Optimizing Diabetes Care: Recent Advances and Guideline Updates

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OU Health | Fran and Earl Ziegler College of Nursing
The UNIVERSITY of OKLAHOMA

Conflicts of Interest

I have no relevant conflicts of interest or financial disclosures.

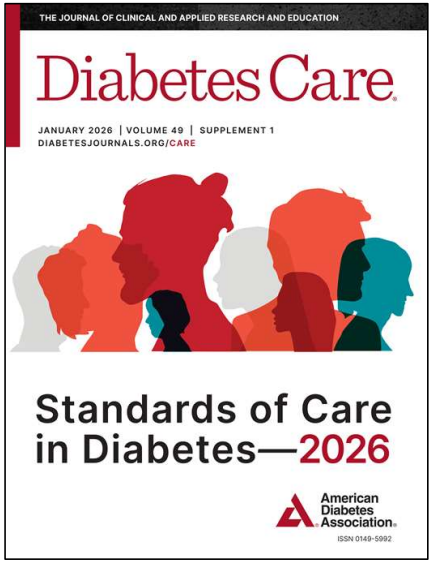
Objectives

- Participants will be able to develop an evidence-based pharmacologic treatment plan to manage diabetes.
- Participants will be able to assess current patient medication regime, adjust and de-prescribe as needed.
- Participants will be able to prioritize patient-specific needs when considering treatment options, including cardiorenal benefit and cost.

*with a focus on outpatient management of type 2 diabetes in non-pregnant adults

Diabetes and Diabetes Guidelines

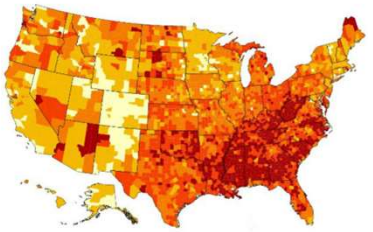
"Diabetes mellitus is a group of metabolic disorders of carbohydrate metabolism in which glucose is both underutilized as an energy source and overproduced due to inappropriate gluconeogenesis and glycogenolysis, resulting in hyperglycemia".



Prevalence

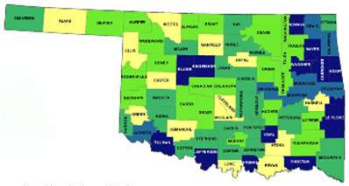
U.S.

- 12% of the US population has diagnosed diabetes
- 27.6% adults with undiagnosed diabetes
- 52.1% adults >65 years have prediabetes
- 7th leading cause of death in the U.S.



Oklahoma

- In 2021, 9th highest diabetes prevalence in the US
- 1 in 3 diagnosed with diabetes takes insulin
- 19.7% non–Hispanic Black, 16.9% American Indian, 12.5% White

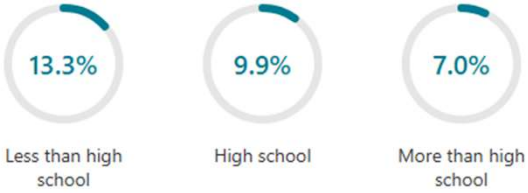


(CDC, 2026), (Oklahoma Health Care Authority, 2022)

Prevalence – U.S. Adults with Diagnosed Diabetes 2021-2023

For both men and women, prevalence of diagnosed diabetes were as follows:

Prevalence varied significantly by education level, which is an indicator of socioeconomic status.



Adults with family income above 500% of the federal poverty level had the lowest prevalence.

(OASH, 2026), (CDC, 2026)

Screening for Diabetes

Table 2.5—Criteria for screening for diabetes or prediabetes in asymptomatic adults

1. Testing should be considered in adults with overweight or obesity (BMI ≥25 kg/m^2 or ≥23 kg/m^2 in individuals of Asian ancestry) who have one or more of the following risk factors:
   - First-degree relative with diabetes
   - High-risk race, ethnicity, and ancestry (e.g., African American, Latino, Native American, Asian American)
   - History of cardiovascular disease
   - Hypertension (≥130/80 mmHg or on therapy for hypertension)
   - HDL cholesterol level <35 mg/dL (<0.9 mmol/L) and/or triglyceride level >250 mg/dL (>2.8 mmol/L)
   - Individuals with polycystic ovary syndrome
   - Physical inactivity
   - Other clinical conditions associated with insulin resistance (e.g., severe obesity, acanthosis nigricans, metabolic dysfunction-associated steatotic liver disease)
2. People with prediabetes (A1C ≥5.7% [≥39 mmol/mol], IGT, or IFG) should be tested yearly.
3. People who were diagnosed with GDM should have testing at least every 1–3 years.
4. For all other people, testing should begin at age 35 years.
5. If results are normal, testing should be repeated at a minimum of 3-year intervals, with consideration of more frequent testing depending on initial results and risk status.
6. Individuals in other high-risk groups (e.g., people with HIV, exposure to high-risk medicines, evidence of periodontal disease, history of pancreatitis) should also be closely monitored.

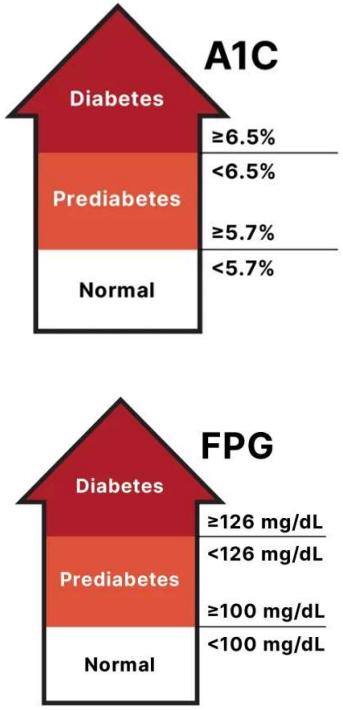
GDM, gestational diabetes mellitus; IFG, impaired fasting glucose; IGT, impaired glucose tolerance.

Diabetes Diagnosis

Result*	A1C Test	Fasting Blood Sugar Test	Glucose Tolerance Test	Random Blood Sugar Test
Diabetes	6.5% or above	126 mg/dL or above	200 mg/dL or above	200 mg/dL or above
Prediabetes	5.7 – 6.4%	100 – 125 mg/dL	140 – 199 mg/dL	N/A
Normal	Below 5.7%	99 mg/dL or below	140 mg/dL or below	N/A

- In the absence of clear hyperglycemia, diagnosis should be based on two abnormal screenings
- Be aware of recent blood transfusions and hemoglobinopathies

Prediabetes Diagnosis and Diabetes Prevention



Lifestyle

- Diabetes Prevention Program reduces risk by 58% over 3 years
  - 5–7% body weight loss
  - Healthy eating pattern
  - ≥150 min/wk moderate activity
- Evidence-based eating pattern
  - no "diabetic diet"
  - Mediterranean, DASH, low-carb, plant-based
- Healthy Sleep

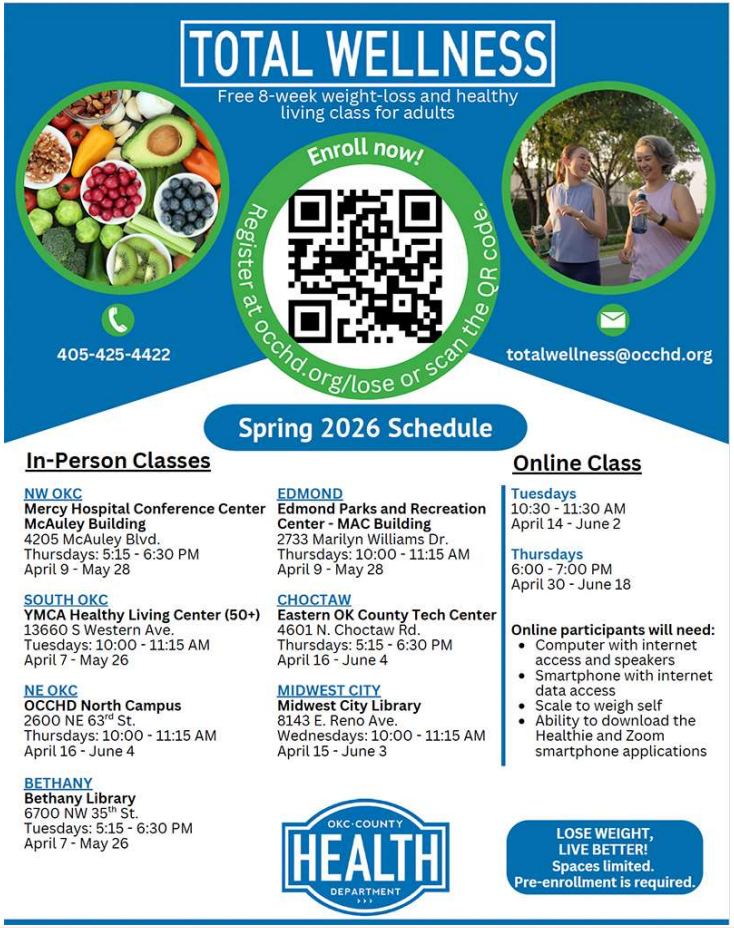
Pharmacologic Treatment

- Metformin
  - Younger individuals
  - History of GDM
  - BMI ≥35 kg/m^2
- Treat obesity

(ADA, 2026)

https://www.thelancet.com/journals/landia/article/PIIS2213-8587(25)00333-X/abstract

OKCCHD Total Wellness Program



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https://occhd.org/tw/

5-7% Weight Loss

Weight loss of 5–7%

- Improves glucose
  - Key to prevent progression from prediabetes to T2DM
- Improves lipids
- Lowers blood pressure
  - 1 kg loss ≈ 1 mmHg reduction
- Lowers CV risk

Baseline Weight (pounds)	5% loss	6% loss	7% loss
150	142.5	141	139.5
175	166.2	164.5	162.7
200	190	188	186
225	213.7	211.5	209.2
250	237.5	235	232.5
275	261.2	258.5	255.7
300	285	282	279
325	308.7	305.5	302.2
350	332.5	329	325.5
375	356.2	352.5	348.7
400	380	376	372
425	403.7	399.5	395.2
450	427.5	423	418.5
475	451.2	446.5	441.7
500	475	470	465

(ADA, 2026)
(AHA, 2008)

Diabetes Diagnosis – Nonpregnant Individuals

Table 2.1—Criteria for the diagnosis of diabetes in nonpregnant individuals

A1C ≥6.5% (≥48 mmol/mol). The test should be performed in a laboratory using a method that is NGSP certified and standardized to the DCCT assay.*
OR
FPG ≥126 mg/dL (≥7.0 mmol/L). Fasting is defined as no caloric intake for at least 8 h.*
OR
2-h PG ≥200 mg/dL (≥11.1 mmol/L) during OGTT. The test should be performed as described by the WHO, using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water.*
OR
In an individual with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose ≥200 mg/dL (≥11.1 mmol/L). Random is any time of the day without regard to time since previous meal.

DCCT, Diabetes Control and Complications Trial; FPG, fasting plasma glucose; OGTT, oral glucose tolerance test; NGSP, National Glycohemoglobin Standardization Program; WHO, World Health Organization; 2-h PG, 2-h plasma glucose. *In the absence of unequivocal hyperglycemia, diagnosis requires two abnormal results from different tests, which may be obtained at the same time (e.g., A1C and FPG), or the same test at two different time points.

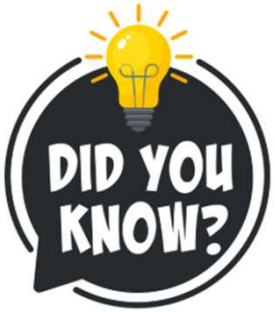
- Type 1 Diabetes = autoimmune
  - LADA
- Type 2 Diabetes = NOT autoimmune
- Pancreatogenic Diabetes
  - Pancreatitis, trauma, cancer, CFRD
- Monogenic
  - Neonatal Diabetes
  - MODY
- Drug-Induced Diabetes
  - Immune checkpoint inhibitors, post-transplant , …

(ADA, 2026)

Did you know?

- 40% of people with type 1 diabetes are diagnosed after age 30
- 59% of people with adult-onset type 1 diabetes have BMI ≥ 25
- 50–62% of adults with type 1 diabetes are overweight or obese

- Type 2 diabetes has a stronger link to family history than type 1



(AACE, 2026)

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

Diabetes Classification

The AABBCC approach

- **A** — **Age** (e.g., for individuals <35 years old, consider type 1 diabetes)
- **A** — **Autoimmunity** (e.g., personal or family history of autoimmune disease or polyglandular autoimmune syndromes)
- **B** — **Body habitus** (e.g., BMI <25 kg/m2)
- **B** — **Background** (e.g., family history of type 1 diabetes)
- **C** — **Control** (e.g., glucose management on noninsulin therapies)
- **C** — **Comorbidities** (e.g., treatment with immune checkpoint inhibitors for cancer can cause acute autoimmune type 1 diabetes)

ANTIBODY TESTING

GAD

IA-2

ZnT8

(ADA, 2026)

Type 1 Staging

IDENTIFY STAGE		
STAGE 1	**STAGE 2**	**STAGE 3**
CHARACTERISTICS		
• Autoimmunity • Normoglycemia • Presymptomatic	• Autoimmunity • Dysglycemia • Presymptomatic	• Autoimmunity • Overt hyperglycemia • Symptomatic
DIAGNOSTIC CRITERIA		

• Multiple islet autoantibodies
• No IGT or IFG
	• Islet autoantibodies (usually multiple)
	• Dysglycemia: IFG and/or IGT
	  • FPG 100–125 mg/dL (5.6–6.9 mmol/L)
	  • 2-h PG 140–199 mg/dL (7.8–11.0 mmol/L)
	• A1C 5.7–6.4% (39–47 mmol/mol) or ≥10% increase in A1C
		• Autoantibodies may become absent
		• Diabetes by standard criteria

FPG, fasting plasma glucose; IFG, impaired fasting glucose; IGT, impaired glucose tolerance; 2-h PG, 2-h plasma glucose.

Alternative additional stage 2 diagnostic criteria of 30-, 60-, or 90-min plasma glucose on oral glucose tolerance test ≥200 mg/dL (≥11.1 mmol/L) and confirmatory testing in those aged ≥18 years have been used in clinical trials.

(ADA, 2026)

Teplizumab-mzwv

- Teplizumab–mzwv
  - CD3–directed humanized monoclonal antibody engineered to have decreased Fc receptor binding, **to delay the onset of stage 3 type 1 diabetes** in people 8 years and older with stage 2 type 1 diabetes
  - Median delay 25–32 months
  - Once daily IV infusion x 14 days
  - Premedication and monitoring required

(ADA, 2026)

Glycemic Targets

Most non-pregnant adults	
A1C target	<7%
Preprandial glucose	80–130 mg/dL
Peak postprandial glucose	<180 mg/dL

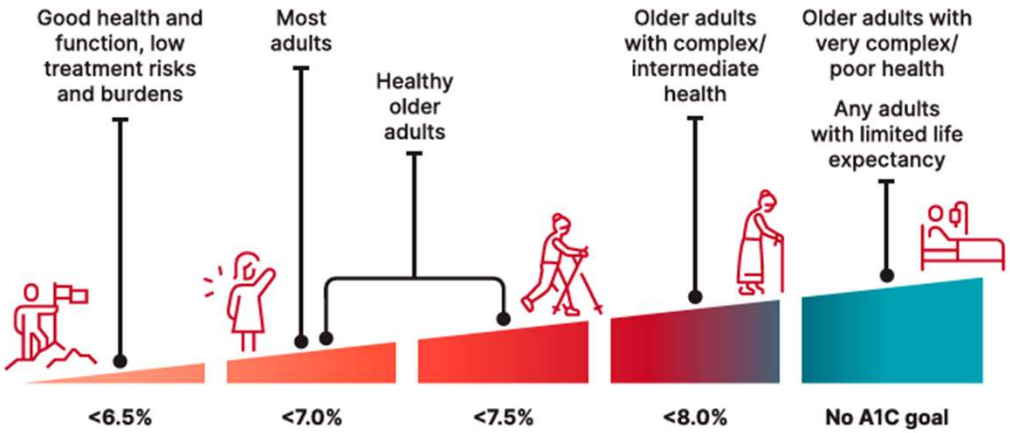
Preprandial glucose measurement should be made before food

Post prandial glucose measurements should be made 1–2 hours after the beginning of a meal

Consider less stringent A1C goals (such as <8%)
Hypoglycemia/hypoglycemia unawareness
Reduced life expectancy
Older age
Increased risk or frequency of hyperglycemia
Established vascular complications
Multiple comorbidities
Patient preference
Lack of resources/support systems

(ADA, 2026)

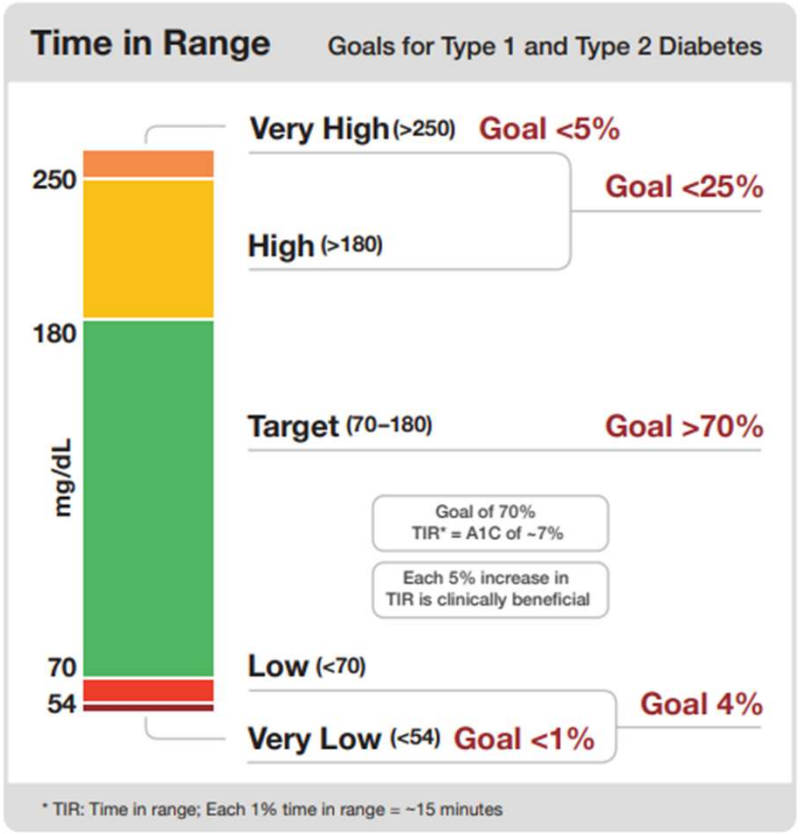
Diabetes Glycemic Goal Adjustment



Modifying Factors

Favor more stringent goal	Favor less stringent goal
Short diabetes duration	Long diabetes duration
Low hypoglycemia risk	High hypoglycemia risk
Low treatment risks and burdens	High treatment risks and burdens
Pharmacotherapy with cardiovascular, kidney, weight, or other benefits	Pharmacotherapy without nonglycemic benefits
No cardiovascular complications	Established cardiovascular complications
Few or minor comorbidities	Severe, life-limiting comorbidities

Continuous Glucose Monitoring Goals



Patient Data

Days Worn:	Recommend 14 days
Time CGM Active:	70% of data from 14 days

Glucose Metrics

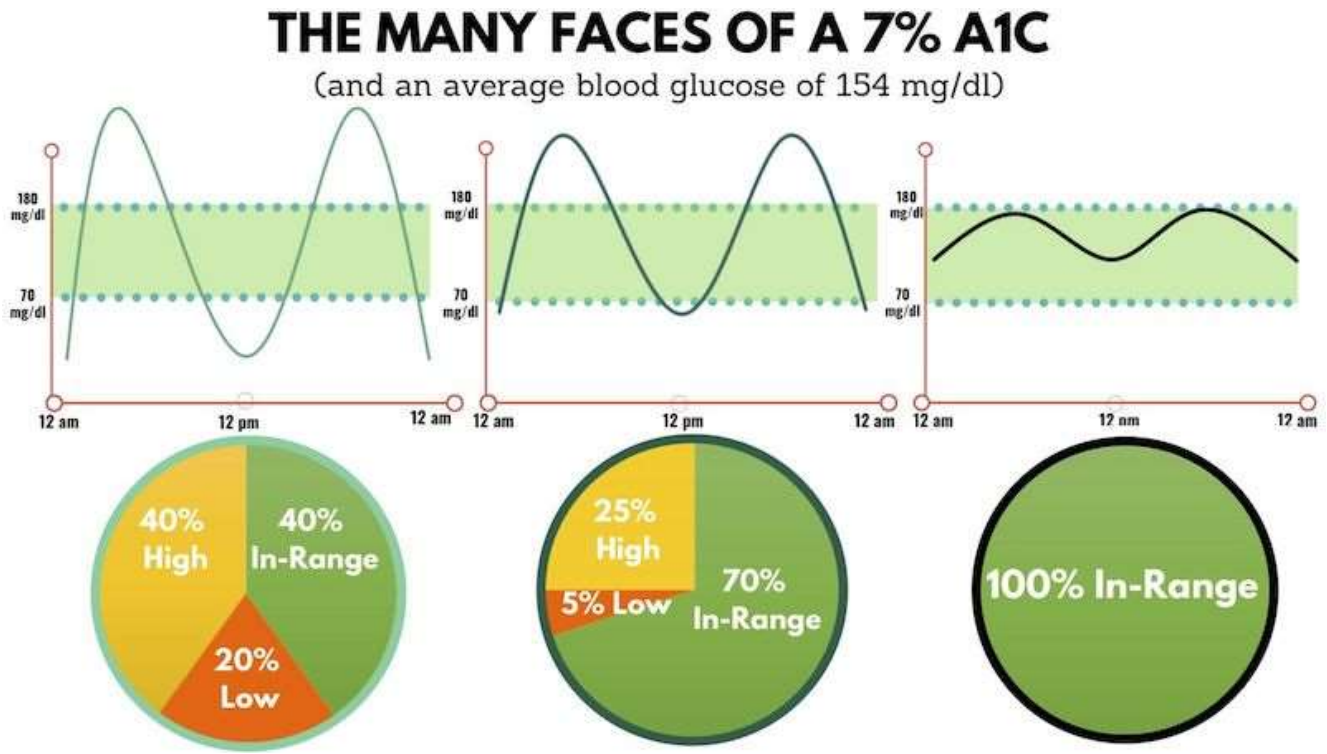
Average Glucose..... Goal <154 mg/dL

Glucose Management Indicator (GMI).....Goal <7%

Glucose Variability..... Goal ≤36%
Defined as percent coefficient of variation

(ADA, 2026)

Continuous Glucose Monitoring vs HbA1c



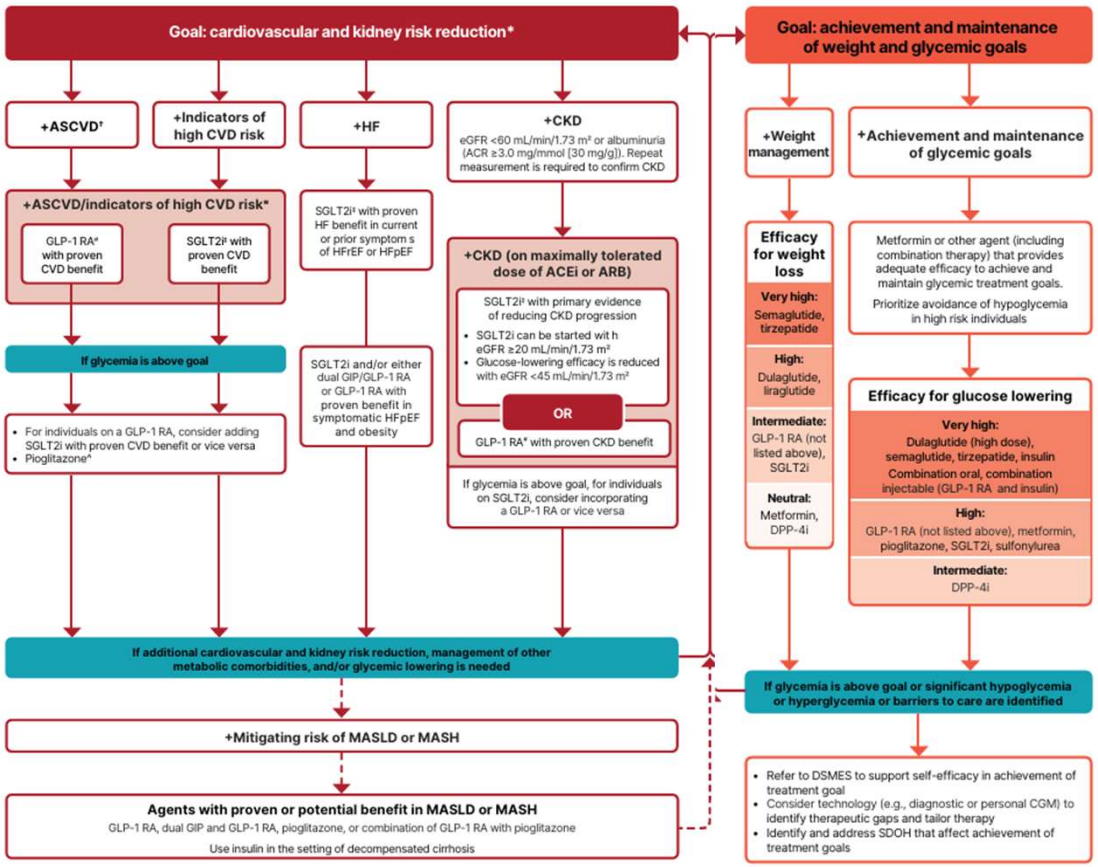
https://www.diabetesnet.com/diabetes-tools/insulin-dose-guide/glucose-goals-variability/

Diabetes Related Complications

- People with diabetes are twice as likely to have CVD & CVA
- CVD leading case of morbidity and mortality in T2DM
- HF hospitalization rates are double in DM
-  37% of adults with DM have CKD
-  DM is the most common cause of CKD
-  Diabetic retinopathy leading cause of blindness in working age adults
- Cancer, amputation, dementia, early death, gum disease
-  Diabetic peripheral neuropathy, PVD, PAD
-  Autonomic neuropathy: CV, GI (gastroparesis), GU

(CDC, 2020)

Type 2 Diabetes – Guideline Directed Medical Treatment



(ADA, 2026)

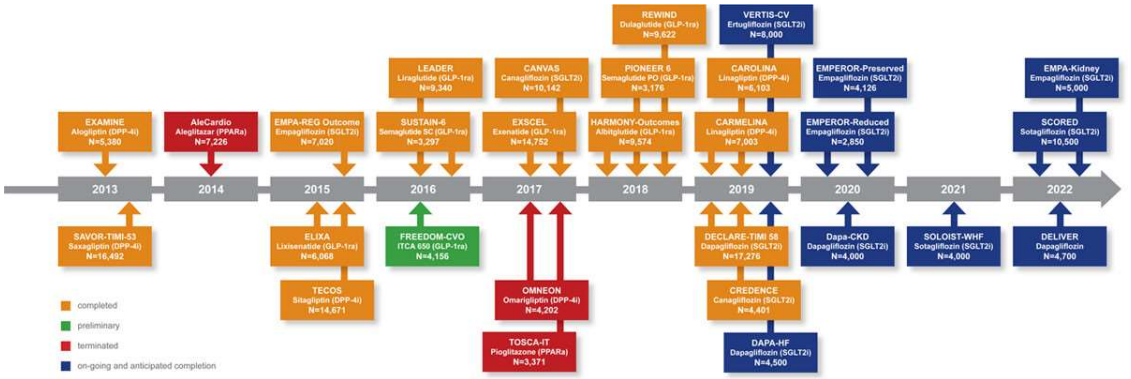
Key Considerations in Diabetes Management

- Evidence–based, guideline directed
- Person–centered
  - Comorbidities (CV, kidney, weight)
  - Cost
  - Reduce burden and risk (FSBS, hypoglycemia, injections)
- Timely treatment decisions, avoid therapeutic inertia
- 2+ agents are frequently recommended (to mitigate comorbidities) and/or meet glycemic goals
- Pharmacotherapy + Lifestyle
- Consider technology – CGM, apps, …
- Deprescribe, deescalate, modify as needed
- Ask about plans to become pregnant

Cardiovascular Outcome Trials (CVOTs)

- FDA mandated CVOTs – 2008
- Designed to prove CV safety after concerns for T2DM medications like rosiglitazone and miraglitzar
- Saxagliptin – risk for HF
- IMPA-REG first trial showing positive outcomes
  - Empagliflozin 16% reduction CV death and stroke and 30% reduction in HF

https://diabetesjournals.org/journals/pages/podcasts_cvot



Timeline of cardiovascular outcome trials since the 2008 US Food and Drug Administration guidance
https://www.ahajournals.org/doi/10.1161/CIRCULATIONAHA.119.041022

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New FDA Approval – once weekly basal insulin - icodec-abae

- Once weekly basal insulin – adjunct to diet and exercise to improve glycemic control in **adults with type 2 diabetes mellitus**
  - Binds to serum albumin = gradual release of insulin icodec
- Clinical trials: ONWARDS 1–4
  - statistically significant HbA1c reductions in ONWARDS 1–3
  - non–inferiority ONWARDS 4
  - Higher rates of significant hypoglycemia ONWARDS 3

U-700 FlexTouch Pens

- 10-unit dosing increments
- max dose = 700 units
- Remind patients to always use pen needle, never draw out of with syringe

Pen size:

- 1050 units = 1.5 mL pen + 13 pen needles (1 pen/pack)
- 2100 units = 3mL pen (1 pen/pack)
- Sample Pen: 700 units = 1 mL pen + 9 pen needles

Storage: use within 12 weeks if opened and/or stored at room temperature

Icodec Dosing

New to Basal Insulin: recommended starting dose = 70 units once weekly

Transition from Daily Basal Dosing:

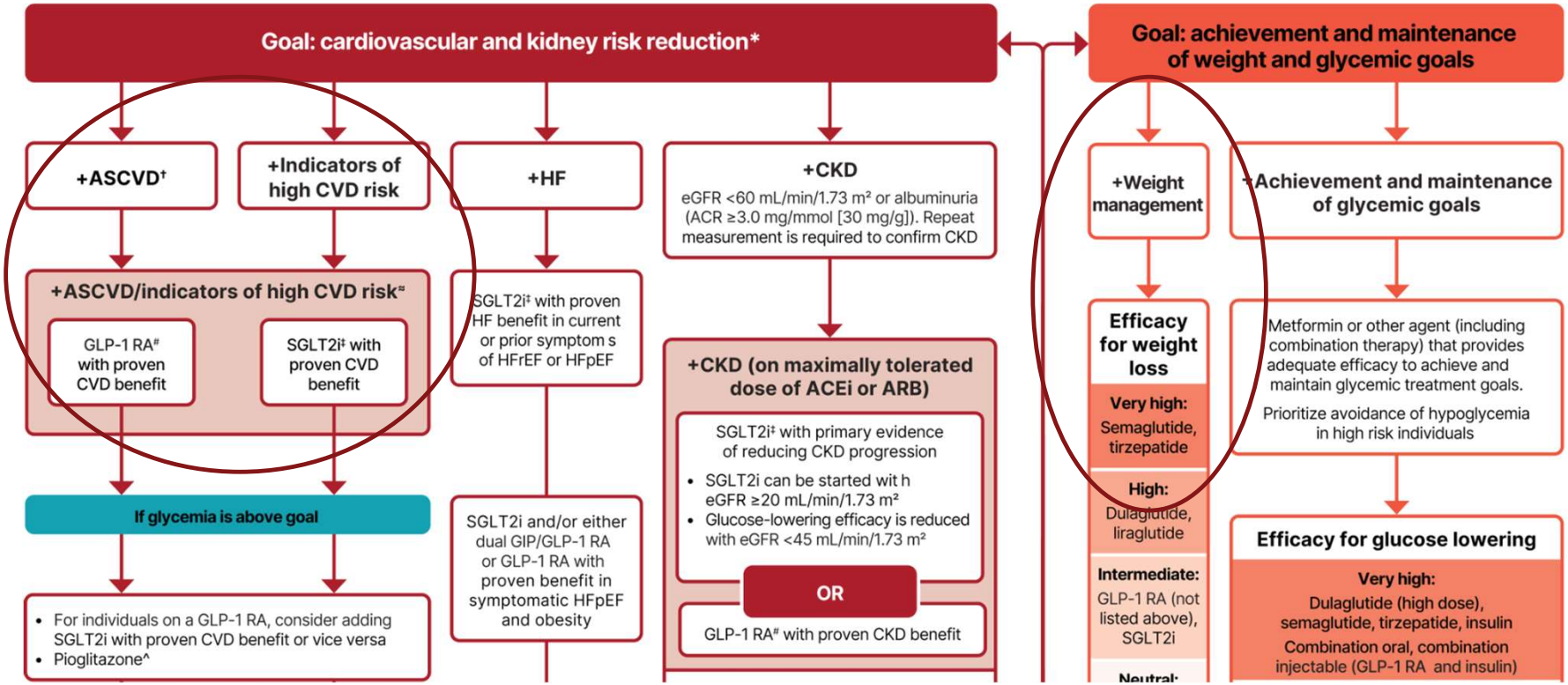
- Dosing table up to 100 units daily in Awiqli PI
  - https://www.novo-pi.com/awiqli.pdf
- Start icodec weekly dose the day after the last daily basal dose
- Week 1 = Multiply previous total daily basal insulin dosage by 7, then multiply by 1.5, and round to the nearest 10 units; Week 2 = Previous total daily basal insulin dosage multiplied by 7, then rounded to the nearest 10 units; adjust based on glycemic goals
- Steady state achieved 2-3 weeks

Missed Dose

- take ASAP within 4 days of last dose. If > 4 days, take next dose on regularly scheduled day

(https://www.novo-pi.com/awiqli.pdf)

Type 2 Diabetes Goal Directed Medication Management – GLP-1 RA, GIP/GLP



GLP & GIP/GLP-1 Agonists

Mechanism of Action	Contraindications	Caution	Indications
• Enhances glucose - dependent insulin secretion • Slows gastric emptying • Increases pancreatic beta cell proliferation • Reduces glucagon release • Decreases appetite • Increases feeling of fullness	• History of pancreatitis or active gallbladder disease • Personal or family history of medullary thyroid cancer (MTC) or Multiple Endocrine Neoplasia syndrome (MEN 2) • Severe gastroparesis • Hypersensitivity or allergy • Pregnancy/Breastfeeding	• Retinopathy • Other GI issues • Can cause intestinal blockage • Alcohol Use – may lower tolerance and increase impairment • Peri-operative period – stop weekly GLP or GIP/GLP at least 1 week before surgery • FDA removed black box warning of suicidal ideation • Reduce insulin or secretagogue dose PRN	• Type 2 Diabetes • Obesity • Obstructive Sleep Apnea • Non-cirrhotic MASH • CV risk reduction in adults with CVD + overweight or obesity

GLP & GIP/GLP-1 Agonists

- Glucagon–like Peptide Receptor Agonists
  - Semaglutide
  - Dulaglutide
  - Liraglutide
  - Exenatide (first GLP–1 designed to mimic Gila monster venom)
  - Coming Soon: orforglipron for T2DM (approved for obesity April 2026)
- GIP/GLP–1 Agonist
  - Tirzepatide
- Coming Soon: Triple Agonists
  - GLP–1, GIP, and glucagon
  - Retatrutide

GLP & GIP/GLP-1 Agonists – Patient Counseling

- Avoid fatty, greasy or fried foods
- Eat small portions
- Balanced meals: protein, fiber, nutrient–rich food
- Stay hydrated
- Resistance and strength training
- Oral contraceptives
  - Reduced effect by delayed gastric emptying and absorption
- Go to the hospital with s/s pancreatitis
- Report new lumps or swelling in the throat
- Report vomiting or constipation
- If injectable: sharps safety, site selection/rotation

GLP-1 and GIP/GLP Formulations and Dosing

GLP-1 & GIP for Diabetes & Weight Loss

Class/Action	Generic Name	Diabetes Version Dose & Indications	Wt loss Version Max Dose & Indications	Considerations
GLP-1 RA - Glucagon Like Peptide Receptor Agonist **"Incretin Mimetic"** • Increases insulin release with food • Slows gastric emptying • Promotes satiety • Suppresses glucagon	exenatide 2x day injection	exenatide 5 and 10 mcg		**Side effects:** N/V, wt loss. Report signs of pancreatitis or ileus, stop med. **Black box warning:** Avoid if family history medullary thyroid tumor. All FDA approved to reduce risk of CV disease, death, MI, stroke (except exenatide, Saxenda). †Approved for peds 10-17 yrs ††Approved for Peds 12-17 years Lowers A1C ~ 0.5 - 1.6% Wt loss: 4-9% (Diabetes versions)
	liraglutide 1x day injection	Victoza† 0.6, 1.2, 1.8mg	Saxenda†† - 3.0mg	
	dulaglutide 1x week injection	Trulicity† 0.75, 1.5, 3.0, 4.5mg		
	semaglutide 1x week injection	Ozempic 0.25, 0.5, 1.0, 2.0mg Tx for CKD	Wegovy†† - 2.4mg High Dose - 7.2mg Tx for MASH	
	semaglutide Daily Oral - fasting w/ H20	Oral Ozempic 1.5, 4, 9 mg Rybelsus 3, 7, 14 mg	Wegovy - 25mg Oral tablet	
GLP-1 & GIP Receptor Agonist Activates receptors for GLP-1 (see above) & Glucose-dependent Insulinotropic Polypeptide (GIP).	tirzepatide 1x week injection. Single dose via prefilled pen or vial.	Mounjaro† 2.5, 5.0, 7.5, 10, 12.5, 15 mg Gradually adjust dose based on shared decision, individual goals.	Zepbound Max dose 15mg Tx for sleep apnea	**Side effects:** N/V, wt loss. Report pancreatitis or signs of ileus, stop med. **Black box warning:** Avoid if family hx of medullary thyroid tumor. †Approved for peds 10-17 yrs Lowers A1C ~ 1.8 - 2.4% Wt loss: 7-14% (Diabetes versions)

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Reminder:
GLP1RA and DPP4i both work on the incretin pathway. They are duplicative if taken together. When starting GLP1RA, stop the DPP4i (Januvia, Tradjenta, Nesina, saxagliptin).

https://diabetesed.net/free-pocketcards-medication-diabetes-education/

GLP & GIP/GLP-1 Agonist Diabetes Formulations

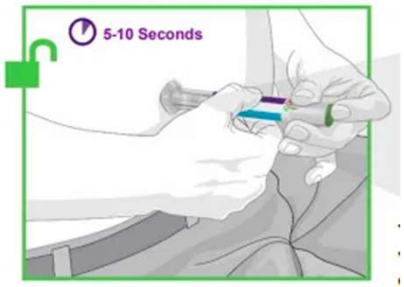
TAKING RYBELSUS

FIRST THING IN THE MORNING

ON AN EMPTY STOMACH

WITH ONLY 4oz PLAIN WATER

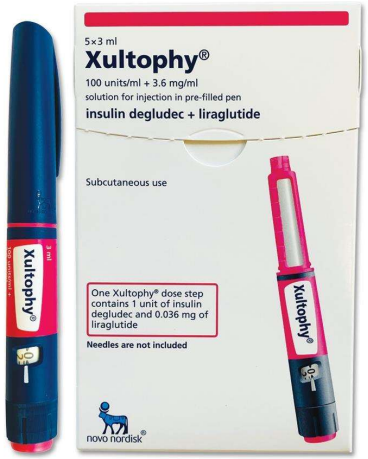
WAIT 30 MIN BEFORE FOOD AND OTHER MEDICATIONS



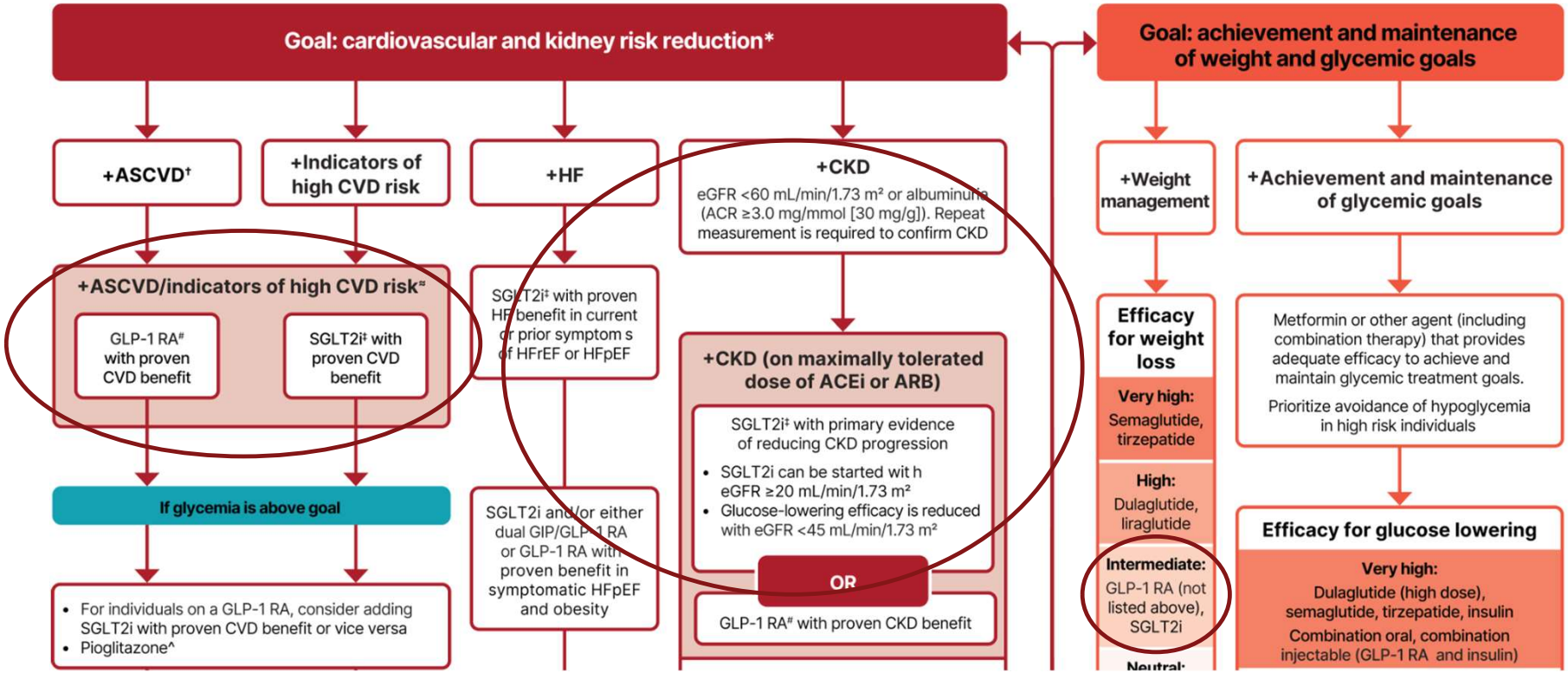
GLP-1 + Basal Insulin Combinations

Once Daily in AM dosing

- Xultophy = degludec + liraglutide
- Soliqua = glargine + exenatide



Type 2 Diabetes Goal Directed Medication Management- SGLT2i



Sodium-Glucose Co-Transporter 2 Inhibitors – SGLT2-i

Mechanism of Action

- Inhibits glucose reabsorption in proximal tubule leading to glucosuria


lowers intraglomerular pressure, reduces hyperfiltration and workload on tubular cells


Reduces inflammation, decreases oxidative stress, prevents adverse cardiac remodeling

Contraindications/Cautions

- Hypersensitivity or allergy
- Pregnancy/Breastfeeding
- Type 1 Diabetes

- Mycotic infections
- UTI
- Dehydration
- Hypotension

- Renal dosing varies, but generally avoid use for glycemic control <30 eGFR

Monitoring

- Monitor volume status and renal function
- There will be an initial dip in eGFR (concern if > 30%)
- May need to proactively titrate diuretics

- Monitor those at advanced age for dehydration and orthostatic hypotension- may contribute to falls

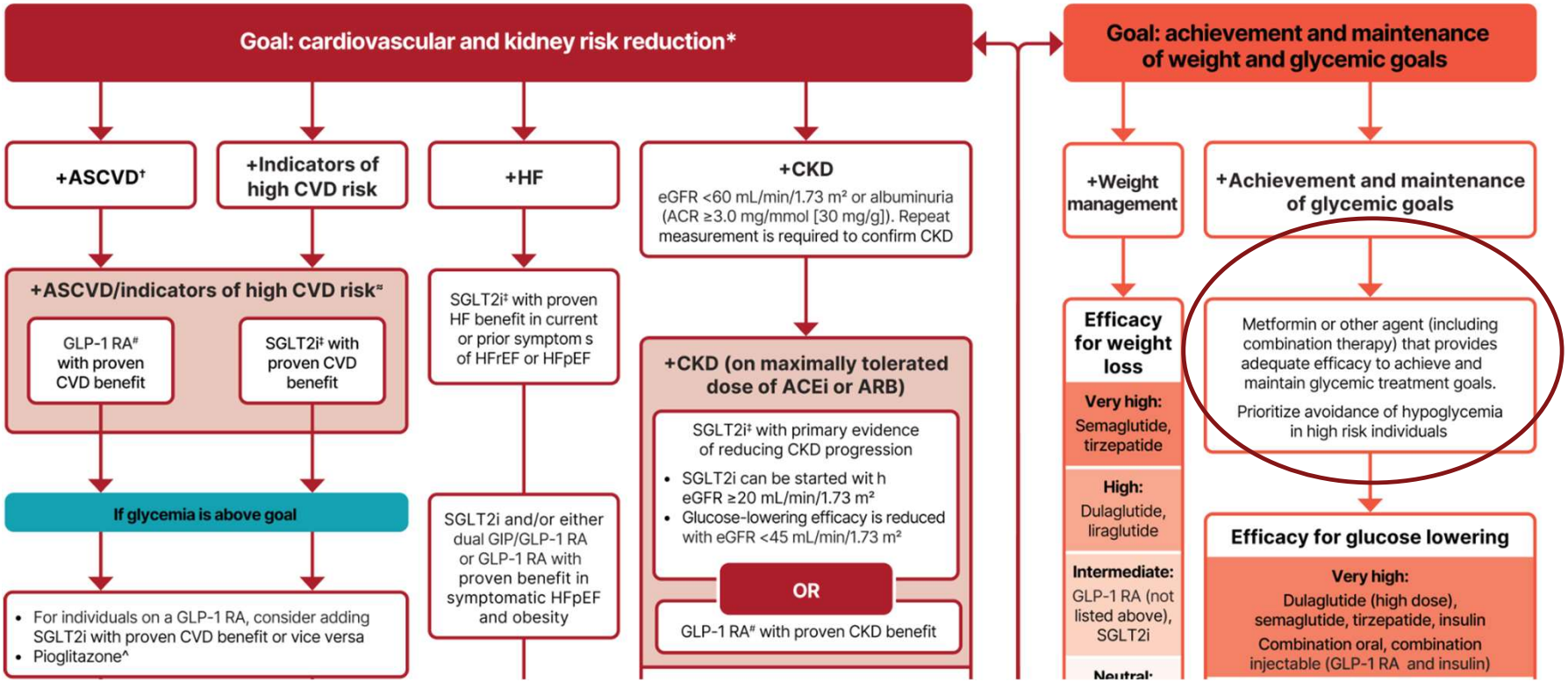
Indications

- Type 2 Diabetes
- Heart Failure
- CVD
- CKD

SGLT2i – Patient Counseling

- Genital yeast infection – most common AE
  - Women and uncircumcised males
  - Maintain good genital hygiene
  - Use wet wipes – make sure all urine is wiped from skin
- Stay hydrated
  - Stop during periods of illness or inability to stay hydrated
- Stop perioperatively
- Avoid ketogenic or very low carb diet

Type 2 Diabetes Goal Directed Medication Management - Metformin

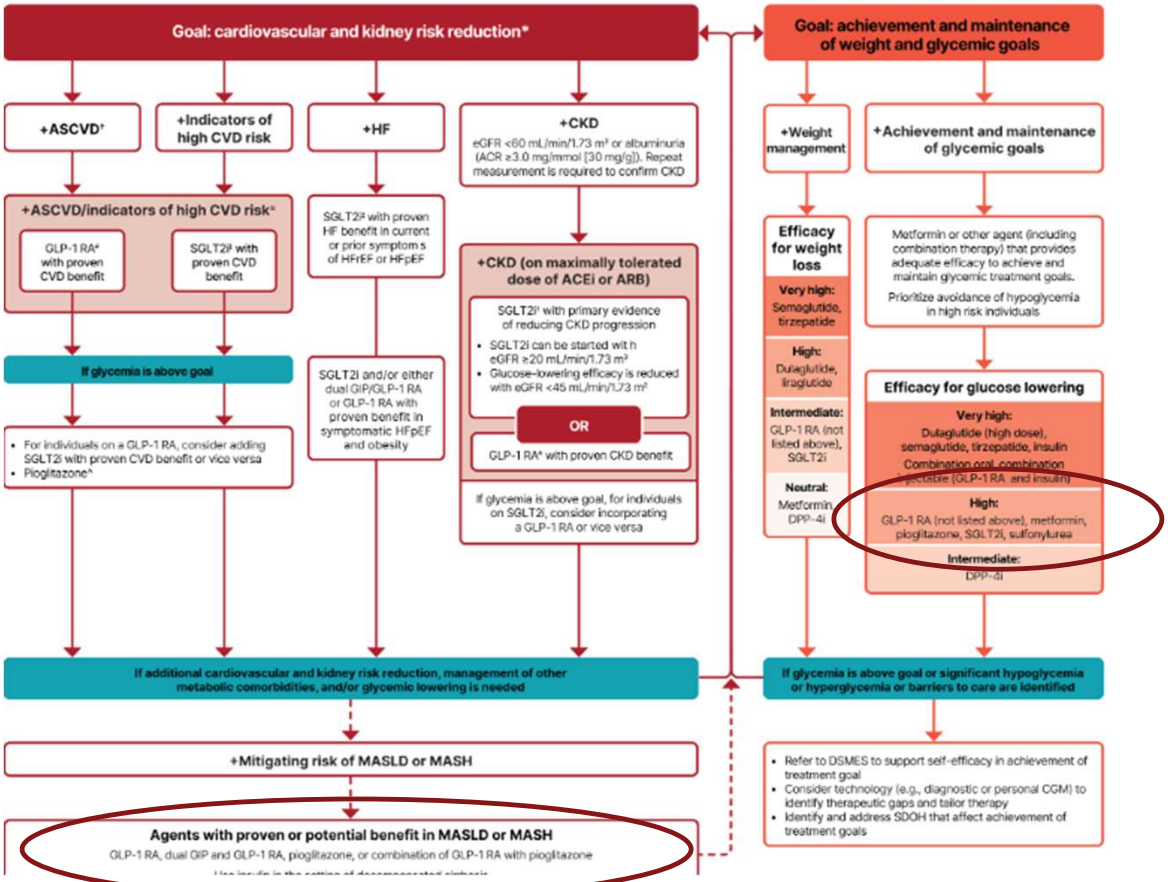


Biguanide - Metformin

Mechanism of Action	Contraindications/Cautions	Benefits	Considerations

• Decreases hepatic glucose output
• Improves peripheral glucose uptake in muscle and fat cells
• Improves insulin sensitivity
	• Renal Dosing
	  • eGFR < 30 = avoid use
	  • eGFR <45 = avoid initiation
		• Safe
		• Effective
		• Low-cost
			• Improves fertility in PCOS
			• Inhibits B12 absorption
			
			• Diarrhea – most common AE
			  • ER formulation
			  • Slow Titration
			  • Take with food
			
			• Reduce insulin or secretagogue dose PRN

Type 2 Diabetes Goal Directed Medication Management - Pioglitazone



Thiazolidinedione - Pioglitazone

Mechanism of Action	Contraindications	Potential Benefits
• Increases fat and muscle cell sensitivity to insulin	• Heart failure • Bladder cancer • Renal impairment due to fluid retention • Risk of bone fracture	• Reduce risk of recurrent CVA • Improves steatosis and liver function in NASH

Insulin - Basal

U-100	U-200	U-300	U-700

• Glargine
  • Lantus
  • Basaglar
  • Semglee
  • Rezvoglar
• Degludec
  • Tresiba U-100
	• Degludec
	  • Tresiba U-200
		• Glargine
		  • Toujeo U-300
			• Icodec
			• Awiqli U-700

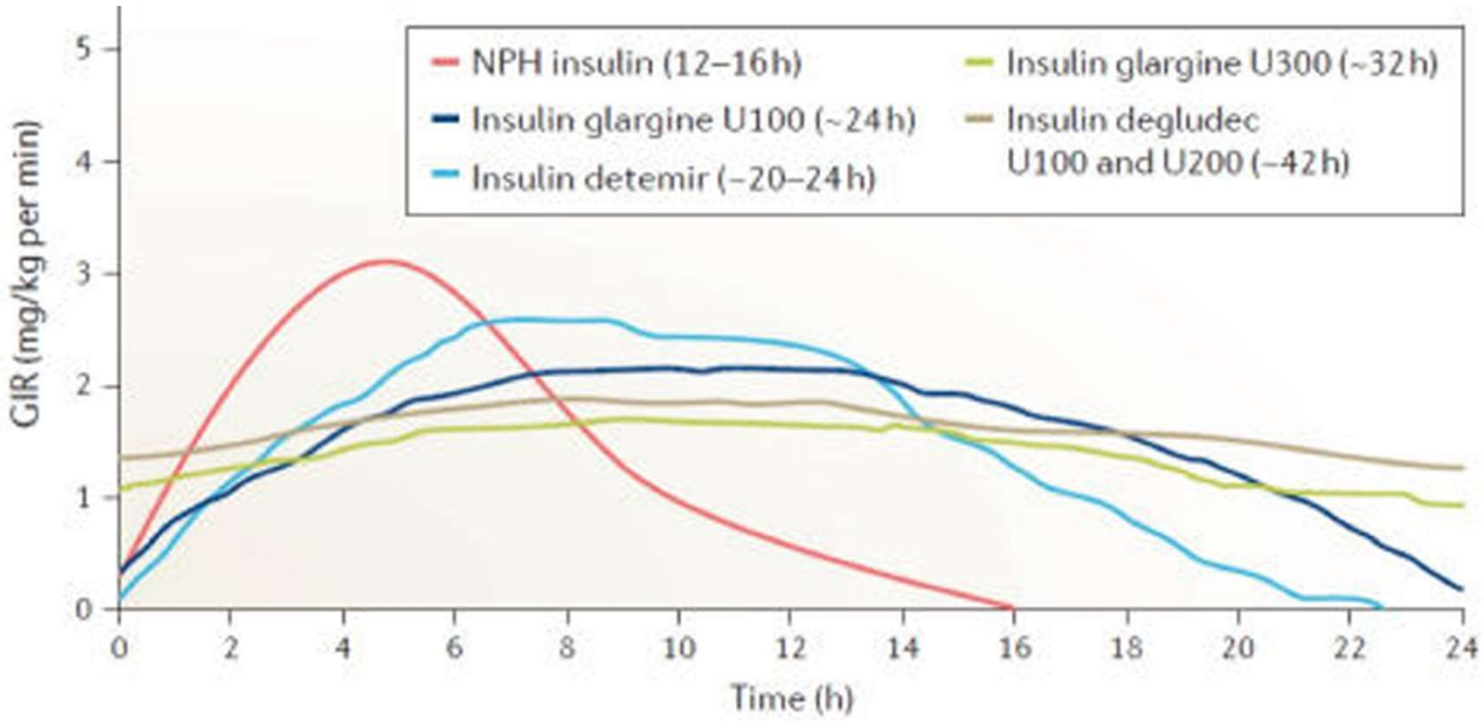
	Once Daily		Once Weekly

- Always use pen needle
- Never draw out with syringe

Basal Insulin Initiation

- Consider if HbA1c >10%
- In presence of glucose toxicity and/or weight loss
- 0.1-0.2 units/kg/day starting dose
- Sharps Safety
- Site selection/rotation
- Hypoglycemia Emergency Kit
- Consider CGM

Pharmacokinetic Profiles of Basal Insulin



https://pubmed.ncbi.nlm.nih.gov/28429780/

Insulin –Prandial

Very Rapid Acting	Rapid Acting - Inhaled	Rapid Acting	Short Acting	Prandial Insulin Initiation

• Aspart
  • Fiasp
• Lispro-aabc
  • Lyumjev
 	
• Take at time of meal
• 15-20 min onset
• 1-3 hour peak
	• Afrezza Inhaled regular human insulin
	 
	• Contraindicated in asthma, COPD
	• Baseline spirometry (FEV_1), 6 months and annually
	
	• Take at time of meal
	• 12 min onset
	• 35-45 min peak
		• Aspart
		  • Novolog
		  • Merilog
		• Aspart-xjhz
		  • Kirsty
		• Lispro
		  • Humalog
		  • Admelog
		• Glulisone
		  • Apidra
		
		• 15 min before meal
		• 15-30 min onset
		• 1-3 hour peak
			• Regular
			
			• 30 min before meal
			• 30-60 min onset
			• 2-4 hour peak
				• Basal insulin titrated to goal fasting glucose but not meeting HbA1c targets
				• 4 units or 10% of total basal insulin at largest meal or greatest PP excursion
				• CGM
				• Overbasalization
				  • Hypoglycemia
				  • High variability

https://afrezza.com/about-afrezza/

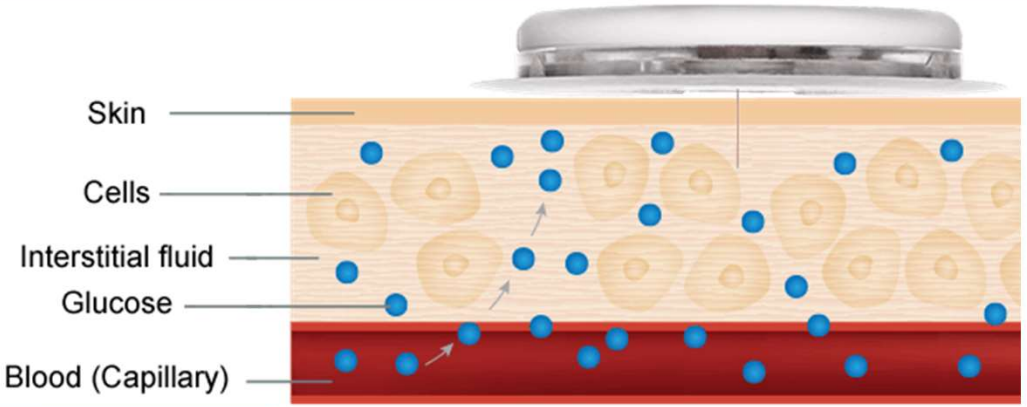
Insulin – U-500

- Regular insulin but works like basal/bolus or mixed
- Insulin resistance >200 units daily
- 3 mL KwikPen holds 1500 units
- Always use pen needle, never draw out with syringe
- Generally dosed 2–3 times daily 30 minutes before meal
- 4–8 hour peak
- 11–17 hour duration, dose dependent

https://pi.lilly.com/us/humulin-r-u500-pi.pdf

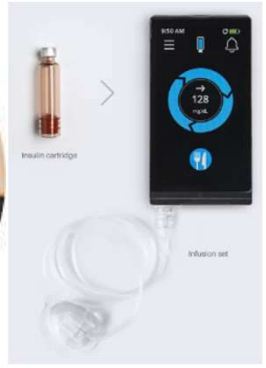
https://pmc.ncbi.nlm.nih.gov/articles/PMC6354819/

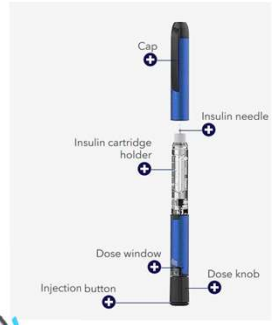
Continuous Glucose Monitoring (CGM)

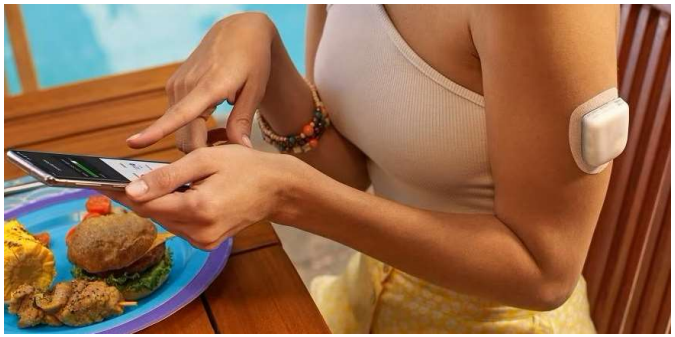


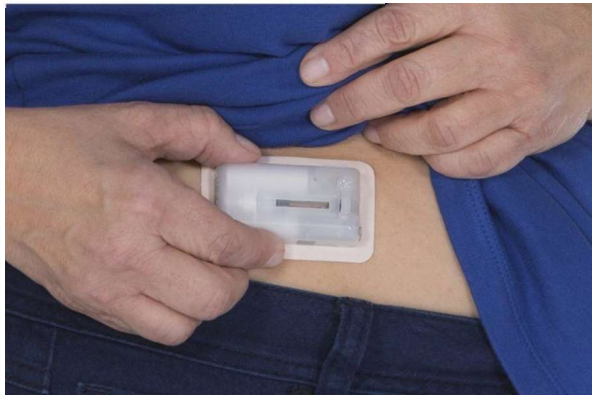
(ADA, 2026)

Diabetes Insulin Delivery Technology









Insulin Delivery Technology

Insulin Pumps

- Continuous subcutaneous insulin infusion (CSII)
- + CGM = AID (automated insulin delivery)
- Consider dexterity, tech-savvy, cost, smartphone, visual impairment
- Continuous basal rate delivered via fast acting insulin
- Auto-correction
- Suspend before low

Patch Pumps

- Basal + bolus OR just bolus option
- Can deliver dose of prandial insulin with touch of button (even through clothes)
- Spring-loaded, tech-savvy not required

Smart Pens

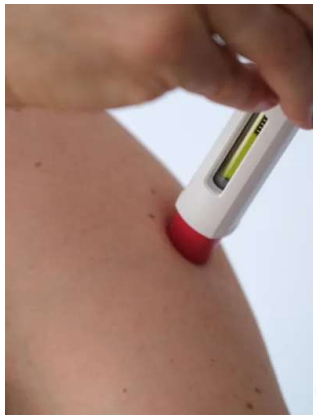
- Penfill cartridges
- In-Pen connects to app and allows calculation of correction factors and carb ratios similar to pump
- NovoPen Echo allows for ½ unit dosing
- NovoPen Echo has non-tech memory feature allowing users to view time/date of last injection

Insulin Pumps

	Basal automation?	Bolus automation?	Algorithm target glucose/ target range?	Which insulin does the user give?
MiniMed™ 780G 	"Auto Basal" calculated from total daily insulin, which is updated each day at midnight. Auto Basal is adjusted every 5 min based on recent CGM glucose trends, aiming for the target glucose value.	Auto correction boluses (max. every 5 min) if glucose is > 120 mg/dL. Auto corrections can be turned on or off.	3 Target options: 100, 110, 120 mg/dL User can set 1 target for 24 hr. period	User gives boluses for meals by entering total grams of carbs in the bolus menu.
t:slim X2™ & Mobi 	Adjusts the programmed basal rates every 5 minutes based on a 30 min prediction of CGM glucose, aiming for the target glucose range.	Auto correction boluses (max once/hr) if glucose is predicted to be >180 mg/dL in 30 min.	Target range: 112.5-160 mg/dL	User gives boluses for meals by entering total grams of carbs in the bolus menu. User can deliver correction boluses as needed.
Omnipod® 5 	"Adaptive Basal" calculated from total daily insulin, which is updated at each Pod change. Adaptive Basal is adjusted every 5 min based on a 60 min prediction of CGM glucose, aiming for the target glucose value.	No automated boluses. Algorithm will increase basal doses up to 400% of the adaptive basal rate to help correct hyperglycemia.	5 target options: 110, 120, 130, 140, 150 mg/dL Can set multiple target settings throughout 24 hr period	User gives boluses for meals by entering total grams of carbs in the bolus menu. User can deliver correction boluses as needed.
twiist™ 	Adjusts the programmed basal rates every 5 minutes based on a 6-hour predicted CGM glucose, aiming for the correction target (middle of correction range).	No automated boluses. Algorithm will increase basal doses up to the max basal rate programmed in the pump to help correct hyperglycemia.	Target range (called "Correction Range"), can set any range between 87-180 mg/dL. Algorithm targets middle of the range. Can set multiple ranges throughout 24 hour day.	User gives boluses for meals by entering total grams of carbs in the bolus menu. User can deliver correction boluses as needed.
iLet Bionic Pancreas 	Insulin Automation is initialized by entering user's weight. Basal insulin delivery adjusts every 5 minutes based on CGM glucose trends and adapts over time based on the iLet's analysis of the user's daily glucose patterns.	All meal bolus doses and correction bolus doses are automated. Auto correction boluses max. every 5 minutes as needed if glucose > CGM target setting.	3 target options: Usual (120 mg/dL), Lower (110 mg/dL), Higher (130 mg/dL) Can set up to 2 target settings per 24 hr period	User completes a meal "announcement" to prompt the iLet to deliver a meal bolus, which involves estimating the carbohydrate amount for each meal ("Usual for Me"/ "More" than usual /"Less" than usual).

Hypoglycemia

	Glycemic criteria/description
Level 1	Glucose <70 mg/dL (<3.9 mmol/L) and ≥54 mg/dL (≥3.0 mmol/L)
Level 2	Glucose <54 mg/dL (<3.0 mmol/L)
Level 3	A severe event characterized by altered mental and/or physical status requiring assistance for treatment of hypoglycemia, irrespective of glucose level



Rule of 15/15 if BG < 70 mg/dL

- 15 gram fast-acting carbohydrate, check BG in 15 minutes (fingerstick)
- Repeat until normal BG
- Call emergency services PRN
- Glucagon Emergency Kit if unable to swallow safely
  - Now available in nasal and autoinjector formulations
  - Patient should be counseled to educate friends, family, coworkers, classmates on use

Pipeline

retatrutide	orforglipron	efsitora	cagrilinitide

• Triple agonist, “triple G” (not “GLP-3”)
• GIP/GLP-1RA/Glucagon once weekly injection
• Phase 3 trials
• Not FDA approved yet, although available
• TRIUMPH-4 obesity or overweight + knee OA and w/o DM
• TRANSCEND-T2-1 (T2DM)
	• Oral small-molecule GLP-1RA
	• Approved last week for obesity
	• No food or water timing restrictions in clinical trials
	• ATTAIN-2 (obesity with T2DM), ATTAIN-1 (obesity)
	• ACHIEVE-1, ACHIEVE-2, ACHIEVE-3, ACHIEVE-5 (T2DM)
		• Once weekly basal insulin
		• Phase 3 trials
		  • Non-inferior to degludec or glargine
		  • QWINT 1-4
			• Long-acting amylin analogue
			• Once weekly dual agonist when combined with semaglutide
			• REDEFINE 1 and 2
			  • weight loss of up to 22.7% (obesity) and 15.7% (T2DM)
			• Submitted NDA for FDA approval Dec 2025 for obesity and overweight indication

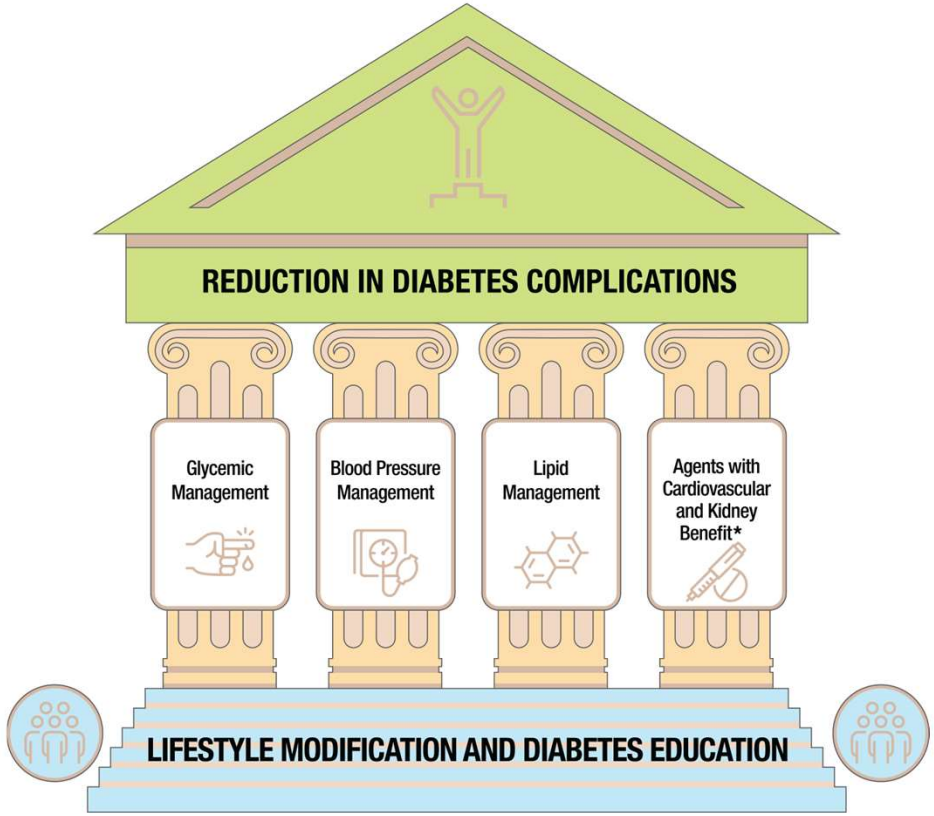
https://www.lilly.com/news/stories/what-to-know-about-retatrutide

https://diabetes.org/newsroom/press-releases/cagrisema-demonstrates-significant-weight-loss-adults-obesity#:~:text=CagriSema%20is%20a%20once%2Dweekly%20combination%20of%20two,body%20weight%20with%20CagriSema%20at%20week%2068.

Cost and Coverage Tips and Resources

- Income-based Patient Assistance Programs
  - Rxassist.org – Website to search patient assistance applications
- Findhelp.org
  - social care network that connects people seeking help with verified free or reduced cost services in their communities
- Soonercare
  - Tirzepatide for OSA + obesity
  - Semaglutide for high-risk of MACE or established CVD + obesity
- Insulin Immediate Assistance
  - www.novocare.com/diabetes/help-with-costs/help-with-insulin-costs/immediate-supply.html
  - www.lilly.com/resources/diabetes-solution-center
  - www.sanofipatientconnection.com
- Low-Cost Insulin Programs
  - Lilly Insulin Value Program – $35/month commercial or no insurance
  - Novo Nordisk $35/month for 3 vials or 2 packs of pens
  - Sanofi $35/month

Blood Pressure and Lipids Treatment Goals



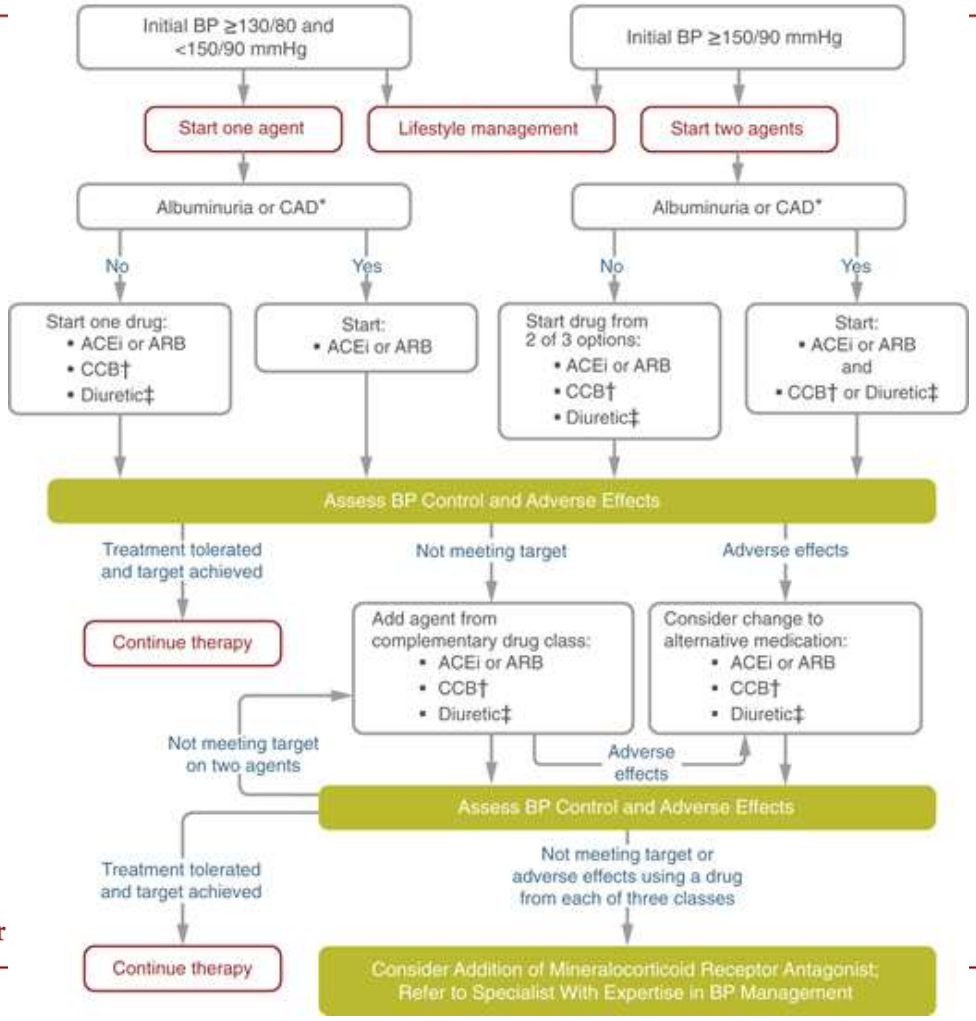
Blood Pressure Management

- <130/80 mmHg blood pressure goal, if it can be safely attained
- DASH eating pattern
- ACE or ARB first-line

Lipid Management

- Primary Prevention = moderate intensity statin and target LDL <70 mg/dL if no ASCVD aged 40-75
- Secondary Prevention = high intensity statin and target LDL goal <55 mg/dL if ASCVD for all ages

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



Screening for Asymptomatic Heart Failure in People With Diabetes

2024–2025 ADA Guideline Update:

Consider screening asymptomatic adults with type 2 diabetes by measuring natriuretic peptides to identify people at risk for heart failure development, progression of symptoms, and heart failure–related mortality.

- B-type natriuretic peptide (BNP)
- N-terminal pro-BNP (NT-proBNP)

Summary

- Early intervention to reduce risk of complications
- Correct diagnosis is key
- "Complication–centric", person–centric guided medication selection for type 2 diabetes
- Consider cost, burden, adverse effects
- Timely treatment decisions, avoid therapeutic inertia, deprescribe as needed
- Recommend diabetes education and lifestyle modification
- No blame, no shame, focus on shared goals, celebrate small wins

When to Refer to Diabetes Education

https://diabetesjournals.org/care/article/43/7/1636/35565/Diabetes-Self-management-Education-and-Support-in

Links and References

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Questions

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