Diabetes Education SERVICES

CELEBRATING 20 OVER 20 YEARS

Advancing Your Career in Diabetes Education

ADA/EASD Meds Update, Solving Glucose Mysteries, 3 Steps to DeFEET Amputations

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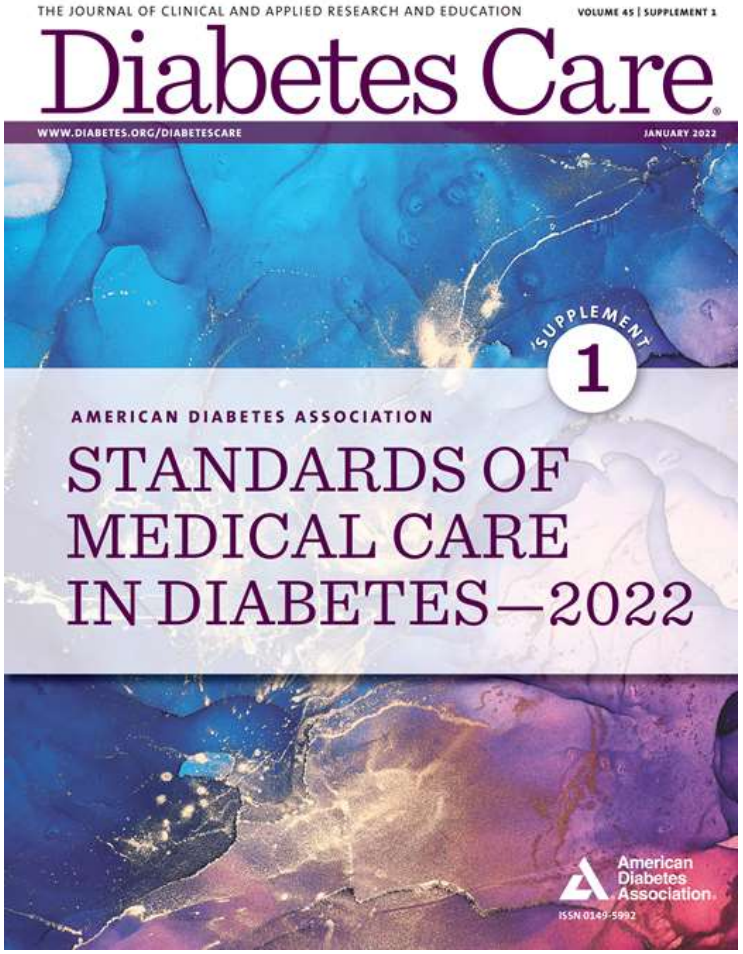
www.DiabetesEd.net

Coach Bev has no Conflict of Interest

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



Diabetes Overview and Glycemic Goals

Objectives:

1. Discuss current state of diabetes in the U.S.
2. Describe goals of care.
3. Summarize the new ADA/ EASD Management Guidelines.
4. Apply new guidelines to individual case studies.

Global Epidemic

537 million adults are living with diabetes

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

Diabetes around the world in 2021

International Diabetes Federation

www. DiabetesAtlas.org

- World Diabetes Day is November 14

CDC Announces

35% of Americans will have Diabetes by 2050

Boyle, Thompson, Barker, Williamson

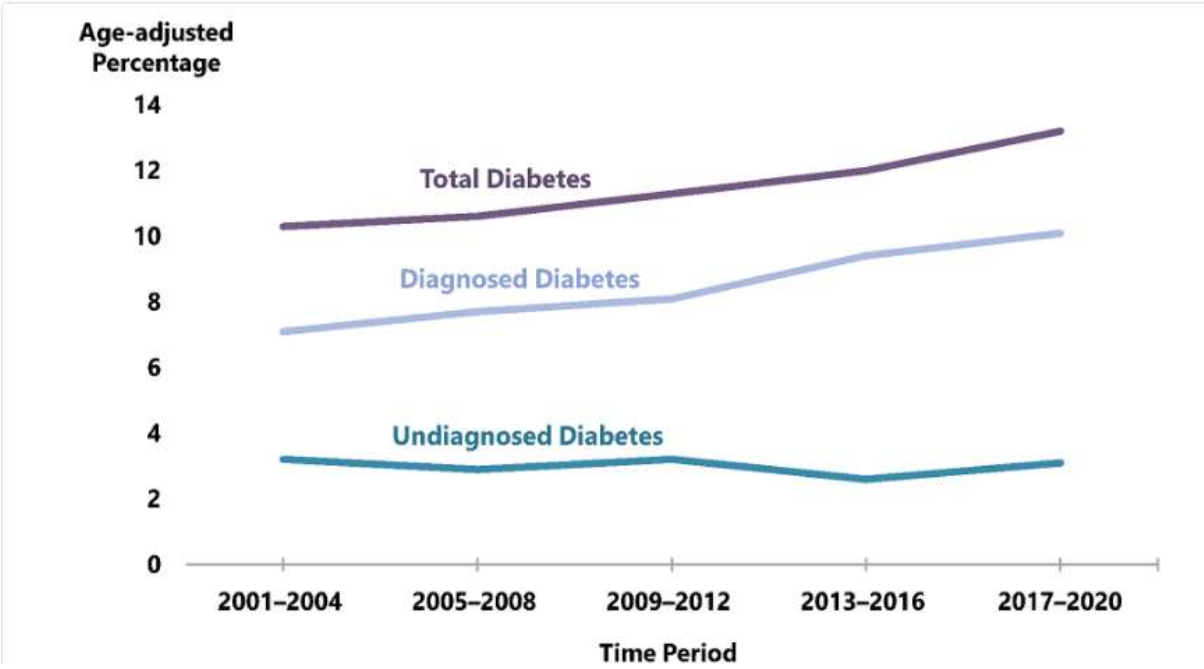
2010, Oct 22:8(1)29

www.pophealthmetrics.com

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

Geography of Diabetes, Poverty, Weight – Diabetes Belt

Americans Living in Poverty

Figure 6

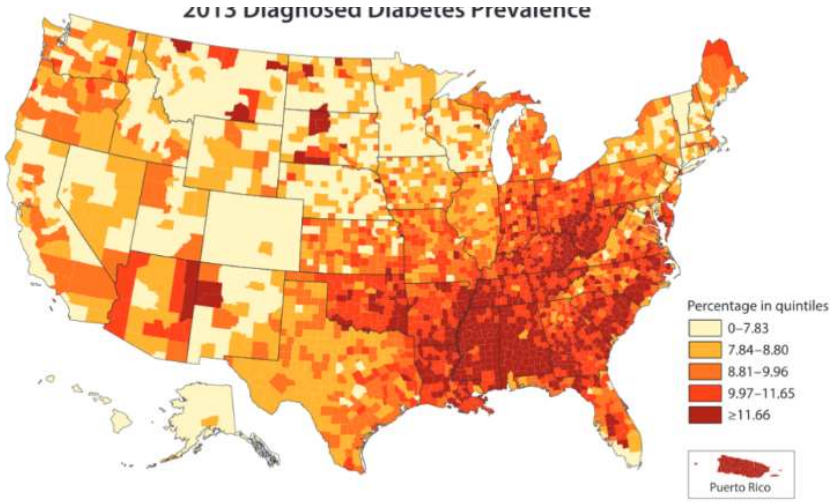
https://stacks.cdc.gov › view › cdc

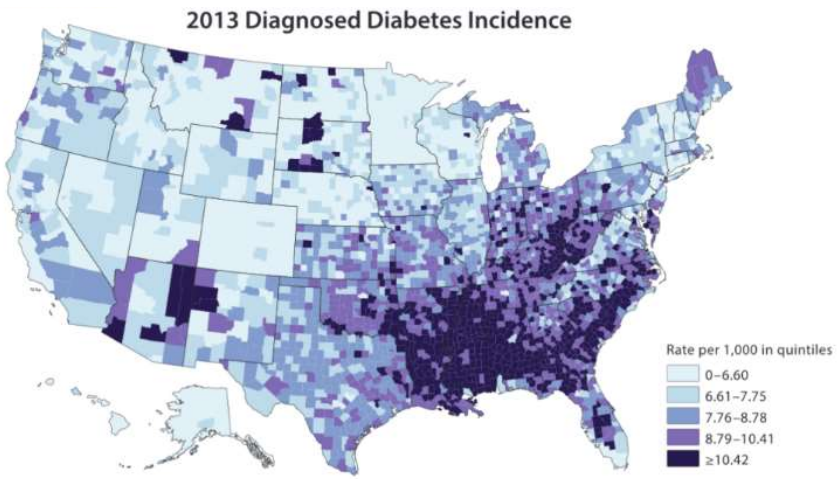
CDC identifies diabetes belt

Search for: Where is the diabetes belt located?

What states are in the diabetes belt?

The 15 states that have counties in the diabetes belt are **Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia and West Virginia.** Mar 8, 2011



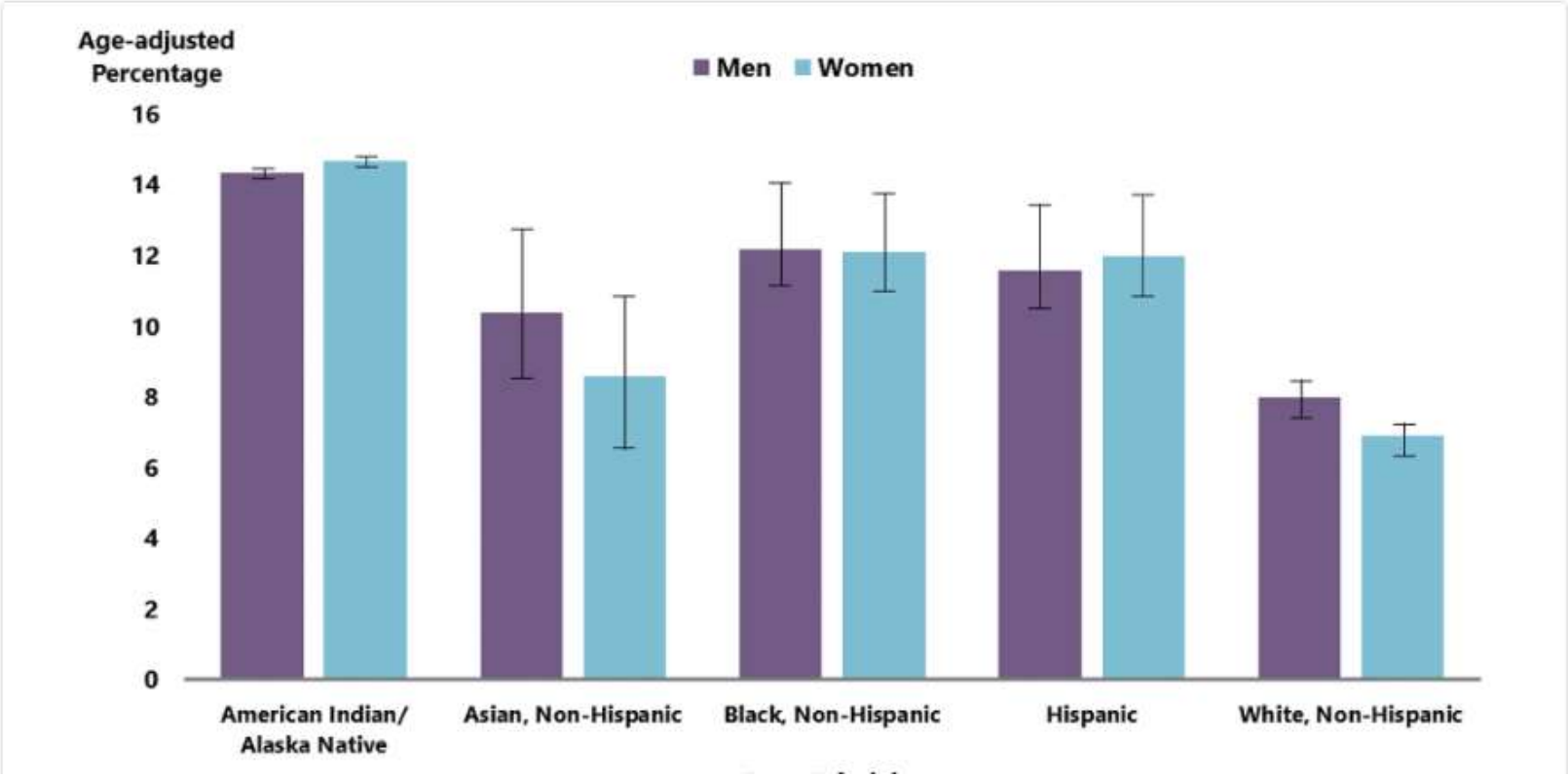


Diagnosed Diabetes by Ethnic Group

- 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

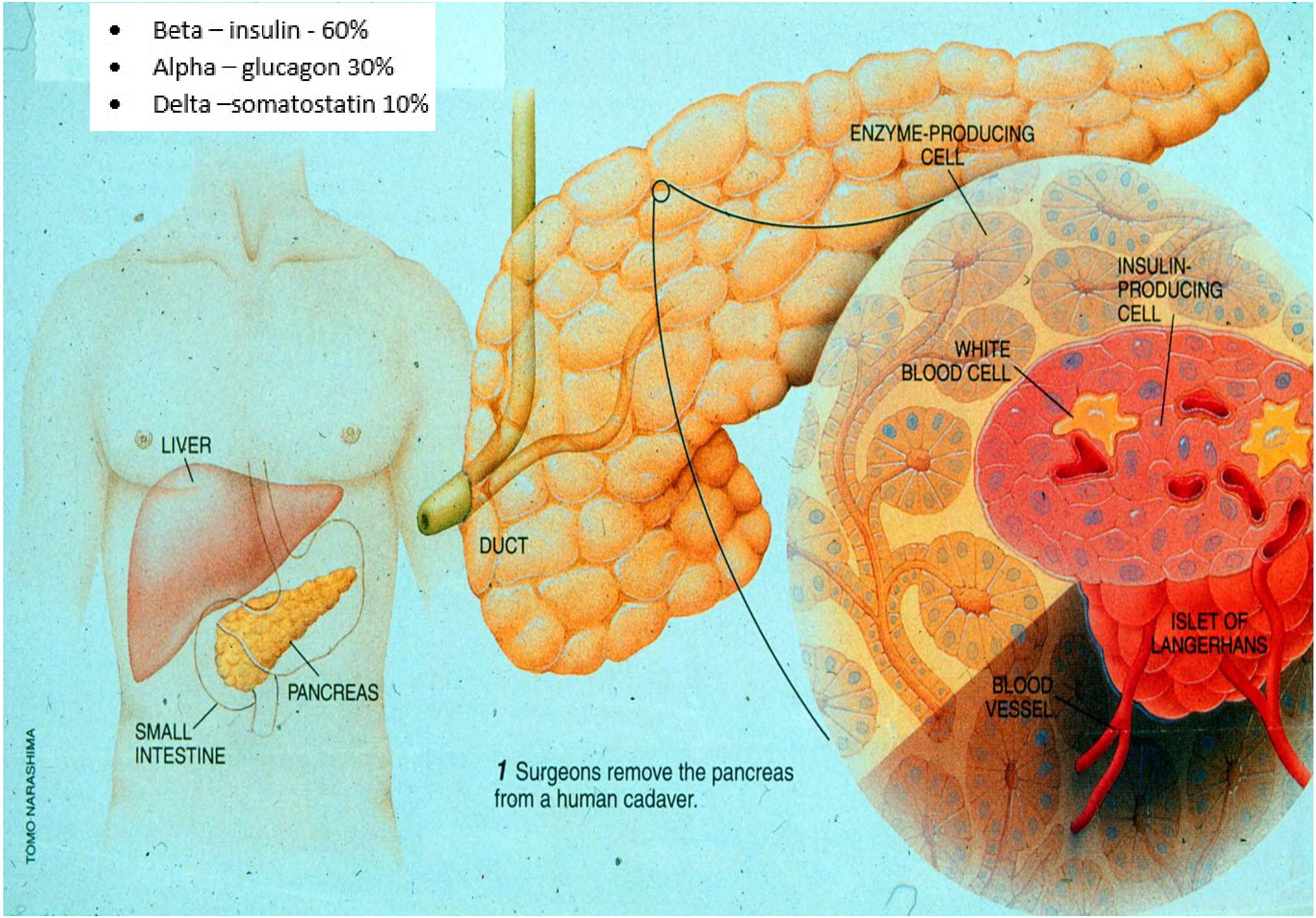
CDC 2022

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

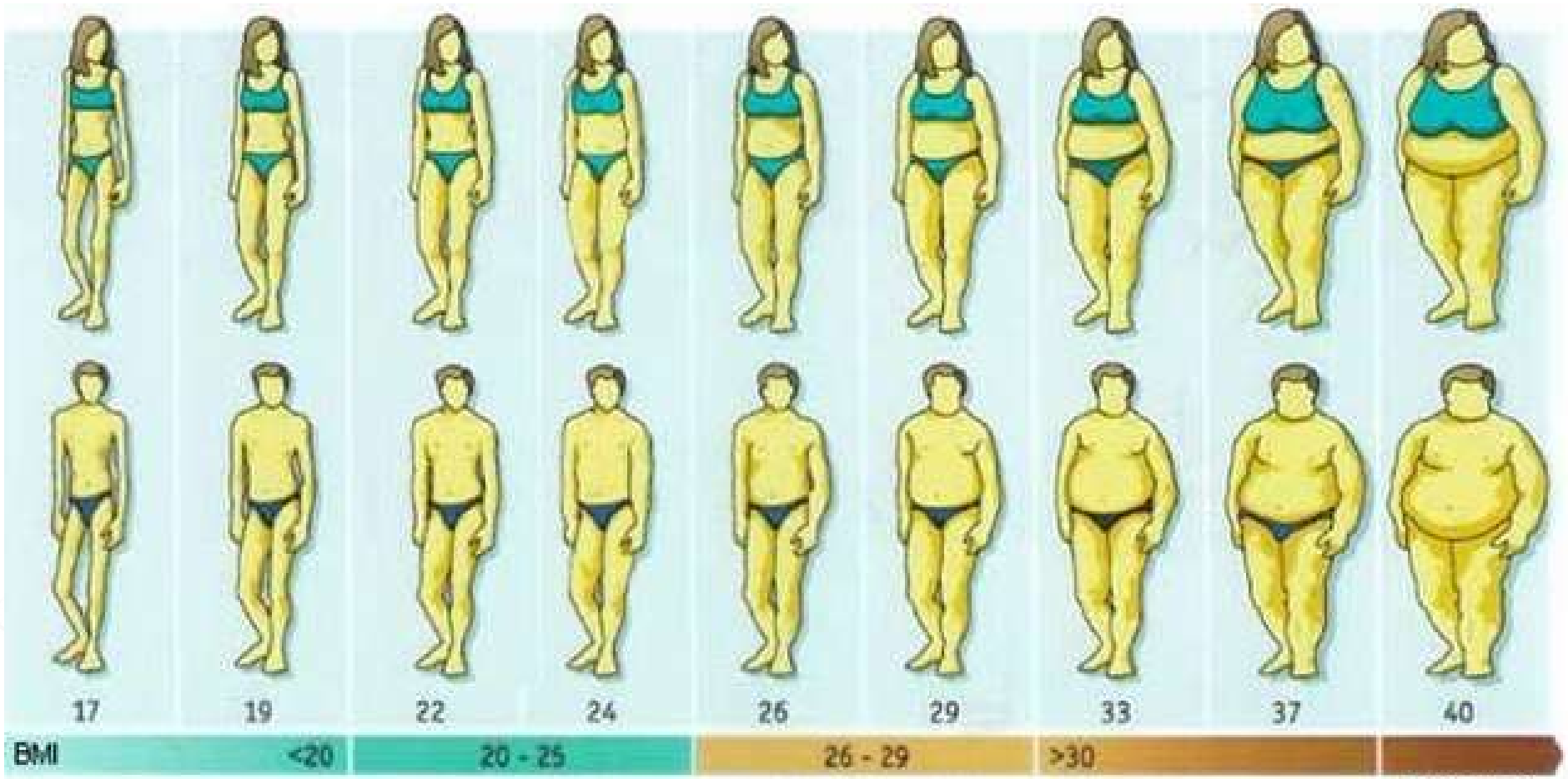
- Beta – insulin - 60%
- Alpha – glucagon 30%
- Delta –somatostatin 10%



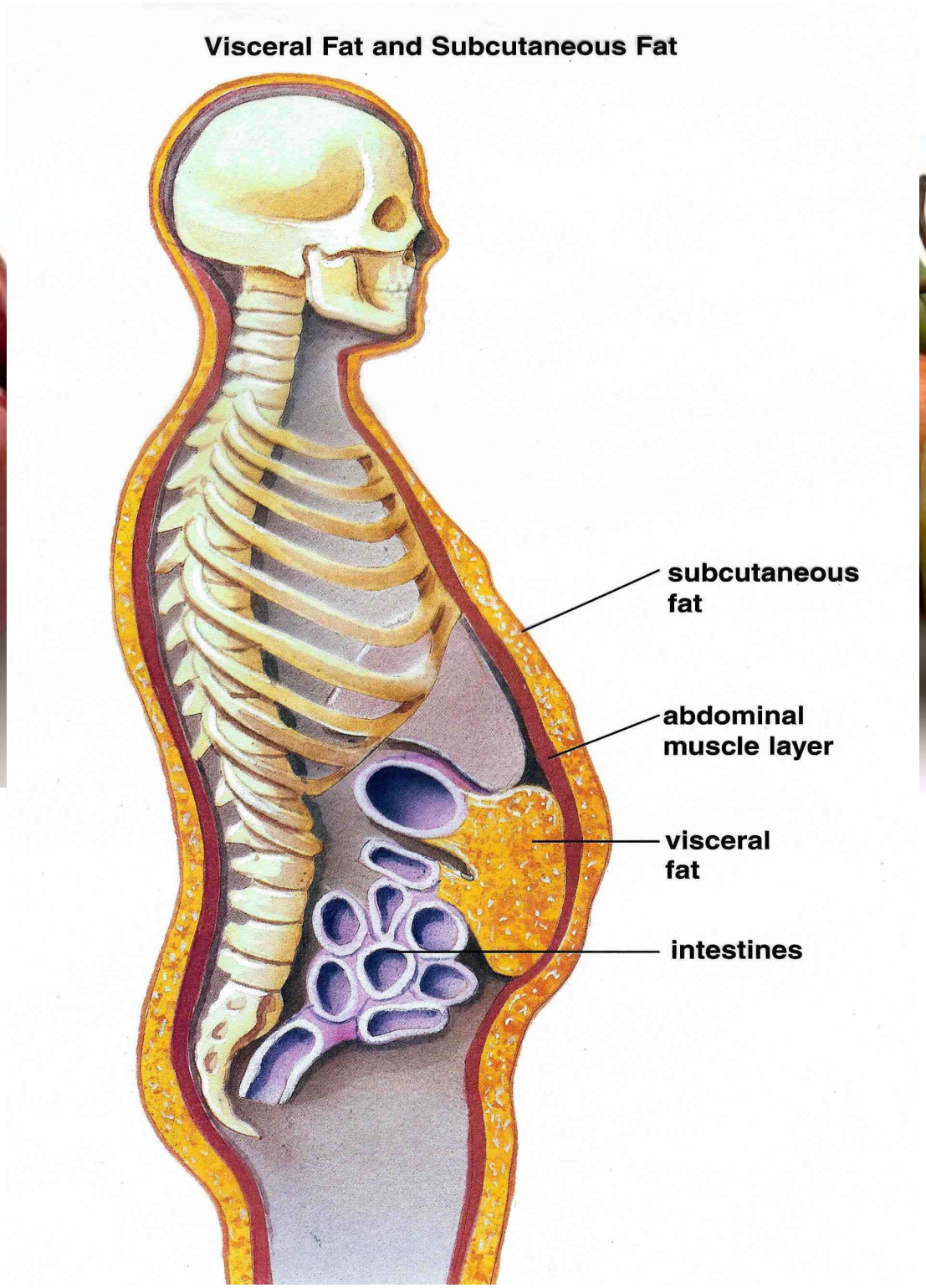
Hormones Effect on Glucose

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

Updated BMI Categories



Experiencing Underwt **Healthy weight** **Experiencing overwt** **Experiencing obesity**


Visceral Fat and Subcutaneous Fat
subcutaneous fat
abdominal muscle layer
visceral fat
intestines

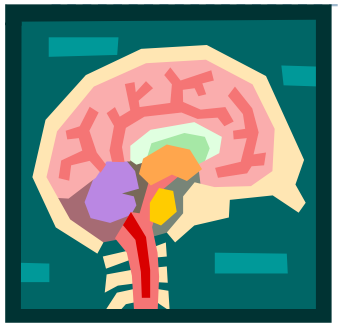
What is Type 2 Diabetes?

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

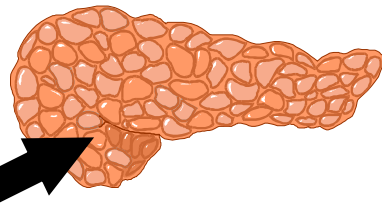
with social, behavioral and environmental risk factors unmasking the effects of genetic susceptibility.

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

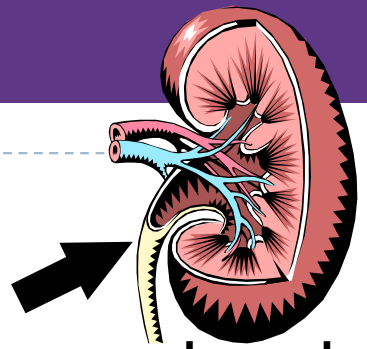
Ominous Octet



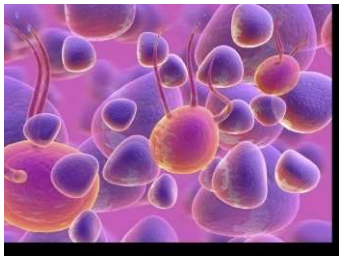
Decreased satiation neuro-transmission



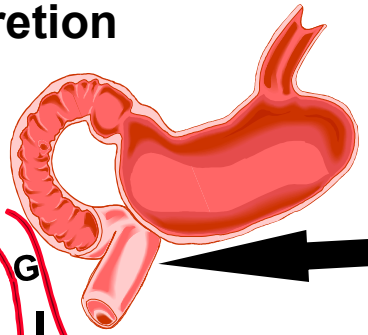
Decreased amylin, β-cell secretion
80% loss at dx



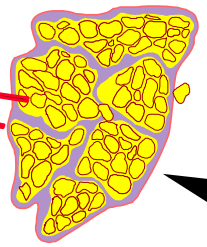
Increased renal glucose reabsorption



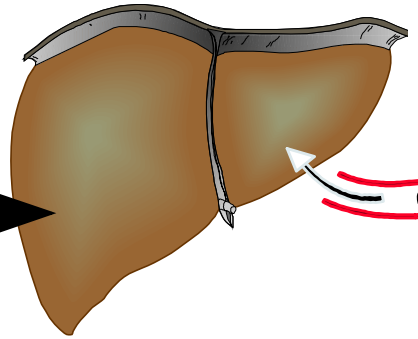
Increased glucagon secretion



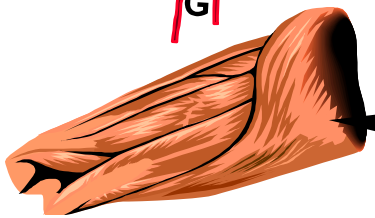
Decreased Gut hormones



Increased lipolysis



Increase glucose production



Decreased glucose uptake

ABCs of Diabetes

- A1c less than 7% (avg 3 month BG)
  - Pre-meal BG 80-130
  - Post meal BG <180
- Blood Pressure < 140/90
  - BP target <130/80
    - **With CVD or if 10 year CVD Risk > 15%**
- Cholesterol
  - Statin therapy

A1c and Estimated Avg Glucose (eAG)

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

6. Glycemic 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

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

Ambulatory Glucose Profile

- Standardized report with visual cues for those on CGM devices

- 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%.

NEW! ADA & European Association for the Study of Diabetes (EASD) Consensus Management of Hyperglycemia in Type 2

Diabetologia
https://doi.org/10.1007/s00125-022-05787-2

CONSENSUS REPORT

Management of hyperglycaemia in type 2 diabetes, 2022. A consensus report by the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD)

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Received: 2 August 2022 / Accepted: 18 August 2022

Abstract
The American Diabetes Association and the European Association for the Study of Diabetes convened a panel to update the previous consensus statements on the management of hyperglycaemia in type 2 diabetes in adults, published since 2006 and last updated in 2019. The target audience is the full spectrum of the professional healthcare team providing diabetes care in the USA and Europe. A systematic examination of publications since 2018 informed new recommendations. These include additional focus on social determinants of health, the healthcare system and physical activity behaviours including sleep. There is a greater emphasis on weight management as part of the holistic approach to diabetes management. The results of cardiovascular and kidney outcomes trials involving sodium–glucose cotransporter-2 inhibitors and glucagon-like peptide-1 receptor agonists, including assessment of subgroups, inform broader recommendations for cardiorenal protection in people with diabetes at high risk of cardiorenal disease. After a summary listing of consensus recommendations, practical tips for implementation are provided.

Keywords Cardiovascular disease · Chronic kidney disease · Glucose-lowering therapy · Guidelines · Heart failure · Holistic care · Person-centred care · Social determinants of health · Type 2 diabetes mellitus · Weight management

This article is being simultaneously published in *Diabetologia* (https://doi.org/10.1007/s00125-022-05787-2) and *Diabetes Care* (https://doi.org/10.2337/dci22-0034) by the European Association for the Study of Diabetes and American Diabetes Association.

A consensus report of a particular topic contains a comprehensive examination and is authored by an expert panel and represents the panel's collective analysis, evaluation and opinion. MJD and JBB were co-Chairs for the Consensus Report Writing Group. VRA, BSC, RAG, JG, NMM and SER were the writing group members for ADA. SDP, CM, GM, PR, TT and AT were the writing group members for EASD. The article was reviewed by EASD by its Committee on Clinical Affairs and approved by its Executive Board. The article was reviewed for ADA by its Professional Practice Committee.

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Extended author information available on the last page of the article

Abbreviations

BGM	Blood glucose monitoring
CGM	Continuous glucose monitoring
CSII	Continuous subcutaneous insulin infusion
CVOT	Cardiovascular outcomes trial
DKA	Diabetic ketoacidosis
DPP-4i	Dipeptidyl peptidase-4 inhibitors
DSMES	Diabetes self-management education and support
ETD	Estimated treatment difference
GIP	Glucose-dependent insulinotropic polypeptide
GLP-1 RA	Glucagon-like peptide-1 receptor agonist(s)
HF	Heart failure
HHF	Hospitalisation for heart failure
MACE	Major adverse cardiovascular events
MNT	Medical nutrition therapy
NAFLD	Non-alcoholic fatty liver disease
NASH	Non-alcoholic steatohepatitis
SGLT1i	Sodium–glucose cotransporter-1 inhibitor

Springer

Sept 23, 2022

Davies MJ, Aroda VR, Collins BS, Gabbay RA, Green J, Maruthur NM, Rosas SE, Del Prato S, Mathieu C, Mingrone G, Rossing P, Tankova T, Tsapas A, Buse JB
Diabetes Care 2022; https://doi.org/10.2337/dci22-0034. *Diabetologia* 2022; https://doi.org/10.1007/s00125-022-05787-2.

ADA & European Association for the Study of Diabetes (EASD) Consensus Management of Hyperglycemia Type 2

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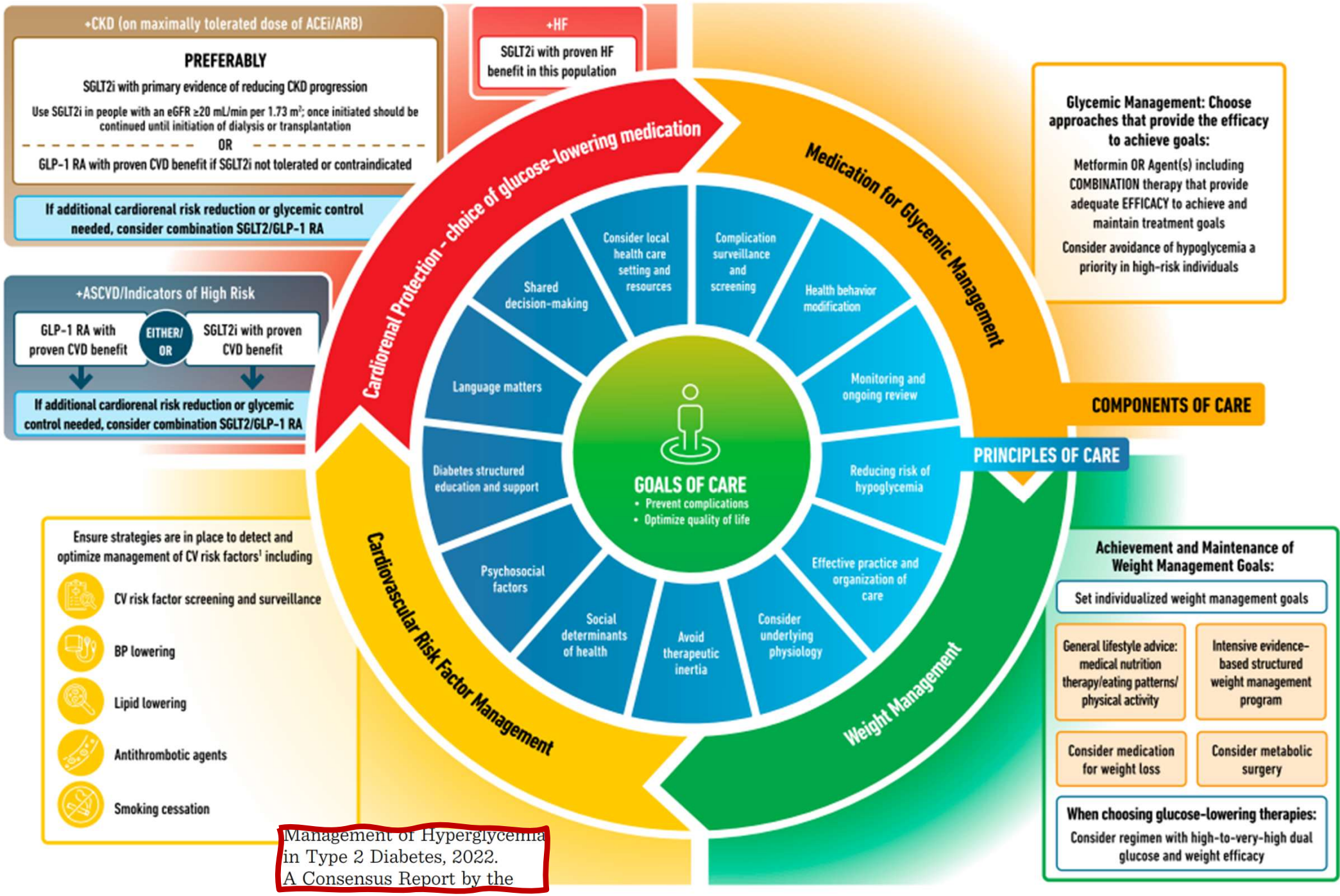
Diabetes Care 2022; https://doi.org/10.2337/dci22-0034.

Diabetologia 2022; https://doi.org/10.1007/s00125-022-05787-2.

HOLISTIC PERSON-CENTERED APPROACH TO T2DM MANAGEMENT



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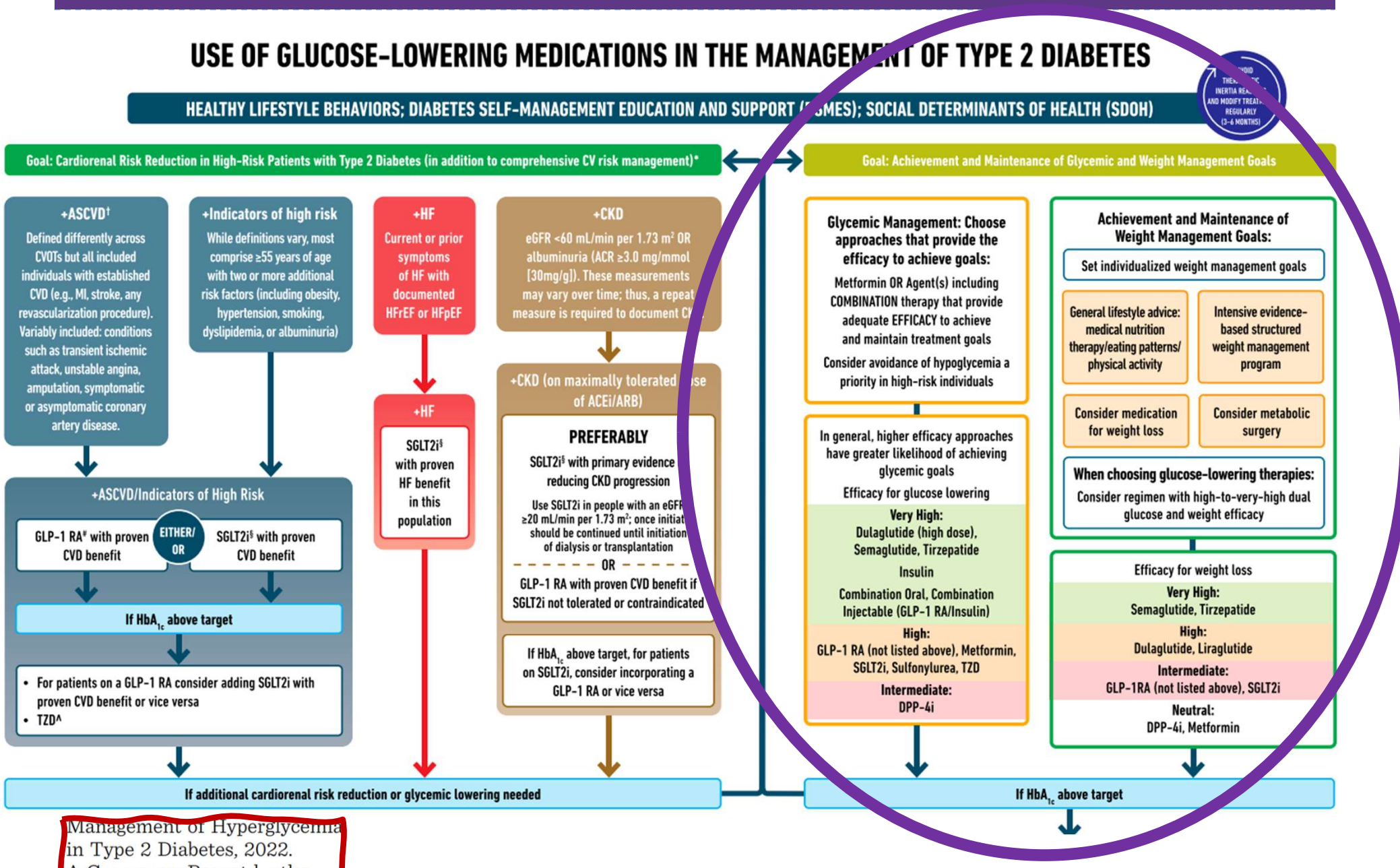
Let's Break it Down / ADA & EASD



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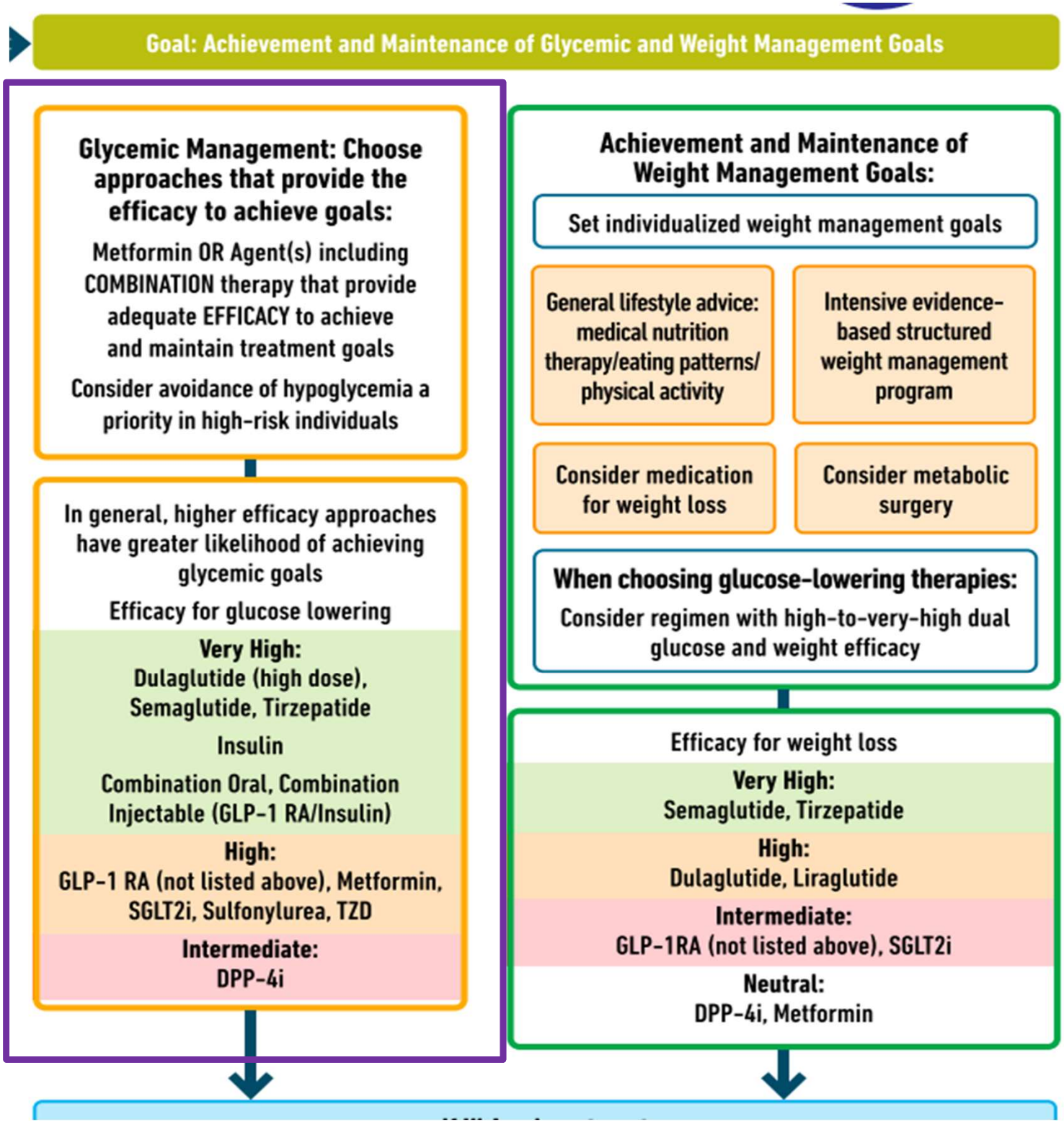
Effectiveness Ranking of Diabetes Meds



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Choice of Glucose Lowering Meds

- Person centered
- Co-conditions
- Values and needs
- Reduce risk
  - CV and renal
- Affordable
- Weight impact

Metformin, Sulfonylureas & DPP-IV Inhibitors

Quick Question 1

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

a. Metformin can cause kidney problems.
b. If you forget to take metformin before the meal, hold the dose
c. Metformin may cause loose stools
d. Stop metformin if GFR is less than 60.

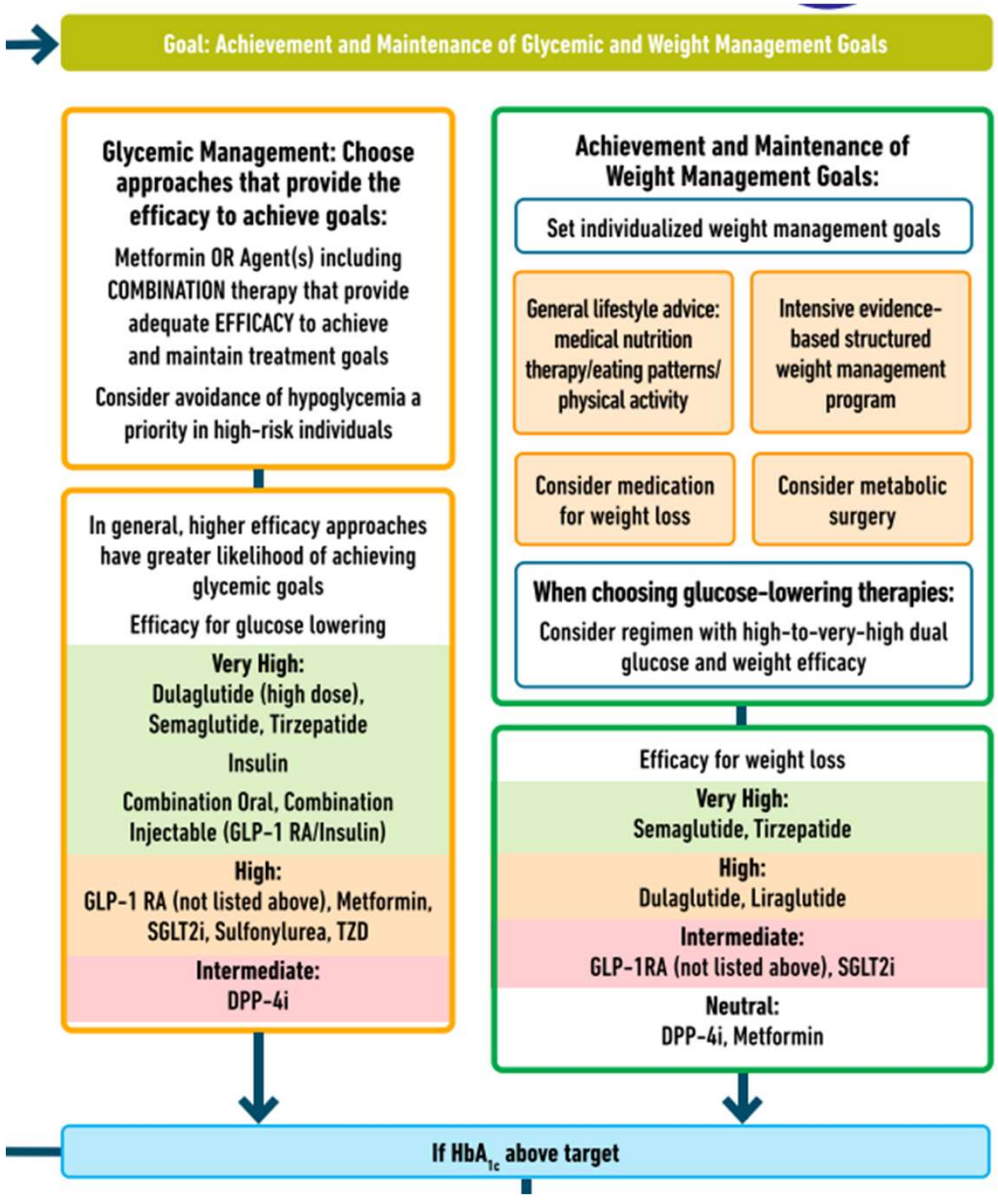
Common Oral Diabetes Meds

Diabetes Education SERVICES

Class/Main Action	Name(s)	Daily Dose Range	Considerations
Biguanides • Decreases hepatic glucose output • First line med at diagnosis of type 2	metformin (Glucophage) Riomet (liquid metformin)	500 - 2550 mg (usually BID w/ meal) 500 - 2550 mg 500mg/5mL	**Side effects:** nausea, bloating, diarrhea, B12 deficiency. To minimize GI Side effects, use XR and take w/ meals. **Obtain GFR before starting.** • If GFR <30, do not use. • If GFR <45, don't start Meformin • If pt on Metformin and GFR falls to 30-45, eval risk vs. benefit; consider decreasing dose. **For dye study,** if GFR <60, liver disease, alcoholism or heart failure, restart metformin after 48 hours if renal function stable. **Benefits:** lowers cholesterol, no hypo or weight gain, cheap. Approved for pediatrics, 10 yrs + Lowers A1c 1.0%-2.0%.
	Extended Release-XR (Glucophage XR) (Glumetza) (Fortamet)	(1x daily w/dinner) 500 – 2000 mg 500 – 2000 mg 500 – 2500 mg	

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

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



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

- If ASCVD, HF or CKD or high ASCVD risk, use SGLT2i or GLP-1 RA +/- metformin

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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.

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

Sulfonylureas

- Mechanism: Stimulate beta cells to release insulin
- Dosed 1-2x daily before meals
- Adverse effects
  - Hypoglycemia, Weight gain, watch renal function
- Low cost, $12 for 3 months supply

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

Case Study KR – Poll 2

KR is a 47yoM with type 2 diabetes x 5 years. Complains of dizziness/shakiness 3x/week, especially after surfing. Last A1C=6.7%. Which of their medications is most likely causing hypoglycemia?

A. Metformin

B. Sitagliptin (Januvia)

C. Glimepiride (Amaryl)

D. Pioglitazone (Actos)

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


glutose 15
glutose 15
glutose 15


SUN-MAID
NATURAL CALIFORNIA
RAISINS


ORANGE
GU
Chomps
PURE PERFORMANCE
ENERGY CHEWS
SUSTAINED ENERGY / ADVANCED NUTRITION


GLUCOSE TABLETS
GLUCOSE TABLETS
Orange
GLUCOSE TABLETS
GLUCOSE TABLETS

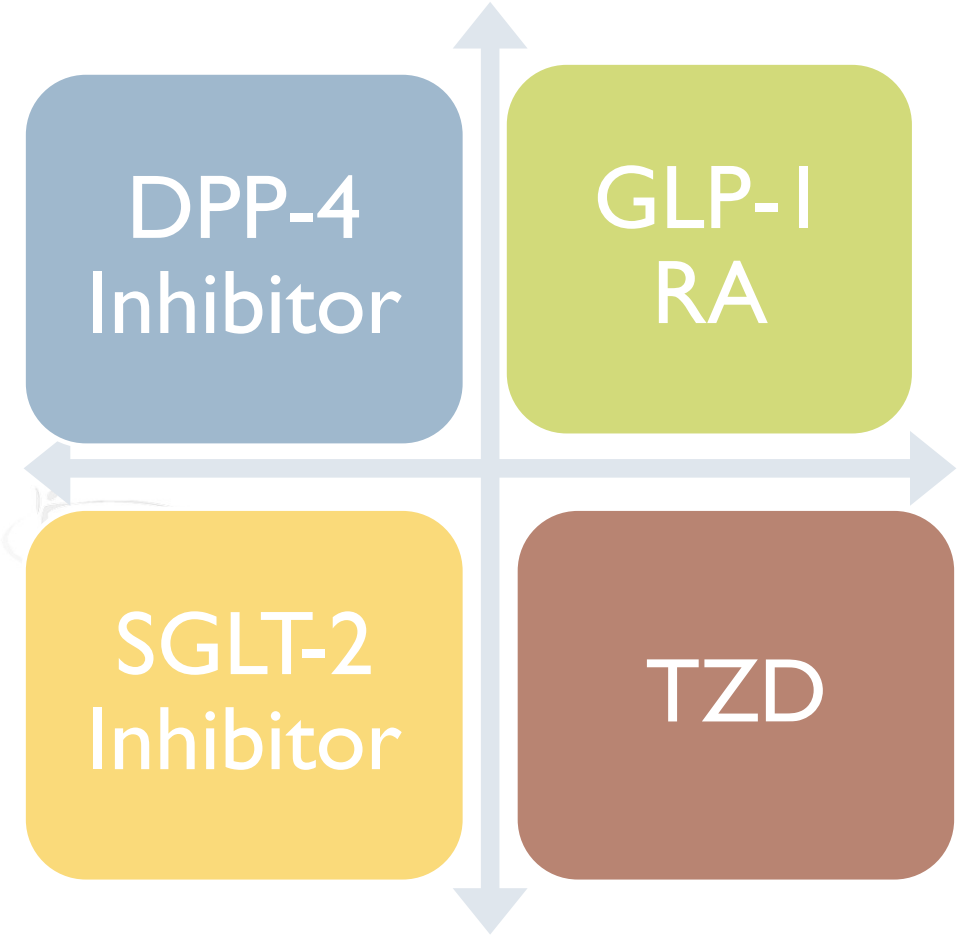
DPP-4 Inhibitors – "Incretin Enhancers"

Januvia (sita*gliptin*) Tradjenta (lina*gliptin*)
Onglyza (saxa*gliptin*) Nesina (alo*gliptin*)

DPP – 4 Inhibitors "Incretin Enhancers" • Prolongs action of gut hormones • Increases insulin secretion • Delays gastric emptying	sitagliptin (Januvia)	25 - 100 mg daily – eliminated via kidney*	* If creat elevated, see med insert for dosing. **Side effects:** headache and flu-like symptoms. **Can cause severe, disabling joint pain.** Contact MD, stop med. Report signs of pancreatitis. † Saxagliptin and alogliptin can increase risk of heart failure. Notify MD for shortness of breath, edema, weakness, etc. No wt gain or hypoglycemia. Lowers A1c 0.6%-0.8%.
	saxagliptin (Onglyza)†	2.5 - 5 mg daily – eliminated via kidney*, feces	
	linagliptin (Tradjenta)	5 mg daily – eliminated via feces	
	alogliptin (Nesina)†	6.25 - 25 mg daily – eliminated via kidney*	

Hypoglycemia & Next Steps

Do NOT Cause Hypoglycemia



Can Cause Hypoglycemia

- Sulfonylurea
- Meglitinides
- Insulin

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

Next Step for KR

KR is a 47yoM with type 2 diabetes x 5 years. Complains of dizziness/shakiness 3x/week, especially after surfing. Last A1C=6.7%.

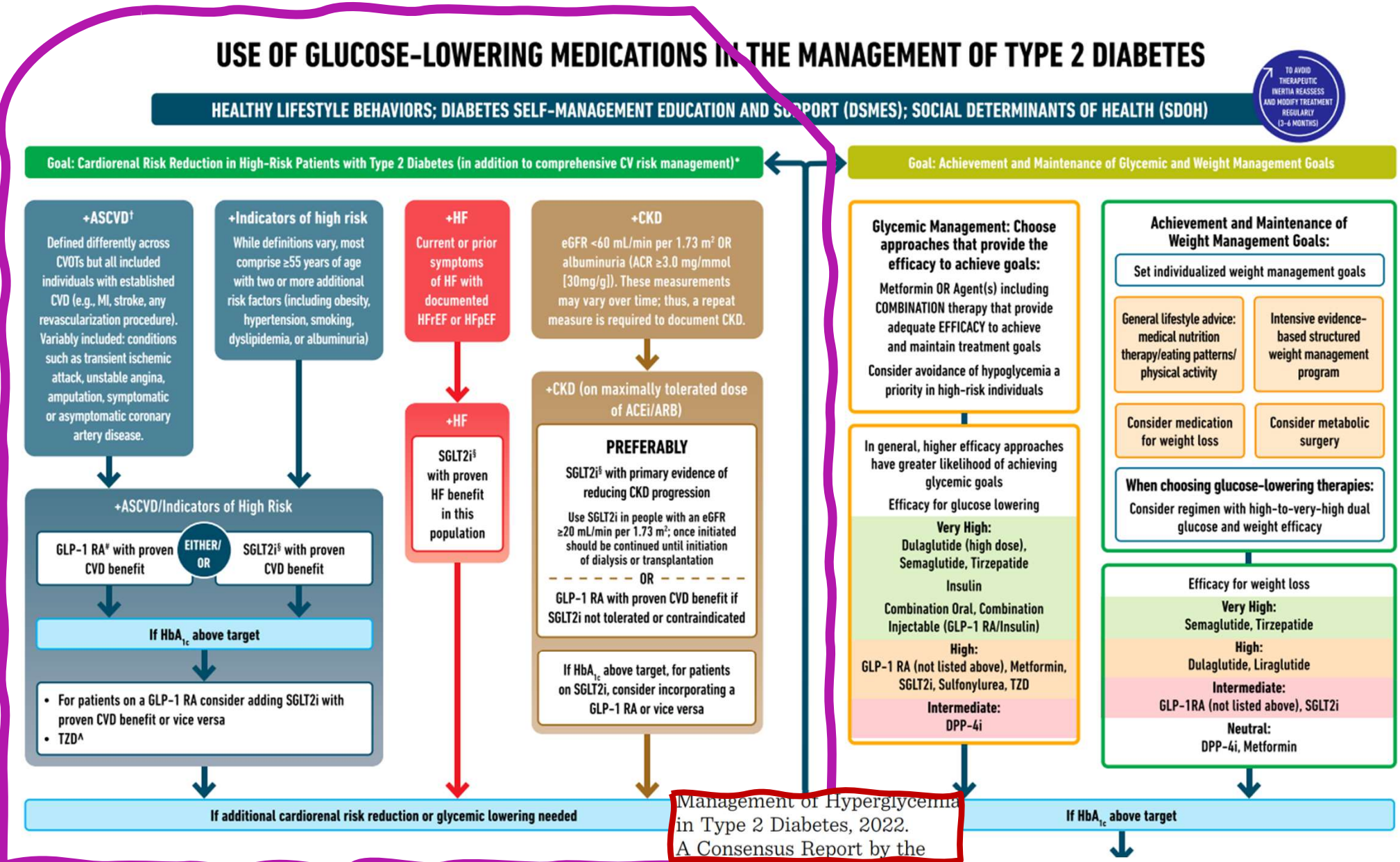
Stopped KR's glimepiride due to hypoglycemia and wt gain.

Referred to DSME Program and RD/RDN

Had a recent "small stroke"

Goal is to reduce Major Adverse Cardiovascular Events (MACE)

Let's Break it Down / ADA & EASD



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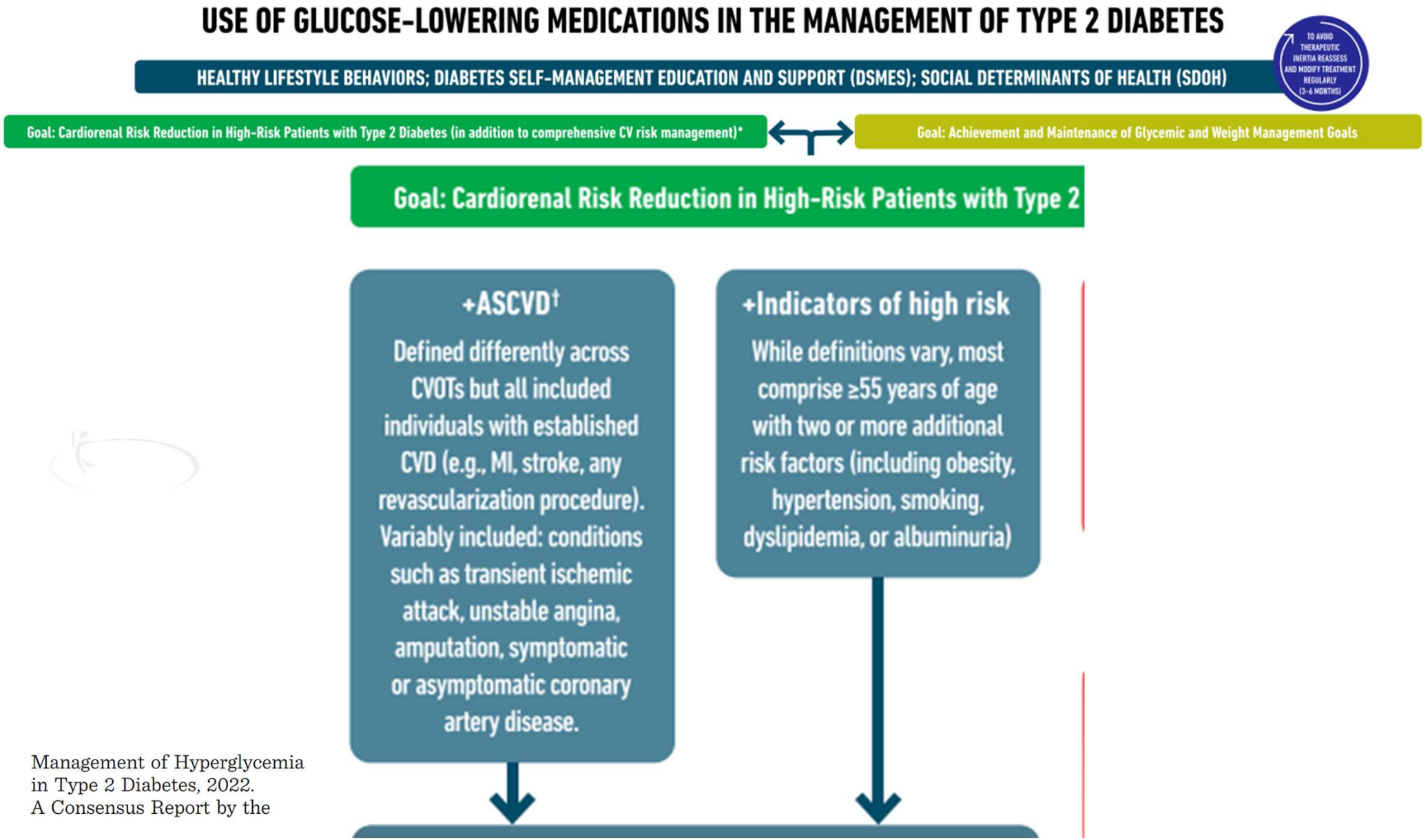
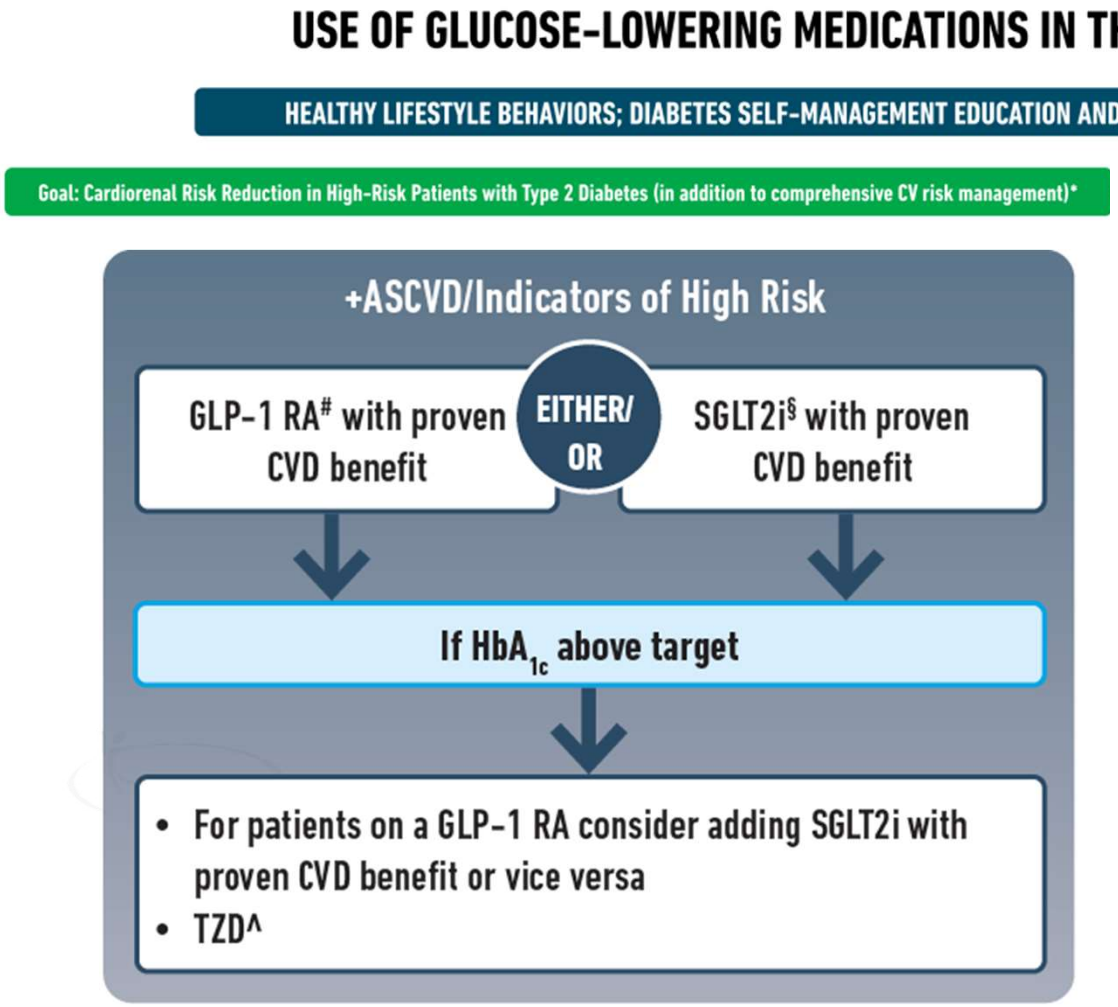
Atherosclerotic Cardiovascular Risk Reduction – High Importance



Management of Hyperglycemia in Type 2 Diabetes, 2022. A Consensus Report by the

Choosing glucose-lowering medication in people with CVD



ASCVD = atherosclerotic cardiovascular disease

Management of Hyperglycemia in Type 2 Diabetes, 2022. A Consensus Report by the

Most effective meds based on Cardiovascular Outcomes Trial (CVOT)

GLP-1 RA's Preferred

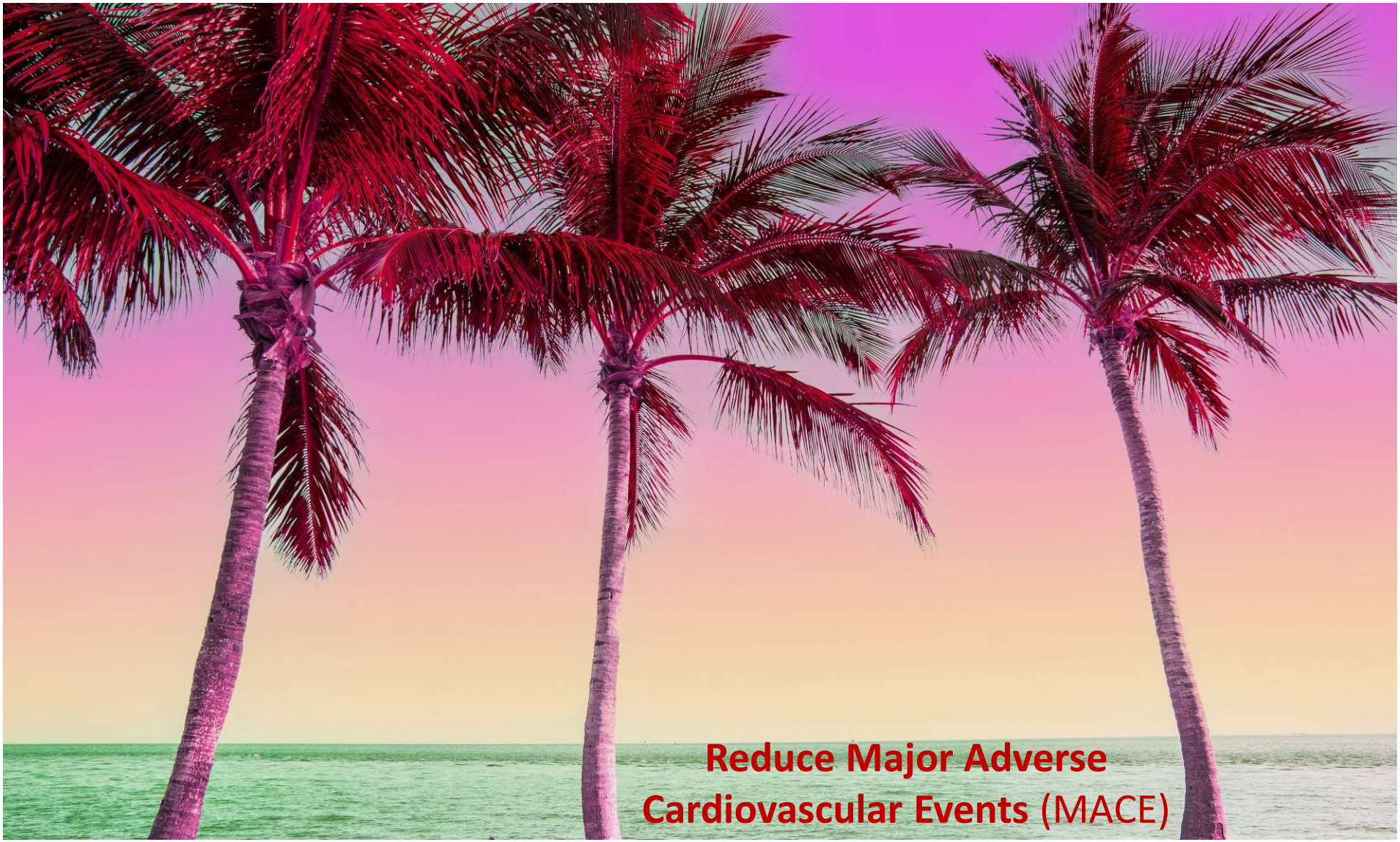
semaglutide (Ozempic), liraglutide (Victoza), dulaglutide (Trulicity)

~ Or~

SGLT2i

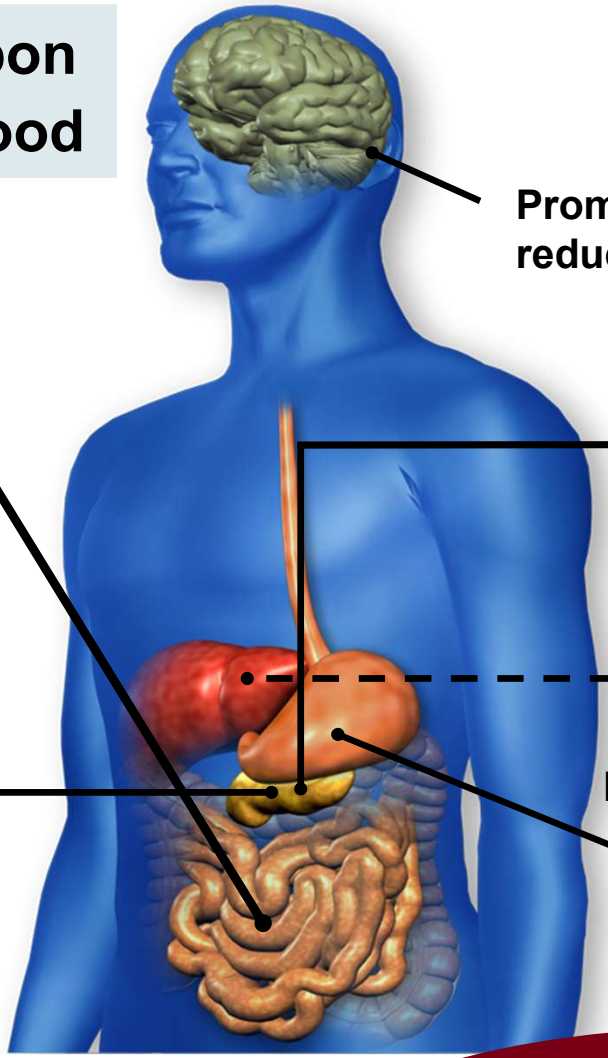
Empagliflozin (Jardiance), canagliflozin (Invokana), dapagliflozin (Farxiga)

GLP & GIP Receptor Agonists



GLP-1 Effects in Humans
Understanding the Natural Role of Incretins

GLP-1 secreted upon the ingestion of food



Promotes satiety and reduces appetite

↑ Beta-cell response

Alpha cells:
↓ Postprandial glucagon secretion

Liver:
↓ Glucagon reduces hepatic glucose output

Beta cells:
Enhances glucose-dependent insulin secretion

Stomach:
Helps regulate gastric emptying

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

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

Pocket Card: GLP-1 & GIP RA

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

GLP-1 Receptor Agonist Devices

Byetta

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

Ozempic

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

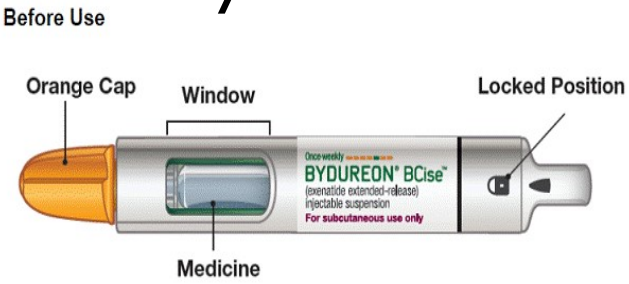
Victoza

1.2mg, 2 pens/mo
- (15 doses per pen)
1.8mg, 3 pens/month
- (10 doses per pen)
Requires Rx for needles

Adlyxin

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

Bydureon



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

Trulicity

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

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

GLP-1 Receptor Agonist Indications

Drug	Lower BG	Reduce CV Risk?	Wt loss approved?
Exenatide IR **(Byetta)** Lixisenatide **(Adlyxin)** Semaglutide **(Rybelsus)**	Yes		
Exenatide ER **(Bydureon)**	Yes for 10 yrs and older		
Dulaglutide **(Trulicity)**	Yes	Yes	
Semaglutide **(Ozempic)**	Yes	Yes	Yes Wegovy 2.4mg
Liraglutide **(Victoza)**	Yes for 10 yrs and older	Yes	Yes Saxenda 3mg

Package inserts, dailymed.nlm.nih.gov

GLP-1 RA Approved for Weight Loss

- Saxenda and Victoza same active ingredient (liraglutide) at different doses
  - Saxenda 3 mg (Victoza 1.8 mg)
  - 6% wt loss, $1619 a month
- Wegovy and Ozempic same active ingredient (semaglutide) at different doses
  - Wegovy 2.4mg (Ozempic 2mg)
  - 6% wt loss, $1619 a month

- 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.

GLP-1 & GIP Receptor Agonists

Class/Main Action	Name	Dose Range	Considerations
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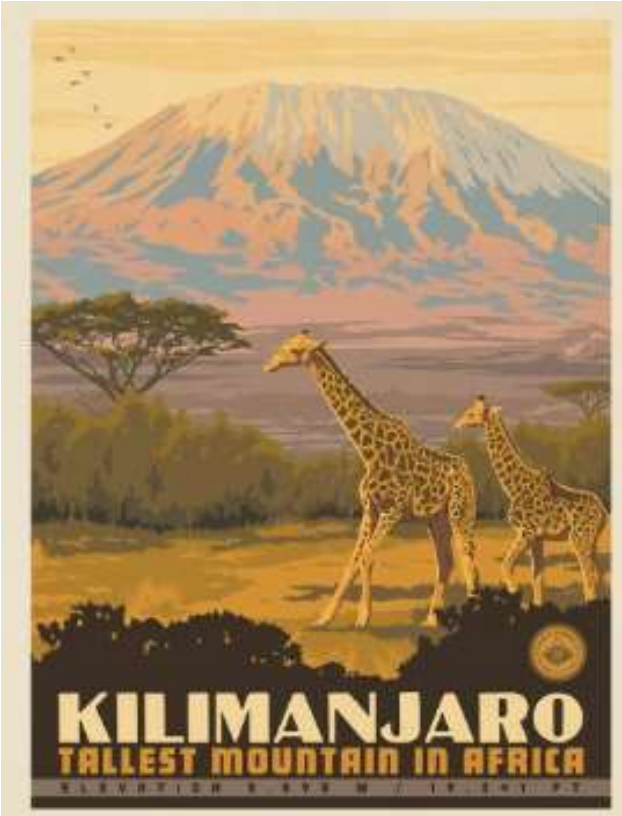
GIP/GLP-1 Receptor Agonist

- 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



GLP and GIP Mechanism of Action

Glucagon-like Peptide-1 Receptor Agonism

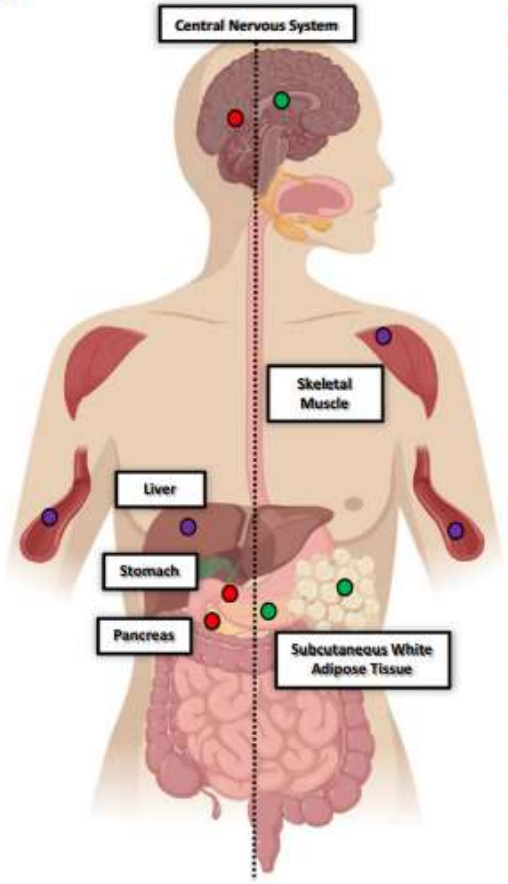
Central Nervous System
- ↑ Satiety
- ↓ Food Intake
- ↑ Nausea
- ↓ Body Weight

Pancreas
- ↑ Insulin
- ↓ Glucagon

Stomach
- ↓ Gastric Emptying

Systemic
- ↓ Hyperglycemia

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



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

Glucose-dependent Insulinotropic Polypeptide Receptor Agonism

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

Pancreas
- ↑ Insulin
- ↑ Glucagon

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

Systemic
- ↓ Hyperglycemia
- ↓ Dietary Triglyceride

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

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

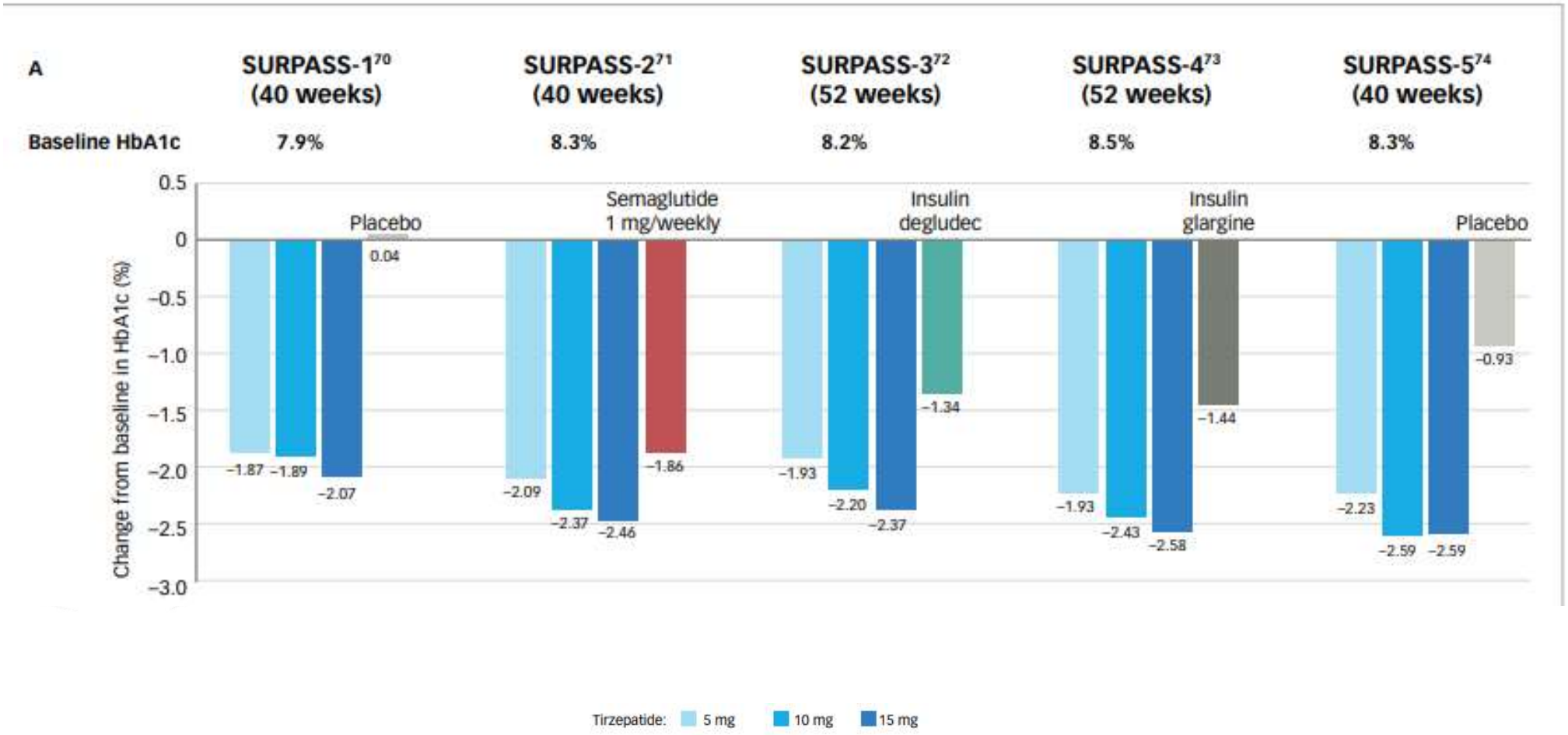
SURPASS Clinical Program

- Evaluated A1C & Weight reductions with Tirzepatide

Study acronym	Study type	Number of participants	Eligibility	Comparator	Study duration (weeks)	Primary outcome
SURPASS-1[70]	Randomized double-blind	478	Drug-naïve	Placebo	40	HbA1c
SURPASS-2[71]	Randomized open-label	1,879	Metformin	Semaglutide	40	HbA1c
SURPASS-3[72]	Randomized open-label	1,947	Metformin w/wo sGLT2i	Insulin degludec	52	HbA1c
SURPASS-4[73]	Randomized open-label	2,002	1–3 antidiabetic medicines (metformin, SGLTi or sulfonylurea) with cardiovascular risk	Insulin glargine	52	HbA1c
SURPASS-5[74]	Randomized double-blind	475	Insulin glargine (U100) w/wo metformin	Placebo	40	HbA1c

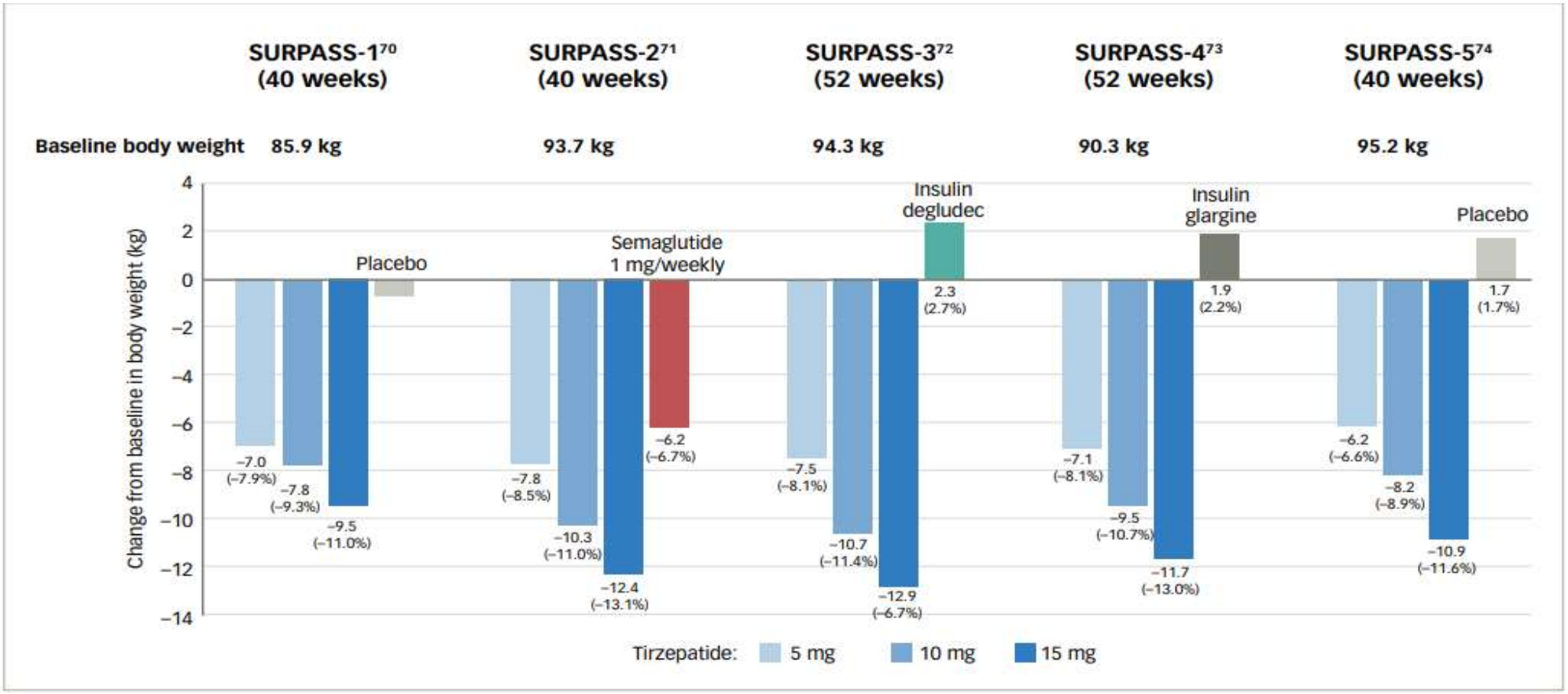
Rosenstock J, et al. Lancet. 2021;398:143–55. Frias JP, et al. N Engl J Med. 2021;358:503–15.82. Ludvik B, et al. Lancet. 2021;398:583–98. 83. Del Prato S et al. Lancet. 2021;398:1811–24. 84. Dahl Det al. Diabetologia. 2021:64(Suppl. 1):S13. Abstr 20. Kaneko S.. touchREV Endocrinol. 2022 Jun;18(1):10-19.

SURPASS: A1C Change w/ Tirzepatide



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

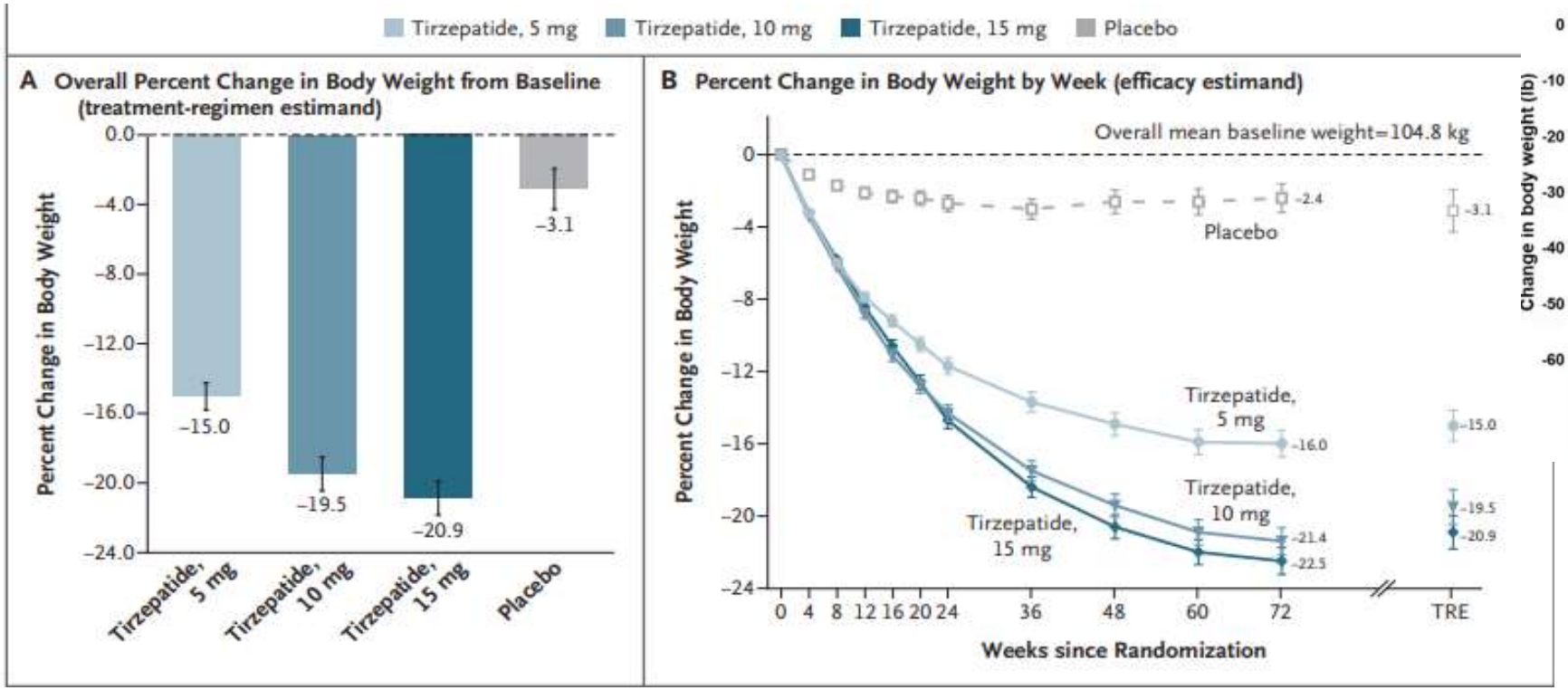
SURPASS: Change in Body Wt - Tirzepatide

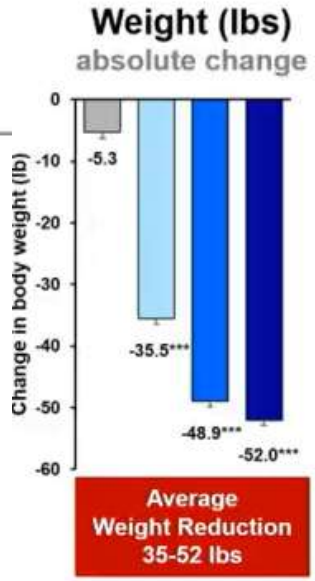


Rosenstock J, et al. Lancet. 2021;398:143–55. Frias JP, et al. N Engl J Med. 2021;358:503–15. 82. Ludvik B, et al. Lancet. 2021;398:583–98. 83. Del Prato S et al. Lancet. 2021;398:1811–24. 84. Dahl Det al. Diabetologia. 2021:64(Suppl. 1):S13. Abstr 20. Kaneko S.. touchREV Endocrinol. 2022 Jun;18(1):10-19.

Surmount-1 Study - Weight loss Results (Tirzepatide) without diabetes

- 20.9% wt loss with 15mg dose or 35-52lbs lost!
- Mean BMI 38 at baseline





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.

Tirzepatide (Mounjaro) Clinical Use

Starting dose (for 4 weeks)

MONTH 1

For at least 4 weeks

MONTH 2

IF ADDITIONAL GLYCEMIC CONTROL IS NEEDED

For at least 4 weeks

For at least 4 weeks

For at least 4 weeks

Maximum dose

Tirzepatide (Mounjaro) 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.

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

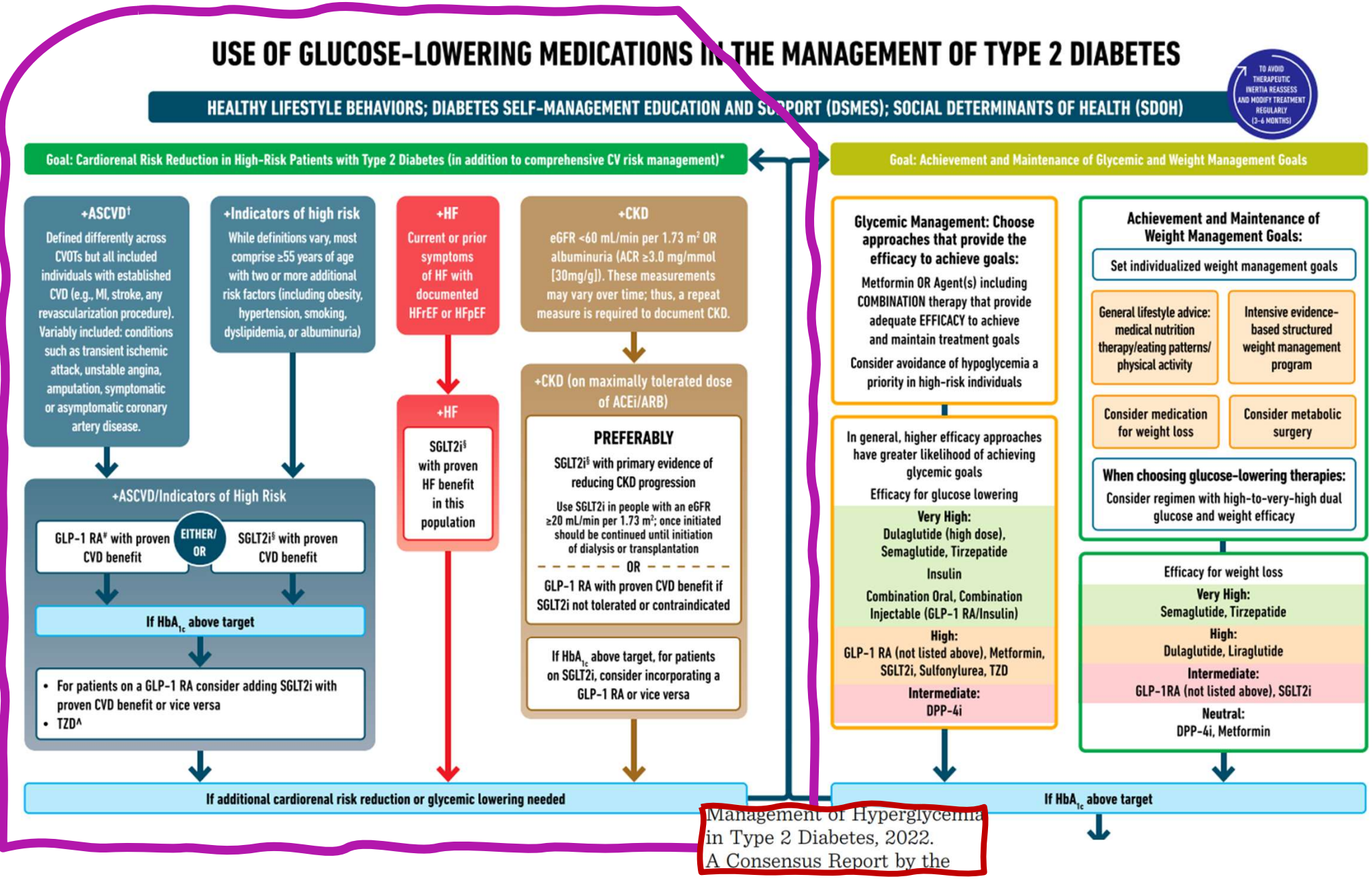
- Avoid if personal or family history of medullary thyroid cancer
- Start at lower dose and titrate
- Eat smaller meals to reduce nausea
- Avoid high fat meals
- Rotate sites
- Store extra pens in fridge
- Avoid in combo with DPP-4 inhibitors
- Caution with pancreatitis
- Ask about recent eye exam
 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

Case Study Question 3

KZ is on max dose of metformin and is started on tirzepatide to help with BMI of 39 and decrease CV risk. What outcomes can KR expect at highest dose?

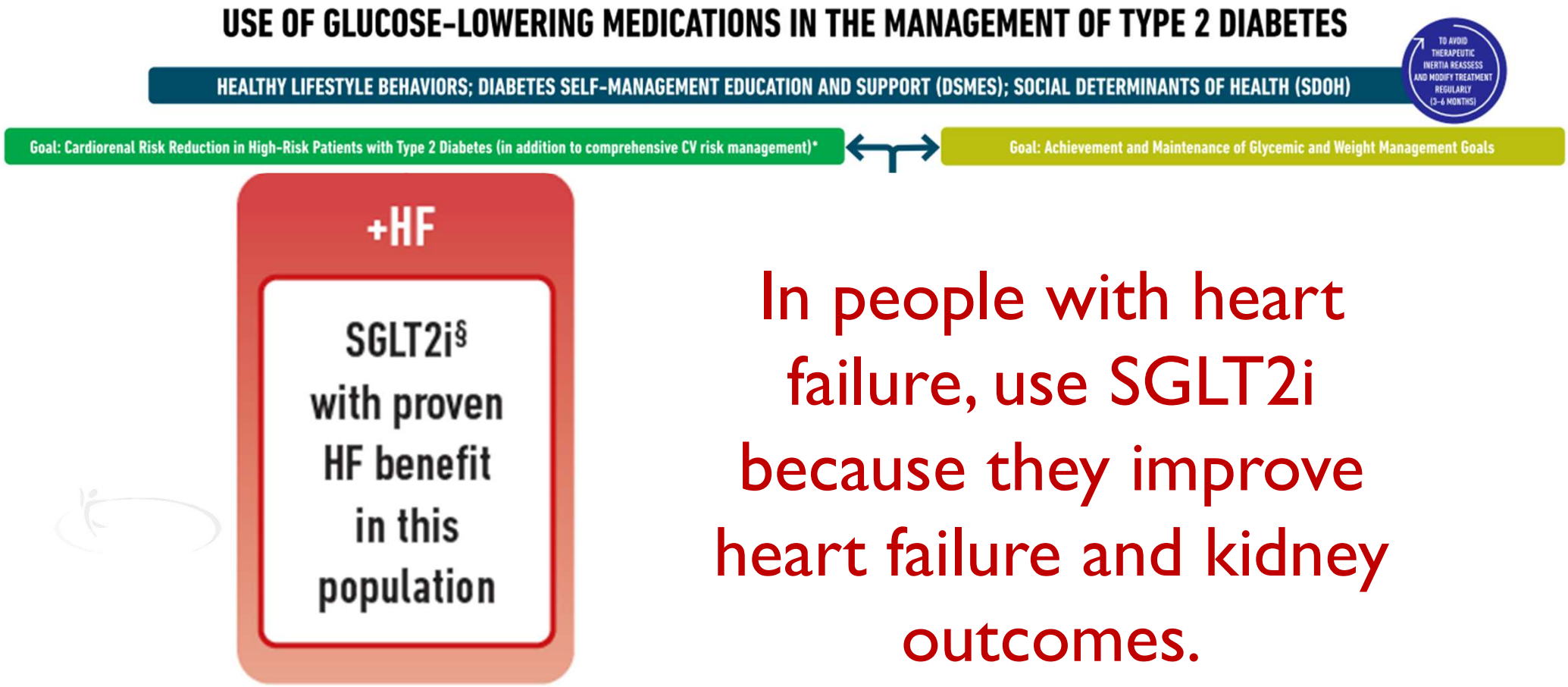
a. A1C drop of 3-4%, Wt loss of 3-5kg
b. Increased risk of UTI, A1C drop of 1-2%
c. Potential for ~10% body wt loss
d. Doubles risk of pancreatic cancer

Let's Break it Down / ADA & EASD



Management of Hyperglycemia in Type 2 Diabetes, 2022. A Consensus Report by the

Choosing glucose-lowering medication in people with heart failure

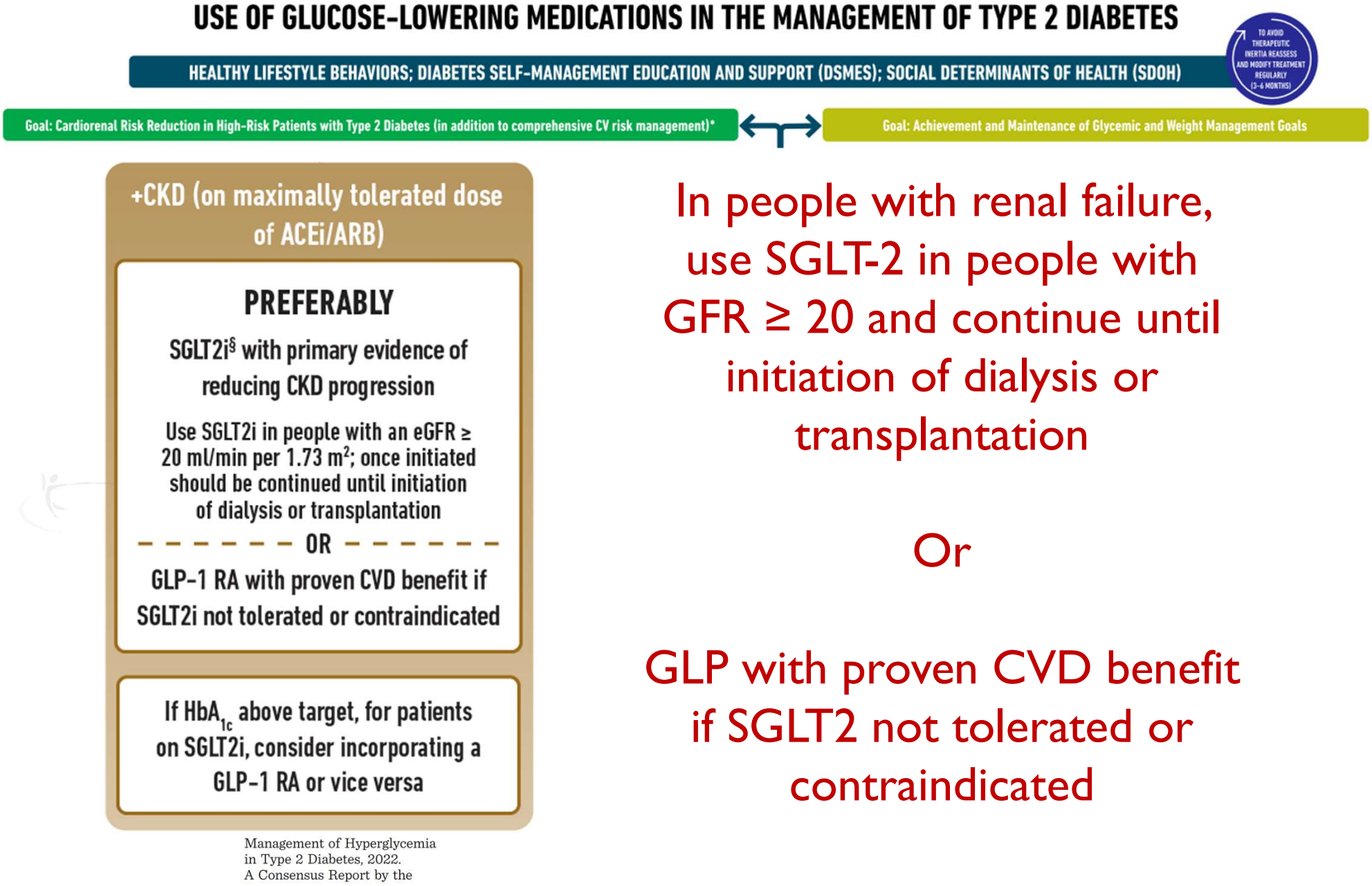


In people with heart failure, use SGLT2i because they improve heart failure and kidney outcomes.

Proven benefit:
Empagliflozin, ertugliflozin, canagliflozin, dapagliflozin

Management of Hyperglycemia
in Type 2 Diabetes, 2022.
A Consensus Report by the

Choosing glucose-lowering medication in people with chronic kidney disease



Management of Hyperglycemia in Type 2 Diabetes, 2022. A Consensus Report by the

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

Or

GLP with proven CVD benefit if SGLT2 not tolerated or contraindicated

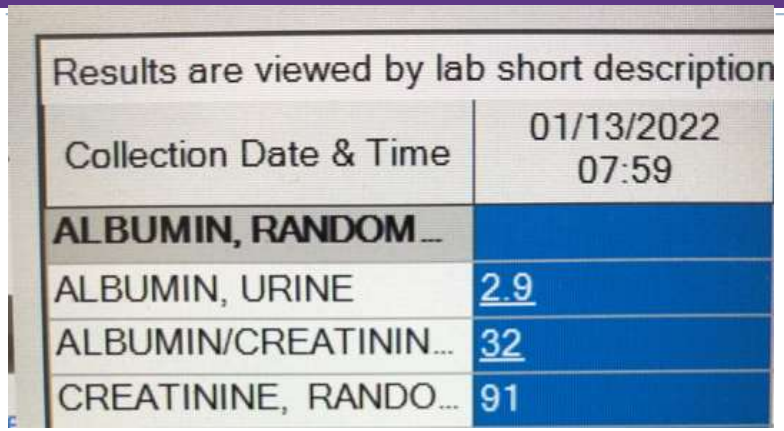
Diabetes + CKD – Increases CVD Risk

- 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



Results are viewed by lab short description	
Collection Date & Time	01/13/2022 07:59
ALBUMIN, RANDOM...	
ALBUMIN, URINE	2.9
ALBUMIN/CREATININ...	32
CREATININE, RANDO...	91

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

From: **11. Chronic Kidney Disease and Risk Management: Standards of Medical Care in Diabetes—2022**

Diabetes Care. 2021;45(Supplement_1):S175-S184. doi:10.2337/dc22-S011

CKD is classified based on: • Cause (C) • GFR (G) • Albuminuria (A)				Albuminuria categories Description and range		
				A1	A2	A3
				Normal to mildly increased	Moderately increased	Severely increased
				<30 mg/g <3 mg/mmol	30-299 mg/g 3-29 mg/mmol	≥300 mg/g ≥30 mg/mmol
GFR categories (mL/min/1.73 m^2) Description and range	G1	Normal to high	≥90	1 if CKD	Treat 1	Refer* 2
	G2	Mildly decreased	60-89	1 if CKD	Treat 1	Refer* 2
	G3a	Mildly to moderately decreased	45-59	Treat 1	Treat 2	Refer 3
	G3b	Moderately to severely decreased	30-44	Treat 2	Treat 3	Refer 3
	G4	Severely decreased	15-29	Refer* 3	Refer* 3	Refer 4+
	G5	Kidney failure	<15	Refer 4+	Refer 4+	Refer 4+


SGLT-2 Inhibitors

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%.

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

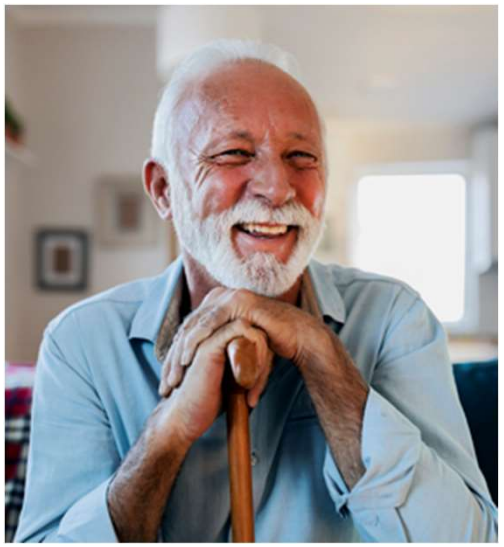
- Genitourinary infections
- Volume depletion
- Increased urination
- Hypotension
- Hyperkalemia
- Diabetes ketoacidosis (DKA)

SGLT-2i Indications

Drug	Lower BG	Reduce CV Risk?	Use to treat Heart Failure?	Slow renal disease?
Ertugliflozin **(Steglatro)**	Yes			Yes
Canagliflozin **(Invokana)**	Yes	Yes	Yes w/ Diabetes	Yes
Dapagliflozin **(Farxiga)**	Yes	Yes	Yes +/- Diabetes	Yes
Empagliflozin **(Jardiance)**	Yes	Yes	Yes +/- Diabetes	Yes

Package inserts, dailymed.nlm.nih.gov

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 LS

LS is 69 with type 2 diabetes for over a decade. Takes metformin 1000mg twice daily and dulaglutide 3mg weekly.

A1C=7.3%.

UACR 212mg/gm

eGFR=56

B/P 146/82

Weight: 205lbs, 5”7, BMI=32kg/m^2

Lost 10lbs in the last year

LS continued Poll 4

- What is the best drug to add to LS regimen?

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

What teaching would you include? Could we increase the dulaglutide dose?

How would we manage other risk factors:

- Use of ACE-inhibitor,/ARB, BP management
- Statin for CV risk

What the Rx?

Now on to other diabetes medications we haven't yet covered

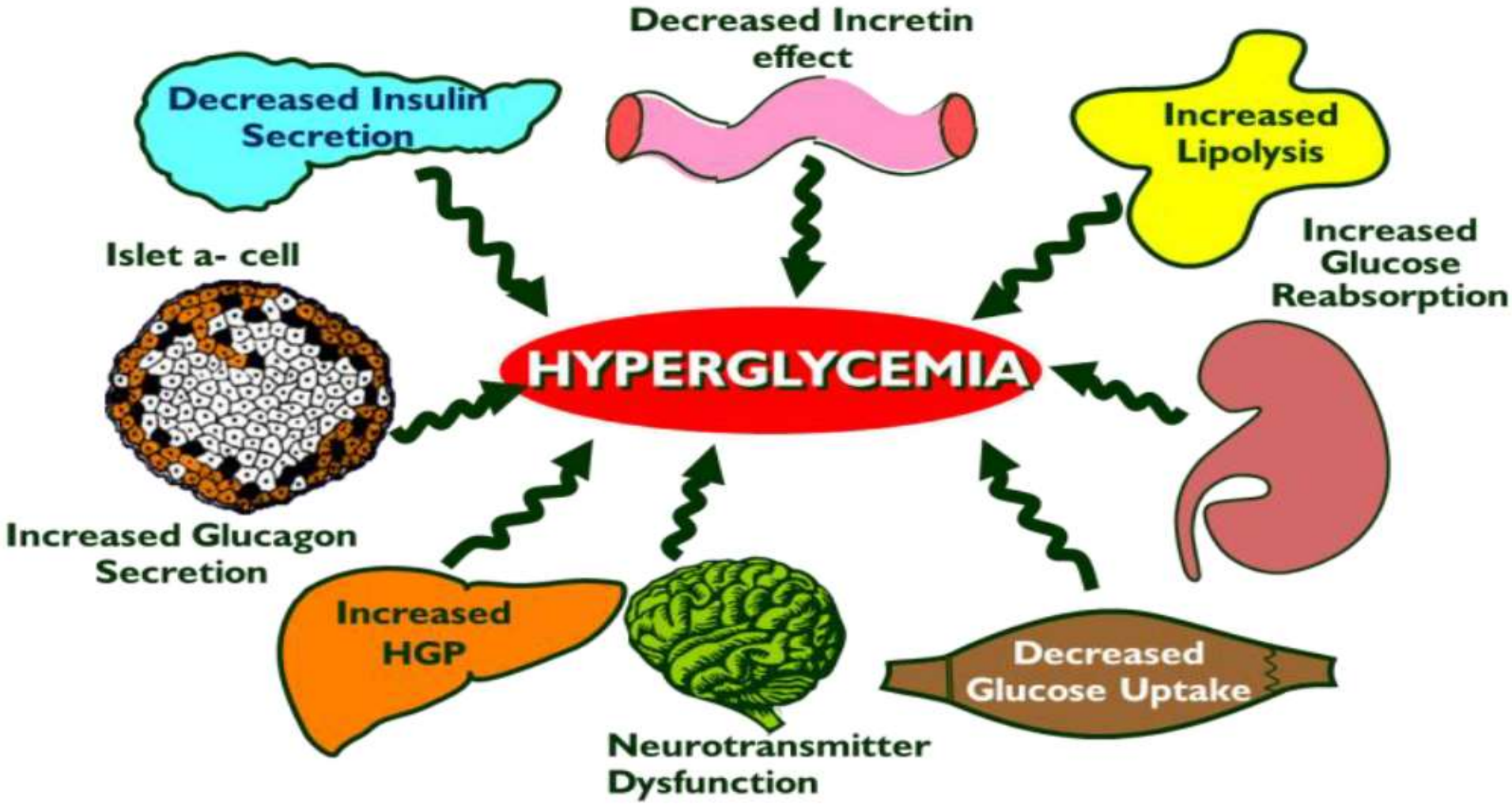
How Many Drug Options for Diabetes?

- 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

Other Oral Diabetes Medications

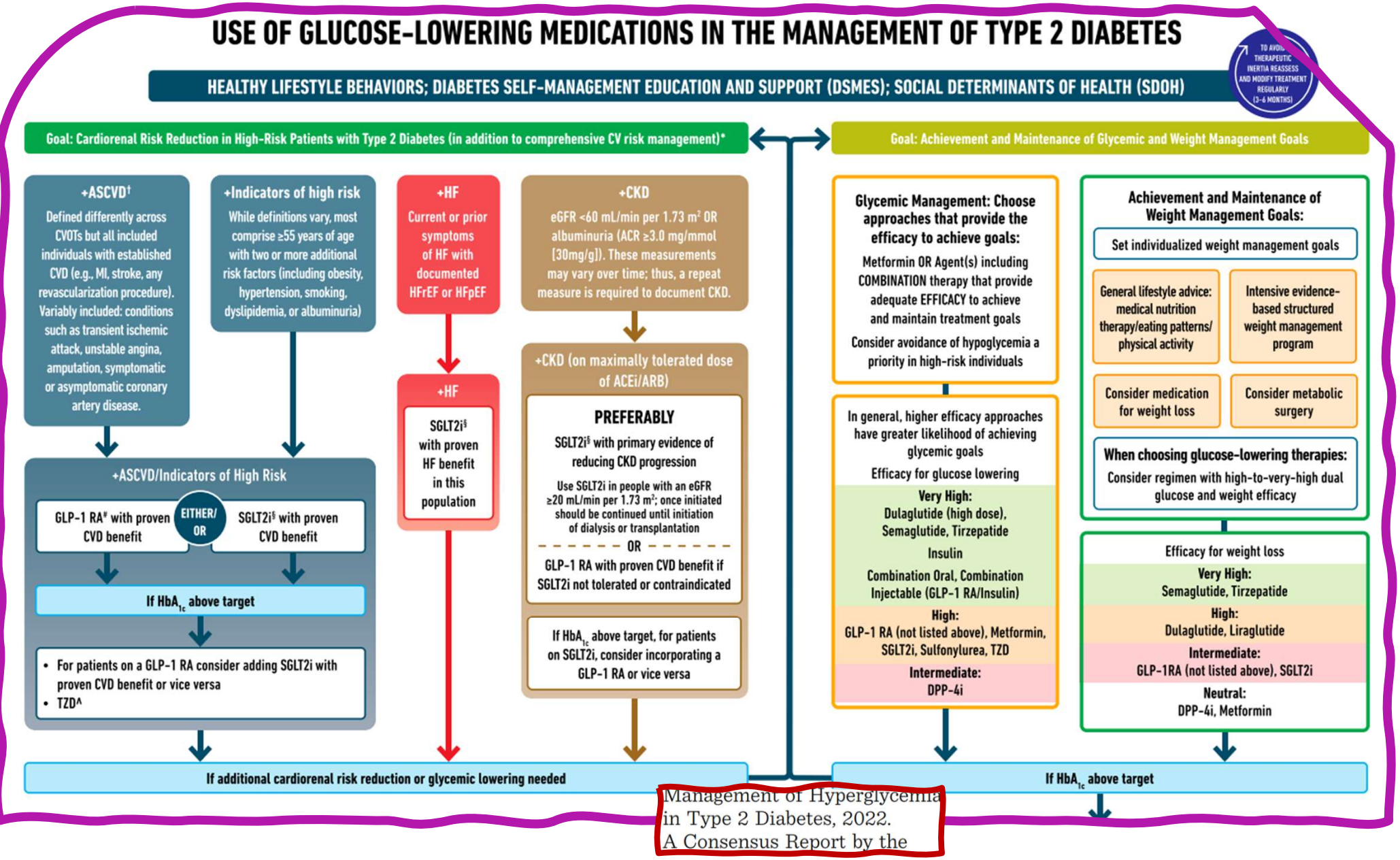
Class/Main Action	Name(s)	Daily Dose Range	Considerations
Thiazolidinediones "TZDs" • Increases insulin sensitivity	pioglitazone (Actos) rosiglitazone (Avandia)	15 – 45 mg daily 4 – 8 mg daily	Black Box Warning: TZDs may cause or worsen CHF. Monitor for edema and weight gain. Increased peripheral fracture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

Drug Targets in Diabetes



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

We Did IT – Now let's apply IT



Management of Hyperglycemia in Type 2 Diabetes, 2022. A Consensus Report by the

Case Study - PR

PR is a 46yoM newly diagnosed with type 2 diabetes. A1C=8.2%.

UACR 13 mg/gm GFR >60

Has hypertension, 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 a 6 pk on most nights)

Poll 5. These are meds covered by PR's formulary. Which is the best medication to Start PR on?

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

Poll Question 6

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

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

PR wants to lose more weight

- After 3 months, PR's A1C has decreased to 7.1%. After meeting with diabetes care and education specialist, has increased physical activity to 3 days/week of walking.
  Lost 6lbs and would like to lose more.
- Current DM Meds:
  empagliflozin(Jardiance) 25mg daily.
- BMI=34kg/m^2

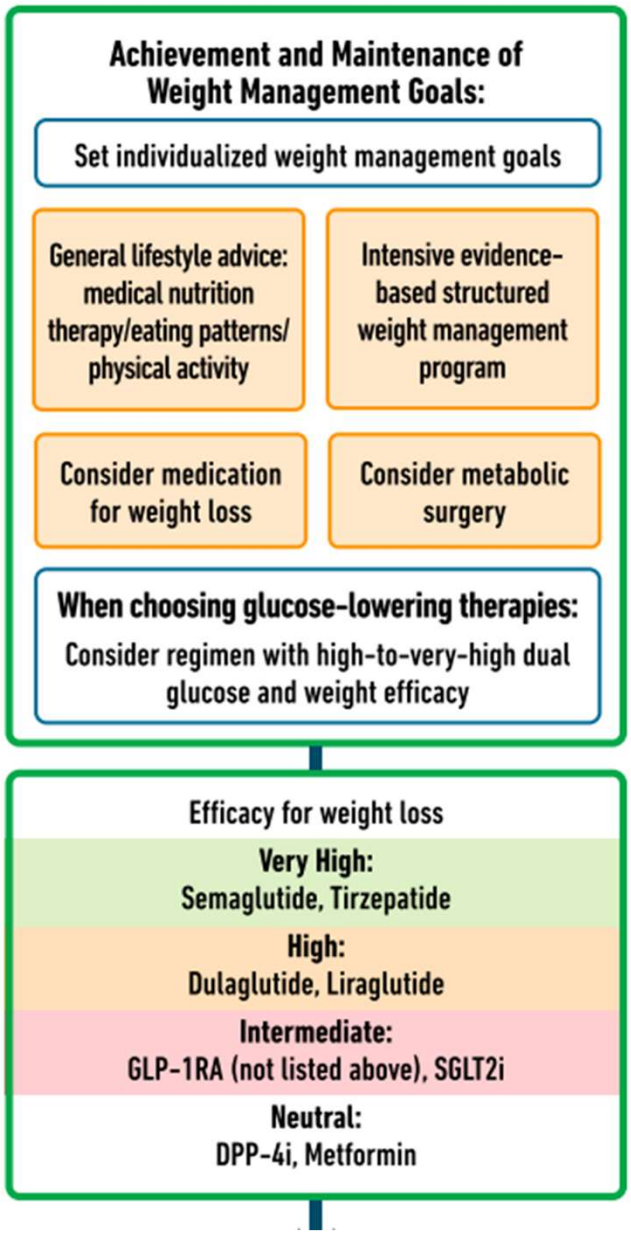
- What drug would be best to start next?

When Goal is to Avoid Weight Gain

- These meds associated with wt loss
  - GLP-1 and GIP agonists
  - SGLT-2 Inhibitors
- These meds are weight neutral
  - Metformin
  - DPP-4 Inhibitor

ADA /EASD

Management of Hyperglycemia in Type 2 Diabetes, 2022. A Consensus Report by the



7. Best medication to lose weight?

- Lost 6lbs and would like to lose more. Current DM Meds: empagliflozin (Jardiance) 25mg daily. BMI=34.
- What drug would be best to start next?

A. Tirzepatide
B. Metformin
C. Semaglutide
D. Degludec
E. A or C

Of course, lifestyle coaching and RD referral included in plan!

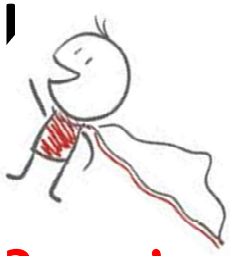
Poll 8 - Check Your Knowledge

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

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

How much do they cost?

- Which of the following groups of meds for a month supply are cheapest? (multip'



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

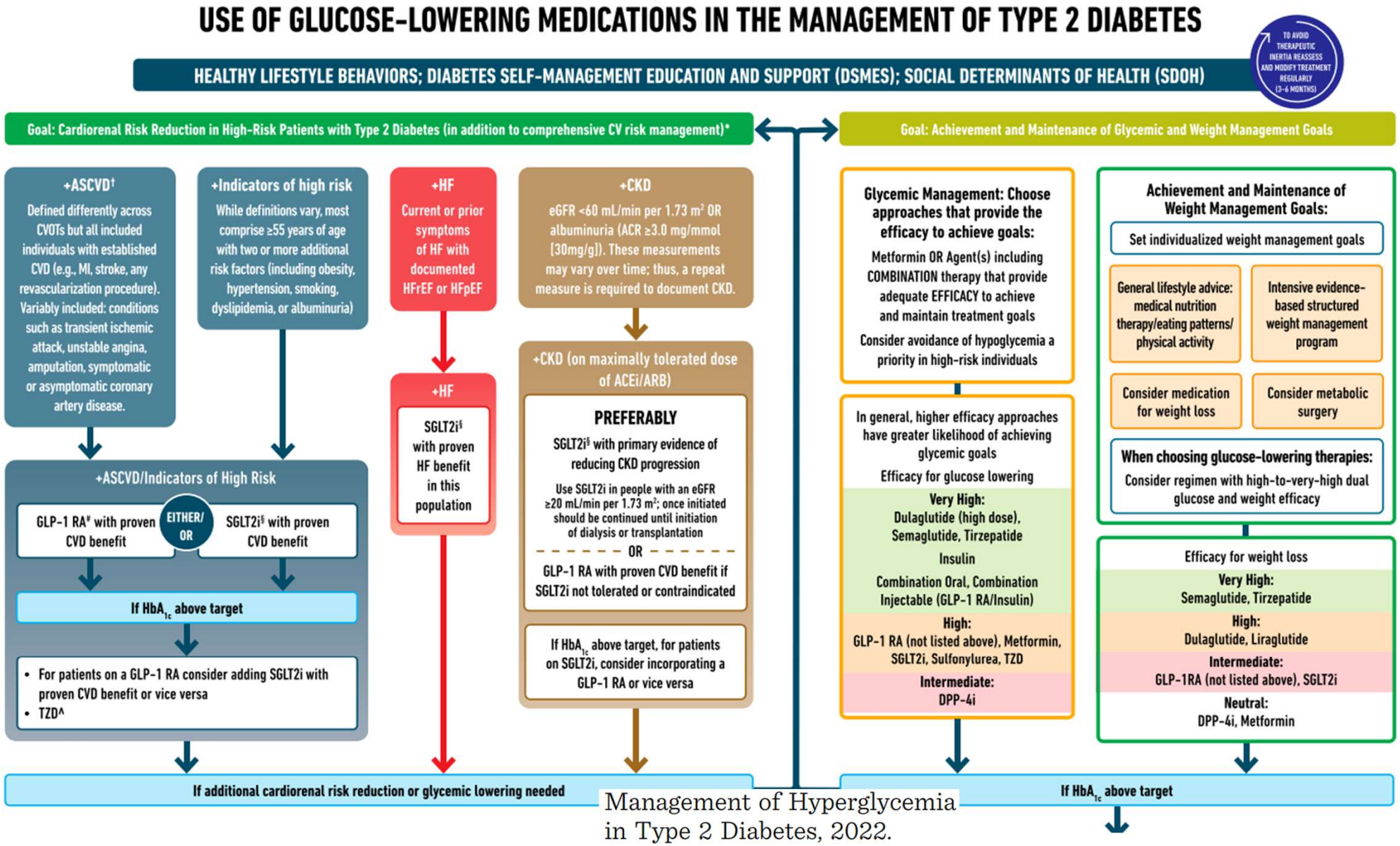
e. Exenatide and Semaglutide $909, $1022

f. Empagliflozin and SGLT-2s $658

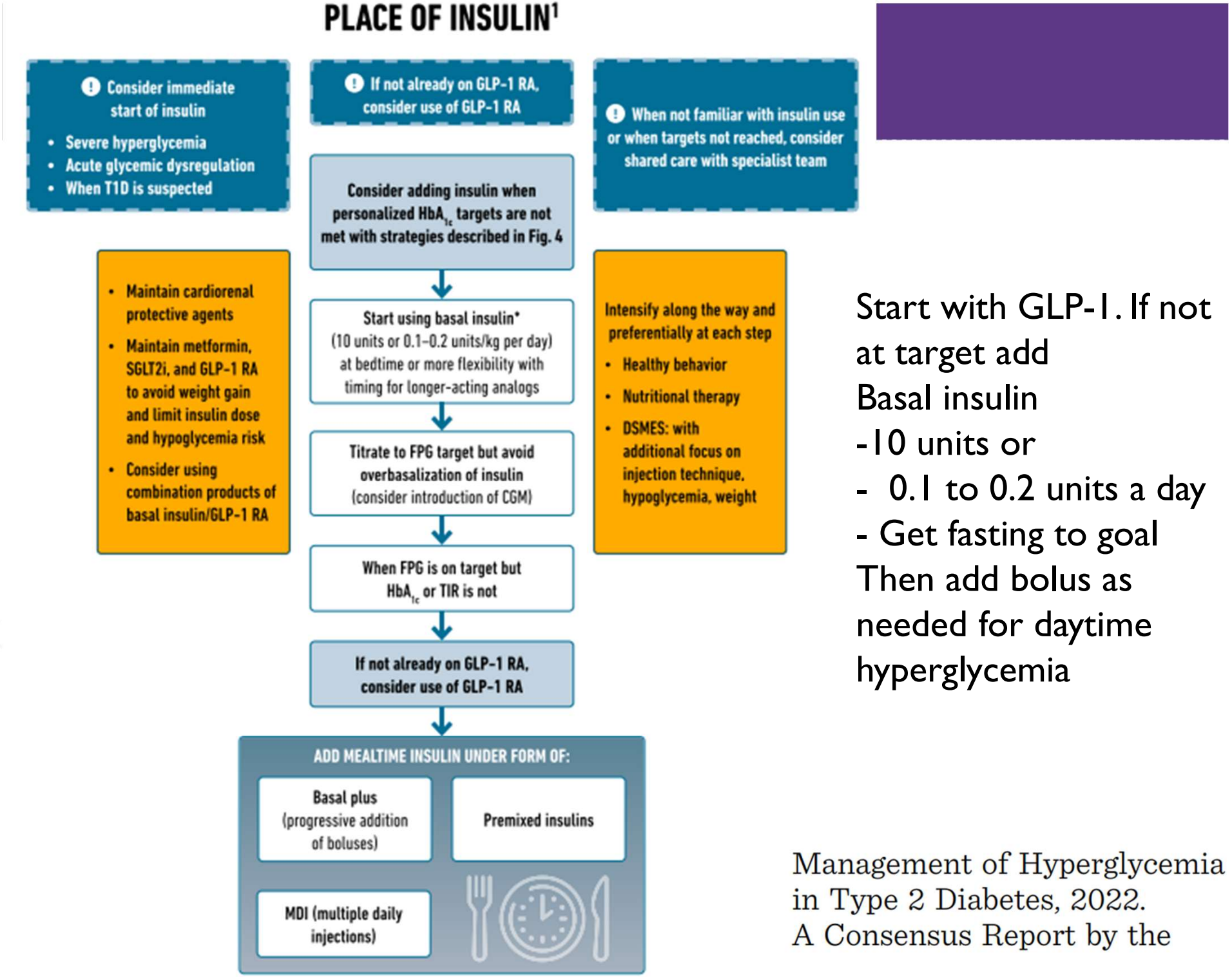
g. Tirzepatide (Mounjaro) $974

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

Wait, what about insulin?



Management of Hyperglycemia in Type 2 Diabetes, 2022. A Consensus Report by the



Start with GLP-1. If not at target add
Basal insulin
-10 units or
- 0.1 to 0.2 units a day
- Get fasting to goal
Then add bolus as needed for daytime hyperglycemia

Management of Hyperglycemia in Type 2 Diabetes, 2022. A Consensus Report by the

Quick Question 14

- 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?

Hypoglycemia (Glucose) Alert Values

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

Identify your signs of hypoglycemia or low blood sugar:

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

Step 2

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

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

Step 3

Have glucagon rescue meds available.

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

Notify your provider of low blood sugar events.

Hypoglycemia Levels:

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

Identify Causes of Hypo & Problem Solve to Prevent Future Episodes

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

Glucagon Rescue Medications for Diabetes-Related Hypoglycemia

Name/Delivery	Supplied	Dose Range		Age / Route / Storage
		Adult	Peds / Age WT Dosing	
Glucagon Emergency Kit Injection requires mixing glucagon powder	1mg / 1mL vial + syringe	1mg	0.03mg/kg or < 6yrs or < 25 kgs | 0.5mg ≥ 6yrs or > 25kgs | 1mg	All ages approved SubQ or IM admin Expires in 2 years at room temp.
Baqsimi Nasal glucagon powder	3 mg intranasal device	3 mg	< 4 yrs: not recommended 4 yrs or older | 3mg dose	Approved Age 4+ Nasal admin Expires ~ 2 years at room temp (keep in shrink-wrapped tube).
Gvoke Injectable liquid stable glucagon solution	0.5mg/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.

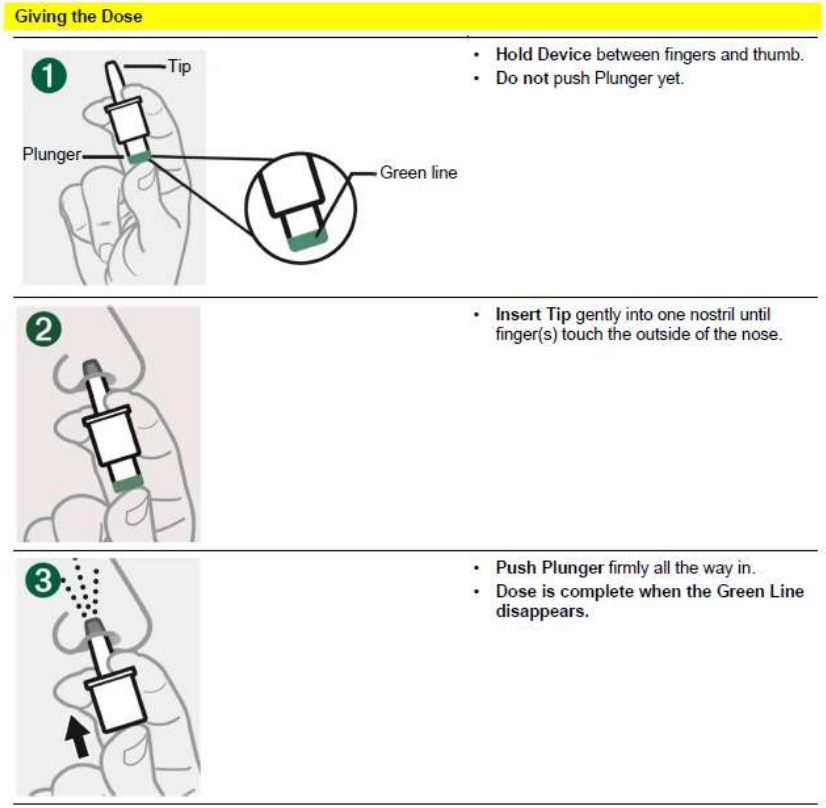
All PocketCard content is for educational purposes only. Please consult prescribing information for detailed guidelines.

Glucagon Emergency Kit

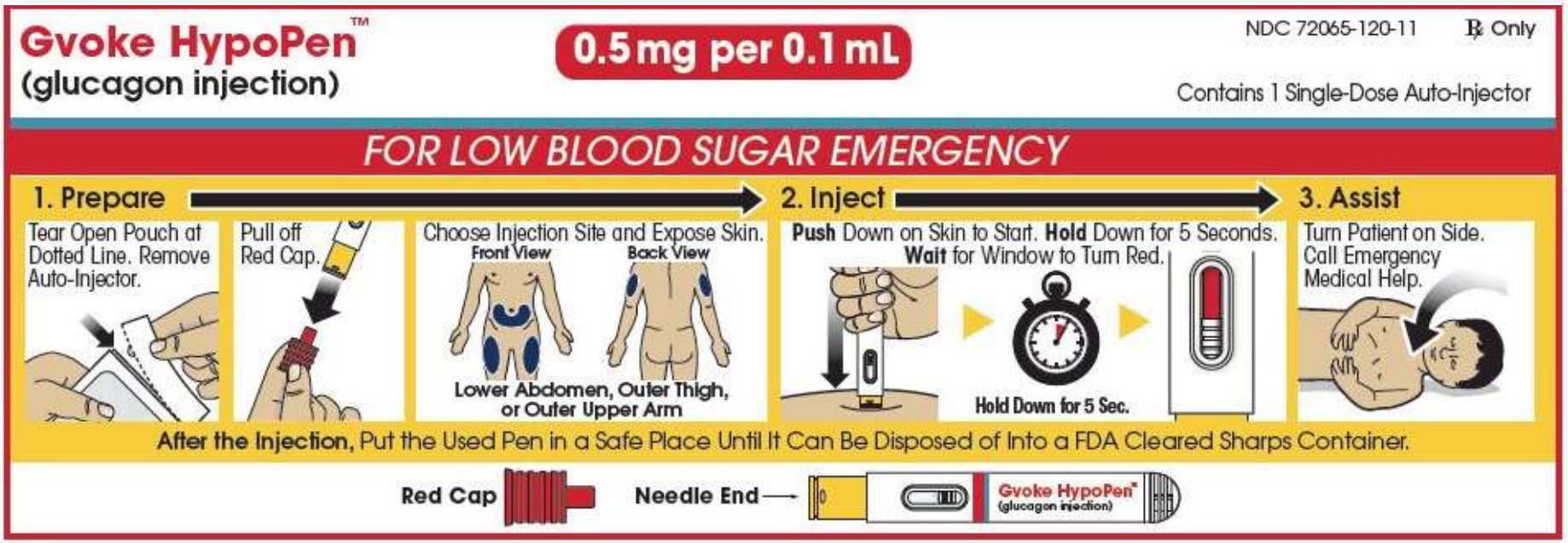
Store 68-77 degrees prior to reconstitution, single use only

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



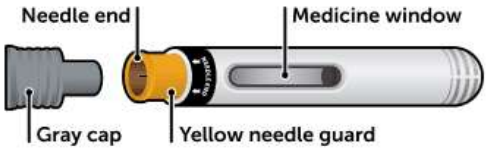
Dasiglucagon (Zegalogue)

Red protective case

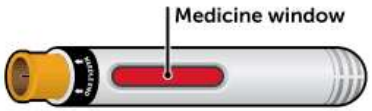
ZEGALOGUE

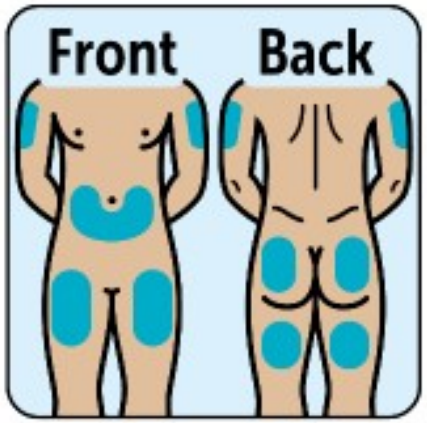
Autoinjector

Before injection



After injection





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)

<u>Life situation</u>

Takes care of dad with dementia

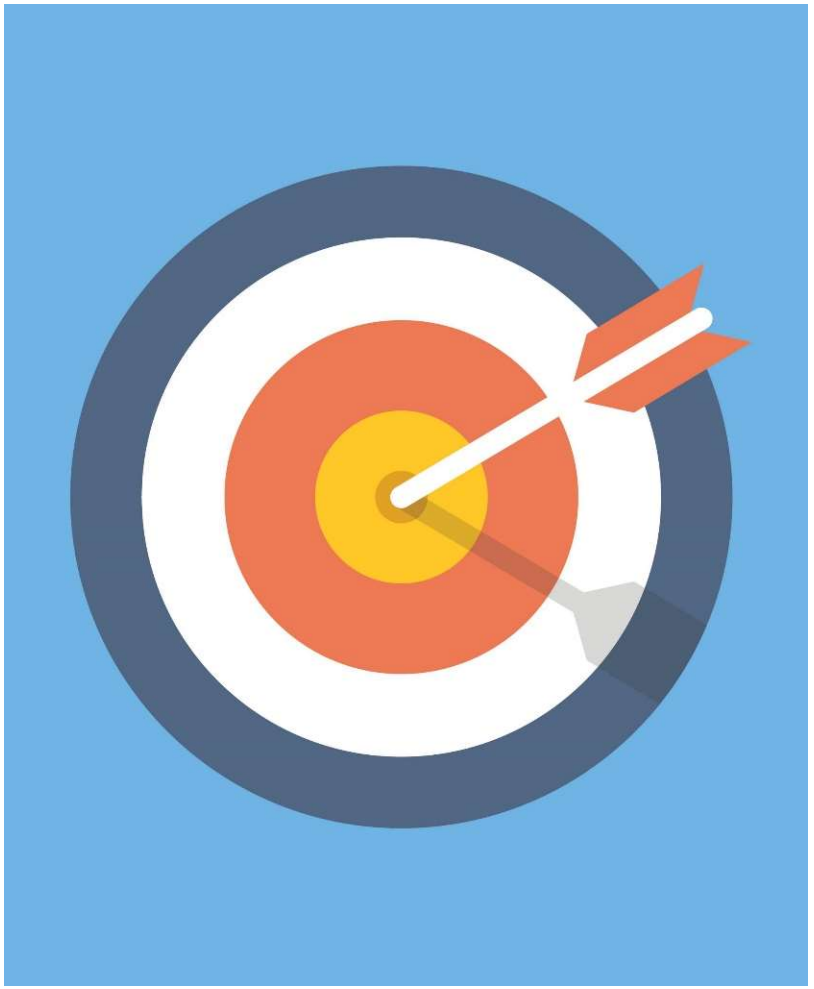
Gums inflamed

No eye doctor for year

Both feet hurt at night

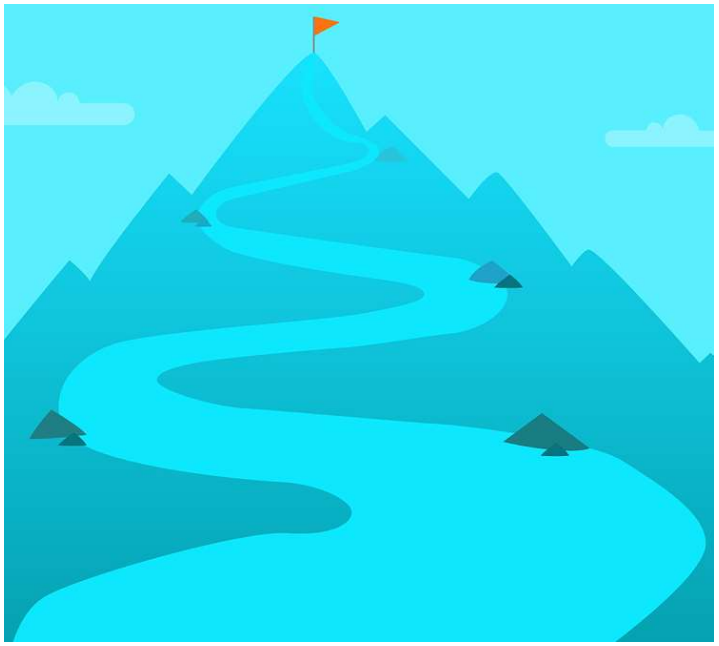
ABCs of Diabetes

- 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

Good Exercise Info / Quotes

- **"Passagiata" – take an after meal stroll**
- Exercise decreases A1c 0.7%
- No change in body wt, but 48% loss in visceral fat

"Every minute of activity lowers blood sugar one point."

"I don't have time to exercise, I MAKE time."
Mike Huckabee

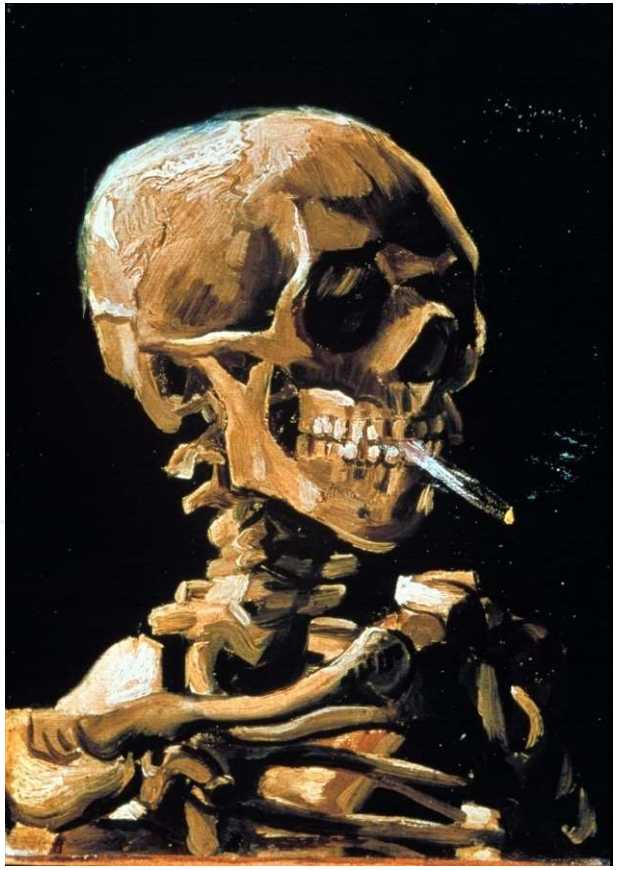
Best Shake For People with Diabetes

"The only diet shake I recommend is the shake your booty makes when you exercise."

From Debbie Nagata's slide collection

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.

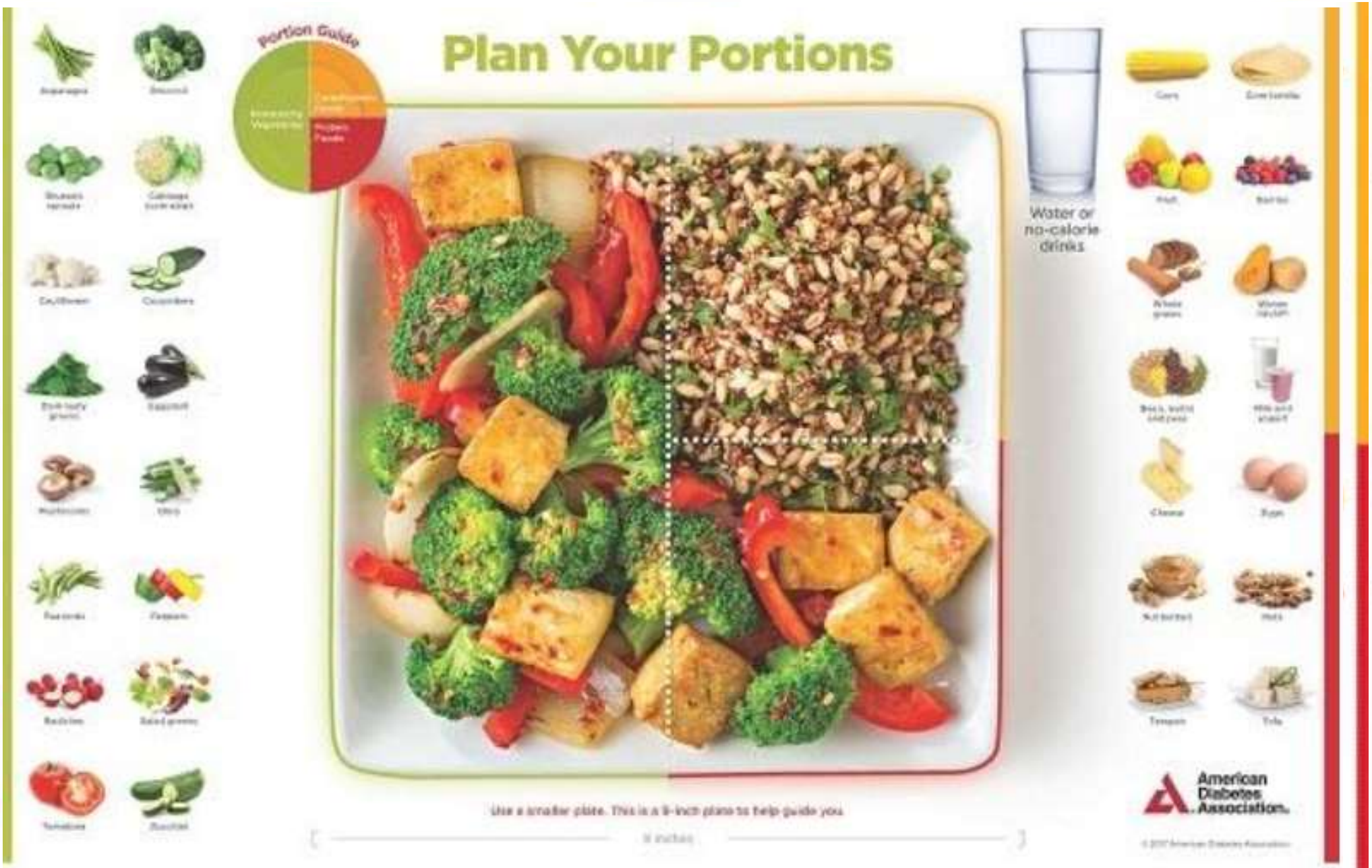
Foods to Reduce

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

Plan Your Portions

American Diabetes Association.
Connected for Life

What Can I Eat?®



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

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?

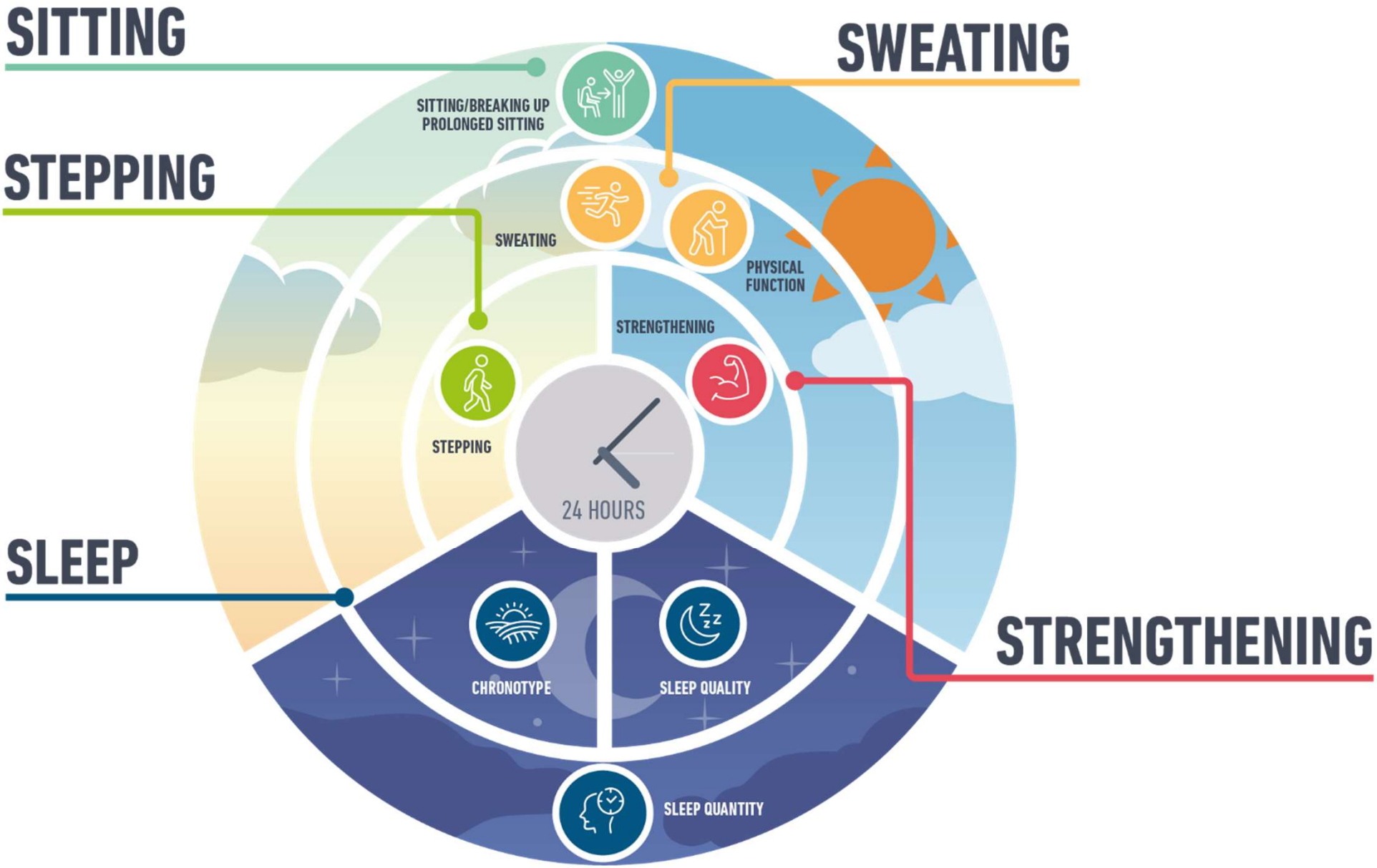
Are these goals realistic?

Exercise Standards

- Adults – 150 min/wk moderate intensity
  - over 3 days a week.
  - Don’t miss > 2 consecutive days w/out exercise
  - Get up every 30 mins - Reduce sedentary time
  - Flexibility and balance training 2-3 xs a week (Yoga and Tai Chi)
  - T1 and T2 – resistance training 2 -3 xs a week

ADA Standards 2022

FIGURE 2: IMPORTANCE OF 24-HOUR PHYSICAL BEHAVIOURS FOR TYPE 2 DIABETES



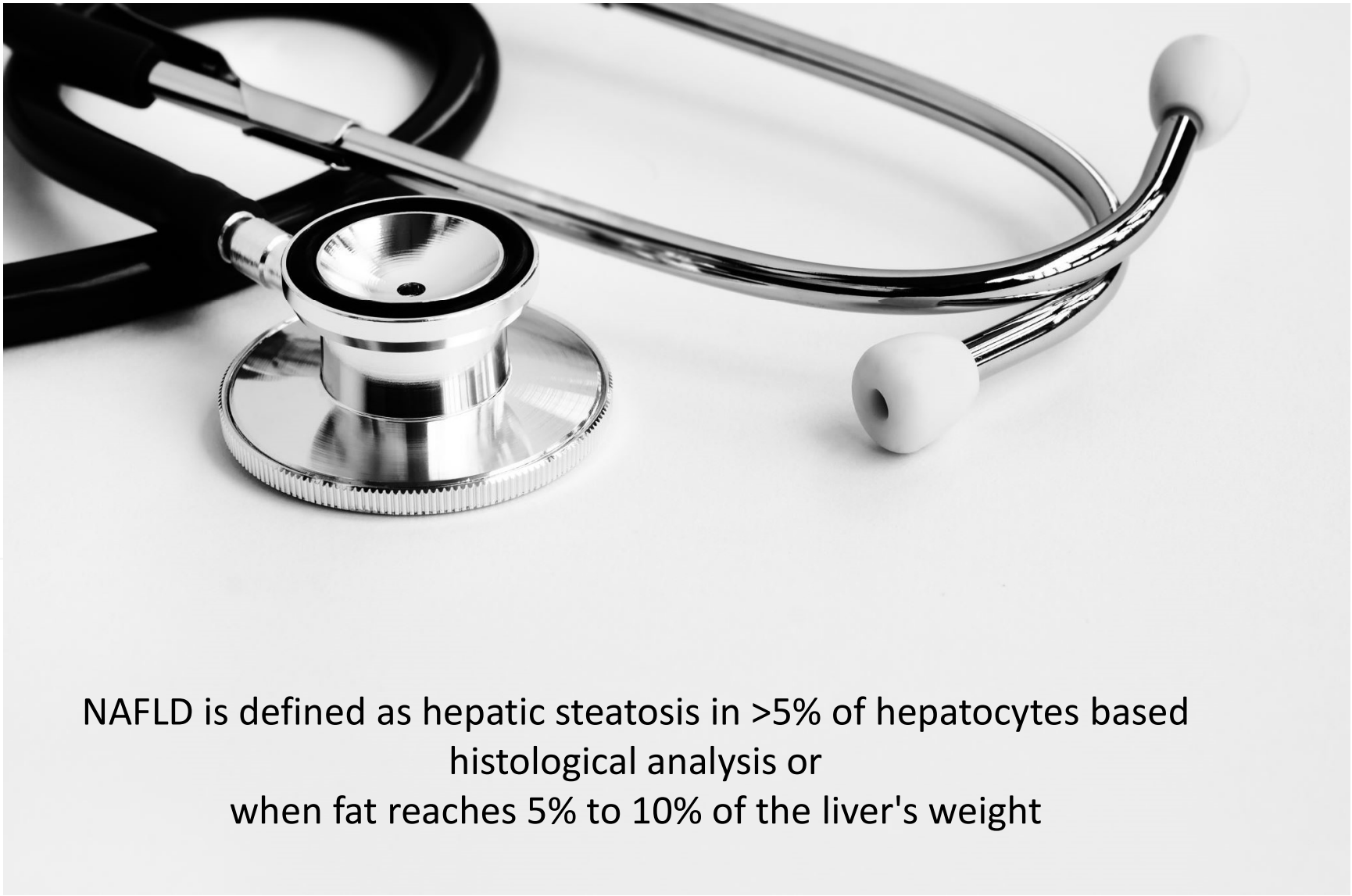
Management of Hyperglycemia in Type 2 Diabetes, 2022. A Consensus Report by the

24 hour Physical Behavior Impact

	Glucose/insulin	Blood pressure	HbA_{1c}	Lipids	Physical function	Depression	Quality of life
SITTING/BREAKING UP PROLONGED SITTING	↓	↓	↓	↓	↑	↓	↑
STEPPING	↓	↓	↓	↓	↑	↓	↑
SWEATING (MODERATE-TO-VIGOROUS ACTIVITY)	↓	↓	↓	↓	↑	↓	↑
STRENGTHENING	↓	↓	↓	↓	↑	↓	↑
ADEQUATE SLEEP DURATION	↓	↓	↓	↓	?	↓	↑
GOOD SLEEP QUALITY	↓	↓	↓	↓	?	↓	↑
CHRONOTYPE/CONSISTENT TIMING	↓	?	↓	?	?	↓	?

Management of Hyperglycemia in Type 2 Diabetes, 2022. A Consensus Report by the

EV has the beginning of NAFLD



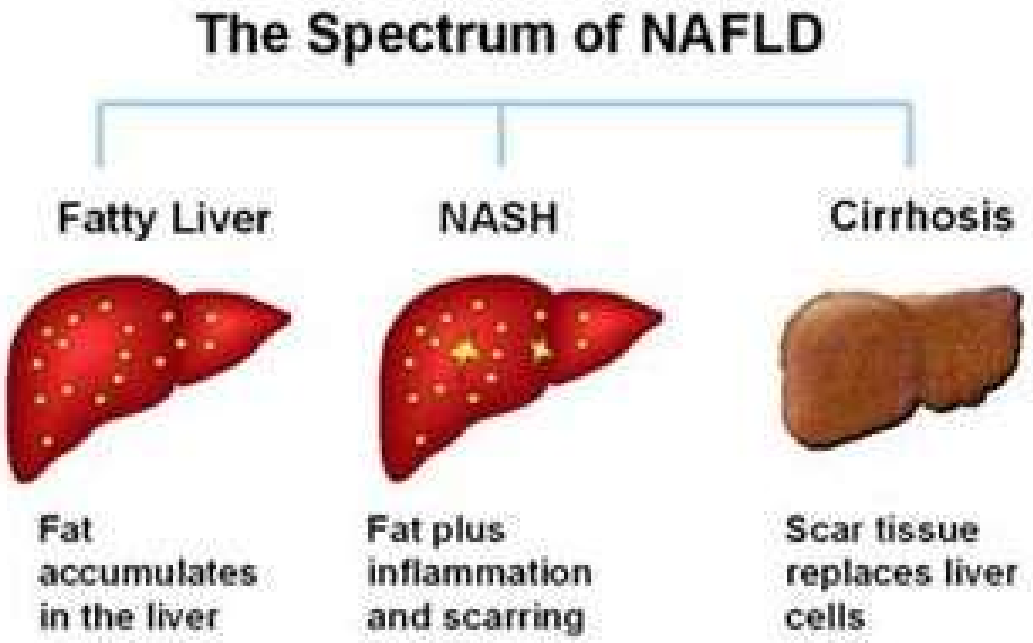
NAFLD is defined as hepatic steatosis in >5% of hepatocytes based histological analysis or
when fat reaches 5% to 10% of the liver's weight

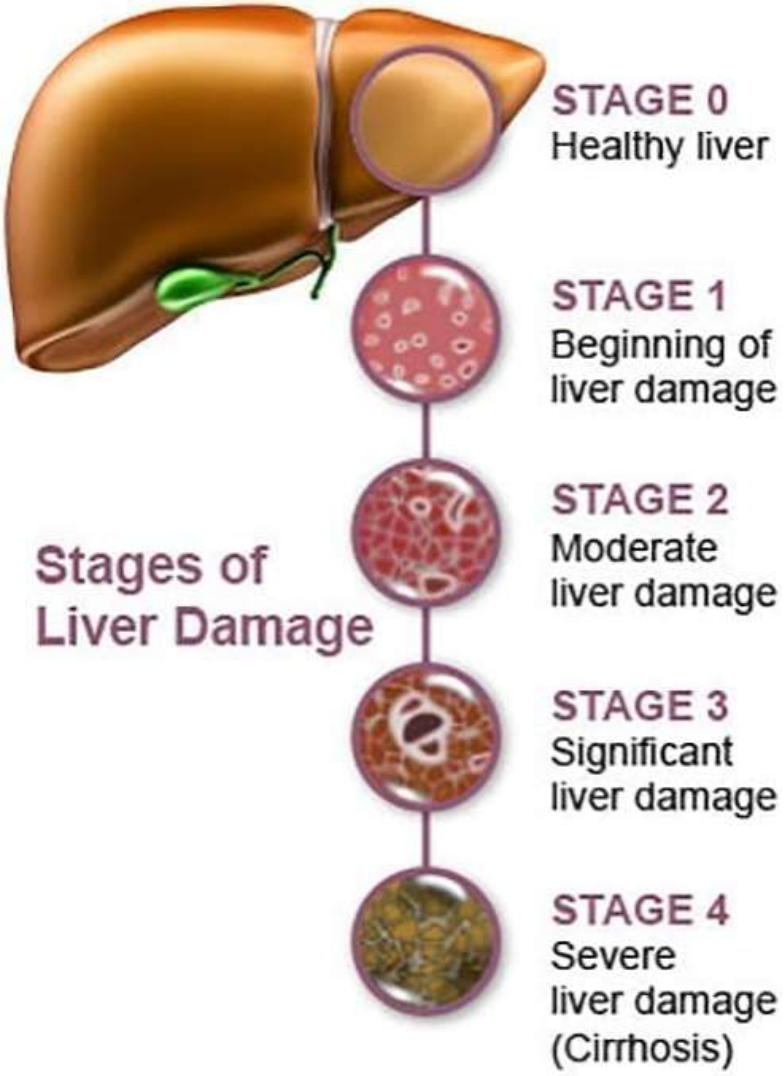
Stages of liver failure

- 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

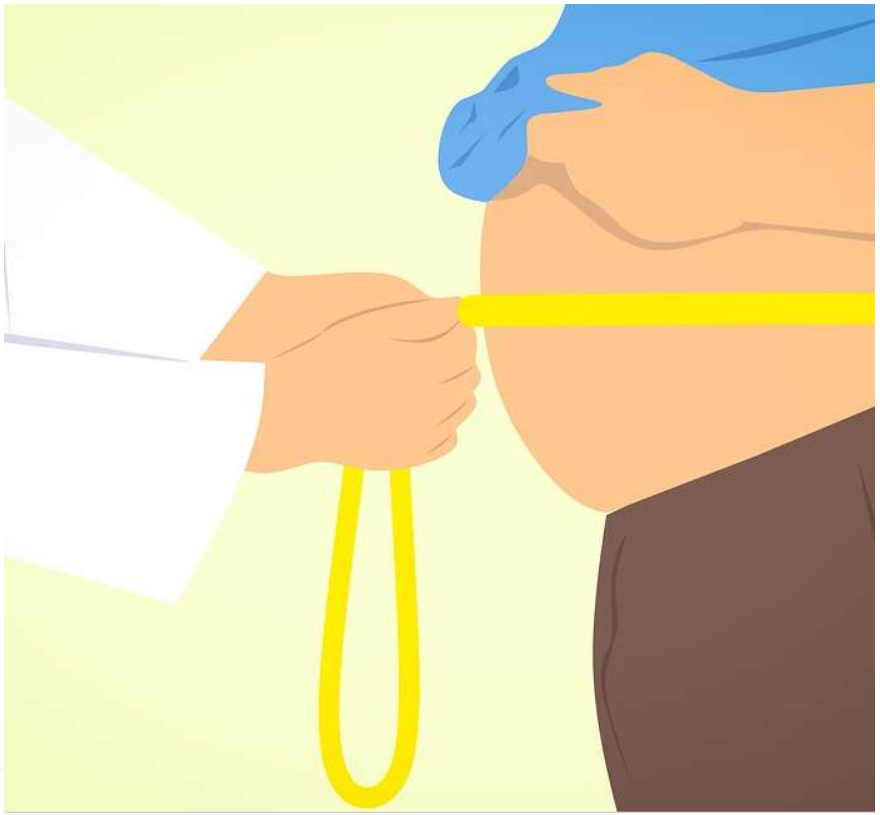




NASH – Non-Alcoholic Steatohepatitis

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

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.
- Feet calluses

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

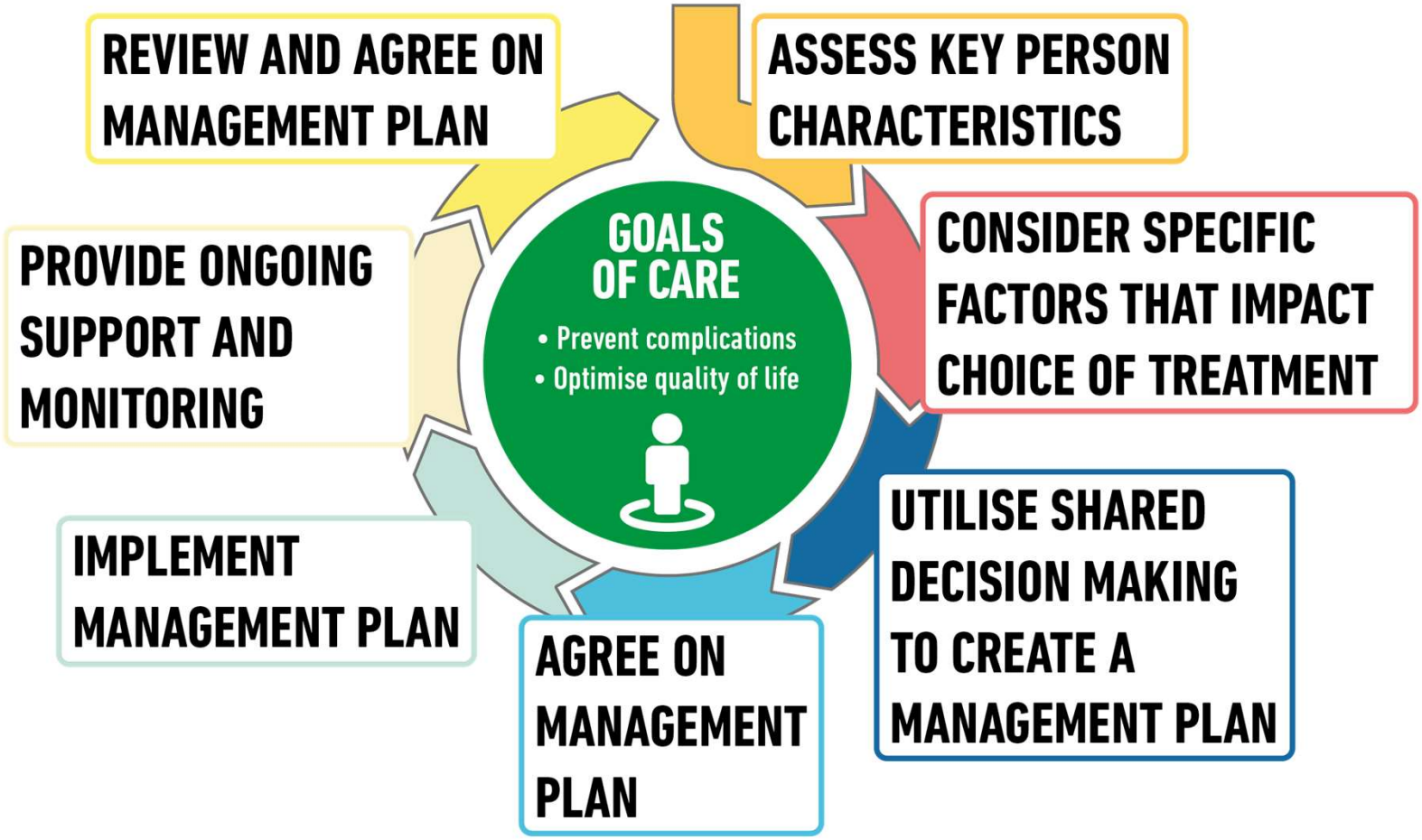
- Music
- Podcasts
- Movies
- Pet's
- Massage
- Touch
- Topical creams
- Lidocaine patches
- Mineral salts baths
- Neurostimulators

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

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.
- Appointment with Podiatrist
- The pain in her feet is better and she is more hopeful overall!

FIGURE 1: DECISION CYCLE FOR PERSON-CENTRED GLYCAEMIC MANAGEMENT IN TYPE 2 DIABETES



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

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

No DE-FEET

Preventing Agony of "DeFeet"

1. Describe risk factors for lower extremity complications.
2. Discuss prevention strategies.
3. Demonstrate steps involved in lower extremity assessment.

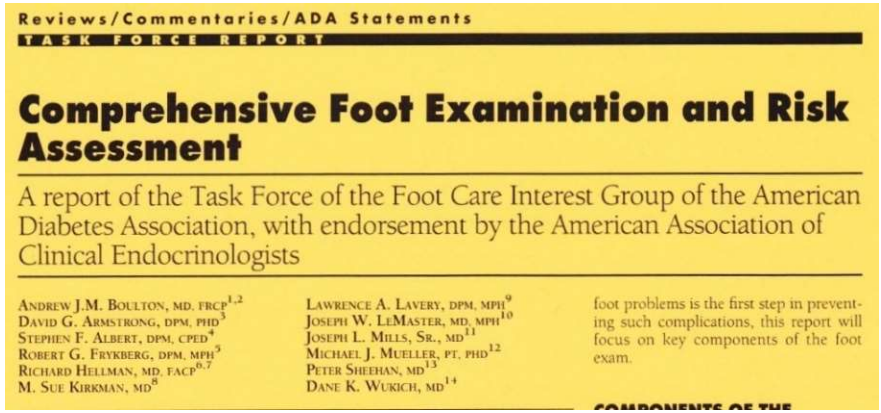
STANDARDS OF CARE | DECEMBER 16 2021

12. Retinopathy, Neuropathy, and Foot Care: *Standards of Medical Care in Diabetes—2022* FREE

American Diabetes Association Professional Practice Committee

Check for updates

Diabetes Care 2022;45(Supplement_1):S185–S194
https://doi.org/10.2337/dc22-S012



Reviews/Commentaries/ADA Statements

TASK FORCE REPORT

Comprehensive Foot Examination and Risk Assessment

A report of the Task Force of the Foot Care Interest Group of the American Diabetes Association, with endorsement by the American Association of Clinical Endocrinologists

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PETER SHEEHAN, MD[13]
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foot problems is the first step in preventing such complications, this report will focus on key components of the foot exam.

COMPONENTS OF THE

Notes from Beverly

All HCP can help save feet!

Some of these images may be difficult to view.

Lower Extremity Complications

- Combination of vascular, neurological, and musculoskeletal dysfunction
- Foot ulcers and amputations (from neuropathy and peripheral arterial disease) are associated with higher morbidity and mortality rates.
- Early recognition and treatment makes a difference

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 (toes)
  - Highest rates in young and middle age adults (18- 64 years).
- 130,000 adults annually with diabetes have lower extremity amputations NIDDK /NIH
- This number equates to **five out of every 1,000** people with diabetes.

Diabetes Care

Diabetes Care 2018

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

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

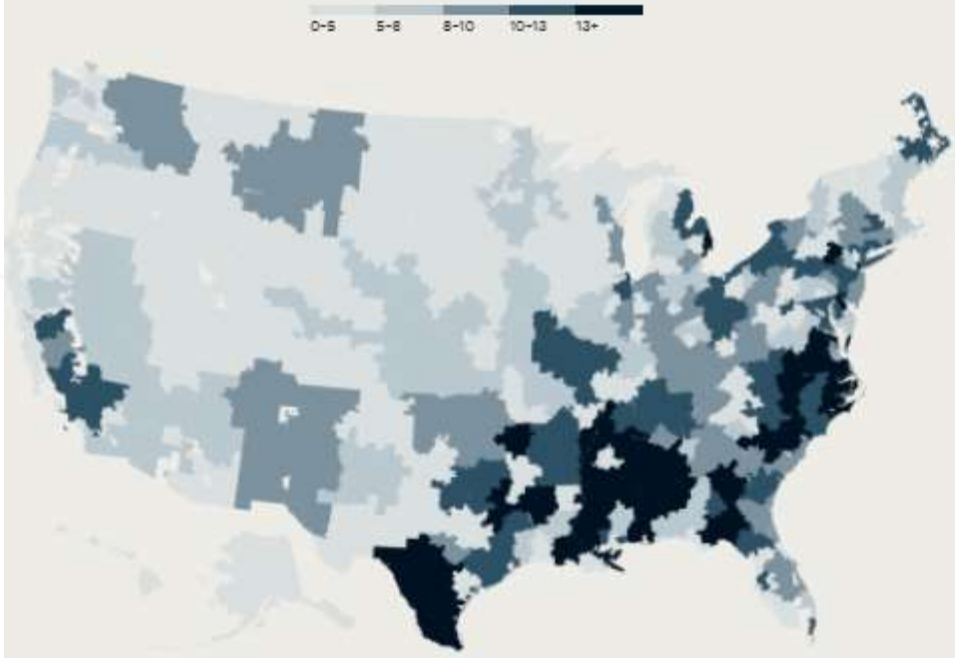
Health Disparities and Lower Extremity Amputations

- African Americans and people of color have 3-4 times the rate of amputation, compared to White Americans
- 60% of amputations in 7% of population
- Amputations cost $30,000 – 60,000
- Associated w/ earlier death compared to revascularization

The Black American Amputation Epidemic

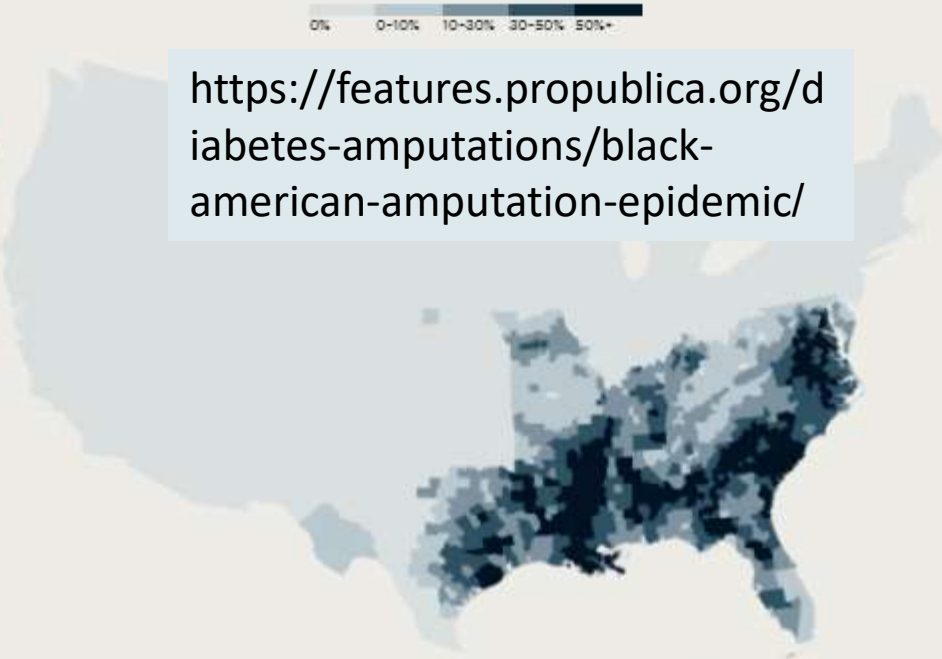
Despite the great scientific strides in diabetes care, the rate of amputations across the country grew by 50% between 2009 and 2015. Diabetics undergo 130,000 amputations each year, often in low-income and underinsured neighborhoods. Black patients lose limbs at a rate triple that of others. It is the cardinal sin of the American health system in a single surgery: save on preventive care, pay big on the backend, and let the chronically sick and underprivileged feel the extreme consequences.

AVERAGE ANNUAL AMPUTATIONS, 2007–9



The average number of amputations for peripheral artery disease per 10,000 patients per year. Source: Dartmouth Atlas of Healthcare

ENSLAVED POPULATION IN 1860



The percentage of the population enslaved in 1860. Source: IPUMS NHGIS, University of Minnesota

https://features.propublica.org/diabetes-amputations/black-american-amputation-epidemic/

Foot Ulcer usually doesn't lead to amputation – but it can.

- Foot ulcers occur in 4–10% of people with diabetes.
- Outcomes include:
  - 60–80 percent of foot ulcers will heal
  - 10–15 percent will remain active
  - 5–24 percent will eventually lead to limb amputation within 6–18 months of the initial evaluation

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3508111/

Diabetes Ther. 2012 Dec; 3(1): 4.
Published online 2012 Apr 20. doi: 10.1007/s13300-012-0004-9

Management of Diabetic Foot Ulcers

Kleopatra Alexiadou[1] and John Doupis[2]

Poll Question 1

- Which of the following factor(s) increase risk for amputation in diabetes?

A. Socioeconomic status
B. Cigarette smoking
C. Previous amputation
D. Age and ethnicity
E. All of the above

Racial Disparities and Amputations

NIH National Institute of Diabetes and Digestive and Kidney Diseases

Research & Funding | Health Information

Home \ Health Information \ For Health Professionals \ Diabetes Discoveries & Practice Blo

Diabetes Discoveries & Practice Blog

Reducing Disparities in Diabetic Amputations

April 21, 2021 0 Comments

Tagged: Complications of Diabetes / Social Determinants of Health

Risk for amputation? Consider these factors:

- **region.** People who live in the southern United States have the highest rates of amputation. They also have the lowest rates of revascularization.
- **race.** Most people receiving amputations are minorities: Black Americans, Hispanics/Latinos, and American Indians.
- **age.** Many people who receive amputations are older. PAD may be missed in older adults because the symptoms are attributed to arthritis or gout. Also, primary care doctors may not know about PAD and may not screen patients for PAD early. Patients undergo an amputation when they are older because PAD was missed.
- **socioeconomic status.** Poorer patients and those living in poorer regions of the country have less access to quality health care and have the highest amputation rates. Unfortunately, many of these patients are minorities with low incomes.
- **hospital volume of vascular procedures.** Hospitals are better at preventing amputation if they can assemble a team of specialists proficient in aggressive limb salvage, wound care, nutritional care, and diabetes management and treatment. Rural areas, such as those in the southern United States, don't have a significant number of these specialists.

https://www.niddk.nih.gov/health-information/professionals/diabetes-discoveries-practice/reducing-disparities-in-diabetic-amputations?utm_source=diabetes%20discoveries%20%26%20practice%20blog&utm_medium=e-mail

Poll Question 2

- Which of the following is true about diabetes and lower extremities?
  A. Over 30% of people with diabete experience amputation.
  B. Over 50% of amputations could have been avoided.
  C. Most amputations happen before the age of 70
  D. The rate of amputations continues to decrease.

Foot Care Standards - ADA

- Perform a comprehensive foot evaluation at least annually to identify risk factors for ulcers and amputations.
- Provide general preventive foot self-care education to all people living with diabetes.
- Sensory loss or prior ulceration or amputation?
  - inspect feet at every visit.
- High-risk may need specialized therapeutic footwear:
  - If severe neuropathy, foot deformities, ulcers, callous formation, poor peripheral circulation, or history of amputation.

High Risk of Ulcers Amputation

Poor glycemic control

Peripheral neuropathy with LOPS

Cigarette smoking

Foot deformities

Preulcerative callus or corn

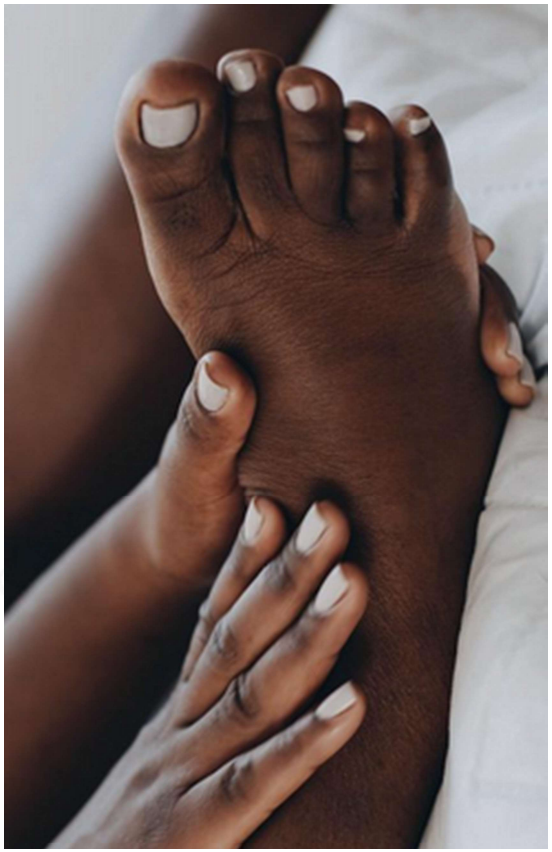
- Peripheral Arterial Disease
- History of foot ulcer
- Amputation
- Visual impairment
- Chronic kidney disease (especially if on dialysis)

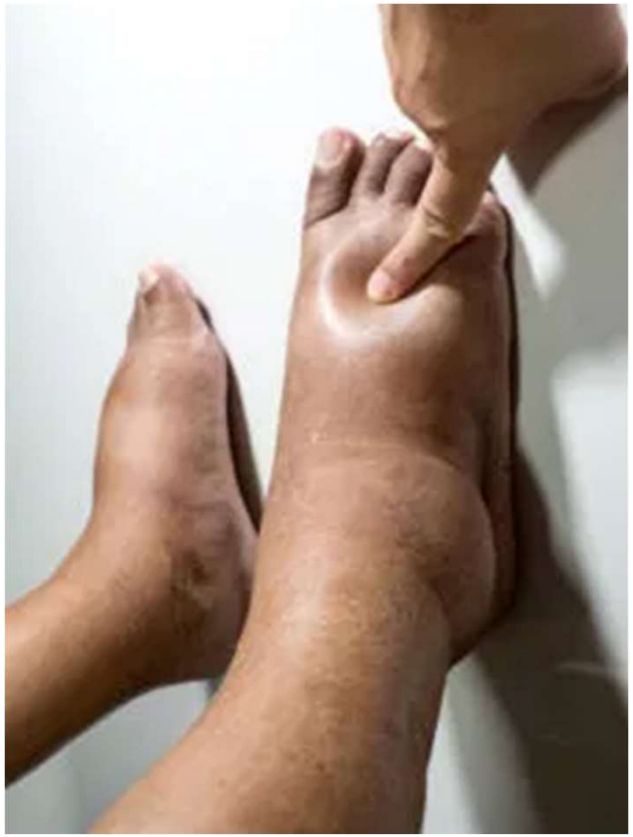
ADA Stds – Exam components

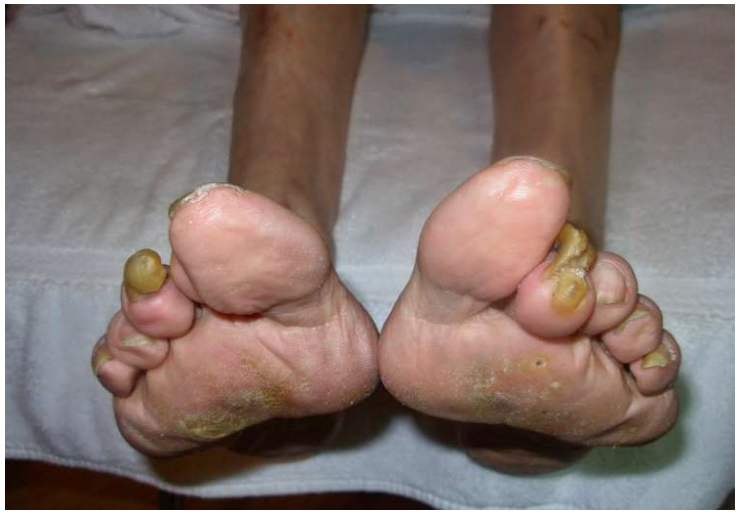
- Inspection of the skin
- Assessment of foot deformities
- Neurological assessment (10-g monofilament testing with at least one other assessment: pinprick, temperature, vibration), and
- Vascular assessment including pulses in the legs and feet.

Lower Extremities

- Lift the Sheets and Look at the Feet







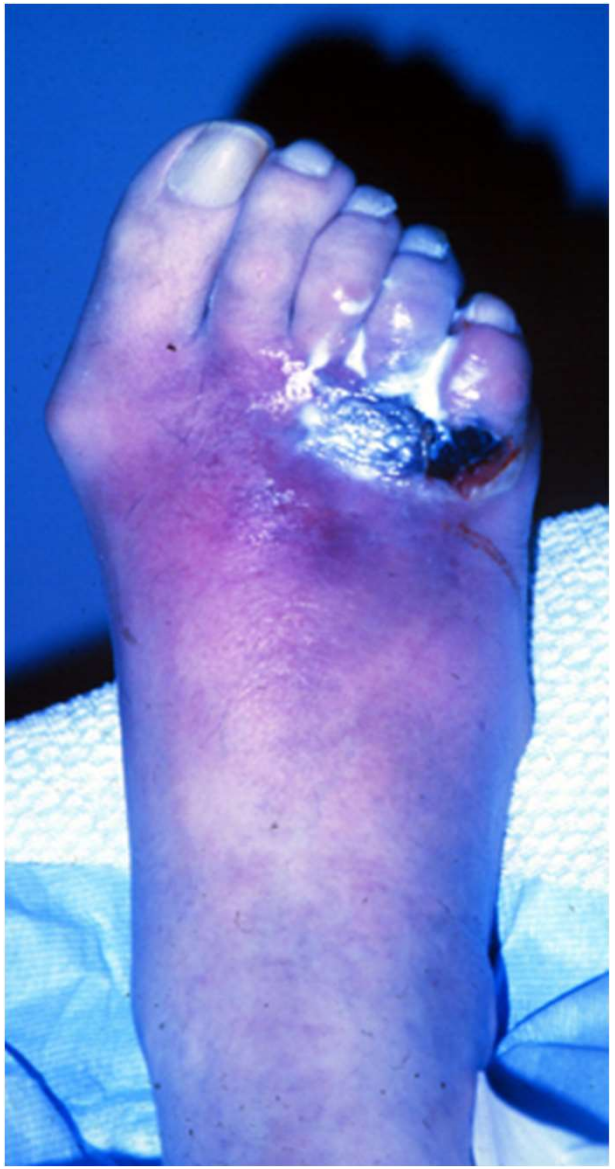
By Alton Johnson Jr., DPM, CWSP
https://www.woundsource.com/blog/amputation-crisis-african-american-patients

12 Steps to Evaluate Lower Extremity Risk

Lift the Sheets and Look at the Feets

Question 1 and 2

- **Question 1: Is there a history of foot ulcers?**
- **Question 2: Is there a foot ulcer now?**
  - History of a foot ulcer increases the risk of developing another foot ulcer and increases the potential of future amputation.
  - A person with a past or present foot ulcer is considered permanently in Risk Category 3.

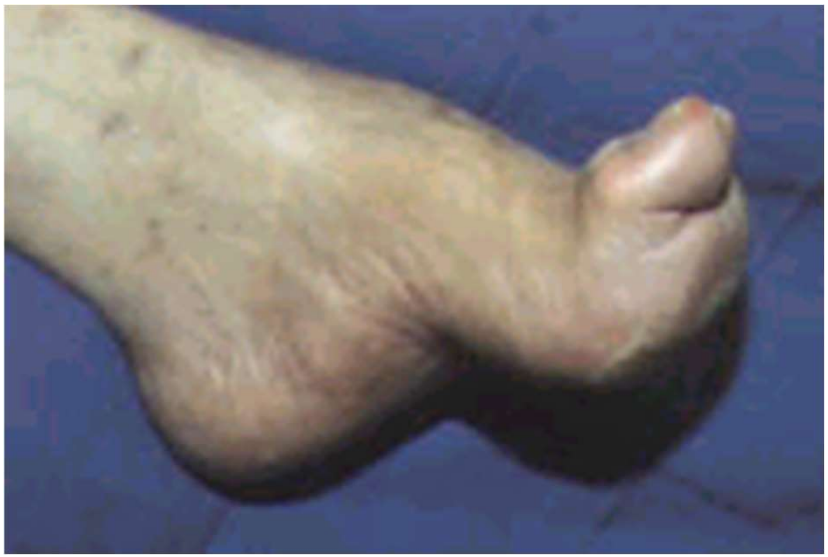


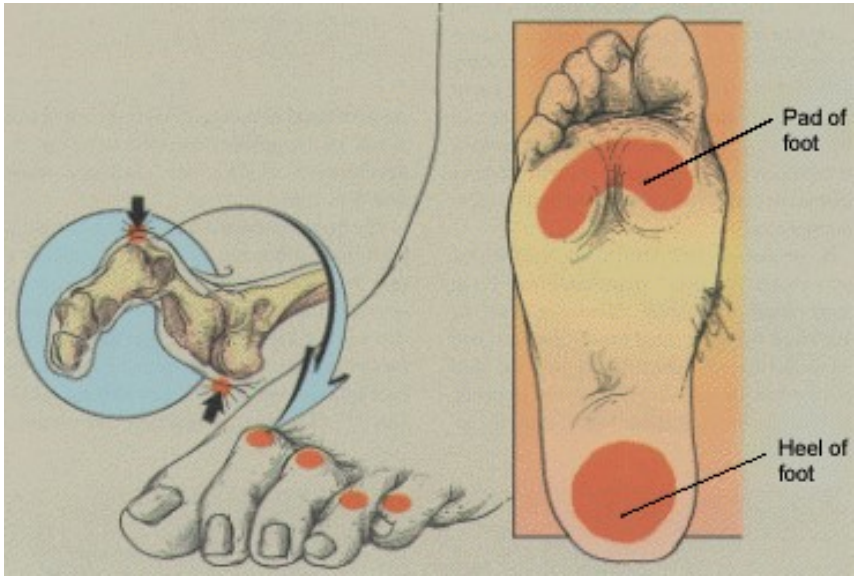
Question 3 – Deformity?

Question 3: Is there toe deformity?

Question 4: Is there an abnormal shape of the foot?

- Look for prominent bony areas,
- Partial or complete amputations of the foot or toes
- Clawed or hammer toes
- Bunions, or "Charcot Foot".

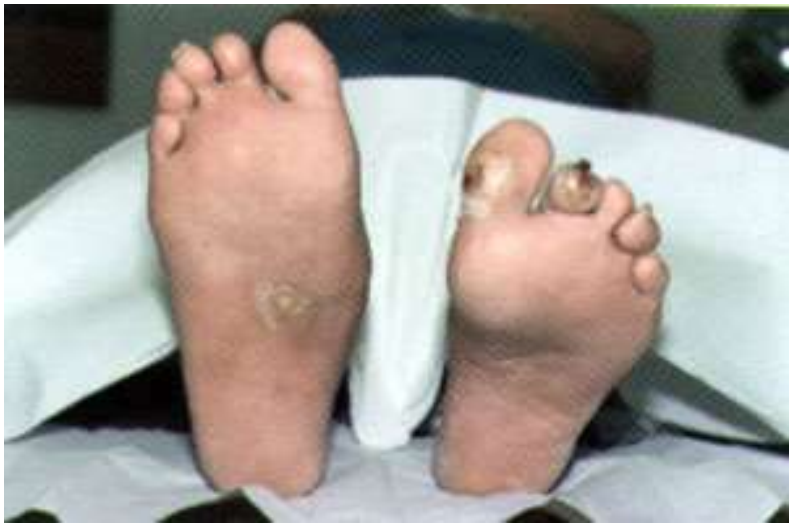




Question 3 and 4 – Charcot Foot

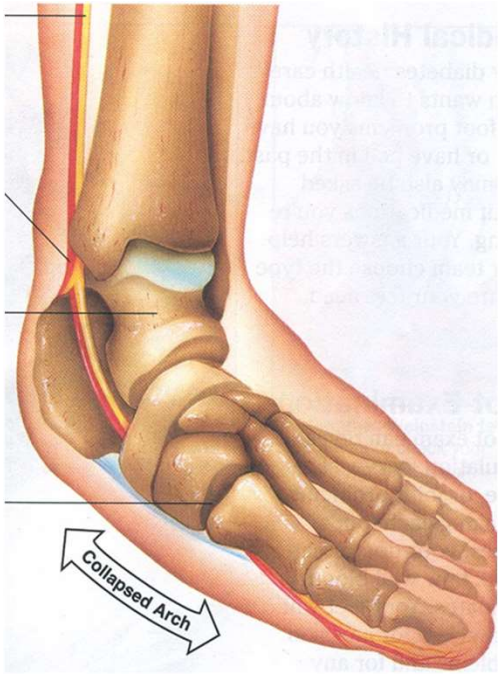
Question 3: Is there toe deformity?

Question 4: Is there an abnormal shape of the foot?



A Charcot Foot is a neuropathic foot that may present with:

- swelling,
- increased temperature,
- and little or no pain.
- Advanced cases show progressive signs of deformity into what is referred to as a "rocker bottom" or "boat-shaped" foot.
- A person with a Charcot Foot is permanently in Risk Category 3.

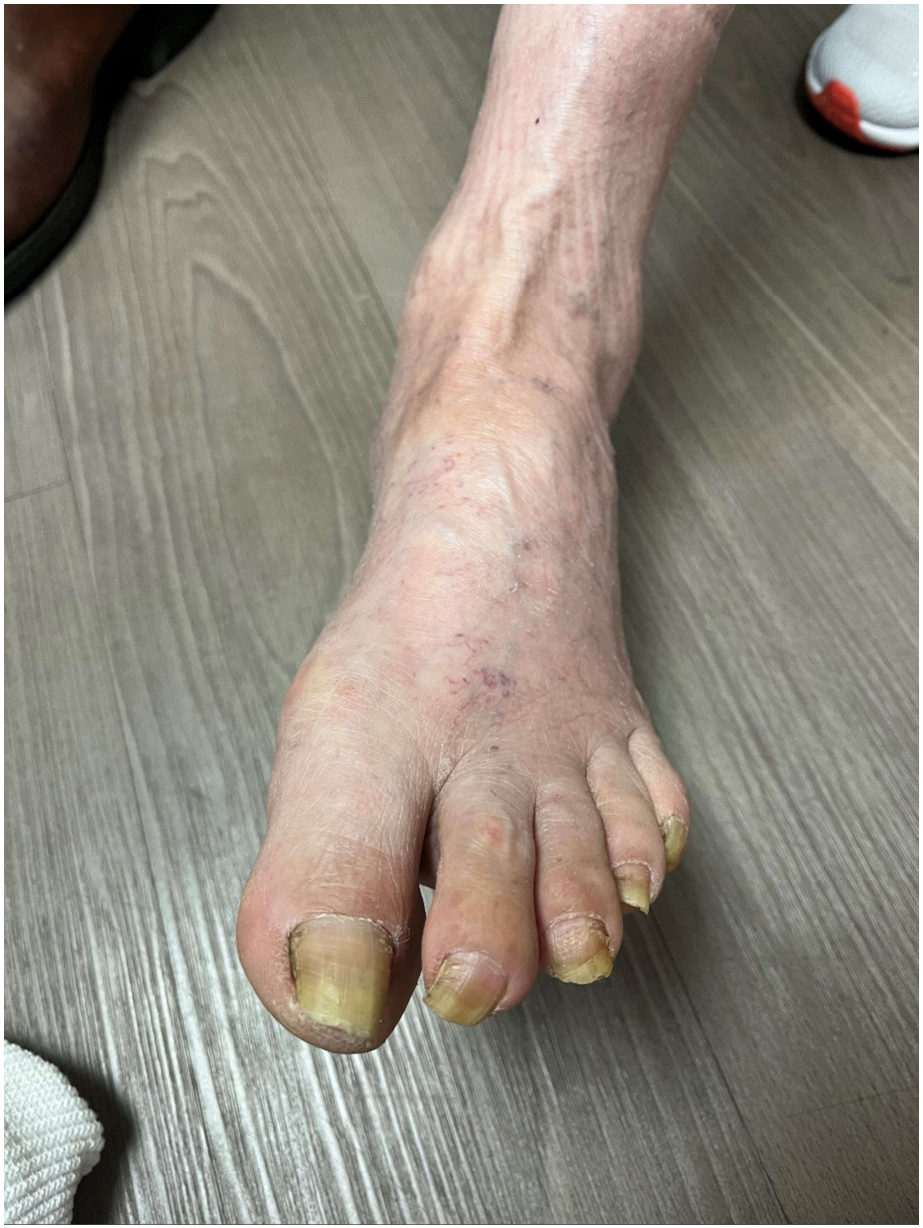


Q5 - Toenails

Question 5: Are the toenails thick or ingrown?

- Identify Mycotic, significantly hypertrophic, or ingrown nails.
- Ask how they are cutting their nails and identify problem areas.

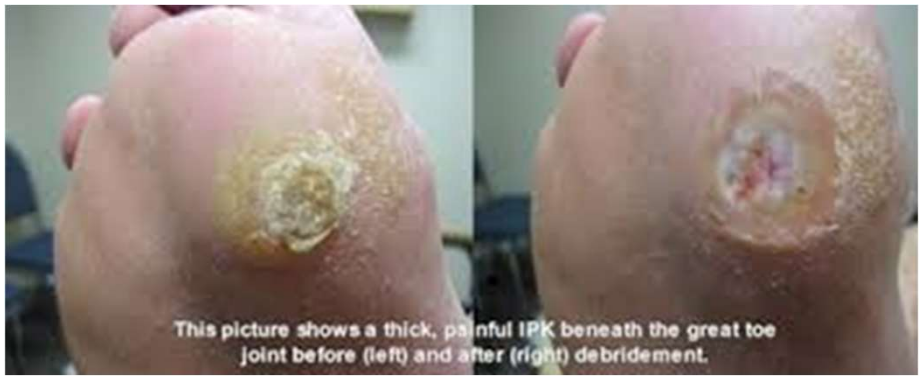
Consider Podiatry Referral and Treatment



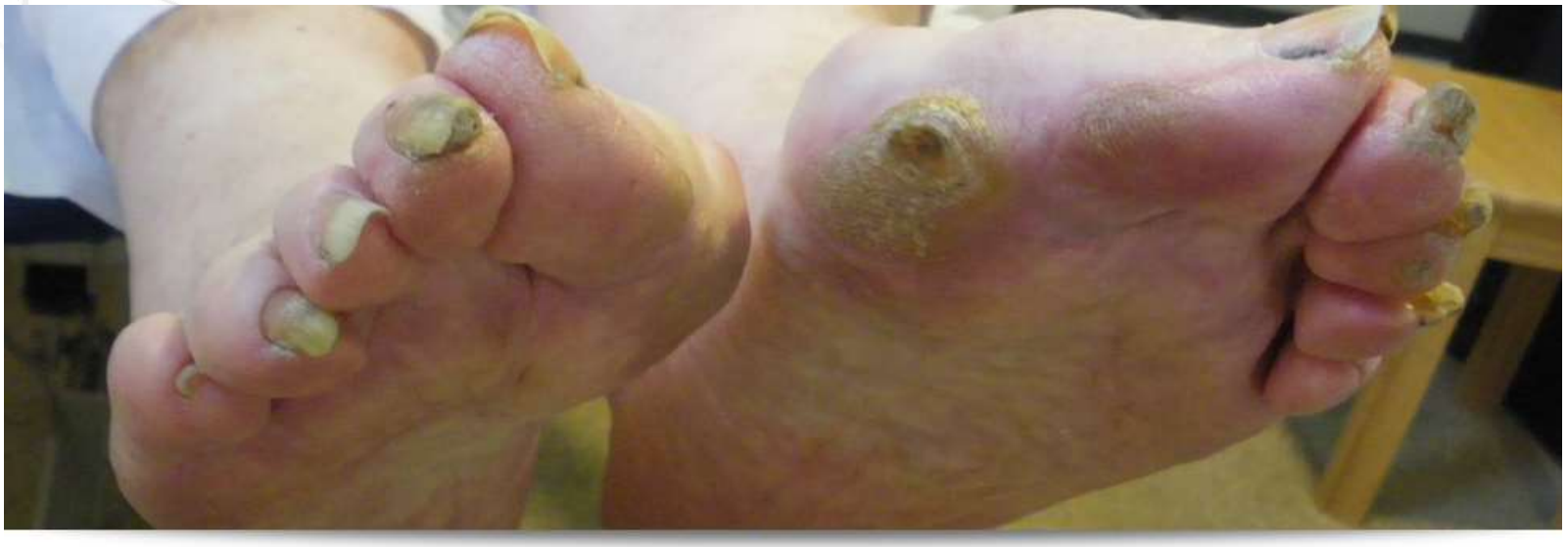
Q6: Callus Buildup

Question 6: Is there callus buildup?

- Identify focal and/or heavy callous.
- Determine cause and provide coaching.



Assess if the person is self-treating calluses (with a razor or other tools) and encourage them to see a foot specialist to prevent complications.



Poll Question 3

JR has dry skin cracks in the back of their heel. What is the best action?

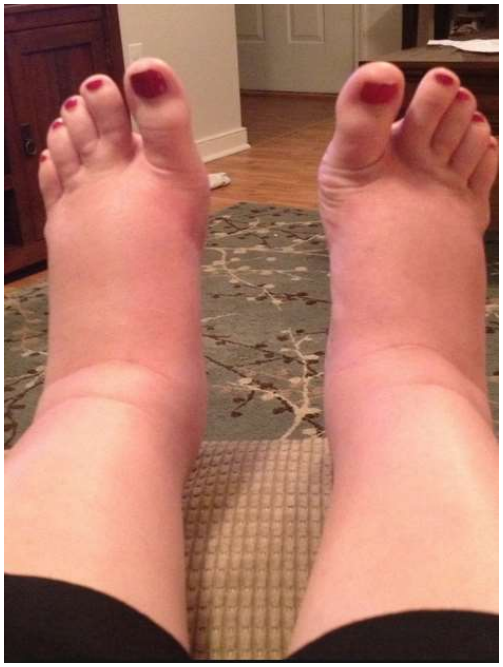
A. Gently scrape the dead skin with a razor
B. Apply petroleum jelly or other lotion nightly to affected area.
C. Walk barefoot to promote healing
D. Wear white cotton socks

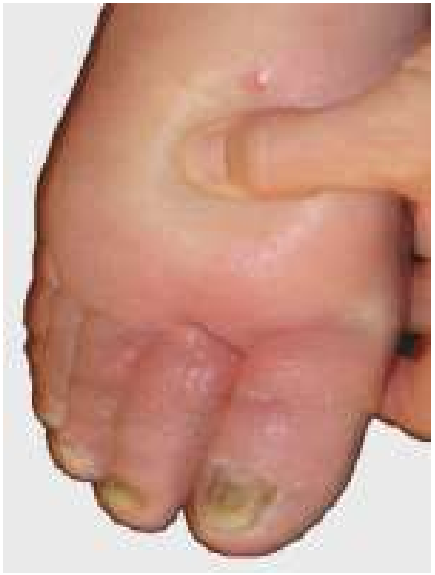
Q7: Assess for Swelling

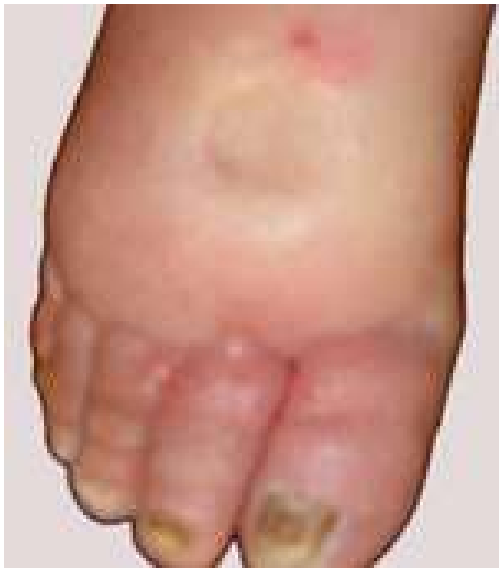
Question 7: Is there swelling?

Swelling may stem from a variety of causes such as a Charcot fracture, infection, or "venous stasis".

Assess for potential causes and encourage the person to elevate extremities and receive treatment.







8- Check for Elevated Skin Temp

Question 8: Is there elevated skin temperature?

Elevated, localized skin temperature can indicate

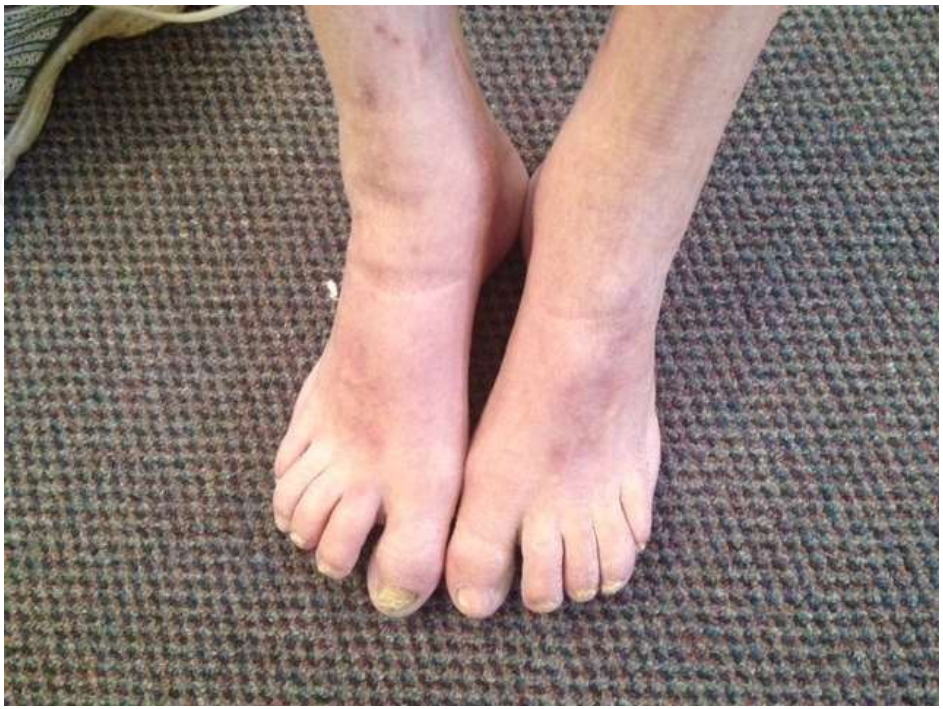
- excessive mechanical stress,
- bone fracture
- or infection and requires further evaluation.

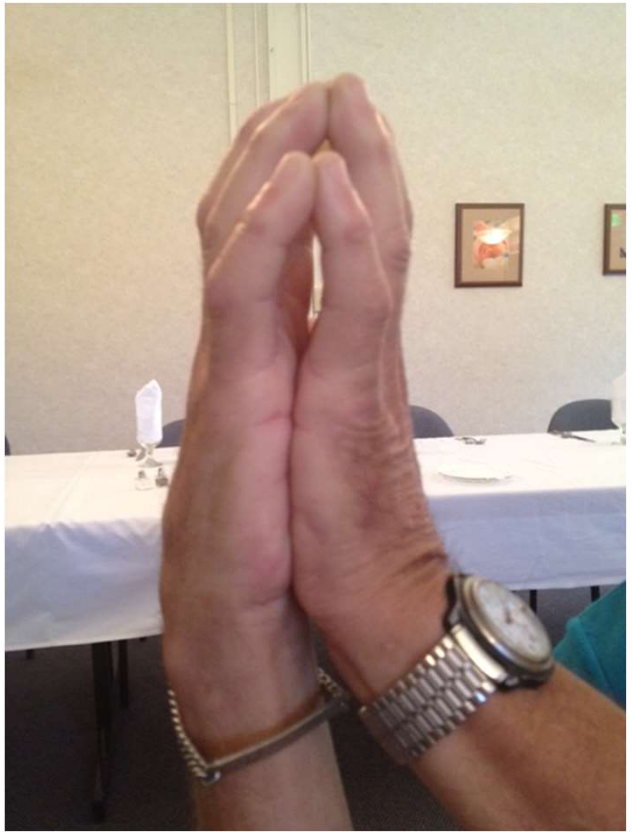
A temperature elevation of greater than 2 degrees centigrade or a noticeable difference by touch when compared with the contralateral foot is considered clinically significant and requires follow-up.

Q9 – Muscle Weakness

Question 9: Is there muscle weakness?

A manual muscle test of foot and great toe dorsi and plantar flexion. Weakness or inflexibility is associated with diabetes neuropathy and increases the risk of injury.



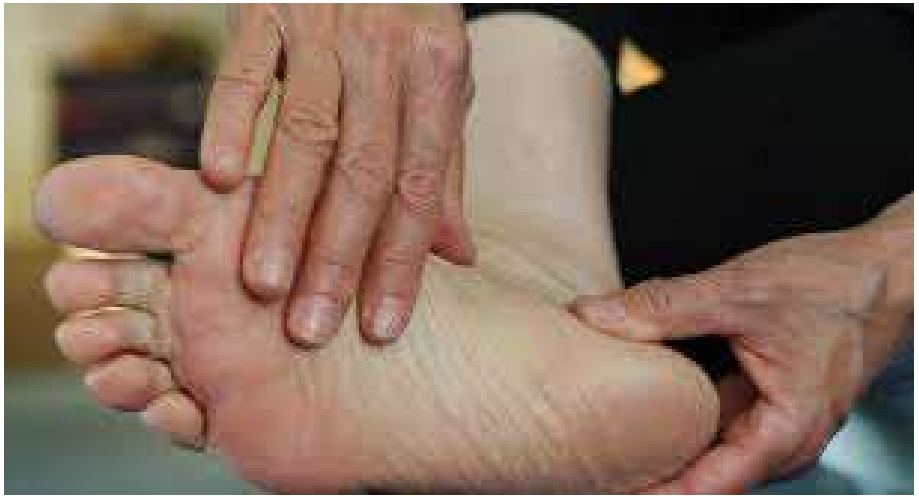


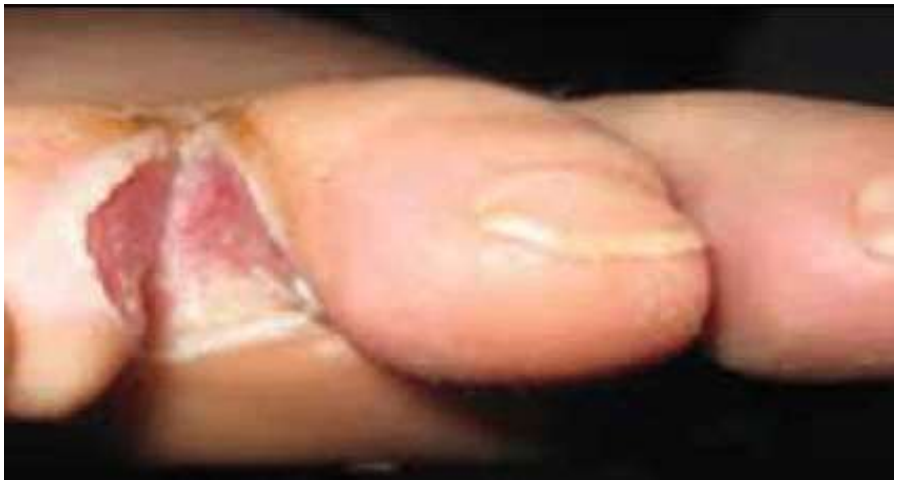
Prayer Sign

Q10 - See Bottom of Feet?

Question 10: Can the person see the bottom of his/her feet?

- Extra weight and/or lack of flexibility can make it difficult for people to visually assess their feet.
- Self-inspection and foot care are also difficult.





Q11 & 12 – How do the Shoes Fit?

Question 11: Are they wearing improperly fitted shoes?

- Can create foot pressures that lead to further complications.
- Sensory loss often results in wearing shoes that are too short and/or narrow resulting in ischemic ulcers on the medial or lateral metatarsal heads or the toes of a foot with claw toe deformity.
- Properly sized added depth shoes with soft custom molded insoles are usually indicated for those with loss of sensation and deformity to prevent ulceration.
- **Question 12: Is the footwear appropriate for their category?**

Poll question #4

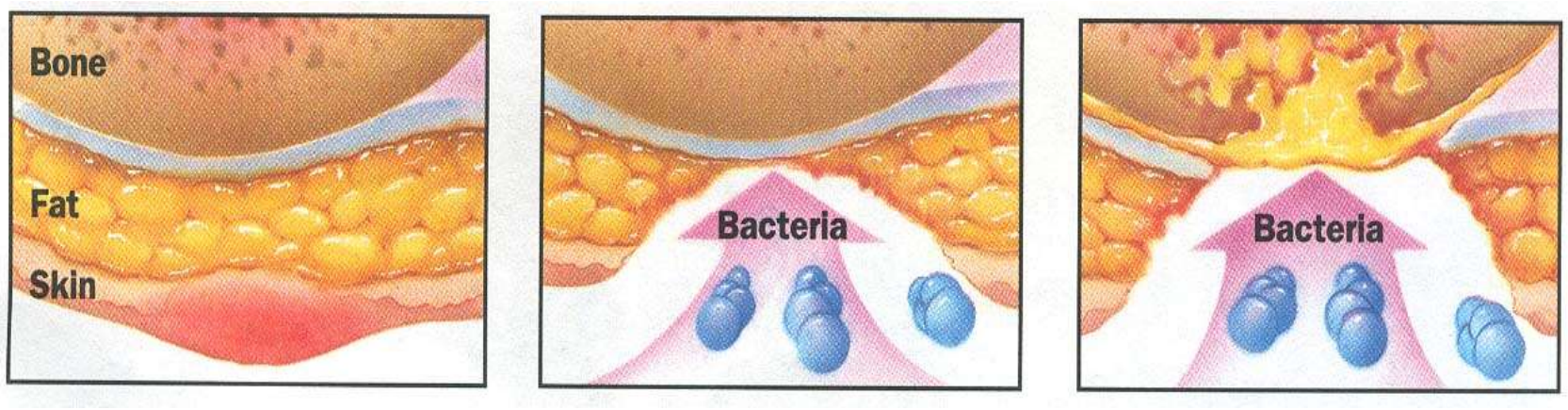
- What is the most common cause of ulcers?

A. Dr. Scholl's corn pads
B. Minor trauma
C. Trimming calluses
D. Burns from hot water

Common Causes of Ulcers

- Tight shoe and minor trauma
- Neuropathy and peripheral vascular disease
  - Autonomic: blood pooling, swelling
  - Motor: atrophic musculature, deformity, joint stiffness
  - Resulting increased plantar pressure, trauma

Foot Wounds



Blisters

Calluses

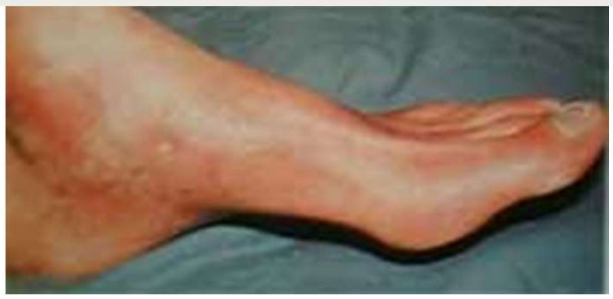
Ulcers

Bone infection

Risk Factors for Peripheral Arterial Disease

- Risk factors include:
- diabetes
- over the age of 60
- hypertension,
- hyperlipidemia,
- who smoke, are at higher risk for PAD.

Luvenia Stokes. (Ruddy Roye for ProPublica)



African Americans have 3-4 times increased risk of PAD

careful screening and appropriate intervention for these higher risk groups is imperative.

Symptoms of Peripheral Arterial Disease

What are symptoms of PAD?

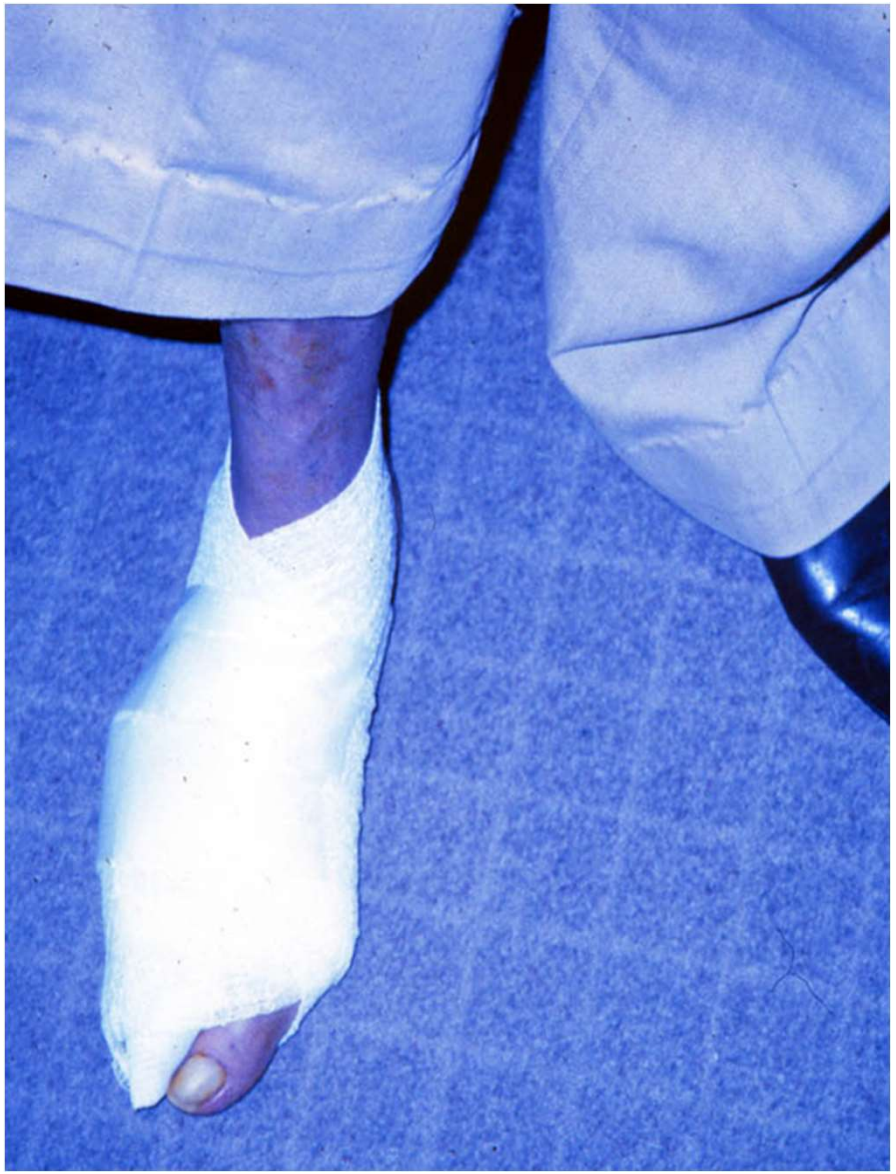
- The classic symptom of PAD is pain in the legs with physical activity, such as walking, that gets better after rest.
- However, up to 4 in 10 people with PAD have no leg pain.
- Symptoms of pain, aches, or cramps with walking (claudication) can happen in the buttock, hip, thigh, or calf.

American College of Cardiology

Signs of Peripheral Arterial Disease

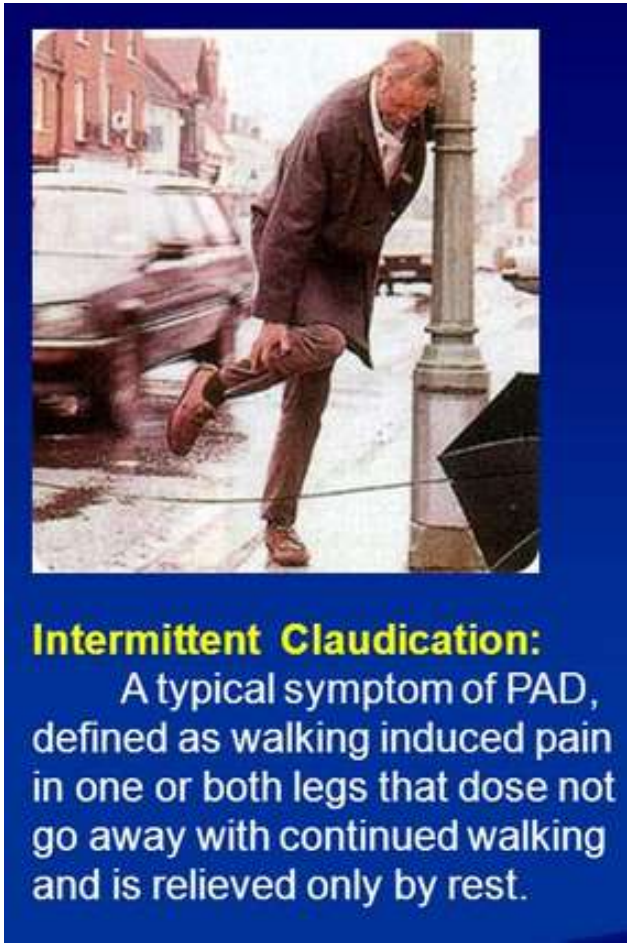
Physical signs

- include leg muscle atrophy (weakness);
- hair loss; smooth, shiny skin;
- skin that is cool to the touch, especially if accompanied by pain while walking (that is relieved by stopping walking);
- decreased or absent pulses in the feet;
- sores or ulcers in the legs or feet that don't heal; and cold or numb toes.



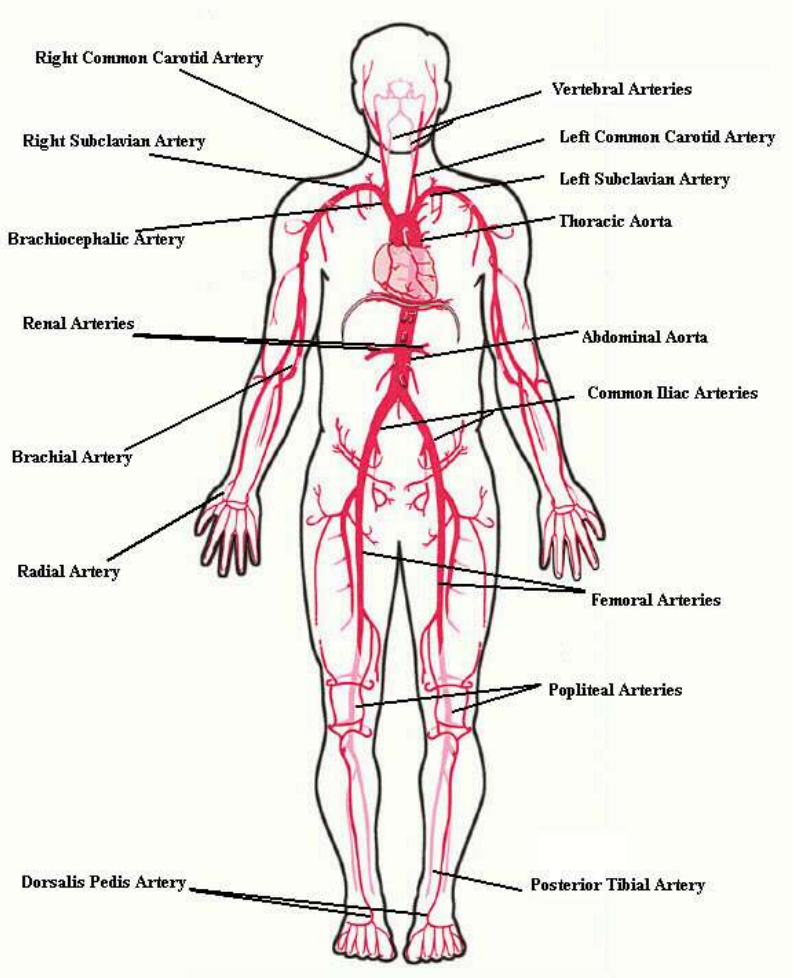
Peripheral Arterial Disease
Intermittent Claudication

- Physical Exam – Skin
  - Pale or blue, purple
  - Dependent rubor, blanching when elevated
  - Cool to touch, loss of hair, nonhealing wounds, gangrenous
  - Diminished pulses
- Treatment = Protect feet
  - Avoid constriction, increase walking, stop smoking, get ABI, medications and/or surgery

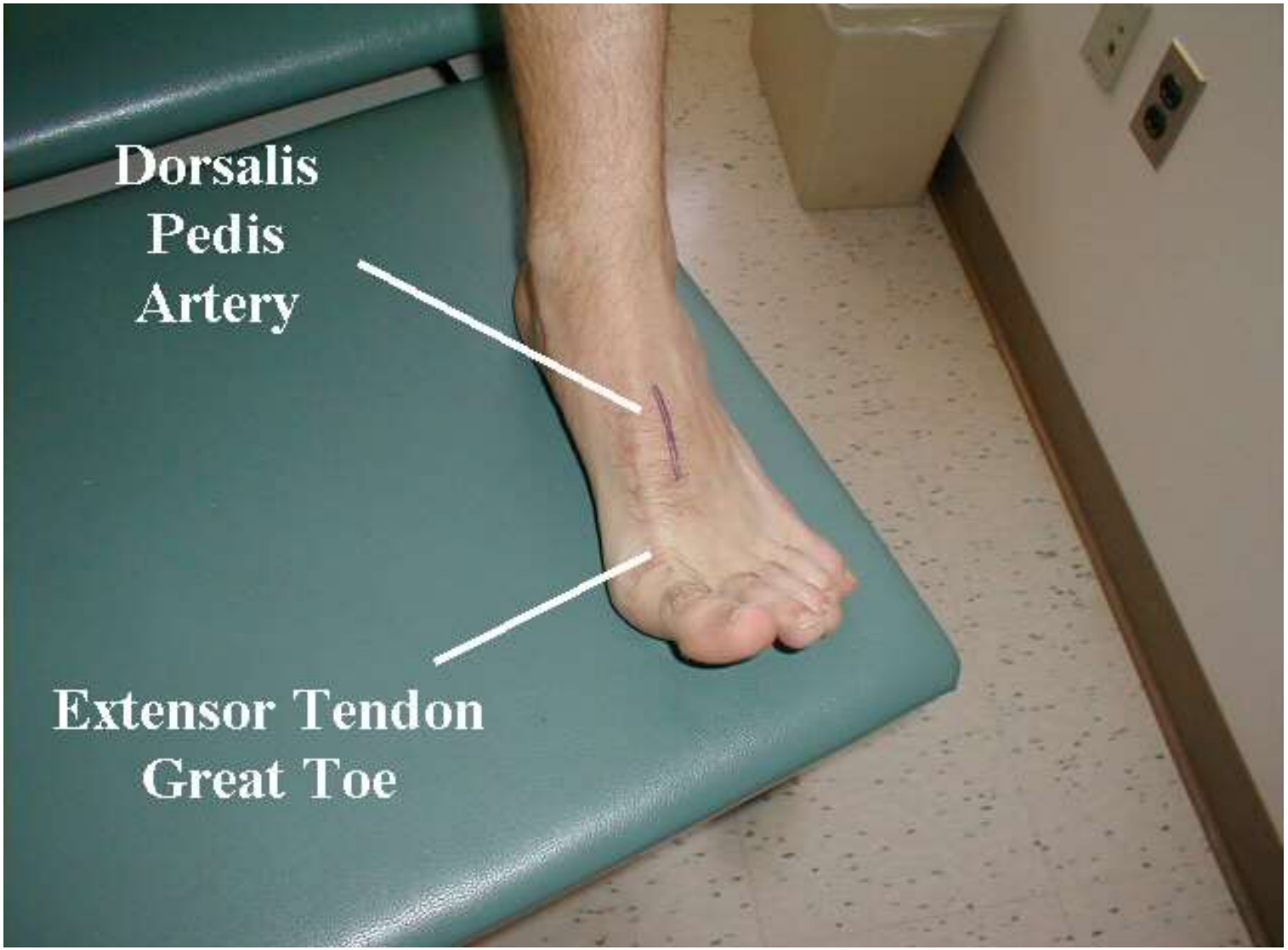


Vascular Status Assessment

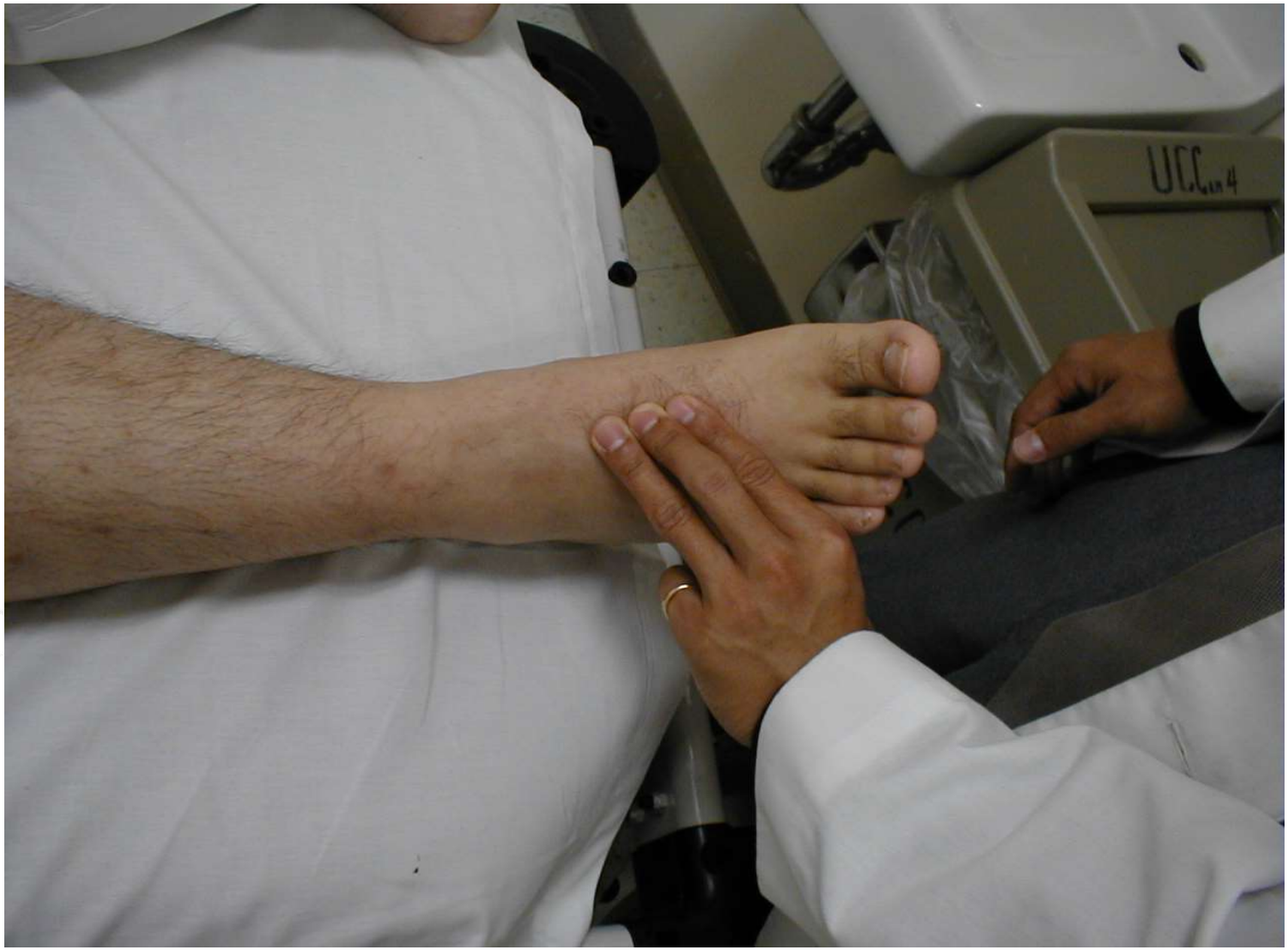
- Posterior tibial pulse
- Dorsalis pedis pulse
- Temperature
- Appearance



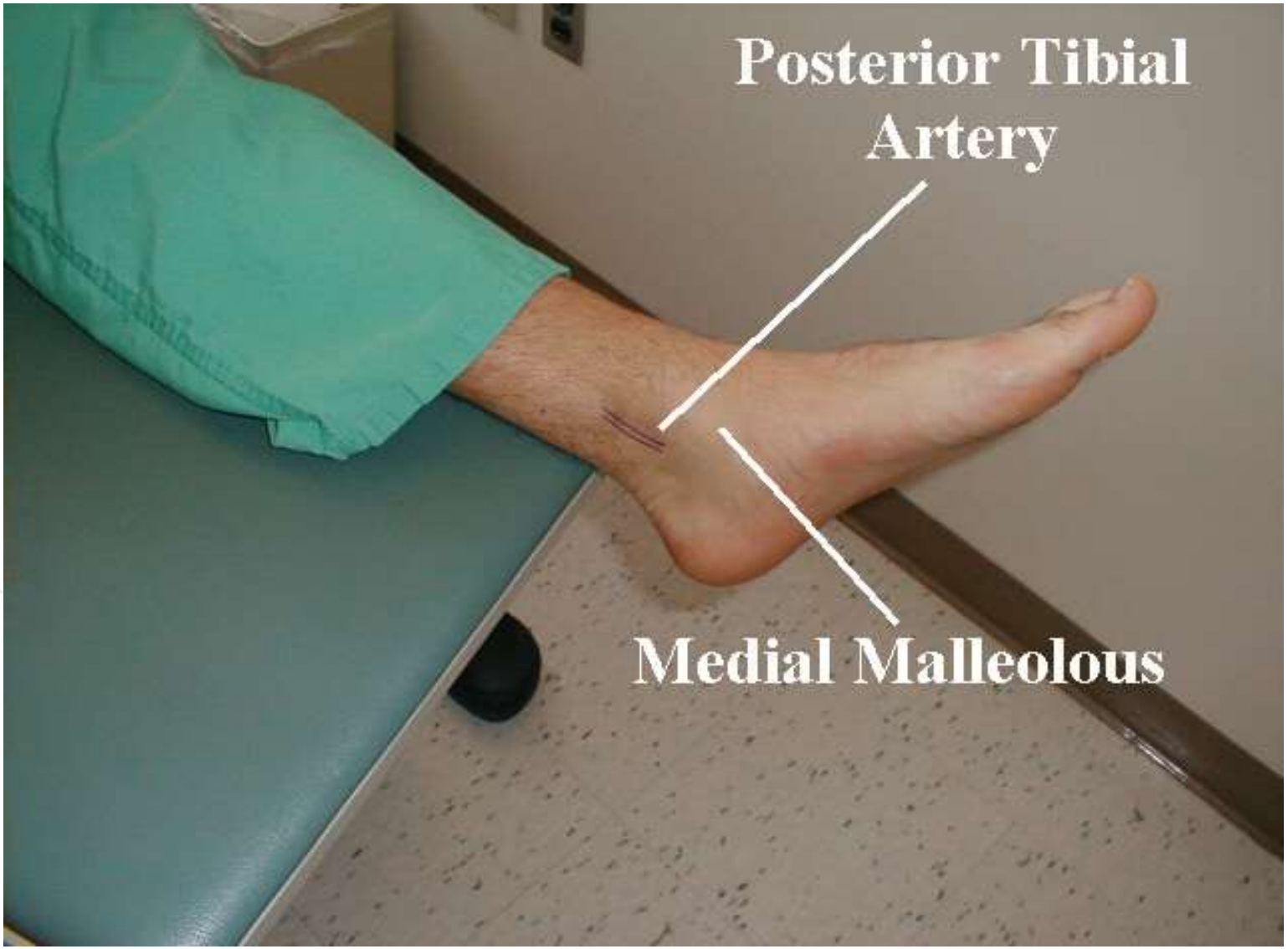
Dorsalis Pedis Pulse



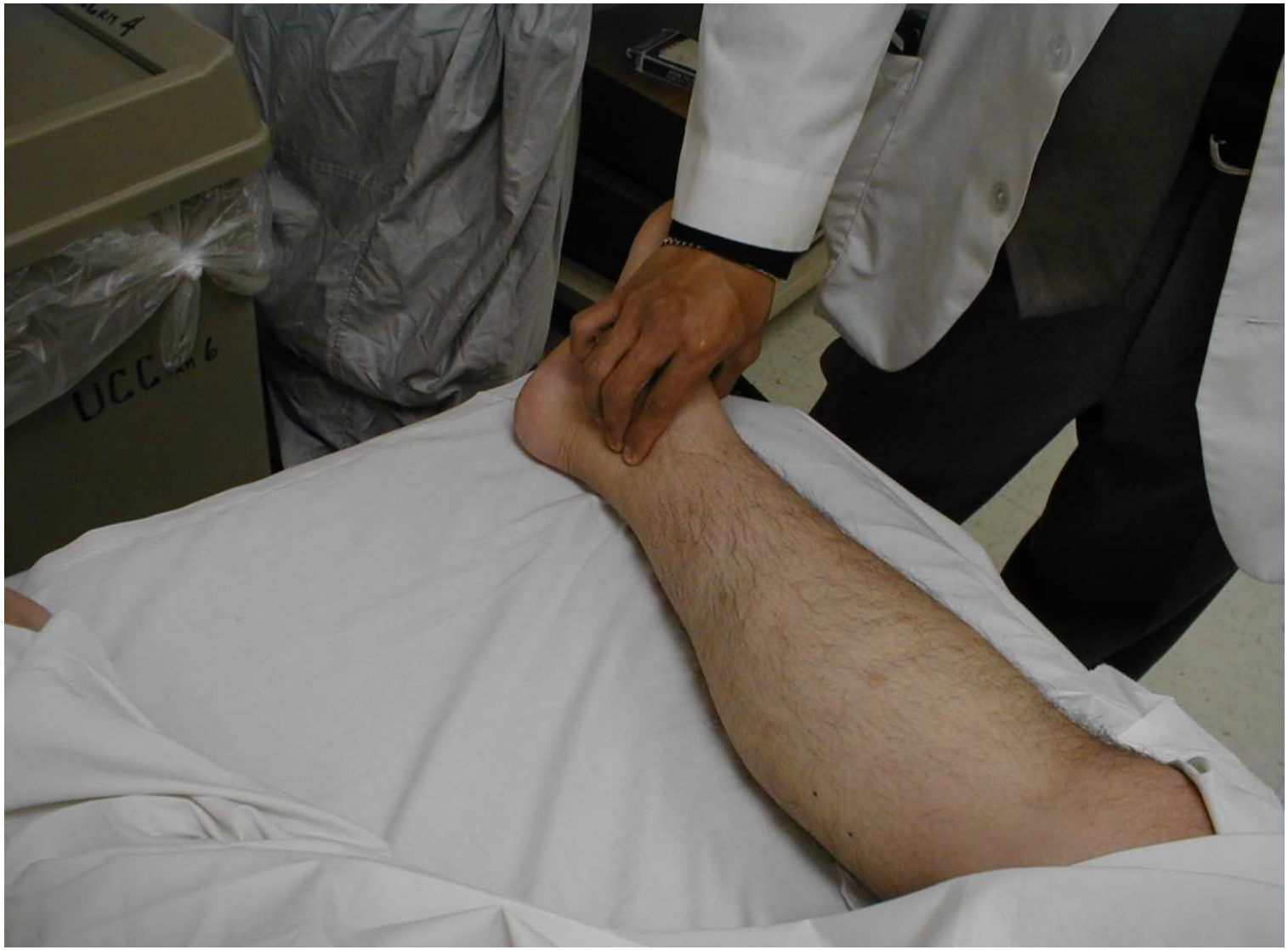
Taking the Dorsalis Pedis Pulse



Posterior Tibial Pulse



Taking the Posterior Tibial Pulse

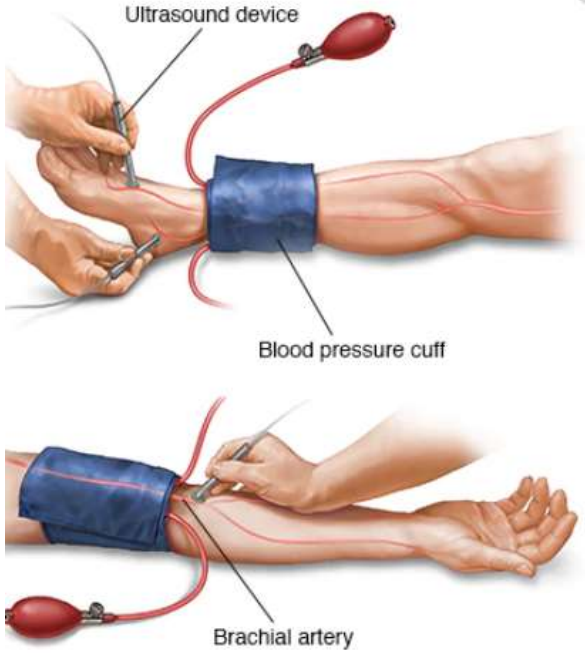


Refer: Include Multi-Disciplinary Team

- **If claudication or decreased/absent pedal pulses**
  - refer for ankle-brachial index and for further vascular assessment
- **Foot ulcers and high-risk feet**
  - Refer to multidisciplinary team(e.g., dialysis, Charcot foot, prior ulcers or amputation
- **Foot care specialists recommended:**
  - those who smoke
  - histories of prior lower-extremity complications
  - loss of protective sensation
  - structural abnormalities
  - peripheral arterial disease
- **Ongoing preventive care lifelong surveillance.**

ADA Stds – Poor Circulation / High risk

- If have symptoms of claudication or decreased or absent pedal pulses:
  - refer for ankle-brachial index and for further vascular assessment as appropriate
- A multidisciplinary approach is recommended for individuals with foot ulcers and high-risk feet
- Use of specialized foot wear recommended



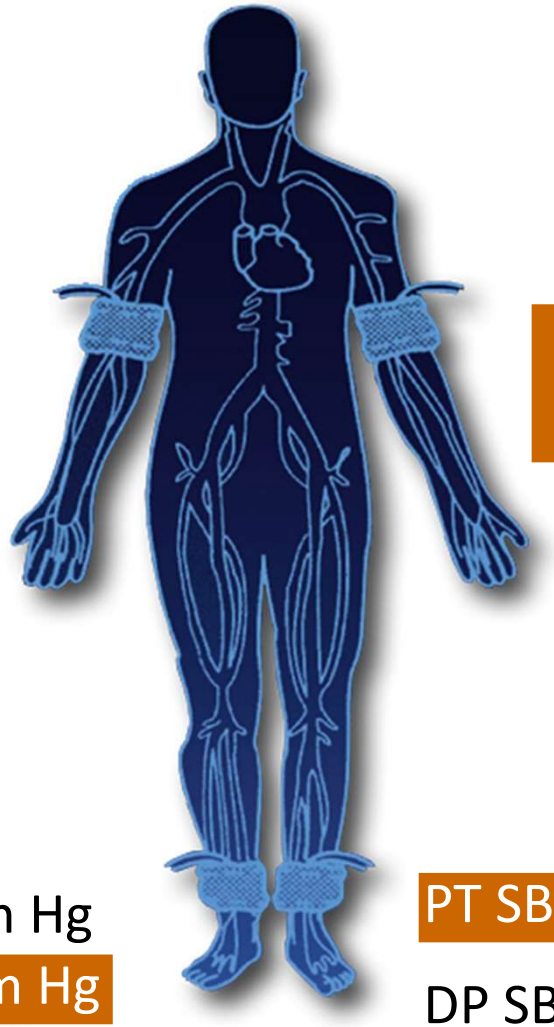
Using the ABI: An Example

Right ABI
80/160=0.50

Left ABI
120/160=0.75

ABI
(Normal >0.99)

Brachial SBP
150 mm Hg



Brachial SBP
160 mm Hg

Highest brachial
Systolic BP

PT SBP 40 mm Hg
DP SBP 80 mm Hg

PT SBP 120 mm Hg
DP SBP 80 mm Hg

Highest of PT or
DP Systolic BP

ABI=ankle-brachial index; DP=dorsalis pedis; PT=posterior tibial; SBP=systolic blood pressure

Interpreting the Ankle-Brachial Index

ABI	Interpretation
1.00–1.29	Normal
0.91–0.99	Borderline
0.41–0.90	Mild-to-moderate disease
≤0.40	Severe disease
≥1.30	Noncompressible

from Hirsch AT, et al. *J Am Coll Cardiol*. 2006;47:e1-e192. Figure 6.

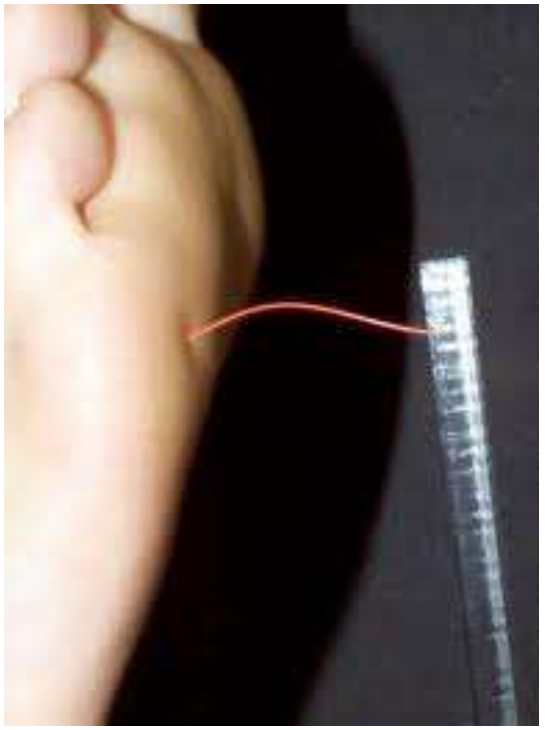
Loss of Protective Sensation (LOPS)

“I didn’t notice”

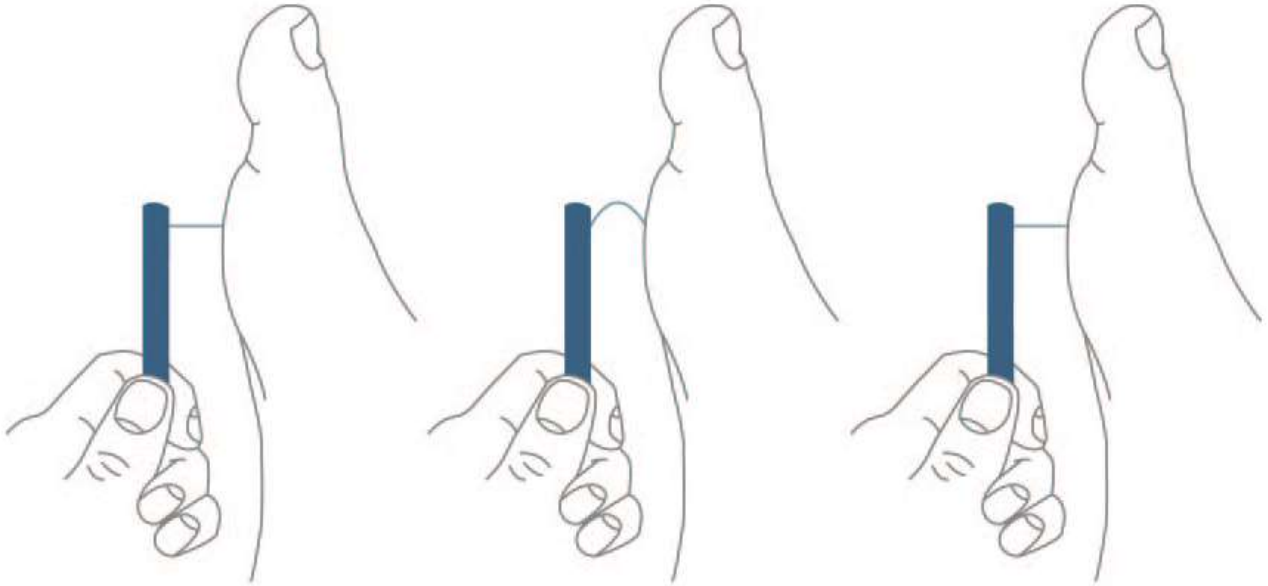
- Needle in foot
- Pebble in shoe
- Stepped on a nail
- Cut too deep
- Shoes were rubbing
- Others?

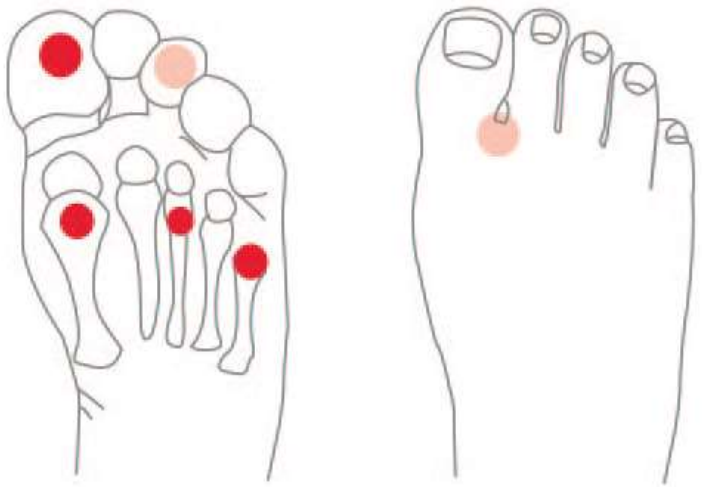
Loss of Protective Sensation

- Monofilament Testing
  - 5.07 touched to plantar surface and top of foot
  - C shape delivers 10 gms pressure
  - Test four sites
    - Plantar surfaces of
      - Each great toe
      - 1st, 3rd and 5th metatarsal head



5.07 monofilament delivers 10gms linear pressure



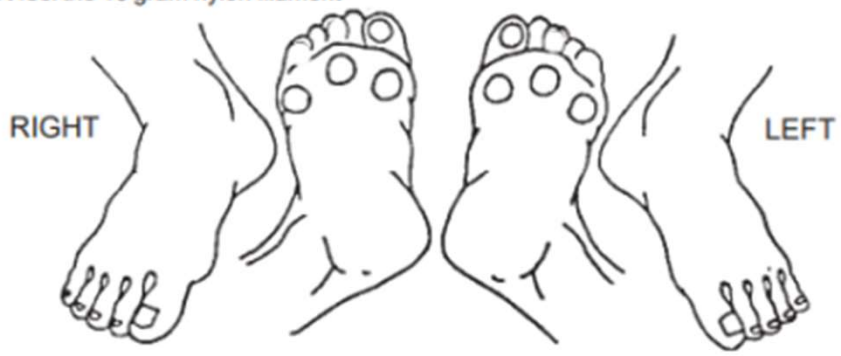


Fill in the following blanks with a "Y" or "N" to indicate findings on the right or left foot.

	R	L
Is there a history of a foot ulcer?	_____	_____
Is there a foot ulcer now?	_____	_____
Is there a claw toe deformity?	_____	_____
Is there swelling or an abnormal shape in the foot?	_____	_____
Is there elevated skin temperature?	_____	_____
Is there limited ankle dorsiflexion?	_____	_____
Are the toenails thick or ingrown?	_____	_____
Is there heavy callus build-up?	_____	_____
Is there foot or ankle muscle weakness?	_____	_____
Is there an absent pedal pulse?	_____	_____
Can the patient see the bottom of their feet?	_____	_____
Are the shoes appropriate in style and fit?	_____	_____

Indicate the level of sensation in circles:

+ = Can feel the 10 gram nylon filament
− = Can't feel the 10 gram nylon filament



Draw in: Callus Preulcer Ulcer (note length/width/depth in cm.)
and Label: Skin condition with R - Redness, D - Discoloration, M - Maceration, T - Tinea

RISK CATEGORY:

_____ 0 No loss of protective sensation.
_____ 1 Loss of protective sensation.
_____ 2 Loss of protective sensation with either high pressure (callus/deformity), or poor circulation.
_____ 3 History of plantar ulceration, neuropathic fracture (Charcot foot) or amputation.

Determine Risk Category

Step 3: Report Risk Category and Needed Follow-Up

- The higher the Risk Category, the higher the risk there is of recurrent foot ulceration, progressive deformity, and ultimately, amputation of the foot.

Risk Category Description - Categories for the Foot

- 0 - Diabetes, but no loss of protective sensation in feet or peripheral arterial disease.
- 1 - Diabetes, loss of protective sensation in feet (doesn't feel 5.07 monofilament in one or more locations) plus deformity
- 2 - Diabetes, loss of protective sensation in feet with high pressure (callous/deformity), or poor circulation (PAD)
- 3 - Diabetes, history of plantar ulceration, amputation or neuropathic fracture.

Action Based On Risk

0 – Provide Education emphasizing disease control, and proper shoe fit/design.
Follow-up yearly for foot screen. Follow as needed for skin/callus/nail care or orthotics

1 - Education emphasizing diabetes management, proper shoe fit/design, daily self-inspection, skin/nail care, and early reporting of foot injuries. Proper fitting/design footwear with soft inserts/soles.
Routine follow-up 3 – 6 months for foot/shoe examination & nail care

2 - Education emphasizing diabetes management, proper shoe fit/design, self-inspection, skin/nail/callus care, and early reporting of foot injuries. Depth-inlay footwear, molded/modified orthotics; modified shoes as needed.
Routine follow-up 1 – 3 months for foot/activity/footwear evaluation and callus/nail care.

3 - Education emphasizing diabetes management, proper fitting footwear, self-inspection, skin/nail/callus care, and early reporting of foot injuries. Depth-inlay footwear, molded/modified orthoses; modified/custom footwear, ankle-foot orthoses as needed.
Routine follow-up 1 – 12 weeks for foot/activity/footwear evaluation and callus/nail care. Diabetic Foot Clinic visit frequency may vary based on individual needs.

Check Feet Daily

- ✓ Check and wash your feet daily. If you have trouble bending, use a mirror to see the bottom of your feet. Make sure to dry well and check in between toes.
- ✓ Let your provider know right away if you discover any sores, red areas, calluses, drainage, or unusual foot odor.
- ✓ Prevent dry skin and cracks by applying lotion or petroleum jelly to the top and bottom of your feet a few times a week.

Lotions – Apply to Top and Bottom

Education Points – Wear Shoes

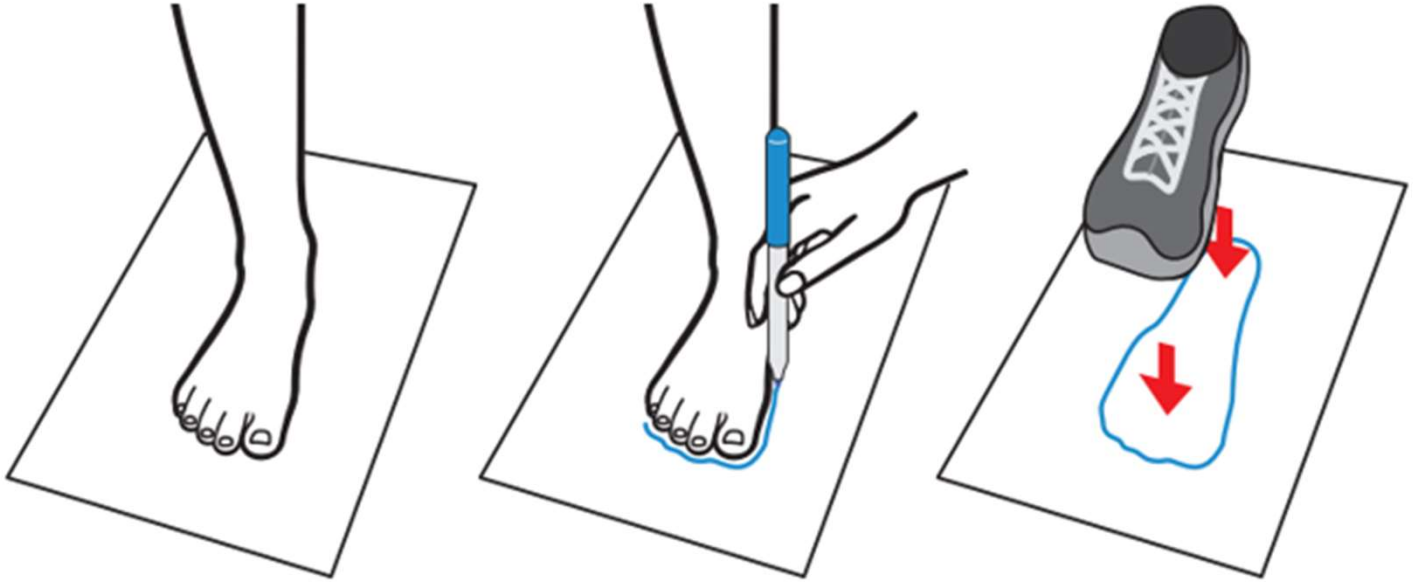
- ✓ Avoid going barefoot, even inside, to avoid accidental injury.
- ✓ Buy new shoes at the end of the day when feet are most swollen.
- ✓ Break in new shoes gradually by wearing them for a few hours each day (1 hour the first day, 2 hours the second day, etc.).
- ✓ Inspect shoes for rough spots, torn linings, or other objects which could injure your feet. Make sure there is enough room to wiggle your toes.

ADA Standards - Shoes

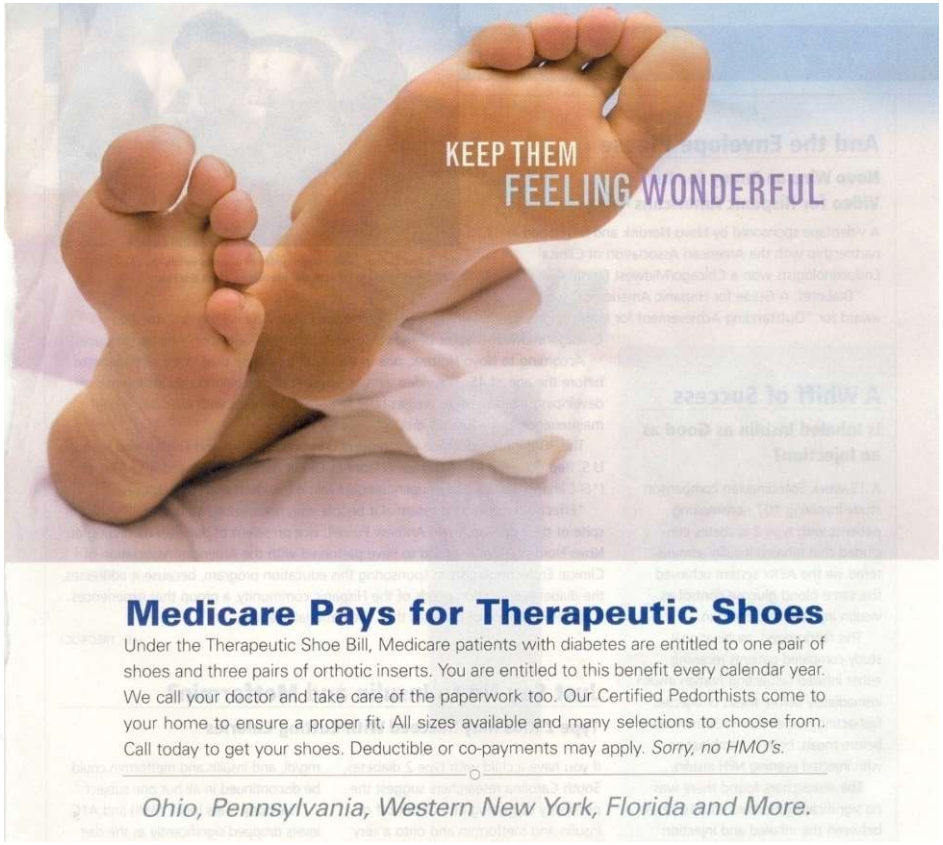
- Broad and square toe box
- Laces with 3-4 eyes per side or Velcro straps
- Padded tongue
- Quality lightweight materials
- Sufficient depth to accommodate a cushioned insole
- Custom shoes as needed
- Medicare approves 1 pair of custom shoes and 3 inserts yearly.

Dr. Comfort 6 Wide

Make Sure There is Enough Room



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

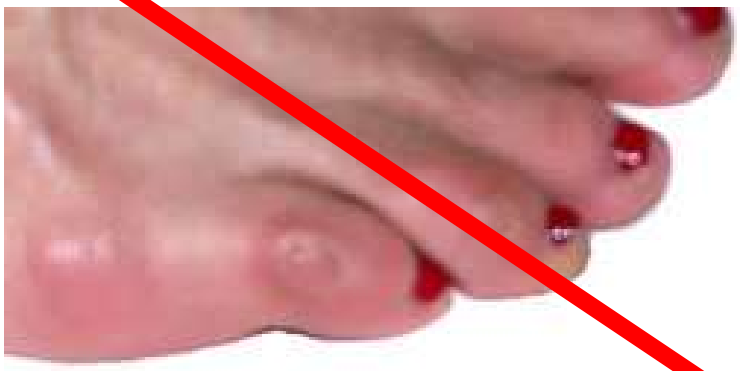
Foot Care Tips – Check Temp

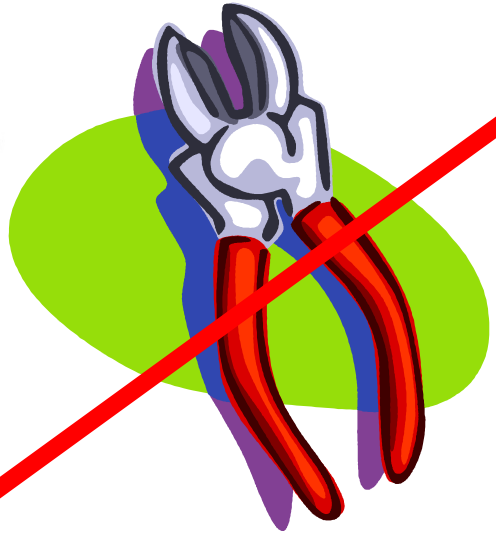
- ✓ Avoid heating pads, Jacuzzis and hot water bottles. Use sunscreen to avoid sunburn.
- ✓ Since feet may not sense temperatures that are too hot or cold, you need to protect them. Wear warm socks or lined shoes if feet become cold.
- ✓ Use diabetes socks that are free of seams and not too tight around the calf.
- ✓ No bathroom surgery (this includes trimming calluses with a razor or liquid corn and callus removers). This can lead to injury.

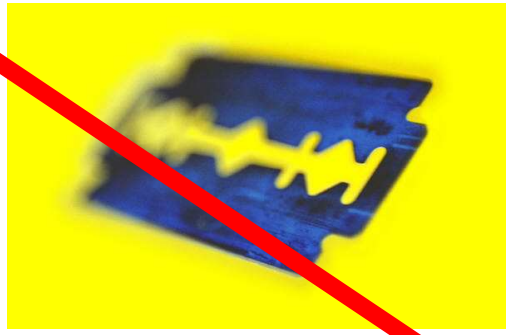
Diabetes Socks

- Seamless
- Not too tight at calf
- Good cushion
- Cotton/poly blend
- Affordable

No Bathroom Surgery



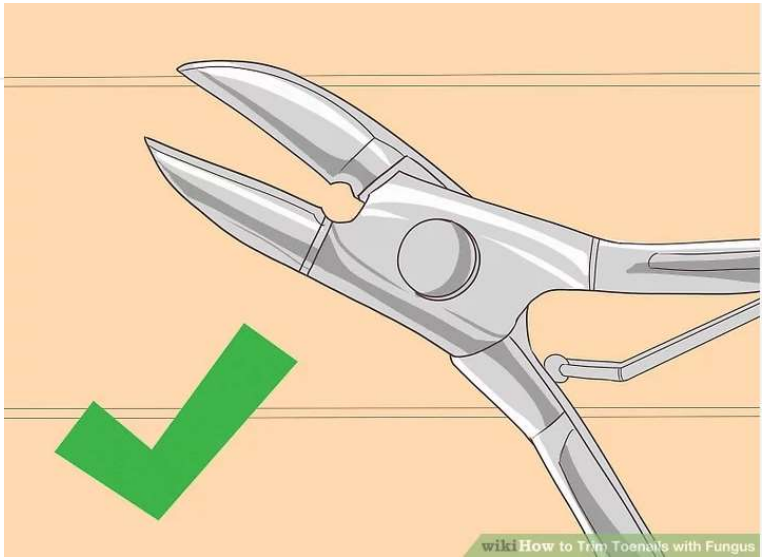




Get Help and Prevent Injury

- Have a foot doctor trim your toenails if you cannot see or feel your feet, you cannot reach your feet, your toenails are thick or yellowed or your nails curve and grow into the skin.

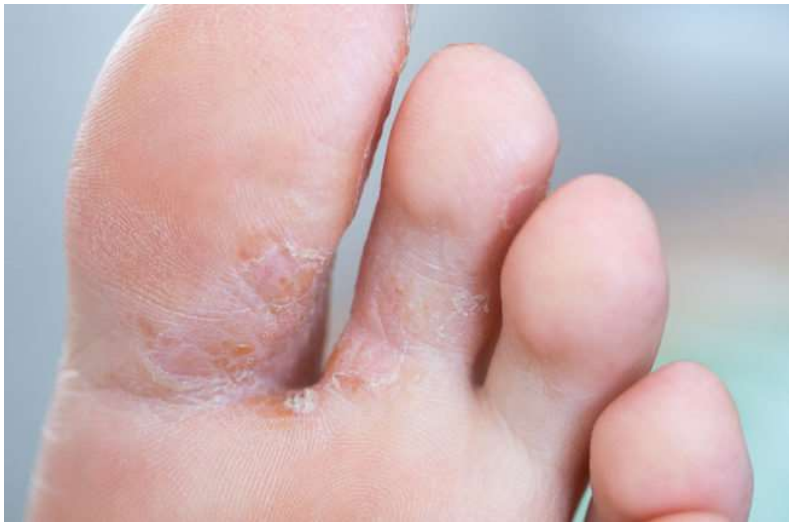
Cutting Thick Toenails



https://www.wikihow.com/Trim-Toenails-with-Fungus

Tinea Pedis / Toenail Fungus

- Fungus that infects the areas between toes and skin of feet is called athlete's foot (tinea pedis).
- Onychomycosis, also called tinea unguium, is a fungal infection that affects either the fingernails or toenails.
  - Often subungual



For skin fungus, try an antifungal cream

For toenail fungus,
topical or oral antifungals

ADA Stds – Education is Critical

- Based on risk assessment, review:
  - Foot care, including nail and skir care
  - Daily foot monitoring
  - If have LOPS, how to evaluate feet status
  - Footwear and home behaviors
  - Identify resources if have trouble with cognition or physical constraints

Lower Extremities

- **“If there is ANY foot problems, take off your shoes and socks and show your feet!"**
- Complete foot exam annually
- More frequent checks on those at high risk
- Keep close eye if loss of protective sensation, foot deformities, or a history of foot ulcers

You 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 h
  - Ability to inspect
  - Loss of protective sensation

FREE NO DeFEET Webinar – Invite your Friends and Colleagues

Thank You

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