



GLP-1 MEDICINES

A Complete Patient Guide

Zepbound, Wegovy, Mounjaro, Ozempic, and every GLP-1 medicine

Inside this guide

- How GLP-1 and GIP medicines work, and the full medicine landscape
- Zepbound, Mounjaro, Wegovy, Ozempic, Rybelsus, Saxenda, Victoza, Trulicity, and more
 - Dosing, injections, side effects, eating, and safety
 - Kidney, liver, dialysis, and transplant considerations
 - Cost, insurance, counterfeits, and myths versus facts
 - 14 diagrams and charts, 7 worksheets, quiz, glossary

For patients, families, students, and community members

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Welcome

Few medicines have changed the conversation about weight, diabetes, and heart, kidney, and liver health as quickly as the **GLP-1 medicines**. Names like **Zepbound, Wegovy, Mounjaro, and Ozempic** are now household words, and they sit alongside older and newer options such as Rybelsus, Trulicity, Victoza, Saxenda, and Byetta. People are asking real questions: Which one is which? What is the difference between Mounjaro and Zepbound? How do I take it? What should I expect? Is it safe for my kidneys or liver? What happens if I stop? How do I avoid fake products?

This guide from **The Liver and Kidney Hope Foundation (TLHF)** is a complete, plain-language handbook that covers **every GLP-1 medicine approved in the United States** (including tirzepatide, which also acts on the related GIP receptor), the medicines now in late-stage development, and the practical side of living with treatment: dosing, injections, side effects, eating, safety, costs, and long-term planning. Because TLHF serves people with kidney and liver conditions, two full chapters explain what is known about these medicines in **kidney disease, liver disease, dialysis, and transplant**.

How this guide is organized

Part	Chapters
Part 1: Foundations	1. What GLP-1 medicines are; 2. How they work; 3. The medicine landscape (every product)
Part 2: Medicine by Medicine	4. Tirzepatide (Zepbound, Mounjaro); 5. Semaglutide (Wegovy, Ozempic, Rybelsus); 6. Liraglutide, dulaglutide, exenatide, and others; 7. Comparing the medicines; 8. The pipeline
Part 3: Starting and Living With Treatment	9. Is a GLP-1 medicine right for me?; 10. Dosing and titration; 11. Injecting, storing, and traveling; 12. Side effects and safety; 13. Eating, drinking, and moving; 14. Results, plateaus, and stopping
Part 4: Health Conditions and Special Situations	15. Type 2 diabetes; 16. Heart and beyond; 17. Kidneys; 18. Liver; 19. Pregnancy and special populations; 20. Surgery, procedures, and drug interactions
Part 5: Access and Reality Checks	21. Cost, insurance, and avoiding counterfeits; 22. Myths and facts
Part 6: Tools	Worksheets and trackers, quiz, numbers, glossary, resources, references

How to use it

Read the boxes marked **Key point** first. Then dive into the tables. Take the worksheets in Part 6 to your appointments. The guide includes 14 original diagrams and charts, and dose, side-effect, and result tables for every medicine.

Things change quickly

Medicine labels, prices, coverage rules, and approvals change often. This guide was prepared in 2026 from public information and may not reflect the newest updates. **Always check the current prescribing information (label) and talk to your own prescriber and pharmacist.**

Medical disclaimer and about TLHF

This guide is provided for **educational purposes only**. The Liver and Kidney Hope Foundation is a Nevada 501(c)(3) nonprofit organization that provides liver and kidney health education, community support, and outreach. **TLHF is not a medical provider** and does not diagnose, treat, or prescribe. TLHF does not sell, endorse, or recommend any medicine, brand, pharmacy, or telehealth company. Nothing here replaces the advice of your doctor, pharmacist, or dietitian. Doses shown are those in standard prescribing information for adults. **Never change your dose, stop, restart, or combine medicines without your prescriber.** Diagrams and charts are simplified for teaching.

Get urgent or emergency help (call 911 in the U.S.)

- Severe, persistent belly pain (with or without vomiting), especially pain that spreads to the back
- Vomiting or diarrhea so severe you cannot keep fluids down, with very little urine, dizziness, or fainting
- Swelling of the face, lips, or throat; trouble breathing; widespread hives
- A lump or swelling in the neck, trouble swallowing, or lasting hoarseness
- Sudden loss of vision in one eye
- Thoughts of harming yourself (call or text 988 in the U.S.)

A few words used in this guide

- **GLP-1** stands for **glucagon-like peptide-1**, a natural gut hormone. **GLP-1 RA** means GLP-1 receptor agonist: a medicine that activates the same receptor.
- **GIP** is **glucose-dependent insulinotropic polypeptide**, a second gut hormone. Tirzepatide activates both receptors.
- **Titration** means gradually increasing a dose. **Maintenance dose** is the dose you stay on long term.
- **Obesity** is used here as a medical term for a chronic disease (not a judgment). **BMI** is body mass index, weight in kilograms divided by height in meters squared.
- **T2D** = type 2 diabetes; **CKD** = chronic kidney disease; **MASLD/MASH** = metabolic dysfunction-associated steatotic liver disease / steatohepatitis (previously NAFLD/NASH).

A word from TLHF

Weight, blood sugar, kidneys, and liver are deeply connected. These medicines work best as one part of a full plan: nutrition, movement, sleep, mental well-being, and regular medical care. Knowledge makes every conversation with your care team better. **Health. Awareness. Hope.**

PART 1

Foundations

CHAPTER 1

What GLP-1 Medicines Are

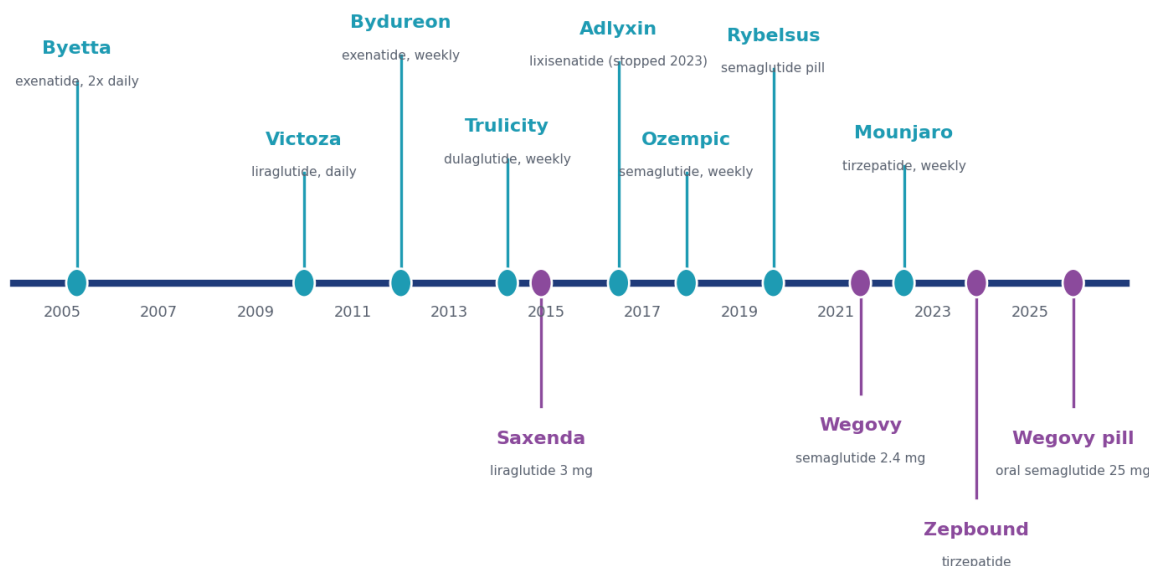
A hormone, a lizard, and a medical revolution

~40% of U.S. adults have obesity (CDC survey estimates)	~38 M Americans have diabetes (most type 2)	~30% of adults worldwide are estimated to have MASLD	#1 diabetes is the leading cause of kidney failure in the U.S.
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GLP-1 medicines are a family of drugs that copy or boost the action of **glucagon-like peptide-1**, a hormone your intestines release after you eat. The hormone tells the pancreas to release insulin when blood sugar is high, tells the brain you are full, and slows the stomach's emptying. Natural GLP-1 is destroyed in about two minutes, so the medicines are re-engineered to last hours, days, or a week.

A short history of GLP-1 medicines (U.S. approvals)

Diabetes approvals above the line; weight-management approvals below. Approval years are the first U.S. approval of each product.



Milestones

2024: Wegovy label adds heart-risk reduction; Zepbound adds obstructive sleep apnea.

2025: Ozempic adds kidney protection in type 2 diabetes with CKD; Wegovy adds MASH (fatty liver with scarring).

Late-stage research: orforglipron (pill), retatrutide, CagriSema, and others (Chapter 8).

Figure 1. Timeline of U.S. approvals for the major GLP-1 medicines. Diabetes products above the line, weight-management products below.

A brief history

Year	Event
1980s	Scientists identify GLP-1 as a product of the proglucagon gene and show it stimulates insulin release; researchers in several labs (including Habener, Mojsov, and Holst) characterize its actions
1990s	A hormone in the saliva of the Gila monster (exendin-4) is found to activate the same receptor and to resist rapid breakdown, leading to exenatide
2005	Byetta (exenatide), the first GLP-1 medicine for type 2 diabetes, is approved in the U.S.
2010 to 2017	Once-daily liraglutide (Victoza), then once-weekly options (Bydureon, Trulicity, Ozempic) improve convenience; heart-outcome trials show benefits for some
2014	Saxenda (liraglutide 3 mg) becomes the first GLP-1 medicine approved for weight management
2019	Rybelsus, the first oral GLP-1 medicine (semaglutide tablets), is approved for type 2 diabetes
2021	Wegovy (semaglutide 2.4 mg weekly) is approved for chronic weight management, with much larger average weight loss
2022 to 2023	Mounjaro and then Zepbound (tirzepatide, acting on GIP and GLP-1 receptors) are approved for type 2 diabetes and weight management
2024 to 2026	Approvals for heart-risk reduction (Wegovy), sleep apnea (Zepbound), kidney disease in type 2 diabetes (Ozempic), and MASH (Wegovy); the first weight-loss GLP-1 tablet (oral Wegovy); a wave of new products in late-stage trials

Same medicine, different names

One of the biggest sources of confusion is that a single active ingredient is sold under several brand names, often with different labels, doses, and insurance rules. The active ingredient (the **generic name**) is what matters medically.

Active ingredient (generic)	Brand names	Maker	Typical use of each brand
Tirzepatide	Mounjaro; Zepbound	Eli Lilly	Mounjaro: type 2 diabetes. Zepbound: weight management and sleep apnea with obesity
Semaglutide	Ozempic; Wegovy; Rybelsus	Novo Nordisk	Ozempic (injection): type 2 diabetes, heart and kidney protection in T2D. Wegovy: weight, heart risk, MASH. Rybelsus (tablet): type 2 diabetes
Liraglutide	Victoza; Saxenda (and generics)	Novo Nordisk	Victoza: type 2 diabetes. Saxenda: weight management
Dulaglutide	Trulicity	Eli Lilly	Type 2 diabetes; heart-risk reduction
Exenatide	Byetta; Bydureon BCise	AstraZeneca	Type 2 diabetes
Lixisenatide	Adlyxin (discontinued in the U.S.); in Soliqua	Sanofi	Type 2 diabetes
Insulin degludec + liraglutide	Xultophy	Novo Nordisk	Type 2 diabetes (fixed combination)

Key point

Mounjaro and Zepbound are the same molecule (tirzepatide). Ozempic, Wegovy, and Rybelsus are the same molecule (semaglutide). Different brands exist so each can carry its own approval and packaging. Do not take two products with the same ingredient together, and do not swap brands without your prescriber and pharmacist.

What these medicines are not

- **They are not stimulants or "diet pills"** like older appetite drugs. They work on gut-brain hormone signals.
- **They are not insulin.** Used alone they rarely cause dangerously low blood sugar because their insulin effect depends on glucose.
- **They are not a short course.** Obesity and type 2 diabetes are long-term conditions; most people need long-term treatment to keep the benefits (Chapter 14).
- **They are not a substitute for nutrition, movement, and follow-up.** Those habits protect muscle and bone, prevent nutrient gaps, and help long-term results.

CHAPTER 2

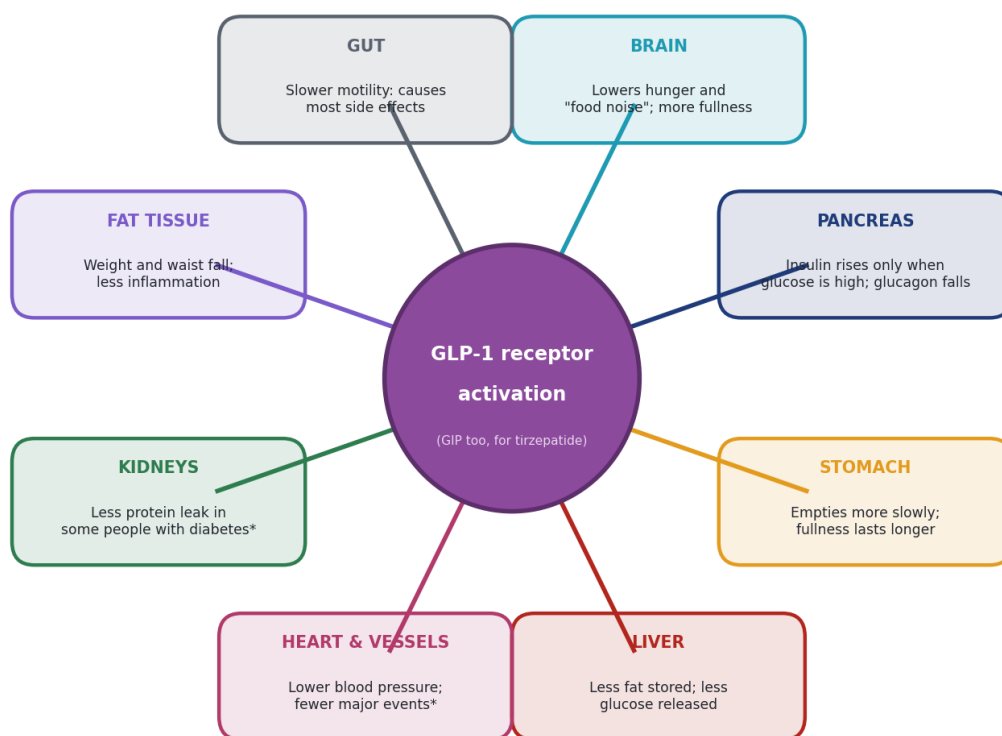
How GLP-1 Medicines Work

The gut-brain-pancreas conversation, explained

When food reaches the small intestine, special cells release GLP-1 (from L-cells in the lower small intestine and colon) and GIP (from K-cells in the upper small intestine). These **incretin hormones** account for the fact that glucose taken by mouth triggers a bigger insulin response than the same glucose given by vein. People with type 2 diabetes have a weakened incretin effect. GLP-1 medicines restore and amplify the GLP-1 part of it.

How GLP-1 medicines act across the body

One signal, several organs: the reason these medicines affect blood sugar, appetite, weight, and more



** shown in outcome trials of specific medicines and people; not every medicine or person has every benefit*

Figure 2. One receptor signal reaches many organs. Benefits marked * have been shown in outcome trials of specific medicines.

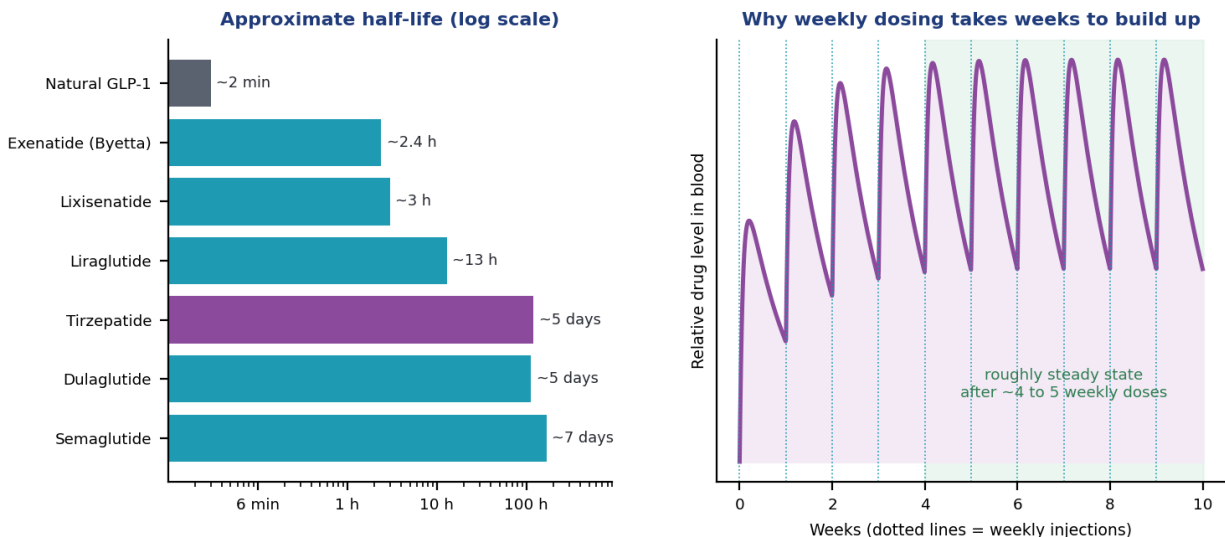
What happens in each organ

Organ	What the medicine does	What you may notice
Brain (hypothalamus, brainstem, reward areas)	Activates satiety pathways and dampens hunger and reward signals; reduces "food noise" (constant thoughts about food) for many people	Feeling full sooner; smaller portions; fewer cravings; less interest in alcohol for some
Pancreas	Raises insulin release only when glucose is elevated; lowers glucagon (the hormone that raises glucose)	Lower blood sugar and A1c; low risk of hypoglycemia on its own
Stomach and intestines	Slows gastric emptying and gut movement (the effect on emptying is strongest early and can fade with time)	Fullness after small meals; nausea, bloating, constipation or diarrhea
Liver	Less sugar release from the liver; loss of liver fat as weight falls and insulin resistance improves	Lower ALT and liver fat on tests
Heart and blood vessels	Modest drops in blood pressure; better lipids; lower inflammation; weight-independent vascular effects are studied	Lower blood pressure (a few mmHg); resting heart rate up slightly (about 2 to 4 beats per minute)
Kidneys	Improved blood sugar, blood pressure, and weight reduce strain; possible direct anti-inflammatory effects; urine protein falls	Slower decline in kidney function in trials of people with diabetes and CKD (Chapter 17)
Fat tissue and muscle	Weight loss (mostly fat, some lean tissue); improved insulin sensitivity	Smaller waist; changes in strength and body composition (Chapter 13)

Why the injections are weekly: engineering a hormone that lasts

Natural GLP-1 is cut up by an enzyme (DPP-4) within minutes. Drug designers solved this in different ways: exenatide is a DPP-4-resistant lizard-derived peptide; liraglutide and semaglutide are attached to a fatty acid that binds the blood protein albumin, protecting them and extending action; dulaglutide is fused to part of an antibody; tirzepatide carries a fatty di-acid chain and is designed to act on both GIP and GLP-1 receptors. The result is half-lives from hours to about a week.

Design of long-acting medicines: half-life and steady state (schematic)



Half-lives are approximate; the curve is an illustrative model, not patient data.

Figure 3. Left: approximate half-lives. Right: why a weekly medicine takes about 4 to 5 doses to reach steady levels (illustrative model).

Why the slow start

Because it takes several weeks for levels to build, doses are increased in steps of at least 4 weeks and the first "starter" doses are meant to help your body adapt, not to give full effect. Being patient with the schedule reduces side effects.

Why tirzepatide is different

Tirzepatide activates **GIP** receptors as well as GLP-1 receptors. GIP appears to boost insulin release, may help fat tissue handle energy, and may reduce nausea signals in the brain. In trials, tirzepatide has produced larger average weight loss than semaglutide 2.4 mg in a head-to-head study (Chapter 7). Newer medicines add a third target (glucagon) or a partner hormone (amylin), which is why you will hear about "dual" and "triple" agonists.

Effects that do not depend on weight loss

Some benefits, such as lower heart-attack and stroke risk in people with type 2 diabetes or established heart disease, appear larger than expected from weight loss alone. Researchers are studying how much comes from direct effects on blood vessels, inflammation, and the brain. This matters because it means the medicines may help even when weight loss is modest, but it also means results in one group of people do not automatically apply to everyone.

CHAPTER 3

The Medicine Landscape

Every GLP-1 product at a glance

The table below lists **every GLP-1 receptor agonist product marketed in the United States**, including those with limited availability. It shows how each is taken and what it is approved for. Approvals are for specific groups of people; using a medicine outside its label ("off-label") is legal but should be a shared decision with your prescriber.

Which receptors does each medicine target?

Filled circle = activates (agonist). Open circle with X = blocks (antagonist). Not all listed drugs are approved; see Chapters 3 to 8.

	GLP-1	GIP	Glucagon	Amylin	
Exenatide (Byetta, Bydureon)	●				approved
Liraglutide (Victoza, Saxenda)	●				approved
Dulaglutide (Trulicity)	●				approved
Semaglutide (Ozempic, Wegovy, Rybelsus)	●				approved
Tirzepatide (Mounjaro, Zepbound)	●	●			approved
Orforglipron (oral, non-peptide)	●				review*
CagriSema (semaglutide + cagrilintide)	●			●	review*
Retatrutide	●	●	●		phase 3
Survodutide, mazdutide	●		●		phase 3 / China
MariTide (maridebart cafraglutide)	●	⊗			phase 3

**Status changes quickly; some may have been approved after this guide was written. Check current FDA information.*

Figure 4. Receptors targeted by approved and investigational medicines. Investigational statuses change quickly.

Approved products (U.S.)

Brand	Generic	How taken	Approved for (adults unless noted)
Zepbound	Tirzepatide	Weekly injection (pen or vial)	Chronic weight management (obesity, or overweight with a related condition); moderate to severe obstructive sleep apnea in adults with obesity
Mounjaro	Tirzepatide	Weekly injection (pen)	Type 2 diabetes
Wegovy	Semaglutide 2.4 mg	Weekly injection (pen)	Weight management (age 12+); lowering risk of heart attack, stroke, and cardiovascular death in adults with obesity/overweight and established heart disease; MASH with moderate to advanced fibrosis (F2 to F3)
Wegovy tablets	Oral semaglutide (25 mg maintenance)	Daily tablet	Weight management in adults (approved in late 2025; check current label)
Ozempic	Semaglutide	Weekly injection (pen)	Type 2 diabetes; lowering cardiovascular risk in T2D with heart disease; lowering kidney disease progression and cardiovascular death in T2D with CKD
Rybelsus	Oral semaglutide	Daily tablet	Type 2 diabetes; cardiovascular risk reduction in T2D with heart disease (label updated in 2025)
Saxenda	Liraglutide 3 mg	Daily injection	Weight management (age 12+)
Victoza	Liraglutide	Daily injection	Type 2 diabetes (age 10+); cardiovascular risk reduction
Trulicity	Dulaglutide	Weekly injection (single-dose pen)	Type 2 diabetes (age 10+); cardiovascular risk reduction
Byetta	Exenatide	Twice-daily injection	Type 2 diabetes
Bydureon BCise	Exenatide extended-release	Weekly injection	Type 2 diabetes (availability has changed; check)
Xultophy	Insulin degludec + liraglutide	Daily injection	Type 2 diabetes
Soliqua	Insulin glargine + lixisenatide	Daily injection	Type 2 diabetes

Generics and discontinued products

Generic **liraglutide** versions of Victoza and Saxenda are now available in the U.S. Discontinued: Tanzeum (albiglutide, 2018), Adlyxin (lixisenatide alone, 2023), and the original Bydureon pen.

Related medicines that are not GLP-1 receptor agonists

Class	Examples	How it relates
DPP-4 inhibitors	Sitagliptin (Januvia), linagliptin (Tradjenta)	Pills that slow breakdown of your own GLP-1. Weaker effect, no weight loss. Usually not combined with a GLP-1 medicine
SGLT2 inhibitors	Empagliflozin (Jardiance), dapagliflozin (Farxiga)	Different mechanism (urine glucose loss). Often paired with GLP-1 medicines in diabetes, heart, and kidney disease
Amylin analog	Pramlintide (Symlin)	A different gut-pancreas hormone; injected with meals in insulin-treated diabetes
Metformin	Metformin	Common companion medicine for type 2 diabetes
Other weight medicines	Phentermine-topiramate, naltrexone-bupropion, orlistat	Older options with smaller average weight loss

Combination cautions

Do not use more than one GLP-1 receptor agonist (or tirzepatide) at once, and avoid combining a GLP-1 medicine with a DPP-4 inhibitor unless your prescriber specifically directs it. Supplements marketed as "natural GLP-1" or "nature's Ozempic" are not equivalent and are not proven to work the same way.

PART 2

Medicine by Medicine

CHAPTER 4

Tirzepatide: Zepbound and Mounjaro

The dual GIP and GLP-1 medicine

Tirzepatide is a once-weekly injection that activates both the GIP and GLP-1 receptors. It is sold as **Mounjaro** (approved May 2022 for type 2 diabetes) and **Zepbound** (approved November 2023 for chronic weight management, and December 2024 for moderate to severe obstructive sleep apnea in adults with obesity). The medicine is the same; the label, indication, and sometimes the packaging and coverage differ.

Weekly	2.5 to 15 mg	~5 days	Up to ~21%
one injection, same day each week	dose range in 2.5 mg steps	half-life	average weight loss at 72 weeks (15 mg, SURMOUNT-1)

Approvals at a glance

Product	Approved for	Notes
Zepbound	Adults with obesity (BMI 30+), or overweight (BMI 27+) with at least one weight-related condition, as an addition to reduced calories and more activity. Moderate to severe obstructive sleep apnea in adults with obesity	Single-dose pens (autoinjector) and single-dose vials sold through manufacturer programs and pharmacies; additional presentations may be introduced
Mounjaro	Adults with type 2 diabetes, with diet and exercise	Single-dose pens; not indicated for type 1 diabetes
Not yet approved (as of writing)	Children and teens (trials in adolescents under way)	Discuss any off-label use with a specialist

Dosing (standard prescribing information)

Step	Weekly dose	Duration	Notes
Start	2.5 mg	4 weeks	Starter dose to help you adapt; not expected to be the full effect
Step 2	5 mg	At least 4 weeks	Effective dose for some people; a maintenance option
Steps 3 to 6	7.5, 10, 12.5, then 15 mg	At least 4 weeks each	Increase by 2.5 mg only if needed and tolerated
Maintenance	5, 10, or 15 mg (Zepbound); up to 15 mg (Mounjaro)	Ongoing	Sleep apnea: 10 or 15 mg. Maximum 15 mg once weekly
Missed dose	Take it as soon as you remember if within 4 days (96 hours)		If more than 4 days, skip and take the next dose on the regular day
Changing the day	Allowed if the last dose was at least 3 days (72 hours) ago		Then keep the new day

Not everyone needs the top dose

Your prescriber may keep you on a lower dose, slow the steps, or pause an increase if side effects are strong. Dose "ladders" are guides, not goals. The dose that works for you with tolerable effects is the right dose.

What the trials showed

Trial	Who	Main result
SURMOUNT-1 (72 weeks)	Adults with obesity, no diabetes	Average weight loss 15.0% (5 mg), 19.5% (10 mg), 20.9% (15 mg) vs 3.1% with placebo; about 9 in 10 lost at least 5% on tirzepatide. At 3 years in people with prediabetes, far fewer developed type 2 diabetes
SURMOUNT-2	Obesity plus type 2 diabetes	About 12.8% (10 mg) and 14.7% (15 mg) weight loss vs 3.2%
SURMOUNT-3 and -4	After intensive lifestyle change; and after 36 weeks of tirzepatide	Additional weight loss with tirzepatide; stopping (switching to placebo) led to regain of about 14% (Chapter 14)
SURMOUNT-5 (head to head)	Obesity, no diabetes	Tirzepatide averaged 20.2% weight loss vs 13.7% for semaglutide 2.4 mg at 72 weeks
SURMOUNT-OSA	Obesity plus obstructive sleep apnea	Large drops in breathing pauses per hour (apnea-hypopnea index), leading to the Zepbound sleep apnea approval
SUMMIT	Obesity plus heart failure with preserved ejection fraction	Fewer worsening-heart-failure events and better symptoms in the trial
SURPASS program	Type 2 diabetes	A1c lowered by roughly 2 to 2.5 percentage points; in SURPASS-2, tirzepatide beat semaglutide 1 mg for A1c and weight
SURPASS-CVOT	T2D with heart disease	Heart-event risk was similar to or slightly lower than dulaglutide (about 8% lower; within the range of noninferiority)

Key safety points for tirzepatide

- **Boxed warning:** thyroid C-cell tumors seen in rodents. Do not use if you or a close relative have had medullary thyroid carcinoma (MTC) or have MEN 2.
- **Oral birth control:** tirzepatide can lower the absorption of oral hormonal contraceptives. Labeling advises switching to a non-oral method or adding a barrier method for 4 weeks after starting and after each dose increase.
- **Common effects:** nausea, diarrhea, vomiting, constipation, indigestion, stomach pain; usually strongest during dose increases (Chapter 12).
- **Rare but serious:** pancreatitis, gallbladder disease, kidney injury from dehydration, allergic reactions, worsening diabetic eye disease in some people with diabetes, hypoglycemia when used with insulin or sulfonylureas.
- **Pregnancy:** not recommended; stop when pregnancy is recognized and discuss planning with your prescriber (Chapter 19).
- **Kidney and liver:** no dose change is needed for kidney impairment or mild to moderate liver impairment, but monitor hydration and kidney function (Chapters 17 and 18).

Safety first

Do not use tirzepatide from unlicensed sources or "research peptide" websites. Only use products dispensed by a licensed pharmacy for the person named on the label. Vial dosing errors (mixing up mg, mL, and syringe "units") have caused overdoses. See Chapters 11 and 21.

Zepbound and Mounjaro: what really differs?

	Zepbound	Mounjaro
Active ingredient	Tirzepatide	Tirzepatide
Main approved use	Weight management; sleep apnea with obesity	Type 2 diabetes
Doses	2.5 to 15 mg	2.5 to 15 mg
Insurance	Coverage of weight-loss drugs varies widely; sleep apnea may open coverage	Usually covered for type 2 diabetes with prior authorization
Off-label	Diabetes control also occurs, since it is the same drug	Weight loss also occurs, but coverage is tied to diabetes

CHAPTER 5

Semaglutide: Wegovy, Ozempic, and Rybelsus

The most widely studied GLP-1 medicine

Semaglutide is a GLP-1 receptor agonist with a half-life of about a week, made by Novo Nordisk. It is available as weekly injections (**Ozempic** for type 2 diabetes; **Wegovy** for weight management and related conditions) and as daily tablets (**Rybelsus** for type 2 diabetes; the **Wegovy tablet** for weight management). It has the largest set of outcome trials of any GLP-1 medicine.

Ozempic, Wegovy, Rybelsus, and Wegovy tablets compared

	Ozempic	Wegovy (injection)	Rybelsus	Wegovy tablets
Form	Weekly pen	Weekly pen	Daily tablet	Daily tablet
Main use	Type 2 diabetes; heart and kidney protection in T2D	Weight; heart risk; MASH	Type 2 diabetes	Weight management
Dose steps	0.25, 0.5, 1, 2 mg	0.25, 0.5, 1, 1.7, 2.4 mg	3, 7, 14 mg (newer tablets 1.5, 4, 9 mg)	1.5, 4, 9, 25 mg (steps about monthly)
Titration	4 weeks each step	4 weeks each step	30 days each step	About 30 days each step
Missed dose	Within 5 days	If next dose is more than 2 days away	Skip and take next day	Skip and take next day

Injection schedules

Wegovy: weeks	Weekly dose	Ozempic: weeks	Weekly dose
1 to 4	0.25 mg	1 to 4	0.25 mg (starting dose, not therapeutic)
5 to 8	0.5 mg	5 to 8	0.5 mg; may increase to 1 mg after at least 4 weeks if more control needed
9 to 12	1 mg	Then	2 mg may be used after at least 4 weeks on 1 mg
13 to 16	1.7 mg		
17 onward	2.4 mg maintenance (1.7 mg is an acceptable maintenance if 2.4 mg not tolerated)		

Missed doses: for Ozempic take the missed dose within 5 days; if more than 5 days have passed skip it. For Wegovy take the missed dose as soon as possible if your next scheduled dose is more than 2 days (48 hours) away; otherwise skip it. If you miss **more than about two consecutive weekly**

doses of Wegovy, ask your prescriber whether to restart from a lower dose. **Changing your injection day** is allowed if the last dose was at least 2 days (48 hours) earlier.

The pill: how to take oral semaglutide

Oral semaglutide is absorbed through the stomach lining and needs a special routine. Follow the current label for your product. The typical instructions are:

- 1** Take it **first thing in the morning on an empty stomach**.
- 2** Swallow the tablet **whole** with no more than about **4 ounces (120 mL) of plain water**. Do not split, crush, or chew.
- 3** Wait at least **30 minutes** before eating, drinking anything else, or taking other oral medicines.
- 4** Take it every day at the same time; do not take extra if a dose is missed.
- 5** Tablet strengths are not interchangeable in every case (different formulations exist). Follow the strength written on your prescription and ask your pharmacist if unsure.

What the trials showed

Trial	Who	Main result
STEP 1 (68 weeks)	Obesity, no diabetes	14.9% average weight loss with semaglutide 2.4 mg vs 2.4% with placebo
STEP 2	Obesity plus type 2 diabetes	About 9.6% vs 3.4% with placebo
STEP 3 and 5	With intensive lifestyle counseling; two-year study	About 16% loss with counseling; weight loss largely kept at 2 years while on medicine
STEP 4	People who stopped after 20 weeks	Those switched to placebo regained much of the lost weight; those continuing lost more
STEP 8 (head to head)	Obesity vs liraglutide 3 mg	About 15.8% vs 6.4% at 68 weeks
SELECT (about 3.3 years)	Adults with obesity/overweight and heart disease, no diabetes	20% lower risk of heart attack, stroke, or cardiovascular death (hazard ratio about 0.80)
STEP-HFpEF; STEP 9	Heart failure with preserved EF plus obesity; knee osteoarthritis plus obesity	Better symptoms and function; less knee pain
ESSENCE (MASH)	Adults with MASH and fibrosis F2 to F3	MASH resolved without worse scarring in about 63% vs 34% with placebo (year-72 interim); scarring improved in about 37% vs 22%
FLOW	Type 2 diabetes plus CKD	About 24% lower risk of kidney failure, big eGFR drop, or kidney or cardiovascular death (Chapter 17)
SUSTAIN and PIONEER programs	Type 2 diabetes (injection and tablet)	A1c falls by roughly 1 to 2 points; SUSTAIN-6 showed a lower risk of heart events
STEP UP; OASIS 4	Higher-dose 7.2 mg injection; oral 25 mg tablet	About 18.7% (7.2 mg, all randomized) vs 15.6% for 2.4 mg at 72 weeks; about 13.6% vs 2.2% for the oral 25 mg at 64 weeks

Higher dose Wegovy

A higher Wegovy dose (7.2 mg weekly) has been approved in some regions and studied in the U.S.; check whether it is approved and available where you live. Higher doses generally bring more GI side effects.

Semaglutide safety highlights

- **Boxed warning** about thyroid C-cell tumors (rodent data). Do not use with a personal or family history of MTC or MEN 2.
- **Pancreatitis, gallbladder disease, dehydration with kidney injury** and worsening diabetic retinopathy (especially with fast blood sugar improvement) are label warnings.
- **Rare optic nerve problem (NAION):** regulators have reviewed reports of sudden vision loss with semaglutide and consider it a rare or very rare effect. Seek urgent eye care for sudden vision changes.
- **Hypoglycemia** risk rises when combined with insulin or sulfonylureas; doses of those may need to come down.
- **Anesthesia:** delayed stomach emptying can leave food in the stomach even after fasting. Tell your surgical team you use it (Chapter 20).
- **Mood:** the labels for weight-management versions advise monitoring for depression or suicidal thoughts. Regulatory reviews of large data sets have not established a causal link, but report any mood change to your clinician.

CHAPTER 6

Liraglutide, Dulaglutide, Exenatide, and Others

The other approved GLP-1 medicines

Before tirzepatide and semaglutide became famous, several other GLP-1 medicines paved the way. Many remain useful, especially where cost, coverage, or specific evidence points to them.

Liraglutide: Victoza and Saxenda

	Victoza	Saxenda
Use	Type 2 diabetes (age 10+); lowers heart-event risk in T2D with heart disease	Weight management (age 12+, weight above 60 kg)
Frequency	Once daily injection (any time of day)	Once daily injection
Dosing	0.6 mg for a week, then 1.2 mg; may increase to 1.8 mg	0.6 mg, then increase by 0.6 mg weekly to 3.0 mg (weeks 1 to 5)
Key trials	LEADER: 13% lower risk of major heart events	SCALE: about 8.0% vs 2.6% weight loss at 56 weeks
Notes	Generics available	Generics available; stop if less than about 4% weight loss after 16 weeks on 3 mg
Not with	Do not combine with Saxenda (same ingredient)	Do not combine with Victoza

Dulaglutide: Trulicity

Feature	Details
Use	Type 2 diabetes (age 10+); reduces major heart events (REWIND: about 12% lower risk)
Frequency and device	Once weekly; ready-to-use single-dose pen with a hidden needle; no mixing
Doses	0.75 mg; then 1.5 mg after at least 4 weeks; then 3 mg, then 4.5 mg at 4-week steps if needed
Missed dose	Take within 3 days (72 hours); otherwise skip
Weight effect	Modest (about 1 to 3 kg on average in diabetes trials)
Notes	Not approved for weight management; no dose change for kidney impairment; same boxed thyroid warning

Exenatide: Byetta and Bydureon BCise

Feature	Details
Origin	Based on exendin-4 from Gila monster saliva; the first GLP-1 medicine
Byetta	5 mcg twice daily within 60 minutes before meals, then 10 mcg twice daily after a month; short acting
Bydureon BCise	2 mg once weekly (extended release in microspheres); small lumps at the injection site are common; availability has changed
Kidney	Not recommended in severe kidney impairment or end-stage kidney disease; use caution in moderate impairment
Notes	Smaller weight effect than newer medicines; boxed thyroid warning applies to the extended-release version

Lixisenatide, albiglutide, and combination products

- **Lixisenatide (Adlyxin)** is a short-acting daily GLP-1 medicine, discontinued as a single product in the U.S. in 2023. It remains in **Soliqua** (insulin glargine plus lixisenatide).
- **Albiglutide (Tanzeum)** was a weekly medicine withdrawn in 2018 for commercial reasons.
- **Xultophy** (insulin degludec plus liraglutide) and **Soliqua** combine basal insulin with a GLP-1 medicine in one daily pen; they are used when a person needs both.
- **Other countries:** additional GLP-1 or related products are approved outside the U.S., including mazdutide and several long-acting agents in China; availability differs by country.

Older does not mean worse for everyone

GLP-1 medicines are not all interchangeable. Older, shorter-acting medicines tend to lower blood sugar less and cause less weight loss than semaglutide or tirzepatide, but they can still be the right choice depending on evidence, tolerance, price, and coverage.

CHAPTER 7

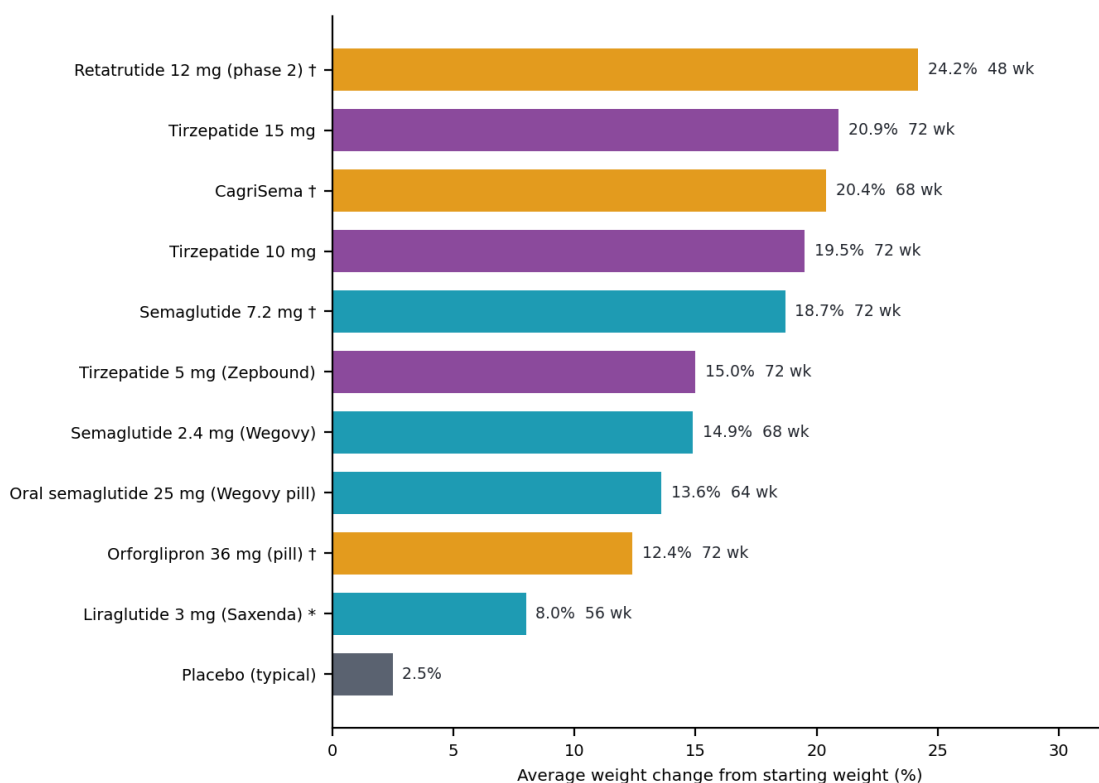
Comparing the Medicines

Weight, blood sugar, heart, kidney, and liver evidence side by side

People often ask "Which is best?" There is no single answer. The best medicine is the one that fits your health conditions, goals, tolerance, coverage, and lifestyle. This chapter puts the evidence in one place.

Average weight loss in major trials (adults with obesity, no diabetes)

Different trials, different lengths and designs: these are not head-to-head comparisons. Individual results vary widely.



* Saxenda trial in adults with obesity; † investigational or newer approval; values are rounded published averages. Placebo groups typically lost about 2 to 3%. In a direct head-to-head trial (SURMOUNT-5), tirzepatide averaged 20.2% vs semaglutide 2.4 mg 13.7% at 72 weeks.

Figure 5. Average weight loss in major trials in adults with obesity without diabetes. These are not head-to-head comparisons except SURMOUNT-5.

Side-by-side summary

Medicine	Weight loss in trials (approx.)	A1c fall in T2D (approx.)	Heart outcome evidence	Kidney / liver evidence
Tirzepatide	15 to 21% (no diabetes); 13 to 15% (T2D)	2.0 to 2.5 points	SURPASS-CVOT vs dulaglutide (noninferior); SURMOUNT-MMO ongoing	MASH phase 2 (SYNERGY-NASH); kidney trials under way
Semaglutide 2.4 mg (Wegovy)	About 15% (no diabetes)	n/a as Wegovy	SELECT: 20% fewer events	ESSENCE (MASH); kidney data from FLOW
Semaglutide (Ozempic)	About 6 to 10% in T2D	1.5 to 1.8 points	SUSTAIN-6: fewer events	FLOW: fewer kidney events in T2D + CKD
Oral semaglutide	13.6% (25 mg, OASIS 4); less at lower doses	1 to 1.4 points (Rybelsus)	SOUL: fewer heart events in T2D (label updated)	Less data
Liraglutide	8% (3 mg)	1 to 1.5 points	LEADER: 13% fewer events	LEADER: slower kidney disease progression signals
Dulaglutide	About 1 to 3 kg in T2D	1 to 1.5 points	REWIND: 12% fewer events	Kidney outcomes secondary
Exenatide	About 2 to 4 kg in T2D	0.8 to 1.5 points	EXSCEL: neutral	Limited

Reading the numbers

Results depend on the population studied, the trial length, and whether analysis counts people who stopped the drug. "Treatment-regimen" (all randomized) results are more conservative than "efficacy estimand" (adherent) results. Real-world weight loss is often smaller than in trials because of dose limits, side effects, and stopping early.

Head-to-head trials

Trial	Comparison	Result
SURMOUNT-5	Tirzepatide vs semaglutide 2.4 mg (obesity)	Weight loss 20.2% vs 13.7% at 72 weeks
SURPASS-2	Tirzepatide vs semaglutide 1 mg (T2D)	A1c and weight fell more with tirzepatide
SURPASS-CVOT	Tirzepatide vs dulaglutide (T2D + heart disease)	Similar or slightly fewer heart events with tirzepatide
STEP 8	Semaglutide 2.4 mg vs liraglutide 3 mg	Weight loss 15.8% vs 6.4%
SUSTAIN-7	Semaglutide 1 mg vs dulaglutide 1.5 mg (T2D)	A1c and weight fell more with semaglutide

How to choose: questions that matter

Question	Why it matters
What is the main goal: weight, blood sugar, heart, kidney, liver, sleep apnea?	Approved indications and evidence differ by medicine
Type 2 diabetes, kidney disease, or MASH?	Ozempic (kidney, heart), Wegovy (MASH, heart), and tirzepatide (large glucose and weight effects) each have distinct evidence
Do I prefer a weekly pen, daily pill, or vial?	Adherence is better when the routine fits your life; pills have strict fasting rules
What does my plan cover?	Coverage often decides which product is practical; a formulary may prefer one brand
How sensitive is my stomach?	Higher doses and some products have more GI effects; slower titration helps
Am I pregnant, planning pregnancy, or breastfeeding?	These medicines are generally avoided
Do I take other medicines (insulin, transplant drugs)?	Dose and monitoring changes may be needed

CHAPTER 8

The Pipeline: What Is Coming Next

Pills, monthly shots, and triple agonists

Research is moving quickly. New medicines aim for more weight loss, easier dosing (pills and monthly injections), fewer side effects, and better preservation of muscle. The information below reflects early to mid-2026 knowledge; some of these products may already be approved, delayed, or changed when you read this.

Investigational and recently approved products

Medicine	Type	Stage and results (approx.)	Notes
Orforglipron (Lilly)	Daily oral small-molecule GLP-1 agonist; no fasting rules in trials	ATTAIN-1: about 12.4% weight loss at 72 weeks (36 mg); type 2 diabetes trials positive; regulatory review was under way (check current status)	Non-peptide; can be manufactured at scale; GI side effects similar to injectables
Retatrutide (Lilly)	Weekly triple agonist (GIP, GLP-1, glucagon)	Phase 2: about 24% at 48 weeks (12 mg). Phase 3 TRIUMPH program reporting; knee osteoarthritis trial showed very large loss	Also affects liver fat strongly; long-term safety still being studied
CagriSema (Novo)	Weekly semaglutide plus cagrilintide (amylin analog)	REDEFINE 1: about 20.4% (all randomized) to 22.7% (adherent) at 68 weeks; submitted for approval	Amylin adds satiety; GI effects common
Semaglutide 7.2 mg (Novo)	Higher-dose weekly injection	About 18.7% at 72 weeks (STEP UP)	Approved in some regions
Survodutide (Boehringer)	Weekly GLP-1 plus glucagon agonist	Phase 3 in obesity and MASH	Liver focus
Mazdutide	Weekly GLP-1 plus glucagon agonist	Approved in China (2025); trials elsewhere	Dual agonist
Maridebart cafraglutide (MariTide) (Amgen)	Monthly or less frequent antibody-peptide: GLP-1 agonist and GIP receptor blocker	Phase 2: roughly 17 to 20% at 52 weeks; phase 3 started	Monthly dosing; nausea with early doses
Eloralintide, amycretin	Amylin-based agents (Lilly; Novo)	Early trials show large loss; amycretin exists as injection and oral	Amylin pathway
Pemvidutide, efinopegdutide	GLP-1 plus glucagon for liver disease	Phase 2 and 3 in MASH	Liver focus
Danuglipron (Pfizer)	Oral small molecule	Development stopped in 2025 after a case of drug-induced liver injury	A reminder that every new drug needs long safety monitoring

Themes to watch

- **Pills:** oral semaglutide is already available; orforglipron and other small molecules may broaden access and lower cost.
- **Fewer injections:** monthly options such as MariTide.
- **More weight loss:** triple agonists and amylin combinations are approaching 20 to 25% average loss in trials, closer to bariatric surgery.
- **Protecting muscle:** add-on drugs (for example bimagrumab, which blocks activin receptors) are being tested to preserve lean mass while losing fat.
- **Organ-specific benefits:** dedicated studies in MASH, chronic kidney disease, heart failure, and osteoarthritis.
- **Lower prices and generics:** generic liraglutide is here; semaglutide patents expire in several countries in the coming years, which may change prices.

Do not buy unapproved products

Investigational drugs are not approved and are not safe to obtain online. Some "research peptide" products sold online carry names such as retatrutide or "GLP-3." These are unapproved, unregulated, and may be contaminated, mislabeled, or wrongly dosed. If you are interested in a new medicine, ask your doctor about **legitimate clinical trials** (clinicaltrials.gov).

Key point

It is reasonable to be excited about the future, but not to postpone care. Approved medicines today are effective, and your best step is a plan you can follow now, with a team that can adjust it as new options arrive.

PART 3

Starting and Living With Treatment

CHAPTER 9

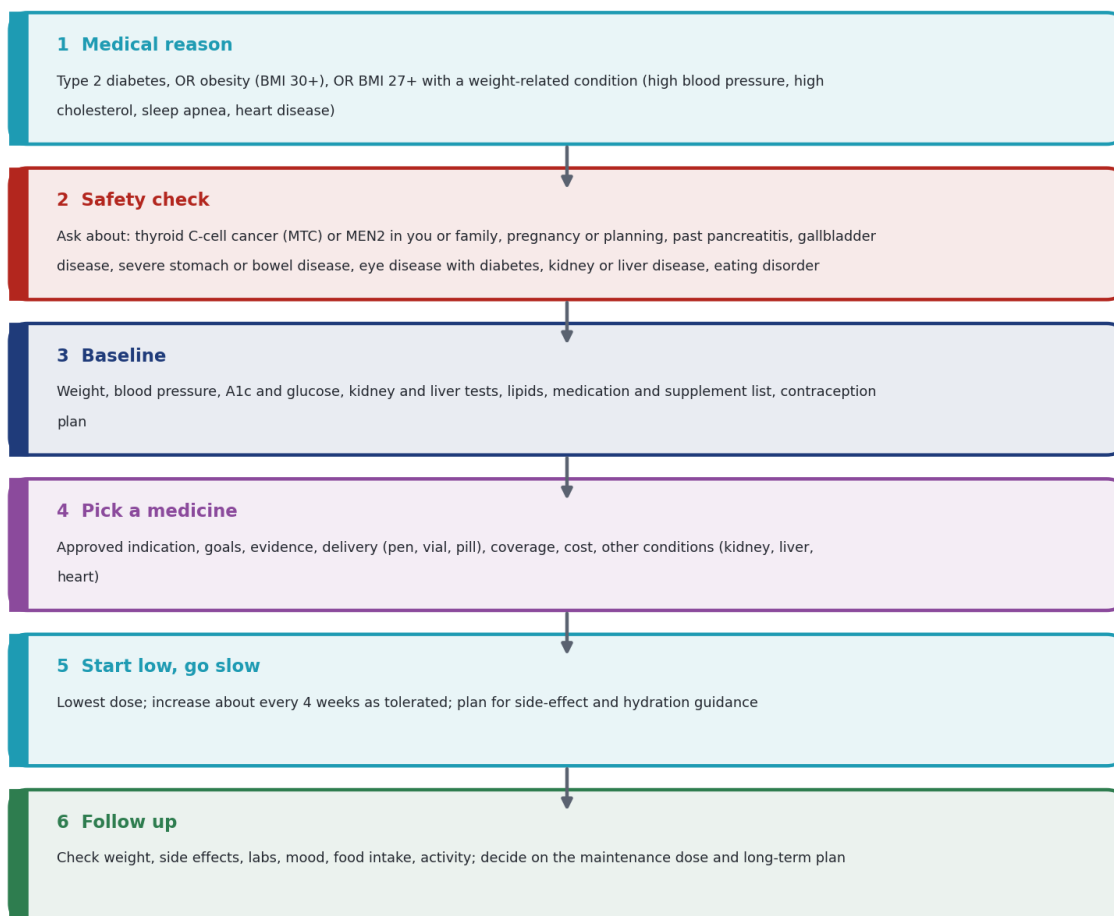
Is a GLP-1 Medicine Right for Me?

Eligibility, cautions, and the conversation to have

These medicines are prescription drugs with real benefits and real risks. Whether one is appropriate depends on your diagnosis, health history, other medicines, and goals. Use this chapter to prepare for a visit with your prescriber, not to decide alone.

Is a GLP-1 medicine worth discussing? A conversation map

Not a diagnosis. Your prescriber makes these decisions with you, using your history, tests, and goals.



If a red-flag condition is present (for example MTC or MEN2, pregnancy), these medicines are generally not used. Other cases need an individual risk-benefit discussion.

Figure 6. A conversation map for discussing GLP-1 medicines with a prescriber.

Who is the medicine approved for?

Group	Typical approved criteria
Weight management (Zepbound, Wegovy, Saxenda, Wegovy tablets)	Adults with BMI 30 or higher, or BMI 27 or higher with at least one weight-related condition (high blood pressure, high cholesterol, type 2 diabetes, sleep apnea, cardiovascular disease), together with reduced calories and more physical activity. Wegovy and Saxenda also for ages 12 and up with obesity
Type 2 diabetes (Mounjaro, Ozempic, Rybelsus, Trulicity, Victoza, Byetta, Bydureon)	Adults (and some ages 10+) with type 2 diabetes. Not for type 1 diabetes
Heart-risk reduction	Wegovy: adults with obesity/overweight and established heart disease. Ozempic, Rybelsus, Victoza, Trulicity: adults with T2D and heart disease
Kidney protection	Ozempic: adults with T2D and CKD
MASH	Wegovy: adults with MASH and moderate to advanced fibrosis (F2 to F3)
Sleep apnea	Zepbound: adults with obesity and moderate to severe obstructive sleep apnea

Some clinical guidelines use lower BMI thresholds for people of Asian ancestry (for example BMI 27 or 27.5 for obesity) because health risks appear at lower BMI. Waist size, body-fat distribution, and conditions matter as much as BMI. Ask your clinician how they define risk for you.

Who should not use these medicines?

Situation	Guidance
Personal or family history of medullary thyroid carcinoma (MTC), or MEN 2	Contraindicated (boxed warning)
Serious allergy to the medicine or its ingredients	Contraindicated
Pregnancy (weight-loss versions)	Contraindicated or not recommended; stop when pregnancy is found; plan ahead (Chapter 19)
Currently taking another GLP-1 or tirzepatide product	Do not double up

Situations that call for extra caution and individual decisions

Condition	Why caution	What to ask
History of pancreatitis	Pancreatitis has been reported; these medicines have not been studied in people with a history	Is the risk worth it for me? Are there alternatives?
Gallstones or gallbladder disease	Rapid weight loss and GLP-1 medicines raise gallstone risk	Should I have an ultrasound? What symptoms should I report?
Severe stomach or bowel disease, gastroparesis	Delayed emptying may worsen symptoms	Is this suitable, and at what pace?
Diabetic retinopathy	Rapid glucose improvement may worsen retinopathy in some people	When is my next dilated eye exam?
Kidney disease	Dehydration from vomiting or diarrhea can injure kidneys; protein and malnutrition concerns in advanced disease	How do I protect my kidneys? See Chapter 17
Liver disease, cirrhosis	Benefits in MASH; limited data in advanced cirrhosis; malnutrition risk	Is my liver disease stage suitable? See Chapter 18
Current or past eating disorder	Appetite suppression can worsen restriction or trigger relapse	Should an eating-disorder specialist be involved?
Depression, anxiety, or suicidal thoughts	Monitoring is advised; weight and mood are linked	Who will monitor my mood?
Insulin or sulfonylurea use	Risk of low blood sugar	Do my diabetes medicines need dose changes?
Older age or frailty	Risk of muscle and bone loss, poor intake	Is my protein intake and strength plan adequate?
Planned surgery or procedures	Aspiration risk under anesthesia	Tell the anesthesia team (Chapter 20)

Before you start: helpful checks

Check	Purpose
Weight, height, BMI, waist, blood pressure, resting heart rate	Baseline to measure progress and safety
A1c and fasting glucose	Diabetes or prediabetes status; plan for diabetes medicine adjustments
Kidney function: creatinine, eGFR, and urine albumin-to-creatinine ratio (UACR)	Baseline kidney health; monitor hydration effects
Liver tests (ALT, AST, ALP, bilirubin), sometimes FIB-4 or elastography	Baseline liver health and fibrosis risk
Lipid panel	Track cardiovascular risk
Complete medication and supplement list, allergies, family thyroid history	Avoid interactions and contraindications
Pregnancy plans and contraception	Avoid unplanned pregnancy on treatment
Dilated eye exam (if diabetes)	Baseline retinopathy check

Make the visit count

Bring your worksheets (Part 6): your medication passport, your questions, and any past lab results. Ask what results the prescriber wants to see at 4, 12, and 24 weeks, and what should prompt a phone call.

Key point

Starting a GLP-1 medicine is a medical decision, not a cosmetic one. It works best when your care team knows your kidneys, liver, heart, and mental health, and when you have a plan for food, activity, and follow-up.

CHAPTER 10

Dosing and Titration

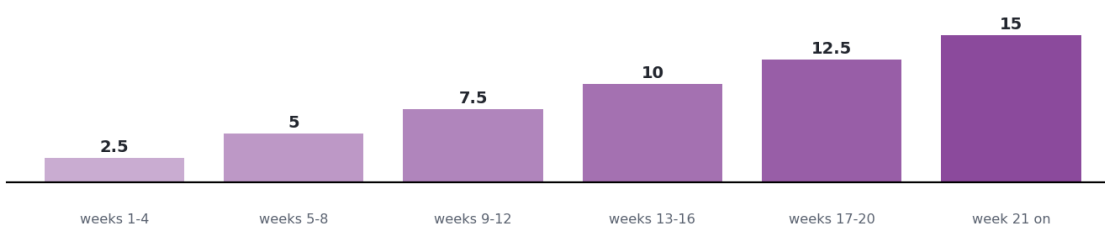
Start low, go slow, and know your schedule

Every GLP-1 medicine is started at a low dose and raised gradually to limit side effects. The schedules below come from standard prescribing information for adults. Your prescriber may change them.

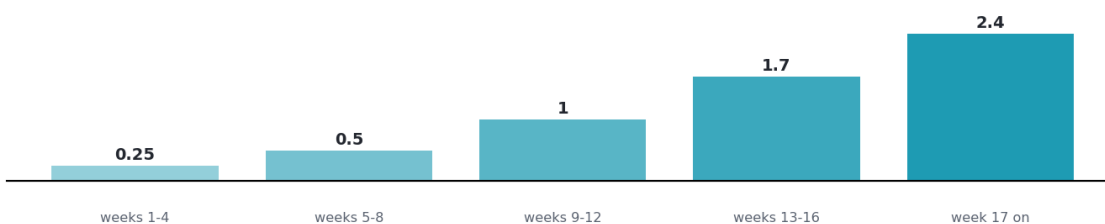
Typical starting schedules: "start low, go slow" (minimum 4 weeks per step)

Prescribers may move more slowly or stay at a lower dose. Not every person needs the top dose. Ozempic steps up only if needed.

Tirzepatide (Zepbound and Mounjaro): weekly, mg



Semaglutide 2.4 mg (Wegovy): weekly, mg



Semaglutide (Ozempic): weekly, mg

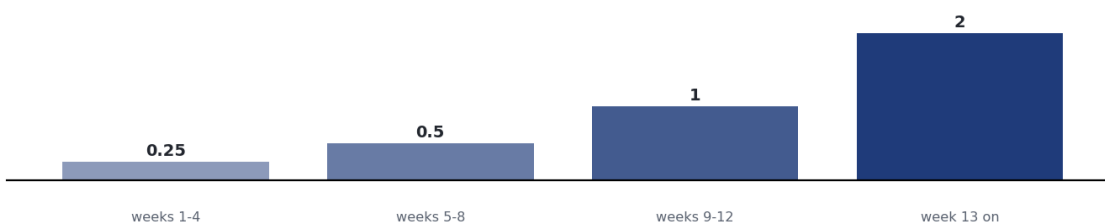


Figure 7. Typical dose ladders for weekly injections. Each step lasts at least 4 weeks; not everyone needs the highest dose.

Schedules for every product

Medicine	Start	Increase	Usual maintenance	Maximum
Zepbound / Mounjaro	2.5 mg weekly x 4 weeks	+2.5 mg every 4+ weeks	5 to 15 mg	15 mg
Wegovy injection	0.25 mg weekly x 4 weeks	0.5, 1, 1.7 mg at 4-week steps	2.4 mg (1.7 mg if needed)	2.4 mg (7.2 mg in some regions)
Wegovy tablets	1.5 mg daily x 30 days	4 mg, 9 mg, then 25 mg (about monthly)	25 mg daily	25 mg
Ozempic	0.25 mg weekly x 4 weeks	0.5 mg; then 1 mg or 2 mg if more control needed	0.5 to 2 mg	2 mg
Rybelsus	3 mg daily x 30 days	7 mg, then 14 mg after 30 days if needed	7 or 14 mg	14 mg (newer formulation strengths differ)
Saxenda	0.6 mg daily x 1 week	+0.6 mg weekly	3.0 mg	3.0 mg
Victoza	0.6 mg daily x 1 week	1.2 mg; then 1.8 mg	1.2 to 1.8 mg	1.8 mg
Trulicity	0.75 mg weekly	1.5, 3, 4.5 mg at 4-week steps	0.75 to 4.5 mg	4.5 mg
Byetta	5 mcg twice daily before meals	10 mcg twice daily after 1 month	10 mcg twice daily	10 mcg twice daily
Bydureon BCise	2 mg weekly	None	2 mg	2 mg

Missed doses and changing the day

Medicine	If you miss a dose	Can you change the day?
Tirzepatide (Zepbound, Mounjaro)	Take within 4 days (96 hours); otherwise skip	Yes, if 3+ days since last dose
Semaglutide weekly (Ozempic; Wegovy)	Ozempic: within 5 days, otherwise skip. Wegovy: take if the next dose is more than 2 days away, otherwise skip. Missing 2+ weeks: ask about restarting lower	Yes, if 2+ days since last dose
Dulaglutide (Trulicity)	Take within 3 days (72 hours); otherwise skip	Yes, if 3+ days since last dose
Oral semaglutide (Rybelsus, Wegovy tablets)	Skip; take the next dose the next morning	Not applicable
Daily liraglutide	Take at the next dose time; do not double; if 3+ days missed, ask about restarting	Any time of day, but be consistent

When in doubt, ask

Rules for missed doses come from the labels and may be updated. If several doses were missed or you are unsure, call your pharmacist or prescriber before you inject. Restarting at a high dose after a long gap can cause severe nausea and vomiting.

Principles for safe titration

- **Do not rush.** Increase only when the previous dose is well tolerated; it is fine to stay at a dose longer than 4 weeks.
- **Do not skip steps or double up** to catch up.
- **Take the dose on a day when you can rest** if you have strong side effects after injections.
- **If vomiting or severe symptoms occur**, call before the next dose. You may need to drop back a step.
- **Do not switch products** (for example Ozempic to Wegovy, or semaglutide to tirzepatide) without instructions on where to restart. Equivalent doses do not exist across drugs.
- **Keep the same day each week** and set a reminder or use the tracker in Part 6.

Vials, pens, and dose confusion

Pens are labeled in milligrams (mg) and dial the dose for you. Some products, such as Zepbound vials, are drawn up with a syringe, which introduces more room for error. Many overdoses reported with compounded or vial products involved confusion between **mg, mL, and syringe "units."**

- Use only the syringes and instructions supplied with your prescription; ask the pharmacist to write the exact volume to draw.
- Never rely on unit conversions from social media or forums.
- If you ever inject more than prescribed, call Poison Control (1-800-222-1222 in the U.S.) or your doctor right away and drink fluids; severe vomiting can follow.

How long until it works?

When	What to expect
Weeks 1 to 4 (starter dose)	Appetite may already ease; blood sugar may begin to fall; side effects most likely; weight change small
Weeks 4 to 16 (escalation)	Steady weight loss for many; side effects flare after each step; adjust food choices
3 to 6 months	Most of the early loss; A1c improving; many at or near maintenance dose
12 to 18 months	Weight usually plateaus at a new level; long-term routine matters

CHAPTER 11

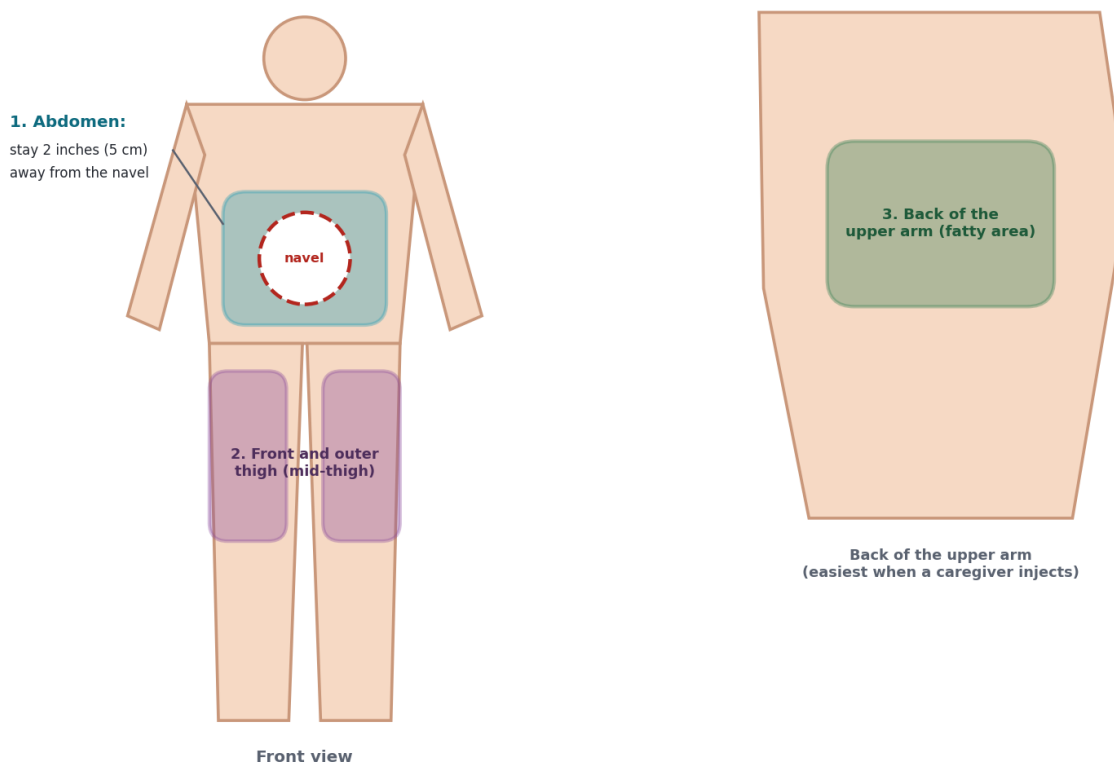
Injecting, Storing, and Traveling

Practical skills for pens, vials, and pills

Most people learn injections in a single visit. This chapter gives general steps so you know what to expect. **Always follow the "Instructions for Use" for your exact device;** steps differ between pens.

Where to inject (weekly and daily pens or vials)

Rotate within a region each week. Use clean, intact skin. Follow the Instructions for Use for your specific device.



- Rotate sites each week; keep a log (see the worksheets).
- Avoid bruised, scarred, tender, red, or hardened skin.
- Do not inject into muscle or a vein; do not rub hard afterward.
- New pen or needle each time; never share pens or needles.

Figure 8. Recommended injection areas for subcutaneous (under the skin) pens and syringes.

Device types

Device	Examples	How it works
Single-dose autoinjector pen	Zepbound, Mounjaro, Wegovy, Trulicity, Bydureon BCise	Each pen holds one dose with the needle hidden; you remove the cap, press against skin, press the button, and hold until the pen finishes
Multi-dose pen with a dial	Ozempic, Victoza, Saxenda, Byetta, Xultophy, Soliqua	You attach a new needle for each injection, dial the dose, and inject; some pens require a first-use flow check
Vial and syringe	Zepbound vials	A pharmacist-prescribed syringe draws up a set volume; requires careful measuring
Tablets	Rybelsus, Wegovy tablets	Fasting routine (see Chapter 5)

General steps for a pen injection

- 1 Wash your hands.** Take the pen out of the refrigerator; some labels allow injecting cold, others recommend standing time. Check the label, name, dose, and expiration date.
- 2 Look at the medicine** (if visible). It should be clear and colorless to slightly yellow; do not use if cloudy, discolored, or containing particles, or if the pen was frozen or dropped.
- 3 Choose a site** (Figure 8), at least 2 inches from the navel, and wipe with an alcohol swab; let it dry.
- 4 Prepare the pen** per instructions (attach a new needle, remove caps, or unlock the pen).
- 5 Inject** at the angle in your instructions (usually straight in), press the button, and **hold for the full time** (often 5 to 10 seconds, or until a counter or plunger shows completion).
- 6 Remove the pen** without rubbing; mild bleeding is fine; press gently with gauze if needed.
- 7 Dispose of the pen or needle** in an FDA-cleared sharps container immediately. Never recap needles or share pens, even with a needle change.
- 8 Log** the date, dose, and site in your tracker.

Storage

Product	Before first use	After first use or out of fridge
Zepbound, Mounjaro	Refrigerate 36 to 46 F (2 to 8 C); do not freeze	Up to 86 F (30 C) for up to 21 days total
Wegovy pen	Refrigerate; do not freeze	Up to 86 F (30 C) for up to 28 days
Ozempic pen	Refrigerate	After first use: refrigerate or room temperature up to 56 days
Trulicity	Refrigerate	Up to 14 days at room temperature
Victoza, Saxenda	Refrigerate before first use	After first use: room temperature or fridge for 30 days
Tablets	Room temperature in original packaging (keep dry)	Do not repackage

Storage windows are from labels and may change. Keep pens out of direct light and heat; never leave them in a hot car. Do not use a pen that has frozen.

Travel

- **Carry medicine in your carry-on** in the original packaging with the pharmacy label. Airport security allows injectable medicines and supplies; tell the officer.
- **Keep cool** with an insulated pouch and a cold pack (not touching the pen). Hotel refrigerators work; do not place next to a freezer compartment.
- **Plan for time zones:** if your day changes, keep at least the minimum interval between doses (Chapter 10).
- **Pack extras** and a small sick-day kit: oral rehydration packets, anti-nausea approach recommended by your clinician, and a list of your medicines.

Authenticity and safety checks

- ☐ The medicine was prescribed to me and dispensed by a licensed U.S. pharmacy (or a pharmacy recommended by my insurer or manufacturer program).
- ☐ The label has my name, the drug name, strength, and directions; the box and pen look like the images on the manufacturer's website.
- ☐ The pen or vial is sealed and undamaged; the lot number and expiration date match the box.
- ☐ I have never bought "research use only" peptides or products that promise no prescription.
- ☐ I know how to reach the pharmacy and my prescriber about a problem.

Counterfeits are real

Counterfeit and tampered GLP-1 pens have been found in the supply chain. Buy only from licensed pharmacies. Report suspected counterfeit products to the FDA (MedWatch) and to your pharmacist.

CHAPTER 12

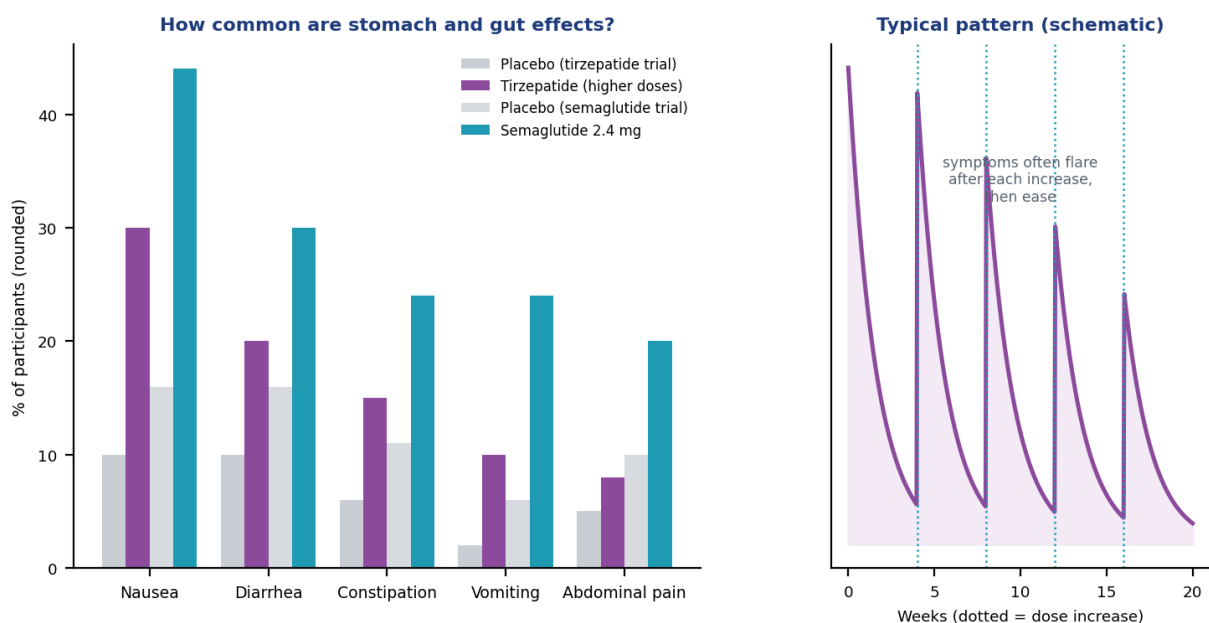
Side Effects and Safety

What is common, what helps, and what needs a call

Most side effects of GLP-1 medicines involve the digestive system and are mild to moderate. They are most likely when you start and after each dose increase, and they tend to lessen over weeks. A small number of people have serious problems, so it is important to know both lists.

Gastrointestinal side effects: frequency and timing

Rounded values from weight-management trials; different trials, so do not compare drugs directly. Most effects are mild to moderate.



Schematic curve on the right is illustrative only. Severe or persistent symptoms need medical advice (Chapter 12).

Figure 9. Frequency of common gastrointestinal effects in weight-management trials, and the typical pattern over dose increases.

Common effects and self-care

Effect	Typical pattern	What often helps	Call your clinician if
Nausea	Most common; peaks days after injection or dose increase	Smaller, slower meals; stop at fullness; avoid greasy, fried, spicy, or very sweet foods; cold or bland foods; sip fluids; ginger or peppermint tea; do not lie down right after eating	You cannot keep fluids down; nausea lasts more than a few days
Vomiting	Less common; often from eating too fast or too much	Same as above; wait until settled before the next meal; small sips of fluids	Repeated vomiting; blood; signs of dehydration
Diarrhea	Days after dose changes	Fluids with electrolytes; bland foods; limit sugar alcohols, greasy or high-lactose foods	More than 2 days; blood; dehydration; fever
Constipation	Common with slowed gut motility	Fluids (if allowed), fiber increased gradually, walking, regular meal times; ask about an over-the-counter osmotic laxative	No bowel movement for several days with pain, vomiting, or swelling
Heartburn, burping, bloating	Often with large meals	Smaller meals, avoid late-night eating, reduce carbonation, stay upright after meals	Chest pain, trouble swallowing, black stools, vomiting blood
Fatigue, headache, dizziness	Often from low calories or fluids	Enough protein and fluids, regular meals, sleep; stand up slowly	Fainting, confusion, very low blood pressure
Injection site reactions	Redness, itching, small lumps	Rotate sites; do not inject into irritated skin	Spreading redness, warmth, pus, hives, swelling of the face or lips
Hair shedding	A few months into rapid weight loss	Adequate protein, iron, zinc, and biotin-independent nutrition; usually temporary	Patchy loss or scalp problems
Resting heart rate increase	Usually 2 to 4 beats per minute	Usually no action	Palpitations, chest pain, or fainting
Taste changes, food aversions	Common	Try new foods; keep balanced nutrition	Unintended weight loss below healthy range

Staying comfortable

Many people find the first week after each dose increase the hardest. It is reasonable to ask your prescriber to hold a dose steady for extra weeks if effects are strong. Never stop suddenly without advice on how to restart safely.

Serious risks and warnings

Risk	What it is	Warning signs	What to do
Pancreatitis	Inflammation of the pancreas	Severe, persistent belly pain that may spread to the back; vomiting	Stop the medicine and seek urgent care
Gallbladder disease	Gallstones or gallbladder inflammation, more likely with fast weight loss	Right upper belly pain after meals, fever, yellow eyes or skin, pale stools	Seek urgent care
Dehydration and kidney injury	Vomiting, diarrhea, or poor drinking can reduce kidney blood flow	Very dark or little urine, extreme thirst, dizziness, confusion	Seek medical help; ask about pausing at-risk drugs
Severe allergic reaction	Rare hypersensitivity	Hives, swelling, trouble breathing	Call 911
Thyroid C-cell tumor warning	Seen in rodents; human risk unknown	Neck lump, hoarseness, trouble swallowing	Report promptly; contraindicated with MTC or MEN 2 history
Low blood sugar	With insulin or sulfonylureas	Shakiness, sweating, confusion, hunger	Treat with fast sugar; call your prescriber to adjust
Eye changes	Worsening retinopathy; rare optic neuropathy (NAION)	Sudden vision loss or blurring	Urgent eye evaluation
Aspiration during anesthesia	Stomach may be full despite fasting	Not a symptom; planning issue	Tell your surgeon and anesthesiologist (Chapter 20)
Mood changes	Depression, anxiety, or suicidal thoughts have been reported and are monitored	New hopelessness, agitation, thoughts of self-harm	Call your clinician; call or text 988 for crisis
Bowel obstruction (ileus)	Rare reports of severe slowing or blockage	Severe constipation with vomiting, swelling	Seek urgent care
Loss of muscle and bone	Part of weight loss	Weakness, falls, fractures	Protein, strength training, vitamin D and calcium plan

Your sick-day plan

When you are vomiting, have diarrhea, cannot eat or drink, or have a fever, your body can lose fluids fast. This is particularly important if you have kidney disease, take diuretics, ACE inhibitors, ARBs, SGLT2 inhibitors, NSAIDs, or transplant medicines. Ask your care team in advance:

- ☐ Which of my medicines should I hold when I cannot keep fluids down (for example diuretics, SGLT2 inhibitors, ACE inhibitors or ARBs, metformin, NSAIDs)?
- ☐ Should I skip my next GLP-1 injection if I am vomiting, and how do I restart?
- ☐ How much fluid should I aim for each hour; what oral rehydration solution is safe for me?
- ☐ For diabetes: how often should I check glucose or ketones?
- ☐ Who do I call, and at what time? What are the numbers for after hours?

Do not wait: seek care

- Trouble keeping fluids down for more than 12 to 24 hours, or signs of dehydration
- Severe belly pain, fever with yellow skin, or black or bloody stools
- Sudden vision loss, facial swelling, trouble breathing
- Chest pain, fainting, or a very rapid heartbeat

Reporting problems

You can report side effects to the FDA MedWatch program (fda.gov/medwatch) and tell your pharmacy. Reports help identify rare events. Do not rely on social media for medical advice about symptoms.

CHAPTER 13

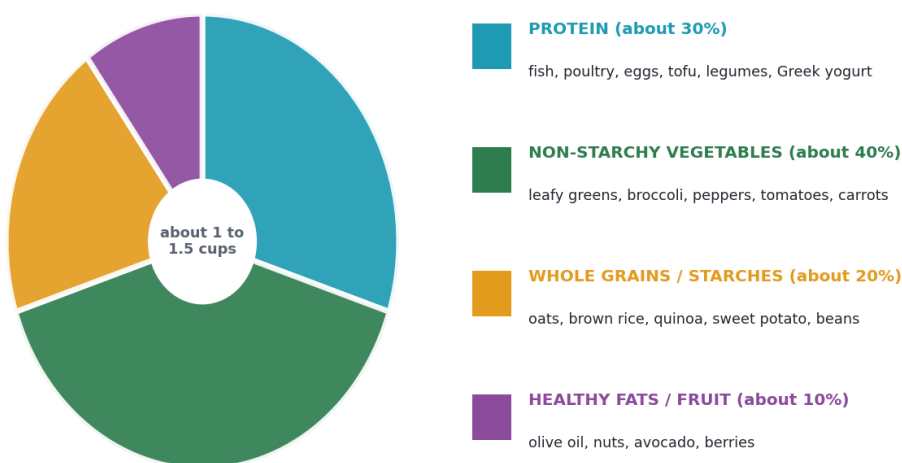
Eating, Drinking, and Moving

Getting the most from treatment while protecting muscle, bones, kidneys, and liver

GLP-1 medicines make it easier to eat less. That is the point, but it means every bite has to count. Undernutrition, dehydration, and muscle loss are avoidable with a plan. A registered dietitian (ideally one experienced in kidney, liver, or diabetes care) is a valuable partner.

A protein-first plate for people on GLP-1 medicines

Small portions, high nutrition density. Kidney, liver, and diabetes needs differ: ask a registered dietitian to adjust this plate.



Tips: eat protein first; eat slowly; stop at comfortable fullness; sip fluids between (not during) meals; limit greasy, fried, and very sugary foods.

With kidney disease, cirrhosis with fluid, or heart failure, protein, salt, and fluid targets may differ. Follow your care team's plan.

Figure 10. A protein-first plate. Ask your dietitian to adapt portions and nutrients for kidney disease, cirrhosis, diabetes, or heart failure.

Nutrition priorities

Topic	General guidance for adults without advanced kidney or liver disease	Notes for kidney and liver conditions
Protein	About 1.2 to 1.6 g per kg body weight per day for many adults trying to preserve muscle (roughly 60 to 100+ g); spread over meals; start each meal with protein	CKD stages 3 to 5 not on dialysis: often lower (about 0.6 to 0.8 g/kg) unless malnourished; dialysis: higher (about 1.0 to 1.2 g/kg); cirrhosis: about 1.2 to 1.5 g/kg with a late-evening snack. Individualize with a dietitian
Fluids	About 1.5 to 2.5 liters per day of water and other fluids, more in heat or activity; sip through the day	Fluid limits may apply in dialysis, advanced kidney disease, heart failure, or ascites. Follow your team's target
Fiber	About 25 to 35 g per day from vegetables, fruit, whole grains, legumes; add slowly with fluids	Potassium and phosphorus in some high-fiber foods may need limits in CKD
Fats	Prefer unsaturated fats; limit greasy or fried foods that worsen nausea	Liver disease: prefer Mediterranean-style patterns
Sugar and refined carbs	Limit sweets and sugary drinks (they can cause nausea and blood-sugar swings)	Diabetes: work with your team on carbohydrate targets
Sodium	Aim for less than about 2,300 mg per day (lower if advised)	Kidney, heart, and cirrhosis with ascites often need less
Vitamins and minerals	Ask about a multivitamin, vitamin D, calcium, iron, and B12 (especially with metformin or low intake)	Do not take supplements with potassium, phosphorus, or herbal ingredients without kidney and liver clearance
Alcohol	Limit or avoid; alcohol can worsen nausea, low blood sugar, and liver damage; some people notice less desire to drink	With liver disease, most teams advise avoiding alcohol
Caffeine	Moderate; it can worsen reflux	

Eating strategies that fit GLP-1 medicine

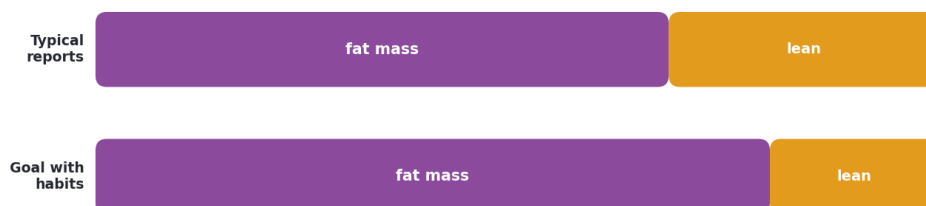
- **Plan 3 small meals and 1 to 2 protein snacks** so you do not rely on hunger cues.
- **Eat slowly, chew well, and stop when comfortably full.** Overeating can trigger vomiting.
- **Choose soft, moist proteins** (fish, eggs, yogurt, tofu, poultry) if meat is hard to tolerate.
- **Use protein shakes or powders carefully.** Check potassium, phosphorus, sodium, and sugar content if you have kidney disease.
- **Cook simply** and keep frozen vegetables, canned fish, and eggs on hand for low-energy days.
- **Watch for "food noise" rebound** when doses are missed or dropped; plan ahead.

A sample day (adjust with your dietitian)

Time	Example	Why
Breakfast	Greek yogurt with berries and oats, or 2 eggs with sautéed spinach and toast	Protein first; fiber
Mid-morning	Cottage cheese or a small handful of nuts	Protein snack
Lunch	Grilled chicken or tofu with a large vegetable salad and a small portion of quinoa	Balanced plate
Afternoon	Hard-boiled egg or protein smoothie (check kidney limits)	Protein; fluids
Dinner	Baked fish, roasted vegetables, and a small sweet potato	Lean protein; vegetables
Evening	Plain yogurt or a warm protein-rich snack (late snack recommended in cirrhosis)	Muscle protection

Where does the weight come from? Protect your muscle

Weight lost on any effective program includes some lean tissue. Protein and strength training help keep more of it.



Reported lean-tissue share of total weight lost is often about one quarter to about 40% (varies by study, age, and method).

The "goal" bar is an illustration of shifting toward more fat loss, not a guaranteed number.

Figure 11. Weight loss includes some lean tissue; protein and strength training may help shift the balance toward fat.

Protecting muscle and bones

Habit	Target	Notes
Strength training	2 to 3 days per week: all major muscle groups (bands, body weight, machines, weights)	Start with a physical therapist or trainer if you are frail, have kidney or liver disease, or joint problems
Aerobic activity	Build up to about 150 minutes per week of moderate activity (brisk walking, swimming, cycling)	Adjust for heart, kidney, and liver limits; check with your team
Protein	Reach your protein goal daily	Before or after exercise if possible
Vitamin D and calcium	Adequate intake per your clinician	Weight loss reduces bone density modestly
Sleep	7 to 9 hours	Poor sleep increases appetite and reduces recovery
Body composition testing	Ask about a DEXA scan, bioimpedance, or grip strength if you are older or frail	Track strength, not just the scale

Beyond the scale

Track more than the scale: waist size, strength (can you lift or stand up more easily?), energy, blood pressure, and blood sugar are all signs of progress. Photos and measurements help when the scale stalls.

Too little is a problem too

Eating too little (for example below about 1,000 to 1,200 calories a day without medical supervision) can lead to muscle loss, gallstones, nutrient deficiencies, and fatigue. If you cannot eat enough, tell your clinician instead of quietly accepting it.

CHAPTER 14

Results, Plateaus, and Stopping

What to expect over months and years

Weight-loss results vary widely. Some people lose more than 20% of their body weight; others lose 5 to 10%. Both can improve health. Weight is only one measure: blood pressure, blood sugar, liver fat, sleep apnea, joint pain, and mobility often improve early.

Thresholds and checkpoints

Measure	What it means
5% weight loss	Improves blood sugar, blood pressure, and liver fat for many
7 to 10%	Improves MASH activity and cardiovascular risk factors
10 to 15% or more	Can improve or resolve sleep apnea, prediabetes, and diabetes; may help fibrosis in liver disease
Early responder check	Some labels suggest stopping or reassessing if weight loss is very small after several months at the maintenance dose (for example Saxenda: less than 4% at 16 weeks on 3 mg); ask your prescriber how they define success for you

Plateaus

Weight loss often slows or stops after 6 to 12 months because your body adapts: energy needs fall as weight drops, appetite hormones adjust, and doses reach a maximum. A plateau is normal, not a failure. Options include reviewing intake and protein, adding resistance training, checking sleep and stress, reviewing other medicines that promote weight gain, and asking your prescriber about dose or medicine changes.

Body changes people notice

- **"Ozempic face":** loss of facial fat can make faces look thinner or older with rapid weight loss. It is a result of fast weight loss, not a unique drug effect. Slower loss and adequate protein may help.
- **Loose skin** after large weight loss is common and varies with age and genetics.
- **Hair shedding** usually improves within months.
- **Cold intolerance, fatigue, or dizziness** can signal too little food.
- **Gallstones** can form during rapid weight loss.

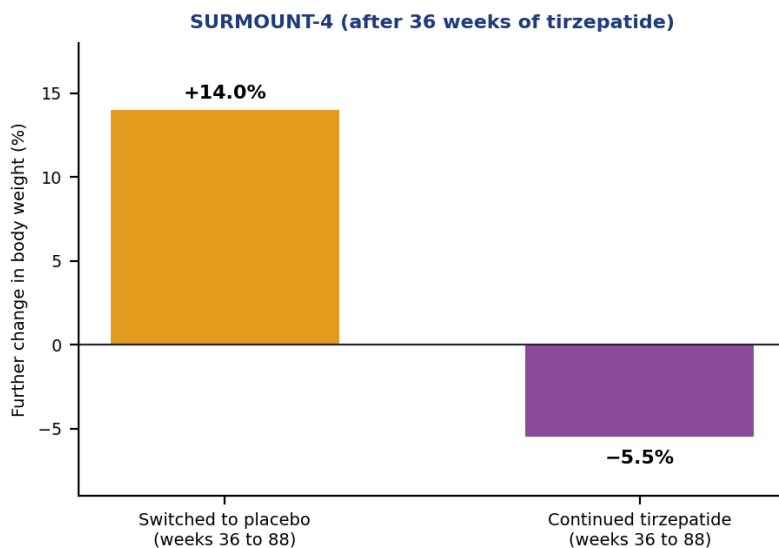
Mind and mood

- Weight loss can bring joy, relief, and stress. Emotions about food, body image, and social pressure are normal.
- Tell your clinician about new anxiety, depression, binge eating, or restriction. Therapy or dietitian support can help.

- Never take the medicine to reach an unhealthy weight. Medicine is for health, not for people already at a healthy weight.

What happens when the medicine is stopped?

People first lost about 21% on tirzepatide, then either continued or switched to placebo. STEP 1 semaglutide follow-up showed a similar pattern.



Key point

Obesity is a chronic, relapsing condition. In trials, most of the weight lost returned within a year or two of stopping, along with the health gains.

Plan for what comes next before you stop.

Rounded published values; verify against the original papers. Some people maintain weight with lifestyle changes or lower doses; this varies.

Figure 12. What happened when tirzepatide was stopped in the SURMOUNT-4 trial. A similar pattern was seen after stopping semaglutide.

Stopping or pausing treatment

Obesity is a chronic condition, and weight regain after stopping is common. In trials of semaglutide and tirzepatide, people who stopped regained a large share of the lost weight within a year or two, and some of the health benefits (blood pressure, blood sugar) faded. That does not mean the medicine "stopped working" or that you failed; it means the biology of obesity pushes weight back up.

If treatment ends

Reasons people stop include cost, coverage changes, side effects, pregnancy planning, surgery, shortages, and reaching goals. If you must stop, ask about a plan that includes: a slower taper if possible, a lower maintenance dose, strengthened eating and activity habits, close weight monitoring, and a path to restart safely.

Long-term plan checklist

- ☐ I know my target range for weight, A1c, blood pressure, and lab values.
- ☐ I have a protein and strength-training routine.
- ☐ I have a plan for what to do if coverage changes.
- ☐ I have regular follow-ups (at least every 3 to 6 months) and know which labs to repeat.
- ☐ I know my emergency signs and my sick-day plan.
- ☐ I know who to call for mood or eating concerns.

PART 4

Health Conditions and Special Situations

CHAPTER 15

Type 2 Diabetes

Blood sugar, A1c, and how to use these medicines safely

GLP-1 medicines were developed for type 2 diabetes, and they remain a core treatment. Current diabetes guidelines favor a GLP-1 medicine or tirzepatide for many adults with type 2 diabetes who have obesity, heart disease, kidney disease, or MASLD, **regardless of baseline A1c**, and not only after metformin fails. Your team will individualize.

What to expect

Effect	Typical result
A1c	Falls about 1 to 2.5 percentage points depending on the medicine and dose (tirzepatide and semaglutide at higher doses are strongest)
Weight	Usually falls; less than in people without diabetes, but still meaningful
Hypoglycemia	Low risk alone; higher with insulin or sulfonylureas
Insulin needs	Often decrease; doses may need to be lowered to avoid lows
Blood pressure, lipids	Often improve
Time course	Glucose improves within days to weeks; the full effect builds with dose escalation

Adjusting other diabetes medicines

Medicine	When you add a GLP-1 medicine
Insulin	Prescriber may lower insulin (sometimes 10 to 20% or more) as glucose falls; never adjust alone
Sulfonylureas (glipizide, glimepiride, glyburide)	Dose often reduced or stopped to avoid low blood sugar
Metformin	Often continued; GI side effects can overlap
SGLT2 inhibitors	Commonly used together for heart and kidney benefit; be careful with dehydration and ketoacidosis warning signs
DPP-4 inhibitors	Usually stopped; no added benefit with GLP-1 medicines
Type 1 diabetes	Not approved. Do not use in place of insulin; risk of ketoacidosis if insulin is reduced or stopped

Hypoglycemia: know the 15-15 rule

Signs: shakiness, sweating, fast heartbeat, hunger, confusion. If glucose is below 70 mg/dL: take 15 grams of fast sugar (4 ounces of juice or 3 to 4 glucose tablets), recheck in 15 minutes, repeat if still low, then have a snack or meal. Call your prescriber about any low; medicines may need adjustment. Severe lows (unable to swallow, unconscious) need glucagon and emergency care.

Eyes, feet, and other check-ups

- **Diabetic eye disease:** a dilated eye exam before starting (or soon after) and as recommended. Rapid improvement in blood sugar can temporarily worsen retinopathy. Report vision changes right away.
- **Kidney checks:** eGFR and urine albumin at least once a year, more often if abnormal (Chapter 17).
- **Foot exams, blood pressure, cholesterol, and vaccines** stay important.
- **Prediabetes:** tirzepatide and semaglutide sharply reduce progression to type 2 diabetes in people with obesity; coverage is generally through the weight-management labels.

Insulin safety

Do not stop insulin or other diabetes medicines on your own when you begin a GLP-1 medicine. Blood sugar can rise quickly, and in people with type 1 diabetes or very low insulin production, stopping insulin can cause diabetic ketoacidosis.

Managing glucose on treatment

Tool	Use
Home glucose meter or CGM	Track patterns, look for lows after dose changes, and share results at visits
A1c every 3 months (or as advised)	Monitors long-term control
Food and dose log	Helps link symptoms and glucose to meals and injection days

CHAPTER 16

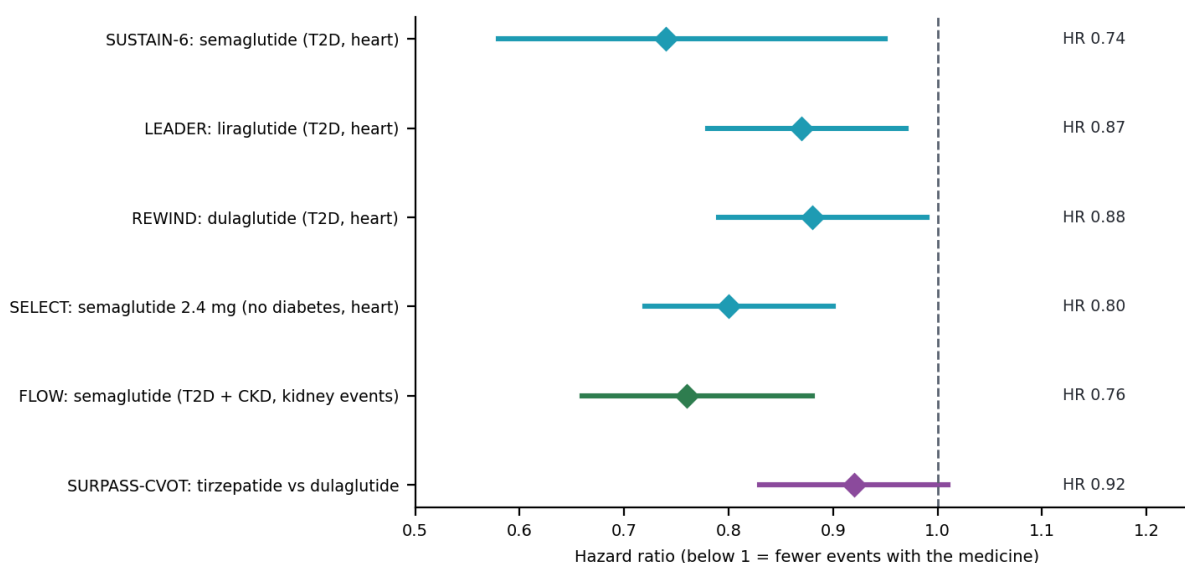
Heart and Beyond

Cardiovascular results and other emerging benefits

The best evidence for benefits beyond weight and glucose comes from large **outcome trials**. They enrolled thousands of people at high risk and counted events such as heart attack, stroke, and death.

Major outcome trials: how much did risk change?

Diamond = average effect; line = 95% confidence range (rounded published values). SURPASS-CVOT compared with an active drug, not placebo.



Heart trials measured major adverse cardiovascular events (heart attack, stroke, cardiovascular death). Verify values against the original papers.

Figure 13. Major heart and kidney outcome trials of GLP-1 medicines. A hazard ratio below 1 means fewer events.

Outcome trial summary

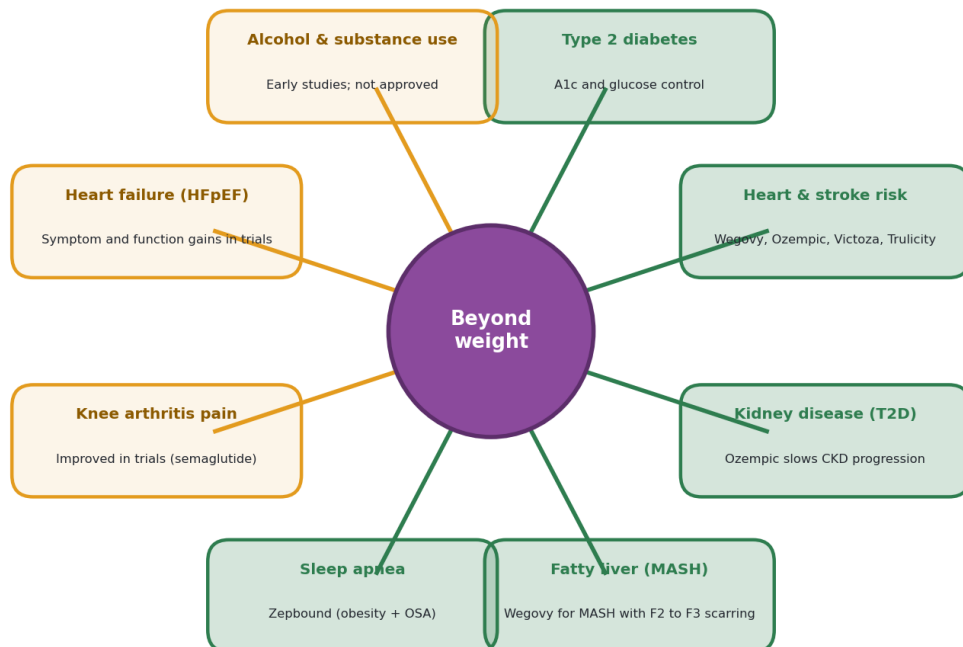
Trial	Medicine	Population	Result (approx.)
LEADER (2016)	Liraglutide	T2D with high cardiovascular risk	13% fewer major heart events; fewer cardiovascular deaths
SUSTAIN-6 (2016)	Semaglutide 0.5 and 1 mg	T2D with high cardiovascular risk	26% fewer major heart events
REWIND (2019)	Dulaglutide	T2D, mostly without prior cardiovascular disease	12% fewer major heart events
SOUL	Oral semaglutide	T2D with heart or kidney disease	About 14% fewer major heart events
SELECT (2023)	Semaglutide 2.4 mg	Obesity/overweight plus heart disease, no diabetes	20% fewer major heart events
FLOW (2024)	Semaglutide 1 mg	T2D plus CKD	24% fewer kidney and cardiovascular composite events
SURPASS-CVOT	Tirzepatide vs dulaglutide	T2D with heart disease	Noninferior; about 8% fewer events
SUMMIT; STEP-HFpEF	Tirzepatide; semaglutide	Heart failure with preserved EF plus obesity	Improved symptoms, function, and (SUMMIT) fewer worsening events

How the benefits may arise

- Weight loss, blood pressure lowering (about 3 to 6 mmHg systolic), and better glucose and lipids.
- Less inflammation and possible direct effects on vessel walls.
- Less fat around the heart and liver.
- Improved kidney function markers, which also protect the heart.

Beyond weight: where GLP-1 medicines have evidence

Filled = approved use for a specific medicine; light = promising or mixed evidence. Which medicine has which approval differs (see Chapter 3).



Not shown: Alzheimer's disease. Two large semaglutide trials (EVOKE, EVOKE+) did not slow early Alzheimer's. Claims of "miracle" benefits beyond the list deserve caution.

Figure 14. Where GLP-1 medicines have approved uses or promising evidence beyond weight loss.

Other conditions and uses

Area	What is known
Obstructive sleep apnea	Tirzepatide (Zepbound) is approved for moderate to severe OSA with obesity; weight loss reduces breathing pauses; CPAP may still be needed
Knee osteoarthritis	Semaglutide improved pain and function in obesity (STEP 9); weight loss reduces joint load
Heart failure with preserved EF	Symptom and function improvements in obesity (STEP-HFpEF, SUMMIT)
Fatty liver / MASH	Wegovy is approved for MASH F2 to F3; tirzepatide showed MASH resolution in phase 2 (Chapter 18)
Polycystic ovary syndrome (PCOS)	Weight loss and insulin sensitivity improve cycles; use with reliable contraception
Alcohol and substance use	Small studies and observational data suggest reduced drinking; not approved for this
Alzheimer's disease	Two large semaglutide trials (EVOKE, EVOKE+) did not slow early Alzheimer's
Cancer	Rodent thyroid tumor warning; human data on thyroid cancer are limited and mostly reassuring so far; obesity-related cancers may fall as weight falls; monitoring continues
Mortality	Outcome trials suggest fewer cardiovascular deaths in high-risk groups; long-term data continue to accrue

Key point

Claims that these drugs "cure" addiction, dementia, aging, or cancer go beyond the evidence. Enthusiasm is fine; hype is not. Look for approved uses and high-quality trials, and ask your clinician what applies to your situation.

CHAPTER 17

GLP-1 Medicines and the Kidneys

Protection, precautions, dialysis, and transplant

Obesity and diabetes are the two biggest drivers of chronic kidney disease (CKD), and diabetes is the leading cause of kidney failure in the U.S. GLP-1 medicines can help kidneys by improving blood sugar, blood pressure, and weight, and possibly through direct anti-inflammatory effects. But they can also endanger kidneys when dehydration occurs. Both sides matter.

Evidence for kidney protection

Study	Result
FLOW (semaglutide 1 mg weekly; about 3,500 people with type 2 diabetes and CKD)	About 24% lower risk of the main composite: kidney failure, at least 50% drop in eGFR, or death from kidney or cardiovascular causes. Slower yearly eGFR decline; fewer heart events. Led to the Ozempic CKD indication in 2025
LEADER, SUSTAIN-6, REWIND (secondary analyses)	Less new or worsening albuminuria; slower eGFR decline in some analyses
Tirzepatide (SURPASS program)	Smaller eGFR decline and lower albuminuria seen in exploratory analyses; dedicated kidney outcome trials (for example TREASURE-CKD, SURMOUNT-MMO) are under way
Non-diabetic CKD	Less certain; ongoing studies

Building blocks of care

Guidelines for diabetic kidney disease often combine several therapies: a maximally tolerated RAS blocker (ACE inhibitor or ARB), an SGLT2 inhibitor, a nonsteroidal mineralocorticoid antagonist (finerenone), and a GLP-1 medicine. These work through different pathways and may be used together, with careful monitoring.

Practical kidney precautions

Issue	Guidance
Dose adjustments	No dose change needed for mild, moderate, or severe kidney impairment for tirzepatide, dulaglutide, and semaglutide; use caution and monitor closely in advanced disease because data are limited. Exenatide is not recommended in severe kidney impairment
Dehydration and acute kidney injury	Vomiting and diarrhea can cause acute kidney injury. Sip fluids all day (unless restricted); use your sick-day plan; contact your team early
Combination risk	Diuretics, ACE inhibitors or ARBs, SGLT2 inhibitors, and NSAIDs increase the chance of kidney injury when you are dehydrated. Ask which to hold on sick days
Blood pressure	As weight falls, blood pressure medicines may need to be reduced; report lightheadedness
Labs to monitor	Creatinine/eGFR, potassium, and UACR at baseline and about every 3 to 6 months (or as advised); check after a vomiting illness
Protein and malnutrition	People with advanced CKD are at risk for protein-energy wasting. A dietitian should set protein and calorie targets; do not rely on high-protein products without checking potassium and phosphorus
Anemia and bone health	Monitor as usual; poor intake may worsen anemia or mineral balance

Dialysis

- Evidence in dialysis patients is limited. GLP-1 medicines have been used off-label, mainly for diabetes control and weight reduction, with some observational reports of safe use.
- Nausea, poor appetite, and delayed emptying can worsen malnutrition in people on dialysis. Muscle and nutrition monitoring are essential.
- Fluid limits and potassium/phosphorus restrictions still apply; discuss with your nephrologist and renal dietitian.
- Some centers use GLP-1 medicines to help people reach a BMI needed for transplant listing.

Kidney transplant: candidates and recipients

Many transplant programs have BMI thresholds (often around 35 to 40) or body-composition goals for listing, because obesity increases surgical complications. GLP-1 medicines are increasingly used to help candidates reach these goals. After transplant, weight gain, diabetes, and cardiovascular risk are common, and interest in GLP-1 medicines is growing.

Topic	Notes to discuss with your transplant team
Timing	Whether to start before transplant, and when to hold or stop around surgery (delayed gastric emptying and aspiration risk)
Immunosuppressant absorption	Slower stomach emptying may change absorption of tacrolimus, mycophenolate, and other oral drugs. Ask about extra drug-level checks after starting or changing the dose
Dehydration and rejection risk	Vomiting can cause you to miss or lose immunosuppressant doses and can injure the graft; have a plan

Topic	Notes to discuss with your transplant team
Evidence	Observational studies and small trials suggest GLP-1 medicines can lower weight and glucose after kidney transplant without an obvious rise in rejection, but large randomized trials are lacking
Infections and other medicines	Ask about interactions with diabetes drugs, antivirals, and steroids
Monitoring	Creatinine/eGFR, drug levels, weight, blood pressure, and glucose more frequently at first

Call your kidney or transplant team

If you are on dialysis or have a transplant, only start, stop, or change a GLP-1 medicine with your nephrology or transplant team. Tell them right away about vomiting, diarrhea, or missed anti-rejection doses.

Kidney safety checklist

- ☐ I have baseline eGFR and urine albumin results and a schedule for repeat tests.
- ☐ I know which medicines to hold when I cannot keep fluids down.
- ☐ I know my daily fluid goal (or limit).
- ☐ My dietitian has set protein, potassium, phosphorus, and sodium targets.
- ☐ My blood pressure medicines have been reviewed for the weight-loss period.
- ☐ I have contacted my nephrology or transplant team about this medicine.

CHAPTER 18

GLP-1 Medicines and the Liver

Fatty liver, MASH, cirrhosis, and transplant

Fatty liver disease is now called **metabolic dysfunction-associated steatotic liver disease (MASLD)**, and its inflamed, scarring form **MASH**. It affects roughly 3 in 10 adults worldwide and is closely linked to obesity, type 2 diabetes, high blood pressure, and high cholesterol. Because weight and insulin resistance drive it, GLP-1 medicines are natural treatments to test.

Evidence in MASLD and MASH

Study or medicine	Result (approx.)
Semaglutide 2.4 mg (ESSENCE)	In adults with MASH and fibrosis F2 to F3: MASH resolution without worsening fibrosis in about 63% vs 34% on placebo; fibrosis improved without worse MASH in about 37% vs 22%. Wegovy received accelerated approval for MASH with F2 to F3 fibrosis in 2025; longer-term outcomes are being confirmed
Tirzepatide (SYNERGY-NASH, phase 2)	MASH resolution in roughly 44 to 62% (5 to 15 mg) vs about 10% placebo; larger trials under way
Survodutide, retatrutide, pemvidutide, efinopegdutide	Glucagon-containing combinations showing large liver-fat reductions; phase 3 studies in MASH under way
Resmetirom (Rezdiffra)	A different, liver-targeted pill approved in 2024 for MASH with F2 to F3 fibrosis; can be used with weight-loss medicines under specialist guidance
Weight loss in general	Loss of 7 to 10% improves inflammation; 10% or more helps fibrosis in many people

Liver considerations by condition

Condition	What is known	Cautions
MASLD (no significant scarring)	Weight loss improves liver fat and enzymes; GLP-1 medicines are commonly used if there is obesity or diabetes	Coordinate with your PCP or hepatologist; monitor ALT/AST
MASH with F2 to F3 fibrosis	Wegovy is approved; specialists may combine with lifestyle and other therapies	Monitor fibrosis with elastography or scores over time
Compensated cirrhosis	Limited but growing evidence that semaglutide and similar agents are tolerated in compensated cirrhosis with obesity or diabetes	Malnutrition and sarcopenia are a major risk; rapid weight loss may harm; hepatology decision only
Decompensated cirrhosis (ascites, encephalopathy, varices bleeding)	Generally not appropriate for weight-loss treatment; data are sparse	Appetite suppression can worsen malnutrition; hepatology guidance is essential
Alcohol-related liver disease	GLP-1 medicines may reduce drinking in early studies; not approved for this	Complete alcohol avoidance is still the central treatment
Viral hepatitis, autoimmune liver disease	No specific restrictions; weight control helps outcomes	Watch liver tests; overlap with fatty liver is common
Liver transplant candidates and recipients	Obesity and diabetes complicate surgery and outcomes; GLP-1 medicines are being studied before and after transplant	Absorption of tacrolimus and other oral drugs; hydration; timing around surgery; team-led decisions

Liver-related safety points

- **Liver tests** (ALT, AST) usually improve on these medicines. New sudden liver test elevation is unusual; report yellow skin, dark urine, or severe fatigue.
- **Gallbladder and bile duct problems** (gallstones, cholecystitis) are increased, especially with rapid weight loss. Right upper belly pain needs evaluation.
- **Dose adjustments:** no adjustment for mild to moderate liver impairment for most products; data in severe impairment are limited.
- **Herbal or supplement liver toxicity:** avoid "natural GLP-1" and "detox" products, which can injure the liver.
- **Acetaminophen:** keep to the daily limit your liver team recommends; delayed gastric emptying does not change the safe maximum.
- **Danuglipron**, an investigational oral drug, was stopped after a case of drug-induced liver injury, a reminder that new products need monitoring.

Tracking your liver

Weight loss with GLP-1 medicines can lower liver fat quickly. Many people see improved ALT within months. Improvement in fibrosis takes longer, so repeated noninvasive testing (such as elastography) every 1 to 2 years helps show whether treatment is working.

Questions for your hepatologist or liver team

- ☐ What stage of fatty liver or fibrosis do I have (FIB-4, elastography, biopsy)?
 - ☐ Is a GLP-1 medicine right for my liver stage, and which one?
 - ☐ Should I combine it with other MASH treatments such as resmetirom?
 - ☐ What weight-loss rate and protein target are safest for me?
 - ☐ What labs and imaging should I have, and how often?
 - ☐ How does this fit with transplant listing or my transplant medicines?
-

CHAPTER 19

Pregnancy and Special Populations

When the usual guidance changes

Pregnancy, fertility, and contraception

Topic	Guidance
Pregnancy	Weight-loss versions are not recommended in pregnancy; weight loss offers no benefit to the fetus. Stop when pregnancy is known and talk with your prescriber. Semaglutide labels suggest stopping at least 2 months before a planned pregnancy because of its long half-life. Diabetes in pregnancy is managed differently (usually insulin)
Fertility	Weight loss can restore ovulation in people with obesity and PCOS, sometimes unexpectedly ("Ozempic babies" in the media). Use reliable contraception if you do not want pregnancy
Oral contraceptives	Tirzepatide can reduce absorption of oral contraceptives; switch to a non-oral method or add a barrier method for 4 weeks after starting and after each dose increase. Vomiting or severe diarrhea can also reduce pill effectiveness
Breastfeeding	Limited data; generally not recommended. Talk with your clinician
Men planning conception	Data are limited; ask your prescriber

Other groups

Group	What to know
Adolescents	Wegovy and Saxenda are approved for ages 12+ with obesity; Victoza and Trulicity for type 2 diabetes ages 10+. Tirzepatide is not yet approved for children. Treatment should be in specialist pediatric programs alongside family-based lifestyle support
Older adults	Benefits exist, but muscle loss, falls, dehydration, and poor appetite are concerns. Emphasize protein, strength training, hydration, and slower titration
Type 1 diabetes	Not approved; risks include ketoacidosis if insulin is reduced. Some specialists use it off-label in obesity with type 1; only by an endocrinologist
Prior bariatric surgery	May be used for weight regain or before/after surgery; team-based decisions
Gastroparesis, IBD, celiac, severe reflux	May worsen GI symptoms; specialist input
Eating disorders	Requires specialist evaluation; appetite suppression can deepen restriction or trigger binge-purge cycles
History of cancer	Individual decision; thyroid history matters (MTC contraindication)
Heart failure or arrhythmia	Benefits in HFpEF; monitor heart rate and volume status
Underweight or normal weight	Not appropriate for weight loss; misuse can cause harm
Athletes and physically active	Protect lean mass and hydration; under-fueling risks performance and bone health

Health, not appearance

Using these medicines for cosmetic weight loss when you are at a healthy weight is medically unnecessary and can be harmful. If you are worried about your body image or eating patterns, talk with a clinician or eating-disorder specialist. Call or text 988 in a crisis, or the National Alliance for Eating Disorders helpline for support.

CHAPTER 20

Surgery, Procedures, and Drug Interactions

Planning ahead and staying safe with other medicines

Anesthesia, endoscopy, and colonoscopy

GLP-1 medicines slow gastric emptying, and there have been reports of retained stomach contents in people who fasted before anesthesia or endoscopy, raising concern for **aspiration** (stomach contents entering the lungs). Guidance has evolved. Earlier advice was to hold weekly medicines for a week beforehand; a 2024 multisociety consensus from anesthesia, gastroenterology, and bariatric societies said most people can continue if the risk is assessed and the team is informed, with extra steps for higher-risk patients.

- **Tell every clinician, dentist, and anesthesia provider** that you use a GLP-1 medicine, the name, dose, and last injection date.
- **Higher-risk situations** include the escalation phase, higher doses, strong GI symptoms, and conditions such as gastroparesis or diabetes with neuropathy. The team may advise a liquid diet for 24 hours before, a temporary hold, or a gastric ultrasound on the day.
- **Do not hold or stop the medicine on your own;** for people with diabetes, stopping can raise glucose and blood pressure. Follow written instructions from your surgical and anesthesia team.
- **Colonoscopy preparation** may need adjusted timing and hydration; nausea with the prep solution can be worse.

Dental work, imaging, and vaccines

- Routine dental care, MRI, and CT are not affected. Contrast dye for CT and kidney function: ask your team about hydration.
- Vaccines can be given as usual.

Drug interactions and cautions

Medicine or class	Concern	What to do
Insulin, sulfonylureas	Low blood sugar	Prescriber may lower doses; monitor glucose
Oral contraceptives	Tirzepatide may reduce absorption	Use a non-oral method or add a barrier for 4 weeks after starts and increases
Warfarin	Changed absorption and diet; INR shifts	More frequent INR checks after starting and changing doses
Levothyroxine and other narrow-window oral drugs	Slower gastric emptying may alter absorption	Recheck levels as advised
Tacrolimus, cyclosporine, mycophenolate	Absorption and vomiting risk; dehydration	Extra drug-level checks; call the transplant team
Diuretics, ACE inhibitors, ARBs, SGLT2 inhibitors, NSAIDs	Dehydration and kidney injury	Sick-day plan; avoid NSAIDs when possible
Blood pressure medicines	Weight loss can lower blood pressure	Doses may need to be lowered
Metformin	Additive GI effects	Often continued; adjust with advice
DPP-4 inhibitors, other GLP-1 medicines	Duplication	Avoid combining
Acetaminophen and other oral pain medicines	Absorption may be slower; onset may be delayed	Do not double doses; follow label limits
Alcohol, herbal products	Nausea, low blood sugar, liver injury	Limit alcohol; avoid unproven supplements
Antidepressants and other mood medicines	No known major interaction; mood monitoring	Report mood changes

Pharmacist check

Keep a current medication list, including supplements, and ask your pharmacist to review it every time a new medicine is started or the dose changes. Bring it to every appointment (see the Medication Passport worksheet).

PART 5

Access and Reality Checks

CHAPTER 21

Cost, Insurance, and Avoiding Counterfeits

Practical ways to get treatment safely

The list price of brand-name GLP-1 medicines is high, coverage varies, and rules have changed repeatedly since 2023. This chapter explains the main pathways and how to avoid dangerous shortcuts. **Prices, programs, and coverage change quickly; confirm current details with your plan, pharmacy, and the manufacturer.**

Coverage pathways

Pathway	What to know
Commercial or employer insurance	Coverage for weight-loss versions depends on the plan; type 2 diabetes versions are usually covered with prior authorization. Some plans limit to certain brands
Medicare Part D	By law, Part D has historically excluded drugs used only for weight loss, but covers these medicines for diabetes and for other approved uses (for example Wegovy for heart-risk reduction, Zepbound for sleep apnea). Newer arrangements announced in 2025 to 2026 may expand coverage; check the current rules
Medicaid	Varies by state; some cover weight-loss versions, others do not
Manufacturer direct programs	Cash-price options through the manufacturers' direct pharmacies (for example for Zepbound and Wegovy) and some federal-partnership programs may offer lower self-pay prices than list price; prices change
Savings cards	For commercially insured patients (not government insurance); coverage and eligibility rules apply
Patient assistance programs	Manufacturer programs (for example Lilly Cares, Novo Nordisk PAP) for eligible uninsured or underinsured people
Generics	Generic liraglutide (Victoza and Saxenda) can be far cheaper; more generics may follow

Working with your insurer

- 1 Ask your plan which GLP-1 medicines are covered, at what tier, and which require prior authorization or step therapy.
- 2 Have your prescriber submit documentation: diagnosis, BMI history, weight-related conditions, past lifestyle programs, A1c or other labs.
- 3 If denied, request the reason in writing and file an appeal; ask your prescriber for a letter of medical necessity and, if needed, a peer-to-peer review.
- 4 Ask whether an alternative product on the formulary offers similar benefits.

- 5 Check whether an HSA, FSA, or employer program can help with costs.
- 6 Plan for coverage changes at the start of each year or job change.

Compounded and unapproved products: what the FDA says

During shortages, compounded versions of semaglutide and tirzepatide were widely sold. The FDA has since declared the shortages resolved and warned that compounded drugs are **not FDA-approved** and are not reviewed for safety, effectiveness, or quality. The FDA has received reports of dosing errors and adverse events, including hospitalizations. Some products use salt forms or unapproved ingredients. Discuss the risks with your prescriber before considering any compounded product, and use licensed U.S. pharmacies that follow safety standards.

Warning signs of a risky source

- ☐ No prescription is required, or the site "prescribes" after a short form with no real clinical review.
- ☐ The product is labeled "for research use only," "not for human consumption," or sold as a "peptide."
- ☐ The price is far below normal, or the seller ships from overseas without a pharmacy license.
- ☐ The seller uses social media influencer promotion and pressures you to buy quickly.
- ☐ The packaging differs from the manufacturer's images; the lot number or expiration date is missing or looks altered.
- ☐ The vial or pen has no clear concentration (mg per mL), and the seller sends "unit" conversions instead.

Get help early

If you have already used an unapproved product and feel unwell (severe vomiting, dizziness, low blood sugar, severe belly pain), seek medical care right away and bring the product with you. You can report problems to the FDA MedWatch program.

Tips for lowering costs safely

- Ask about the lowest effective dose; not everyone needs the highest one.
- Compare cash prices at licensed pharmacies and manufacturer programs.
- Ask whether a lower-cost approved product (such as generic liraglutide) fits your needs.
- Never split, stretch, or re-use pens or needles to save money; this is unsafe.
- Do not share medicine with a family member.

CHAPTER 22

Myths and Facts

Straight answers to common claims

Myth	Fact
"Taking a GLP-1 medicine is cheating or the easy way out."	Obesity and type 2 diabetes are complex diseases involving hormones, brain circuits, genes, and environment. Medicines treat the biology; healthy habits still matter
"Ozempic, Wegovy, Mounjaro, and Zepbound are totally different drugs."	Ozempic, Wegovy, and Rybelsus are semaglutide; Mounjaro and Zepbound are tirzepatide. Labels and doses differ
"I can take Mounjaro and Zepbound together for a bigger effect."	No. They are the same drug; combining is an overdose
"Once I lose the weight, I can stop and keep it off."	Most people regain much of the weight after stopping. It is a chronic disease that usually needs ongoing care
"These medicines are only for people who need to lose a lot of weight."	Eligibility includes BMI 27 plus a related condition; type 2 diabetes, heart, kidney, liver, and sleep apnea uses exist
"Natural supplements work the same way (berberine, "nature's Ozempic")."	No supplement has been shown to replicate these effects; some cause harm
"Microdosing is safer and works just as well."	There is no proven benefit to non-label dosing, and errors are common. Follow your prescribed schedule
"GLP-1 medicines cause thyroid cancer."	Thyroid C-cell tumors occurred in rodents; human evidence is limited and reassuring so far, but the boxed warning stands. Avoid if you have MTC or MEN 2 in the family
"They destroy muscle."	Weight loss reduces both fat and lean mass; protein and strength training help preserve muscle. Lean loss is not unique to these drugs
"They cause pancreatitis in everyone."	Pancreatitis is uncommon; know the warning signs
"These drugs ruin kidneys."	In diabetes with CKD, semaglutide slowed kidney disease progression in trials. Kidney injury mostly occurs from dehydration, which is preventable
"Compounded copies are the same as the brand."	Compounded drugs are not FDA-approved and have caused dosing errors; talk to your clinician
"If I feel nauseated, the medicine is not right for me."	Nausea often improves with dose pacing and food choices; talk with your prescriber before stopping
"Weight-loss medicine is for looks."	Its purpose is health: less risk of diabetes, heart disease, kidney and liver problems, and joint pain

Key point

When someone tells you "everyone should be on these," or "they are dangerous for everyone," be skeptical of both. The truth is nuanced: real benefits, real risks, and a decision that belongs to you and your care team.

WORKSHEET W1

My Medication Passport

Complete this with your prescriber or pharmacist and update it whenever anything changes. Bring it to every appointment.

PART 6

Tools and Worksheets

My name

Date of birth

Prescriber name and phone

Pharmacy name and phone
GLP-1 medicine (brand and generic)

Device or form (pen, vial, tablet)

Start date

Current dose and day of week

Target (maintenance) dose

Reason prescribed

Insurance / program

Allergies
Other medicines and supplements

Emergency contacts

Emergency contact
Nephrologist / hepatologist / transplant team
Poison Control: 1-800-222-1222 (U.S.)
988 Suicide and Crisis Lifeline (call or text 988)



WORKSHEET W2

Weekly Injection and Dose Log

Record each dose. Tracking helps you rotate sites, catch patterns, and answer questions at visits.

Date	Dose	Site	Weight	Notes (side effects, missed doses)

Sites: A = abdomen (left/right), T = thigh (left/right), U = upper arm (left/right).

WORKSHEET W3

Side Effect and Symptom Diary

Rate symptoms 0 (none) to 3 (severe). Bring this to your appointment, especially after dose increases.

[illegible]

Do not wait

Call your team right away for repeated vomiting, severe belly pain, signs of dehydration, black stools, or sudden vision changes. Call 911 for trouble breathing or facial swelling.

WORKSHEET W4

Weekly Food, Protein, and Fluid Tracker

Track protein and fluids for a week. Ask your dietitian for your personal targets first (kidney and liver conditions change them).

My protein goal (g/day)

My fluid goal (cups or mL/day)

My sodium limit (mg/day)

Other limits (potassium, phosphorus, carbs)

Day	Breakfast	Lunch	Dinner	Snacks	Protein (g)	Fluids
Mon						
Tue						
Wed						
Thu						
Fri						
Sat						
Sun						

Movement this week

Day	Strength training (minutes)	Walking or cardio (minutes)	Energy level (1-5)
Mon			
Tue			
Wed			
Thu			
Fri			
Sat			
Sun			

WORKSHEET W5

Questions for My Prescriber

Check the boxes for questions you want answered and write notes.

- ☐ Which GLP-1 medicine is best for my goals and health conditions, and why?
- ☐ What is my starting dose, schedule, and maintenance target?
- ☐ What side effects should I expect, and when should I call?
- ☐ What should I eat, and how much protein and fluid?
- ☐ Do any of my other medicines (insulin, diuretics, blood pressure, transplant drugs) need changes?
- ☐ What labs will you order and when (kidney, liver, A1c, lipids)?
- ☐ What is my plan if I get sick, vomit, or cannot eat or drink?
- ☐ How will we measure success beyond weight?
- ☐ What is the plan if coverage changes or I need to stop?
- ☐ How does this affect my kidney or liver condition or transplant plans?
- ☐ What contraception do you recommend, and what if I want to become pregnant?

Notes and answers:



WORKSHEET W6

Insurance and Access Tracker

Keep a record of calls, approvals, and appeals.

Date	Who I spoke to	Reference #	What was decided	Next step

WORKSHEET W7

My Kidney and Liver Safety Plan

Fill in with your care team. Keep a copy on your phone and refrigerator.

- ☐ My baseline labs are done (eGFR, UACR, liver tests, A1c, lipids).
- ☐ I know which medicines to hold when I cannot keep fluids down.
- ☐ I know my fluid goal or limit.
- ☐ I know my protein target from my dietitian.
- ☐ I told my nephrologist / hepatologist / transplant team about this medicine.
- ☐ I have a list of symptoms that mean "call today" and "call 911."
- ☐ I will avoid NSAIDs (ibuprofen, naproxen) unless my team approves.
- ☐ I have an after-hours number for my team.

Sick-day medicines to hold

Daily fluid goal

Team phone (day)

Team phone (after hours)

EXERCISE M1

Match the Brand to the Generic

Write the active ingredient for each brand name. Check with the answer key on the next page.

Brand name	Your answer: active ingredient
Zepbound	
Mounjaro	
Wegovy	
Ozempic	
Rybelsus	
Saxenda	
Victoza	
Trulicity	
Byetta	
Xultophy	

Extra challenge: which brand names are the same medicine sold for different uses? (Answer: Zepbound and Mounjaro; Wegovy, Ozempic, and Rybelsus; Saxenda and Victoza.)

Answer key: match the brand to the generic

Zepbound	Tirzepatide
Mounjaro	Tirzepatide
Wegovy	Semaglutide
Ozempic	Semaglutide
Rybelsus	Semaglutide (oral)
Saxenda	Liraglutide
Victoza	Liraglutide
Trulicity	Dulaglutide
Byetta	Exenatide
Xultophy	Insulin degludec + liraglutide

Review quiz: 25 questions

Circle the best answer. The answer key follows. Score: 22 to 25 = excellent; 17 to 21 = good; below 17 = review the chapters and try again.

1. Which two brand names contain the same active ingredient, tirzepatide?
A. Ozempic and Wegovy **B.** Mounjaro and Zepbound **C.** Victoza and Saxenda **D.** Trulicity and Byetta
2. Ozempic, Wegovy, and Rybelsus all contain:
A. Liraglutide **B.** Dulaglutide **C.** Semaglutide **D.** Exenatide
3. Besides the GLP-1 receptor, tirzepatide also activates the:
A. GIP receptor **B.** Insulin receptor **C.** Thyroid receptor **D.** Amylin receptor only
4. Natural GLP-1 in the body is broken down in about:
A. 2 minutes **B.** 2 hours **C.** 2 days **D.** 2 weeks
5. For weekly injections, the usual minimum time on each dose before increasing is:
A. 1 week **B.** 2 weeks **C.** 4 weeks **D.** 12 weeks
6. The usual starting weekly dose of Zepbound and Mounjaro is:
A. 0.25 mg **B.** 2.5 mg **C.** 5 mg **D.** 15 mg
7. The usual maintenance dose of Wegovy injection is:
A. 0.25 mg **B.** 1 mg **C.** 2.4 mg **D.** 15 mg
8. The boxed warning on most GLP-1 medicines concerns:
A. Liver failure **B.** Thyroid C-cell tumors **C.** Bone fractures **D.** Hearing loss
9. Who should not use these medicines?
A. Anyone over 50 **B.** People with a personal or family history of medullary thyroid carcinoma or MEN 2 **C.** People who exercise **D.** People taking vitamins
10. The most common side effects are:
A. Skin rash and hair growth **B.** Nausea and other digestive effects **C.** Hearing changes **D.** Joint swelling
11. If you miss a weekly Zepbound dose, you can take it if within:
A. 1 day **B.** 4 days (96 hours) **C.** 10 days **D.** Never
12. Oral semaglutide (Rybelsus) is taken:
A. With a large meal **B.** On an empty stomach with a small sip of water, then wait 30 minutes **C.** At bedtime with milk **D.** Crushed in juice
13. To avoid the navel area when injecting into the abdomen, stay about:
A. 2 inches (5 cm) away **B.** 1 cm away **C.** Directly at the navel **D.** 10 inches away
14. Unopened GLP-1 pens are generally stored:
A. In the freezer **B.** In the refrigerator (36 to 46 F / 2 to 8 C) **C.** In a hot car **D.** In direct sunlight
15. The SELECT trial of semaglutide 2.4 mg showed:
A. No heart benefit **B.** About 20% fewer major heart events **C.** Increased heart events **D.** Only weight benefit
16. The FLOW trial studied semaglutide in people with:
A. Type 1 diabetes **B.** Type 2 diabetes and chronic kidney disease **C.** Cirrhosis **D.** Asthma
17. The head-to-head trial comparing tirzepatide with semaglutide 2.4 mg for obesity was:
A. STEP 1 **B.** SURMOUNT-5 **C.** LEADER **D.** REWIND

- 18.** In SURMOUNT-4, people who switched from tirzepatide to placebo:
A. Kept losing weight **B.** Regained about 14% of body weight **C.** Had no change **D.** Improved diabetes
- 19.** Which symptom needs urgent medical care?
A. Mild nausea for a day **B.** Severe persistent belly pain that may spread to the back **C.** A small bruise at the injection site **D.** Mild fatigue
- 20.** Tirzepatide and oral contraceptives: the label advises:
A. No change is needed **B.** A non-oral method or a barrier method for 4 weeks after starting and after each dose increase **C.** Stopping contraception **D.** Doubling the pill
- 21.** Before surgery or an endoscopy with sedation, you should:
A. Say nothing **B.** Tell the team you use a GLP-1 medicine, including the last dose **C.** Double your dose **D.** Stop drinking water for 3 days
- 22.** Which product is approved for MASH with F2 to F3 fibrosis?
A. Wegovy **B.** Byetta **C.** Rybelsus **D.** Victoza
- 23.** The best way to protect the kidneys during vomiting or diarrhea is:
A. Ignore it **B.** Follow a sick-day plan, stay hydrated, and call your team **C.** Take extra doses **D.** Take an NSAID
- 24.** Compounded semaglutide and tirzepatide are:
A. FDA-approved **B.** Not FDA-approved and not reviewed for safety, effectiveness, or quality **C.** Identical to the brand by law **D.** Always safer
- 25.** Besides weight management, Zepbound is approved for:
A. Obstructive sleep apnea in adults with obesity **B.** Type 1 diabetes **C.** Hypothyroidism **D.** Asthma

Quiz answer key with short explanations

1	B	Mounjaro (diabetes) and Zepbound (weight, sleep apnea) are both tirzepatide.
2	C	Ozempic, Wegovy, and Rybelsus are all semaglutide.
3	A	Tirzepatide is a dual GIP and GLP-1 receptor agonist.
4	A	Natural GLP-1 is broken down in about two minutes.
5	C	Doses are increased no sooner than every 4 weeks.
6	B	Zepbound and Mounjaro start at 2.5 mg weekly.
7	C	Wegovy is titrated up to 2.4 mg weekly.
8	B	The boxed warning refers to thyroid C-cell tumors seen in rodents.
9	B	Contraindicated with personal or family history of MTC or MEN 2.
10	B	Nausea, diarrhea, vomiting, and constipation are the most common.
11	B	Take it if within 4 days; otherwise skip.
12	B	Oral semaglutide needs an empty stomach, about 4 ounces of water, and a 30-minute wait.
13	A	Stay about 2 inches from the navel.
14	B	Unopened pens are refrigerated; do not freeze.
15	B	SELECT found about 20% fewer heart attacks, strokes, and cardiovascular deaths.
16	B	FLOW studied semaglutide in T2D with CKD.
17	B	SURMOUNT-5 compared tirzepatide and semaglutide 2.4 mg directly.
18	B	Placebo switchers regained about 14% in SURMOUNT-4.
19	B	Severe persistent belly pain may signal pancreatitis or gallbladder disease.
20	B	The label advises a non-oral or barrier method around starts and dose increases.
21	B	Delayed gastric emptying raises aspiration risk; tell the team.
22	A	Wegovy received an approval for MASH with F2 to F3 fibrosis.
23	B	A sick-day plan protects kidneys from dehydration.
24	B	Compounded products are not FDA-approved or reviewed.
25	A	Zepbound is also approved for moderate to severe OSA with obesity.

Quick reference: medicines by the numbers

Medicine (brand)	Route / frequency	Start	Usual max	Half-life (approx.)
Tirzepatide (Zepbound, Mounjaro)	Injection, weekly	2.5 mg	15 mg	~5 days
Semaglutide (Wegovy)	Injection, weekly	0.25 mg	2.4 mg	~7 days
Semaglutide (Ozempic)	Injection, weekly	0.25 mg	2 mg	~7 days
Oral semaglutide (Rybelsus)	Tablet, daily	3 mg	14 mg	~7 days
Oral semaglutide (Wegovy tablets)	Tablet, daily	1.5 mg	25 mg	~7 days
Liraglutide (Saxenda)	Injection, daily	0.6 mg	3.0 mg	~13 hours
Liraglutide (Victoza)	Injection, daily	0.6 mg	1.8 mg	~13 hours
Dulaglutide (Trulicity)	Injection, weekly	0.75 mg	4.5 mg	~5 days
Exenatide (Byetta)	Injection, twice daily	5 mcg	10 mcg	~2.4 hours
Exenatide ER (Bydureon BCise)	Injection, weekly	2 mg	2 mg	Extended release

Key results

Measure	Value (approx.)
SURMOUNT-1 tirzepatide 15 mg, 72 weeks	20.9% weight loss (placebo 3.1%)
STEP 1 semaglutide 2.4 mg, 68 weeks	14.9% weight loss (placebo 2.4%)
SURMOUNT-5 (head to head)	Tirzepatide 20.2% vs semaglutide 13.7%
SELECT	20% fewer major heart events
FLOW	24% lower risk of major kidney and cardiovascular events
ESSENCE (Wegovy in MASH)	MASH resolved in ~63% vs 34%
SURMOUNT-4 after stopping	About 14% regain
Protein target for many adults on treatment	About 1.2 to 1.6 g/kg/day (individualize; different in CKD and cirrhosis)
Activity goals	150 minutes aerobic per week + 2 to 3 strength sessions
Injection distance from navel	About 2 inches (5 cm)
Room-temperature storage windows	Zepbound/Mounjaro 21 days; Wegovy 28 days; Trulicity 14 days; Ozempic 56 days after first use

Values are rounded from trial reports and labels and may change with new data. A clinician or pharmacist should verify them before you rely on them.

Glossary

A1c	Blood test showing average blood glucose over about 3 months.
Agonist	A drug that activates a receptor.
Amylin	A hormone released with insulin that slows stomach emptying and increases fullness.
Aspiration	Stomach contents entering the lungs, a concern during anesthesia.
BMI	Body mass index: weight in kg divided by height in meters squared.
Boxed warning	The most serious FDA label warning.
CagriSema	Investigational weekly combination of semaglutide and cagrilintide.
CGM	Continuous glucose monitor.
CKD	Chronic kidney disease.
Compounded drug	A medicine made by a pharmacy to order; not FDA-approved.
Contraindication	A situation in which a medicine should not be used.
Dehydration	Too little body fluid; can injure the kidneys.
DPP-4	Enzyme that breaks down natural GLP-1; DPP-4 inhibitors block it.
Dulaglutide	Generic name of Trulicity.
eGFR	Estimated glomerular filtration rate: a measure of kidney function.
Exenatide	GLP-1 medicine derived from Gila monster saliva (Byetta, Bydureon).
FDA	U.S. Food and Drug Administration.
Fibrosis	Scar tissue, staged F0 to F4 in the liver.
Food noise	Constant intrusive thoughts about food; often reduced by GLP-1 medicines.
Gastric emptying	The rate at which the stomach empties food.
Gastroparesis	Delayed stomach emptying.
GIP	Glucose-dependent insulinotropic polypeptide; a gut hormone targeted by tirzepatide.
GLP-1	Glucagon-like peptide-1: a gut hormone that boosts insulin and fullness.
Glucagon	Hormone that raises blood glucose.
Half-life	Time for the drug level in blood to fall by half.
Hemoglobin A1c	See A1c.
Hypoglycemia	Low blood sugar.
Incretin	Gut hormone that stimulates insulin release after eating.
Lean mass	Muscle, organs, bone, and water; body weight without fat.
Liraglutide	Generic name of Victoza and Saxenda.
MASLD / MASH	Metabolic dysfunction-associated steatotic liver disease / steatohepatitis.
MEN 2	Multiple endocrine neoplasia type 2; a genetic syndrome linked to MTC.
MTC	Medullary thyroid carcinoma.
NAION	Non-arteritic anterior ischemic optic neuropathy; a rare optic nerve problem.
Off-label	Use of a medicine for something not listed on its label.

Orforglipron	Investigational oral GLP-1 receptor agonist.
Pancreatitis	Inflammation of the pancreas.
Placebo	An inactive treatment used for comparison in trials.
Prior authorization	Insurance approval required before a drug is covered.
Retatrutide	Investigational GIP, GLP-1, and glucagon triple agonist.
Semaglutide	Generic name of Ozempic, Wegovy, and Rybelsus.
SGLT2 inhibitor	Diabetes, heart, and kidney medicine class that lowers glucose through urine.
Steady state	When the drug level stabilizes with repeated dosing.
Subcutaneous	Under the skin.
Tirzepatide	Generic name of Zepbound and Mounjaro.
Titration	Gradual dose adjustment.
Type 2 diabetes	A condition of insulin resistance and reduced insulin secretion.
UACR	Urine albumin-to-creatinine ratio; a kidney damage marker.
Weight-loss plateau	A period when weight stops changing.

Resources and next steps

These sources offer reliable information. Please confirm website addresses and phone numbers before sharing this guide, as they can change.

Organization or tool	What it offers	Website / contact
DailyMed (U.S. National Library of Medicine)	Current official prescribing information (labels) for every medicine in this guide	dailymed.nlm.nih.gov
U.S. Food and Drug Administration (FDA)	Drug approvals, safety communications, compounding warnings, MedWatch reporting	fda.gov
National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK)	Patient information on diabetes, obesity, kidney and liver disease	niddk.nih.gov
American Diabetes Association	Diabetes standards of care and patient tools	diabetes.org
Obesity Action Coalition; Obesity Medicine Association	Patient education and clinician finder for obesity care	obesityaction.org; obesitymedicine.org
National Kidney Foundation	Kidney disease education and diet guidance	kidney.org
American Liver Foundation	Liver disease and MASLD/MASH education	liverfoundation.org
Academy of Nutrition and Dietetics	Find a registered dietitian	eatright.org
Poison Control (U.S.)	Help with accidental overdose	1-800-222-1222
988 Suicide and Crisis Lifeline	Call or text for crisis support	988
ClinicalTrials.gov	Legitimate clinical trials for new medicines	clinicaltrials.gov

Key trials mentioned (search by name)

Important: this guide was prepared without access to a live literature database. Trial names and numbers below are given from general knowledge and must be verified against the original publications and current prescribing information. Do not rely on any citation without checking it.

- Weight management: STEP 1 to 5, 8, and UP (semaglutide); SURMOUNT-1 to 5 and SURMOUNT-OSA (tirzepatide); SCALE (liraglutide); OASIS 4 (oral semaglutide); ATTAIN-1 (orforglipron); REDEFINE 1 (CagriSema).
- Heart and kidney: LEADER, SUSTAIN-6, REWIND, SELECT, SOUL, FLOW, SURPASS-CVOT, STEP-HFpEF, SUMMIT.
- Diabetes: SUSTAIN and PIONEER programs, SURPASS program.
- Liver: ESSENCE (semaglutide in MASH), SYNERGY-NASH (tirzepatide).
- Guidance: FDA labels for each product; ADA Standards of Care in Diabetes; multisociety guidance on GLP-1 medicines and anesthesia (2024).

Where to go from here

- Bring this guide and the worksheets to your next appointment.
- Ask your pharmacist to review your medicine list and demonstrate the injection device.

- Reach out to TLHF for education and community support.

Thank you for learning with TLHF

You now know more about GLP-1 medicines than most people learn: how they work, what each brand does, how to use them safely, and how they relate to your kidneys and liver. Knowledge is the beginning of good questions, and good questions lead to good care. **Health. Awareness. Hope.**

Write anything you want to remember or ask your healthcare team: