

Impact of Roux-en-Y Gastric Bypass and Sleeve Gastrectomy Bariatric Procedures on US Healthcare Cost

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Introduction

While the efficacy of bariatric surgery has been well studied, the economics are less understood. With the emergence of new medical therapies, the objective of this study was to quantify the economic impact of Roux-en-Y gastric bypass (RYGB) and sleeve gastrectomy (SG) procedures on US healthcare.

Methods & Analysis

A literature review and meta-analysis were performed utilizing Ovid Medline. Of 135 total articles, 52 articles containing 116,610 patients met the inclusion criteria for this meta-analysis. Mean BMI, DM population prevalence, and HTN prevalence were evaluated at baseline and annually postoperatively. Annual costs, quality-adjusted life years (QALYs), and incremental cost-effectiveness ratios (ICERs) were assessed post-operatively per Second Panel on Cost-Effectiveness in Health and Medicine recommendations.

Gastric Bypass (Roux-en-Y) vs Vertical Sleeve Gastrectomy

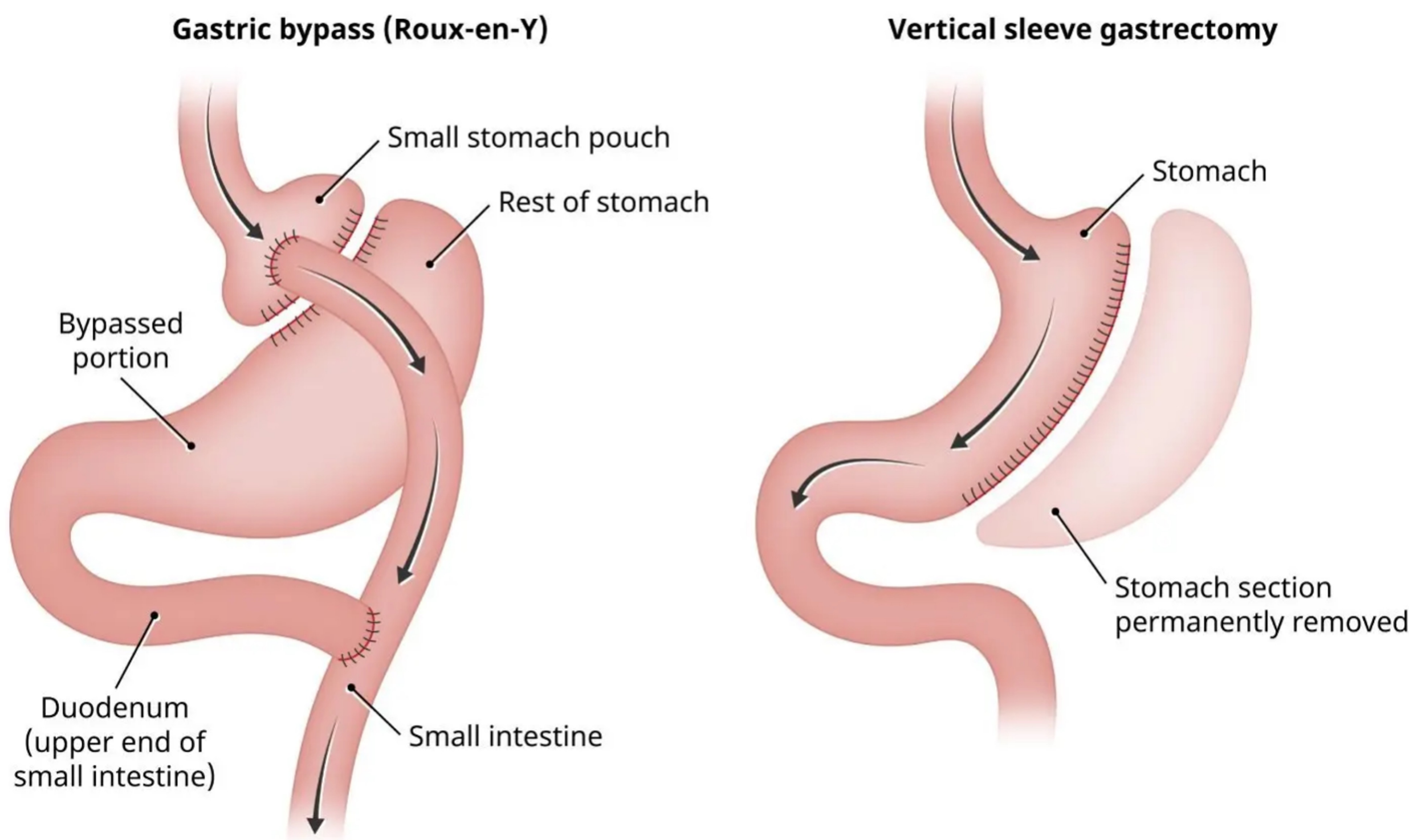


Table 1: Obesity-associated Healthcare Cost and Utility Outcomes

Post-operative Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BMI (kg/m2)																					
RYGB	48.8	33.8	29.3	35.0	30.8	35.7	33.1	32.4	33.2	32.9	33.3	31.6	35.2	33.8	32.5	31.1	31.2	31.2	31.3	31.3	31.4
Sleeve	48.7	34.6	31.0	38.2	32.3	37.6	39.2	37.1	37.3	37.6	37.8										
Control	41.6	36.1	37.9	39.2	40.5	43.3	46.1	39.2	40.5	39.2	40.3	39.2	44.5	43.0	41.5	40.0	39.9	39.9	39.8	39.8	39.7
Annual Per-person Comorbidity Expense (USD)																					
RYGB	1,249	626	1,410	837	1,510	1,156	1,061	1,160	1,119	1,176	1,316	1,912	1,688	1,464	1,241	1,250	1,260	1,270	1,280	1,290	
Sleeve	1,354	855	1,862	1,037	1,781	1,995	1,707	1,739	1,772	1,804											
Control	1,574	1,811	1,995	2,179	2,565	2,951	1,995	2,179	1,995	2,151	2,563	3,428	3,185	2,942	2,699	2,689	2,679	2,669	2,659	2,649	
Incremental utility																					
RYGB	0.080	0.103	0.073	0.095	0.070	0.083	0.087	0.083	0.085	0.082	0.091	0.072	0.079	0.087	0.094	0.094	0.093	0.093	0.093	0.092	
Sleeve	0.075	0.094	0.056	0.087	0.059	0.051	0.062	0.061	0.059	0.058											
Control	0.029	0.020	0.013	0.006	-0.009	-0.024	0.013	0.006	0.013	0.007	0.013	-0.015	-0.007	0.001	0.009	0.009	0.009	0.010	0.010	0.010	

Table 2: Type 2 Diabetes Associated Healthcare Cost and Utility Outcomes

Post-operative Year	0	1	2	3	4	5	6	7	8	9	10	11	12
DM Prevalence (%)													
RYGB	32.0	9.2	4.8	9.4	9.6	8.6	10.6	17.6	16.9	16.1	15.3	14.0	12.7
Sleeve	33.7	12.9	13.4	16.5	20.0	9.2	14.9	20.7	22.3	24.0	25.6		
Control	27.6	28.9	30.2	31.9	33.6	35.4	37.1	38.2	39.3	40.4	41.5	42.6	43.7
Annual Population Average Comorbidity Expense (USD)													
RYGB	676	334	766	704	704	777	1,293	1,236	1,179	1,122	953	982	
Sleeve	947	984	1,346	1,466	749	1,216	1,683	1,818	1,953	2,087			
Control	2,354	2,461	2,601	3,360	3,532	3,704	3,111	3,924	3,291	4,144	3,303	3,959	
Incremental utility													
RYGB	0.124	0.237	0.124	0.124	0.125	0.123	0.116	0.117	0.117	0.118	0.119	0.121	
Sleeve	0.122	0.121	0.118	0.115	0.125	0.120	0.114	0.113	0.111	0.109			
Control	0.102	0.101	0.099	-0.004	-0.006	-0.007	0.093	-0.008	0.091	-0.010	0.089	-0.012	

Table 3: Hypertension Associated Healthcare Cost and Utility Outcomes

Post-operative Year	0	1	2	3	4	5	6	7	8	9	10	11	12
HTN Prevalence (%)													
RYGB	54.6	18.8	22.3	24.6	20.4	29.9	33.9	36.7	39.6	42.5	51.9	44.0	36.1
Sleeve	53.5	31.3	32.5	31.8	32.9	35.0	41.5	47.9	54.4	60.9	67.3		
Control	46.9	50.5	54.1	55.1	56.1	57.0	58.0	59.1	60.2	61.3	62.4	63.5	64.6
Annual Comorbidity Expenses (USD)													
RYGB	198	234	259	215	314	356	386	417	447	545	462	379	
Sleeve	329	341	335	346	368	436	504	572	640	708			
Control	531	568	579	589	600	610	621	633	644	656	667	679	
Incremental utility													
RYGB	0.021	0.019	0.018	0.020	0.015	0.012	0.011	0.009	0.007	0.002	0.006	0.011	
Sleeve	0.013	0.013	0.013	0.012	0.011	0.007	0.003	-0.001	-0.004	-0.008			
Control	-0.002	-0.004	-0.005	-0.006	-0.006	-0.007	-0.007	-0.008	-0.009	-0.009	-0.010	-0.011	

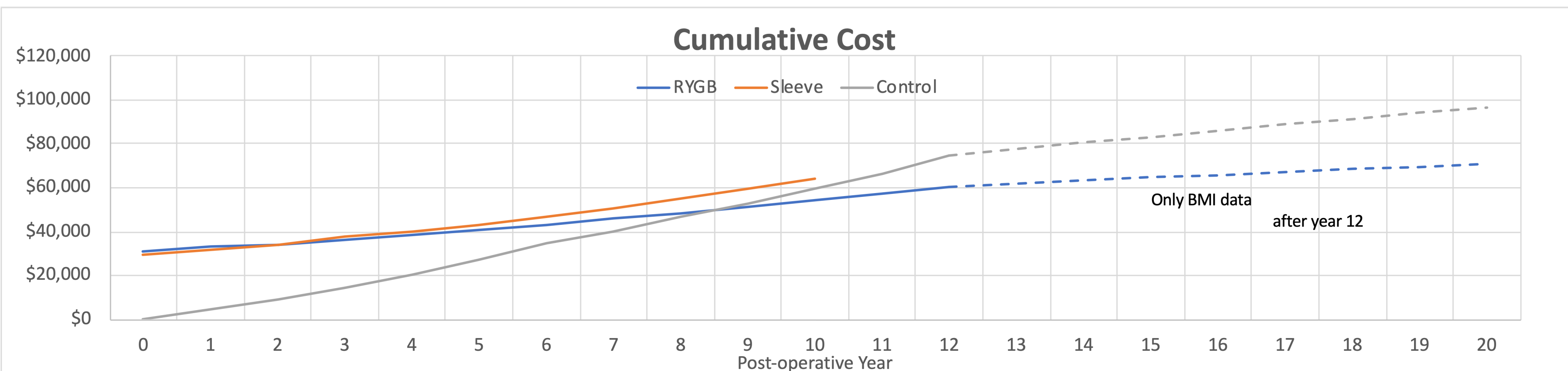
Table 4: Cost-Utility Outcomes

	10 Years	12 Years	20 Years
Comorbidity-associated cost			
RYGB			
Obesity	\$11,303	\$14,532	\$25,275
T2DM	\$8,791	\$10,726	
HTN	\$3,372	\$4,213	
Net cost	\$23,466	\$29,471	
Sleeve			
Obesity	\$15,906		
T2DM	\$14,248		
HTN	\$4,579		
Net cost	\$34,733		
Control			
Obesity	\$21,396	\$27,388	\$49,559
T2DM	\$32,480	\$39,743	
HTN	\$6,031	\$7,377	
Net cost	\$59,907	\$74,507	

	10 Years	12 Years	20 Years
Comorbidity-associated Utility Gain			
RYGB			
Obesity	0.84	1.01	1.73
T2DM	1.32	1.56	
HTN	0.14	0.15	
Net gain	2.30	2.72	
Sleeve			
Obesity	0.66		
T2DM	1.17		
HTN	0.06		
Net gain	1.89		
Control			
Obesity	0.07	0.07	0.12
T2DM	0.45	0.53	
HTN	-0.06	-0.08	
Net gain	0.46	0.52	

	10 Years	12 Years
Incremental Cost-effectiveness Ratio (ICER)		
RYGB	-\$3,047.50	-\$6,436.77
Sleeve	\$2,791.07	

ICER Equation:
Cost of Surgery + Comorbidity-Associated Costs (Surgery-Control)
Comorbidity-Associated Utility Gain (Surgery-Control)



Results

Greater reductions in DM prevalence were appreciated with RYGB (-12.3%) and SG (-10.5%) when compared with medical regimens (+12.8%) at ten years post-operatively. Analysis of annual population spending identified a point of cost neutralization following the seven-year post-operative mark, in which compounded costs of surgery and medical interventions equated. Incremental QALY gains were appreciated following RYGB (2.65) and SG (2.17) at ten years postoperatively. Both RYGB (-\$4,040/QALY) and SG (\$622/QALY) demonstrated a cost-effective ICER at a ten-year follow-up.

Conclusion

The results of this analysis demonstrate the significant and lasting impact bariatric surgery has on the reduction of obesity-related comorbidities such as type-2 diabetes. Additionally, using the Cost-Utility Analysis method, it shows that with the reduction of these comorbidities, bariatric surgery is not only cost neutral at seven years, but also a significantly cost-effective tool for lowering comorbidity related healthcare costs.