculate BMI and document in medical record at annual visit
  - Be sensitive and allow for privacy when weighing
  - Use person-centered, nonjudgmental language

Using a Weight Neutral Approach

- Ask whether weight loss is a goal before assuming
- Remember: there are many indicators of success!

or

Setting Goals with a Weight Neutral Approach

- I will continue to care for my by body by doing [x].
- I will focus on small changes –such as checking my BG – instead of taking my weight daily
- I will increase my self worth by telling myself "I am worth self-care"

Healthy Eating Patterns & Macronutrients

Carbohydrates, Protein, & Fat

Healthy Eating Patterns

- Consensus Recommendation: Evidence suggests there is no ideal percentage of calories from carbohydrate, protein, and fat for people with diabetes.
- A healthy eating pattern should:
  1. ↑ non-starchy vegetables
  2. ↓added sugars and refined grains
  3. Choose whole foods over highly processed foods when possible
- This limits saturated and trans fats, added sugar, and sodium.

Carbohydrates & Sweeteners

Sugars, High Intensity Sweeteners,
Sugar Alcohols, Starch & Fiber

Carbohydrates

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

Carbohydrates

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

Carbohydrates

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

Sugars

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

Fructose as a Sweetener

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

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

Fructose in Fruit

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

Sugar Sweetened Beverages (SSBs)

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

Hypoglycemia Treatment

- Treat hypoglycemia with 15-20g fast-acting carbs if glucose level reaches <70 mg/dl
  - Best option: pure glucose
  - Other options: glucose-containing carbs
  - Do NOT select foods with fat, or, particularly in person with type 2 diabetes, foods with protein
- Recheck 15 minutes later; retreat if still low
- Real-world tip: Often, liquid sugars are a "quicker" treatment than solids like hard candies

High Intensity Sweeteners

- Ingredients used to sweeten and enhance the flavor of foods
- FDA approved for consumption by the general public and PWD
- Significantly sweeter than sucrose, so smaller amounts are needed to achieve the same sweetness as sugar in food
- Other names: sugar substitutes, nonnutritive, artificial, or low-calorie sweeteners

High Intensity Sweeteners

- Six are approved by the FDA as food additives
  1. Saccharin
  2. Aspartame
  3. Acesulfame potassium
  4. Sucralose
  5. Neotame
  6. Advantame
- GRAS Sweeteners
  1. Stevia
  2. Siraitia grosvenorii Swingle fruit (Monk Fruit)

High Intensity Sweeteners

- Current consensus statement from ADA:
  - High Intensity Sweeteners contribute no/few calories to the diet and generally do not raise blood sugar levels
    - Could reduce overall calorie/carb intake, as long is there is no compensatory energy increase elsewhere
    - Mixed evidence regarding weight management

High Intensity Sweeteners

- Current consensus statement from ADA:
  - "Using sugar substitutes does not make an unhealthy choice healthy; rather, it makes such a choice less unhealthy."
  - Overall, encourage fewer SSBs.
  - Ok to use nonnutritive-sweetened beverages as an alternative, but emphasize water intake

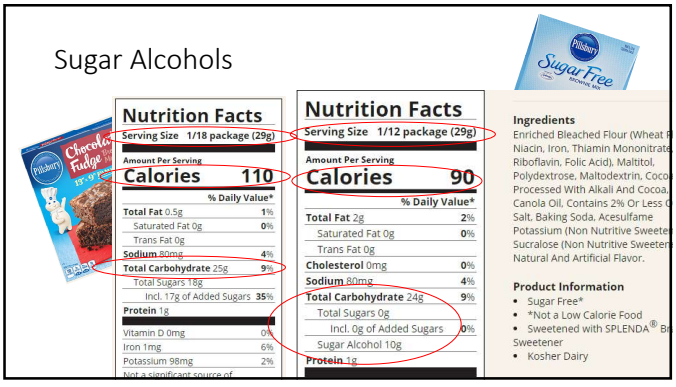
Sugar Alcohols

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

Sugar Alcohols

- Little evidence on benefit for people with diabetes
- Consumption produces a small rise in blood glucose
  - Postprandial response is lower than with fructose, glucose, or sucrose

Sugar Alcohols



Starch

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

Fiber

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

Fiber

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

Fiber

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

Fiber

- Two varieties of fiber
  1. Soluble: dissolves in water
     - Associated with improved BG and ↓ blood cholesterol
     - Goal: 7-13 grams/day
     - Sources: oatmeal, oat bran, apples, pears, psyllium, barley, legumes
  2. Insoluble: does not dissolve in water
     - Moves food thru the GI system, helping to prevent constipation
     - Sources: whole wheat and grains, nuts, beans, and vegetables

Knowledge Check

Which of the following is true about sucrose digestion?

A. Sucrose is broken down into glucose & fructose, and the fructose is metabolized almost completely in the liver
B. Sucrose is broken down into glucose & maltose, and the glucose is metabolized almost completely in the liver
C. Sucrose is broken down into glucose & fructose, and the glucose is metabolized almost completely in the liver
D. Sucrose is broken down into glucose & maltose, and the maltose is metabolized almost completely in the liver

Knowledge Check

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

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

Protein

Protein Sources

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

Protein

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

Protein

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

Protein & CKD

- Dietary protein in diabetes management for persons with kidney disease (nondialysis-dependent stage 3 CDK or higher)
  - Intake should be 0.8g protein/kg body weight/day
    - Less doesn't provide benefit and may increase malnutrition risk
    - More is associated with accelerated decline in kidney function

Protein & CKD

- For persons with diabetes on dialysis
  - Malnutrition is common
  - Intake higher than 0.8g protein/kg body weight/day should be considered to reduce risk of malnutrition

Protein

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

Protein

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

Fats

Trans, Saturated, & Unsaturated Fats

Fats

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

Fats

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

Saturated Fat

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

Saturated Fat

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

Trans Fat

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

Trans Fat

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

Trans Fat

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

*GRAS: "generally recognized as safe"

Mono and Polyunsaturated Fats

- "Healthy Fats": eating patterns rich in these can improve glycemic control and blood lipids (Ex: Mediterranean diet)

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

Mono and Polyunsaturated Fats

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

Mono and Polyunsaturated Fats

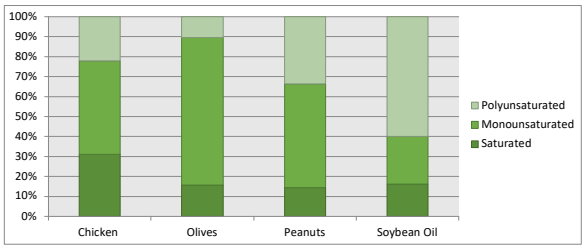
- Evidence does not conclusively support recommending omega-3 (EPA and DHA) supplements for all people with diabetes for the prevention or treatment of cardiovascular events

Knowledge Check

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

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

Knowledge Check: Answered



Knowledge Check

Olive oil and canola oil are good sources of:

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

Macronutrients & Supplements

Sodium

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

Micronutrients & Supplements

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

Micronutrients & Supplements

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

Micronutrients & Supplements

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

Micronutrients & Supplements

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

Alcohol

Alcohol & Glycemia

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

Alcohol & Glycemia

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

Alcohol & Glycemia

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

Alcohol & Glycemia

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

Knowledge Check

Chris has had T1D for 30 years. He uses MDI and wears a CGM. He is out celebrating and has 4 rum and cokes and appetizers. He takes insulin for his carbs. When he gets home, his Dexcom shows his glucose at 162 mg/dl. Drinking alcohol put Chris at risk for:

A. Hyperglycemia through the night due to gluconeogenesis
B. Hyperglycemia through the next day
C. DKA due to ketone production associated with excessive alcohol consumption
D. Hypoglycemia due to inhibition of gluconeogenesis in the liver

Nutrition Interventions for Special Populations

Youth, Pregnancy, Celiac Disease, and Eating Disorders

Youth with Diabetes

- Key concepts for youth with all types of diabetes
  - Meet energy requirements for growth and activity
  - Use *food plan* or *meal plan* rather than *diet*
  - Engage the child or adolescent in planning, shopping, and preparing healthy foods for the entire family

Youth with Diabetes

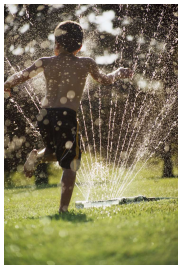
- In all youth with diabetes who also have dyslipidemia, use MNT to support the following changes:
  - Limit calories from fat: 25-30%
  - Limit calories from saturated: <7%
  - Limit cholesterol: <200 mg/day
  - Avoid trans fat
  - Aim for ~10% of calories from monounsaturated fat
  - If triglycerides are elevated, focus on ↓ simple sugar and ↑ omega-3s

Youth with T1D

- Provide individualized MNT
- Balance carbohydrate intake and insulin to optimize glycemic management
- Integration of insulin regimen into lifestyle
- Withholding food to prevent hyperglycemia or having a child eat without an appetite to avoid hypoglycemia is discouraged.

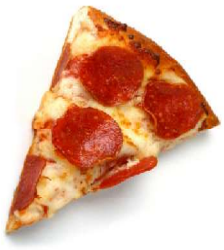
Youth with T1D

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



T1D & Flexible Insulin Therapy

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



Youth with T2D

- Youth and family must prioritize lifestyle modifications
  - Dietary recommendations:
    - Focus on nutrient dense, high quality foods / decrease calorie-dense, nutrient-poor foods (particularly SSBs)
  - Increase exercise
  - Aim for sustainable 7-10% decrease in excess weight for youth with overweight/obesity

Pregnancy

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

Pre-pregnancy BMI and Weight Gain

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

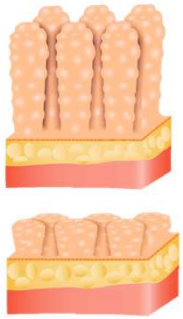
Moore Simas, T. A., Waring, M. E., Sullivan, G. M., Liao, X., Rosal, M. C., Hardy, J. R., & Berry Jr, R. E. (2013). Institute of Medicine 2009 gestational weight gain guideline knowledge: Survey of obstetrics/gynecology and family medicine residents of the United States. *Birth*, *40*(4), 237–246. https://doi.org/10.1111/birt.12061

DRIs and Pregnancy

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

Celiac Disease

- Immune-mediated disorder where destruction of the small intestine villi occurs following exposure to gluten
  - Interferes with nutrient absorption
- Occurs at an increased frequency in people with T1D
  - 1%-16% of individuals compared to 0.3%-1% in general population



Celiac Disease

- Diagnosis via blood tests and a small intestine biopsy
  - Soon after the dx of T1D, screen for celiac by:
    - If normal serum IgA, measure IgA-tTG antibodies
    - If IgA deficient, measure tTG-IgG or DGA-IgG
  - Repeat within 2 and at 5 years of dx

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

Celiac Disease

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

Nutrition Interventions: Celiac Disease

Gluten Free Whole Grains & Starches include:

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

**Oats are inherently gluten-free may be contr growing or processing.*

Disordered Eating Patterns

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

Disordered Eating Patterns

- Consider screening for these patterns when hyperglycemia and weight loss are unexplained
- Multidisciplinary team approach to treatment is a standard of care
  - Early referral to mental health professional

Disordered Eating Patterns

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

Knowledge Check

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

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

Knowledge Check

What are the nutrient goals for pregnant women?

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

Nutrition to Support the Management of Diabetes Complications

Mediterranean Diet

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

DASH Diet

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

Plant-Based Eating

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

Nutrition for Lipid Management

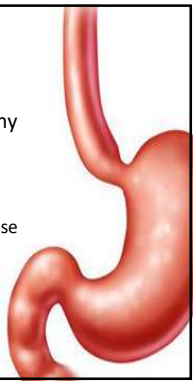
- Consider a calorie-restricted (for wt. loss) Mediterranean-style or DASH eating pattern
- Reduce saturated and trans fat, increase omega-3 fatty acids
- Increase fiber
- Increase plant stanols/sterols

Nutrition for Hypertension

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

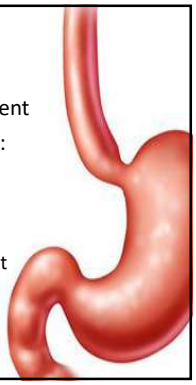
Nutrition for Gastroparesis

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



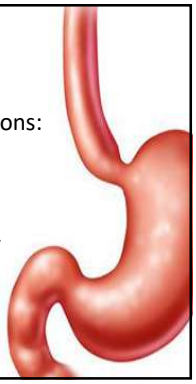
Nutrition for Gastroparesis

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



Nutrition for Gastroparesis

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



Knowledge Check

Jane has type 1 diabetes and was recently diagnosed with gastroparesis. She is a runner and has not been able to exercise recently due to nausea, vomiting, bloating, and intestinal pain. She experiences lows about 3 times a week. What hypoglycemia treatment should she use?

A. Juice
B. Fruit
C. Glucose tablets or gels
D. Peanut butter crackers

Meal Planning & Recommended Eating Plans

Meal Planning & Recommended Eating Plans

- Plate Method
- Carbohydrate considerations:
  - Exchanges
  - Carbohydrate Counting

Meal Planning: Strategies for Carb Management

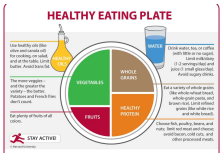
Therapy	Strategies for Carbohydrate Management
Nutrition therapy only or on meds excluding insulin or insulin secretagogues	Use carbohydrate management strategies such as reducing overall carb intake, portion sizes, plate method, or food exchange lists
Fixed insulin doses or insulin secretagogues	Educate on carbohydrate consistency with respect to time and amount. Use tools such as carbohydrate counting or choices, plate method, simplified meal plan, or food exchange lists
Flexible insulin therapy	Educate on carbohydrate counting and using an insulin-to-carb ratio

Plate Method

- MyPlate introduces simple nutrition
  - Emphasizes portion control and healthy food choices
  - Using a small plate and filling ½ plate with fruits and veg helps with calorie management
  - Consider using with:
    - Individuals with T2D not on insulin
    - Those with limited health literacy or numeracy
    - Older adults prone to hypoglycemia

Plate Method Alternatives

- Harvard School of Public Health alternative =“Healthy Eating Plate”
  - Visit www.hsph.harvard.edu/nutritionsource
- ADA alternative = “Diabetes Plate Method”
  - Visit diabetesfoodhub.org



Exchanges

- The exchange system groups like foods that have similar nutritional value (specifically macronutrient and caloric value) into exchanges that can be swapped for another
  - Example: the "starch" category has food items in predetermined servings that are ~80 kcals, ~15g of carb, and ~3g protein
- An individual may count the number of food exchanges in each category at each meal/thru the day

Exchanges

Advantages

- Allows for flexibility and personalization
- Encourages consistency in the timing and amounts at meals and snacks

Disadvantages

- Requires learning how to fit unlisted foods into the plan (especially today with so many food choices)
- Less attention given to micronutrient content

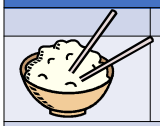
Exchanges

- Categories within the exchange system
  - Starch 
  - Fruit
  - Dairy / Milk 
  - Sweets/ Dessert 
  - Vegetable 
  - Meat / Protein 
  - Fats 
  - "Free" 

	Exchange	Carb	Prot	Fat	Cals	Examples
	Starch	15	3	0-1	80	⅓ cup beans, lentils, peas, rice, ½ cup cooked cereal, corn, potato, pasta 1 oz. bread (1 slice) or bagel (½), ½ english muffin
	Fruit	15	0	0	60	1 small apple or kiwi, ½ large banana, 1¼ cup whole strawberries, 1 cup raspberries, ¾ cup blackberries, ½ (most) to ⅓ (grape, cran) cup juice
	Dairy / Milk	12	8	0-8	90-120	1 cup milk, 8 oz. plain yogurt (any fat content)
	Sweets/ Desserts	15	Varies	Varies	Varies	¼ cup granola, 1 small granola bar, ½ cup frozen fruit yogurt, ½ cup ice cream (any flavor)

	Exchange	Carb	Prot	Fat	Cals	Examples
	Veggies	5	2	0	25	1 cup raw vegetables, ½ cup cooked vegetables of vegetable juice
	Meat / Protein	0	7	1-8	35-100	1 oz. fish, chicken, beef, pork or cheese, ½ cup tofu, 1 egg
	Fat	0	0	5	45	1 tsp. oil, butter, or mayo, 6 almonds, 2 whole walnuts
	Free	0-5	0	0	0-25	Sugar free gelatin, 1 tbsp catsup 2 tsp sugar free jam, 1-2 tbsp sugar free syrup, coffee, tea, spices

General Rules for Serving Sizes

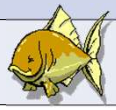
	Exchange	Category	Measure
	Starch	Beans/Lentils/Peas/Rice	⅓ cup
		Cooked Cereals/Pasta/Potato	½ cup
		Bread Products	1 ounce
	Fruit	Fresh	1 small piece
		Dried	¼ cup
		Juice/Canned/Applesauce	½ cup
		Cubed Melon	1 cup

General Rules for Serving Sizes

Exchange	Category	Measure
Dairy / Milk	Skim, 1%, 2%, Whole	1 cup
	Ice Cream	½ cup
	Yogurt	1 cup
Sweets / Desserts	Cookies	1 small (1¾")
	Granola	¼ cup
	Cake	1½" square

General Rules for Serving Sizes

Exchange	Category	Measure
Vegetables	Raw	1 cup
	Cooked	½ cup
	Juice	½ cup
Protein	Meats/Chicken/Fish	1 ounce
	Cheese	1 ounce
	Egg	1



General Rules for Serving Sizes

Exchange	Category	Measure
Fat	Avocado	1/8 whole
	Butter/Margarine/Oil/Mayo	1 tsp
	Nuts/Seeds	1 tbsp
Free	Coffee, tea	Unlimited
	SF Syrup	1-2 tbsp
	SF Jam/Jelly	2 tsp

Carbohydrate Counting

- Reading nutrition facts to carb count
  1. Look at the serving size
  2. Look at "Total Carbohydrates"
  3. Adjust the count depending on the number of servings that will be eaten
  4. Total the carbs for all items in the snack/meal

Nutrition Facts

8 servings per container

Serving size **2/3 cup (55g)**

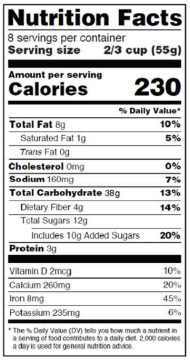
Amount per serving

Calories **230**

	% Daily Value*
Total Fat 8g	**10%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 38g	**13%**
Dietary Fiber 4g	**14%**
Total Sugars 12g	
Includes 10g Added Sugars	**20%**

Carbohydrate Counting

- Things to consider:
  - Will simpler portion guidelines (like the plate model) suffice?
  - Does the PWD have measuring tools? Does the PWD feel comfortable doing the math?
  - Is the PWD motivated to learn carb counting?



Nutrition Facts

8 servings per container

Serving size **2/3 cup (55g)**

Amount per serving

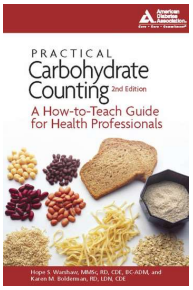
Calories **230**

	% Daily Value*
Total Fat 8g	**10%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 38g	**13%**
Dietary Fiber 4g	**14%**
Total Sugars 12g	
Includes 10g Added Sugars	**20%**
Protein 3g	
Vitamin D 2mcg	10%
Calcium 260mg	20%
Iron 8mg	45%
Potassium 235mg	6%

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Tips for Carb Counting

- Understanding and teaching carb counting:
  - Practice carb counting your own meals!
  - Keep foods in your office for practice
  - Encourage the PWD to bring in familiar foods into the office to practice with you
  - Encourage a "cheat sheet" with counts for regularly consumed foods



Tips for Carb Counting

- Understanding and teaching carb counting:
  - Buy measuring cups/spoons at the dollar store
  - Watch/share online tutorials on fractions
  - Encourage a calculator for math
  - Encourage the PWD practice/record using food logs; review logs prior to moving on to more complicated topics like using an ICR
  - Encourage books, phone apps, and carb counting sheets for assistance

Tools for Carbohydrate Counting

- Resources for carbohydrate counting:
  - Calorie King (book, website, smartphone application for iOS and Android)
  - Diabetes Tracker (app $)
  - MyFitnessPal (smartphone application for iOS and Android)
  - Nutrition.gov (website)
  - Smart food scales

Nutrition Facts

12 servings per container

Serving size	**1 cup (31g)**
Amount Per Serving	
Calories	**120**
	% Daily Value*
Total Fat 0.5g	1%
Saturated Fat 0g	0%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 210mg	10%
Total Carbohydrate 26g	9%
Dietary Fiber 2g	7%
Total Sugars 3g	
Includes 4g Added Sugars	8%
Protein 2g	4%

NOTE: The 1 cup measure as the serving size is for convenience only! All information provided by the Nutrition Facts label is based on the weight (the information in parentheses) of the food serving.

Tools for Carbohydrate Counting

- Smart food scales can be purchased to do the math

Kitrics Nutritional Scale

Perfect Portions Scale

Case Study: Patient L.J.

- L.J. is a 43 year old female dx with T2DM 8 days ago
- At dx, her PCP started her on the following medications:
  - Metformin: 1000 mg BID
  - Crestor: 10 mg per day
  - Amlodipine: 5 mg per day

Lab Work / Vitals at Dx	
BMI	29.6 kg/m^2
A1C	6.9%
Total Cholesterol	198 mg/dL
LDL	127 mg/dL
HDL	36 mg/dL
Triglycerides	207 mg/dL
BP	148/90 mm Hg

Case Study: Patient L.J.

Other important considerations:

- Eager to making dietary changes
- Has a family hx of CVD
- Has a strong family support system
- Enjoys a variety of foods, cooking with her family, and her husband's favorite dishes are chicken mole and pollo verde
- Would like to increase the nutritious foods in her children's diet, as well.

DASH Diet

- Addresses elevated blood pressure and other CV risk factors
- Incorporates chicken, where plant-based eating would minimize fleshy foods

Case Study: Patient C.S.

- C.S. is a 68 year old male dx with with T2DM 13 years ago
- Current medications:
  - 30u Lantus QHS
  - 10u Novolog TID before B, L, D
  - 1000 mg Metformin XR BID
  - Lipitor 20 mg/day
  - Lisinopril 10 mg/day
- Other important considerations:
  - Low health numeracy
  - Has hypoglycemia unawareness
  - Lives alone

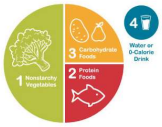
Most Recent Lab Work / Vitals	
BMI	35.2 kg/m^2
A1C	7.9%
Total Cholesterol	176 mg/dL
LDL	103 mg/dL
HDL	49 mg/dL
Triglycerides	122 mg/dL
BP	128/82 mm Hg

C.S.'s Diet Recall

Fasting BG	Breakfast Meal	2 Hrs PP
102	2 eggs scrambled with ½ cup beans and fajita vegetables, ½ large banana, 1 cups milk	172
-	2 eggs, 4 pieces turkey bacon, 2 slices bacon, water	58
117	1 cup cooked oatmeal, 1 large banana 1 cup milk, 1 hardboiled egg	199
108	Large Carmel Macchiato and breakfast sandwich	257
130	1 cup granola, 1.5 cups milk	223
-	4 corn tortillas, 2 scrambled eggs w/ potatos, peppers, and onions	200
140	1 large banana with peanut butter, water	165

ADA's Plate Method

- Encourages consistent carbohydrate intake to help balance fixed insulin dosages
- Balance carbohydrates with protein/veg
- Simple and avoids complicated math



Calculating Mealtime Insulin

Carbs & Carb Ratios PLUS Blood Sugar & Correction Factors

Meal Planning: Strategies for Carb Management

Therapy	Strategies for Carbohydrate Management
Nutrition therapy only or on meds excluding insulin or insulin secretagogues	Use carbohydrate management strategies such as reducing overall carb intake, portion sizes, plate method, or food exchange lists
Fixed insulin doses or insulin secretagogues	Educate on carbohydrate consistency with respect to time and amount. Use tools such as carbohydrate counting or choices, plate method, simplified meal plan, or food exchange lists
Flexible insulin therapy	Educate on carbohydrate counting and using an insulin-to-carb ratio

Calculating Mealtime Insulin

- Carb counting and using an insulin-to-carb ratio (ICR)
  - Can be used with flexible insulin therapy, including MDI and CSII, where bolus insulin is used at mealtimes

Pros	Cons
• Flexibility for the PWD • Insulin/food matched precisely = improved BGs	• It is easy to lose sight of overall nutritional quality

Calculating Mealtime Insulin

- To calculate mealtime insulin, you will need the following pieces of information:
  - Total grams of carbohydrate being eaten
  - Carbohydrate ratio (ICR)

  } Food Bolus

  - Current BG
  - Target BG
  - Correction ratio/factor (ISF)

  } Correction Bolus

- To get the total bolus, add the food bolus and correction bolus

Calculating Mealtime Insulin

- ICR: specifies how many grams of carb are "covered" by 1 unit of insulin
  - For example, a 1-unit-per-10-grams-of-carb (1:10) ratio means that one unit of insulin will cover 10 grams of carb
  - ICRs are personalized
- Use this formula to calculate the amount of insulin needed for carbs:

$$\frac{\text{Total carbs (g)}}{\text{ICR}} = \text{Food Bolus}$$

# of units of insulin required to cover carbs

Calculating Mealtime Insulin

Example: Kathy needs to take her Novolog for a meal that has 86 grams of carbohydrate. Her insulin to carb ratio is 1:8. She uses an insulin pen. How many units of insulin does she need to cover her food?

86 grams of carb ÷ 8 = 10.75 units of insulin

$$\frac{\text{Total carbs (g)}}{\text{ICR}} = \textbf{Food Bolus}$$

# of units of insulin required to cover carbs

Calculating Mealtime Insulin

- Insulin sensitivity factor (ISF): specifies how far a unit of bolus insulin will lower blood glucose
  - For example, a 1-unit-per-50 mg/dl (1:50) factor indicates that 1 unit of insulin will lower the blood glucose by 50 mg/dl.
  - Also referred to as a "correction factor"
- Use the following formula to calculate insulin to lower BG to goal:

$$\frac{\text{(Current BG – Goal BG)}}{\text{ISF}} = \textbf{Correction Bolus}$$

# of units of insulin required to bring blood sugar to goal

Calculating Mealtime Insulin

Example: Kathy checks her blood sugar and it is 280 mg/dl. Her goal blood sugar is 120 mg/dl. Her ISF is 1:40. How many units of insulin does she need to lower her glucose to target?

$$\frac{(280 \text{ mg/dl} - 120 \text{ mg/dl})}{40} = 4.0 \text{ units of insulin}$$

$$\frac{\text{(Current BG – Goal BG)}}{\text{ISF}} = \textbf{Correction Bolus}$$

# of units of insulin required to bring blood sugar to goal

Calculating Mealtime Insulin

$$\frac{\text{Total carbs (g)}}{\text{ICR}} = \text{Food Bolus} \quad + \quad \frac{\text{(Current BG – Goal BG)}}{\text{ISF}} = \text{Correction Bolus} \quad = \text{Total Bolus}$$

Calculating Mealtime Insulin

Food Bolus		Correction Bolus		Total Bolus
Kathy needs to take her Novolog for a meal that has 86 grams of carbohydrate. Her insulin to carb ratio is 1:8		Kathy checks her blood sugar and it is 280 mg/dl. Her goal blood sugar is 120 mg/dl. Her ISF is 1:40.		Add the food bolus and correction bolus to get the total
10.75 units	+	4.0 units	=	**14.75 units**
Since Kathy is using an insulin pen…			=	**15 units**

Calculating Mealtime Insulin

- On the exam, round your final answer when using an insulin pen or syringe
  - Round up to nearest whole unit if ≥ 0.5
  - Round down to nearest whole unit if ≤ 0.4
- On the exam, is ok to use decimal places if PWD uses CSII
- In real life, consider:
  - Insulin sensitivity
  - Starting blood sugar
  - What's happening next

Knowledge Check

Erandy is going to eat the following breakfast: A whole english muffin, 2 scrambled eggs with 1 oz cheese, ½ a large banana, and an 8 oz. glass of 1% milk. How many grams of carbohydrate is she having?

A. 42g
B. 57g
C. 60g
D. 72g

Knowledge Check: Answered

Food	Amount	Carbs (g)
English muffin	1 whole	15 x 2 = 30
Eggs, scrambled	2	0 x 2 = 0
Cheese	1 oz.	0 x 1 = 0
Banana, large	½	15 x 1 = 15
Milk, 1%	8 oz.	12 x 1 = 12
Total		**57g**

Knowledge Check - Continued

Now Erandy checks her BG and it is 298 mg/dl. Her goal BG is 150 mg/dl. How much Humalog insulin will she need to take by syringe if her carb ratio is 1:12 and her correction factor is 1:60?

A. 7 units
B. 7.2 units
C. 8 units
D. 9.7 units
E. 10 units

Knowledge Check - Answered

1) Calculate the food dose
   1) Total Carbs: 57g
   2) ICR: 1:12

   $57g \div 12 = 4.75$ units

2) Calculate the correction dose
   1) Current blood sugar: 298 mg/dl
   2) Goal blood sugar: 150 mg/dl
   3) ISF: 1:60

   $\frac{(298 - 150)}{60} = 2.46$ units

$$\frac{\text{Total carbs (g)}}{\text{ICR}} = \text{Food Bolus} + \frac{\text{(Current BG – Goal BG)}}{\text{ISF}} = \text{Correction Bolus}$$

Knowledge Check - Answered

• Erandy will need: 4.75 units + 2.46 units = 7.21 units
= 7 units

*Remember: Since Erandy is injecting her insulin with a syringe, she is limited to giving herself whole units of insulin

Knowledge Check

The Nutrition Facts panel on a package of cookies reveals that there are 28 g of carbohydrate and 5 grams of fat in 2 cookies. If Ryan eats 4 cookies, how many carbohydrate and fat servings will he consume?

A. 2 carb serving and 1/2 fat serving
B. 2 carb servings and 1 fat serving
C. 4 carb servings and 1 fat servings
D. 4 carb servings and 2 fat servings

Knowledge Check

Grace has T2DM controlled with lifestyle. Her typical weekday breakfast is 2 eggs, 2 slices turkey bacon, 1 slice WW toast with margarine, and ½ cup apple juice. Her 2-hour post-prandial BG generally runs <140. She has noticed that on weekends, when she eats her breakfast consisting of 1 English muffin with margarine, ½ banana, and 1 cup skim milk her 2-hour post-prandial BG generally runs higher. Why?

A. Breakfast carbohydrate intake is higher on the weekend
B. Breakfast carbohydrate intake is lower on the weekend
C. Physical activity is likely lower on the weekend
D. Variation in meal timing is contributing to glucose variation

Activity, Movement, & Exercise

Types & Benefits of Exercise

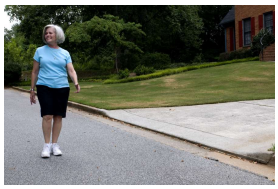
Aerobic, Resistance Training, and Flexibility

Types of Exercise: Aerobic Activity

- Aerobic, also called "Cardio"
  - Repeated/continuous movement of the same large muscle groups
  - Typically have the greatest acute impact on BG
  - Examples: walking, biking, dancing, swimming
- Studies show benefit of walking 10,000 steps a day
  - 2,000 steps = 1 mile

Impact of Aerobic Activity on DM

- BG improves for 2-72 hours after aerobic activity; thus need to do it regularly to maintain improved BGs
- Postprandial exercise can prevent/reduce the rise in BG levels that occurs after eating



Types of Exercise: Resistance Training

- Use of muscular strength to move a weight or work against a resistive load
- Increases strength, endurance, and overall calories burned in a day
- Example: weightlifting, sprinting

Impact of Resistance Training on DM

- Resistance training may improve glycemic levels more than aerobic activity in T2D
  - Best results come from mix of resistance and aerobic
  - Results are less clear for individuals with T1D

Impact of Resistance Training on DM

- Resistance exercise may weaken the exercise related decrease in BGs during and after exercise
  - In T1D: complete resistance training 1st, aerobic training 2nd to ↑ glycemic stability ↓ post exercise hypo
- Key for older adults for maintaining independence
  - Improved strength/balance reduces fall risk
  - Increases mobility

Types of Exercise: Flexibility

- Flexibility (stretching / postural):
  - The ability to move a joint through complete range of motion
  - Examples: Yoga, tai chi, or other with balance, agility, coordination

Impact of Flexibility Training on DM

- Benefits less established than other exercise types
  - Yoga and tai chi may improve glucose and lipid levels, body comp, neuropathic symptoms, and quality of life
  - May help prevent falls
- Minimal precautions needed with this type of activity

Sedentary Time: The benefit of Reducing It

- Long-periods of sedentary activity (regardless of physical activity) may be associated with the onset of T2D.
  - Encourage breaks in sedentary activity every 30 minutes
  - Small increases in activity may reduce mortality from all causes and improve insulin resistance/BG, BP, and BMI

Exercise Goals for Various Populations

Children, Adults, and Older Adults

Exercise: All Children

- Exercise Goals:
  - Aerobic: 60 minutes of moderate to vigorous-intensity activity daily
  - Resistance training: at least 3 days/week
- Other considerations if using insulin
  - Due to risk of hypo, advise frequent glucose monitoring before, during, and after. Use CGM when possible
  - Educate on targets, management of blood sugars including hypo

Exercise: Children with T1DM

- If using insulin, educate on strategies to prevent hypo before, during, and after exercise. Consider:
  - Lowering meal or snack time insulin before exercise
  - Reducing basal insulin
  - Increasing carb intake
  - Eating a bedtime snack
- Some of these recommendations may be helpful for kids with T2DM on insulin, as well.

Exercise: Adults with Prediabetes

- Exercise Goals:
  - Increase moderate-intensity physical activity to at least 150 minutes/week
    - Example: brisk walking
    - May include resistance training
  - Break-up sedentary time
- Achieving the behavioral goal of 150 minutes of physical activity per week reduces the incidence of type 2 diabetes by 44% (even w/o weight loss!)

Exercise: Adults with T1 or T2 Diabetes

- Exercise Goals:
  - Aerobic: ≥150 minutes/week of moderate to vigorous-intensity activity
    - Tips: spread over 3 or more days/week with no more than 2 consecutive days w/o activity
    - For those who achieve weight loss goals, long-term maintenance is supported by 200-300 minutes/week
  - Resistance exercise: 2-3 sessions/week on nonconsecutive days

Exercise: Adults with T1 or T2 Diabetes

- Exercise Goals:
  - Sedentary Time: All adults, particularly those with T2DM, should reduce sedentary time
    - Interrupt sitting every 30 minutes
  - Flexibility and balance training: recommended 2-3x per week for older adults

Hormone Response with Diabetes & Exercise

Physiology of Exercise

Physiology of Exercise: Without Diabetes

- Blood glucose levels remain stable
- Normoglycemia is largely driven by hormones
  - Insulin, glucagon, epinephrine, growth hormone, and cortisol
- Initial energy: supplied from glucose in the muscle and liver glycogen
- Later energy: TG's in adipose break into FFA's
  - Occurs 20-40 minutes into activity

Hormone Response Without Diabetes

- Insulin production is decreased
- Counter-regulatory hormones increase
  - Release stored glucose and breakdown glycogen
- Glycogen stores are replenished up to 48 hours after completion of exercise

Hormone Response with T1D / Insulin Use

- Exogenous insulin remains high and can block counter-regulatory hormones
  - Injected/pumped insulin continues to be released from subq depots (and at a faster rate)
  - Cannot be regulated without pre-exercise planning
- Increased insulin absorption/sensitivity

Hormone Response w/o Insulin or Secretagogues

- Decreased secretion of endogenous insulin
  - Counter-regulatory hormones kick in as needed
- Increased sensitivity to insulin
- Results in improved blood glucose levels

Hypoglycemia & Hyperglycemia with Activity

Hypoglycemia Risk and Prevention plus Hyperglycemia

Exercise, Medications, and Hypoglycemia

- Fear of hypo is most reported barrier to exercise in individuals on insulin and insulin secretagogues
- If PWD has a low risk of hypo, communicate this to reduce the potential perceived risk

Exercise, Medications, and Hypoglycemia

- T1DM
  - Exogenous insulin can prevent the increased mobilization of glucose needed in exercise
- T2DM
  - Low risk for hypo if treated by diet and/or medications that do not cause hypo
  - Concern if on insulin, and/or insulin secretagogues
  - Anecdotal reports of hard-to-treat hypo with activity and GLP-1 agonists and pramlinitide

Hypoglycemia Risk

- Risk is high during and immediately after exercise
- Post exercise late onset hypoglycemia
  - More often seen in T1D
  - Associated with high intensity exercise >30 minutes
  - May occur at night and up to ~24 hours after exercise
- Best indicator of hypo risk is experience in the past

Hypoglycemia Prevention

- Planned exercise: reduce insulin or medications
- Unplanned exercise: eat a snack with carbohydrate
  - Consider a snack according to starting BG level and anticipated activity
  - Not recommended unless on insulin or insulin secretagogues
- Carry fast-acting carbohydrates
- Consume extra carb in the post-exercise period
- Caution use of alcohol after exercise

Hypoglycemia Prevention

Carbohydrate Replacement During Physical Activity			
Intensity	**Duration**	**Carb Replacement**	**Frequency**
Mild to Moderate	<30 minutes	May not be needed	N/A
Moderate	30-60 minutes	15 grams	Each hour
High	>60 minutes	30-50 grams	Each hour

Hyperglycemia Risk

- Hyperglycemia during exercise occurs when there is too little insulin in circulation
- T2D: Low risk of exercise worsening hyperglycemia
- T1D: Risk of hyperglycemia with exercise
  - Possible lack of insulin can impair glucose utilization
  - Excessive counter-regulatory hormones
  - Enhanced hepatic glucose production
  - Lipolysis and ketogenesis

Ketone Testing

- Type 1: recommendations vary but consider checking ketones in BG is >250 mg/dl
- Do NOT exercise if ketones are positive; can worsen hyperglycemia
- Not necessary to postpone exercise if BG is elevated, ketones are negative, and PWD feels well

Knowledge Check

Matt has T2D and runs 3-4 miles several times per week. Before his afternoon run on Tuesday his blood sugar is 156 mg/dl. After the run his BG was 43 mg/dl. Which of the following was not a possible contributor to the low?

A. Elevated exogenous insulin
B. Increased sensitivity to insulin
C. Increased insulin absorption
D. Elevated endogenous insulin

Knowledge Check

Which of the following describes the normal hormonal response and acute metabolic impact of physical activity?

A. Insulin levels increase to reduce FFA production
B. Glucagon rises and hepatic glucose production is increased
C. Both epinephrine and norepinephrine are reduced, and FFA production is inhibited
D. Growth hormone and cortisol are decreased, and insulin-stimulated glucose uptake is enhanced

Teaching Tools, Books & Cyber Monday Sale

Pancreas Partner plus DiaCell Teaching Tools

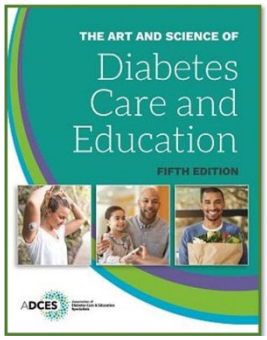
Captivate your students while explaining the pathophysiology of diabetes.

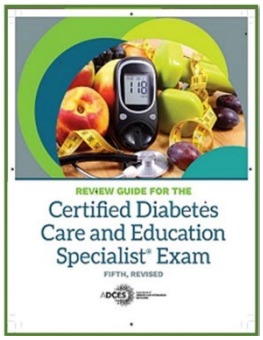
$44.99

ADCES Desk Reference + ADCES Certified Diabetes Specialist Exam Review Guide

This is our most popular book bundle for exam preparation.

$344.95





Cyber Monday Sale 2022

Save the date for our upcoming Cyber Monday sale! On Monday, November 28th, 2022, for one day only, **save 25% off all Online Courses**!

Diabetes Education SERVICES

Visit our website www.DiabetesEd.net to view our entire collection