

# Patients Who Undergo Bariatric Surgery Achieve Greater Weight Loss and Lower Cardiovascular Event Rates Compared to Those on GLP-1 Medications

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## Key Findings:

- 76% of patients who undergo bariatric surgery lose at least 15% of their starting weight within a year, compared to 46% of patients prescribed tirzepatide, 30% of patients prescribed semaglutide, and 8% of patients prescribed liraglutide.
- Patients on a GLP-1 medication have higher rates of myocardial infarction (MI) and angina compared to those who have bariatric surgery.

GLP-1 medications have become increasingly popular in recent years for managing obesity.<sup>1</sup> Another obesity management treatment that has been an option for patients for decades is bariatric surgery. Bariatric surgery works by restricting or bypassing the stomach to reduce the amount of food and caloric intake the patient has following surgery.<sup>2</sup> We aimed to compare the benefits and risks of both treatment options.

We first analyzed weight change patterns in the year following initial treatment with either bariatric surgery or prescription of a weight-loss dosage of a GLP-1 medication. We matched patients based on sex, age, number of weight readings in the follow-up year, and BMI classification at the start of treatment. We found that patients who underwent bariatric surgery experienced significantly greater weight loss in the year following treatment and had lower rates of weight gain compared to those on one of the GLP-1 medications, as seen in Figure 1.

## Weight Change in Year Following Bariatric Surgery or GLP-1 Medication

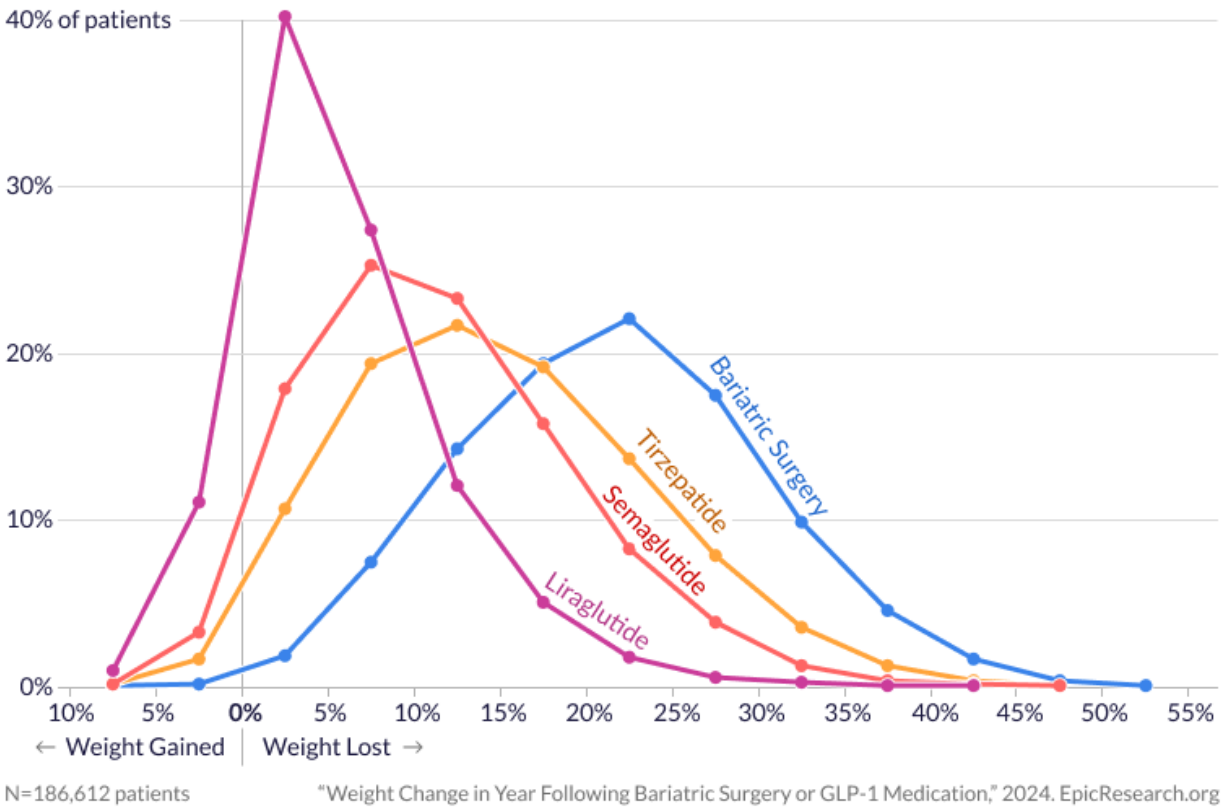


Figure 1. The percentage of patients by amount of weight change in the year following bariatric surgery or a GLP-1 medication prescription.

We further explored the proportion of patients who lost at least 15% of their starting body weight. Of patients who underwent bariatric surgery, 76% lost at least 15% of their starting body weight within one year, as seen in Figure 2. Among the patients prescribed GLP-1 medications, those who were prescribed tirzepatide experienced the greatest weight loss, with 46% losing at least 15% of their starting body weight within a year, while 30% of semaglutide patients and 8% of liraglutide patients lost at least 15% of their starting body weight.

## Proportion of Patients Who Lost at Least 15% of Their Body Weight

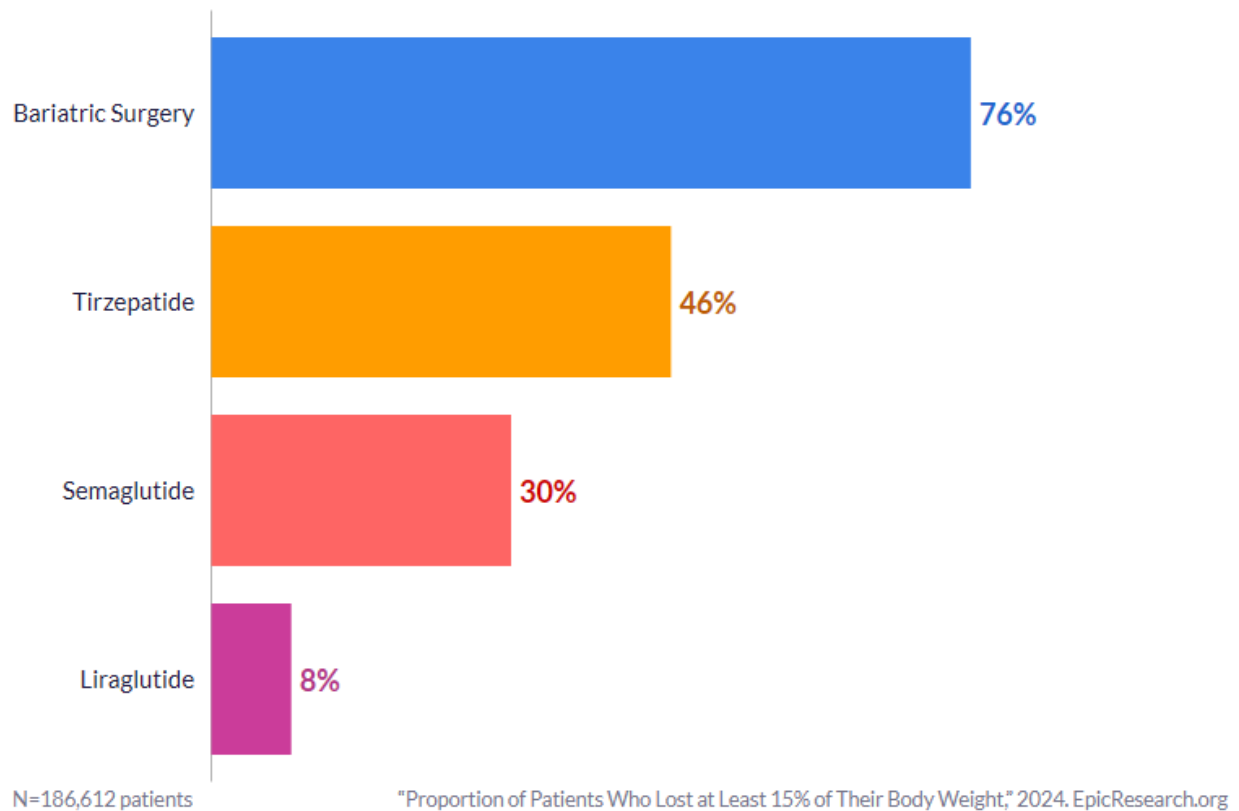
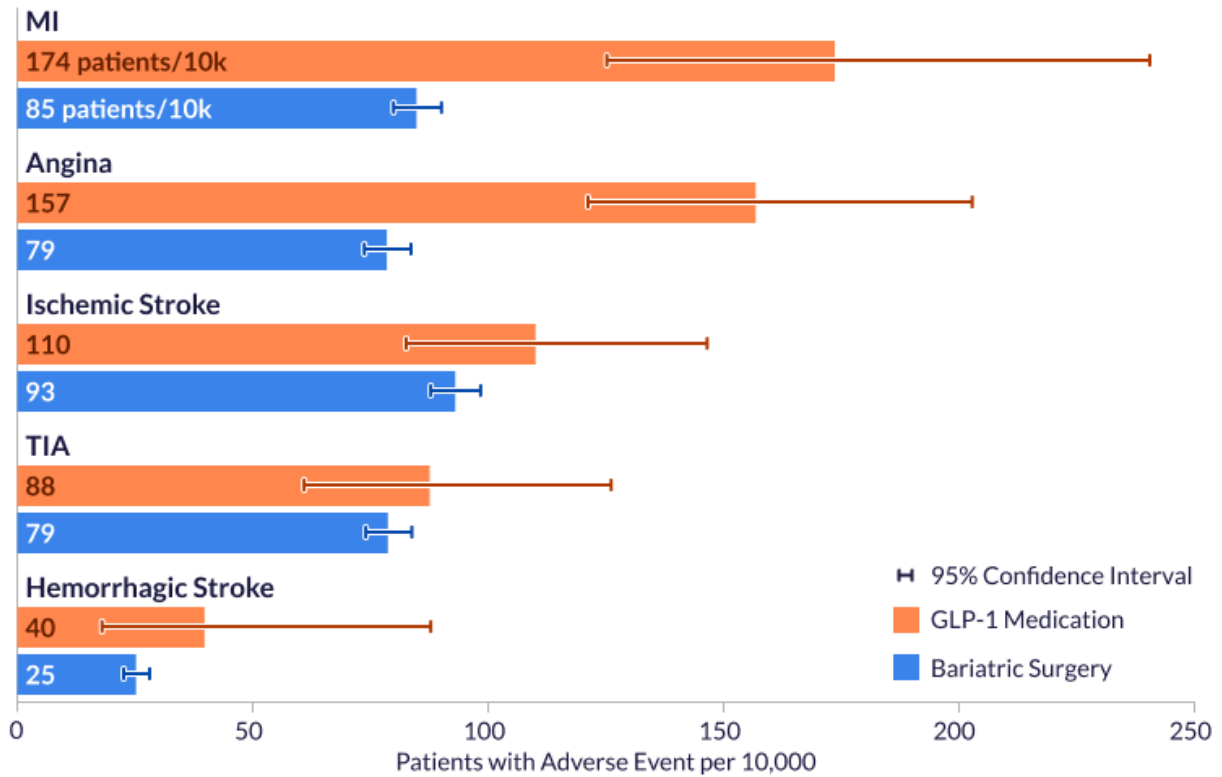


Figure 2. The proportion of patients who lost at least 15% of their body weight within a year after treatment.

We also examined the three-year prevalence of angina, transient ischemic attack (TIA), myocardial infarction (MI), ischemic stroke, and hemorrhagic stroke among 208,692 patients on any dose of a GLP-1 medication and 208,388 patients who had bariatric surgery. We matched on patient age, sex, and BMI classification.

We found that patients who were prescribed a GLP-1 medication had higher rates of angina and MI within three years, while the rates of ischemic stroke, TIA, and hemorrhagic stroke were higher but not statistically significant, as seen in Figure 3.

## Adverse Event Prevalence Three Years Following Bariatric Surgery or GLP-1 Medication



N=417,080 patients "Adverse Event Prevalence Three Years Following Bariatric Surgery or GLP-1 Medication," 2024. EpicResearch.org

Figure 3. The prevalence of MI, angina, ischemic stroke, TIA, and hemorrhagic stroke in the three years following bariatric surgery or GLP-1 medication prescription.

These data come from Cosmos, a dataset created in collaboration with a community of Epic health systems representing more than 277 million patient records from 1,500 hospitals and more than 36,000 clinics from all 50 states, Lebanon, and Saudi Arabia. This study was completed by two teams that worked independently, each composed of a clinician and research scientists. The two teams came to similar conclusions. Graphics by Brian Olson.

### References

1. Yeo YH, Rezaie A, Hsieh TYJ, et al. Shifting trends in the indication of glucagon-like peptide-1 receptor agonist prescriptions: A nationwide analysis. *Ann Intern Med.* 2024;177(9):1289-1291. doi:10.7326/m24-0019
2. Faria GR. A brief history of bariatric surgery. *Porto Biomed J.* 2017;2(3):90-92. doi:10.1016/j.pbj.2017.01.008

### Data Definitions

Term	Definition
Study period	1/1/2016 to 8/1/2023
Study population	Age 18+ at the index (time of the <b>bariatric surgery</b> or <b>GLP-1 medication</b> prescription). Weight and BMI measurements between 90 days before index

	<p>date through 30 days after the index date. BMI measurement must be at least 30.</p> <p>Exclusions:</p> <ul style="list-style-type: none"> <li>• Patients on a <b>GLP-1 medication</b> with evidence of <b>bariatric surgery</b> or <b>bariatric surgery removal/reversal</b> within a year</li> <li>• Patients with <b>bariatric surgery</b> with evidence of a <b>GLP-1 medication</b> prior to or within the year after surgery</li> <li>• Patients whose earliest bariatric surgery documentation is for a <b>removal/reversal</b></li> </ul>
<b>Follow up</b>	<p>Weight loss outcome: The lowest observed weight between 14 days after the index and one year after the index. Patients needed at least one observation in this window to be included.</p> <p>Adverse events: Bariatric surgery patients were tracked until the earliest of:</p> <ul style="list-style-type: none"> <li>• A documented bariatric surgery removal/reversal</li> <li>• Their latest outpatient, ED, or admission encounter</li> <li>• Prescription of a <b>GLP-1 medication</b></li> </ul> <p>GLP-1 patients were tracked until the earliest of:</p> <ul style="list-style-type: none"> <li>• The end of their prescription with no subsequent GLP-1 medications ordered in the following four weeks</li> <li>• Documentation of a <b>bariatric surgery</b></li> </ul>
<b>GLP-1 medication</b>	<p>Semaglutide (oral): 7mg, 14mg          Semaglutide (SubQ): 1mg, 2mg, 1.7mg, 2.4mg          Dulaglutide (SubQ): 1.5mg, 0.75mg, 3mg, 4.5mg          Exenatide (SubQ): 2mg, 0.01mg, 0.005mg          Liraglutide (SubQ): 0.6mg, 3mg          Tirzepatide (SubQ): 5mg, 10mg, 15mg</p>
<b>Bariatric surgery</b>	<p>A procedure with CPT code 43644, 43645, 43659, 43770, 43771, 43772, 43773, 43774, 43775, 43845, 43846, 43847, 43848, 43886, 43887, 43888, 43842, or 43843</p>
<b>Bariatric surgery removal/reversal</b>	<p>A procedure with CPT code 43772, 43773, 43774, 43848, 43886, 43887, or 43888</p>
<b>Outcomes</b>	<p>Myocardial infarction: ICD-10-CM code I21*, I22*, or I23*          Ischemic stroke: ICD-10-CM code I63*          Hemorrhagic stroke: ICD-10-CM code I60*, I61*, or I62*          Transient ischemic attack: ICD-10-CM code G45*          Angina: ICD-10-CM code I20*</p>

<b>Confounders</b>	Age:
	• 18-34
	• 35-49
	• 50-64
	• 65-74
	• 75+
	Legal sex: male/female
Starting BMI classification:	
• Class 1 obesity: [30 to 35)	
• Class 2 obesity: [35 to 40)	
• Class 3-1 obesity: [40 to 50)	
• Class 3-2 obesity: [50 to 60)	
• Class 3-3 obesity 60+	

**Table 1: Weight Change in Year Following Bariatric Surgery or GLP-1 Medication**

Weight Lost	Total	Total (%)	Bariatric	Bariatric (%)	liraglutide	liraglutide (%)
[-10, -5)	303	0.4%	16	0%	199	1%
[-5, 0)	3163	4.1%	47	0%	2158	11%
[0, 5)	13728	17.7%	374	2%	7793	40%
[5, 10)	15443	19.9%	1462	8%	5313	27%
[10, 15)	13840	17.8%	2770	14%	2347	12%
[15, 20)	11534	14.9%	3761	19%	982	5%
[20, 25)	8911	11.5%	4288	22%	350	2%
[25, 30)	5824	7.5%	3403	18%	123	1%
[30, 35)	2938	3.8%	1929	10%	53	0%
[35, 40)	1246	1.6%	895	5%	20	0%
[40, 45)	449	0.6%	335	2%	13	0%
[45, 50)	116	0.1%	84	0%	-	-
[50, 55)	30	0.0%	18	0%	-	-
[55, 60)	11	0.0%	-	-	-	-

Weight Lost	Total	Total (%)	semaglutide	semaglutide (%)	tirzepatide	tirzepatide (%)
[-10, -5)	303	0.4%	45	0%	43	0%
[-5, 0)	3163	4.1%	637	3%	321	2%
[0, 5)	13728	17.7%	3477	18%	2084	11%
[5, 10)	15443	19.9%	4902	25%	3766	19%
[10, 15)	13840	17.8%	4516	23%	4207	22%
[15, 20)	11534	14.9%	3061	16%	3730	19%
[20, 25)	8911	11.5%	1608	8%	2665	14%

[25, 30)	5824	7.5%	764	4%	1534	8%
[30, 35)	2938	3.8%	254	1%	702	4%
[35, 40)	1246	1.6%	81	0%	250	1%
[40, 45)	449	0.6%	30	0%	71	0%
[45, 50)	116	0.1%	11	0%	17	0%
[50, 55)	30	0.0%	-	-	-	-
[55, 60)	11	0.0%	-	-	-	-

**Table 2: Proportion of Patients Who Lost at Least 15% of Their Body Weight**

Overall	40%
Bariatric	76%
Tirzepatide	46%
Semaglutide	30%
Liraglutide	8%

**Table 3: Adverse Event Prevalence Three Years Following Bariatric Surgery or GLP-1 Medication**

Event	Patients/10k	95% CI Low	95% CI High
MI GLP-1	173.6	125.2	240.5
MI Bariatric Surg.	84.8	79.9	90.1
Angina GLP-1	156.8	121.2	202.8
Angina Bariatric Surg.	78.5	73.7	83.6
Ischemic Stroke GLP-1	110.1	82.6	146.5
Ischemic Stroke Bariatric Surg.	93.0	87.8	98.4
TIA GLP-1	87.6	60.9	126.1
TIA Bariatric Surg.	78.7	74.0	83.8
Hemorrhagic Stroke GLP-1	39.8	18.0	87.8
Hemorrhagic Stroke Bariatric Surg.	25.2	22.6	28.1